Table 4. Measurements on palatal dimension of preterm infants.

<table>
<thead>
<tr>
<th>Studies</th>
<th>Study group / study design</th>
<th>Method and validity of method</th>
</tr>
</thead>
<tbody>
<tr>
<td>[37]</td>
<td>- See Tab. 5.</td>
<td>- See Tab. 5.</td>
</tr>
<tr>
<td></td>
<td>- Prospective longitudinal study.</td>
<td>- Impressions (polyether material with a predominance of catalyst to hasten the set on stock impression tray) of the palate “as soon after birth as possible”, at 32 W GA and at term.</td>
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<tr>
<td></td>
<td>- n= 45 PT &lt; 30 W GA;</td>
<td>- 50/50 stone plaster mix casts, for the palate plate group a second model was cast to construct the protective appliance;</td>
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<td>- 3 groups:</td>
<td>- Measurements with a reflex microscope coupled to a pc;</td>
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<td></td>
<td>- 15 babies requiring orotracheal intubation were after random selection fitted with palatal protective appliances as soon as possible after birth and throughout the intubation period (32.1 D (19.3)), (GA at birth 26.6 (1.75) W, BW 0.86 kg (0.176)), (plates replaced all 10-14 D to allow for growth)</td>
<td>- Test of the accuracy of the impression technique by repeated impressions on the same occasion at 6 randomly chosen babies (paired t-test); differences between the impressions NS</td>
</tr>
<tr>
<td></td>
<td>- Other 15 intubated babies requiring orotracheal intubation 30.8 D (25.5 D) without protective plates (GA at birth 26.2 W (1.94), BW 0.95 kg (0.23))</td>
<td>- 25 % of the models were measured on a different occasion and tested with a paired t-test to indicate the error of the method.</td>
</tr>
<tr>
<td></td>
<td>- All intubated babies were similar in sex distribution, BW and GA at birth.</td>
<td>- For palatal depth measurements a significant error at the 1.4. % level was found!</td>
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<tr>
<td></td>
<td>- Controls: 15 non intubated babies (GA at birth 29.7 (1.5), BW 1.42 kg (0.36))</td>
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<tr>
<td>[45]</td>
<td>- See Tab. 5.</td>
<td>- See Tab. 5.</td>
</tr>
<tr>
<td></td>
<td>- Inclusion:</td>
<td>- Four investigators.</td>
</tr>
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<td></td>
<td>- Study group:</td>
<td>- Clinical examination +</td>
</tr>
<tr>
<td></td>
<td>- n=52 children of the neonatal unit of the University of Illinois Hospital (1985- 1990),</td>
<td>- Plaster casts from alginate impressions.</td>
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<td></td>
<td>mean BW 1151 g (SD 418.3), mean GA 29.4 W (SD 3.4) intubated at least 24 H (mean 26 D (24.5), aged 2- 5 Y, a majority with hyaline membrane disease and subsequent bronchiolpulmonary dysplasia.</td>
<td>- Assessment of palatal dimension similar to that used by Shellard et al. (1986) and advocated by Klami et al. (1979).</td>
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<td>- Controls:</td>
<td>- Measurements by an adjustable template.</td>
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<td></td>
<td>- 45 NBW children matched for age (only for palatal depth).</td>
<td>- Depth: measured from a line connecting left and right interproximal areas of the first and second primary molars, at the gingival margin, perpendicular to the palate by 4 investigators (interexaminer measurements did not differ significantly from the sample mean (α= 0.01 (t-test))).</td>
</tr>
<tr>
<td></td>
<td>- Exclusion:</td>
<td>- Palatal grooving: tracing the cross section of the plaster cast in a transverse direction (at the same location where palatal depth was measured); measurements with a flexible plastic ruler from the deepest point of the groove to an imaginary line crossing the palate; 2 examiners, in case of different ratings repetition of the evaluation until agreement was reached.</td>
</tr>
<tr>
<td></td>
<td>- History of craniofacial surgery, congenital abnormalities and syndromes or orthodontic</td>
<td>- Palatal shape and contour (palatal vault): cross sections of the palate, creating a matrix of very deep, deep, shallow or flat palate (in case of different ratings repetition of the evaluation until agreement was reached)</td>
</tr>
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<td>treatment.</td>
<td>- Posterior dental crosses: evaluation of plaster casts.</td>
</tr>
<tr>
<td>[15]</td>
<td>- See Tab. 1.</td>
<td>- Accuracy of the method not given!</td>
</tr>
<tr>
<td></td>
<td>- See Tab. 5.</td>
<td>- See Tab. 1.</td>
</tr>
<tr>
<td></td>
<td>- Prospective, interdisciplinary, longitudinal study.</td>
<td>- Impressions.</td>
</tr>
<tr>
<td>[46]</td>
<td>- 26 non orally intubated PT infants, GA at birth 30.8 W (2.76), BW 1468 g, (531), divided</td>
<td>- Evaluation of nutrition, calcium and phosphate substitution and weight by patients’s records and history.</td>
</tr>
<tr>
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<td>into a breastmilk fed and a commercial formula fed group matched for corrected age and weight.</td>
<td>- Accuracy of the method not given.</td>
</tr>
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<td></td>
<td>- Impressions at 36.8 W (1.4) and 52.6 W (7.16) postmenstrual age.</td>
<td>- See Tab. 5.</td>
</tr>
<tr>
<td>[47]</td>
<td>- See Tab. 5.</td>
<td>- Impressions.</td>
</tr>
<tr>
<td></td>
<td>- Prospective, interdisciplinary, longitudinal study.</td>
<td>- 3 measurements with a 3 D laser digitizer.</td>
</tr>
<tr>
<td></td>
<td>- 27 PT infants, GA at birth 30.7 W (2.8).</td>
<td>- Evaluation of nutrition, calcium and phosphate substitution and weight by patients’s records and history.</td>
</tr>
<tr>
<td></td>
<td>- Impressions at 37.6 W (3.15) (n=27), and at a corrected age of 13.8 W (5.9).</td>
<td>- Accuracy of the method not given.</td>
</tr>
</tbody>
</table>
- See Tab. 5 and Tab. (3 Part 1)

[48] - See Tab. 2.

[10] - Inclusion: Caucasians without craniofacial anomalies, without habit activity, intact dentition with deciduous canines to second primary molars present (remark of the authors: no information was given if the children did or did not have orthodontic treatment).

- 43 PT, LBW children (GA 20-37 W, BW 957-2040 g) from Oxford.
- Mean age 10 Y (range 8.4-11.1)
- Mean intubation time 15 D (range 1-58) (23 <=15 D, 20 > 15 D)
- All fed orogastrically

- 50 NBW, term children (GA 39-41 W, BW 2650-3970 g., aged 8.9-10.8 Y) from Oxford, individually matched with respect to age and gender, without history of intubation or orogastric feeding.

- See Tab. 5 and Tab. 3 (Part 1)

- Alginate impressions, wax bite registrations, cast within 24 H with a 50-50 % plaster and white stone. Remark of the authors: alginate loses its dimensional stability after a few H, thus incorrectness of the casts’ dimensions might have resulted.

- Width, length and height measurements recorded as values of the x, y and z coordinates of the cartesian scale.

- Marks for sagittal (median palatal raphe according to Lebret (1962) [66]) and horizontal reference planes (gingival alveolar margins of the deciduous and permanent teeth according to Kopra and Davis (1991) [48]) on the dental casts, from these the measurements were taken.

- Reference points: canine tips or estimated canine tips.

- Messobuccal cusp tips of first permanent molars.

- Temporomandibular diameter (TMD) (horizontal distance between the temporomandibular joints) taken with dividers, measured with a caliper calibrated to 0.1 mm (repeated measurements 2 h apart from 10 VLBW not included indicated repeatabity r=0.95).

[42] - Study conducted exclusively to compare the different measuring methods (see right column).

- See Tab. 1.

[49] - See Tab. 5.

- Inclusion:

- Total of 54 infants.

- Intervention group: n=31, BW 1110 g (227), GA at birth 28.5 W (1.4), mechanically

- See Tab. 1.

- 1. Stereophotogrammetry (binocular vision + analytic plotter).


- 3. Olivetti inspector machine (allows direct measurement of dimensions on the three Cartesian axes on a millimeter scale with an SD of 0.1 – 0.4 mm and reading of measurements directly on a display panel [42].

- Stereophotogrammetry was found to be the most consistent method of measuring the palatal configuration of preterm infants. Vernier calipers significantly overestimated the height and underestimated the width, and were therefore considered not to be suitable for VLBW infants. Compared to stereophotogrammetry, the Olivetti inspector machine significantly underestimated the width [42].

[52] - See Tab. 5 and Tab. (3 Part 1)
ventilated for 240 H (362), fitted with a pair of pressure dispersing pads (pdp), of high
density lightweight cushion designed to fit the lateral aspect of the head to relieve direct
pressure from the zygomatic bones, associated structures and ear, while dispersing pressure
across temporal, parietal and mandibular structures; continuously worn after the initial
measurement, changed every 7 D.
- Controls: n=23, BW 1215 g (215), GA age at birth 29.2 W (2.2), ventilated for 165 H (532)
without pdp.
- No significant difference between the groups in BW, GA, duration of oral intubation, type of
milk intake, in terms of subject age at each test measure and number of D between test
measures.
- 2 phase study over 20 months.
- Test 1: 2-7 D after birth, when moulding from delivery disappeared and infant’s condition
was stable.
- Test 2: 1 D prior to commencement of oral feeding.
- Test 3: 1 or 2 D prior to discharge or at 40 W.
- Exclusion:
- 5 of 68 infants meeting the criteria for initial inclusion were excluded because of a grade 3
intraventricular haemorrhage (possibility of aberrant head growth ± loss due to transfer to
other centres).

[53] -See Tab. 3 (Part 1), here: 20 PT infants, see Tab. 5.
[50] - See Tab. 5.
- Prospective, longitudinal study;
- 76 neonates, GA 25-41 W (median 33)
- BW 715-4730 g! (median 1880 g)
- 23 infants ventilated 1-32 D (endotracheal tube; Portex Blue);
- 19 intubated <10 D
- 4 intubated ≥10 D
- Infants with need of intensive care nursed prone, others mostly supine.
- Nasogastric tubes used for delivering lavage feeds.
- Division into 3 groups:
- 27: < 32 W of GA (21 infants ventilated);
- 29: 32-35 W of GA (2 infants intubated (<10 D);
- 20 ≥36 W of GA (none intubated);
- Controls: 15 PT non intubated babies (it was not possible to obtain a strictly matched control
group, thus the mean BW and state of GA was higher for the control group; time interval
between initial impressions and those at 32 W GA was shorter in the control than in the
intubated groups).

BW = birthweight, D = day(s), F = female, GA = gestational age, GW = gestational weeks; H = hour(s); LBW = low birthweight, M = male, MO = month(s), NBW = normal birthweight, NS = not significant,
PT = preterm, VLBW = very low birthweight, W = weeks, Y = year(s).

- Compound palatal impressions by 1 single investigator (palatal impression was not taken if an
orotracheal tube was in situ at a particular testing time).
- Stone cast poured from each palatal impression.
- Stereophotogrammetry to measure parameters of the palatal cast.
- From the computer file of coordinates, measurements of maximum width, maximum height and
area were calculated.
- Assessment of bone metabolism was not performed but the type of milk intake.
- Statistics: version of ANOVA (general linear models procedure), which took in account any
missing variables due to an orotracheal tube in situ, medical instability or earlier transfer to
regional hospitals, and tested the influence of oral intubation on outcome
- Student’s t test showed statistically significant differences for birth parameters, initial craniofacial
and palatal measurements and total H of orotracheal intubation.
- Contingency table was used to explore differences in nutritional intake.
- P < .05 level of significance.
- Study examined changes within time:
  - Period 1: from test 1 to test 2.
  - Period 2: from test 2 to test 3.
  - Period 3: covered the whole study period.

- See Tab. 3 (Part 1), here: 20 PT infants, see Tab. 5.
- See Tab. 5.
- One investigator.
- Vinylpolisiloxone impression (Elite fast).
- Stone hard plaster model (n=267).
- 267 impressions attempted; in 10 cases no impression was possible due to non compliance, in 40
the landmarks could not clearly be identified ⇒ 217 casts were included in the study.
- Palatal depth: at the deepest point of the palate (identified by visual inspection) relative to the
alveolar crest.
- Palatal width: perpendicular to a line constructed by the midline point of the anterior crest of the
alveolar gum pad ridge (identified by visual inspection) and the deepest point of the palate.
- Measurements at 28, 32, 36, 40, 53, 66, 92 W of postmenstrual age.
- Accurate identification of palatal width required that the model was held in a specially constructed
spring loaded deck with a transparent upper deck that rested on the alveolar crestal margins, and
had 0.5 mm holes drilled at 3 mm intervals along the sagittal and coronal planes; hole at the
intersection lines was aligned perpendicular to the deepest point using a 0.5 mm pencil lead
inserted through the hole vertically to the deepest point. By aligning the holes in the sagittal plane
of the deck with the midpoint of the alveolar ridge the coronal plane on the palate model was
marked and the points for measurement of palatal width identified.
- Measurements with a high precision reflex microscope (resolution of 0.2 m!).
- Reliability of the method not given.
- See Tab. 2.