Incisionless otoplasty

A review

Evolution of incisionless otoplasty

Incisionless otoplasty has been an evolving surgical procedure since its introduction in 1995 [1]. There were various stages of development. Starting with cadaver and histologic examination, the procedure was first introduced in combination with other otoplasty and mastoid procedures. It soon became clear that it was a successful free-standing procedure unto itself. Nevertheless, improvements continued to address weaknesses. Version 1.0 evolved through to the current Version 4.0. The original procedure delivered the retention sutures without an incision and corrected the antihelical and conchal bowl problems. Version 2.0 introduced incisionless weakening of the antihelical fold by cartilage scoring in order to decrease stress on the retention sutures and allow for intra-cartilaginous scar tissue formation as a retention device [2]. Version 3.0 combined the antihelical and conchal bowl corrections into a one-step suture placement in selected cases [3, 4]. The one-step suture anchored the antihelical bend correction to the mastoid. The 3.0 procedure also devised a lobule correction [3]. Version 4.0 again separated the antihelical and conchal bowl corrections within the operation, but addressed the cartilage memory spring of the conchal bowl. Thus, the presently used 4.0 procedure delivered the retention sutures percutaneously. Crucial for retention suture placement.

Preoperative assessment

To achieve a successful cosmetic correction, the pinna problems must first be diagnosed. The antihelix, conchal bowl, and lobules should be assessed separately. The thickness of cartilage, cartilage memory spring, and degree of protrusion of the ears are the main issues. Preoperative measurement of the overall protrusion can give an objective aspect to evaluation. Also, disqualifiers to surgery such as microtia or macrotia, which need open surgical correction with tissue addition or removal, must be assessed. Once the scope of malformation is understood, then the incisionless surgical correction can commence.

Surgical technique

Incisionless otoplasty gives each of the three malformed areas (antihelix, conchal bowl, lobule) a two-step surgical treatment. First, the cartilage memory spring is broken by cartilage scoring. Second, retention sutures are placed by percutaneous incisionless technique. Each of these two steps is individualized to every ear depending on the cartilage characteristics and shape. The two-step surgery deals with cartilage correction. The soft tissue will follow the cartilage. If the two-step process is followed, a reliable result is the outcome.

Prior to starting the envisioned correction, near-complete vasoconstriction of the ear is needed. A vasoconstrictive agent is placed by local injection. The vasoconstricting epinephrine should cause the ear to become cold and cadaveric during the surgery. For this reason, peri- and intra-auricular injections are placed onto the anterior and posterior sides of the pinna. Small, nondistorting amounts of injection fluid are used. In this way, the surgeon can work for up to 1.5 h with near complete hemostasis.

Incisionless cartilage scoring

A vital aspect to success is to break any cartilage memory spring opposing the suture correction. Rather than have a bowstring-like energy stressing the retention sutures, a flaccid cartilage is created by percutaneous needle tunnels (Fig. 1, 2). In this way, the retention sutures are not under tension. The trick is to puncture the cartilage with enough 20 gauge needle tunnels to break the cartilage spring without creating a large, confluent dissection cavity that could allow a hematoma to form.

Retention sutures should not be under tension

Thus, the needle is entered into several areas along the conchal bowl and antihelix. Multiple tunnels are created from each entry point. Assessment by finger palpation gives the surgeon an idea of when the cartilage spring is broken and only soft tissue resistance remain. All cartilage scoring of the pinna, in all areas, is done before any suture placement in order to prevent cutting of the sutures by subsequent needle penetrations. Using this incisionless percutaneous technique, the cartilage resistance is broken and the pinna is ready for retention suture placement.

Retention suture placement

The Incisionless technique delivers retention sutures percutaneously. Crucial to an easily performed procedure is that the suture must enter and exit through the same needle hole and same needle tract between the skin surface and
the perichondrium (Fig. 3). To repeat the essential technique: “The same needle hole and the same needle tract”. After the “same needle hole” is used, a “tract” for the suture is created by entering and exiting the needle at a 90° angle through the entire thickness of the skin. This technique prevents dimpling of the skin, inclusion cyst formation, infection of the suture tracts, rejection of the sutures, and allows for the final knot to slip and submerge subcutaneously. During the suture placement, a cutting needle (Ethicon/3–0 white Mersilene®/FS-1 reverse cutting/Somerset, NJ) is needed. The cutting needle allows for percutaneous suture placement since a distinct needle hole and tract are created.

Correction of the conchal bowl

The conchal bowl correction forms the foundation upon which the entire otoplasty correction depends. If the protuberant conchal bowl is not recessed, then the antihelical and lobule efforts are much less effective. In order to effectively reduce the conchal profile, it must be brought closer to the mastoid. Sutures alone usually cannot anchor the very resilient, thick, and spring-like conchal cartilage to the mastoid. Therefore, it is usually necessary to score the conchal bowl cartilage (Fig. 2). The scoring occurs medial to the point A anchoring suture site and allows the morselized conchal cartilage to better contour to the mastoid. To help hold the conchal bowl foundation firmly in place, the anchoring point B stitch on the mastoid soft tissue must be placed into the very tough mastoid–process fascia so that it is immovable and will not slowly loosen (Fig. 4, 5, 6, 7, 8). Muscle alone will not anchor the conchal bowl effectively.

Correction of the lobule

The lobule correction depends on releasing the cauda helicis from the pinna. This is done by palpating the cauda and then using cartilage scoring to disassociate the cauda from the pinna. Then, percutaneous sutures anchor the cartilage to the conchal bowl (Fig. 9, 10, 11). By rotating the cauda helicis in a posterior direction onto the conchal bowl the entire lobule itself changes shape. No skin excision is necessary. Indeed, skin excision alone cannot permanently alter the lobule profile. The lobule profile will follow the cartilage improvements to a cosmetic shape.
Correction of the antihelical fold

The antihelical fold receives the most attention from patients and surgeons alike. Since the antihelix is the outermost part of the pinna and forms the ear silhouette, it is most easily noticed. Therefore, proper correction of the antihelix is important to the overall success of the otoplasty surgery.

Overall success depends on proper correction of the antihelix, which forms the ear silhouette.

After the cartilage scoring, and conchal bowl and lobule suture placements, it is time to place antihelical sutures (Fig. 1, 12, 13, 14). The suture loops are placed as deeply under the skin as possible. They run between the thin subcutaneous tissues and the perichondrium. Indeed, the sutures will penetrate into the perichondrium along their course at several points. Usually two to three sutures are needed to hold the pinna in its new position. The knot is planned to be positioned closer to the postauricular sulcus as that tissue is thicker than the outer edges of the pinna and, therefore, better able to cover the knot.

It is also critical that the suture needle passes through the entire skin and subcutaneous thickness down to the perichondrium at a right angle to the skin surface. This allows exit and reentry by the needle through the same needle hole and tract. If angulation of the skin entry occurs, then entry and exit will be through different tracts and skin dimpling and an inability to submerge the knots will occur. If the knots cannot be submerged, then the suture loop must be replaced.

After the two to three antihelical sutures are placed, they are tightened. The tightening maneuver is done by pinching the antihelix to its desired curvature while simultaneously and slowly pulling the free suture ends. It is analogous to slowly tightening the loop of a purse string. A slow and progressive tightening is preferred to repeated tightening–loosening as the latter sawing motion could damage the cartilage. A replacement of the suture would then be necessary. All of the placed suture loops are pulled tight to the preferred position. Then a ruler measurement and visual aesthetic confirmation is done. The ears are slightly overcorrected by 3 mm to compensate for knot placement and any suture laxity. The knots are placed and at least five half-hitches are used. In this way, the antihelical shape is individually corrected for every ear.

Knot submergence maneuver

After placement, the knots initially rest on the skin surface. The knot is actually “floating” on the skin surface since the entry and exit suture fibers are in the same needle tract down to the cartilage. All that remains is for the suture knots to be submerged subcutaneously. This is done by pulling on the skin surrounding the knot with a skin hook. Since the suture is anchored to the inelastic cartilage, and the skin is very elastic, by pulling on the skin, the knot will slip and submerge along the tract. If the skin is pulled, then the knot will move through the needle tract from the skin surface to the cartilage surface (Fig. 15).

Postoperative care

The whole procedure is performed by percutaneous minimally invasive needle punctures. For this reason, complications are minimized since no dissection planes or skin flaps are created [4]. There are no hematoma formations or skin flap ischemias [5]. For these reasons, postoperative care is minimal. An antibacterial ointment is used to cover the ears. An overnight bilateral mastoid-like light compression dressing is placed. The main consideration on the first day postoperative is for pain control due to the many needle passes. The pain medication is usually necessary for the first 2 days. Water exposure is avoided for 1 week until the needle holes have healed. The patient is given perioperative antibiotics.

Conclusions

- Incisionless otoplasty can correct all aspects of the protuberant ear.
- The Incisionless techniques are applied as needed to the conchal bowl, lobule, and antihelix.
The incisionless technique for the conchal bowl suture is completed by taking a very forceful deep suture bite into the mastoid fascia. © IUSM Visual Media

As the conchal suture loop is tightened, the pinna profile lowers and forms the foundation upon which the neo-antihelix rests. © IUSM Visual Media

The lobule cauda helicis cartilage is first released by cartilage scoring. © IUSM Visual Media
Incisionless technique is used to anchor the free-floating cauda helicis to the conchal bowl. © IUSM Visual Media

After the suture is placed and tightened, the cauda helicis cartilage becomes recessed onto the conchal bowl. No skin excision is necessary. Indeed, skin resection alone cannot permanently alter the lobule profile. With cartilage recession work, the lobule profile will follow and be lowered. © IUSM Visual Media

The antihelical suture loop begins close to the sulcus. The needle is guided at a 90° angle into and out of the skin. The “short limbs” of the suture loop are placed on the anterior pinna cartilage surface. © IUSM Visual Media

The “long limbs” of the suture loop are located on the posterior surface of the pinna cartilage. The suture is placed on and into the perichondrium to anchor the suture to the cartilage and prevent bow-stringing of the suture. © IUSM Visual Media

The suture loop starts and ends on the posterior pinna surface. The two suture threads are within the same needle tract. This is important since it allows the final knot to slip through the tract down to the cartilage. © IUSM Visual Media

The suture knots are initially located “floating” on the skin surface over a needle tract. Upon pulling the skin with a hook, the knot slips and submerges through the needle tract to its final position resting on the cartilage surface. © IUSM Visual Media
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References