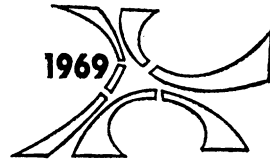


Pre- and Early Postoperative Growth-Guidance in Cleft Lip and Palate Cases by Maxillary Orthopedics (an Alternative Procedure to Primary Bone-Grafting)



MARGARET M. HOTZ, M.D., D.M.D.
Zürich, Switzerland

In Zürich, preoperative treatment of cleft lip and palate, based on McNeil's original concept (4), was started in 1957. After a few years of continued observation and evaluation of preliminary results, the following facts became apparent.

a. Moving segments or moulding arches is quite easy, maintenance of the original good occlusion or of attained results is the problem. Without retention the most beautiful alignment collapses after surgical closure, especially after palate repair—a common experience. Hence the alternative: stabilization by bone-grafting or mechanical retention.

b. The question when to operate is still unsolved, but a compromise of some sort is necessary. As seen by us, the optimal compromise in the timing of lip and palate repair would be when the positive effects of closure can best be utilized and adverse effects compensated. In other words, it is when mechanical retention is possible, thereby maintaining muscular balance until growth is advanced enough to allow secondary procedures, surgical and/or orthodontic.

We were skeptical concerning primary bone graft with or without preoperative treatment. To date, it looks as if we were justified, since long term results do not fulfill the hopes of being the solution to the problem of maxillary collapse, in spite of some temporary benefit in early stages. Apparently the early bone-grafts interfere with growth to varying degrees.

We developed an alternative procedure for maintenance, using the principles of jaw-orthopedics. Our cases may serve for comparison with bonegrafted or conventionally treated ones. The term growth-guidance sounds rather presumptuous, but the approach includes supervision of development throughout the growth period and entails all aspects of

Dr. Hotz is affiliated with the University of Zürich.

This paper was presented at the 1969 International Congress on Cleft Palate, Houston.

long range cleft lip and palate habilitation: surgical, dental, speech and psychological.

The present management consists of: a) early pre- and postoperative treatment and retention with plates, and b) postponement of necessary surgery to allow modelling and less impeded growth until retention becomes possible.

In the majority of cases, moving segments actively before lip operation is *not* necessary or even *desirable* with a view to occlusion. In comparing models of 50 normal neonates with 73 with clefts, we found not one pre-existing crossbite. Except for the more or less forward displaced premaxillary segment in clefts, the so-called physiological distal bite varies within the same limits as in normals. True micrognathia is rare (Pierre-Robin syndrome excepted). Mandibular measurements in clefts are analogous to those of normals. We consider the fact that the average maxillary arch of clefts is wider than in normals to be a *positive* factor. What we have to do in cleft cases is not active approximation of segments or closure of the gap, but to *maintain adequate arch-width* to accommodate the normally growing mandible. Approximation of segments and reduction of width occurs spontaneously through natural growth and by lip surgery, but it has to be guided and prevented from going too far. Both induced closure with McNeil's procedure or uncontrolled scar contraction can predispose to crossbite. This well-known fact called for the combined procedure of preoperative treatment and bone graft. Unfortunately the graft does not seem to follow the normal growth pattern in later development.

Thus, our general aims are: a) to create or to maintain good initial conditions as regards width and occlusion, b) to prevent adverse effects of primary surgery by mechanical retention, and c) to guide occlusion and tooth eruption.

As soon as possible following birth a plate of combined soft and hard acrylic is inserted (hard across the palate, from one ridge to the other). This serves as obturator, closing the hard palate and much of the soft as the child tolerates. For better fixation until habituation the plate has a soft extension into the nose cavity, which is gradually reduced. Acceptance occurs quickly in a very young baby, since the device is both a sucking and feeding plate and, as such, a great psychological asset for the mother.

The part of the plate covering the vomer is relieved from contact on the model. By gradually grinding away in the area of the underdeveloped and displaced segments, we allow for growth and shifting in the desired directions. The modelling effect as a result of the functional influence of sucking consists of the narrowing of the gap and straightening of the vomer. The soft vestibular part of the plate gives way and adapts itself to growth. It is a well-known fact that after lip closure, when unity of musculature is established, a closer approximation of the alveolar seg-

ments occurs. The amount of this approximation, though, has to be controlled. It is dependent upon the size and position of the mandible. Normal occlusal relationship and not a butt joint is the aim. Four to six months is the normal age for lip closure.

The plate is worn continuously and, owing to its adaptability, does not need to be replaced for several months. Immediately after lip operation, previous to reinsertion as a retainer, the parts in the vicinity of the scar are cut away. A new corrected plate is adapted after complete healing.

Early insertion of the plate is important for both habituation and producing the modelling effect. A newborn will tolerate practically everything and after adjusting to this kind of pacifier will wear it naturally as a retainer for six to eight months following lip closure. We allow for tooth eruption by drilling small openings in the plate. These can be shaped like small inclined planes and can direct palatally-inclined incisors labially, thus preventing frontal crossbite. Such a crossbite is often the consequence of a slight premature contact in the frontal segment. The forward shifting of the mandible then establishes itself as a habit, inducing inferior prognathism.

In our experiments on young monkeys with artificially produced class III occlusions (2), the mandibular prognathism did not relapse spontaneously into normal position when released. The gonial angle had increased and teeth moved forward. A parallel in young children is likely to happen.

Another important fact is that, by use of the plate the tongue is not only kept out of the cleft, but its posture and the swallowing pattern are changed and brought closer to normal. On the feeding bottle, a short nipple is used and regular mandibular forward movement occurs. Cineradiographic feeding tests show the difference with and without obturator.

We cannot yet judge what influence these functional changes may have on speech development. Our clinical experience corroborates the findings of Mylin, Hagerty, and Hess (5) and others that children treated with plates show greater skill in producing dental and palatal sounds.

Lip closure, as a rule, does not affect the buccal segments. Arch form is stable after eruption of 1st deciduous molars; scar contracture of the lip is no longer active. The plate can be removed or worn only for feeding or during sleep. This will depend on the child's temperament and the mother's discipline and authority. Swallowing pattern and muscular balance are established and the tongue no longer reaches into the cleft, owing to vertical growth of the palate and acquired habit.

Lateral maxillary collapse occurs mainly during the first three to six months after palate repair, diminishing in the second half year and second year. In our material, the contracture in former and not retained cases ranged from 1 to 10 mm. In order to prevent lateral collapse we

need retention. For this we need anchorage, namely, *teeth*. Thus, palatal closure is now delayed until full deciduous dentition is present, age two and one half to three years.

Two to three weeks after palatal operation, we insert a conventional retainer with arrow head clasps, jack or pivot screw, depending on the form of alveolus and occlusion. A rate of $\frac{1}{4}$ mm widening per month is sufficient to keep up with growth of the arches. The retention period is six months to a year, depending on degree of overbite, intercuspitation and, unfortunately sometimes, caries susceptibility.

Not all cases will need the same routine. An estimate of the amount of probable collapse is not easy. We consider excess lateral width and even buccal nonocclusion (complete crossbite) as prognostically favorable. In such cases, we must wait and observe after closure and, when contracture has reached normal intercuspitation, we insert a retention device.

Previously collapsed segments show a great tendency to relapse after expansion, primarily-retained ones relapse very little. Since the pull of the contracting scar is greatest during the first six months after operation, it seems natural to check it. *Expansion* itself amounts to actual early treatment and is only used in cases with insufficient preoperative control. It is not a *routine* procedure. Usually a removable appliance, which can double as a bite plate or correct simple crossbite with finger springs, is adequate.

Postponement of palatal closure until age two and one-half or three naturally brought us into conflict with the established opinion of surgeons and speech pathologists who claim that velar closure should be effected before speech begins. We made careful speech tests in all postponed cases and found no significant clinical differences between early and postponed repair. Articulation proficiency is often retarded anyway. If, however, speech development takes place before eruption of 2nd deciduous molars, or, if substitute sounds or glottal stop appear, we time the compromise differently and revert to early veloplasty in order to keep the possibility of anterior expansion. Occasionally we do an earlier total closure with retention by means of a palatal arch with bands on the 1st and 2nd deciduous molars.

In bilateral cases the procedure is analogous. Preoperative treatment, however, generally includes expansion with a split plate and retrusion of the premaxilla by elastic traction. For isolated palatal clefts, the same principles are valid. A feeding plate of soft acrylic only is used until deglutition is normalized and vertical growth has occurred.

Prevention and interception is our line of thought. We try to avoid development in the wrong direction. Early frontal crossbite, as already mentioned, inducing functional lower prognathism or incipient transverse forced bite which results in dysplastic asymmetry, can be prevented. By inhibiting scar contracture we can avoid premature contacts and thus

mandibular deflection. Considered in this connection, jaw-orthopedics may be more than just a "fringe benefit" (3).

It is common knowledge that function leads form and that a feedback between the two occurs. Quoting Enlow (1): "growth is an intricately regulated sequence". Isn't it rather wishful thinking to assume that surgery can at once restore failing function by correcting form? Surgery is quick and spectacular, jaw-orthopedics slow and tedious, not at all spectacular, and demands patience, understanding, and psychological skill. However, it is closer and better adaptable to any growth manifestation.

In our opinion we ought to refrain from major surgery at least until the well known $\frac{4}{5}$ of maxillary development has occurred, that is, age five to six at least, preferably seven to nine.

Supervision, guidance and adequate timing of intervention should help to avoid or minimize functional and esthetic disturbances.

reprints: Dr. Margaret M. Hotz
University of Zürich
Zürich, Switzerland

References

1. ENLOW, DONALD H., Wolff's law and the factor of architectonic circumstances. *Amer. J. Orthod.*, 54, 803-822, 1968.
2. JOHO, J. P., Die Reaktion der Zähne und Kiefer auf Veränderung der Bisslage. Thesis, University of Zürich, 1968.
3. MAISELS, DAVID O., Early orthopedic treatment of clefts of the primary and secondary palates: a surgeon's view. *Cleft Palate J.*, 3, 76-85, 1966.
4. MYLIN, W. K., R. F. HAGERTY, and D. A. HESS, The pin-retained prosthesis in cleft palate orthopedics. *Cleft Palate J.*, 5, 219-227, 1968.
5. McNEIL, C. KERR, Orthodontic procedures in the treatment of congenital cleft palate. *Dental Record (Glasgow)*, 70, 126-132, 1950.