41 39

No. 2 Volume 10 May 1982 Page 61–128

Sonderdruck

Journal of Maxillofacial Surgery

Official Publication of the European Association for Maxillo-Facial Surgery

Editor-in-Chief:
H. P. M. Freihofer
Nijmegen, The Netherlands

Assistant Editors:
P. B. Clarke
Aberdeen, Scotland
R. A. C. A. Voorsmit
Nijmegen, The Netherlands

Editorial Board:
K. Bitter, Berlin
R. Brusati, Parma
J. Conley, New York
P. Egyedi, Utrecht
R. Fries, Linz
R. J. Gorlin, Minneapolis
I. R. H. Kramer, London
L. A. Nwoku, Lagos
H. L. Obwegeser, Zürich
G. Pfeifer, Hamburg
V. Popescu, Bucharest
N. L. Rowe, Woking
A. Škokljev, Belgrade
P. Tessier, Paris
J. M. Vaillant, Paris

J. max.-fac. Surg. 10 (1982) 80–83
© 1982 Georg Thieme Verlag Stuttgart · New York

Stability of Le Fort I Osteotomy in Class III Cases with Retropositioned Maxillae*

Ullrich Teuscher and Hermann F. Sailer

Department of Orthodontics and Childrens Dentistry (Head: Prof. P. W. Stöckli, D.M.D., M.S.) University of Zürich and Clinic of Maxillo-Facial Surgery (Head: Prof. H. L. Obwegeser, M.D., D.M.D.) University Hospital, Zürich

Sicher, H.: Skeletal disharmonies and malocclusions. Amer. J. Orthod. 43 (1957) 679

Smith, G. H., M. McKeown: Experimental alteration of the coronal sutural area: a histological and quantitative microscopic assessment. J. Anat. 118 (1974) 543

Steinhilber, W.: Die operative Behandlung von Mittelgesichtsfrakturen. Metallurgische, tierexperimentelle und klinische Untersuchungen. Quintessenz, Berlin 1976

Stenström, S. J., B. L. Thilander: Facial skeleton growth after bone grafting to surgically created premaxillomaxillary suture defects: An experimental study on the guinea pig. Plast. Reconstr. Surg. 40 (1967) 1

Stenström, S. J., B. L. Thilander: Effects of nasal septal cartilage resections on young guinea pigs. Plast. Reconstr. Surg. 45 (1970) 160

Stewart, R. E., G. Dixon, A. Cohen: The pathogenesis of premature craniosynostosis in acrocephalosyndactyly (Apert's syndrome). Plast. Reconstr. Surg. 59 (1977) 699

Ten Cate, A. R., E. Freeman, J. B. Dickinson: Sutural development: Structure and its response to rapid expansion. Amer. J. Orthod. 71 (1977) 622

Tessier, P.: Relationship of craniostenoses to craniofacial dysostoses, and to faciostenoses. Plast. Reconstr. Surg. 48 (1971 a) 224

Tessier, P.: The definitive plastic surgical treatment of the severe facial deformities of craniofacial dysostoses. Plast. Reconstr. Surg. 48 (1971 b) 419

Tessier, P.: Total osteotomy of the middle third of the face for faciostenosis or for sequelae of Le Fort III fractures. Plast. Reconstr. Surg. 48 (1971 c) 533

Tönnis, W., O. Kleinsasser: Über die röntgenologischen Zeichen erhöhten Schädelinnendruckes im Kindes- und Jugendalter. Z. Kinderheilk. 82 (1959) 387

Troitsky, W.: Zur Frage der Formbildung des Schädeldaches. Z. Morph. Anthrop. 30 (1932) 504

Ullik, R., K. Hollmann: Primäre Osteoplastik bei Lippen-, Kiefer-, Gaumenspalten. Fortschr. Kiefer- und Gesichtschir. 16/17 (1973) 124

Virchow, R.: Knochenwachstum und Schädelformen mit besonderer Rücksicht auf Cretinismus. Virchows Arch. path. Anat. 13 (1858) 323

Watanabe, M., D. M. Laskin, A. G. Brodie: The effect of autotransplantation on growth of the zygomatico-maxillary suture. Amer. J. Anat. 100 (1957) 319

Watzek, G., H. Matras, A. Perneczky, A. Tuchmann: Auswirkungen von prämaturen Synostosen des Neurokraniums auf das Viszerokranium. Fortschr. Kieferorthop. 38 (1977) 205

Watzek, G., F. Grundschober, H. Plenk: Beeinflussung des Wachstums der Jochbogensutur im Tierexperiment. Verh. Anat. Ges. 73 (1979) 637

Weinmann, J. P., H. Sicher: Bone and Bones. Mosby, St. Louis 1955

Whitaker, L. A., L. Schut, L. P. Kerr: Early surgery for isolated craniofacial dysostosis. Plast. Reconstr. Surg. 60 (1977) 575

Wolff, J.: Markierversuche am Scheitel-, Stirn- und Nasenbein der Kaninchen. Arch. path. Anat., Physiol., klin. Med. 101 (1885) 572

Wurmbach, H.: Wirksame Kräfte beim Wachstum, der Formgestaltung und der Gewebsdifferenzierung. Acta anat. 66 (1967) 520

Yen, P. K.-J., J. H. Shaw: Studies of the skull sutures of the rhesus monkey by comparison of the topographic sampling technique, autoradiography and vital staining. Arch. oral. Biol. 8 (1963) 349

Young, R. W.: The influence of cranial contents on postnatal growth of the skull in the rat. Amer. J. Anat. 105 (1959) 383

Georg Watzek, M.D., D.M.D.
Abt. f. zahnärztliche Chirurgie der Univ. Klinik
f. Zahn-, Mund- und Kieferheilkunde
Wöhringerstraße 25 a
A-1090 Wien
Austria

J. max.-fac. Surg. 10 (1982) 80–83
© 1982 Georg Thieme Verlag Stuttgart · New York

Stability of Le Fort I Osteotomy in Class III Cases with Retropositioned Maxillae*

Ullrich Teuscher and Hermann F. Sailer

Department of Orthodontics and Childrens Dentistry (Head: Prof. P. W. Stöckli, D.M.D., M.S.) University of Zürich and Clinic of Maxillo-Facial Surgery (Head: Prof. H. L. Obwegeser, M.D., D.M.D.) University Hospital, Zürich

Summary

Of 65 adult class III patients with retropositioned maxillae subjected to Le Fort I Osteotomy, 16 were selected at random for a clinical and cephalometric examination of postoperative stability. Lateral head plates prior to treatment, 6 weeks post-treatment and 1 year post-treatment were compared. In 9 out of the 16 cases 5 year post-treatment head plates were available. Statistical evaluation of the longitudinal differences revealed the repositioned maxilla to remain stable. The upper lip, however, lost 44 % of its postoperative advanced position within the 1st year subsequent to the operation. In the period between 1 year and 5 years postoperatively no further cephalometric changes of any significance were recorded.

Key-Words

Osteotomy – Cephalometric evaluation – Stability – Orthopaedic surgery of the maxilla – Le Fort I

Introduction

Anterior repositioning of the retrognathic maxilla has become an almost routine procedure in maxillo-facial surgery today (*Obwegeser* 1962, 1964, 1965, 1969). Dental factors determine whether operation alone is performed exclusively or orthodontic treatment has to be carried out beforehand or subsequently. In any case stability of the result is of paramount importance. Especially in combined surgical orthodontic cases the stability of the operation becomes a prerequisite to satisfactory long term results.
Willmar (1974) reported on 3 years post-treatment results, but as yet stability of the soft tissue profile improvements and the reactive changes in position of the mandible have not been studied quantitatively. The study submitted evaluates changes in position of the maxilla, the mandible, the dentition and of the anterior points of the soft tissue profile following Le Fort I Osteotomy.

Sample and Method

16 out of 65 dentate patients who had undergone anterior repositioning of the maxilla were selected at random and recalled for 5 year follow up records. They had not been treated orthodontically and their mean age was 27 at the time of operation. Only 9 of the 16 patients attended. However, all 16 cases had 1 year follow-up records. Thus lateral head plates prior to therapy, 6 weeks postoperatively, 1 year postoperatively from 16 patients and 5 years postoperatively from 9 of them were available.
A reference system using the Frankfort Horizontal and a vertical line through the sella (Fig. 1) was selected for longitudinal comparison of cephalometric changes. The co-ordinate system, the maxillary landmarks ANS, PNS, A and the mandibular landmarks B, Pg, Gn, Me, Go were transferred by structural superimpositioning from the first to the subsequent lateral head plates of an individual case. The reference system was transferred by superimposing on a maximum of structures of the anterior cranial base. The maxilla was superimposed along the palatal outline and the visible parts of the nasal floor, the mandible was superimposed using the symphysis, the nerve canal and lower border of the body. This procedure of structure – related transfer of cephalometric landmarks is the only way to record changes in the position of the maxilla, the mandible and the teeth without all measurements being affected by postoperative bone remodelling. The co-ordinates of the points given in Fig. 1, the angles SNA, SNB, NL/FH, Occ/FH, MeGo/FH, the distances between the projections of A- and B-point on the Frankfort Horizontal and on the occlusal plane (Fig. 2), the anterior facial height (NMe) and the vertical distances of the upper and lower incisors and first molars from NL and MeGo were recorded with the aid of a D-Mac plotting table. To record the horizontal changes in position of the maxilla as a whole, the mid-point between ANS and PNS was used. Linear and angular changes between cephalograms were tested for significance with the Wilcoxon-test for paired differences.

Results

Subjective inquiry of the recalled patients revealed that all of them would again give permission for the operation. Where autogenous bone graft material, taken from the iliac crest, had been interposed during the Le Fort I osteotomy, the patients claimed pain at the iliac crest site to be worse than the pain caused by the relocation of the maxilla.
Clinical findings: One year post-treatment one of the patients showed unilateral opacity of the maxillary sinus. In 45 % of the patients, at that point in time, not all of the teeth reacted to CO_2-testing. In the patients examined more than 5 years post-treatment, only 2 % of the teeth tested showed no reaction to CO_2 without discoloration or apical inflammation being observed.

* Paper read at the 30th Congress of the German Society for Oral and Maxillo-Facial Surgery and 25th anniversary of the Clinic of Maxillo-Facial Surgery, University Hospital, Zürich, Switzerland, 19. 5.–23. 5. 1980.

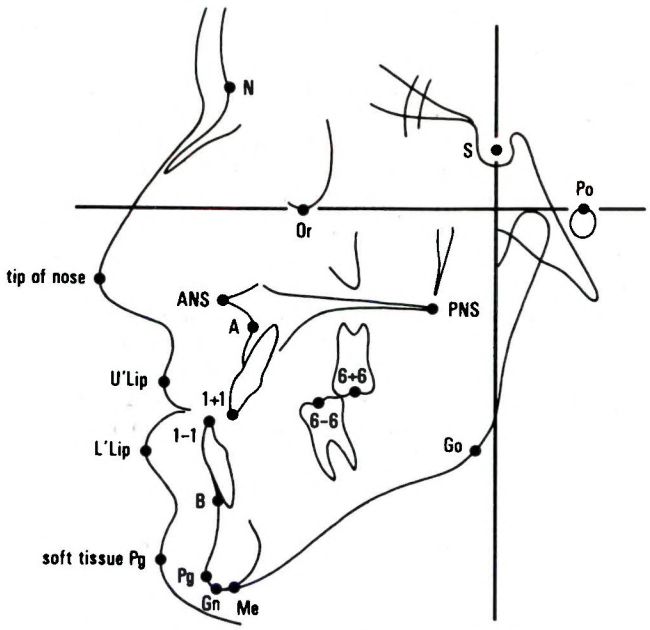


Fig. 1 Cephalometric points used in the evaluation. Frankfort Horizontal (OrPo) and a vertical through sella (S) serve as reference system.

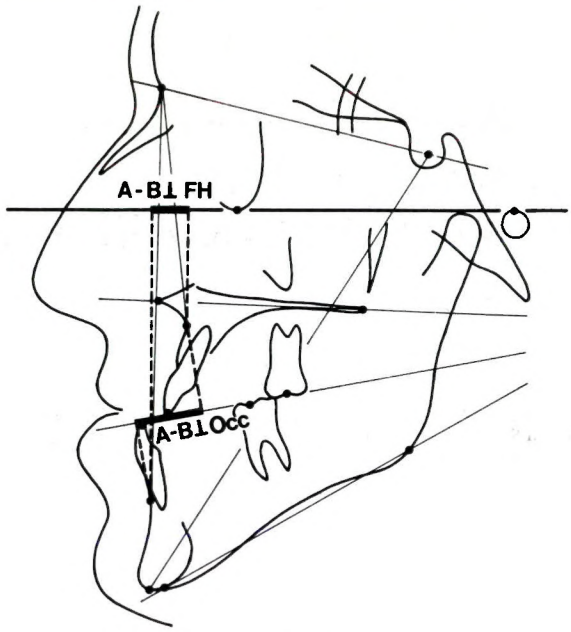


Fig. 2 Angles used in the evaluation. The differences between the projections of A- and B-point on the occlusal plane and on Frankfort Horizontal (short solid lines) describe the pre-treatment configuration of the sample.

Table 1 Pre-treatment sagittal discrepancies (n = 16)

	$\bar{x}$	s	min	max
SNA°	76.51	4.76	67.8	84.7
SNB°	83.04	5.33	75.9	95.1
ANB°	−6.53	1.84	−10.4	−2.1
Diff. A − B ⊥ FH mm	−9.84	3.43	−18.3	−4
Diff. A − B ⊥ Occ mm	−11.09	3.93	−18.3	−5.6

$\bar{x}$: mean. s: standard deviation. min., max.: minimum and maximum values.

Cephalometric results: The pretreatment values of the 16 patients revealed that the skeletal class III configuration was partly due to a prognathic mandible but was mainly caused by a retrognathic maxillary position (Table. 1). Considerable negative differences between the projections of A- and B-point on the occlusal plane indicated the degree of the class III relationship of the alveolar structures; the negative differences between A- and B-point when projected on the Frankfort Horizontal displayed the degree of profile discrepancy.

The mean anterior relocation of the maxilla was 7.1 mm. With the procedure the upper lip was advanced by 7.5 mm. and the tip of the nose by 2.4 mm. on average. Even the lower lip, due to its changed relationship to the upper lip, moved anteriorly by 1.7 mm. In the 6 weeks post-treatment records the changed occlusion was obviously not yet settled and the mandible showed slight posterior rotation. As a consequence the bony and soft tissue pogonion moved backward by 2.7 mm. and the SNGn angle opened by 1.3°. The maxillo-mandibular-plane angle (NL/MeGO) opened by 1.5° and the total anterior face height (NMe) increased by 1.6 mm. Statistically no significance was found for alveolar tooth movement (Table 2 a).

The one year follow up head plates, when compared to the operative results, proved the achieved position of the maxilla to be stable. A loss in position of −0.38 mm. was insignificant. On the other hand there was a significant backward movement of the upper lip by 3.3 mm. and of the nose by 0.9 mm. The mandible, by slight anterior rotation during this one-year time interval, returned to its original pre-treatment position.

As an overall result one year after the Le Fort I operation, anterior repositioning of the maxilla by 6.7 mm. of the upper lip by 4.2 mm. and of the tip of the nose by 1.5 mm. is recorded. All other values correspond to the original data. In the period of time between one and five years post-treatment no further skeletal, dental or soft tissue changes of significance were seen. The very small changes during this time averaged below 0.5 mm. and 0.5°.

Discussion and Conclusions

In contrast to other studies (*Hogeman* and *Willmar*, 1967; *De Haller*, 1969; *Kufner*, 1971; *Willmar*, 1974; *Bell* and *McBride*, 1977) the cephalometric findings of this study refer to a highly uniform sample of retro/micromaxillary class III cases. Statistical evaluation proved that the Le Fort I osteotomy, in respect of the anterior relocation of the maxillary bone, is an operation of excellent post-treatment stability. In the studies by the above mentioned authors and in a study by *Moser* and *Freihofer* (1981) on combined relocation of maxilla and mandible, and also in a publication by *Sailer* (1981) on operative rotation of the face in otomandibular dysostosis cases, the maxillary relocation is likewise demonstrated to be a stable operation.

In retromaxillary class III cases where a combined surgical-orthodontic approach is indicated, the orthodontist has to prepare proper conformity of the dental arches.

Table 2a Cephalometric changes

pre-treatment / 6 weeks post-treatment (head plates II – I, n = 16)					6 weeks post-treatment / 1 year post-treatment (head plates III – II, n = 16)			
Parameter	$\bar{x}$	s	min.	max.	$\bar{x}$	s	min.	max.
Maxilla $_{sag}$ mm.	7.14*	2.59	3.6	13.7	–0.38	0.49	–1.3	0.6
ANS $_{vert}$ mm.	1.11	2.74	–4.0	6.1	–0.93	1.58	–4.6	1.1
PNS $_{vert}$ mm.	0.54	1.76	–1.8	4.9	–0.26	0.80	–1.9	0.9
NL/FH°	0.55	3.57	–6.3	6.6	–0.79	2.08	–5.9	1.5
Occ/FH°	0.42	2.08	–3.0	4.6	–1.51	2.0	–5.75	2.3
Tip of nose $_{sag}$mm.	2.41*	0.84	1.6	4.0	–0.94*	0.8	–2.3	0.2
U'lip $_{sag}$ mm.	7.52*	2.45	4.2	12.6	–3.30*	2.43	–8.3	1
L'lip $_{sag}$ mm.	1.68*	1.59	–1.2	4.2	–0.74	1.87	–3.3	3.1
Soft tissue Pg $_{sag}$ mm.	–2.83*	1.99	–6.7	1.0	2.44*	1.89	–0.3	6.5
Pg $_{sag}$ mm.	–2.69*	2.05	–7.5	0.9	2.23*	1.50	0.0	5.8
NSGn°	1.32*	1.48	–0.8	4.8	–1.38*	1.15	–4.5	–0.1
NL/Me Go°	0.93	4.59	–6.2	10.4	–0.67	1.39	–3.1	2.4
MeGo/FH°	1.49*	1.79	–1.6	5.7	–1.49*	1.21	–4.3	–0.2
NMe mm.	1.61*	2.15	–1.6	6.3	–1.65*	1.82	–6.5	0.5
1+1 ⊥ NL mm.	0.08	0.77	–2.1	1.2	–0.63	0.92	–2.5	0.6
6+6 ⊥ NL mm.	0.47	1.18	–1.8	3.5	–0.23	0.91	–3.6	0.4
1–1 ⊥ MeGO mm.	0.25	0.52	–0.6	1.3	–0.21	1.0	–3.1	1.3
6–6 ⊥ MeGO mm.	0.12	0.47	–1.1	1.0	–0.41	0.7	–1.7	0.7

*Wilcoxon-test for paired differences; 2p = 0.01
$\bar{x}$: mean changes. s: standard deviation. min., max.: minimum and maximum values.

Table 2b Cephalometric changes

pre-treatment / 1 year post-treatment (head plates III – I, n = 16)					1 year post-treatment / 5 years post-treatment (head plates IV – III, n = 9)			
Parameter	$\bar{x}$	s	min.	max.	$\bar{x}$	s	min.	max.
Maxilla $_{sag}$ mm.	6.76*	2.54	3.3	13.15	–0.08	0.27	–0.5	0.35
ANS $_{vert}$ mm.	0.18	3.13	–5.7	5.3	–0.08	0.72	–1.6	0.80
PNS $_{vert}$ mm.	0.28	1.76	–1.8	4.9	0.32	0.45	–0.2	1.2
NL/FH°	–0.24	4.44	–9.5	5.0	–0.44	0.83	–2.4	0.3
Occ/FH°	–1.09	2.9	–7	2.9	0.06	0.81	–1.45	1.15
Tip of nose $_{sag}$ mm.	1.48*	0.80	0.0	3.2	0.06	0.57	–0.9	0.8
U'lip $_{sag}$ mm.	4.22*	1.81	–0.2	6.8	–0.21	1.09	–1.7	1.6
L'lip $_{sag}$ mm.	0.94	2.00	–3.5	4.9	–0.39	0.66	–1.2	0.5
Soft tissue Pg $_{sag}$ mm.	–0.39	2.45	–4.9	5.0	0.30	1.32	–1.5	2.8
Pg $_{sag}$ mm.	–0.46	2.29	–4.0	4.5	0.13	0.95	–1.1	2.1
NSGn°	–0.06	1.63	–3.9	2.8	0.13	0.48	–0.6	0.7
NL/MeGo°	0.26	5.02	–5.4	10.2	0.40	0.93	–0.6	2
MeGo/FH°	0.0	1.87	–3.4	3.8	–0.06	0.85	–1.1	1.6
NMe mm	–0.04	2.67	–6.2	4.5	0.42	0.76	–0.6	1.5
1+1 ⊥ NL mm.	–0.55	1.11	–3.4	1.1	0.21	0.64	–0.5	1.3
6+6 ⊥ NL mm.	0.24	0.86	–1.8	1.5	–0.01	0.32	–0.6	0.5
1–1 ⊥ MeGo mm.	0.04	1.05	–3.2	1.2	–0.13	0.69	–1.3	0.7
6–6 ⊥ MeGo mm.	–0.29	0.87	–1.6	1.7	0.03	0.36	–0.7	0.7

*Wilcoxon-test for paired differences; 2p = 0.01.
$\bar{x}$: mean changes. s: standard deviation. min., max.: minimum and maximum values.

Consequently, relapse in interdisciplinary patients may be ascribed either to surgical and/or orthodontic relapse. From the results of this study the risk of relapses caused by the operative part of such combined procedure seems rather unlikely. In contrast to the post-treatment stability of the maxilla, the upper lip moved backward by 44% of its original anterior advancement, mainly due to the resorption of the postoperative lip oedema. Thus upper lip advancement finally ends up in a 4.2 : 6.7 relationship in terms of anterior relocation of the maxilla. This corresponds to the

Table 3 Mean changes produced operatively and changes 1 year post-treatment (n = 16)

	$\bar{x}_1$	$\bar{x}_2$	%change
Maxilla $_{sag}$ mm.	7.14*	−0.38	5 %
tip of nose $_{sag}$ mm.	2.14*	−0.94*	39 %
U'lip $_{sag}$ mm.	7.52*	−3.3*	44 %

*Wilcoxon-test for paired differences, 2p = 0.01.
$\bar{x}_1$: mean changes pre-treatment / 6 weeks post-treatment (head plates II – I)
$\bar{x}_2$: mean changes 6 weeks post-treatment / 1 year post-treatment (head plates III – II)

data of *Freihofer* (1976), who found a ratio of 4.04 : 6.2. The tip of the nose which had been advanced by 2.41 mm. on average moved back by 0.94 mm. during the first postoperative year, thereby ending up in a significant final anterior relocation of 1.48 mm. Thus the anterior relocation of the tip of the nose in relation to the maxilla was 1.48 : 6.76. *Freihofer* (1977) reported a similar ratio of 1.64 : 6.2.

The postoperative vertical position of the maxilla (mean of ANS and PNS) was stable. On average a downward relocation of 0.83 mm. and posterior rotation of 0.55° was performed during the operation. Between 6 weeks and 1 year postoperatively an upward movement of 0.60 mm. and an anterior rotation of 0.79° occurred. Both, the mean operative changes of the vertical position of the maxilla and its rebound movement were small and statistically insignificant. Similarly the slight mean posterior rotation of the maxillary complex during the operation and its subsequent anterior rotation were insignificant (Table 2 a). It is likely however, that these small vertical and rotatory changes of the midfacial position during the operation and the first postoperative year account for corresponding rotations of the mandible. A small but significant posterior rotation of the mandible following the operation was cancelled out by a significant and similar amount of anterior rotation during the first postoperative year. Thus no significant changes of the rotatory and vertical positions of the midface and of the mandible were recorded one year subsequent to the operation. This is in contrast to the findings of *Hedemark* and *Freihofer* (1978) who described the same cranial rotation however with a high significance. An explanation for this difference in the two groups of patients operated upon by the same technique in the same clinic may be given by the fact, that a measuring technique on the basis of structural superimposition was used in this study, which eliminates more possibilities of error and which was not applied in the earlier study.

All of the adaptations discussed above (Table 2 a, 2 b), especially the partial regression of the original advancement of the upper lip and of the tip of the nose occur within the first year post-treatment. After more than one year post-treatment no further changes of any clinical concern or statistical significance were observed (Table 2 b).

Acknowledgements
This study was supported by grants from the Swiss National Foundation for Scientific Research, the Hartmann-Müller Foundation for Medical Research and the Foundation of the Swiss Dental Society for Scientific Research.

References

Bell, W. H., K. L. McBride: Correction of the long face syndrome by Le Fort I-osteotomy. Oral Surg., Oral Med., Oral Path. 44 (1977) 493

De Haller, Ch.: Ergebnisse des operativen Vorbringens des Oberkiefers. Diss. 1969, Zürich

Freihofer, H. P. jr.: The lip profile after correction of retromaxillism in cleft and non-cleft patients. J. Maxillofac. Surg. 4 (1976) 136

Freihofer, H. P. jr.: Changes in nasal profile after maxillary advancement in cleft and non-cleft patients. J. Maxillofac. Surg. 5 (1977) 20

Hedemark, A., H. P. Freihofer jr.: The behaviour of the maxilla in vertical movements after Le Fort I-osteotomy. J. Maxillofac. Surg. 6 (1978) 244

Hogeman, K.-E., K. Willmar: Die Vorverlagerung des Oberkiefers zur Korrektur von Gebißanomalien. Fortschr. Kiefer- u. Gesichtschir. 12 (1967) 275

Kufner, J.: Four year experience with major maxillary osteotomy for retrusion. J. Oral Surg. 29 (1971) 549

Moser, K., H. P. Freihofer: Erfahrungen mit der gleichzeitigen Bewegung von Ober- und Unterkiefer. Fortschr. d. Kiefer- und Gesichtschir., Bd. XXVI, Thieme, Stuttgart (1981) 136

Obwegeser, H.: Chirugia del "mordex apertus". Rev. Odont. Argentinia 50 (1962) 429

Obwegeser, H.: Der offene Biß aus chirurgischer Sicht. Schweiz. Mschr. Zahnheilkunde 74 (1964) 668

Obwegeser, H.: Eingriffe am Oberkiefer zur Korrektur des progenen Zustandsbildes. Schweiz. Mschr. Zahnheilk. 75 (1965) 365

Obwegeser, H.: Surgical correction of small and retrodisplaced maxillae. Plast. reconstr. Surg. 43 (1969) 351

Sailer, H. F.: Ergebnisse der Rotation der unteren Gesichtshälfte zur Korrektur der Dysostosis otomandibularis. Fortschr. d. Kiefer- und Gesichtschir., Bd. XXVI, Thieme, Stuttgart (1981) 170

Willmar, K.: On Le Fort I-Osteotomy. Scand. J. Plast. Reconstr. Surg. Suppl. 12 (1974)

Dr. U. Teuscher
Abt. für Kieferorthopädie und Kinderzahnmedizin
Zahnärztliches Institut der Universität
Plattenstraße 11
CH-8028 Zürich

PD Dr. H. Sailer
Abt. für Kieferchirurgie
Zahnärztliches Institut der Universität
Plattenstraße 11
CH-8028 Zürich

J. max.-fac. Surg. 10 (1982) 84–91
© 1982 Georg Thieme Verlag Stuttgart · New York

Surgical Correction of Vertical Maxillary Excess: A Re-Evaluation

Frank Moloney, Roger A. West, R. William McNeill

Department of Oral and Maxillo-Facial Surgery (Head: Philip Worthington, MD, BDS, FDSRCS) and Orthodontics (Head: Donald R. Joondeph, DDS, MS), University of Washington, Seattle, U.S.A.

Summary

Correction of vertical maxillary excess by Le Fort I osteotomy has become a widely accepted practice. Although the downfracture method is used almost exclusively in most major centres, the total maxillary alveolar osteotomy still has its advocates. Two patients surgically treated by total maxillary alveolar osteotomy and presented in this journal are re-evaluated with respect to the long-term stability of maxillary intrusion. Literature pertaining to the stability of the maxilla following intrusion by Le Fort I osteotomy and after various combinations of anterior and posterior maxillary ostectomy is reviewed. The advantages of the downfracture method are discussed. An alternative method of achieving the desired degree of intrusion is presented, which ensures more intimate bone contact.

Key-Words

Vertical maxillary excess – Total maxillary alveolar osteotomy – Downfracture – Stability – Maxillary intrusion – Le Fort I – Follow-up.

Introduction

There exists a group of dysplasias with clinically distinguishable facial characteristics that can be satisfactorily corrected aesthetically and functionally by combining orthodontic therapy with surgical upward repositioning of the maxilla (*West* and *McNeill* 1975, *Hall* and *Roddy* 1975, *Schendel* et al. 1976 a, 1976 b, *Bell* et al. 1977, *Fish* et al. 1978, *Goldsmith* et al. 1980, *Epker* and *Schendel* 1980). Cephalometric analysis of 31 adults with vertical maxillary excess (VME) by *Schendel* et al. (1976 a) documented the typical findings of this group of patients, dividing them into those with and those without an open-bite deformity.

Although the term "long-face syndrome" was coined by these authors to describe this constellation of clinical and cephalometric findings and has been subsequently adopted by workers in the field (*Bell* et al. 1977, *Fish* et al. 1978, *Epker* and *Schendel* 1980), the terminology is incompatible with currently accepted definitions of a syndrome, as adopted in recent texts (*Cohen* 1981 a, 1981 b), and continued use of this catch-phrase for patients with VME should be discouraged. Vertical maxillary excess is a developmental deformity demonstrating a spectrum of skeletal, dental, occlusal, muscular, functional and aesthetic characteristics, the common denominator of which is excessive vertical growth of the maxillary alveolus. This usually results in inability to achieve lip seal at rest with or without an excessive display of teeth and gingiva when the patient smiles. The presence of anterior open bite is a frequent but variable finding.

The purpose of this article is: (1) to review the literature on the subject of stability after maxillary intrusion by existing methods; (2) to re-evaluate on a long-term basis the two cases previously presented in this journal (*West* and *McNeill*, 1975) treated by a total maxillary alveolar osteotomy (TMAO) procedure; (3) to discuss the reasons why this technique has been abandoned at this centre in favour of the downfracture method and (4) to describe an alternative method of achieving the desired degree of intrusion which produces a maximal bone interface.

Stability after Maxillary Intrusion

That the maxilla could heal and remain stable after being downfractured and replaced in its presurgical position was first demonstrated in 1867. *Cheever* (1870) described an operation on the right hemimaxilla of an 18-year-old male patient to gain access to a nasopharyngeal tumour, in which he removed initially and again when it recurred 18 months later. *Cheever* observed on both occasions the successful healing of the right maxillary segment, together with the return of stable function. In that same year, he performed the first total maxillary downfracture, again to gain access to a large nasopharyngeal tumour, and successfully repositioned the upper jaw, securing it with internal transosseous silver wires. The patient, however, succumbed five days later to postoperative complications associated with his general debilitated condition. (For details of this procedure, see *Moloney* and *Worthington*, 1982.)

Posterior Maxillary Ostectomy

First described as a two-stage procedure by *Schuchardt* (1959) and developed as a single-stage operation by *Kufner* (1970), posterior maxillary ostectomy received criticism because of difficulty in achieving the desired degree of intrusion at the time of surgery and lack of postoperative stability. In *Kufner's* 18 patients, some of whom were followed up for 10 years, the results were less than satisfactory in 6 cases, all of whom experienced partial relapse. This he believed was due mainly to inadequate ostectomy or insufficient mobilization of the segment at the time of surgery. Although their follow-up was for less than three years, *West* and *Epker* (1972) reported successful results in 12 patients treated in this manner, emphasizing complete mobilization of the posterior maxilla to achieve easy repositioning as the critical key to postoperative stability. Two of their patients had undergone combined anterior and posterior maxillary osteotomy.

Two years later *Stoker* and *Epker* (1974) reported stable results in 11 patients followed up for 6 months to 2 years,