DISLOCATIONS AND FRACTURES

OF THE

CLAVICLE AND SHOULDER-JOINT.
"Ex quattuor autem locis, in quibus legis et naturam vimque divisimus, primus ille, qui in veri cognitio[n]s consistit, maxime naturam attingit humanam. Omnes enim trahimur, et ducimus ad cognitiones evadentiae cupiduntem; in qua excellere pulchrum putamus; labi autem errare, noscire decipi, et malum, et turpe dicemus."

CICERO DE OFFICIIS, Caput V.
A DISSERTATION
UPON
DISLOCATIONS AND FRACTURES
OF THE
CLAVICLE AND SHOULDER-JOINT.

BEING
THE JACKSONIAN PRIZE ESSAY FOR 1846.

BY
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DEMONSTRATOR OF ANATOMY TO GUY'S HOSPITAL, ETC. ETC. ETC.

LONDON:
SAMUEL HIGHLEY, 32, FLEET STREET.
1849.
THIS ESSAY,
THE FIRST FRUITS OF PROFESSIONAL STUDIES, PURSUED
UNDER THEIR GUIDANCE AND TEACHING,
IS RESPECTFULLY INSCRIBED

to
CHARLES ASTON KEY, Esq.,
BRANSBY B. COOPER, Esq., F.R.S.,
EDWARD COCK, Esq.,
JOHN HILTON, Esq., F.R.S.,
THE SURGEONS OF GUY'S HOSPITAL,

AS
A TRIBUTE IN ADMIRATION OF THEIR SKILL AND EXPERIENCE
AS SURGEONS, THEIR ACCURACY AND LEARNING AS
ANATOMISTS, AND THEIR GENERAL
SCIENTIFIC ACQUISITIONS;
 ALSO
IN ACKNOWLEDGMENT OF MANY OBLIGATIONS TO THEM FOR
THEIR CARE, KINDNESS, AND COURTESY,

BY THEIR FAITHFUL SERVANT,
THE AUTHOR.

WELLINGTON STREET, LONDON BRIDGE;
MARCH 1849.
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INTRODUCTION.

The adjoined Table of Contents will give some idea of the view I have taken of my subject, and of the course which I purpose pursuing in its examination. It is a field which has been gleaned by preceding surgeons of great renown and intelligence, with diligent hand and scrutinising eye. To reach truth or certainty in such an intricate subject, demands a watchful attention and abundant opportunities, and that, through no inconsiderable portion of time. This circumstance will, I fear, nearly preclude any expectation or hope, upon my part, that I should be able to throw a new light upon any known subject, or to bring any new fact to the test of past experience. It has occurred to me, however, that the injury that the longer head of the biceps occasionally suffers in connexion with dislocation and other injuries to the shoulder-joint, has not met with that attention or consideration that their intimate relation would seem to have demanded; and having met with several injuries to this articulation, of whose actual nature, and consequently, of whose proper treatment I was ignorant, I was induced to consider the subject with some attention, the more so
as the peculiarity and importance of the injury, with reference to dislocation, had been much insisted upon by my friend Mr. John Hilton, and also by Mr. G. Soden, jun., of Bath.

Of fractures of the neck of the scapula I was entirely ignorant; the existence of such an injury was conjectured only by some to be a possibility, spoken of with certainty by others as a frequent accident, and admitted by all to be a grave and serious injury. Here again was much to interest: while the importance of any mischief, whether lesion or displacement, to the head of the humerus was palpable and obvious.

In the "anatomical sketch" I have avoided, as much as possible, all minute detail, which, from being well known, would become prolix, and have confined my attention more to surgical and regional than to transcendental anatomy, only departing from this rule when I had any particular theory to illustrate or to maintain. Such a course, it appeared to me, would be most in accordance with the intended object of the present essay. I have selected from various sources such cases as would illustrate most fully and completely each kind of accident that I have described, giving a preference, however, to those which have come under my own immediate observation, and which I have reported myself; the others are verbatim copies. Preparations, I need hardly observe, are necessarily few; the advance of professional knowledge, joined to the rare opportunities of making a post-mortem ex-
amination of any articulation, are, I think, explanatory causes. I have therefore been obliged to collect from the dissecting-room what few specimens I might find, and my endeavours even here have not been so satisfactory as I could have wished, and had anticipated. To the museums of various hospitals I am indebted for the description of some of the rarer accidents. In conclusion, I have availed myself of the recorded experience and opinions of the best authorities confirmatory or otherwise of any practice I may have advocated, with the hope that by contrasting my humble perceptions with their more matured opinions, I should either have my views strengthened or my judgment corrected, and thus ascertain the best methods of treatment. Still I have not scrupled sometimes to express an unequivocal opinion, in extenuation and defence of which boldness I may quote the words of the great Mr. Locke: "The floating of other men's opinions in our brains makes us not one jot the more knowing, though they happen to be true; and beaten tracks lead those whose thoughts reach only to imitation. Non quo eundem est, sed quo itur."

I conceived it to be due to the Royal College of Surgeons, as the fountain and head of surgical honours and talent, that the Jacksonian Prize for 1846 should be printed. With a few trifling alterations and inconsiderable additions, it is now presented precisely as it was submitted to the Committee for approval, and only claims to be considered as an Essay. I am, moreover, quite unaware of any reason why a young man
should be forgetful of that *diva sententia* of Pliny, whose truth, unfortunately, has been but too often a matter of sad experience to many: "Neque cuiquam tam statim clarum ingenium est, ut possit emergere, nisi illi materia, occasio, fautor, etiam commendatorque contingat."*

* Plin., Epist.
THE SHOULDER-JOINT,
&c. &c.

THE BONES.

As a perfect understanding of our subject depends upon a clear and precise knowledge of that part of the body, concerning whose injuries we are about to treat, and as their features and treatment derive importance from a correct idea of the structures implicated, I have not hesitated to enter upon the subject with an anatomical sketch of the component parts, and, if possible, thus, by showing "how parts relate to parts, and these to whole," to start with certain praeognita.

Perhaps, in the whole human body, there is no one part calculated to awaken in an observer's mind so great a feeling of admiration and interest as the upper extremity; its manifold powers and tactile delicacy in human, and its ingenious modifications in comparative anatomy, have been the theme of respectful eulogy of many writers. The accomplished mind of Sir C. Bell, in his masterly treatise on the Hand, has offered an elegant tribute to the Creator's praise, and left a lasting monument of his own industry and talent; he speaks in unbounded admiration of his subject, indeed considers the mode of demonstrating the muscles of the human hand and arm "as no mean test of the perfec-
tion of a Teacher:” it is little wonder, then, he himself excelled in such a topic, and less, that I approach a part of it with hesitation and diffidence.

I shall only speak of the lightness of the bones of the upper extremity in comparison with the lower, as evidencing its intended adaptation alike to celerity and nicety, as to force, and precision of action, whereby we are enabled to perform any acts, or practice any ingenuity, that the mind may suggest; its freedom and extent of motion point also to this, for if the hand be placed in a supine position, with its palm directed upwards, by employing the whole member, that is, the scapulo-humeral, and radio-ulnar articulations, and by rotating it inwards, it may be made to describe a complete circle, and the palm be again brought upwards. As proof of its power, it is stated by Dr. N. Arnott, in his work on Physics, that the muscles of the shoulder-joint, in the exertion of lifting a man upon the hand, pull with a force of 2000 lbs. The practice of our own profession affords abundant proof of its delicacy and accuracy; even amongst the old Hindoos the hand ranked as “the first, best, and most important of all surgical implements.” I hardly know any enumeration of the capabilities of the hand more admirable, feeling, and concise than that of Galen (De usu Partum): “With this he weaves the garment that protects from the summer’s heat, and the winter’s cold; with this he forms the various furniture of nets and snares, which give him dominion over the inhabitants, as well of the water, as of the air and the earth; with his hand he constructs the lyre and lute, and the numerous instruments
employed in the several arts of life; with the hand he erects altars and shrines to the immortal gods; and lastly, by means of the same instrument, he bequeaths to posterity, in writing, the intellectual treasures of his own divine imagination; and hence we, who are living at this day, are enabled to hold converse with Plato and Aristotle, and all the venerable sages of antiquity.”

The bones of which we shall have to speak will be those of the shoulder, viz., the Scapula, Clavicle, and Humerus, or Os brachii.

Upon commencing a description of the anatomy of the shoulder-joint, it appeared to me most correct to give each structure separately, and, beginning with the bones, to build, as it were, the superjacent structures upon them; and I was not the less confirmed in my opinion by the fact of the bones being, in our intended subject, the principal objects of our attention.

**Scapula.**—The scapula, one of the broad or flat bones, is placed at the posterior and lateral part of the thorax, and extends from the first to the seventh rib; it is embedded in and surrounded by muscles, which converge towards it from all sides, and influence it in all the movements of the extremity. In form, it is asymmetrical, and presents for our notice two surfaces,—a dorsal, posterior, or superficial, and a costal, anterior, or ventral one. It has three sides, or costae, —anterior, posterior, and superior; three angles,—an internal, inferior, and anterior or glenoid; three processes,—the spinous, acromion, and coracoid; and two

* J. Kidd, M.D., Bridgewater Treatise.
articulatory surfaces,—the acromio-clavicular and the glenoid. The ventral aspect of the bone is concave, and is called the subscapular fossa, from its giving origin to that muscle; indeed, it is usually marked by two or three ridges, running from the glenoid angle, downwards and backwards, formed by its action: these the older anatomists thought were caused by the action of the ribs,—a thing clearly impossible, as the two are in no way parallel. At the internal angle of the same surface is a smooth space, to which is attached the superior portion of the serratus magnus muscle. The dorsal aspect is divided into two principal portions by the spinous process, which, lending its name to either, and dividing the bone unequally, enables us to distinguish the supra- and infra-spinatæ fossæ,—the former comprising one and the latter about three-fourths of the bone: these are both filled up by muscles, each in like manner called supra- and infra-spinatus. The superior border, or costa, is thin and somewhat concave, terminated at one extremity by the internal angle, at the other by the coracoid process; it has intermediately a notch, converted into a foramen in the fresh bone by ligament, through which the supra-scapular nerve passes, separated from its corresponding artery by the ligament itself.

The anterior costa commences at the inferior border of the glenoid cavity, and becomes lost in the inferior angle; it is the thickest of the three, concave in its outline, and gives origin from a rough depression immediately below the glenoid cavity to the longest head of the triceps, more inferiorly, and rather to its ventral aspect, by a bony sulcus, to the teres major, and from
a rough ridge below the origin of the triceps to the teres minor.

The posterior costa, called also "the base," is the longest of the three, and extends from the inferior to the internal angle, at one fourth of the length of the bone from which, and on its dorsal aspect, there is a small, smooth, triangular space, over which, though separated by a bursa, the trapezius plays, and from whence the spine commences. This latter, increasing in size, and gradually augmenting in depth and breadth, suddenly leaves the body of the bone, and spreads itself into a broad, flat, and rough process, which, beetling over the glenoid cavity (though separated from it by a deep notch), forms the acromion process. The process is slightly curved in form, its upper surface, which is subcutaneous, forming the apex of the shoulder, is rough, and being continuous with the spine, its aspect is rather backwards; the under surface is smooth and somewhat concave, and having precisely an opposite direction to its upper surface, it protects the glenoid cavity where it would otherwise be most exposed to injury, viz., from above and behind: upon that edge of the process which looks forwards and inwards, there is a smooth ovoid horizontal facette, usually a quarter of an inch in length, where the clavicle and scapula articulate; its external margin rough for muscular attachment. The spine has the deltoid and trapezius muscles respectively attached along its upper and under rough edges. The acromion process is one of the three parts which may be said to enter into the composition of the anterior angle of the bone; the other two, which more truly
constitute the angle, are the coracoid process, and the glenoid cavity. The bone at this part appears much thickened, and is frequently spoken of as the neck; it shows upon its anterior aspect a smooth, shallow, concave, oval surface, having its axis from above downwards: this, which looks forwards and outwards, is the glenoid cavity; it is surmounted, rather anteriorly, by a rough longish portion of the bone, resembling the little finger when semiflexed, which is known as the coracoid process, from some fancied resemblance to a raven's beak; it passes under the clavicle, and stands out slightly in advance of the glenoid cavity; its concavity looks backwards and downwards, so as to protect the articulation in front. These two processes have, posteriorly and internally, two constrictions,—the one the proper notch of the scapula, with its nerve and artery, on the superior costa, and the other that deep, curved sulcus which separates the acromion, or spine, from the glenoid cavity, they thus give the anterior angle the appearance of being somewhat contracted, and this is known, surgically, as the neck of the scapula. The internal angle resembles a right angle, whilst the inferior, acute in its inclination, is marked internally by the origins of the serratus magnus, and externally has a smooth surface, from which occasionally arise some accessory fibres of the latissimus dorsi.

The object of the scapula, with reference to the upper extremity, is clearly to give origin to the muscles of the shoulder, independently of the ribs, for the necessity would, without doubt, oftentimes occur of the muscles of the shoulders being put into vigorous action.
at the same time that the respiration was actively going on and the ribs in full play; it would not, therefore, be possible for the two actions to occur simultaneously, and antagonism would necessarily take place.

Besides the connexion of this bone with the muscles of the shoulder and arm, we find it fulfilling a very important office, and playing a very prominent part in the respiratory functions,—it is most materially employed in forced respiration. Tolerable evidence of its necessity in reference to this system, is given in a case mentioned by Sir C. Bell, of a boy born without arms, but who, nevertheless, had both clavicles and scapula. "It is," he says, "the centre and point d'appui of the muscles of respiration." It certainly plays a very important part in that function.

I cannot omit to notice the very careful and ingenuous investigations made by my friend, Mr. F. O. Ward, on the vertical actions of the scapula, showing the persistence of a law hitherto unnoticed, viz., that "each fossa has its greatest depth opposite a certain central point, and consequently the thickest part of each muscle lies in that precise position in which it can operate most effectively on the head of the humerus."*

Ossification of the body of this bone usually, according to Quain, commences about the eighth week from the time of conception, gradually spreading to the processes. Ossific granules are first visible in the coracoid process, which, giving origin to the biceps and coracobrachialis muscles, requires some greater solidity to favour the purchase of the muscles of the arm.

* Human Osteology, p. 276.
THE CLAVICLE.—The clavicle is one of a pair of long and somewhat cylindrical bones, placed at the upper and anterior part of either half of the thorax; its direction is horizontal, between the sternum and the acromion process of the scapula. It presents two curves in its course, that which is nearer the sternal end is the larger of the two, and presents its convexity anteriorly, the external and smaller one has its concavity forwards; the degree of these curves varies with the sex. In the male they are well marked, but in the female much less developed. The bone in the latter sex is said by Cruveilhier, and other anatomists, to be longer than in the male; as far as my own observation goes, I have not found such to be the case. Out of fourteen skeletons in the museum of Guy’s Hospital, five of which were female and nine male, the respective lengths were:

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<td>5½</td>
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<td>4</td>
<td>6½</td>
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<td>4½</td>
<td>5½</td>
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Besides the two curves above mentioned, we may observe that the bone appears twisted, so that, in a well-marked subject, the upper surface of the acromion end of the bone appears to begin at the anterior part of the greater or sternal curve, and its under surface, if it be traced inwards, will soon be found to have a backward aspect. I prefer, in describing it, to divide the bone into two portions: an external and flat, and an internal
and quadrangular portion; the former has a superior and an inferior surface for our consideration, with anterior, posterior, and external borders; the superior surface is more commonly flat, sometimes concave from side to side, at others convex from before to behind; sometimes tuberculated, or else perforated by small nutrient foramina; the inferior surface is irregular, and perforated by numerous foramina; towards its posterior border is a tubercle for the conoid ligament, and running outwards and forwards is a rough ridge for the trapezoid ligament, and immediately internal to these is a well-marked sulcus for the subclavian muscle. The two surfaces are separated from each other anteriorly by an acute, rough, concave edge, and posteriorly by a thick, convex one: these both become lost as they are traced inwards about the centre of the bone. The external border begins at right angles to the commencement of the anterior margin, and describing a tolerably accurate semicircle, whose convexity looks outwards, it gradually becomes lost in the posterior border; it is thick and cellular, and towards its commencement is found an oval articulating facette, where the bone is in relation with the scapula. The centre portion of the bone is prismatic in form, and convex anteriorly, its posterior border being the thicker. A foramen for the principal nutritious artery of the bone is observable at this point, on its under surface. As we trace the bone from its centre, it gradually becomes quadrangular in form; superiorly it has an impression made by the sterno-cleido-mastoideus muscle, its posterior surface is smooth, concave, and triangular; inferiorly we ob-
serve a rough impression for the rhomboid ligament, and anteriorly the bone is convex and rough, for the attachment of the pectoralis major muscle. Its internal extremity, where it articulates with the sternum, is triangular in form. The general direction of its surface is downwards, inwards, and forwards; it is slightly convex from above downwards, and as much concave from before to behind; the apex of the triangle is directed backwards and downwards, and upon its inferior lip is often observed an articulatory surface, through which the bone moves on the first rib. Ossification begins in this bone very early, about the thirtieth day; its structure is cellular, although a medullary canal, more or less developed, is commonly found about its centre. The greater or less development of its curves varies with the extent to which the extremity has been employed,—their alternation must necessarily increase the elasticity of the bone, by decomposing any violence applied to the shoulder. Mr. F. O. Ward gives some experiments on its elasticity, "from which," he says, "we may infer, in general terms, that the clavicle possesses sufficient longitudinal elastic force to throw its own weight nearly two feet on a level surface; and sufficient transverse elastic force, opposite the centre of its anterior convexity, to raise its own weight about one foot vertically."* The clavicle is of the utmost importance to the upper extremity; for, besides acting mechanically, and thereby preventing the shoulder from being drawn forwards by

the pectoral muscles; upon its presence, perfection, or integrity, depends in a great measure the degree of motion and power enjoyed by the arm. Comparative anatomy most fully illustrates this: it is perfectly developed in those mammals that dig, burrow, or climb; so also in the rodentia; in the carnivora, who rotate and strike with the paw, it is not so perfect; while in the ruminantia and pachydermata, among which the anterior extremity is used alone in progression, the bone is not present: the reason for this arrangement is clearly shown by Sir C. Bell, for as the horse, in leaping, springs from his hind-legs, and alights upon his fore-legs, he would, had he clavicle, most certainly fracture or dislocate it, every bound he made: to obviate this, "the fore-hand" is slung, as it were, and entirely attached to the trunk by the serratus magnus muscle. We shall find hereafter that in man, under peculiar circumstances, as when the weight of the body is unexpectedly thrown on the anterior extremity in falling, fracture of the clavicle is not uncommon.

The Humerus—a long cylindrical bone, presents also for examination a body and two extremities, the upper of which is smooth, rounded, and known as the head; the body of the bone has a peculiar appearance of having been twisted one quarter round, that is, if the upper portion were fixed, and the bone put straight, the depression for the olecranon process of the ulna would look towards the side. The posterior surface of the body is smooth, and covered by the triceps muscle externally; at the junction of the upper
Humerus.

and middle thirds of the bone, we observe a V-shaped muscular impression, answering to the insertion of the deltoid and origins of the brachialis anticus, and below this, curving round from the posterior part we see a shallow groove for the superior profunda artery, and musculo-spiral nerve. The inner side is smooth above, and rough in its centre for the coraco-brachialis, the foramen for the nutritious artery running from above downwards, is here to be observed. The head of the humerus presents at its extremity a spheroidal eminence, forming about one third or one fourth of a sphere, which is directed upwards, backwards, and inwards, and articulates with the glenoid cavity of the scapula. It is surrounded by a rough eminence to which the capsular ligament is attached, and which marks the anatomical neck of the bone; on the anterior and external surface of the head are two eminences, the greater and lesser tubercles; these are separated by a sulcus, called the bicipital groove, from its receiving and lodging the long head of the biceps. The greater tubercle has three articulatory facettes: one on its superior part, for the tendon of the supra-spinatus; the second and third, more posteriorly, for the infra-spinatus and teres minor tendons respectively. To the lesser tubercle is attached the tendon of the subscapularis; the bone now becomes constricted, and that part below the tubercle where the body joins the head is called the surgical neck.—The lower extremity of the bone is much flatter from before backwards, the transverse diameter being to its antero-posterior as four to one; at its end there is a smooth rounded articulating
HUMERUS.

surface, divided by an eminence into two parts: the external one allows of a ginglymoid and rotatory motion of the radius; the other, which is larger, and called the trochlea, articulates with the ulna; it has a depression above on the anterior surface of the bone for the coronoid process of the ulna, whilst posteriorly it is surmounted by a much deeper one for the olecranon. There are two prominences, one on either side of this surface, which we know as condyles; they serve for the attachment of the ligaments of the elbow-joint and muscles of the fore-arm; the external, smaller than its fellow, has a rough ridge, running upon the shaft of the bone, for about one third of its extent, whilst above the larger internal one, the ridge is less prominently developed. The motion which the humerus enjoys with the scapula is greater than that of any other bone in the body; its peculiar feature is that of a most complete circumduction, that is, the humerus can describe a cone of any magnitude, whose apex shall be at the glenoid cavity of the scapula, and whose base shall be determined by the hand: this, of course, includes every kind of movement.
THE LIGAMENTS.

STERNO-CLAVICULAR ARTICULATION.

Class Diarthrosis—Subdivision Arthrodia.

The ligaments at the sterno-clavicular articulation are of two kinds: those immediately entering into the structure of the joint, as the anterior and posterior, with an inter-articular cartilage, and two synovial membranes; and those which are accessory to the strength of the parts, but are true ligaments of the clavicle, as the inter-clavicular and costo-clavicular.

The anterior.—The anterior sterno-clavicular ligament is composed of a broad band of tendinous fibres, which arise, as it were, from the clavicle, and run downwards and inwards to the first bone of the sternum, covering its anterior surface, and decussating with the corresponding ligament of the opposite side.

The posterior—not so well developed as the anterior, but of similar figure, takes a like course over the posterior aspect of the two bones; it is in relation, posteriorly, with the sterno-hyoideus and thyroideus muscles. If the anterior part of the sternal end of the clavicle and the first bone of the sternum be removed by a perpendicular section with the saw, the inter-articular fibro-cartilage will be brought into view; it is a flat cartilaginous plate, circular in outline, but, like the intervertebral substance of the spine, thick at its margins, and gradually becoming thin towards the centre; it is attached above to the clavicle, and below to the cartilage of the first rib, and is prolonged under the inferior border of the clavicle. Its edge presenting diagonally forwards, one
surface will look upwards and outwards, the other downwards and inwards, as might be supposed from parallel articulations. There are two synovial membranes—one between the sternum and cartilage, the other between the cartilage and clavicle; a prolongation of the membrane is brought rather under the end of the clavicle, to accommodate its action when the shoulder is elevated; sometimes the cartilage will be pierced by a hole at its centre; in this case the two cavities would, of course, communicate.

The *inter-clavicular* ligament is a dense band of fibres connecting the two clavicles; it does not pass transversely across, but, dipping down, is attached to the first bone of the sternum, thus not only joining the two clavicles, but acting as a *superior ligament* to either of the sterno-clavicular articulations.

The *costo-clavicular*, or rhomboid ligament, is a strong, short, broad band of fibres, arising from the inner and upper margin of the cartilage of the first rib; it passes upwards and outwards, and is attached to a tubercle upon the under surface of the clavicle. Posteriorly, it is in relation to the subclavian vein.

From the above description of these ligaments, it will be seen that the weakest part of the joint is posteriorly, where it is least obnoxious to dislocation, and therefore where least strength is required. For a complete dislocation *upwards*, the inter-clavicular and costo-clavicular ligaments must be ruptured; from their great strength, however, I should not think this often occurs. What I conceive to be more probable is this, viz., that the clavicle is first thrown forwards, the
rhomboid ligament partially torn, and the shoulder being depressed by the weight of the arm, the liberated end of the bone naturally rides upwards. The bone is also drawn upwards by the sterno-cleido-mastoideus, as in fracture of the clavicle. The surgical opinions upon this point will be entered into more fully hereafter, when treating of the fractures of that bone.

The clavicle, at its humeral extremity, is attached to the scapula by three ligaments—the superior, and inferior acromio-clavicular, and the coraco-clavicular. The first two assist in the formation of an articulation bearing their own name: the superior, thick and broad, passes across from the upper part of the acromial end of the clavicle, to the acromion process; while the inferior, less developed, passes along their under surfaces,—a synovial bag is placed between the two bones, lining their articulating surfaces. Sometimes they are separated by the intervention of a fibro-cartilage, and two synovial sacs: this arrangement is generally wanting, though occasionally the cartilage will extend partially through the joint. Mr. Quain has seen it as distinct as in the temporo-maxillary joint. The coraco-clavicular ligament consists of two ligamentous bundles of fibres,—one anterior, the other posterior; they are, however, continuous, and only to be distinguished by the direction of their fibres. The posterior, conoid in its shape, consists of a fasciculus of fibres, attached to the tubercle on the under surface of the clavicle, and passes downwards to the root of the coracoid process; while the anterior and external, passes from the internal edge of the coracoid process to an oblique ridge on the external
end of the clavicle. This ligament has been divided into a conoid and trapezoid portion, from the appearance which it presents under different aspects: when seen from before, it has a quadrilateral form, hence its name trapezoid; but, observed from behind, it presents a triangular appearance, the base being upwards, and is then called the conoid ligament. From the coracoid process of the scapula a fibrous aponeurosis is given off, called, from its attachments, the costo-coracoid membrane; it extends from the inner edge of the coracoid process to the lower surface of the clavicle, and internally to the first rib; it conceals, and, with the clavicle, forms an osteo-fibrous sheath for the subclavius muscle, between which and the subclavian vein it intervenes, and, passing downwards, becomes lost near the head of the humerus, on the axillary plexus; it would most probably be ruptured in a dislocation of the acromial end of the clavicle, and in some fractures of that bone. It is perforated by the cephalic vein, acromio-thoracic artery, and anterior thoracic nerve going to supply the pectoralis major. Its use is, most probably, to prevent the subclavian vein being pressed upon by the subclavius muscle, an occurrence which would tend to obstruct the flow of blood from the head. The ready entrance of air into the vein during amputation at the shoulder-joint, is perhaps owing to the vein remaining patulous, from the adhesion of its external coat to the surrounding fibrous tissue of this membrane.

Two ligaments, viz., the ligamentum proprium posticum, and the ligamentum proprium anticum, or
coraco-acromial, are described as proper to the scapula, that is, as not serving to connect it with any other bone; but I should, for my own part, be more inclined to class them as ancillary ligaments to the scapulo-humeral articulation: the first, because its use is to protect the nerve supplying some of the most important muscles of the joint; and second, because it assists in forming its supplementary cavity. The proper ligament of the notch consists of a transverse band which stretches across the indentation at the root of the coracoid process, thereby converting it into a foramen. Cruveilhier does not speak of this ligament.

The coraco-acromial is a strong, firm band of fibres, stretched between the coracoid and acromion processes; in form it is triangular, having its base attached to the coracoid process; its direction is somewhat horizontal; it forms a very important barrier to any violence from above, and would prevent any dislocation upwards and forwards. Some anatomists have described an aponeurotic lamina as being given off from its edge, and separating the deltoid from the joint: the clear demonstration of this would depend upon the development of the bursa intervening between the capsular ligament of the shoulder-joint and the under surface of the acromion process.

SCAPULO-HUMERAL ARTICULATION.

Class Diarthrosis—Subdivision Enarthrodia.

The bones which enter into the composition of the scapulo-humeral articulation are the caput humeri, and the true glenoid cavity of the scapula; the head of the
LIGAMENTS.

humerus is further protected by the supplemental arch formed by the coracoid and acromion processes with their connecting ligament. The ligaments of the true cavity are, the glenoid; the capsular, with its synovial membrane; the coraco-humeral, or accessory; and the long head of the biceps, or inter-articular.

The *glenoid ligament* is a band of fibrous structure, oval in its form, which runs around the rim of the cavity, and, by elevating its margin, serves to deepen it; it is formed by the splitting of the long head of the biceps, which, bifurcating at its upper border, passes round, and again becomes united at the inferior margin of the cavity. The fibrous capsule is attached around the margin of the glenoid cavity, receiving and enveloping, as in a bag, the head of the humerus; it becomes lost on the anatomical neck of the same bone, by being blended with the periosteum; it is a large loose bag, so lax, that when the protecting set of muscles are cut away, the humerus falls away from the scapula for more than an inch, and so large, that it would lodge a bone twice as large as the head of the humerus; it has inseparably connected with it the tendons of the supra- and infra-spinatus, and teres minor, which, besides their bony insertions, send additions to the capsule; at its inner aspect, near the concave edge of the coracoid process, it is sometimes found deficient, there being at that point an opening for the tendon of the subscapularis muscle; it also arches over the bicipital groove to permit the exit of the long head of the biceps; both these tendons are invested—the latter, indeed, entirely surrounded—with synovial
membrane, and therefore external to the joint. The effect, then, of the four articular muscles (viz. supraspinatus, infra-spinatus, teres minor, and subscapularis) acting upon the capsule would be, not only to move the humerus, but to draw the ligament out of the way of injury during any violent and sudden motion; and thus, were the nerve which supplies these muscles to receive a blow, and for the moment become paralysed, the humerus would drop from the cavity, were it not for the atmospheric pressure; should, however, any force be applied to overcome that, as any sudden action of the more powerful muscles, or violence, so as forcibly to throw the head of the bone downward, by acting on the lower end of the humerus, dislocation would easily ensue. The supraspinous nerve* supplying some of these protecting muscles is protected, by having its course through the notch of the scapula —perhaps designedly to prevent such an accident.

The long head of the biceps is of so great importance to the integrity of the shoulder-joint, in directing the head of the humerus, that it has very properly been considered as an inter-articular ligament by some anatomists; by surgeons, however, its importance has been rather neglected or undervalued. Its surgical pathology will be spoken of hereafter. It arises from the upper part of the glenoid cavity (being most intimately connected, or rather identical with the glenoid ligament itself), passes over the head of the humerus, and under the capsular ligament; being perfectly in-

* The supraspinatus and infra-spinatus muscles are supplied by this nerve.
LIGAMENTS.

dependent of either, it is entirely invested by a synovial sheath of its own, and holds much the same relation to the cavity of the shoulder that the ligamentum teres does to that of the hip. Having arrived at the margin of the anatomical neck of the bone, it passes between the two tuberosities, and down the bicipital sulcus, to the belly of the muscle, whose great natural contractile power, being further stimulated by the constant action of the fore-arm, tends to keep the tendon tense, otherwise it would be constantly liable to be thrown into a fold, or, becoming lax, to impede the motions of the joint. It will thus be seen that the tendon, in some measure, tends to render the capsule of the joint incomplete; it, however, forms about one third of a circle, which, with the concavity of the glenoid cavity, together make about two thirds of a circle, and compensate in no slight degree for the general shallowness of the cavity. Let us suppose that the deltoid be put into motion: the head of the humerus ought to be brought directly upwards, and would, without doubt, impinge against the under surface of the acromion arch. This, however, does not take place; the polished hemisphere of the humerus is carried against the under surface of the tendon, which, acting as a curved director, guides the rounded head of the bone inwards and backwards against the glenoid cavity.*

* For the above physiological view of the function of the tendon of the biceps, I am in the main indebted to Mr. J. Hilton, the Lecturer on Anatomy at Guy's Hospital; it is mentioned in no anatomical work with which I am acquainted, although pointed out by him for some years.
LIGAMENTS.

A reference to the subjoined diagrams will explain this perhaps more fully.

Fig. 1. If the deltoid \( n \) be put into motion, the bone \( h \) is drawn, not, as would be expected, in the direction of the straight arrow \( A \), but guided by tendon \( T \), takes the course of the curved arrow \( C \).

Fig. 2, represents the joint with the tendon ruptured; in this instance, the same force continuing, the bone being carried in the direction of the arrow \( A \), comes in contact with the under surface of the acromion, and the patient is unable to raise his arm beyond a certain point.

This will be considered more at length when we come to speak of the subject surgically.

The synovial membrane lines the glenoid cavity, the capsular ligament, and, investing the tendon of the biceps in a tubular sheath of its own, becomes reflected again upon the internal surface of the capsule, and thus preserves the integrity of the joint.

Mr. Stanley, in his Lectures before the College of
Surgeons, gives the following history of the development of the tendon of the biceps: "It is in the early embryo altogether outside the shoulder-joint; but in succeeding periods, becoming, as it were, protruded into the cavity, it carries upon and after it a duplicature of the synovial membrane, which attaches it to the upper wall like a mesentery. But this double fold soon splits and disappears, and the tendon is left, passing through the cavity of the joint, surrounded by synovial membrane, which is continuous with that lining the capsular ligament only at its two extremities."*

The coraco-humeral ligament appears to be a mere exaggeration of some of the anterior fibres of the capsule; they may be traced from the coracoid process to the greater tubercle of the humerus. It is worthy of remark, that they cross the bicipital groove obliquely, and thereby strengthen the articulation at what would otherwise be considered as a weak part. It would tend much to prevent a dislocation of the tendon.

In the 'Edinburgh Med. and Surg. Journal,'† is a description of a "third proper ligament of the scapula;" it is described, as stretching from the base of the acromion process to the upper part of the glenoid cavity. Its discoverer, Mr. Sheness of Brechin, calls it the acromio-cervical ligament. He has, as far as my observation goes, mistaken a few tendinous fibres of the infra-spinatus muscle for it: I have never succeeded in finding anything but what would come clearly under that denomination.

† April 1832.
THE MUSCLES.

So many differing and opposing methods of classification have been followed by all writers on myology, that on entering upon a description of the muscles of the shoulder-joint, I have been somewhat perplexed; the plan which appears most reasonable, and which I always adopt, is that of grouping them in accordance with their associated actions, and this I think the more accurate, as they then are not only spoken of in connexion with their nervous supply, but it is the most surgical method of treating of them, and therefore most germane to our subject. Pursuing this course, we shall have to speak of two sets of muscles,—1st, those which act on the clavicle and scapula; and 2d, those which move the arm on the scapula: the first set is divided into elevators and depressors.

The elevators are,—
Trapezius,
Rhomboidei,
Levator anguli scapulæ.

The depressors are,—
Subclavius,
Pectoralis minor,
Serratus magnus.

All these muscles play a very important part in forced respiration, the principal of each set, viz. trapezius and serratus magnus, having a respiratory nerve proper to themselves. The muscles which move the arm on the
scapula, or the second set, are those of the true scapulo-humeral articulation; and these, in turn, admit of division,—they are of two sets, viz. the muscles of protection, and the muscles of power: the former, four in number, are the supra-spinatus, infra-spinatus, teres minor, and subscapularis; those of power are five in number, viz. deltoid, coraco-brachialis, pectoralis major, latissimus dorsi, and teres major.

The protecting group, which are deep seated, and closely connected with the joint, support the humerus, and keep it in apposition with the glenoid cavity; they strengthen the capsular ligament, and defend it during the varied actions of their more powerful neighbours, thus modifying and regulating any violence of those of the other class which from its suddenness or magnitude might tend to dislocate the bone. They are true articular muscles, and act as rotators of the joint.

The muscles of power—are those which we employ in all the forcible movements of the upper arm, as elevation, adduction, abduction, and circumduction. It is with these that we direct "the keepers of the house" in all offensive and defensive acts. It will thus be seen, that the terms protection—and power—are derived from the office each group fulfils, with reference to the shoulder-joint.

Besides the actions which have been ascribed above to those muscles which are inserted into the scapula, reflection and experience show us they have others, and apparently contradictory ones: thus we shall find the rhomboideus, major and minor, acting chiefly upon the inferior angle of the bone, and drawing it upwards,
must necessarily depress the apex of the shoulder; the levator anguli scapulae would assist in this also; again, the serratus magnus is not only a depressor of the entire scapula, but an elevator of its apex; this is chiefly caused by its lower fibres acting upon its inferior angle and posterior costa.

The trapezius is obviously an elevator of the apex, as well as of the entire bone. It acquires its name from the four-sided figure that itself and fellow conjointly make upon the back. From some fancied resemblance to a hood, it was called by the older anatomists M. cucullaris; it ought more correctly to be called the triangularis dorsi, for it is a flat, thin, triangular muscle, having an angle respectively at the tubercle of the occiput, at the spinous process of the twelfth dorsal vertebra, and at the apex of the shoulder; its base would be represented by a line drawn between its two first-mentioned angles.

It arises tendinous from the occipital protuberance and internal third of the superior curved line of the occiput, from the ligamentum nuchae, and from the spinous processes, and supra-spinous ligaments of all the dorsal vertebra, being here closely connected with its fellow: from these various points the fibres take different directions towards their insertions—the superior set pass downwards and outwards, curving slightly round the neck, to reach its attachment into the posterior border of the outer third of the clavicle; the middle fibres pass horizontally outwards to the acromion process, the inferior ascending to the upper margin of
the spine of the scapula, its insertion thus answering, in a great measure, to the origin of the deltoid, which it antagonises. If the lower portion of this muscle be examined carefully, both its origin and insertion will be found worthy of attention; its origin, from the three or four lower dorsal spines, is by a small delicate tendon; and if it be traced up to the spine of the scapula, this portion of the muscle again becomes tendinous, and is inserted by a flat tendon into the under edge of the spine of the scapula, for about its internal fifth or fourth, and plays over the small triangular surface whence the spine arises, a small bursa there intervening. This portion of the muscle would draw the scapula downwards and inwards, or tilt the apex of the shoulder upwards. Thus the actions of the scapula are exceedingly free, not only does it glide upon the thorax, but it appears, to a certain extent, to rotate, as it were, on its own centre. The trapezius conceals the splenius, complexus, the rhomboids, and levator anguli; externally its surface is subcutaneous, and its anterior border forms one of the boundaries of the posterior triangle of the neck.

The rhomboideus is divided into major, and minor portions: the major arises from the four or five upper dorsal spines, and its fibres take a direction downwards, and outwards, to be inserted into the vertebral costa of the scapula, between its spine and inferior angle; the minor consists of a slender portion, above the major, passing from the seventh cervical vertebra and liga-

mentum nuchæ, to that part of the same costa which corresponds with the triangular surface from which the
spine springs. Some of the fibres of the major terminate in tendon, which passes over the base, and becomes a dense fascia, binding down the infra-spinatus, and with which the trapezius is also connected.

The levator anguli scapulae is an elongated, flattened bundle of muscular fibres, arising, by three or four fasciculi, from the posterior tubercles of the transverse processes of the three or four superior cervical vertebrae, and passing downwards to be inserted into that portion of the posterior costa above the spine. This muscle, with the two preceding ones, are all that attach the scapula to the trunk posteriorly.

We now come to the muscles which depress the shoulder.

The pectoralis minor is entirely concealed by the greater pectoral; it arises by fleshy serrations, from the third, fourth, and fifth ribs, near their cartilages; its fibres pass downwards and outwards, across the centre of the axillary space anteriorly, to be inserted, tendinous, into the coracoid process of the scapula. Its upper border forms an important landmark, with reference to the anatomy of the axillary vessels; whilst its lower margin, showing itself when the arm is raised, from behind the great pectoral, has the long thoracic artery running parallel to it.

The subclavius is a roundish slender muscle, crouched under the clavicle, and hidden from view by the costocoracoid membrane, which surrounds it inferiorly; it arises by a round tendon from the cartilage of the first rib, and passes in its osteo-fibrous sheath upwards and
outwards, to be inserted into the groove, in the under surface of the outer half of the clavicle. It exercises a powerful influence upon the clavicle in fractures of that bone; this will be spoken of more fully hereafter.

The *serratus magnus* is a broad, thin, and somewhat quadrilateral muscle, covering the lateral part of the thorax; it takes its rise by nine indigitations, from the eight superior ribs (two of its origins being connected with the second); its first indigitations arise from the first and second ribs, the fibres of which pass upwards, outwards, and backwards; those from the third and fourth run horizontally outwards, taking a curve backwards, round the convexity of the ribs, whilst those from the fifth, sixth, and eighth indigitate with the origins of the obliquus externus abdominis, and pass upwards, outwards, and backwards; the whole muscle is then inserted into the posterior costa of the scapula, separating the rhomboideus and subscapularis; one surface of the muscle is applied to the ribs and intercostal muscles, the other, or external surface, is in relation above with the subscapularis, while below it is subcutaneous. This muscle, as has been previously mentioned, assists the most powerfully of any in forced respiration.

We now arrive at those muscles proper to the shoulder-joint, divided into two sets, viz., those of protection and those of power: these last comprising coracobrachialis, pectoralis major, deltoïd, latissimus dorsi, and teres major; the former supra- and infra-spinatus, teres minor, and subscapularis.
The coraco-brachialis, the smallest muscle of the upper arm, arises tendinous from the coracoid process of the scapula, between the insertion of the pectoralis minor and the short head of the biceps, to which latter it is inseparably attached, the size of the one, according to Cruveilhier, being always in inverse ratio to that of the other; it continues to be connected with the biceps for one third of its own length, and then separating from it, is inserted into the humerus, between the triceps and brachialis anticus, that is, at the juncture of the upper and middle thirds of the bone. It also sends off numerous tendinous fibres to assist in forming the internal septum of the arm. It is covered by the pectoralis major and deltoid, lies between the anterior and posterior boundaries of the axilla, and guides the operator in cutting down upon the axillary artery; it is perforated by the external cutaneous nerve of the arm. Its action is to elevate the humerus, bringing it at the same time forwards and inwards.

The pectoralis major, perhaps the most powerful muscle I have to describe, may be considered as having three origins, a clavicular, from the anterior surface of the sternal half of the clavicle; a sternal, which, besides decussating with its fellow of the opposite side, springs from the anterior surface of the entire length of the sternum; and lastly, a costal, from the cartilage of the second, third, fourth, fifth, sixth, and seventh ribs; it is also connected by a tendinous aponeurosis with the sheath of the rectus abdominis. The clavicular, or upper set of fibres, pass obliquely downwards, overlapping the middle, which are almost transverse, and the inferior are directed
upwards and outwards, behind the superior and middle sets, so that those which are highest at the inner attachment become inferior at the outer, and those which are lowest at their origin, become superior at the humerus: these sets become inserted, by a flat tendon, into the outer lip of the bicipital groove; the tendon, as Cruveilhier justly says, is composed of two laminae, the sternal and clavicular being inserted into the anterior, while the posterior receives the inferior set; they are sometimes divided, and I have seen the long head of the biceps passing between the two. The posterior lamina may be generally seen to pass backwards, and joining with the tendon of the latissimus dorsi to line the floor of the bicipital groove. Its superior border runs parallel with the internal border of the deltoid, separated from it, however, by the cephalic vein, and humeral branch of the acromio-thoracic artery. It forms the anterior boundary of the axilla, having the mamma upon its lower and external border. It is an adductor and rotator inwards of the humerus.

The deltoid, so called from its resemblance to a reversed Δ, covers the shoulder-joint; it arises from the external half (sometimes third) of the clavicle, from the anterior edge of the acromion process, and from the whole of the inferior edge of the spine of the scapula. Its fibres, which in texture are thick and coarse, similar to the greatest gluteus of the hip, are, in a well-developed subject, in three sets, corresponding to their bony origins, and having prolongations of cellular tissue dipping down between them; those which arise from the clavicle pass downwards, outwards, and
very slightly backwards. The middle, or acromial set take a course from above downwards, and form a curve whose concavity looks downwards and inwards, and whose convexity gives rotundity to the shoulder; the posterior or scapular set run rather horizontally, outwards and forwards; the three uniting are inserted by a strong tendon into the middle of the outer surface of the humerus; the anterior border of the muscle is in relation to the pectoralis major, although separated from it by the cephalic vein and thoracica humeraria artery; the posterior border overhangs the infra-spinatus, teres minor, and triceps, concealing their insertions; its upper surface is subcutaneous, or having some few fibres of the platysma myoides intervening, whilst its deep concave surface covers in the fibrous capsule of the shoulder-joint, but separated from it by a quantity of filamentous cellular tissue, amongst which, more or less developed, is a bursa; its insertion is embraced by the two origins of the brachialis anticus. The deltoid raises the humerus, although its action depends more particularly upon the set of fibres which are chiefly employed; the anterior would partake somewhat of the action of the greater pectoral, while the posterior would draw it backwards and upwards, the middle set alone elevating it. Bichât thought the anterior and posterior could depress the arm when raised, and Cruveilhier states that there is nowhere on record any dislocation (downwards of course) produced by its action; this he accounts for, by saying that it being parallel to the lever upon which it acts, it loses much of its power.
The latissimus dorsi (the broadest muscle in the body) arises from the six inferior dorsal spines; from all the lumbar spines, and the corresponding supraspinous ligaments; from the back of the sacrum; from the posterior third of the crest of the ileum, and by muscular slips from the three lower ribs, at their lateral aspects: the fibres from the dorsal region pass transversely, the lumbar ascend obliquely, and the costal portion of the muscle takes a nearly vertical course; they all converge towards the inferior angle of the scapula, from which the muscle sometimes gains some auxiliary fibres: it winds round the teres major, making a turn upon itself, and, becoming attached to the anterior surface of the teres for a short space, is ultimately inserted into the inner and posterior edge of the bicipital groove. Its dorsal origins are covered by the trapezius, the rest of the muscle is subcutaneous, until it arrives at the axilla, of the posterior boundary of which it forms a part, its external and inferior border is free. It is always in associated action with the teres major: they are adductors and rotators inwards, they would also draw the humerus inwards, backwards, and downwards.

The teres major (being, however, neither "teres" nor "rotundus," for it is flattened and compressed,) arises from the quadrilateral surface at the inferior angle of the scapula, and for some distance along the anterior costa, its fibres are directed forwards and outwards, and forming a broad flat tendon of about three fingers' breadth, are inserted into the posterior border of the bicipital groove; the tendon of the latissimus dorsi winds round from behind and below it, and becomes
ANTEOR to it; they are intimately blended together for some distance, but just before their arrival at the bone are separated, and have a small bursa between them. The muscle forms part of the posterior border of the axilla; it is separated by the longest head of the triceps from the teres minor, its inferior border and the anterior surface of its tendon are in intimate connexion with the latissimus dorsi. The actions of the teres major, and latissimus dorsi are precisely similar, both being supplied by the same nerve, viz., the subscapular. The triceps muscle is in intimate connexion with the two teretes, though its longest head separates them; its second arises below the insertion of the teres minor, and the shortest head arises below the insertion of the teres major. A triangular space is formed by the internal margin of the long head of the triceps and the two teretes, through which passes the arteria dorsalis scapulæ, a branch of the A. subscapularis, whilst the external edge of the triceps, the neck of the humerus, and the two teretes, form a quadrilateral space, through which pass the posterior circumflex artery and its accompanying nerve.

The muscles of "protection" are—supra-spinatus, infra-spinatus, teres minor, and subscapularis.

If the trapezius be cut away, the base of the acromion process sawn through, and about an inch of the clavicle removed, the four deep muscles are displayed. The supra-spinatus arises from all the surface of the fossa of that name; it is covered by a fibrous tissue, from which it derives an origin and assistance; it is triangular
MUSCLES.

in its shape, and composed of fibres, which, converging towards each other, take a direction forwards and outwards, under the acromion process and triangular ligament, and terminate by a tendinous insertion into the uppermost of the facettes in the greater tubercle of the humerus; its tendon is so intimately connected with the capsular ligament that it cannot be separated; it sends also a prolongation to its next neighbour, the infra-spinatus. Indeed the three muscles, supra-spinatus, infra-spinatus, and teres minor, are at this point so immediately connected with each other and with the capsular ligament, that they are hardly separable. The muscle is in relation with the upper costa of the scapula, and the omo-hyoid muscle, and by its base with the levator anguli scapulae and lesser rhomboid. Its action would appear to be to assist the deltoïd (to a modified extent), to support the humerus, and protect the capsular ligament. Cruveilhier thinks it forms a sort of active arch, whose resisting power is in proportion to the force tending to push the humerus upwards; he considers Winslow's opinions of the deep fibres protecting the capsular ligament as problematical, but that it does so, I must think, with every submission, is clear. It assists powerfully in the reduction of the dislocation of the humerus downwards, in which accident it would be much put on the stretch, and perhaps have a few fibres ruptured.

The infra-spinatus occupies the infra-spinous fossa, from the whole of whose entire surface it arises, including the under surface of the spine itself; it is encased in an aponeurotic sheath, which gives a point
d'appui for many of the fibres. The general form of the muscle is that of an irregular triangle; it takes a course upwards, outwards, and slightly forwards; its superior fibres passing more horizontally outwards than the inferior: the two together form a tendon, which is inserted into the middle facet of the greater tubercle of the humerus, and into the capsule of the articulation; it is in relation above with the spine of the scapula, behind with the greater rhomboid, whilst below it is intimately connected with the next muscle, viz. teres minor, which we will now consider. This muscle will be seen arising from the dorsal aspect of that ridge, which surmounts the axillary costa of the scapula, and from the surrounding fascial investment; its fibres ascend parallel to the lower fibres of the last-described muscle, and are inserted into the lowest facet of the greater tubercle of the humerus, and into the capsular ligament; its upper border is joined with the infra-spinatus, its lower is separated from the teres major by the longest head of the triceps.

The last-described two muscles are so intimately blended in their origins, course, and insertion, that a separation is with difficulty made out; there is, however, a process of fascia, which dips between them, and serves as a guide to the dissector. Cruveilhier describes the two muscles as one; they have, however, a different nervous supply, the teres minor being largely supplied by the circumflex nerve, the infra-spinatus by the supra-scapular; and although small nervous filaments pass from one muscle to the other, the chief supply is as here stated. The two muscles would assist the deltoid
to elevate the arm; they would rotate the humerus outward, and the teres minor perhaps draw it backwards, as in throwing a stone; they would retain the arm in a raised position, and offer a powerful protection to the posterior aspect of the articulation.

To show the subscapularis, the arm must be entirely removed from the trunk, and then the ventral aspect of the scapula will be seen to be filled up by muscular fibre, which arises from that concave surface which is known as the subscapular fossa. On the dried scapula will be seen two ridges running towards the anterior angle of the bone: these give origin to tendinous septa, which divide the muscle, and give it some resemblance to the three muscles on the dorsum of the bone, viz. the supra- and infra-spinati, and teres minor muscles. The fibres pass upwards, outwards, and forwards; the superior horizontally, the inferior most obliquely; they terminate in a tendon, which is inserted into the lesser tubercle of the humerus, and is also inseparably connected with the capsule of the joint. In relation, the muscle is in close proximity to the serratus magnus, but separated from it by a layer of fascia; superiorly it touches the omo-hyoid, while inferiorly the teres major, latissimus dorsi, and long head of the triceps are in juxtaposition to it. When put into action, it would necessarily rotate the humerus inwards, and would be stretched or torn in the dislocation forwards. All these protecting muscles, of course, preserve the capsular ligament from being nipped between the head of the humerus and the scapula, and keep the latter in close adaptation to the glenoid cavity.
THE NERVES.

After the muscles, it would be most correct to treat of the stimuli of their actions, viz. the nerves; but it is not my intention to occupy much space with their description. I shall divide the nerves into those supplying the integuments covering the shoulder, and those supplying the muscles.

DISTRIBUTION OF THE CUTANEOUS NERVES.

<table>
<thead>
<tr>
<th>The skin—</th>
<th>Is supplied by—</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over the entire length of the clavicle and acromion</td>
<td>Supra-clavicular and acromial, from the cervical plexus.</td>
</tr>
<tr>
<td>Over the inner part of the greater pectoral</td>
<td>Anterior intercostal nerves.</td>
</tr>
<tr>
<td>Over the lower part of the greater pectoral</td>
<td>Middle intercostal.</td>
</tr>
<tr>
<td>Of the axilla</td>
<td>Intercosto-humeral and small internal cutaneous.</td>
</tr>
<tr>
<td>The side of the thorax (upper part)</td>
<td>Intercosto-humeral.</td>
</tr>
<tr>
<td>Of the lower part of dorsal aspect of scapula</td>
<td>Intercosto-humeral.</td>
</tr>
<tr>
<td>Over the trapezius</td>
<td>Posterior branches of third and fourth cervical.</td>
</tr>
<tr>
<td>Over the back part of the shoulder, and the posterior margin of deltoid</td>
<td>Circumflex nerve.</td>
</tr>
<tr>
<td>Over insertion of the deltoid</td>
<td>Circumflex nerve.</td>
</tr>
<tr>
<td>Of the inner side of the arm</td>
<td>Intercosto-humeral and internal cutaneous.</td>
</tr>
<tr>
<td>Over the long head of the triceps</td>
<td>External branch of first dorsal and subscapular.</td>
</tr>
</tbody>
</table>
**DISTRIBUTION OF NERVES TO THE MUSCLES.**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Supra-spinatus is supplied by the</td>
<td>Supra-scapular.</td>
</tr>
<tr>
<td>Infra-spinatus</td>
<td>Subscapular and circumflex.</td>
</tr>
<tr>
<td>Teres minor</td>
<td>Circumflex and subcapular.</td>
</tr>
<tr>
<td>Subscapularis</td>
<td>Subscapular.</td>
</tr>
<tr>
<td>Deltoid</td>
<td>Circumflex.</td>
</tr>
<tr>
<td>Pectoralis major</td>
<td>Superficial branch of anterior thoracic.</td>
</tr>
<tr>
<td>Trapezius</td>
<td>Spinal accessory of the eighth pair.</td>
</tr>
<tr>
<td>Serratus magnus</td>
<td>Long respiratory, from fourth cervical.</td>
</tr>
<tr>
<td>Pectoralis minor</td>
<td>Deep branch of anterior thoracic.</td>
</tr>
<tr>
<td>Coraco-brachialis</td>
<td>External cutaneous, (same branch supplies the biceps.)</td>
</tr>
<tr>
<td>Subclavius</td>
<td>Separate branch from the fourth cervical nerve (axillary plexus).</td>
</tr>
<tr>
<td>Levator anguli scapulae</td>
<td>Anterior branch of fourth and fifth cervical.</td>
</tr>
<tr>
<td>Rhomboidei</td>
<td>Fourth and fifth cervical.</td>
</tr>
<tr>
<td>Teres major</td>
<td>Subscapular and circumflex.</td>
</tr>
<tr>
<td>Latissimus dorsi</td>
<td>Subscapular and circumflex.</td>
</tr>
</tbody>
</table>

The capsular ligament and synovial membrane of the shoulder-joint are supplied by the circumflex nerve; the branch of supra-scapular joining to the infra-spinatus also sends a filament to the capsule.
THE ARTERIES.

The blood is carried to the parts previously described, by two branches of the subclavian, and all the branches of the axillary artery; none of the small branches are of any surgical importance; the trunk of the axillary itself has occasionally been the subject of rupture in the misdirected attempts at reduction of a dislocation, it might also receive an injury simultaneous or in connexion with a fracture of the clavicle, as from a splinter of bone, &c.

The branches from the subclavian that supply the parts under our notice, are the transversalis colli, or posterior scapular, and the transversalis humeri, or supra-scapular arteries.

The former is the largest branch of the thyroid axis; it passes backwards across the neck, to get under the levator anguli and rhomboidei muscles, runs down parallel with the base of the scapula, and anastomoses with the subscapular, a branch of the axillary.

The supra-scapular passes across the neck, obliquely outwards, rather behind the clavicle, runs over the notch of the scapula, and divides into rami, supra- and infra-spinati: the former sends a branch to the capsule and synovial membrane, which anastomoses with the circumflex, and the latter communicates with the dorsalis scapulae of the subscapular artery.

Of the seven branches of the axillary artery, four are thoracic, the other three pass outwards, to supply
the scapula and caput humeri. The principal trunk of the axillary artery takes a curved course, from the lower border of the first rib, to the same part of the tendon of the latissimus dorsi muscle; it traverses the axillary space from above downwards, and from within outwards, forming an arch whose concavity looks downwards and inwards. The four thoracic branches are, thoracica acromialis, thoracica suprema, thoracica alaris, and thoracica longa: they present nothing remarkable for observation. The first sends a long branch between the pectoralis major and the deltoïd muscle, running along with the cephalic vein, and anastomoses with the circumflex artery; the suprema supplies the pectoral muscles; the third, usually consisting of a leash of branches, supplies the glands and tissue in the axilla; the last supplies the skin and mammary gland, and sends a branch to inosculate with the subscapular.

The subscapular is the largest and most regular of all the axillary branches; it runs along the anterior costa of the scapula, with its own vein and nerve; about an inch and a half from its origin it divides into two principal trunks: the anterior continues its course, distributing branches to the neighbouring muscles as far as the inferior angle of the scapula, where it anastomoses with the posterior scapular; the posterior branch passes through the triangular opening formed by the longest head of the triceps, teres major, and the muscles attached to the inferior costa, and subdivides into two branches, of which the superior anastomoses with the supra-scapular, and the inferior with
the posterior and subscapular arteries; the surrounding muscles receive branches of supply from them.

From this account it will be seen, that the scapula has, running along each of its borders, an artery, and that it is, owing to the distribution and free anastomosis of these arteries, encircled by an arterial plexus.

The anterior circumflex passes outwards, and forwards to the surgical neck of the humerus, it sends a branch up to the bicipital groove, which, upon arriving at the anatomical neck, turns inwards at a right angle, to supply the cancellated structure of the head of the bone; it sends, also, a small branch to supply the capsule, and which anastomoses with the thoracic humeri and posterior circumflex.

The posterior circumflex winds round the surgical neck, passing through the quadrilateral scapular space; it supplies the deltoïd, and transmits ascending branches to the capsule, which inosculate with the branches of the supra-scapular,—some descending branches anastomose with the superior profunda artery.
FRACTURES OF THE CLAVICLE.

When writing upon fractures, it is not my intention to treat of the process by which bone is united. I shall, therefore, content myself with observing, that the clavicle unites earlier than any other bone of the body, the patient usually returning (if a labourer) to his avocations about the end of the fourth week: in connexion with this, however, there is a curious parallel between its commencing ossification in the foetus and its union after fracture, the former operation taking place earlier than any other bone in the body, i.e. about the seventh week. I am not prepared with facts, to say to what amount the extent of cancellated structure in this bone may influence its repair, neither am I able to show, satisfactorily, at what ages its fractures occur most frequently; it certainly is very common among children, and those of tender years,—is oftentimes overlooked,—still the great number of specimens to be met with in most museums, show that the adult clavicle is very often broken, perhaps consequent upon its great exposure to circumstances likely to produce the accident. I therefore am inclined to receive anything but statistics with caution, in drawing a parallel between this and any other bone of the body, with reference to the ages at which it is most frequently broken.

The clavicle, as might be expected from its exposed situation, is very liable to be the seat of fracture, its position being unsupported below, and firmly attached at its two ends; its structure being entirely spongy,
and having an ill-developed or small medullary canal, are both predisposing causes; superadded to these, its intimate connexion with, and consequent participation in all violence which might be applied to the upper extremity, render it very obnoxious to injury.

Mr. Lonsdale, in his Treatise on Fractures, gives a table of the comparative frequency of the fractures of the bones of the body: of 1901 fractures that were brought to the Middlesex Hospital in the space of six years, 273, or one seventh, were of the clavicle; this is making them, with the exception of the ribs (357, or 1 in 5 1/3), the most frequently affected.

The slender form of the bone, the smallness of its articulatory facettes, the great strength of its ligaments, account for the great excess of the fracture over the dislocation of this bone.

Desault* says, "La fracture arrive alors plus souvent que la luxation, et l'une est à-peu-près à l'autre comme 6 : 1." Malgaigne has, in his 'Études Statistiques,' a very interesting table, showing the average proportion of the two accidents, but the parallel will of course only hold good with reference to force individually applied, or to contre-coup. He takes the accidents admitted into the Hôtel-Dieu during eleven years.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1806—08</td>
<td>39</td>
<td>12</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>1830—33</td>
<td>68</td>
<td>29</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>1834—37</td>
<td>60</td>
<td>17</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Total...</td>
<td>167</td>
<td>58</td>
<td>20</td>
<td>3</td>
</tr>
</tbody>
</table>

* Œuvres Chirurgicales, tom. i, p. 327.
I am unable to find any statistics bearing upon the seat of fracture. It seems, however, generally admitted upon all hands, that the centre of the bone is the most common one. In the museum of Guy’s Hospital are 22 broken clavicles, which have been examined and reported upon by Mr. T. W. King, in the ‘Cyclopædia of Practical Surgery:’* he says, “Of these 22, 15 have been divided close to the middle, or very slightly external to this point; but two of the same have also been divided at about one inch from their outer extremities. Four other specimens have been broken transversely, in the situation last named: the remaining 3 have been fractured about an inch from their sternal ends, and one has a double transverse fracture with a longitudinal split.” The proportions stand thus:

```
Clavicles broken at the middle simply . . . 12, say 7.
      ”      ” twice . . . 1.
      ”      ” and outer end . . 21
      ”      ” outer end only . . 4
      ”      ” inner end only . . 3
```

Unfortunately, in this table also there is no history of the injuries, and therefore, unless a distinction can be drawn between those fractured by a force directly applied, and those broken by contre-coup, we can come to no just or correct conclusion upon the point. It seems, however, that it may be broken in any part of its course, between its two extremities, the exact site being dependent upon the nature and situation of the applied violence; its weakest point is at the junction of its two curves, and we therefore find the fracture

* Page 341.
occurs most frequently about its centre. The acromial end, the next most exposed part, is consequently the next to suffer, while the internal being round and strong, and most protected, is the least liable to injury. Like those of all other bones, fractures of the clavicle may be transverse, with or without displacement; and oblique, with a greater or less extent of riding; they may be simple or comminuted; and, lastly, simple or compound.

Perhaps no better classification can be adopted than that which is now employed by nearly all surgeons. I shall, therefore, speak of those which occur internal to the coraco-clavicular ligament, and those which occur external to it: this division is the more obvious, because the phenomena which occur in the two fractures are very dissimilar, and dependent in a great measure upon the ligament, and because all fractures within the ligament exhibits mere shades of difference. They are, then, either intra-coracoidian or extra-coracoidian.

_Intra-coracoidian fracture._—When the bone is fractured upon the sternal side of the ligament, the patient first becomes aware of the accident by finding that he is unable to raise his arm to his head, and that all attempts to do so give him pain. Cases do, however, occasionally occur,* in which the patient is able, even in well-marked fractures, to use his arm; the pain is said to be greater than that of any other fracture: this, I expect, if true, is simply because the patient, being anxious to assist himself, continually moves the extremity. Upon

examination, the surgeon finds the shoulder drawn downwards, forwards, and inwards; that the distance from the acromion to the sternum is less than upon the sound side; that the sternal portion of the bone projects, and to an inexperienced observer would appear to be at fault, and that, by placing one hand in the seat of the fracture, and seizing the humerus with the other, and therewith moving the shoulder up and down, crepitus is discovered. Desault says, after the accident has existed some hours, the patient inclines his trunk and head towards the affected side, and supports the elbow of the injured arm with the sound hand. He shrewdly remarks, that a man with fractured clavicle appears to belong to the "non-claviculé" class of animals.

The diagnosis becomes, however, somewhat more difficult when the fracture is transverse: in this last instance little or no displacement or local deformity may exist; the surgeon must then have recourse to other manoeuvres. Let an assistant support the shoulder and arm so as to relax the muscle; if he now take a portion of the fractured bone between either finger and thumb, he will by attrition have abundant evidence of the nature of the injury.

Fracture of the clavicle within the coracoid process.—
(Original case.)

I subjoin a case which came under my own inspection, and may be taken as a type of the accident:

John Sylvester, aged 35, was admitted into Cor-
nelius Ward of Guy’s Hospital, under Mr. B. B. Cooper, with a fracture about the centre of the clavicle. He was a man of strumous diathesis, fair complexion, hair and eyes light; but said he never “had a day’s illness in his life;” his habits were temperate. On Dec. 23 (the day of the accident), whilst following his calling of a carpenter in a half-finished house, a rafter of the floor above gave way, and fell from a height of 9 feet upon his shoulder; he was knocked down by the blow, and upon rising, found his shoulder injured and arm disabled; his master sent him to the hospital. On his admission, a well-marked fracture of the clavicle was discovered, it appeared to be oblique, and the fragments held their common relation. On drawing the shoulders back, nearly all deformity disappeared; a pad was put in the axilla, and a modification of Desault’s bandage applied. At the end of three weeks a ring of callus could be felt round the fracture; he complained of his arm being very weak, but anxious to go to his employment, he was presented.

Before proceeding to the other parts of our subject, let us devote a few minutes’ attention to the cause of deformity in this accident. The opinion of nearly all English surgeons is embodied by Mr. Samuel Cooper:* "The external portion,” he says, “drawn down by the weight of the arm and the action of the deltoid, and forward and inward by the pectoral muscle, is carried under the internal portion, which projects over it.”

* Surgical Dictionary.
Mr. Cooper here makes no mention of the subclavius muscle: I think it would have a material effect upon the broken bone.

Sir C. Bell* thinks "the sternal portion would be a little elevated by the sterno-cleido-mastoideus." Mr. Liston† "thinks the same portion is sometimes elevated by the sterno-cleido-mastoideus. Desault‡ gives great attention to the subject; he attributes the shoulders being brought downwards to the weight of the arm, its direction inwards to the power of the pectoralis and subclavius; to these he adds the influence that the offending foreign body may have had upon the bone. Petit, and Duverney attributed the direction of the shoulder to the deltoïd taking a fixed point from the humerus, and acting upon the broken bone. Boyer§ says, in this fracture (intra-coracoidian) there is always displacement, that the external part is drawn inwards by the pectoralis and subclavius, and is directed from above downwards, and from within to without (he says "de haut en bas" and "de dedans en dehors"). M. Gerdy,|| admits this, and adds to it, that the external end of the sternal fragment is drawn upwards by the sterno-cleido-mastoideus. M. Guerin¶ lays great stress upon the necessity of preventing the mobility of the internal portion: he says, that, where a person with fractured clavicle turns his face towards the sound side, both arms hanging down, the internal frag-
ment of bone is carried upwards by the sterno-cleido-mastoideus, and that even when the arm is bandaged by the ordinary methods, a crepitus is produced by their motions. He directs that the face should be kept towards the affected side by bandages. Professor Syme, of Edinburgh, gives an equal share to the arm with its muscles, and to the action of the sterno-mastoideus. Mr. Lonsdale says: "The muscle, no doubt, has the power of doing so to a slight extent, but I do not think that it ever acts sufficiently in these cases to make it important enough to pay any attention to it."

For my own part, I am inclined to think with Professor Syme and others, that the sterno-cleido-mastoideus does assist in the elevation of the bone, because I have observed upon the dead body that when the clavicle has been sawn through its centre, for the removal of the upper extremity (in dissecting), that the remaining sternal portion enjoys a great degree of mobility, and there being no antagonising muscle, I conceive it very probable that the broken bone would be influenced by the muscle. Having duly considered the extent of power acting upon the collar-bone, it will be easy to comprehend, how rare cases must be in which an opposite condition of things shall occur, scilicet, in which the acromial end of the bone shall be the projecting one. To this condition of the fractured bone surgical writers allude very indistinctly.

Desaut and Xavier Bichât say, it is "très peu ordinaire." Lonsdale says, "The fracture just described is the most common one," but adds, "I have, however,
seen, in one case, the scapular end placed anteriorly to the sternal, and forming a prominence instead of it." This is certainly an approach to it.

The only well-authenticated case that I can find, is one by Professor Syme, in the Edinburgh Journal for July, 1835.

"Margaret Crawford, aged 45, was admitted on the 17th of February, on account of an injury which she had suffered the same evening, from the wheel of a carriage passing obliquely over the chest. The clavicle was found to be fractured about its middle, some of the superior ribs of the same side were broken, and the integuments of the thorax and chest emphysematous. With bleeding, light bandaging round the chest, and the free internal administration of antimony, she made a good recovery; but the remarkable feature of the case was the position of the broken surfaces of the clavicle. They were completely reversed from the usual one, and required no inconsiderable force to urge them into the same level, and even when the cure was completed, the sternal extremity lay rather below its fellow."

He remarks upon it, "there are few fractures so uniform in their relations as those of the clavicle; of all that have come under my notice, I never saw any exception to the general rule but in the following case."

Should the fracture occur between the centre of the bone and its sternal end, the symptoms are precisely similar, although somewhat mitigated; the salience of the bone is less, and the other marks of the injury not so visible, the treatment is precisely similar, and will be given below.
The causes of the fracture would be: 1st, any blow or force applied directly by a foreign body, as a sabre; 2dly, an indirect force, applied mediately, as a fall upon the apex of the shoulder; and, 3dly, an indirect force, applied intermediately, as by a fall upon the hand; this last is called fracture by contre-coup. Taking a common-sense view of the matter, one would expect that oblique fracture of the bone would result from indirect violence, while the transverse or comminuted would be the effect of direct violence, and such is the opinion of Desault, although he does not give any facts to support this view. Muscular action would be quite inefficient to produce the accident, although under certain conditions of bone, in abnormal secretion, as in excess of phosphate of lime, or vitiated action, as in cancerous affection, no limit could be put to this matter. I know a family of five children, out of whom two are the subjects of fractured clavicle; one of the girls, indeed, has had both her clavicles fractured: their attention was only directed to some small projection or irregularity of the bone, as they approached womanhood, and I was much laughed at for suggesting that these clavicles had been broken, there not being the slightest history of the accident. I can also point out a like circumstance in another family. In my own mind, I have little doubt that it occurred during birth or infancy, perhaps through the gaucherie of the attendant practitioner, or else was caused by the nurse: anybody who has observed the manner in which persons of this class carry children across a road, holding them by the shoulder, will readily understand its feasibility. The
same people are not over scrupulous as to the degree of violence they employ in forcing a baby's arm into the sleeve of a frock. Sir A. Cooper mentions the fact of these small tumours, the result of undiscovered fracture, being mistaken for exostosis; they are generally situated at the most common seat of fracture, viz., about the middle of the bone.

There is a paper by M. Blandin, in the 'Journal de Méd. et de Chirurg. Prat.'* upon some cases of fractured clavicle, in its middle without displacement, occurring in young people. He mentions a case of a lad, aged 17, who was admitted to the Hôtel-Dieu with a tumour as large as half a hen's egg, oval in shape, well circumscribed, colourless, and hard, but sensible to pressure; no deformity of the shoulder, nor any abnormal modification of the axis of the bone; the movements of the arm caused pain, but could be made without difficulty. It was thought by his colleague, M. Marjolin, to be exostosis; a sudden movement displaced the ends of the bone, and showed the true nature of the injury. M. Blandin has since had two other cases: one was treated with Desault's bandage, the other without,—this last had consecutive displacement, the first recovered without deformity. He considers the periosteum and cartilaginous layer covering the bone in young people, as preventing displacement, the bone not separating until a fresh accident overcomes the resistance of the fibrous capsule. The five patients under his notice were under the age of 25. I have never seen any other notice of this accident than

* July 1842.
in South, (Chelius, p. 550,) who "has frequently ob-
served it in children."

Extra-coracoidian fracture, from its very simplicity, and want of obvious symptoms, is oftentimes over-
looked, its characteristic being a negative one, viz., the absence of displacement. In this accident, the motions of the arm are impaired, but to no considerable degree; measurement of the two shows no difference. I have, however, observed a somewhat drooping inclination in the affected shoulder. Crepitus is, above all, the sign most to be sought for and relied upon; let the finger and thumb of one hand be placed upon the supposed seat of fracture, (they will occasionally detect the frac-
ture of themselves,) and let the humerus be in turn abducted, rotated, elevated, and depressed with the other; during one or other of these movements, (most commonly the former,) the injury will be made manifest. While speaking of crepitus as a sign of fracture, I will mention the great care which ought always to be em-
ployed in feeling for it, in all injuries within the vicinity of joints. It must be carefully borne in mind that, upon injury, effusion rapidly takes place, both in, and about joints, and if the parts be then moved, a sen-
sation is produced by the rupture of the cells of the areolar tissue, very similar to that sought for. I have even known the cracking of the joint mistaken for crepitus. The method I prefer, in this accident, is to have the humerus supported, and the parts about the joint (shoulder) thereby relaxed, and then seizing a portion of bone between each finger and thumb, to
rub them together; should this fail, I am sceptical about the fracture, unless I have other and unequivocal signs. It is remarkable how free the motion of the upper extremity is in this fracture, and how little the patient will occasionally suffer from it.

Lonsdale relates a case of a boy, whom it was difficult to persuade that he had broken a bone, he had such complete command over the limb; a ring of callus soon offered convincing testimony of the fact. Should there be displacement, the fracture is, of course, obvious, shortening of the distance from the shoulder to the sternum occurs, and the injury is said to have the appearance of a dislocation of the bone.* I cannot fancy any tolerable surgeon hesitating upon the point for one moment.

A great deal has been written upon the cause of non-displacement: it was thought by the older surgeons, MM. Petit, Baudin, and Duverney, to depend upon the trapezius, which was considered to counteract the weight of the arm; it is now pretty well understood to depend upon the coraco-clavicular and coraco-acromial ligaments, which, holding both portions of bone in situ, prevent any displacement. Mr. Lonsdale attributes it to the broken ends of the bone being locked together by the breadth of their surfaces, and to the deltoid pulling the sternal portion downwards. I myself must look upon the breadth of fractured surfaces as of very secondary consideration, and so small

* I may here express my regret that I am unable to find any statistics with reference to shortening as a diagnostic mark in fractures of the clavicle.
a portion of deltoïd is able to act, that its importance appears very questionable; the two combined, even, to my views of the matter, are in no way to be compared in importance to the effect that such powerful ligaments as those we are considering are likely to have.

Mr. Smith,* Surgeon to the Richmond Hospital, at Dublin, brought before the Pathological Society of that city, a series of fractures of the clavicle occurring between the conoid and trapezoid ligaments; to quote his own words: "In all, the fracture had united; in some without deformity, but in the greater number the deformity resulting from the injury remained, and in each specimen presented nearly similar characters; the fragments being united nearly at a right angle, which was salient upwards and backwards, the supra-clavicular space was considerably diminished by the displacement consequent upon the fracture; in every one of the specimens a remarkable process of bone, varying in length from a quarter to three quarters of an inch, had sprung from the under surface of the clavicle at the seat of fracture." He further observes: "This portion of bone is generally to be found when fracture has traversed the bone between the conoid and trapezoid ligaments; in none of the specimens was there any overlapping of the fragments." This accident, I should

* Dublin Med. Journal, July 1841. This is the first opportunity that I have of using the name of Mr. R. W. Smith, of the Richmond Hospital, Dublin. I am indebted to him for many very valuable remarks which he has scattered throughout the numbers of the Dublin Medical Journal; they are, as must be apparent to every one, the result of great experience and acumen. Since this Essay was written he has published a treatise on Fractures, which ranks second alone to that of Sir A. P. Cooper.
think, would be often overlooked in the first instance, the motions of the arm not being much impaired—the clavicle being little, if at all, shortened. To Mr. Smith is undoubtedly the credit due of being the first to mention it.

Nothing can be more favorable than the prognosis we are enabled to give of fractures of this bone; they nearly always do well, the bone becoming united pretty firmly, and the patient regaining the entire use of his arm about the fifth week, although occasionally, in very short muscular people, with some deformity.

I know, in my own somewhat limited experience, no case of false joint, nor do I know of any preparation of such in any museum. I found and dissected one, however, in the autumn of last year (1845), in the dissecting-room at Clamat (Paris); it was preserved by the Prosector of Anatomy: the deltoïd was not wasted. In the museum at Guy's Hospital there is a specimen of extra-coracoidian fracture united by ligament—this is not common, and I should suspect must have been associated with a rupture of the biceps tendon.

Compound fractures of this bone, although it is so subcutaneous, are very rare, unless the wound be caused by some foreign body, which, at the same time that it breaks the bone, wounds the superjacent integument, a condition of things I hold not to be a true compound fracture—which, to my apprehension, consists properly of wound communicating with, and caused by, the fractured bone: the practical bearing of the distinction is this—the violence which produces the fracture and consequent wound breaks up the cellular
tissue, investing the neighbouring muscles, and soft parts, into which the air becoming admitted, induces those enormous, and formidable suppurating cavities in the limb, which we find so frequent after compound fractures. In short, it seems the distinction between a simple and compound fracture is, that the former heals by the adhesive, and the latter, by the suppurative process of inflammation.

More important complications of the injury are still more rare—such as any fragment of the bone wounding the subjacent vessels. Sometimes, however, according to Mr. T. W. King, the brachial plexus of nerves is injured; he says: "Paralysis often occurs from weighty bodies falling on the shoulder, and thereby injuring the nerve."

Mr. Earle relates a case where the axillary plexus was crushed, and paralysis, with a fearful susceptibility to change of temperature in the limb, was occasioned. Like all other fractures, it may, of course, be comminuted.

The reduction of the fractured ends of the bone to their normal condition, if attempted, is exceedingly easy; indeed, the facility with which the bones are readapted, can only be equalled by the difficulty which the surgeon experiences in keeping them in perfect apposition; nor ought this to be a matter of wonder to us, when we consider the conflicting opinions as to the offending portion of bone, and to the muscles which influence it. To effect a creditable cure, innumerable contrivances have been invented and advocated; and apparatus of all kinds have been proposed and adopted,
but to this day I doubt if any fracture (if I except the fracture of the extremity of the radius) turns out so unsatisfactory; not that the ill effects (which are fortunately confined to deformity, and thus usually concealed by the dress) are of any great importance, or detract from the usefulness of the limb. But, viewing the matter surgically, fractures of the clavicle do not usually turn out triumphs of our art.

For all the fractures of the clavicle, whether oblique or otherwise, within or without the coracoid process, one apparatus will be found sufficient; but that must have for its objects—first, to maintain the fragments in apposition; second, keep them immovable; and, third, to prevent excoriation, or undue pressure. Let us consider the best plan to fulfil these ends. It is not my intention to enter into a description of all the machines, &c., that have been adopted for the treatment of this injury, as it would serve no good purpose, and they are doubtless well known. The old method of reducing the injury, was by throwing the shoulders well back, and the figure-of-8 bandage was for this purpose put into requisition. As this failed occasionally, Heister invented a T-shaped instrument, which would answer the then desired purpose, very well; it is even thought in the present day, by a surgical authority, that it “might be employed with much advantage in some cases, where very great extension is required.” It was reserved for Desault to introduce the scientific method of making permanent extension, viz., by putting a pad in the axilla, and making the humerus act as a lever, to draw the fractured end outwards, the shoulder being at
the same time carried upwards by a roller. MM. Baron Boyer, Brasdor, and Mr. Earle, have in turn invented ingenious combinations of pad, buckle, and strap, but they all partake of Desault's view of the matter, and carry his principle out. His method consisted of five pieces: first, a conical pad; second, a bandage to secure it to the side; third, another to fix the arm to the side, great pressure being made upon the elbow; fourth, a roller to raise the humerus, and thereby to throw its head upwards and backwards; and, lastly, a small sling for the fore-arm and hand.*

In England a modification of it is employed, less complex, but equally useful; and as it is a bandage I shall recommend in fractured acromion, fractures of the two necks of the humerus, and in all dislocations about the shoulder complicated with bony lesion, I may be pardoned if I describe it: Two single-headed rollers, nine yards in length, and a wedge-shaped pad for the axilla, are required for its formation; the pad is placed in the axilla with its base uppermost, and secured by two tapes attached to it; the elbow is then carried forward, upward, and inward, against the chest, the fore-arm being bent, where it is retained by an assistant; the humerus is thus made to act as a lever upon the pad in the axilla, and extend the broken bone; one of the rollers is then carried round the chest and upper arm, drawing it more lightly as it approaches the elbow; a soft piece of lint is then placed over the fracture, to prevent the bandage from hurting the part. The second roller is now taken up, and, commencing in the oppo-

* Editio Paris, 1830, par Xav. Bichât, tom. i.
site axilla, is carried across the breast, over the compress and shoulder, and passing down behind the arm, and under the elbow, again mounts upon the breast; its course is then continued, under the sound shoulder, across the back, a second time over the compress and fractured clavicle, and down in front of the arm to the elbow, whence it ascends obliquely across the back to the axilla, where it commenced, and the same course is repeated till the roller terminates. A few stitches (not pins) keep it tolerably firm, and the hand is supported in a sling.

The objection to this bandage is, that, owing to the pressure it makes upon the mamma and thorax, it is not well adapted for females; it requires some little skill in bandaging, and is very apt to become deranged. Still it has a neat look: if it excoriates the part can be cut—its application does not terrify the patient—and, above all, pressure can be better regulated by a roller than by any other apparatus.

Modifications of Desault's bandage are numerous: Mr. Liston recommends that the fore-arm should be bandaged: this, a practical suggestion, is doubtless of some utility and value. M. Mayer employs two "cravates" where the bone is comminuted. I have seen, at Guy's Hospital, several cases which have come under my care as dresser turn out very fairly, by the employment of a figure-of-8 bandage made of flannel—the secret of their success was the application of a pad* in each axilla, this enabled me to make more equal extension, the

* M. Ricord suggests that these pads should be filled with air,—their utility would thereby be doubtless much improved.
flannel did not excoriate, and two or three turns of a roller sufficed to retain the arm by the side—it is the plan always adopted there. M. Velpeau* has given his name to a bandage for this accident; he uses no pad, but makes the patient clasp the sound shoulder, with the hand of the affected extremity, so as to bring the elbow in the mesian line of the body; the arm is bandaged in this manner, care being taken to support the elbow; the general effect is to push the shoulder upwards, backwards, and outwards; like Desault’s, it also keeps the arm perfectly at rest. Baron Dupuytren,+ finding that inconvenience was occasionally produced by Desault’s bandages, advocated the treatment of fractures of the clavicle by position: he placed the patient’s arm upon a pillow, and confined him to his bed, compelling him to lie upon his back; and he gives three cases treated in this manner—two were cured in thirty-two days; the third, at the end of a month. He notices a curve of the clavicle: this was, however, in a patient of fifteen years, and is evidently the fracture without displacement, as enlarged upon by M. Blandin.

If the fracture be comminuted, it would be advisable to endeavour, by careful manipulation, to get all the fragments in situ, the bandage would be the same, only I should, if possible, use more care in its adaptation. I do not think any local application, as a plaster, would prove serviceable, because, if the arm were kept at rest, the fragments would give little trouble. I make it a rule to pay attention to the rollers at the end

* Chirurg. Opérat., tom. i.  
† Leçons Orales, tom. i.
of a week, and to readjust them altogether at the end of a fortnight. M. Velpeau,* in advocating the treatment of fractures with the starch bandage, of course uses them to those of the clavicle. He applies another bandage, "bien imbibée de dextrine," over that I have described above: he says, "Je l'ai employé déjà un grand nombre de fois et il m'a paru si simple, d'une application si facile, que je n'hésite point à le donner comme préférable à tous ceux qui ont été proposés jusqu'ici."

I have had no experience, personal or otherwise, as to its use, and must confess myself no advocate for the starch bandage in any but fractures of some little standing.

* Clinique Chirurgicale, tom. ii, p. 547.
DISLOCATIONS OF THE CLAVICLE.

From the anatomical description of the ligaments connecting the clavicle to the bones with which it articulates, it will be readily seen that the force necessary to produce their rupture must be of a peculiar kind, or of considerable amount. The bone may be dislocated at either of its ends; the accident may be simple or compound, complete or incomplete.

Its sternal extremity may be thrown before or behind the first bone of the sternum; and some surgical authors, Desault, S. Cooper, and Chelius, speak of dislocation upwards. Mr. Lawrence* says, "I believe there is no other kind of dislocation of the clavicle except forwards." Mr. Abernethy† only mentions two; and Mr. Liston‡ has never seen a dislocation upwards. Sir A. Cooper only mentions two. From this, I think, we may infer that if it does ever occur, it is merely a dislocation of the bone forward, taking place in a person of loose habit, and that the shoulder being carried down by the weight of the arm, the other end of the bone becomes tilted upwards. I shall consider it more at full when I come to describe the accident.

The scapular end of the bone may be thrown over,

* Lectures on Surgery, Medical Gazette.
† Lectures on Surgery, Lancet, vol. xi.
‡ Operative Surgery.
or under the acromion process of the scapula; of the last kind I can only find one instance.

The most prominent sign of dislocation forwards, is the appearance of a projection upon the anterior part of the uppermost bone of the sternum, which, upon examination, proves to be continuous, and identical with the clavicle; measurement, both by the eye and tape, show an approximation of the acromion process of the injured side towards the median line of the body; if the shoulder be forced backwards, the end of the bone falls into its place, the tumour then nearly disappearing. The other extremity of the bone being very strongly bound to the shoulder, when the latter is depressed the projection ascends, but descends upon the elevation of the shoulder; all these motions give the patient, who uses the arm with difficulty, great pain; his head is sometimes drawn towards the affected side, and the sterno-mastoid muscle rendered very tense and prominent.

The causes of the accident would be a fall upon the apex of the shoulder, thereby driving the bone inwards and forwards. Sir A. Cooper thinks it would occur from a fall upon the elbow, when the arm is abducted from the side, and any great force, applied to the anterior part of the shoulder, would be sufficient to produce it. The reduction of this dislocation is exceedingly easy. The surgeon taking his stand behind the patient, who is seated upon a low stool, applies his knee between the scapulae, at the same time drawing both the shoulders backwards; the bone will then recede into its proper place; should this not be sufficient,
pressure made by the thumb of an assistant will complete the reduction. Unfortunately, upon these forces being taken away, the bone again nearly always slips out from its nidus; and the surgeon will find, despite of his treatment, that it is a most troublesome accident to treat, some degree of deformity nearly always existing afterwards.

The method of treatment is precisely similar to that of fracture of the clavicle: the indication being to throw the shoulder upward, outward, and backward, and thereby to extend it; for this purpose I would employ the apparatus (a modification of Desault’s for the clavicle) that I have described above. Should the bone still continue to project, the question would arise, to what extent, and in what manner pressure upon the projecting end of the bone would overcome the deformity. A French surgeon, M. Melur,* has applied a sort of truss upon the bone with some success; one end of it is attached behind to the apparatus of M. Boyer for fractured clavicle, the other, well padded, presses upon the end of the bone, the arc of the truss passing over the affected shoulder; it is an ingenious but rather complicated affair, and requires something like facts, or well-authenticated cases to induce its adoption. It is very possible for a partial dislocation to take place at this articulation, owing to a few of the fibres of the capsule or anterior ligament being ruptured, or perhaps stretched (if such a thing ever takes place), in persons of delicate habit, and lax

* Arch. de Méd., tom. xix, p. 53.
fibre; relaxation of the fibrous tissues about the joint certainly results occasionally: here I should enjoin rest, and paint the part with the tinctura iodinii.

It is pretty evident, from the silence of all surgeons upon the point, that in all the dislocations of this end of the bone, the inter-articular cartilage remains attached to the sternum. Were this not to be the case, no one could fail to detect the loose cartilage attached to the clavicle; it would simulate a fracture or separation of the epiphysis, and would be readily detected by the touch. Anatomy would lead us to expect this, for the capsule between the clavicle and cartilage is somewhat looser than that between the cartilage and sternum. It would not in any way complicate the matter.

Dislocation of the clavicle backwards.—A dislocation of the clavicle behind the first bone of the sternum is, next to its dislocation under the acromion process, the rarest in the body. I have been able to collect but eight cases: one by Sir A. Cooper, and this not from violence; a case by M. Pellieux, in the ‘Revue Médicale;’ two in the ‘Gaz. Médicale’ for 1836 and 1837;* two others in the same Gazette for 1841; the following case from Ranking’s ‘Abstract;’ and the last, a compound one (or rather complicated with articular wound), from the St. Thomas’s Hospital Reports, and quoted by South in his ‘Chelius.’ I have chosen that from the ‘Abstract’ as being the most

* One of these is mentioned and reported by Mr. T. Morton, in Mr. S. Cooper’s Treatises on Surgery.
recent. Sir A. Cooper's is the often-quoted case of Mr. Davie, of Bungay, in which the sternal end was sawn off.

The signs are, depression at the level of the sterno-clavicular articulation, the scapular end of the bone is brought more forward than that of the other shoulder; it approaches also somewhat to the mesian line (sixteen lines in one case), and is with difficulty thrown back; owing to pressure upon the oesophagus, deglutition is somewhat impaired, although the looseness of the cellular tissue in its neighbourhood, combined with its own elasticity, effectually preserve the trachea from harm; it is also possible for the jugular veins, and carotid arteries to be affected. The patient complains of pain along the neck of the injured side, towards which he inclines his head.

The accident has always resulted from some great violence; any excessive force applied to the anterior part of the sternal end of the bone would be sufficient to produce it; a fall, driving the shoulder inwards and forwards, would be another cause, as in three of the cases, a kick from a horse was another; but, as in all cases of sudden injury, it will be invariably found a somewhat difficult matter, to obtain from the patient an account of the precise way in which the accident happened.

The surgeon would first try to reduce the bone by drawing the shoulders outwards and backwards, as in the dislocation forwards; in attempting this, it is very likely that the bone might come in contact with the posterior part of the sternum, and all continued effort on the operator's part in this way would prove
then fruitless. Should it not succeed, the patient's body being fixed, extension of the arm should be made horizontally outwards by an assistant, the surgeon at the same time placing his knee between the scapulae, and drawing them backwards, as in his first endeavour. The patient's head and neck should be bent towards the dislocated bone, this would most commonly be effectual.

The reduction being effected, the arm should be put up, as in a fracture of the clavicle, and kept at rest for a fortnight, and some attention, with purgatives and rest, should be paid to the patient, for I think it possible that mischief being produced in the cellular tissue behind the sternum, an abscess might form there, and burrow down into the anterior mediastinum—a formidable evil.

Case.*—Dislocation of the sternal end of clavicle backwards.

"On the 2d inst., a well-known Cornish wrestler, commonly called the 'Little Roper,' was brought to Drs. Hender and Brown, with an injury sustained in the ring. He had been thrown to, or rather upon the left shoulder, so that this was forced upwards. The great force of the fall was assisted by the weight of the other wrestler coming down upon him. Instead of the clavicle giving way, as one would have expected, at its outer curvature, the sternal end of the bone was completely driven backwards. There was much pain, with

* By W. Brown, Esq., of Callington—Medical Gazette, August 1st, 1845.
some embarrassment of breathing. The case being clear, the plan of treatment adopted was the method of Desault, as modified and practised at University College Hospital for fractured clavicles, that is, the reduction, and keeping the parts in place having to be effected indirectly, the limb was put up with the wedge-shaped pad in the axilla, the elbow, in order to be made to act as a lever, being fastened to the side by means of a roller, passing alternately round the body, and over the right shoulder. Thus the elbow was supported, and the fore-arm fixed upon the breast, whereby the shoulder was well kept back, in addition to the primary object being obtained, of confining the elbow to the side, and so making the pad effective as a fulcrum. Perhaps one reason why the articulation gave way instead of the bone was, that though wide, he was still flat in the chest.”

Supposing the surgeon to be unable to reduce the bone, the deglutition being affected, it becomes a question as to what course he ought to adopt. If the difficulty of swallowing, is really formidable and threatens the wellbeing of the patient, it ceases to be a question; it is then his duty to cut down upon the bone, pass a broad, curved spatula behind it, and with Scultetus’s chain, or Solly’s saw, remove the offending portion of bone. The clavicle, both in its totality, and in part, has been frequently removed. Mott, Travers, and Liston, have all operated upon this bone. The surgeon would secure all the vessels that might bleed during the operations as he proceeded; in Mott’s case as many as forty ligatures were applied.

M. Morel, who has had three cases (one doubtful),
divides this accident into two kinds; viz., that upwards and backwards, and that which takes a direction downwards and backwards. I must look upon the former as a consecutive form of the latter, produced by the weight of the arm, and perhaps by the action of the sterno-cleido-mastoideus,—and this brings me to a consideration of the dislocation upwards.

I believe it results from the dislocation forwards, of which it is a sequence and a consequence. To be a luxation, *sui generis*, the interclavicular and rhomboid ligaments ought to be ruptured: these are ligaments of great strength, and I scarcely think it possible to depress the humeral end of the bone, by any violence, to such an extent as shall make the sternal end start upwards out of its place; because the entire shoulder, humerus, and scapula, would have to be depressed, to produce the accident, inasmuch as the accident could not be caused by the depression of the clavicle alone, as the descent of this bone would be limited by its coming in contact with the coracoid process, and its further descent prevented.

In the museum of Guy's Hospital are the clavicles and scapulae of a milkman, who had, in following his trade, been accustomed to carry his pails on his shoulders, in the usual way, both the clavicles articulated by their under surfaces, with the coracoid processes of their respective scapulae. On both sides, the sternal end of the clavicle was in proper relation to the sternum, the coraco-clavicular ligament was much shortened and thickened, and there was no appearance of a dislocation upwards. I conclude, therefore, that it is necessary for the anterior dislocation to take place
before the end of the clavicle shall make its appearance above the level of the sternum, and then it is the result of two forces, one (the weight of the arm) depressing the shoulder, the other (the action of the sterno-mastoïd) drawing the sternal end upward.

Its treatment, should it occur, would be to elevate the shoulder, and then drawing it upwards, backwards, and outwards, to secure it with Desault's bandage.

The humeral end of the clavicle may be thrown above or beneath the acromion process of the scapula; the latter is so extremely rare, that there is but one instance on record. The dislocation upwards, is said by Desault, Bichât, and Boyer, to be more rare than the displacement of the sternal end. Mr. S. Cooper also considers it uncommon. Sir A. Cooper entertains precisely an opposite opinion. Malgaigne, in his 'Études Statistiques,' minute as he generally is, gives no account of their relative proportions; he merely says, that out of 421 dislocations of all the bones of the upper extremity, 33 (26 men and 7 women) were of the clavicle. Desault and Boyer have, I think, been guided more by the probability, than by any experience; they both consider the strength of the coraco-clavicular ligament as a sufficient guarantee for rarity of the accident. Within the last twelvemonth two have applied for relief at Guy's Hospital.

The signs of the accident are, an unnatural prominence of the acromion process of the scapula, anteriorly; the shoulder, which is drawn nearer to the sternum, is less projecting than that of the sound side; there is also an undue prominence of the external end of the clavicle. If the finger be carried along the spine of
the scapula, it will come in contact with the posterior edge of the clavicle; there is great difficulty and pain in the motions of the arm. In the cases that I have seen, the anterior edge of the trapezius muscle was tense and projecting. Boyer thought that this muscle played a very important part in the production of the dislocation. He said, "when a person falls upon his shoulder, the scapula is strongly and suddenly depressed: if, at this moment, a mechanical instinct determines the contraction of the muscles of the shoulder, the action of the trapezius will be impotent upon the scapula, which is fixed by the ground, but it will act so forcibly upon the clavicle, that this muscle will drag it upwards, the more so from the lever that it presents at its point d'appui at the internal side, and consequently at a place far removed from the spot where the power acts."

If he means that this takes place when the ligament is ruptured, he is doubtless right, although I cannot admit the action of the trapezius under any other circumstance. Like most other injuries of the shoulder which fall into ignorant or inexperienced hands, this has been mistaken for a dislocation of the humerus.

The first cause I should mention of a dislocation at this joint, would be a predisposing one, viz., the obliquity of articulating surfaces. The articulatory facette of the clavicle is obliquely cut, at the expense of the inferior surface of bone; that of the acromion is placed at the internal border of this process, and shaped in an opposite manner to the other. The clavicle would thus have a direct tendency to glide
over the acromion process. A fall upon the shoulder is nearly always the direct cause, although in one of the cases I have mentioned, a kick from a horse was sufficient to produce it. The violence, then, would most probably be applied from behind,—a kick or blow on the fore-part of the shoulder would be more likely to injure the shoulder, or fracture the clavicle.

Dislocation of the acromial end of the clavicle over the scapula.—(Original case.)

W. C., aged 50, was admitted Nov. 12, 1845, into Guy’s Hospital, with an injury to his left shoulder. It was immediately pronounced by the dresser, to be a dislocation backwards of the acromial end of the clavicle over the scapula. The patient was a man of fair aspect, and moderately muscular build, married, of temperate habits, and said to have always enjoyed good health. He said that upon the previous evening, while passing through the stables, a horse kicked him on the shoulder, the blow glanced from his shoulder to the side of his head, which was slightly bruised; he was stunned for the moment, but soon recovered himself, he then found he was unable to raise his arm, although he could swing it to and fro, and use the fore-arm. A medical man saw him the next day, and finding the injury intractable, sent him to the hospital. There being little bruise, and no effusion, the injury, on his admission, was very palpable, and the bone appeared very firmly fixed. The patient was seated upon a low stool, his shoulders were forced backwards, the surgeon's
knee being placed between the scapulae; pressure was at the same time made upon the posterior edge of the bone, but without effect; he was then put into a warm-bath, at 107 Fahr., and, upon his feeling faint, the same measures were adopted, without the bone yielding in the slightest degree. On the following day the surgeon for the week, Mr. C. A. Key, saw him, and the attempts at reduction were again renewed, but without success. Every possible manœuvre, and all kinds of expedients were tried, with no avail.

Mr. Key then had recourse to a very ingenious plan, he took a piece of wood, well padded with lint, and having applied it to the distal end of the bone, and struck it several times with a mallet, a fair trial was given to this, and the bone, although evidently not so prominent, and somewhat moved, was still unreduced; a bandage was applied (a pad put in the axilla), so as to throw the shoulder upwards and backwards, and the patient put to bed.

I examined the shoulder on the 17th; the bone was still out of its proper place, and very immovable. The patient left the hospital a few days afterwards for his employment, and was directed to come as an outpatient; this he neglected to do, and I consequently lost sight of him.

The violence which produced the injury was doubtless the cause of the very obstinate position of the bone. It never evinced the slightest disposition to move, until struck in the way above described, and although affected by this treatment, the result was not as effectual as could be wished.
Dislocation of the clavicle over the acromion process of the scapula.—(Original case.)

G. Hill, aged 35, was admitted Dec. 25, 1845, into Guy’s Hospital, under Mr. C. A. Key, with a dislocation of the clavicle upwards and backwards, over the acromion process of the scapula. He was of a moderate conformation, light brown hair and eyes, by occupation a carpenter, and moderately temperate; says he always enjoyed good health, but six years since had had syphilis.

The history of the injury was this: whilst wrestling he was thrown down on the tip of his shoulder; he rose, but found his arm immediately drop powerless by his side. It became very painful. He applied to the hospital for relief, and examination by Mr. Forster, the dresser, showed a well-marked injury. The anterior edge of the trapezius was observed to be tense and well defined. Like the preceding case, it could not be reduced by drawing the scapula backwards. Mr. F. then placed his left arm in the patient’s axilla, and taking the elbow of the affected side in his right hand, pushed it upwards, backwards, and outwards, as had been tried without effect in the preceding case, the bone immediately slipped into its place. A pad was put in the axilla, the arm fixed well to the side, and the elbow brought rather forwards.

At the end of a little more than three weeks it was carefully examined, and hardly any deformity was visible.
The treatment of this accident gives the surgeon a great deal of trouble. If the shoulder (i.e. the scapula) be carried upwards, outwards, and backwards, the bone usually slips into its place. This is not always the case, as in the patient I have mentioned, where Mr. Key, with his usual acumen, had recourse to striking the distal end of the bone, after every manoeuvre to effect the reduction had failed. The common difficulty is, to retain the bone in its proper place, and is one of which nearly all surgeons have complained. Sir A. Cooper directs "the shoulders to be brought back, and a pad to be placed in each axilla; the clavicle bandage is then to be applied, care being taken that its straps should be sufficiently broad to press upon the clavicle, the scapula, and upper part of the os humeri, so as to keep the clavicle down, the scapula inwards and backwards (which is the chief object), and the arm backwards and elevated."

The figure-of-8 bandage is on no account to be applied, as its pressure would have a great tendency to drag the bone backwards, and increase the mischief. All surgeons concur in speaking of the unfavorable result that attends the injury; I speak, of course, with respect to deformity: the motion and power of the arm are unimpaired.

The relation of the clavicle to the coracoid process would make us suspect that the dislocation of its scapular end, under the acromion process of the scapula, must be exceedingly rare. J. L. Petit says, that it appears to him that it ought to occur more frequently than the dislocation over the acromion process; but,
as he says, he never saw any case of the former accident, and the latter only twice; and as it is an opinion so entirely opposed to our knowledge of the anatomy of this region, I think we may consider his opinion on this point as of no great weight. Boyer justly remarks, that reasoning is, upon this point, in perfect accordance with experience. Neither Sir A. Cooper, nor Mr. S. Cooper, ever saw an accident of this kind. The only case recorded is one that has been quoted by nearly all writers upon this subject; it first appeared in the 'Archives de Médecine,' for December 1837, and came under the observation of M. Tournel, of Cambrai.

In the commencement of June 1836, a private of the twelfth regiment of chasseurs, garrisoned at Maubeuge, fell with his horse, which rolled over him. The horse on rising trod upon the anterior part of the rider's left shoulder, a fact which was ratified by the presence, at the thick part, of an ecchymosis, nearly in form like a horse's shoe. The great pressure exercised by the weight of the horse caused the displacement and retrocession of the scapula. The clavicle remained attached to the sternum; but the superior and inferior acromio-clavicular, and the coraco-clavicular ligaments being torn through, its external extremity quitted the two articulatory facettes, and glided under the acromion. The injured part presented two projections: a superior one, formed by the acromion; the other, inferior, by the external extremity of the clavicle; the apex of the same shoulder appeared approximated nearer to the trunk; moreover, there was no projection
to be felt above the acromion process, thus doing away with any idea of its being a dislocation over the acromion process. A bandage was applied after the principles of Desault for fractures of the clavicle, and after thirty-two days the patient was well.

Certain it is that, for the accident to take place, the patient must be under a peculiar combination of circumstances, both with reference to his position at the time, and the immediate cause of the accident. By the first force the clavicle must be disconnected from the acromion; and then by a second, the former bone must be driven under the latter, the scapula being at the same time fixed. The signs peculiar to the accident would be those observed in the above case—the two projections of the coracoid and acromion processes, and the approach of the shoulder to the median line of the body would distinguish it from all other injuries of the kind.

According to M. Malgaigne, a post-mortem examination would demonstrate the previous existence of this injury even after sixty years.
FRACTURES OF THE SCAPULA.

The Scapula, as might be expected from its protected situation, is not very liable to fracture; the muscles with which it is surrounded, the looseness with which it is attached to the trunk, and its consequent mobility, all tend to diminish the chances of this injury. Still we find that its prominences, being more exposed than the general body of the bone, suffer from the application of external violence. In Mr. Lonsdale’s Table, taken during six years at the Middlesex Hospital, out of 1901 fractures of all the bones of the body, 18 were of the scapula.

Of the body of the bone there were 8

" acromion process " 8

" neck " 2

Of the upper extremity, it is certainly the bone least frequently fractured. From what I have seen I cannot but think that the acromion process more frequently suffers than the body of the bone, the former accident not being so severe as the latter. Mr. Lonsdale gives no history of his two cases of fractured neck.

I shall divide the fractures of this bone, 1st, into those of the body, as supra- and infra-spinal fracture; 2dly, those of its angles, as fracture of the anterior angle or neck of the bone, and fracture of the inferior angle; and, lastly, I shall speak of fracture of its processes.
Fractures of the Scapula.

Fracture above the spine would nearly always be transverse or oblique, and this latter case would amount to a fracture of the internal angle; but, as it would be nearly impossible for either one or the other to occur without implication of the angle, I shall speak so, and describe them as a supra-spinal fracture. I do not think it possible for a vertical fracture to take place above the spine without the whole body of the bone sharing in the accident. From the great depth at which this portion of the bone is situated, and the complete manner in which it is covered with a pad of muscular fibre (the supra-spinatus), it is an accident exceedingly unlikely to occur. Chelius alludes to one; Mr. B. B. Cooper, in his Anatomy, gives a drawing of one; Mr. South says he never saw one. I can find no reference to fracture in this part of the bone by any authority I have consulted; should it occur, I think the supra spinatus, and serratus magnus, would antagonise the levator anguli, and prevent displacement. It would be very difficult to detect; the patient might complain of pain upon making a forced inspiration; the motions of the arm would be affected; and upon drawing the shoulder backward, to relax the muscles, a notch might be felt in the posterior costa. I should apply a figure-of-8 bandage, and enjoin rest. It could only occur from great violence.

Fracture of the body below the spine may be perpendicular or transverse, the latter by far the most common; it must, however, be borne in mind, that there is always great difficulty in speaking as to the precise direction a fracture shall have taken, a musket-
shot passing through the bone, or a cart-wheel over it, would produce complications, which would materially impede the accuracy of the diagnosis.

Fractures of the body of the scapula are nearly always the result of some great and direct violence, the soft parts covering it commonly suffer severely with it. Mr. South thinks the violence necessary to produce the injury has been underrated. He adds,* "Nor have I seen any very severe bruising of the soft part attending these accidents." Mr. S. Cooper, and most writers, concur in the degree of violence necessary to produce the injury. All the cases I can find, with the exception of one, the following, which occurred from muscular action, have been from direct force.

* Chelius, vol. i, p. 584; † South.
† By Dr. Heylen. From Ranking's 'Half-Yearly Abstract of the Medical Sciences.'
have made great efforts to preserve his equilibrium, until, after having proceeded a hundred yards, the animal stopped, and allowed him to put his feet to the ground; he did not feel at first any pain, but found some difficulty in approximating the arm to the body. In the evening he felt a sharp pain in the left shoulder, which on the least motion of the arm, on coughing or sneezing, became a lancinating pain. He remained in this state "till the 11th, two days after the accident, when he applied to Dr. Heylen, thinking he had sprained his shoulder. On examination, the following symptoms were observed:—The shoulder presented no manifest deformity, where the arm was applied to the trunk. It was not greatly swollen. On separating the arm from the trunk, and raising it, the hand could be easily applied to the head. He was prevented by pain from doing this himself, without the aid of the other arm. On letting the arm fall, a degree of rigidity was observed in its motion, and it was only by raising it that it could be returned to its original position. At a certain point the patient screamed, and said he heard a cracking, which was also felt at the hand: no loss of continuity could be felt in the clavicle or humerus. On examining the shoulder, it appeared to be normal, yet it was certain, bony crepitation could be felt. On sliding the finger along the spine of the scapula, a depression was found in the middle of the apophysis, and, on pressing the most elevated part, it gave way with crepitation: this was also produced on rotating the arm, the finger being placed on the spine of the scapula, and on the clavicle. To determine whether it was a frac-
ture of the spine, the base being separated from the body of the bone, a finger was placed on the coracoid process while the arm was rotated, when crepitation was felt; the shoulder did not present that deformity described by authors as characteristic of fractures of the acromion, and of the spine of the scapula. It was now inferred, either that the neck was fractured, or that the spine, at its base, was completely separated from the body of the bone. The exact diagnosis was difficult, for the displacement was little marked, the fragments being retained in juxtaposition by the muscles of the shoulder-joint, which retain the head of the humerus on the glenoid cavity. Externally, there was no ecchymosis or trace of violence.

If there be transverse fracture through the body and below the spine, the patient complains of pain, and tenderness at the seat of injury, which is increased upon moving the extremity or drawing a deep inspiration; if the surgeon apply the palm of his hand flat against the scapula, a sudden crepitus is often felt; to obtain this sign more fully and clearly, let the hand be applied to the spine of the bone, and the lower portion moved against the upper in the ordinary way, and crepitus will be generally detected.

To assist in the reparation of the injury, I should apply a flat compress upon the dorsum, and another against the anterior costa of the bone, securing them with a flannel bandage; this I should pass round the trunk for a necessary number of times, and by its last turn or two secure the arm to the side; in this, as in all bandages to the trunk, I should stitch each fold
together, and throw transverse slips across each shoulder to support the whole (as in fractured ribs). When the fracture is vertical, there is little displacement, but, owing to the greater violence required for its production, more contusion of soft parts. The treatment would be precisely similar. Inflammation of the chest, as a sequence of the injury, I should not expect to follow, unless a rib were broken simultaneously, or a spicula of the fractured scapula driven through an intercostal space, and the pleura thereby wounded; in this case the scapula would most likely be comminuted, and the symptoms be not unlike those of a fractured rib.

Fracture of the inferior angle only differs from the fractures of the other part of the body of the bone by the peculiarity of the deformity which accompanies it; the serratus magnus, being stronger than the lower portion of the rhomboideus major, draws the separated portion of the bone forwards. The teres major would assist in this most materially. The best diagnostic mark of the accident is, that upon the patient's employing his arm, the lower portion of bone does not participate in the movements of the upper portion of the scapula, but remains stationary; the converse of this, of course, takes place.

The treatment is similar to the other fractures, care being taken that the arm is well secured and kept at rest. Mr. T. W. King says he has seen this fracture united by ligament, but does not add whether the powers of the extremity were much impaired. For my own part I should fancy not.
The question of the existence of a fracture of the cervix scapulae, or anterior angle of the bone, has for years, like that of a union of fracture of the cervix femoris, been debatable ground among English surgeons. At one time all injuries in and about the shoulder, which were at all obscure, and which baffled the acumen of the surgeon, were set down as fracture of the cervix scapulae; if any accident was found to be neither a fracture of the head of the humerus, nor dislocation of that bone, then the scapula was at fault, and a fracture of its neck was diagnosed. The rarity, however, of any pathological specimens of this injured bone have gradually led many surgeons in the present day to suspect the frequency of its occurrence, and some to withhold altogether their belief as to its existence. Mr. South says, "I believe there seems good reason for believing this accident never occurs. . . . I believe there is not any existing specimen of fracture of the neck of the blade-bone."*

If the injury exist at all, it can only take place across the surgical neck of the bone; i.e. from the notch upon the superior costa to about half an inch below the glenoid cavity. A fracture of the true anatomical neck, i.e. a separation of the glenoid cavity, is clearly impossible, unless the bone be so entirely comminuted that no part can be said to be broken off from the other.

The drawing in the frontispiece, Fig. 1 (taken from the original preparation in the Museum of

* Chelius, vol. i, p. 549.
Guy's Hospital), shows clearly what is ordinarily understood by a fractured cervix, and is, I believe, unique; indeed there is hardly a single case known of fracture occurring by itself without the bone suffering at the same time some other severe fracture. In the Museum at Fort Pitt, Chatham, there is a specimen, but the anterior portion of the bone is much comminuted. Duverney mentions a case of simple fracture, proved by post-mortem examination, and therefore valuable; Boyer another; and Sir A. Cooper three; but the last four cases were not verified by inspection. I am, indeed, able to state, that before his death Sir A. Cooper expressed himself very doubtful of the possibility of the injury.

The great strength of the bone at this part, the depth of its situation, and the protection it receives from surrounding structures, all tend to diminish the probability of the accident; should it occur, it must result from most direct violence, as a grape-shot passing through, or a cart-wheel passing over it; all indirect force, as contre-coup, &c., is quite out of the question in the production of the accident; and I should, primâ facie, be sceptical as to the existence of a fractured cervix scapulæ, were the injury said to be the result of a fall or blow,—grounding my opinion on the natural solidity of the part, its protected situation, and the extreme mobility of the bone.

The signs of the injury are entirely negative; at first sight the accident is taken for a dislocated shoulder, there is a hollow beneath the acromion, a flattening of the deltoid, a lengthening of the arm, and the head of
the humerus can be felt in the axilla; this, however, is easily restored to its proper situation, but soon again relapses into its abnormal condition. If the coracoid process be fixed, and the humerus rotated, crepitus will be felt, a sign to be received with great caution, as the cracking sound being near a joint may be produced by other bones and structures besides the fractured surfaces of the scapula. The displacement is inconsiderable, owing to the acromio-clavicular and acromio-coracoid ligaments, which would retain the fragments *in situ*; should these be ruptured, the coracoid process of the injured side would sink upon a plane lower than that of the opposite one; this would materially assist the diagnosis, and for myself I should rely upon it with greater confidence than upon any other symptom; the arm hangs helpless by the side, the entire shoulder droops, and all the motions caused by the surgeon, although free, are productive of great pain. It is known from the dislocation downwards, by the great freedom of motion which it has, the ease with which the deformity is made to disappear, the great pain upon moving the arm, the absence of the projection of the elbow from the side, and the want of numbness in the fingers. It very closely resembles a fracture of the anatomical neck* of the humerus; in this latter injury, upon abducting the arm from the side and tilting the elbow upwards, the acute margin of the fractured bone, in place of its rounded head, is felt in the axilla; there is also a want of lengthening in the limb, i.e. from the acromion process to the external condyle of the humerus; moreover, if the scapula
be injured, pressure upon the coracoid process produces pain, which is not the case if the humerus be fractured. It sometimes, though rarely, happens that a small portion of the lip of the glenoid cavity may be chipped off; this could not, of course, be detected by the surgeon, it would give the patient great pain and inconvenience, perhaps be attended with deformity,—even this would be slight. In this latter case I should enjoin rest and spica bandage, but should much fear that the integrity of the joint would permanently suffer.

The treatment of a fractured cervix consists in putting a pad in the axilla, throwing the shoulder upwards and backwards, and bringing the elbow forwards and to the trunk. These ends may be accomplished with Desault's apparatus. At the end of seven weeks I should remove the bandage and commence passive motion, and direct the patient to resume the use of his arm with caution. The depth at which the fracture is seated renders the employment of all external applications fruitless. The cold douche bath might perhaps be of service, as tending to restore the tone of muscles which had been so long quiescent.

Fracture of the Cervix Scapula.*

A moderately tall man, aged 44, and apparently healthy, being in a state of intoxication, was thrown out of a cart, and he seems to have fallen on the back part of his head, and also on the right shoulder. His

* By the late T. W. King, of Guy's Hospital. Post-mortem and history by Messrs. Cock and Hilton.
most serious injury was of the head. A transverse fracture of the scapula was discovered by Mr. Cock, of Guy's Hospital, with some difficulty; crepitus was not felt on pressing its processes and rotating the humerus, but the hand on the inferior angle detected grating. The roundness of the shoulder was not lost, but there was an incomplete dislocation of the outer end of the clavicle upwards. The figure-of-8 bandage was applied with pads in the axilla. He survived only eight days. The coraco-clavicular ligaments were not torn through; the injury to the scapula consisted of separations between the spine, with a considerable part of the supra-spinous fossa, and the neck, and the inferior portion of the bone; a line of fracture run from the posterior costa along the under side of the base of the spine, and another from the superior costa, leaving a little of the supra-spinous fossa attached to the cervix, and also half an inch of the foundation of the root of the spine; this line terminated at about an inch and one third from the glenoid cavity, in a third line which extended from near the inferior edge of the glenoid cavity more than half way towards the inferior angle, tending to isolate the thick edge of the interior costa. Fig. 1 in the frontispiece is a drawing of this fracture; the original is in the Museum of Guy's Hospital.

Of the two processes, acromion and coracoid, the former is by far the most liable to fracture, indeed it is more frequently broken than any other part of the scapula; situated as it is above the shoulder-joint, it
must necessarily be obnoxious to all violence threat-
ening the articulation from that quarter. Its fracture
might also result, but this very rarely, from a force
applied from below. I can find no case of this occur-
ing without a simultaneous dislocation of the shoulder
upwards, and the accident is most commonly caused
by a fall upon the elbow, drawing the head of the
humerus upwards, fracturing the acromion, and pro-
ducing the displacement. It may occur at any part
between its base and apex, but most commonly at one
inch from its extremity, and has the peculiarity of
nearly always being transverse.

It is known by the shoulder assuming a slightly
flattened aspect; there is a depression upon the apex
of the shoulder (noticed by Cheselden) upon carrying
the finger along the spine of the scapula; an acute de-
pression is felt at the point of separation; if the spines
of the two scapulae be measured, the suspected one
will be found shorter than its fellow; the distance
between the sternum and the shoulder is less upon
the injured side than upon the opposite; the arm
drops down by the side, the patient being unable to
elevate it; he has all the under motions of the joint,
but they give him pain. If the hand be placed upon
the shoulder, and the humerus pushed upwards and
rotated, this movement restores the contour of the
joint, and crepitus is felt.

To favour the reparation of the injury, the elbow
should be tilted well upwards, and slightly backwards,
and the deltoid relaxed by putting a pad between the
side and the elbow (this is according to Sir A. Cooper).
Chelius recommends a conical pad between the side and the arm, its base being downwards; both plans would have the same effect; should they be thought superfluous, the hand and fore-arm should on no account be supported in the bandage (which should act upon the elbow alone), their weight having a very beneficial effect in throwing the elbow backwards, and consequently the head of the humerus upwards. A spica bandage, or a complete encasement of soap plaster may be applied prior to the chief suspensory bandage, but this at the discretion of the surgeon—and I think quite superfluous.

The bone most commonly unites by ligament; sometimes, but more rarely, a false joint is formed, as in the preparation.* In the fourteenth volume of the Medical Gazette are seven dissections of injured shoulder-joints, their pathological condition described by Mr. Gregory Smith; five had the long tendon of the biceps ruptured, and in two it was dislocated; two of these having the tendon ruptured, had fractures of the acromion, in both a false joint: they must have been preparations precisely similar to my own. I account for the formation of a false joint in the three cases thus: the tendon of the biceps being ruptured, the head of the humerus loses its chief anterior ligament, and rides forward, and cannot offer the same support to the fractured acromion as it would under ordinary circumstances. The process, wanting that natural support or splint, is

* The preparation sent in was a fracture of the acromion, with false joint, and rupture of the biceps tendon. It was not calculated to show well in a drawing, or I would have had a sketch made of it.
continually acted upon by the deltoid muscle; gentle attrition takes place between the fragments, and a synovial sac is formed. Fortunately the utility of the arm is not much affected by the want of bony union; I should, however, certainly try to obtain it by keeping the patient's arm in the bandage for six weeks.

The coracoid process could only be broken by some direct violence, and its fracture is usually accompanied by some other important lesion. The two cases mentioned by Messrs. South and Arnott, in the Medico-Chirurgical Transactions (vol. xxii), and one by Mr. Boyer, died; the last of the shock. It is somewhat curious, and worthy of remark, that both the former were accompanied by fracture of the clavicle.

The fractured portion would be moveable under the finger and thumb, and drawn downwards by the three muscles, pectoralis minor, coraco-brachialis, and biceps, which radiate from it. Mr. Liston says, the crepitus may be felt by placing the hand over the process, and making the patient breathe deeply. I have never met with a case of the kind, but should employ Velpeau's bandage, i. e. should fix the hand of the injured side upon the opposite shoulder. A pad, I think, would be of very equivocal utility. Fergusson says, "I have known an instance where the coracoid process was broken, and drawn down by the combined action of the pectoralis minor, coraco-brachialis, and biceps muscles: nothing could be done to keep the process in its natural position."

* Practical Surgery, p. 184.
Displacement of the Lowest Angle of the Scapula.

An accident to the inferior angle of the scapula, with reference to the upper margin of the latissimus dorsi muscle, although painful to the patient, and troublesome to the surgeon, is happily of rare occurrence. The only mention of it by any surgical authority is in the 'Elements of Surgery,' by Mr. Liston, who thus describes it: "The inferior angle of the scapula occasionally escapes from under the border of the muscle; the displacement is occasioned by raising the arm above the head to an unnatural extent. The angle of the bone projects considerably, and the muscle is felt playing beneath it; the movements of the limb are limited and painful." He directs the reduction to be effected by raising the arm, and pressing the angle inwards; the parts are to be treated with a bandage passed lightly round the chest: this is to be retained for a considerable time; "for," he adds, "in general the bone soon regains its former unnatural position." I saw a case of the kind among the outpatients at Guy's Hospital, under Mr. Callaway; it was in a young girl of 17 or 18 years of age; I have, however, no history, or particulars of the case.

I think it is a question worthy of consideration, whether the accident depends at all upon the muscle having an origin from the angle of the bone; at any rate, I think this circumstance is a predisposing cause, and would be very likely to favour the accident, inasmuch as these fibres, taking their point d'appui,
under peculiar circumstances, from the insertion of the muscle, would act upon the angle of the bone, and draw it upwards and over that portion of the muscle arising from the dorsal spines. It would occur, I conceive, in weak, delicate persons. Were I to have a case whose reduction I was unable to effect, I should not hesitate to divide by a subcutaneous section the obstructing fibres of the muscle; for although the patient ultimately suffers but little inconvenience from the injury, yet in men the deformity would be very apparent; in women who wear stays the projection would be pressed upon, and somewhat controlled; still a very troublesome bursa might form between the bone and the superimposed integuments, giving rise to much trouble and inconvenience.
DISLOCATION OF THE SHOULDER-JOINT.

No slight degree of complexity appears to exist upon the subject of dislocations of the scapulo-humeral articulation; and although books, brochures, and letters innumerable have been written upon the subject, it is still veiled in much ambiguity. Had this diversity of opinion been confined to a difference in the nomenclature, it would have been a no very herculean task to have reconciled the apparent discrepancies; but the evil is of far greater magnitude, for it is on the actual occurrence of individual dislocations that much controversy exists, e.g. the two chief modern French surgeons, MM. Malgaigne and Velpeau, are not agreed as to the existence of a dislocation directly downwards.

I believe this disagreement among surgeons results from two principal causes. And firstly, from the different views taken of the axillary space in its dissection; by some the scapula is drawn from the side, and, when dissected, almost forms its external boundary; while to others the anterior costa of the scapula seems to form its posterior boundary. Under such circumstances, the same dislocation is not likely to be described alike, or called by a similar name, by the two individuals.

Another, and very principal, cause of the perplexity is, that the injury is described, and derives its name,
at one time from its relation to the glenoid cavity; at another from the position which the head of the bone holds with respect to the processes of the scapula or the surrounding muscles; whilst a third appears to be a combination of the two.

The divisions made by the French surgeons are most artificial and laboured; indeed, their principal aim appears to have been to avoid simplicity, "that mother of surgery," as much as possible; like Hudibras, they appear to be able "to divide a hair 'twixt south and south-west side." Still their industry and observations are most meritorious, and worthy of imitation; and certainly if, on the other hand, a glance be taken at the various kinds of luxations spoken of by English surgeons, nothing would appear to be more simple or better understood. A little diversity of opinion may exist among them upon some pet scheme or method of reducing the bone, but upon the main points they seem tolerably well agreed. Mr. Pott appears to have observed this apathy some years since, for he writes—"No part of surgery is thought to be so easy to understand as that which relates to fractures and dislocations. Even the most inexpert and least-instructed practitioner deems himself perfectly qualified to fulfil this part of the chirurgic art; and the majority even of those are affronted by an offer of instruction on a subject with which they think themselves already so well acquainted;" and although I admit that the theoretical part of the subject has in this country been somewhat slighted, yet the practical has met with much attention and investigation.
The great size of the articulating head of the humerus, the shallowness and comparative smallness of the glenoid cavity, the looseness of the capsular ligament, and the varied motions of the arm, all tend to render the shoulder exceedingly liable to be displaced. Upon this point surgeons are tolerably unanimous. Bichât mentions, that it appears from a table taken during seven years at the Hôtel-Dieu, this accident had been as frequent, and more so, than dislocation of all the other bones taken collectively. According to Malgaigne,* out of 491 dislocations of all the bones in the body, 321 were of the humerus, or nearly two thirds of the number. In the hospital of Pennsylvania, U. S., 84 dislocations were admitted from 1830 to 1839 inclusively: of these, 49 were of the humerus. Sir A. Cooper says, the dislocation is more common than that of all the joints in the body.

Owing to the weakness of the capsule of the joint at its lowest part, we shall find that the head of the bone is most liable to take a direction downwards; the common cause of the accident, viz. a fall with an outstretched arm, also favours the frequency of this kind of accident. The displacement forwards, and then on the dorsum, follow in the next order.

The influences of sex, age, and particular seasons, have been much insisted upon by M. Malgaigne, with reference to their effects in producing, favouring, or modifying dislocations. I give, from his statistics, some tables, which are very curious, and I believe perfectly unique of their kind:

* Études Statistiques.
THE SHOULDER-JOINT. 103

Years of age.
From 2 to 15, of 13 dislocations 3 were of the shoulder, or 1 in 4
15—45, " 216 " 113 " " 1—2
45—55, " 101 " 73 " " 1—1.36
55—70, " 129 " 101 " " 1—1.27
Above 70, " 35 " 30 " " 1—1.17

Thus, dislocations of the shoulder are exceedingly rare before 15. From 15 to 45, during adolescence and adult age, they are not far short of half the total number of dislocations of the body; but from 45 the decline of life begins, and immediately the number goes on increasing. At first it does not reach altogether to three fourths, then to four fifths, and above 70 to the incredible proportion of six sevenths. M. Malgaigne adds, one may say this dislocation "est l'apanage de la vieillesse, et de la vieillesse la plus avancée."

The following elaborate table, showing the influence of age, and the seasons upon dislocations of the humerus, is taken from that gentleman's 'Etudes Statiques,' originally published in 'Les Annales de Chirurgie.'*

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<th>Summer M, F</th>
<th>Winter M, F</th>
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<td>55—60</td>
<td>9 2 6 1</td>
<td>5 2 8 1</td>
<td>23 6 6</td>
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<td>60—65</td>
<td>8 3 4 5</td>
<td>5 2 6 5</td>
<td>23 15 15</td>
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<td>65—70</td>
<td>5 1 4 2</td>
<td>2 2 10 3</td>
<td>21 8 29</td>
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<td>70—75</td>
<td>4 1 2 2</td>
<td>1 3 2 1</td>
<td>9 7 7 16</td>
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<td>75—80</td>
<td>1 1 ... 1</td>
<td>1 1 4 3</td>
<td>6 5 5 11</td>
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<td>80—90</td>
<td>1 1 ...</td>
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<td>2 1 3</td>
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Total 66 14 44 23 48 21 75 29 233 87 320

* Octobre 1841.
If any reliance is to be placed upon the above table, which reflects the greatest credit upon the industry and perseverance of M. Malgaigne, one may lay it down as a rule—1st, that dislocation of the scapulo-humeral articulation most commonly occurs between the ages of 45 and 70; 2dly, with women, rarely before 25, that is, three before, to thirty-two after that age; and 3dly, during the winter and spring quarters, the accident is much more prevalent: 184 cases occurred during these two quarters to 136 which happened in the summer and autumn.

The controverted question of various kinds of dislocation would have been deprived of much of its difficulty, if the terms used, had been better explained: upon the right understanding of these, the whole perplexity turns.

If by a dislocation upwards, it is meant that the head of the bone is ever placed immediately above the glenoid cavity, without a fracture of the acromion, instead of upwards and forwards under the clavicle, I do not think there can be a doubt of its non-existence; in the same way, for a dislocation to take place directly downwards, it is necessary for the longest head of the triceps to be ruptured or torn away from its origin. Now, if a line be taken from the acromion process, and let fall so as to bisect the glenoid cavity, from apex to base, and be then continued along the scapular head of the triceps, it will necessarily follow that all dislocations must be anterior or posterior to it; and as the head of the humerus has an inclination towards the thorax, the dislocations would necessarily partake of that character. It appears to me quite impossible to lay down any rule,
THE SHOULDER-JOINT.

or place any limit, as to the exact spot where the head of the bone shall rest in the anterior dislocation; it may be found in any part between the clavicle and the base of the axilla. The most usual sites for it are under the pectoral muscle, under the clavicle, and into the axilla: in this last the head of the bone may rest against the anterior costa of the scapula, and is then simply in the axilla; or it may pass more internally, and be buried among the anterior fibres of the subscapular muscle. Still I believe any modifications, depending upon accidental circumstances, as the direction or extent of the dislocating force, may in each of these take place. Posteriorly, the head of the bone appears to take a pretty constant course, and to settle itself under the spinous process, and upon the posterior part of the neck of the scapula: it is an injury not often seen in this country, but we find that, on the Continent, it has been divided into two kinds. MM. Velpeau and Sédillot speak of it as being complete or incomplete, and M. Laugier speaks of a subspinous and a sub-acromio-spinous. When I come to describe this posterior dislocation, I shall give M. Velpeau's views and his reasons for describing a partial dislocation in that direction, I shall myself adopt the anterior and posterior dislocations, with the following subdivisions:—

A. Anterior.  B. Posterior.
β. Subscapular.  
γ. Subclavicular.

A few words will not be misplaced on the subject of primary and secondary dislocations. It is thought by some, that for any of the anterior dislocations to occur,
the head of the bone must take a circuitous course, i.e., it must pass downwards, and then have a direction upwards to its ultimate position. I cannot think that any change takes place in the head of the bone, beyond that of merely settling, as it were, in its new position; because, 1st, that in a case quoted by Sir P. Crampton, of subclavicular displacement (with recent dissection), the laceration of the capsule was at its upper and anterior part, through which the bone had passed straight to its situation, without reference to the axillary space. 2dly. It appears to me necessary, for the occurrence of a secondary dislocation, that the bone should in all cases take the same course, and be guided thereto by some muscle or tendon; and 3dly, because I believe the secondary position is always produced by the patient’s own effort either to move his arm, or by the movements given to it when it was being examined. Sir A. Cooper says, “I do not believe in any change of place after dislocation, beyond that slight change which pressure, by producing absorption, will sometimes occasion. The bone is generally at once thrown into the situation which it afterwards occupies.”

I subjoin a table of dislocations, according to various French authors:

<table>
<thead>
<tr>
<th>Author</th>
<th>Dislocations</th>
<th>Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. Scullot</td>
<td></td>
<td>1. Incomplete.</td>
</tr>
<tr>
<td></td>
<td>1. Anteriorly</td>
<td>2. Under the coracoid process.</td>
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<tr>
<td></td>
<td></td>
<td>4. Into the axilla.</td>
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<tr>
<td></td>
<td></td>
<td>5. Against the thorax (inter-costate).</td>
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<tr>
<td></td>
<td></td>
<td>6. Between the scapula and clavicle.</td>
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<tr>
<td></td>
<td></td>
<td>7. Between the clavicle and ribs.</td>
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<tr>
<td></td>
<td></td>
<td>1. Into the infra-spinous fossa.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Against the neck of the scapula.</td>
</tr>
</tbody>
</table>
THE SHOULDER-JOINT.

Author. Dislocations. Varieties.

M. Langier.

1. Anteriorly and inferiorly
   1. Incomplete.
   2. Under the coracoid process.
   3. Under the subscapularis.
   4. Into the axilla.
   5. Against the thorax (inter-costate).
   6. Between the scapula and clavicle.
   7. Between the clavicle and ribs.
2. Posteriorly
   1. Into the infra-spinous fossa.
   2. Against the neck of the scapula.
3. Directly upwards.
4. Directly downwards.

M. Petiténin.

1. Downwards and forwards
   1. Incomplete.
   2. Under the coracoid process.
   3. Under the subscapularis.
   4. Into the axilla.
   5. Between the coracoid process and clavicle.
2. Backwards
   1. Into the infra-spinous fossa.
   2. Into the axilla (directly downwards).

M. Malagigne.

1. Anteriorly
   1. Incomplete.
   2. Under the coracoid process.
   3. Under the subscapularis.
2. Posteriorly
   1. Under the acromion.
3. Downwards.

Sir Ashley Cooper.

1. Anteriorly
   1. Incomplete.
   2. Downwards and inwards.
   3. Forwards.
2. Posteriorly
   1. Into the infra-spinous fossa.

M. Velpeau.

1. Forwards and inwards
   1. Incomplete.
   2. Under the subscapularis.
   3. Under the pectoral muscle.
   4. Under the clavicle.
2. Backwards and outwards
   1. Into the infra-spinous fossa.
   1. Complete.
   2. Incomplete.

Messrs. Desneut, Boyer, Senan, Grand, &c.

1. Anteriorly
   1. Forwards and inwards, following the dislocation downwards.
   2. Downwards.
   3. Upwards and inwards, following the dislocation inwards.
2. Posteriorly
   1. In the infra-spinous fossa.
The head of the bone in the dislocation downwards may have two situations, either lying against the anterior costa of the scapula and towards the ribs, that is, in the axilla, or it may be driven among fibres of the subscapular muscle, lying almost in the subscapular fossa, while the neck is embraced by some of the fibres of the muscle. The former is that form of dislocation, in which there is lengthening of the arm, and which is so easily reduced; while in the latter, the lengthening is less marked, often absent, and the difficulty of reduction greater.

The symptoms of the axillary and subscapular dislocations are nearly similar. There is a marked hollow under the acromion, the process itself appears to project, there is a flattening of the shoulder, whose anterior aspect is also much increased in depth; from above downwards, a very important sign, the axis of the limb is altered, the arm appears to pass out from the thorax, the elbow projects, with an inclination slightly forwards, from the side, with which it usually cannot be brought in contact, all attempts to do so, and they occasionally succeed, producing much pain and numbness of the hand. The patient will complain of this pain pretty constantly, and endeavour to alleviate it by bending his body towards the injured side, and supporting the arm with the opposite hand. Chelius, copying Desault, says, he supports the elbow upon his hip: this is a mistake. The surgeon, after the first hour or so, finds a rigidity and immobility of the shoulder; if he elevate the arm, the head of the bone is tilted downwards, and made very distinct in the axilla.
Sometimes rotation gives a slight crepitus. To the eye the limb appears lengthened, although by measurement this is not always found to be the case. If the vertical circumference of the shoulder, i.e. from its top to the anterior fold of the axilla, from \( E \) to \( F \) (vide diagram), be measured, and compared with the sound one (usually about eighteen inches and a half), a great increase of about two inches will be found, this is an invariable concomitant; for the head of the bone, go where it will, must distend and displace parts, augmenting the depth of the shoulder and the breadth of the base of the axilla.

The only distinction I can draw between the two dislocations, the axillary and subscapular, is, that in the axillary the arm is lengthened, and the head of the bone more distinct and more moveable in the axilla.

It must have occurred to every surgeon that, upon occasionally measuring the arm in a dislocation downwards, he has found little comparative lengthening, to his eye it was distinct, but the tape rectified all source of fallacy. What, then, was the cause of this? Lengthening has, by nearly all surgeons, been considered as an universal concomitant of the injury; by Dupuytren, indeed, it was considered as pathognomonic of the dislocation downwards. For an explanation of the difficulty let us refer to the accompanying diagram. If a subscapular dislocation take place, i.e. if the head of the bone \( B \) be thrown to \( D \), and the arm be measured from the acromion \( A \), to the condyle \( h^3 \), and supposing the length of the sound arm from \( A \) to \( n \) to be fourteen inches (about the average), according to the received
theory of lengthening, the distance from $A$ to $H^9$ ought to be an inch and a half or two inches longer than from $A$ to $H$. Now this is clearly not the case, because at the same time that the head $B$ passes to $D$ among the fibres of the subscapular muscle, that is, in a direction inwards, as well as forwards and downwards, so the condyle $H'$ takes the position $H^9$, and is brought proportionally near to the acromion $A$, and these two points being usually taken for measurement, the lengthening is found not to exist. If this be true, I think I may add, much more then shall shortening take place in the other anterior dislocations, as when the bone is at $C$ and $L$.

M. Duverney* thought that the lengthening depended upon the head of the bone being placed below the glenoid cavity. M. Malgaigne† maintains that it is constant in all dislocations of the shoulder, and that shortening cannot take place; M. Sédillot is evidently inclined to favour the theory of lengthening. Dupuytren‡ thought it a distinctive mark between dislocation and fracture of the anatomical neck. M. Velpeau.§ who has paid great attention to the subject, lays much stress upon the two arms being measured in the same position: in some cases he has found shortening, in others a lengthening; on the whole, he is satisfied there was lengthening occasionally, of a few lines, half an inch, and even to an inch in the sub-pectoral

* Sur les Os, tom. ii, p. 142.
† Gazette Médicale, 1834.
‡ Leçons Orales.
§ Clinique Chirurgicale, tom. i, p. 295.
dislocations; in the subscapular the length was nearly equal, perhaps a few lines more or less between the two sides, while in the subclavicular there was a shortening varying from a few lines. In comparing these results with the experiments he has made upon the dead body, he has found these two perfectly to accord. M. Maisonneuve,* in two cases of dislocation downwards and forwards, found shortening of one inch in one case, and of eight lines in the other; to satisfy himself upon the point, he produced twenty artificial dislocations; in all there was a shortening more or less marked. He explains the anomaly by the fact, that surgeons are contented with optical rather than actual measurement, according to Boyer's plan. For my own part, I have met with so little success, and so few satisfactory results in the production of complete dislocations upon the dead body, unless the scalpel was employed in the division of ligaments and tendons most freely, that I must receive all post-mortem experiments with suspicion. M. Laugier found shortening to the extent of half an inch in a dislocation which he thought was incomplete. Upon the whole, I am inclined to look upon this symptom as anything but certain, and, quoad measurement, should rely far more upon the vertical circumference of the joint than upon the distance between the acromion process and the external condyle.

The usual cause of the dislocation downwards is a fall while the patient's arm is outstretched from his

* Proposition sur quelques Points, &c., p. 25.
side; a direct blow upon the head of the bone would be the next most frequent cause; in both instances it would result from external violence, combined with a sudden and powerful action of the greater pectoral, subspinus dorsi, and teres major muscles: the latter cause would most probably be induced by some confusion upon the shoulder or upper-arm. Muscular action is oftentimes sufficient, per se, to produce the injury, as in a man throwing a ball or lifting a weight; but this most commonly occurs with those people who have previously dislocated the limb. I have, in my note-book, an instance of a man who had dislocated the same shoulder seven times; it was always easily reduced, and I am somewhat inclined to suspect some mechanical lesion about the articulation. It has occurred with people during fits of a convulsive or epileptic nature; more often, however, we find these circumstances obtaining as a cause of dislocation in young, delicate, and hysterical females, of an atonic habit of body, in whom the fibrous tissues are lax and feeble;—the patellæ are the bones usually displaced. For this class of patients, after reduction (which is easily effected), steel, generous but not stimulating diet, country air, and attention to the secretions, particularly the menstrual, will do all that is required. Sea-bathing or the shower-bath would be of great advantage.

While upon the causes of dislocation, I do not think I can do better than notice the views of Baron Dupuytren and M. Guerin abroad, and Mr. R. W. Smith, of the Richmond Hospital, Dublin, upon con-
genital dislocation: the last gentleman, to whom I have had occasion to refer previously, as having his attention peculiarly directed to injuries of the osseous tissues, has written an essay upon the subject in the 'Dublin Journal.'* The injury, or rather the displacement, appears to be analogous to, and often concomitant with, other congenital deformities, as wry-neck or club-foot. From Mr. Smith's account, their occurrence is often overlooked, and it is not until the muscles become well developed and the points of bone prominent, that the true nature of the mischief is made manifest. He divides the injury into a congenital sub-coracoid and a congenital sub-acromial displacement. In the former case, the head of the bone, which was oval in its shape, articulated with the base of the coracoid process, the arm was shortened one inch, the shoulder flattened, its muscles and those of the arm shrunk, the glenoid cavity could be felt empty, the motions of the arm were restricted, elevation and abduction impossible, and it is somewhat curious the patient was unable to flex the arm to a right angle, owing to the atrophy of the biceps. The congenital sub-acromial is entirely similar to the sub-acromio-spinous dislocation of MM. Sédillot, Laugier, and Velpeau; the coracoid process projects anteriorly, the front part of the shoulder is flattened, the head of the bone can be felt posteriorly under the acromion process, and the fore-arm is rotated inwards. The subject, however, may truly be said to be in its infancy: should a case occur, and be

* Vol. v, p. 236.
discovered by the attendant practitioner, he would en-
deeavour to replace the bone if possible, and retain it, in situ, with some mild unirritating plaster.

Dislocation of the humerus might occur from disease
dependent upon some extensive suppuration in the
joint, and most probably accompanied with exfoliation
or other disease of the articulatory surfaces; entire de-
struction of the integrity of the joint must follow, and
the direction which the bone might take would depend
upon accidental circumstances. It would be the aim of
the surgeon to establish a false joint as near as possible
to the proper articulation, and it might be necessary for
him to cut down upon the joint, remove or scrape the
head of the bone, and endeavour, by setting up a
healthy action, to form a new joint in lieu of the old.

The principles upon which a dislocated bone is to be
reduced depend upon the circumstance of the injury
being remote or recent: in the latter case, much may
be done by stratagem, contrivance, and tact; but, in
the former, where the bone has gained fresh connexions,
we have to depend upon force, applied in a regular
and scientific manner, and modified by the nature of
the case. In both it rests at the discretion of the
surgeon to employ therapeutical agents as auxiliaries.
The first indication to be fulfilled would be to relax all
the muscles of the shoulder, a plan which is best
effected by placing the arm at right angles with the
trunk, and, although this rule is departed from occa-
sionally, as in the reduction by the heel, under the
sanction of high authority, yet we shall find that slight
extension in this position often succeeds in replacing
the bone. The second plan is to fix one bone, disen-gage the head of the other, so that the articular muscles shall draw the latter into its place, in other words, by extension and counter-extension. All attempts to make these methods subservient to the laceration of the capsule, so that the bone shall retreat by the aperture it shall have made in its descent (and this has been much insisted upon by Desault—no mean opinion), are, I fear, hopeless, and I think unnecessary; still, it ap-pears to me that, upon the capsule being lacerated, the articular muscles, having an insertion into and most direct influence upon it, would immediately cause it to gape, so as to allow the head of the bone to retreat with ease. In many, indeed the vast majority of cases, I should expect the capsule to be stretched rather than torn: to look upon it as obstructing the reduction, it must, I think, be considered as analogous to a portion of flaccid dura mater playing a mere mechanical part, and uninfluenced by muscular action. I need scarcely premise that all attempts to enlarge the aperture are most unsurgical and unphilosophical.

From the great interest which the treatment of dislocations of the shoulder has always excited, there have resulted manifold and numerous plans for effecting their reduction; indeed, I think there is hardly a single complication of the injury for which, could it be clearly diagnosticated, there is not a corresponding and adequate plan for obviating the difficulty. In early times the great and principal aim was force; the bone, often at the expense of its integrity, or that of the neighbouring tissues, was pushed into its place by mechanical violence. "Many," Mr. Pott says, "or
most of them, indeed, are much more calculated to pull a man’s joints asunder than to set them to rights.” Their formidable appearance has been most happily satirized by Hogarth in that picture of ‘Marriage à la Mode,’ in our National Gallery, where the rake is with his mistress consulting the surgeon. The ‘ambe,’ a lever of the first order, described and employed by Hippocrates, and afterwards modified in various ways, was not discontinued till a comparatively late period. Ambrose Paré, Deverney, improved upon it. A door open at its upper third was another ancient plan; also a ladder, the first half dozen rounds of which the patient ascended, and passed his arm over one of the rounds, so as to have it in the axilla, his hand being seized by an assistant, the patient dropped. These methods are now quite exploded, although, it is somewhat curious, the use of the ladder, upon a different principle, has been revived by Sir P. Crampton.

I should endeavour to reduce a recent dislocation by that plan which promised most success with the least expenditure of time, apparatus and labour, in a few words, by stratagem. Mr. Abernethy says, “If you can get a person off his guard you have first to put your hand up to the head of the bone, depress the elbow, and it will sometimes succeed in putting it in.”

Sir P. Crampton recommends this, but upon an improved plan; he directs the surgeon to place his left arm, extended horizontally below the walls of the axilla, between the dislocated arm and the chest, and then grasping the wrist with his right hand, he should draw the arm forcibly across the patient’s body, thus making his arm a fulcrum and the dislocated humerus
a lever of the first kind. Much of the success of this plan depends upon the muscles being, as John Hunter expresses it, "taken by surprise;" it is very well adapted for the simple dislocation downwards, when the bone is free from all entanglement with the muscles. Should this method not succeed, more formidable measures must be resorted to, and at this stage of the operations some therapeutical agents may be adopted. The patient ought to be placed in a hot bath, at a heat varying from 100 to 106 Fahrenheit, and kept in until he shall faint; while in a state of syncope other measures, as the heel, &c., may be tried with great effect: the usual plan of putting a patient into the hot bath, and taking him out the moment he feels faint, is worse than useless, for I believe it has the effect of stimulating the patient afterwards; a full and unequivocal effect ought to be produced by the bath. Nauseating doses of tartar emetic, perhaps, combined with the bath, have an excellent and marked effect in diminishing muscular energy. With respect to tobacco enemata and venæ sectio, I would avoid the former altogether, and the latter if possible. Blood, the pabulum vitae, is of too much importance, and its loss too lightly regarded. I have no hesitation in saying that the abstraction of a pound or two of blood, particularly from a person residing in the metropolis, is likely to have a most prejudicial result, as producing an effect and inflicting a shock upon the system, from which it does not easily recover, and which often lays the foundation for future constitutional mischief: to a labouring, perhaps a poor man, it is a hazardous experiment.
Nevertheless, should the patient be a plethoric, muscular man, and insensible to either debilitating agents, I should be obliged to employ it; my chief reliance would be on the antimony and bath carried to syncope. Tobacco is too powerful and uncertain in its operation to be had recourse to upon a slight emergency.*

Mr. White, of Manchester, in the year 1764, published an account of a new method of reducing dislocation, viz. by making extension in a vertical direction, by drawing the arm upwards above the head: its chief excellence is, that the supra- and infra-spinatus muscles are relaxed, as well as that portion of the capsule yet entire: it is a most useful and successful plan, and has been much used abroad. Mothe and Malgaigne have, in turn, ineffectually laid claim to it; but it is still often spoken of as the "métod de Withe" (pro White).

For its performance, let the patient be seated upon the ground, and let an assistant, standing upon a chair, raise the arm steadily, as though he were about to lift the patient by it; a second assistant fixes the scapula, and steadies the patient; while the surgeon, directing the humerus, retains his fingers upon its head, and as soon as it shall have arrived on a level with the glenoid

* This was written before the introduction of ether, and of its more elegant and useful improvement, chloroform. It may be most advantageously used in some cases, but where patients are subject to fits, to any cardiac affection, or have any phthisical tendency, I should avoid it. I am moreover much inclined to think that there is an age when its exhibition is hazardous, that is, when the vessels of the brain are somewhat "fatigué" from age. It is almost needless to observe that its administration should be confided to one, and that an experienced, person.
cavity, presses it upwards with his fingers. I have never seen it tried.

The plan advocated by Sir A. Cooper is that of making extension downwards parallel to the axis of the body, so as to free the head of the bone from the glenoid cavity. He says, "in recent cases it very rarely fails, and it is so easily applied in all situations, that I have recommended all our young men to employ it in the first instance, when called to the occurrence." The patient is placed upon his back, and a wetted roller bound round the arm above the elbow, upon which is fixed a handkerchief; with one foot on the floor, he separates the patient's elbow well from his side, places the other heel in the axilla, he himself being in the sitting position: care should, however, be taken to bend the fore-arm so as to relax the biceps muscle. After pulling steadily for three or four minutes the head of the bone is commonly brought to the margin of the cavity, and slips in. Should this not succeed, it is as well, after making extension vertically, for some minutes to vary the direction of the applied force, by making it slightly across the patient's body, so as to tilt the head of the bone from under the inferior lip of the glenoid cavity. Great difference of opinion, I may here remark, has arisen with reference to the method of applying the extension, some contending that it is more advantageous to apply the extending force immediately to the displaced bone; others maintaining that it is more advisable to make the extension with the intervention of other articulations, as from the wrist. Mr. Pott thinks, by the intervention of the
elbow- and wrist-joints, with their component ligaments, there is a great loss of power. He would therefore always have the force applied to the other extremity of the injured bone, and as much as possible to that only. He is followed and supported in this view by most English surgeons. Sir A. Cooper, acknowledging the propriety of this rule, thinks, however, that the shoulder is an exception to it. Paré, Duverney, and Sédillot coincide with Pott. Some French surgeons of great celebrity, as Desault, Velpeau, Malgaigne, and White and Crampton of this country, prefer that this extending force should not be applied to the displaced bone. They argue that the length of lever is increased, and an addition of power thereby attained, and that the muscles near the joint are not stimulated by the application of bandages. For myself, I should employ the latter when the former failed. It is an axiom in the reduction of dislocations, subscribed to by all surgeons, that the extension should be made slowly and gradually, and unrelentingly, until the object be effected: all renewed attempts occasioned by the necessity of a readjustment of the apparatus are to be discountenanced; all jerking or irregular extension is carefully to be avoided; it is the equable nature of the extending power that forms the prominent advantage in the pulley.

The surgeon will sometimes succeed in replacing the bone by taking his stand behind the patient, and inserting his flexed knee in the axilla, the arm being abducted, and his own foot firmly planted upon the chair; if he now grasps the humerus close to the
elbow, so as to gain leverage, and depresses the elbow, reduction will sometimes follow. The difficulty is, to keep the patient in his chair: he commonly raises himself, and thus counteracts the effects of the operation.

We now come to the reduction by the pulleys; these are only employed when other means have failed in powerful persons, and in old dislocations. Steady extension, and counter-extension, are the great advantages. The patient is seated in a chair midway between two staples, firmly fixed to opposite sides of the room; the injured arm is passed through a sort of padded leathern collar, which is adapted to the shoulder, and fixes the scapula; straps are passed from it across the body to the staples farthest from the dislocated arm; the upper arm is then bandaged with a wetted roller to prevent the towel or other apparatus from slipping; the towel may be applied by a clove hitch, or what I commonly see employed over the roller; a well-padded armpiece, with two sets of buckles, is used; to this the pulley is attached, and this again to the other staple. All being ready, the patient being perhaps prepared by a few doses of antimony, the hot bath, or other anti-tonic measures, the extension is made transversely across the body by an assistant, the surgeon occupying himself in rotating the arm, pushing the head of the bone upward with his knee, or depressing the scapula. I should not, in an obstinate or old dislocation, carry my measures on for a longer period than forty minutes.

Sir P. Crampton prefers the lever to the pulleys, because, in the first place, it is always at hand, there
being few places in which either a pole or ladder cannot be obtained; secondly, on account of the ease with which the direction of the extending force may be varied; and thirdly, for the suddenness with which it may be withdrawn when the bone shall be opposite the glenoid cavity. The patient, by this plan, stands upright between the rounds of a ladder, his body being fixed by a sheet, and held by assistants; one end of the ladder is fixed to the ground by the foot of an assistant, the other is held in an elevated position by a second, who is ready to depress it, and thus make extension downwards and outwards upon the patient's arm, which is attached to the centre of the ladder; the surgeon stands astride before the patient ready to give a lateral inclination to the extension, or to act upon the head of the bone. This, in its turn, has the objection of wanting at least three assistants and a large room.

Mr. Jervis, an American surgeon, obtained a gold medal from the British Society of Arts for a machine for the reduction of dislocations; it was taken from, and acted upon the precise principle of the box-winch used by stone-masons for removing heavy masses of stone. It was said to have been very successful; but although tried in various metropolitan hospitals, I know of no instance of its successful use; on the contrary, I know that in one case it was supposed to have separated the anatomical neck from the shaft of the bone, and in another it nearly drove in the thoracic parietes. It has the great fault of gaining its purchase at the expense of the ribs.
There are numerous modifications of all these methods, but as none of them involve fresh principles, their detail would be of little profit.

*Dislocation of the humerus downwards (i.e. subscapular) reduced by the knee in the axilla.*

John Dowley, aged 45, applied for relief as an outpatient at Guy's Hospital for a hurt to his shoulder. He stated that while at work as a scavenger two days previously, the cart upon which he was standing moved on, and losing his balance he fell from a height of about eight feet, striking himself upon the upper and outer side of the arm, about the insertion of the deltoide. The injury presented the usual signs of a dislocation downwards; the elbow was well from the side, vacuity of the glenoid cavity well marked, and distance from the top of the shoulder to the anterior margin of the axilla greatly increased. The sterno-mastoid and trapezius were remarkably prominent on the affected side. Not having a very muscular man to deal with, I suggested to the dresser, Mr. Collins, that he try to reduce it with his knee in the axilla. Having placed him sideways upon a chair, the dresser raised the arm from the side, so as to get his knee well in the axilla, and depressed the elbow forcibly (the opposite shoulder being steadily held by assistants). After two or three minutes the bone slipped into its place, not, however, with a snap, but by a *scrench* or grinding sort of noise, no doubt occasioned by the head of the bone against the under surface of the neck.
Dislocation of the shoulder into the axilla reduced by the heel.

William Ryan, aged 51, was brought, May 17th, 1846, to Guy's Hospital, with a dislocation of the right shoulder. It presented the usual signs of a dislocation on the axilla; measurement showed a lengthening of one inch and a half. He was a stout, flabby man, married; said that, with the exception of occasional rheumatism, he had always good health.

The accident occurred by his falling into a barge; he said he pitched on his hand and arm. He had $\frac{3}{4}$ of vin. ant. p. t. given to him. Extension was made with the heel in the axilla, and, with the aid of two assistants, in about ten minutes it slipped into its place. The arm was bandaged up and the man put to bed; he left the hospital next day, and on the 23d was beginning to use his arm.

Dislocation into the axilla twice reduced.

Jane Turner, aged 46, was admitted into Dorcas Ward, Guy's Hospital, under Mr. Key. She was an exceedingly stout woman, fair complexion, high cheek-bones; said she got her living as a washerwoman, was married, and had had twelve children; her health, with the exception of a little rheumatism, was good. She presented herself as an out-patient for an injury she had sustained to her left shoulder the previous day, by being thrown out of a cart; the dislocation downwards was well marked, the arm and hand swollen, painful, and numb. The dresser reduced it with his heel in
the axilla: as the patient was rising from the horizontal position, the bone again slipped out, it was easily put in again, a pad applied anteriorly, the arm bandaged up, and the patient taken to bed: in a fortnight she was made an out-patient, and in a month expressed herself as quite well, and able to use the arm nearly as well as before the accident.

In the dislocation under the clavicle the bone either passes over the subscapularis muscle, or, what is more common, ruptures some of its superior fibres, crosses the axilla under the pectoralis minor, and becomes lodged upon the inner side of the coracoid process; it is, however, possible that the bone may not proceed as far, but may stop short and take its situation at the root or below the process. Its principal sign is a prominence under the clavicle, in place of the usual depression; this is occasioned by the head of the bone, which may be distinctly felt to rotate under the fingers; in thin persons it is even visible. The salience of the acromion process, and the flattening of the deltoid, are more evident behind than before; the humerus has a direction from the centre of the clavicle outwards, downwards, and slightly backwards; the upper arm is usually shortened, the fore-arm not bent; its movements, which are sometimes accompanied by crepitation, are very limited; little pain and no numbness attends the accident, and the posterior costa of the scapula projects outwards.

The injury is usually caused by a blow or a fall while the arm is abducted, and having a slight incli-
nation backwards; some great force most probably acting upon the humerus, and drawing the head of the bone upwards, inwards, and forwards. I do not believe that it could be effected by muscular action.

The treatment is very similar to that of the other. Sir A. Cooper recommends his favourite plan of the heel in the axilla, only directing the surgeon to place the heel rather forwards. After the extension has been kept up in this way for some minutes, it is often useful to draw the arm across the body, so as to throw the head of the bone outwards. If the head of the bone appears somewhat firmly fixed, it is sometimes advisable to commence by drawing the humerus out at right angles from the body, and thus convert the injury into the downward dislocation; its reduction would thereby be much facilitated. Should the pulleys be used, the arm must be drawn in a direction outwards, and slightly downwards and backwards; as soon as the bone has passed beyond the limit of the coracoid process, the direction may be altered, and the extension made more evenly with the body; or the surgeon may bring the humerus slightly forward by applying his knee to the anterior part of the shoulder. Mr. White's plan for this dislocation was used and approved of by Mr. Hey of Leeds.

The dislocation backwards of all the dislocations of the shoulder is the least frequent. Boyer only saw one; Dupuytren, three; Velpeau, one (the case given by Sédillot),—he gives, however, three incomplete; Sir A. Cooper relates but two, although in the 'Guy's Hosp. Reports,' Oct. 1840, he says "several others
have come to my knowledge.” Its existence is even doubted by some, for Sir C. Bell, in his ‘Operative Surgery,’ says, “that no force can be applied in a direction to dislocate the humerus, and push its head behind the scapula;” for this very evident reason, that the chest prevents the necessary position of the humerus.

The posterior part of the capsule is torn, the subscapularis muscle stretched, and the head of the bone is buried among the fibres of the infra-spinous muscle. This displacement is said to be easily diagnosed from the facility with which the head of the bone may be felt below the spine of the scapula; the shoulder is flattened anteriorly, its transverse diameter increased in contradistinction to the other two, in which the vertical is increased, and the coracoid process more projecting; the arm is said to be lengthened, and the elbow certainly carried forwards; the humerus is in close approximation to the chest, the fore-arm turned inwards, and passing transversely across the body; all movements are difficult and painful. The reduction may be effected by extension downwards with the heel in the axilla, or by pulleys, the extending force having a direction downwards, forwards, and outwards. Sir A. Cooper reduced two by raising the hand and arm, and then turning the hand backwards behind the head. In a recent injury, where the patient could be taken off his guard, I think this plan very likely to succeed.

If a partial dislocation backwards exists at all, it has never been noticed in this country. Sir A. Cooper merely speaks of the partial dislocation forward; three
French surgeons concur in making a division of the posterior dislocation. M. Laugier speaks of a sub-acromio-spinous, and of a subspinous, divisions; MM. Sédillot and Velpeau of a spinous complete, and subspinous incomplete. From the position which M. Velpeau holds on the Continent, and from what I have seen of his practice at the Hospital la Charité of Paris, I am induced to place the greatest confidence upon his judgment and observations, and I cannot but think his remarks upon the subject as very judicious. "If," he says, "by an incomplete dislocation, one would understand that the cartilaginous surface of the head of the humerus may have slipped for one half (of its size) from the glenoid cavity, no doubt one ought not to admit of its existence; but if, on the contrary, one would understand by an incomplete dislocation a displacement in which the humerus is stopped by some part of its anatomical neck on the border of the glenoid cavity, it is impossible to doubt its existence."* He gives two cases of partial dislocation backward. In both the arm was lengthened, to an extent of half an inch in one, and to eight lines in the other: in both the movements of the arm were impossible, or very painful; the elbow had a direction forwards, and the head of the bone could be felt projecting posteriorly in both. The first was reduced by extension with the pulleys, thirteen months after the injury, which was received in a scuffle; in the second case, the reduction was easily effected by raising the arm so as to throw

* Leçons Orales, tom. i, p. 277.
the head of the humerus from above downwards, and
from behind forwards. It went into its place with a
snap.

The after treatment for the axillary, subscapular, and
subclavicular dislocations is the same. I should apply
Velpeau's bandage for fractures of the clavicle: place the
hand of the injured side upon the opposite shoulder, and
thus bring the elbow well forwards, so as to throw the
head of the bone upwards and backwards; a pad in the
axilla would be unnecessary, as only having the effect
of throwing the head of the bone outwards. I should
employ the same apparatus for the dislocation on the
dorsum as for a fracture of the acromion, but without
the pad in the axilla; the head of the bone would thus
be thrown forwards and upwards. The arm should be
kept in this position for at least a week. If the bone,
however, has a tendency to slip out of its place again,
I should have recourse to pads, placed either anteriorly
or posteriorly, according to the exigencies of the case;
the arm in such instances should not be disturbed for
a space of three weeks. Should any severe mischief, as
consequent synovitis, set in, leeches, fomentations, and
poultices would be employed with great benefit; the
arm would then be merely confined to the side, and
the elbow supported by a handkerchief.

It frequently happens that a patient presents himself
to the surgeon with a well-marked dislocation of the
shoulder, and, upon making inquiry into the history,
the latter finds that the injury has existed for eight or
ten weeks. The patient requests his opinion as to the
feasibility of its reduction, and upon that often depends
the future utility of the limb, or even a more serious termination. It is a matter requiring no little consideration, for although reduction has been effected after a long lapse of time, yet most untoward results affecting the life of the patient have arisen from attempts to replace the bone. "It is only by repeated and multiplied experience," observed Baron Dupuytren, "that any approach can be made to the solution of the question." He gives a short digest of a Memoir published by M. Haubert, of Rouen, who, it appears, has been singularly unfortunate in his attempts to effect the reduction of old dislocations; five out of six cases were accompanied with serious injuries to surrounding soft parts. The experience of M. Marx and the Baron points to a decidedly opposite result. Of 33 cases of luxation brought forward by the latter gentleman, 25 are of the shoulder in different directions, 5 of the femur, and 3 of the fore-arm. The following is a tabular view of them:

| 5 were reduced from the 5th to the 10th day |
| 6 | 10th | 20th |
| 4 | 20th | 30th |
| 5 | 30th | 40th |
| 5 | 40th | 50th |
| 2 | 50th | 60th |
| 2 | 70th | 80th |
| 2 | 80th | 90th |
| 1 | 90th | 100th |
| 1 | after two years |

Desault was at first cautious as to any attempts; but, according to Bichat, he afterwards reduced the bone when a period of three or four months had passed
after the injury. M. Gerard, of the Hôtel-Dieu, reduced a dislocation of the shoulder after 90 days; M. Sansin, 90; M. Breschet, 82, 90, and 98; M. Delamotte, 60.

Dr. S. W. Norris, in his Statistics,* when speaking of dislocation of the shoulder, shows that during a period of ten years, from 1830 to 1839 inclusive, 94 cases of dislocation of various articulations came under his notice. Of these 49 were of the shoulder; 45 were cured; 3 relieved; and 1 died. Of the 3 relieved, 1 had existed in a young man of 20; it was a forward dislocation of the head of the humerus of 62 days' standing. Some days after his entrance, an attempt was made by Dr. Hewson to reduce it by means of pulleys, but without success. At the request of the patient, strong efforts were again made to reduce it, but with no better effect. The other case was a forward luxation of three months' standing, which it was found impossible to reduce. (This is reported at length in the 'American Journal' for Feb. 1840.) Among the cases of dislocations at the shoulder cured, are those which had been out 26, 45, 58, 31, 10, 21, and 31 days respectively.

Sir A. Cooper and Chelius consider three months as the limit for any attempts. Perhaps the most extraordinary case on record† is one that occurred in the practice of Mr. Nathan Smith, of Yale College; both the humeri had been dislocated into the axilla, of a lady,

* Statistics of Fractures and Dislocations treated in the Pennsylvanian Hospital, from 1830 to 1839, by Dr. G. W. Norris, M.D., one of the surgeons to the institution.
† Philadelphia Medical Journal.
by puerperal convulsions. One was reduced at the end of seven months and a half, and the other shoulder was reduced at the expiration of ten months and a half. For my own part, I must look upon them both as in some degree hysterical, and therefore not fair cases. The circumstances which would deter me from any attempts at reduction would be, first, the lapse of ninety days; the patient having a tolerable use of his arm; the formation of bony deposit about the head of the bone assisting in the formation of a new joint; the history of previous inflammation concomitant with the injury, which would make all the parts adherent, and perhaps the muscular fibre soft; a rigid condition of his arteries; and, lastly, obscurity or obliteration of the glenoid cavity. The surgeon would be guided much by the wish of the patient; and the attempt being determined upon, he should be kept low for some days previously, and the part frequently steamed or poulticed.

Dislocation into the axilla reduced after five weeks, under Mr. B. B. Cooper.

William Parker, aged 52, of fair complexion and short stature, was admitted into Guy's Hospital, Dec. 17, 1846. He was a lieutenant in the navy; had been to sea off and on for forty years; his health had always been good till the last sixteen years, since which time he had been much afflicted with gout. He had received sabre wounds upon the head and throat, but suffered no ill effects from them: lives well, and is
moderately temperate. Five weeks since he fell down, in what particular way he is unable to say, but that the inside of the right arm was very black afterwards: says he did not observe if his coat was dirtied. This was followed by a fit of gout. His shoulder was much swollen, and he applied vinegar to it. On examining the arm, the elbow could be brought to the side; to the eye the arm appeared lengthened, the flattening of the shoulder was well marked, the hand was edematous; he complained of great numbness down the hand; was unable to bend the elbow, or to use the hand: he was put in a hot bath, and vini ant. pt. 3ij given to him; and, upon feeling faint, he was removed to the operating theatre. Extension was made by four or five assistants, the operator's heel being in the axilla. This was kept up for twenty minutes, during which time 3iv more of vini ant. were administered, the bone being frequently rotated. A powerful assistant was now directed to place his heel in the axilla, and make extension by the wrist (this was adopted, because the arm was quite excoriated by the towel, and had become so painful, that the patient was unable to bear its further application). The extension being kept up for two or three minutes in this way, the operator suddenly withdrew his heel, and passed the patient's arm across his body. No effect was produced: this manœuvre was repeated a second time, and something suddenly appeared to give way, and the bone relapsed into its place. The reduction was not very obvious; the arm was, however, bandaged up, and the patient put to bed.
On examining the shoulder, about three weeks after the accident, the patient had no more use of the arm, but the deformity was much diminished, and he could bear passive motion with less pain, and to a much greater extent.

*Subclavicular dislocation of the humerus, of nine weeks' standing, reduced by Mr. E. Cock.*

J. W., aged 43, a spare man of florid complexion, was admitted December 3d, 1846, into Luke's Ward of Guy’s Hospital, with a subclavicular dislocation of the humerus. He was by trade a druggist, living at Royston, in Hertfordshire, had always enjoyed good health, and his habits of life had been regular. He stated that, on August 30th, while turning the corner of the street, in a tax cart, the wheel came in contact with a post, and he was thrown out; he fell upon his left hand, and thinks he struck his shoulder, but is unable to say with certainty. A medical man saw him, called the injury a bruise, prescribed some lotion, and said the joint would soon recover its proper shape. Examination showed a loss of the natural contour of the shoulder, the acromion projected in a marked manner, and the cup of the glenoid cavity could be felt tolerably free; the head of the bone was plainly to be discovered under, and rather to the sternal end, of the coracoid process; it could be rotated easily; the distance from the acromion process to the external condyle was, in the sound arm, exactly thirteen inches, while, on the injured side, there was hardly any perceptible difference; if any, it was merely a line or two, the
vertical circumference of the shoulder on the sound side was eighteen and a quarter inches, on the injured side close upon nineteen inches; he had considerable use of the arm, all the under movements, and could raise it to an acute angle from his side, with which the elbow could nearly be brought in apposition. Being very anxious to have something done, the bone being very moveable, it was determined by Mr. Cock to attempt the reduction. The patient, having previously taken a dose of vini antimon. was seated upon a chair, with his arm at right angles to his trunk; extension and counter-extension were made with pulleys, the arm being frequently rotated; after some little time Mr. Cock attempted to throw the head of the bone backwards, by pressing upon it with his knee, and bringing the elbow a little forwards; at the end of twenty-five minutes the head of the bone was clearly to the outer side of the coracoid process, the greater pectoral muscle appeared very tense. No further progress being made, the patient, who had been kept under the influence of tartar emetic, was placed upon his back, Mr. Cock placed his heel in the axilla, and extension was made by several assistants; in about ten minutes the bone made an evident movement, and the deformity had in a great measure disappeared, there was, however, still a projection at the anterior part of the joint; a pad was placed in the axilla, the elbow bound to the side, and the patient put to bed.

On the 6th the bandages were readjusted, and on the 14th, the patient being very anxious to return home, the shoulder was examined—it was nearly normal
in its aspect, and the patient was told to continue the bandage for a fortnight, and then commence passive motion.

On January 29, 1847, he was regaining the use of the arm; the head of the bone was rather more forward than normal; and, by March 11th, the motion was perfect, and the integrity of the arm was completely restored.

The complications which might occur in conjunction with any dislocation of the humerus are twofold, viz. injuries to the bone, and injuries to soft parts. Under fractures of the humerus, I shall speak of the difficulties that arise when its neck becomes injured simultaneously with a dislocation; an injury to either scapula or clavicle, as fracture of acromion or coracoid processes, or fracture of the clavicle, would only make the surgeon more careful in his attempts at reduction; they would offer no adequate excuse for any postponement of the replacement of the bone. Should the integuments be much bruised at the time of the injury, a warm saturnine lotion would be beneficial. A wound might, however, penetrate to the joint, being made from without to within, or from within to without; in other words, the dislocation might be compound. Were the circumstances of the case favorable, i.e. no vessels or nerves implicated, the health and habits of the patient good, the limb should be saved. Lint dipped in blood should be applied (the dislocation being reduced), so as to convert the compound into a simple dislocation, and every possible means taken to prevent suppuration.
Abernethy mentions three successful cases, Fergusson one, and Sir A. Cooper a fifth: all recovered with most useful limbs. Should the vessels be at the same time injured, amputation is the only resource.

Dislocations of the shoulder may be accompanied with injury to the axillary artery, vein, or axillary plexus of nerves. The circumflex nerve is often said to suffer; but I believe much of the difficulty which is sometimes experienced by the patient in attempting to elevate the arm depends upon the rupture of the biceps tendon—paralysis of the deltoid, from injury to the nerve, being commonly set down as the cause. In true injury to the nerve, the deltoid wastes, and cannot be made tense at the will of the patient; sensation on the posterior part, and over the insertion of the muscle, is absent or obscure.

In the Museum of St. Bartholomew's Hospital is a preparation showing the nerve, flattened and compressed by the neck of the humerus bone.

The following is a case illustrative of injury to the brachial plexus of nerves, as a concomitant with dislocation of the shoulder. I am indebted for it to Mr. E. Cock, under whose care it came, and of whose report I am kindly permitted to avail myself.

A. B., a gentleman of Reading, consulted Mr. Cock concerning an injury to the shoulder; he was 59 years of age, of a healthy habit, and stout, muscular conformation. He stated that, seven weeks previously, while getting out of a coach, he fell upon his left side, with his arm extended. The immediate effects of
the accident were total loss of motion of the whole arm and hand, entire loss of sensation in thumb and finger, with numbness over the fore-arm. Ever since the accident he had suffered excruciating pain, more particularly in the course of the ulnar nerve, so as to deprive him of all rest. When Mr. Cock first saw him, the elbow was carried backward, and the arm slightly separated from the side; there was much subcutaneous effusion, which had commenced soon after the accident; there was most sensation in the terminal branches of the radial nerve on the back of the hand; the acromion projected, the shoulder was flattened externally and posteriorly, and the head of the humerus could be felt to the inner side of the coracoid process. It was clearly a dislocation of the shoulder forwards and inwards; the bone was movable, and could be drawn down from its situation.

On August 12, 1840, sixteen ounces of blood were taken from the opposite arm, and the displaced limb was bandaged from the fingers up to the shoulder. Gradual extension outwards was made with the pulleys, and the bone rotated at the same time; the force was continued until it became severe and painful. A dose of antimony was given him, and he then for the first time became faint. The extension being abandoned, the operator's knee was placed in the axilla, and his foot supported on the chair; the patient's elbow was then forcibly carried to the side. This was followed by a considerable amendment; the normal appearance of the shoulder being restored.

On the following day the head of the bone appeared
THE SHOULDER-JOINT.

fixed in its proper position; the pain in the shoulder was less, the arm very stiff, and the œdema a little subsided. A needle was thrust into the extremity of the middle finger without producing the slightest evidence of sensation.

On the 14th he was free from pain; the œdema was less; there was a tingling sensation in the fingers, and the head of the bone appeared well in situ; a smaller pad was applied, with a flannel roller.

Jan. 18. Mr. Cock heard from the patient (he had returned home to Reading): he was improving, the arm becoming smaller.

Feb. 8. Stimulating applications had been used, which had excoriated his fore-arm, and produced a return of the œdema and neuralgic pain. This, which was formerly in the course of the ulnar nerve, is now transferred to the cutaneous branch of the radial; it is very severe, darting over the back of the thumb, hand, fore-arm, and middle finger; there is not the slightest power of motion of the elbow and fore-arm, but slight in the shoulder; and passive movements of that joint produce no pain. The arm was unbound, and Goulard lotion was applied.

Feb. 10. The pain was much less; the œdema was diminished. Belladonna liniment was ordered.

By Feb. 29 the motion of the shoulder was improved; there was slight pronation and supination; some degree of numbness still remained in the thumb and next two fingers; the swelling, which had entirely subsided, returned, and the arm was as œdematous as ever, with some erysipelas. There were also rheumatic
pains over the insertion of the deltoid. This was traceable to incautious exposure to a cold wind.

April 27. He was better, and had gone to Bath.

May 25. He had been slowly improving; the arm was of its natural size; the motion of the shoulder much improved, so that he could raise his hand above his head; the movements of the elbow were restored, and there was slight rotatory motion of his hand. There was clearly a total loss of the motor and sensory influence of the median and ulnar nerves; while the functions of the radio-spiral and outer cutaneous seemed unimpaired; the pronators and flexors were shrunken and powerless; the hand, thumb, and fingers in a permanent state of extension. There was not the slightest sensation in the palm of the hand, or the palmar extremities of the fingers, which were shrunken. Sensation returned, though not in perfection, in the back of the hand, thumb, and fingers. He almost constantly experienced pain in the course of the dorsal branches of the ulnar: the rheumatic pains in the shoulder still continued to trouble him. On pinching the median and ulnar nerves, sensation was conveyed towards their distribution in the hand; this clearly indicated that their integrity was impaired, and encouraged hopes as to the future integrity and utility of the limb.

June 4. Motion at the wrist was improved; and on the 11th galvanism and electricity were applied, the current being sent from the cervical region to the fingers. There was more motion and sensation by the 27th. He continued this treatment,
and the account on July 15 was, "improving in all respects."

Dec. 20. Sensation complete to the ends of the fingers, but he could not close the hand. This appeared to result from rigidity of the muscles.

April 27, 1841. He was in perfect health. The arm was quite recovered except the hand; the muscles of the shoulder, elbow, and fore-arm were firm and healthy; the motions of the shoulder- and elbow-joints, and pronation and supination of fore-arm, perfect; the joints of the fingers were stiffened; hand shrunk, and nearly powerless; the muscles of the thumb and little finger, and soft parts of the hand, were shrunk away; the motions of the hand were limited and feeble; the thumb was extended, and could be but slightly drawn down to the palm; the fore and little fingers were extended, the two others semiflexed.

A gradual improvement of the sensation and motion in the fingers took place, but it was extremely slow.

Galvanism was resorted to for several weeks, but this increased the pain, which ran from the arm. The subsequent improvement was gradual; and by moderate friction and frequent fomentations, the patient ultimately recovered the entire use of the hand.

If the artery were injured, a diffused aneurism would result. In its recognition and treatment, the surgeon would be guided by the ordinary rules of his profession. I am much inclined to think that a rupture of the vein would prove more formidable and less tractable than this latter injury. I should expect, in this latter case, an enormous thrombus, œdema
of the limb, phlebitis, and profuse suppuration as immediate consequences, death, or ultimate amputation would probably result. These untoward results, unfortunately, occasionally follow ill-directed attempts at reduction, or where too long a period being permitted to lapse between the injury and the operation, adhesions having perhaps taken place between the injured vessel and its surrounding structures.
INJURIES TO THE LONGER HEAD OF THE BICEPS.

The accident which is usually described as a partial dislocation of the humerus forwards, I believe to result from either dislocation or rupture of the long head of the biceps muscle. Having given my reasons for this view, and a short account of different opinions I could collect upon the subject, I shall proceed to describe the two injuries, and their pathological effects upon the shoulder-joint.

In the first place, I cannot understand how it is possible for the head of the humerus to rest upon the anterior lip of the glenoid cavity—to be, as it were, balanced upon the glenoid ligament. Supposing, however, that it were so for a moment, it would be precisely in that position that we endeavour to place it in a complete dislocation, so as to favour and permit the action of the supra- and infra-spinatus and teres minor muscles: to be stopped or entangled by the coracoid process, the bone must have left its socket entirely, or be completely dislocated; and I think that injuries to the tendon of the biceps so completely account for all the symptoms of the so-called dislocation (partial), that I cannot hesitate upon the point.

I shall describe injuries to the tendon under the two heads of rupture and dislocation.

Out of twenty-two injuries to the tendon described
by Messrs. Knox, Stanley, G. Smith, Soden, Cruveilhier, Hargrave, and Barron, five were dislocations. The three* preparations I have sent in are ruptures of the tendon, showing the three different kinds of reparation. These will make the numbers twenty-two to five, or about four to one. The first person who appears to have noticed a morbid condition of the tendon of the muscle is Dr. Knox of Edinburgh. It is in a letter of his, in the 'Medical Gazette,' vol. i, "On the altered condition of that portion of the tendon of the biceps flexor cubiti, which passes into the shoulder-joint." The specimen was discovered in the dissecting-room in the year 1826. He says the tendon adhered along its whole course to the internal surface of the capsule, and was indeed reduced to a few cellular and fibrous-looking threads, which could be traced with difficulty. Since that, Dr. Knox had met with three others: in all, the tendon had more or less disappeared; in one, altogether. The humerus in another case had become slightly altered in the vicinity of the anatomical neck of the bone, and the appearances bore some resemblance to the commencement of those alterations so commonly observed in the head and neck of the femur, so often described as specimens of fracture, followed by ossific union.

In the third volume of the same journal† is a letter

* In one, the tendon hangs loose and fringed within the joint; in the second, the tendon is adherent to the bone, and surrounded with adventitious deposit; in the third, it becomes lost in the capsule, which is much thickened, as was also the case in the second specimen.

† Medical Gazette, vol. iii, p. 12.
from Mr. Stanley in corroboration of Dr. Knox's views. He says—"In two instances I have found the tendon of the biceps separated from the edge of the glenoid cavity, and firmly adherent to the humerus, at the margin of the bicipital groove. In a third instance I found the tendon of the biceps dislocated from its groove, and resting upon the great tuberosity of the humerus." He relates also two cases of rupture of the tendon; in both there was effusion and loss of motion in the biceps. In the Museum of St. Bartholomew's Hospital are three preparations illustrating these remarks. The first (55) is an example of dislocation, the other two are specimens of rupture of the tendon, with adhesion of it to the bicipital groove (n 61, n 62). Cruveilhier says—"In two subjects I found this tendon terminating by a strong adhesion in the bicipital groove, from which it took its origin. I consider this division of the tendon to have been accidental, for the groove was depressed, and the interarticular ligament flattened, and, as it were, lacerated."

In the 14th vol. of the 'Gazette' is an account of the dissection of seven shoulder-joints, and the morbid appearances found therewith. As before stated, in five the long head of the biceps was ruptured, in two it was dislocated, in all the subscapularis muscle or its tendon had suffered, and in all a communication existed between the subacromial bursa of the joint and its capsule; indeed, the two synovial cavities were thrown into one. Mr. E. E. Barron, teacher of anatomy, notices three instances in the 'Medical Gazette' for July 1837: "The long head was detached from its natural origin,
and adherent to the upper margin of the bicipital groove." This was accompanied by "a great deal of irregularity at the upper part of the glenoid cavity." It had also been observed by Mr. Pilcher, who attributed it to senile atrophy.

In the 24th vol. of the 'Medico-Chirurgical Trans.' is a paper by Mr. Soden, of Bath, upon the dislocation of the tendon. He relates two cases, and makes some pertinent observations on the connexion between partial dislocation of the humerus, and dislocation of the tendon. He says—"I can only find three dissections of joints in a state of partial dislocation on record. In Mr. Hargrave's* case the tendon was ruptured; in Sir A. Cooper's also, but had again become united; in the third (Dupuytren's†), its condition is not alluded to." In Mr. Soden's case, the symptoms were "a slight flattening on the outer and posterior parts of the joint, and the head of the bone looked as though it were drawn up higher in the glenoid cavity than it should be. Examination verified this appearance in two ways: first, in moving the limb crepitus was felt, caused by the head of the bone rubbing against the under surface of the acromion; secondly, the difficulty of abduction, caused by the greater tubercle coming in contact with the acromion. The arm was powerless; great pain induced by any exercise of the biceps." I cannot agree with Mr. Soden in attributing the crepitation to the attrition of the humerus against the under surface of the acromion. I think it more likely

* Edinburgh Journal, 1837. † Leçons Orales.
to be produced by the head of the bone playing against the tendon in its new situation. Of the three cases related by Mr. Stanley, the symptoms in some degree coincide. He mentions one sign which I should look upon as important, viz. "the slightest movement of the elbow backwards was followed by acute pain precisely in the situation where the tendon of the biceps turns over the head of the humerus. There was also effusion of blood into the subcutaneous cellular tissue, but confined to the tract of the biceps tendon." This latter circumstance was accidental, and occasioned most probably by the rupture of the branch of the anterior circumflex artery ascending the groove. The former is of more importance; the pain I consider to have been caused by the head of the humerus either stretching still further the dislocated tendon, or else coming in contact with the newly-ruptured and inflamed tissue. The question now arises as to the possibility of distinguishing between a dislocation and rupture of the tendon, and I fear there are a few distinctive signs which would materially help us in our diagnosis.

Rupture of the tendon usually takes place in persons beyond the meridian of life, in whom the powers of nutrition begin somewhat to fail, and in whom that senile change, so well described by Sir H. Halford as a climacteric disease, is about to set in; the usual situation of the separation is about midway between the glenoid cavity and the anatomical neck of the humerus. Should it occur within the groove, the effusion is greater, and the retraction of the separated portion to the belly of
the muscle is more marked, because it, in this instance, escapes from the groove. The drawing, Plate 3, which is taken from a cast in the Museum of Guy's Hospital, shows the appearance of the arm upon the occurrence of this injury. I can, unfortunately, find no detailed history of the case. When the injury has taken place more within the joint, sufficient connexion remains between the tendon, the synovial membrane, and the cellular membrane around it in the groove, to prevent this great retraction. The capsule of the joint is little, if at all, ruptured; and this forms one distinguishing mark between the two injuries, because the effusion is less, the subsequent inflammation not so severe, and the patient sooner uses his arm. I am indeed much inclined to look upon rupture as a comparatively mild injury to the displacement, but occurring in persons of bad or deficient nutrition.

Of the five cases of dislocation, the tendon was dislocated inwards, and to the lower part of the joint in three; it was lodged respectively in the greater and lesser tuberosities in the two others. If it be thrown upon the greater tuberosity, I believe a degree of muscular irritation would be kept up until the tendon had formed fresh connexions, and had become accustomed to its novel situation. To this cause I attribute "the peculiar spasmodic and vibratory movement of the biceps," which occurred in Mr. Wormald's case, upon that muscle being put into action. Indeed I should expect, in this injury, much more pain and a greater loss of power than in the rupture of the tendon, the patient being in nearly the same condition as if he had a loose
cartilage in the joint. As soon as the articulation had recovered from the immediate effects of so severe an injury, and when the displaced tendon had accommodated itself to its new position, the same effect would take place about the joint as described in the pathology of the rupture of the tendon.

Both dislocation and rupture are, besides the above-named symptoms, accompanied with lateral and posterior flattening of the shoulder, and prominence of the head of the bone anteriorly, from which latter circumstance it arises that the injuries are mistaken for a partial dislocation.

In either of these injuries I do not think that much can be done in the way of treatment. If I suspected, from the symptoms, a dislocation of the tendon, I fear that no plan I could devise would be at all efficacious in bringing it back to its true anatomical position: on the other hand, I think much mischief, as synovial inflammation, might be produced by any ill-directed efforts to accomplish the desired end. I should elevate the shoulder, and direct the patient to flex and extend the fore-arm, at the same time rotating the humerus, and then apply warm fomentations (a plan to be adopted in all sprains and injuries to tendinous structures), and advise perfect rest, taking great care to throw the head of the bone backwards by bringing the elbow forwards, until all chance of inflammation had ceased. At the end of a fortnight or three weeks, I should recommend passive motion, so as to enable parts to adapt themselves to their new position. Should it appear that the tendon was ruptured, I
should adopt the same plan—fomentations, rest, and afterwards passive motion, would be all that the surgeon could advise. The vis medicatrix naturae would do the rest. As the object would be to accustom the bone to its slight change of position, I should not employ either pads or bandages; a sling for the arm, in the manner above stated, would be all that is necessary. It is of course possible that acute synovitis might set in immediately after the occurrence of either injury; it would be combated in the usual way.

The tendon is found usually in one of three conditions. Firstly, lying loose in the joint, and presenting a fringed cellular edge; secondly, closely adherent to the capsule of the joint; or, thirdly, inseparably attached to the neck of the humerus and its bicipital groove. In both these latter cases the capsule of the joint is much thickened, as though it had become strengthened by the fibres of the tendon. The morbid changes which take place in and about the articulation, as a consequence of the injury, appear to be two. First, a coalescing of the capsule and synovial cavity of the shoulder-joint with the bursa between the capsule and the acromion; or, to speak more correctly, the formation of a false joint between the head of the humerus and the under surface of the acromion; secondly, in soft, oily, and caseous bones, in which there is a deficiency of phosphatic deposit, a change takes place in the head of the bone, the anatomical neck slides slightly downwards (chiefly in old people), and assumes a rather more lateral aspect than normal, while the inner shell of the bone passes upwards and
inwards, and penetrates the cancelli. This, I think there can be no doubt, is the result of the upward pressure against the acromion process. In Sir A. Cooper's case, the tendon was said to have united. With every possible submission to so high an authority, I think he must have meant that it had become united to the capsule of the joint. The deltoid muscle is not so much affected by the change in the joint as would be expected; occasionally it is slightly atrophied, but the muscle soon again recovers its proper size and tone. Should there appear to be much wasting of it, the surgeon would then have to decide upon the probability of its dependence upon some injury to the posterior circumflex nerve.

In this case sensation over the posterior fold of the axilla and over the insertion of the deltoid would be much impaired.

When speaking of fracture of the acromion process I have described, and the preparation shows the effect of a combination of the two injuries, viz. rupture of the tendon and fracture of the process, a false joint is produced, owing to the impossibility of retaining the head of the humerus under the fractured bone, which consequently wants its most natural and effectual splint.

The symptoms which occur on a rupture of the biceps tendon have been mistaken, not only for a partial dislocation of the humerus forwards, but also for the displacement upwards, and this from the post-mortem appearances. In the 'Lancet' there is an account of a dissection of a partial dislocation upwards,
by Mr. A. Smee:* as in all the cases I have quoted, a communication existed between the sub-acromial bursa and the capsular ligament of the joint; the longer tendon of the biceps was torn, retracted, and adherent to the margin of the bicipital groove (the common termination of the injury); there existed a fracture of the clavicle, which certainly would have complicated and made the case more difficult of diagnosis; the acromion process was entire, but presented upon its under surface those appearances which result from the attrition of the head of the humerus. It was, I think, as fair a specimen of ruptured tendon of the biceps as could possibly exist.

This case is commented upon by the late J. O. Potter, M.B., of University College. He relates a similar case, and lays particular stress upon the laceration of the supra- and infra-spinatus muscle. Neither of these gentlemen, however, have any evidence of there having been a partial dislocation recognised by a medical man; both were most probably "sprains" of the shoulder-joint: and the same force that would rupture the biceps tendon in a person advanced in years, would, I think, be quite sufficient to produce an injury in those muscles. I even think that attempts at reduction would assist in this. In both instances "the rent" in the capsule was only, I take it, the communication between the sub-acromial bursa and the synovial cavity, produced by attrition. Sir A. Cooper, in a work on Fractures and Dislocations, gives a case of partial dislocation, and as

* Lancet, May 22, 1845.
INJURIES OF THE BICEPS.

it illustrates to a certain extent my view of the injury in question, I shall transcribe it.

Mr. Brown, aged 50 years (the period of life when the biceps tendon becomes much atrophied, and therefore obnoxious to injury and senile changes), was thrown from his chaise on his shoulder, and upon examination after the accident, the roundness of the shoulder was lost, and there was a hollow under the acromion; the head of the bone projected forwards and inwards, against the coracoid process; the arm could be raised from the side if brought forward, but with difficulty raised directly upwards. By extension of the shoulders backwards, I at last brought the head of the bone to the glenoid cavity, but it directly slipped forwards as the extension ceased. This dislocation differs from that forwards under the pectoral muscle, in the head of the os humeri being still on the scapular side of the coracoid process, while in the complete dislocation forwards it is thrown on its external side.

In this case the symptoms resemble those of either a ruptured tendon of the biceps, or else a fracture of the anterior lip of the glenoid cavity. I cannot but thus look upon the dissection of the other case of supposed partial dislocation as evidencing a fracture of the margin of the glenoid cavity.
Case of supposed Partial Dislocation of the Humerus forwards.

(Rupture of the Long Head of the Biceps?)

John Gadsby, aged 40, applied for relief as an outpatient at Guy's Hospital, June 20, 1846; was a sailor, and said that the night before the last he had fallen down and hurt his shoulder; he could give no precise account as to the way in which the accident happened, or as to the way in which he fell, being at the time, to use his own expression, "a sheet or two in the wind." He was a man of fair aspect, said he was at sea most of his time, very healthy, and had never had any rheumatic affection of his body or joints. He entered the surgery supporting his left arm with his right hand. On examination, there was found some swelling about the left shoulder-joint, but not sufficient to mark any important points; the rotundity of the shoulder was not materially impaired; there was no depression to be felt under the acromion, no difference in the length of the two arms, but a decided prominence in the fore part of the joint; the elbow could be brought with ease to the side; he complained of great pain on attempting to raise his arm to his head ("something appeared to catch," he said); and upon throwing the elbow backwards, there was great tenderness over the bicipital groove; but he was able to flex the fore-arm without pain. Some attempts at reduction had been made by extension. It was put up, at my suggestion, upon M. Velpeau's plan, and the arm confined in that position for three weeks.
Upon removing the bandages, there was still found a slight projection anteriorly of the head of the bone, and upon abducting the humerus from the side, it appeared to come against the acromion. I enjoined passive motion, cold ablutions, and occasional friction. The patient did not return.

In leaving this subject, I do not think I can do better than quote the words of a celebrated surgeon; they are taken from Mr. Abernethy’s Lectures in the ‘Lancet,’* and given verbatim in his somewhat peculiar style. “There is an accident occurring about the shoulder-joint which I have always found to be a very vexatious one, and is very generally found to be a vexatious one, it is what some surgeons call a semi-dislocation of the os brachii. Well, with regard to this word, I say if you allow such definitions, we shall next have it as in music, a semi-demi. Now the bone is out of its socket, or it is not, and I say in this case it is not, but it bulges forwards; a man tumbles down, falls on his shoulder, and drives the os brachii forward, but not out of the socket, he sprains and perhaps tears the tendon of the os brachii, the head of the bone is sticking forward, but it is not out of socket. Now those who would examine it and say it was not, might say ‘you must put your arm in a sling, and I will send you some wash.’ The patient puts it in a sling, and if you let a man put his arm in a sling, he generally puts it back, which is the very thing to throw the head of the bone forward; but put your elbow

* Lancet, May 22, 1845.
forward, and the head will recede and go into the socket. Well, but I say all this may be prevented merely by bringing the elbow forwards; put it in the sling, but let it be brought forward, and leeches be applied to the front of the joint."
FRACTURES OF THE HEAD OF THE HUMERUS.

I cannot approach the subject of fractures of the scapular end of the humerus without feeling the difficulty of any attempt to add one word to a subject which has received so much undivided attention from such distinguished authors, and from what I know of fractures, to obtain any valuable fact, or lay down any correct rules, it is necessary to observe a large number of cases. Upon this last circumstance depends the great strength and value of the opinions of such men as Cooper and Dupuytren: with them nothing was a matter of mere opinion; all was fact, experience, and inductive reasoning.

The proportions of fractures to dislocations of the humerus is shown by Malgaigne in the following table, taken from the records of the Hôtel-Dieu, that I have before quoted:*

<table>
<thead>
<tr>
<th>Humerus.</th>
<th>Fractures</th>
<th></th>
<th>Dislocations</th>
<th></th>
<th>Total</th>
<th></th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1806-08</td>
<td>47</td>
<td>34</td>
<td>54</td>
<td>19</td>
<td>81</td>
<td>73</td>
<td>1:11:1</td>
</tr>
<tr>
<td>1830-33</td>
<td>56</td>
<td>28</td>
<td>47</td>
<td>25</td>
<td>84</td>
<td>72</td>
<td>1:16:1</td>
</tr>
<tr>
<td>1834-37</td>
<td>93</td>
<td>41</td>
<td>65</td>
<td>15</td>
<td>134</td>
<td>80</td>
<td>1:67</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>103</td>
<td>166</td>
<td>59</td>
<td>299</td>
<td>225</td>
<td>1:27:1</td>
</tr>
</tbody>
</table>

* Etudes Statistiques.
As he evidently speaks in round numbers, I give his deductions in his own words: "On voit combien le chiffre des luxations se rapproche ici de celui des fractures; en dernier résultat, il y a 32 fractures pour 25 luxations de l’humérus; encore est-il juste de remarquer que la différence est bien moindre en 1806 parce que là toutes les luxations comptent; tandis qu’en 1830 il y a 7 luxations, sans siège désigné, dont 4 au moins devraient se rapporter à l’humérus, ce qui remettrait la proportion à 1:10 : 1, et de même en 1834, il y a 26 luxations indéterminées, dont les 2 tiers, 17, revenant à l’humérus, tout en ajoutant aussi une dizaine de fractures indéterminées, qui reviendraient aux fractures humérales, ramèneraient la proportion pour cette série à 1:49 : 1, et le rapport général à 1:22 : 1, ou, en d’autres termes, à 30 fractures de l’humérus pour 25 luxations du même os. Chez les femmes, la proportion des fractures est notablement augmentée, ce qui s’accorde avec ce que nous avons dit plus haut, savoir que les téguments chez les femmes, comparativement à ce qui a lieu chez les hommes, résistent mieux que les os eux-mêmes."

Dr. G. W. Norris gives, in the ‘American Journal of Medical Sciences,’* some statistics of fractures and dislocations. They are, I regret to say, somewhat loose; for in the table having reference to fractures, the word "arm" is used comprehensively for humerus, radius, and ulna. I extract the following:

* American Journal of Medical Sciences, 1841.
<table>
<thead>
<tr>
<th>Year</th>
<th>Total No</th>
<th>Arm</th>
<th>Clavicle</th>
<th>Scapula</th>
</tr>
</thead>
<tbody>
<tr>
<td>1830</td>
<td>82</td>
<td>27</td>
<td>10</td>
<td>...</td>
</tr>
<tr>
<td>1831</td>
<td>99</td>
<td>27</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>1832</td>
<td>71</td>
<td>19</td>
<td>9</td>
<td>...</td>
</tr>
<tr>
<td>1833</td>
<td>94</td>
<td>20</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>1834</td>
<td>103</td>
<td>20</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>1835</td>
<td>119</td>
<td>27</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>1836</td>
<td>96</td>
<td>36</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>1837</td>
<td>95</td>
<td>28</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>1838</td>
<td>103</td>
<td>24</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>1839</td>
<td>97</td>
<td>27</td>
<td>8</td>
<td>...</td>
</tr>
<tr>
<td>Total</td>
<td>959</td>
<td>255</td>
<td>84</td>
<td>10</td>
</tr>
</tbody>
</table>

He only records 94 dislocations of the body as occurring during this period; of these 49 were of the shoulder. This differs much from the results deduced by Malgaigne.

In Lonsdale's table of fractures, out of 1901, 118 were of the humerus; thus—

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td></td>
<td></td>
<td>89</td>
</tr>
<tr>
<td>Neck</td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Condyles</td>
<td></td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

I regret much that in the above tables there is no mention of the age of the patients; but from Sir A. Cooper's work on Fractures and Dislocations, it would appear that youth and age seem to be particularly obnoxious to the accident. Out of 10 cases 7 were between the ages of 60 and 77, one at 10, the others were not specified. This would result from the easy separation of the epiphysis in the young, and from the brittleness usually concomitant with age.

I shall divide the fractures of the humerus into those of the anatomical neck—that is, where a separation of the hemispherical portion of the bone within the cap-
sule takes place; secondly, fracture external to the capsule, and above the insertions of the pectoralis major, latissimus dorsi, and teres major; and thirdly, fractures implicating either or both of the tubercles, or in any way comminuting the head of the bone. The two former injuries are sometimes accompanied with dislocation of the bone.

The accident which I shall first describe will be fracture of the anatomical neck, and shall then speak of dislocation, as being an after-occurrence.

According to Desault, it results from force applied, not only directly, but also by contre-coup; a blow upon the shoulder would illustrate the first, and a fall upon the elbow the second kind. Dupuytren thought it likely to occur from a fall upon the elbow, the arm being at the same time confined to the side. The accident is known by a flattening of the shoulder and a slight projection of the acromion; the arm hangs helplessly by the side, unless supported by the patient, and this is usually found to be the case. All motions of the limb occasion great pain, which is referred to the seat of the injury. If the surgeon's thumb be placed upon the anterior part of the joint, and the forefinger beneath the acromion, so as to grasp the fractured portion of bone between them, and the humerus be at the same time rotated, crepitus may be produced; upon abducting the bone from the side, so as to tilt the fractured portion downwards, its acute margin may be felt in the axilla. According to some authorities, the fragment may be felt in the same situation. Sir A. Cooper says, the head of the bone remains in the
glenoid cavity of the scapula, so that the shoulder is not sunken, as in dislocation; but this will depend upon the exact seat of the injury; for should the separated portion include any of the insertions of the protective set of muscles, then the fragment would remain, to a certain extent, in situ. I speak of this fracture as occurring within the capsule, more perhaps with reference to the classification of the injury, than as implicating the joint between the head of the humerus and the articulating surface of the scapula. I have seen no case to prove, and should doubt the existence of a nice and accurate separation of that portion of the humerus alone which is covered by cartilage from its supporting body. Some portion of the body or tubercle is usually involved in the injury; this depending upon the strength of the bone at the line of junction of the body with the epiphysis, a transverse fracture as accurate as an artificial section is hardly to be expected.

When the shoulder is examined, a projection of bone is perceived upon the point of the coracoid process; and when the elbow is raised and brought forwards, this projection is rendered particularly conspicuous. By drawing the arm down, the projection is removed, but it immediately reappears upon giving up the extension, and the natural contour of the shoulder is lost. Although the accident has occasionally been confounded with dislocation, the diagnosis is not very difficult. First, in the fracture there is great mobility of the arm; whereas, in dislocation, the arm projects stiffly outwards and slightly forwards from the side; 2d, the flattening of the shoulder is much less in
the fracture than in the dislocation; in the former it is produced by the traction on the deltoid by the weight of the arm, and diminished by the presence of the separated fragment. This sign is of course variable, and dependent upon the degree of swelling and effusion. Sometimes, however, the fractured shaft may be drawn inwards by the muscles, and this, when accompanied by any great effusion, might, to an inexperienced eye, prove a source of fallacy. The presence of crepitus, and the absence of any shortening, would place the matter, moreover, beyond doubt.

The treatment is simple: a splint (the best I know of is a mill-board, one applied wet, so as to mould itself to the form of the shoulder, and is moreover cleaner than starch, and cheaper) is to be put upon the anterior and external part of the arm and shoulder; a pad is to be put in the axilla, so as to support the fragment; the hand and arm to be supported in a sling, but on no account to be pushed upwards. I should expect union in about six weeks. Dupuytren treated some of these cases by position, confining the patient to bed, and supporting the arm on a pillow.*

When the injury is associated with dislocation of the bone, according to Sir A. Cooper (the only surgical writer who has noticed the accident at any length)—"By the first impression of the accident the os humeri is dislocated; by a second, the neck of the bone is broken, and the head is dislocated and lodged beyond the axilla." It is usually accompanied by great effusion and bruising of the soft parts, with rupture of the

* Leçons Orales.
capsule and its tendons. In it all the common signs of dislocation are present, some of them are, however, modified and altered. The flattening over is said to be slight, owing to the shaft of the bone quitting the head, and returning to the glenoid cavity. The elbow can be brought to the side, and, in place of lengthening, there is invariably shortening of the limb. If one hand be placed upon the head of the bone, and the humerus rotated, the former is found not to move. The arm is powerless, and all attempts at active or passive motion are productive of great pain.

The surgeon’s first care should be to attempt to reduce the bone, by thrusting it upwards with his finger or thumb. A species of tourniquet has been invented for this purpose by M. Delpech; it takes its point d’appui from the acromion process, and acts upon the fragment in the axilla. I should not, however, be induced to use it myself, because the surrounding effusion would most probably interfere with its correct adjustment, or successful application. Sir A. Cooper seems to speak of its treatment in a desponding tone. "Little," he says, "is to be effected by extension; if at all, it will probably be by the heel or knee, in the axilla." He directs a pad to be put in the axilla, a clavicular bandage, and the arm should be supported by a sling. Let the surgeon do what he will, the head of the bone will probably remain in the axilla, and the upper motions of the arm will be in a considerable degree lost. With a tone of liberality and good feeling, which should and does influence every gentleman, Sir Astley insists upon the propriety of confessing the limited extent of
our art in this matter, and upon the necessity of refraining from every observation which might reflect upon the practice of a fellow-labourer.

Fracture, external to the capsule, and above the insertions of the tendons of the great pectoral lattissimus dorsi and teres major muscles, like the former accident, usually occurs in age or youth, and is invariably the result of direct violence, never of contre-coup. Its peculiar characteristic is the displacement which invariably accompanies it. Thus, according to Sir A. Cooper, the head of the bone preserves its place, but the broken shaft is carried forward under the pectoral muscles. Boyer thought that the articular muscles, supra and infra spinatus, and teres minor, elevated the fractured portion, because, the bone being thick, separation of the ends must take place before displacement can occur. M. Blandin is of the same opinion. M. Vidal thought the inferior fragment was drawn inward by the deltoid. M. Malgaigne thinks the subscapular would counteract the spinati and lesser teres muscles.

The accident is usually accompanied by much concussion and effusion. It is known by a slight depression in the middle of the deltoid; an irregular tumour is to be felt in the axilla upon abducting the arm; the axis of the limb is altered; like a dislocation, it appears to pass from the trunk, but, unlike it, has considerable mobility, more so than in all the preceding fractures; all voluntary motions are nearly impossible; the limb is shortened, and the anterior diameter of the shoulder is increased; the elbow can be brought by
the side; crepitus is very distinct, and numbness of the fingers occasionally felt.

For the reparation of the injury I should apply a pad in the axilla, and millboard splints along the outer and anterior part of the arm and shoulder; the elbow should be kept to the side, and the fore-arm supported by a sling. In this and the previous injury I should not keep the patient in bed for a longer time than six or seven days, this, however, depending upon the extent of contusion and swelling; and I should then put the fracture up in the way described, and allow the patient to sit up.

Dislocation, as a concomitant with this fracture, is not mentioned by any surgical author. Sir A. Cooper only speaks of fracture of the neck, with reference to the exact point, but from his description, drawings, and preparations, he clearly alludes to the anatomical neck. In the 'Dublin Journal,' Mr. R. W. Smith,* of the Richmond Hospital, reports a case of "fracture, two inches below the tubercles, with luxation, in which the fragments had united with considerable deformity." He, however, speaks of Sir Astley's opinion upon this point. I see no reason why dislocation should not occur in combination with the fracture of the surgical neck, as well as with that of the other fracture, and have no cause to doubt their separate existence. According to Mr. Smith, the symptoms are precisely similar to those I have described in speaking of the fracture of the anatomical neck, with dislocation. With regard to treatment, although the surgeon would have a larger

* Fig. II, vol. xxv.
piece of bone to act upon, yet the difficulties of the case would be serious, and I should fear the deformity great. I cannot, under any circumstances, counsel any attempt to reduce the bone when union shall have taken place; a separation or second fracture would most probably result. The head of the bone is often greatly comminuted, its tubercles shattered, and the cancellated structure laid open, as in the third and last cases detailed below. Here all attempts to arrange the injury under any one particular head would be fruitless; the injury to the soft parts caused by the violence necessary for the production of the accident—a violence direct and intense in its kind—would mask in a great measure the precise nature of the injury; considerable mischief, as constitutional irritation and local inflammation, would follow. The treatment would then be: rest, leeches, fomentations; and when the effusion had sufficiently subsided, and a reparative action set up, the application of splints for a few weeks would be advisable. Friction, passive motion, and the local fomentations would tend materially to the ultimate integrity of the limb.

_Fracture of the Humerus through the Tuberosities of the Bone._

E. M., æt. 63, was admitted, May 18, 1844, under Mr. Key, into Esther Ward, Guy’s Hospital. She was a fair woman, of intemperate habits, by occupation a washerwoman. She gave a vague history of her walking with her husband, and slipping from the curbstone, and then falling with “all her weight” on her
left arm and side. The road she fell upon was very rough and stony. On examining the arm, a fracture, slightly oblique, was discovered across the tuberosities of the left humerus (it was pretty clear that the epiphysis of the bone had separated from the shaft); there was no displacement.

She was placed in bed, the arm on a pillow, and the shoulder covered with saturnine lotion. Two days afterwards she was attacked with delirium tremens. Gin, beer, and morphia were given her, and by the 23d she was better. The shoulder was discoloured, and she was still restless. She improved up to June 6th, when the arm and shoulder were put up in millboard splints, with a starch bandage; morphia entirely omitted, and a more moderate supply of beer allowed her.

11th. She was doing well, only complained of the tightness of the bandage: it was cut.

17th. The bend of the elbow somewhat excoriated from the bandage; there was also a little oedema.

27th. She was better; health good, but complained of general aching pains in the limb; and by the 29th they had increased, nor was she so well; her pulse was quick, skin dry, and she had some little cough; her bowels were attended to, and she was watched for a day, and soon became well again.

July 1. The bandages were removed; there was very good union, and she was directed to commence passive motion of the joint. Her progress was slow; but in about a fortnight she left the hospital, with the arm daily improving, and directed to attend as an out-patient.
Fracture through the Tubercles.

Mary Lavington, æt. 62, was admitted into Guy's Hospital, under Mr. Key, December 5, 1843. She was a married woman, by occupation a charwoman, temperate in her habits, and enjoying tolerably good health. With the exception of those diseases connected with her married state, her only illness had been occasioned by a fracture of the ribs, occurring eight years since. She was coming down stairs the day previous to her admission, when her foot slipped, and she fell about six steps, striking her shoulder against a clock-case, her arm (the left) falling under her; and upon rising, she found she had entirely lost the use of it. The shoulder was much bruised, swollen, and discoloured; the pain was chiefly referred to the inner and outer sides of the acromion process; there was also a discoloured spot over the inner condyle of the humerus. On examining the condition of the humerus, a fracture was found across the tubercles; the head of the bone appeared to come forwards.

The arm was kept for a few days on a pillow, the elbow being raised, and moistened with an evaporating lotion. On the 8th the patient complained of much pain over the acromion; the shoulder was also much discoloured. On the 13th the arm was put up in four splints, before, behind, and on each side respectively.

19th and 26th, she was going on well.

30th. The splints causing some slight swelling, they were loosened; and after the swelling had subsided, they were reapplied.
FRACTURES OF THE HUMERUS.

Jan. 5. The splints removed, and pasteboard and starch bandage applied.

Jan. 17. The apparatus was taken off, and the fracture found to be firmly united. She was presented.

Comminuted Fracture of the Surgical Neck.—Death.

Price Jones, a Welshman, aged 55, was admitted into Cornelius Ward, Guy's Hospital, under Mr. Key, on Feb. 5, 1846. He has been for many years an exciseman; his habits have been very intemperate, but his health good, although he has occasionally suffered from rheumatic gout; his aspect is that of a man of irregular habits, and he looks much older than he really is. About twenty-four hours before his admission, he was knocked down by a cab, and fell upon his left elbow, he was, however, so intoxicated at the time that he was quite unable to give any correct account of the occurrence; the outer side of his arm was covered with mud. On admission, there was flattening of the left shoulder, with immense effusion and tenderness; there was apparent lengthening of the arm, and on rotating it crepitus was distinct. It was pronounced to be a fracture just below the tubercles. An evaporating lotion was applied at first, and afterwards a cataplasm ammon. hydrochlor.

Feb. 6. In the evening he displayed symptoms of delirium tremens; there was great restlessness, partial incoherence, with incessant talking. He took some haustus senna and ol. ricini; when the bowels had been acted upon, antim. pot. tart. gr. j, was given to
him, and the consequent sickness having abated, opii, gr. ij.

Feb. 7. He was ordered porter, Oj, with gin, and at bedtime pulv. opii, gr. ij; the shoulder was very painful.

Feb. 8. He had slept soundly, and is more composed. A catheter has been passed, on account of the obstinate stricture to which he is subject, and some thick ammoniacal urine was drawn off.

Feb. 9. He was better.

Feb. 12. Better. Mr. Key ordered a starch bandage, with a pad in the axilla; from examination he thought the greater tubercle was separated.

Feb. 13. Has passed a restless night; the bandage has slipped off; a flannel one with a pad was applied. To continue the opium.


Feb. 15. Complained much of flying rheumatic pains, appetite capricious.

Feb. 16. The pad had slipped from the axilla, and the arm was out of position. He complains much of wandering rheumatic pains. His left shoulder is again beginning to swell; tongue covered with a dry, brown coat; pulse 110, and weak.

Feb. 17. The shoulder was much swollen, red, tense, and tender; a small exploratory puncture was made with a grooved needle, and a little blood and pus, with a distinct and abundant escape of air, took place; tongue dry and brown, pulse 120, and feeble. Vespère. The swelling has increased; there is fluctuation to be felt, and distinct resonance on percussion.
An incision was made into the shoulder, a puff of air escaped, and eight or nine ounces of ill-conditioned offensive pus. Hot fomentations and poultice were ordered; opium as usual, and hot rum and water.

Feb. 18. Great discharge, shoulder diminished in size, tongue the same, pulse quieter. Wine.

Feb. 20. Discharge abundant and offensive, tongue moister, appetite bad, pulse 100. Opium, porter, gin, and rum to be continued.

Feb. 22. He was better; took some oysters.
Feb. 23. Occasional rigors, discharge less.
Feb. 24. Much the same, only more restless.
Feb. 25. Mr. Key thought there was a collection forming under the pectoral muscle.
Feb. 26. Tongue coated, discharge less, but more viscid.

Feb. 27. Very restless, talks about getting up and walking about; refuses his gin and rum; discharge more in quantity.

Feb. 28. Much weaker; discharge more copious, thinner, offensive, and of a greenish hue.

March 1. Very little discharge: an incision was made about one inch below the original one, and several ounces of dark, coffee-coloured, offensive water fluid were evacuated.

March 2. Sleeps very badly; discharge abundant, and of the same character, tongue dry and coated, pulse very feeble, constant eructation and sickness.

He continued in this state, gradually becoming worse, until the 6th, when he died.

*Post mortem*, 24 hours after death.—There was
diffused suppuration about the joint; there was a fracture at the surgical neck; the head of the bone appeared flattened; the greater tubercle was fractured, but attached; the tendon of the biceps was torn, the sub-acromial bursa unaffected; the capsule of the joint entire, but its synovial membrane highly injected. The bone appeared very deficient in cancellated structure, and brittle; a coagulum filled up its medullary canal.

Fracture of the Neck of the Humerus at the Surgical Neck.

A. M., æt. 17, employed in a white-lead manufactory, was admitted under Mr. Key, Dec. 23d, 1843. He was a healthy-looking boy, with light brown hair and blue eyes. Whilst at work he fell off some hay, a distance of about sixteen feet, and pitched upon his right shoulder. He was stunned for a few seconds, and upon arising, found his shoulder disabled. He was admitted into the hospital a few hours after the accident. Examination showed the right humerus fractured below the tubercles; there was little displacement, and but slight effusion or swelling around the seat of fracture. The head of the bone could be felt in co-adaptation with the glenoid cavity, and the broken shaft projected towards the axilla. Crepitus was distinct when the head of the bone was grasped, and extension, with slight rotation, made from the elbow. The arm was supported in a semi-flexed position on a pillow, so placed that the elbow and fore-arm were above the level of the shoulder, so
as to counteract the tendency of the end of the bone to tilt forwards. Cold lotion was applied over the whole; and on January 6, pasteboard splints, with a starch bandage, were applied over the shoulder-joint; and by the 20th, the arm appeared pretty strong, the ends of the bone having united, without shortening or displacement; the paste-board was reapplied, and he was made out-patient.

_Fracture of the Surgical Neck of the Humerus, with fractured Rib and Radius._

J. B. was admitted, August 24th, 1848, into Esther Ward, Guy's Hospital, under Mr. Morgan, with the above injury. She was a healthy girl, of somewhat strumous aspect, and moderate conformation. Her habits of life were regular, her general health good, and she had had no previous diseases but of an infantile or trivial character. Her account of the accident was, that during a fire in her master's house she jumped out of a third-story window, striking her shoulder, side, and loins, and falling partly upon her hands. On her admission, she was in a state of collapse, her left side, loins, and shoulder were much bruised, but without any abrasion of the cuticle. The humerus, on examination, was found to be fractured through its surgical neck. The motions of the arm were tolerably free, but extremely painful. There was a great deal of deformity, which was immediately removed by extension, and very considerable ecchymosis below the acromion process of the scapula; no very obvious depression was to be observed here.
On rotating the elbow, the broken shaft of the bone could be felt to roll under the deltoïd muscle. The radius was likewise fractured just above the joint, the hand being drawn upwards and backwards, so as to make the styloid process of the ulna project, and the broken end of the radius could be distinctly felt. Her respiration was painful; on attempting to cough or take a deep breath, she felt a sharp pain below the mamma shooting backwards. The pulse was feeble, soft, and about 80. There was no sickness. Hyd. chloridi, gr. iiij, ext. colocynth, gr. xij, were given her. A pad was put in the axilla, and padded splints over the upper and fore-arms. Lotio plumbi being applied over all.

August 25. A flannel bandage was passed on the thorax, and connected with shoulder-straps. The pain in the side still continues very severe; there was no cough; the pulse was quick, but neither full nor hard; no restlessness or heat of surface.

On the 29th the pleurodynia was diminishing, and in other respects she was doing well.

31st. Last night her pain in respiration had been greater, and consequently her sleep less perfect; the pulse was small and soft; tongue a little dried and furred posteriorly; bowels open, and urine natural; the arm remains as before, and is free from pain.

Sept. 10. Up to this period no bad symptoms had supervened; the pain in the loins and side fast declining, and by the 20th they had entirely disappeared; her bodily health was good, and the arm was retained in its proper position by the splints as before.
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On Sept. 29 pasteboard splints were applied, and this was followed by some œdema of the fore-arm and hand; all motion of the shoulder was limited and painful.

Oct. 5. The pasteboard was removed; the roundness of the shoulder was somewhat impaired; union appears pretty firm, but considerable thickening could be felt about the shoulder; the radius was doing very well; the splints were removed, and soap-plaster and a bandage applied; the patient continued to do well, and left the hospital for her friends in the country. A month afterwards she complained of rheumatic pains of the shoulder and wrist; but these ultimately disappeared, and she acquired the entire command and use of the limb.

Fracture of the Head of the Humerus, without separation of the Fragment.

J. D., æt. 16, was admitted into Cornelius Ward, Guy's Hospital, on August 28, 1845, being severely injured both as to his head and shoulder. He was of short, stout build, and fair aspect. His friends stated that he was healthy, and temperate in his habits, and had enjoyed a perfect immunity from all previous diseases and injuries. The history of the accident was as follows: Whilst at work, he was directed to support some large pieces of slate, but his strength gradually giving way, he became overpowered, and was buried by their superincumbent weight (about 6 cwt.) On his admission, a scalp wound was discovered, extending, in a crescentic form, from the right orbit upwards
over the squamous suture, with which it appeared to correspond; the pericranium was everywhere exposed, and the parietal tuberosity denuded of it. He exhibited all the symptoms of fractured base of the skull. There was a large bruise surrounding the right shoulder, and a small wound over the infra-spinatus muscle, from which a small quantity of dark blood oozed. Upon examination, the head of the humerus could be thrown with ease in any direction, but appeared quite sound and free from fracture; the scapula much comminuted, and the clavicle intact. With these injuries the effusion was considerable, and the poor fellow moaned loudly while under examination. From the great severity of the injury to the head, nothing could be done with any hope of success. He lingered till the following morning, when he died. Inspectio cadaveris showed a most extensive fracture of the basis cranii, including sphenoid, ethmoid, and orbital plate of frontal bones; the anterior cerebral lobes were lacerated, and much blood effused; the membranes (although there had hardly been time for inflammation) were opaque. On examining the shoulder, there were several ecchymosed spots, from effused blood, in the deltoid and infra-spinatus muscles; the scapula was fractured in the way shown in the Frontispiece; the head of the humerus appeared as though it had been squeezed in a vice—fracture, but not separation, having taken place. It bore a very striking resemblance to the bone in Price Jones's case.
It had not been my intention originally to have published this Essay, and I had looked upon it only as a nucleus or foundation for future observations and prospective labours; but circumstances arose, and motives suggested themselves, which induced me to depart from my purpose, and into which it would be now futile to enter. Since the foregoing pages were written, indeed, several cases have been published by various surgeons, (and I allude more particularly to the valuable observations of Mr. R. W. Smith, in his 'Treatise on Fractures in the Vicinity of Joints,') which relate more or less directly to their subjects; but I felt how great was the necessity for accurate data, and how much more was it essential that these should be observed closely, arranged carefully, and estimated fairly, before I ventured to indulge in any half-encouraged ambition, and extend the sphere of my observations.

Throughout I have been impressed, and that to a most forcible degree, with a void in our professional knowledge, or rather with a vivid sense of the suppression of a certain portion of it. I am sure every one must acknowledge the extreme value of a complete system of accurate Hospital Reports, and no one can, I think, reflect upon the vast quantity of valuable material that every hospital annually furnishes, in the shape of Cases, either illustrating the generic features of some peculiar class of disease or injury, or instructing
us in some Truth by the elimination of some novel and important Fact, without feeling how great is the scandal that results to us from our culpable neglect of this important advantage.

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