Kathmandu University Medical Journal (2006), Vol. 4, No. 1, Issue 13, 109-114

Review Article

Versatility of orthognathic surgery in the management of maxillofacial deformities

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Abstract
Orthognathic surgery is a surgical procedure which is widely practiced throughout world for the correction of various maxillofacial deformities. The procedure for correction of a particular deformity will be done after proper evaluation, which includes cephalometric and dental model analysis and photographs. The patient undergoes pre surgical orthodontic correction for the dental compensation after which the surgery is planned.

Key words: Facial deformity, Lefort1 maxillary osteotomy, sagittal split mandibular osteotomy

The facial deformity caused by asymmetry has long been of great mutual interest to the orthodontist and the oral surgeon. The deformity of maxillo facial region is readily expressed as a profile disfigurement, since the soft tissues of the face depend on the jaws for much of their contour. The selection of the proper type and site of osteotomies in orthognathic surgery is based on the extent of the dentofacial deformity, the degree of the desirable jaw movement and the anticipated soft tissue changes following surgical intervention.

Improvement of the stomatognathic function is a major reason for seeking combined orthodontic surgical therapy, but the consequences of surgery on facial appearance are of great importance, even for the patient whose chief complain is not dominated by the cosmetic rationale.

Therefore an accurate prediction of the postoperative facial profile comprises an essential and integral part of the diagnostic and treatment planning procedures of the combined surgical orthodontic therapy.

Deformities of the face are more often congenital, but may result from trauma, burn, neoplasm or any other pathology involving the facial skeleton.

Clinically, deformities of the middle and lower third of face range from simple dento -alveolar discrepancy (malocclusion) to severe facial asymmetry and disfigurement. Facial disfigurement causes social embarrassment and often results in compromised masticatory and speech function. Furthermore, it often has a severe impact on the patients self esteem and jeopardizes his or her quality of life.

A study conducted by the National Research Council of USA reveals that dentofacial deformities affect 20% of the population, out of which 5% of the population have major severe skeletal deformities.

Surgical Correction of jaw deformities was reported by Hullihen as early as 1849. He performed the first operation for the correction of mandibular deformity caused of burn. The treatment of traumatic injuries of the face and jaws during the world wars had greatly enhanced the demand for surgical correction of facial deformities. However problems associated with infection, anaesthesia and stabilization of the fragments resulted in a limited acceptance of such procedures by surgeons. But in recent decades refinement of surgical technique, strict control of infection, better understanding of the anatomy and physiology of bone healing and modern anaesthesia all contribute to the advancement of surgical correction of jaw deformities with predictable results.

The purpose of this article is to review and to illustrate with some cases, the various aspects regarding the surgical management of patients with maxillofacial deformities.

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Classification

Abnormal skeletal anatomy can be classified into many different ways. The abnormalities may affect the jaws, namely the maxilla and the mandible, or may be complicated by associated abnormalities in other parts of the face and skull.

The following classification of jaw deformities is proposed by Henderson[1]. It is found to be adequate for clinical purposes.

1. Symmetrical Disproportion Of Jaws
   - Mandibular enlargement
   - Mandibular deficiency
   - Maxillary enlargement
   - Maxillary deficiency
   - Bimaxillary disproportion

2. Asymmetrical Disproportion Of Jaws
   - Unilateral mandibular enlargement
   - Unilateral mandibular deficiency
   - Unilateral maxillary abnormalities

3. Cleft lip and Cleft Palate

Each type may further be classified into various subtypes. It must be emphasized that these groups are not mutually exclusive and the various conditions may co-exist.

Treatment Planning

The treatment plan is formulated and tailored specifically for each individual patient. Thorough evaluation and diagnosis are among most important aspects of overall patient's management. The evaluation and treatment plan is based on the outcome of analysis of the patient's medical history, social history, motivation, objective facial aesthetic profile (frontal, lateral) cephalometric measurement of soft and hard tissues of the facial skeleton, dental relations, and the degree of fractional, social and psychological disturbances. Patient evaluation for orthognathic surgery maybe divided into four main areas- 1. Patient concerns or chief complaints, 2. Clinical examination, 3. Radiographic and imaging analysis and 4. Dental model analysis.

A patient's ultimate satisfaction with treatment outcome often depends upon attention to the patient's chief concerns. Patients with unrealistic expectations must be counselled, so that they understand treatment limitations and likely outcomes before initiating orthodontic or surgical therapy. Co-operative studies between surgeons and psychiatrists have provided some valuable guidelines in the evaluation and selection of patients for corrective surgery.

All major anomalies should be corrected at the initial operation, within the limits of good surgical practice. The orthodontist is usually consulted prior to the formulation of a definitive surgical plan. A stable occlusal relationship of the jaws is critical for the stability of the fragments post operatively. Speech therapy may also be integrated into treatment plan in selected cases.

Corrective surgeries of the mandible

Mandibular ramus osteotomy

Bilateral Sagittal split osteotomy is probably one of the most popular osteotomy performed today to correct mandibular deformity. The technique was initiated by Trauner & Obwegeser[2] with later modifications by Dal Pont[3], Hunsuck[4] & Epker. The natural plane of cleavage between the lingual and buccal cortical plates of the ramus is used to develop a sagittal split separating the proximal (condylar) fragment from the distal (dento alveolar) segment. This allows forward, backward or rotational repositioning of the constituent parts relative to one another. This is highly cosmetic procedure, as it is done intra orally (no extra oral scar) plus there is broader bony contact of the osteotomy segments ensuring good healing. Other ramus osteotomies of the mandible have been described, depending on the design of bone cut, e.g. - inverted L, vertical sub sigmoid etc. Each of these variations has its own advantages & disadvantages.

Other mandibular osteotomy techniques

Osteotomies of the mandible have been described at every part of the bone other than the ramus including the body, anterior segment, Chin, etc. This allows mobilization- and reposition of bone fragments to almost any desired position.

Corrective surgeries of maxilla

Osteotomies of the maxilla are described according to the common fracture patterns of the middle third of facial skeleton. Hence the Le Fort I, II, & III osteotomies indicate the levels at the maxilla which may be sectioned electively from the rest of the skull.

Le Fort I osteotomy (Low level)

Le fort I osteotomy is a versatile procedure which is done intraorally to resolve many functional and aesthetic problems. A horizontal osteotomy is made from the lateral part of the pyriform rim posteriorly across the canine fossa and through the base of zygomatic buttress to the pterygomaxillary fissure. The posterior aspect of the lateral maxilla, the pterygomaxillary suture, the lateral nasal wall and the

nasal septum are sectioned with osteotomy. Then the whole maxilla is down fractured and mobilized. In this position simultaneous advancement, vertical or horizontal movements of the maxilla are possible. The operative results and the precision of the operative technique as reported by Obwegesser have proven the versatility of this technique.

Le Fort II Osteotomies (pyramidal or zygomatic)

Le fort II osteotomy is a pyramidal osteotomy which is again based on the observation by Le fort on fracture of the upper jaw. The osteotomy cut extends from the pterygomaxillary suture forward to the zygomatic buttress. It then passes superiorly crossing the orbital rim and passes posteriorly along the orbital floor. Now the cut turns medially to reach the area behind the lacrimal groove . It then turns forwards across the apex of the lacrimal groove to emerge from the orbit just below the midpoint of the medial canthal attachment. The frontal process of the maxilla is then crossed and the cut becomes continuous with the osteotomy cut of the other side across the nasal bone.

Le Fort III Osteotomies (High level or Suprazygomatic)

The basic osteotomy was originally described by Tessier in 1971 and was aimed to achieve anteroposterior movement of the whole facial mass. It separates the facial mass from the cranial base along the inter-frontofacial and inter-pterygomaxillary plane. The upper part of the osteotomy cut transverses on each side the medial orbital wall, the orbital floor, and the lateral orbital wall to reach frontozygomatic suture region. The frontal process of the zygomatic bone is then split. The two sides are connected centrally through the frontonasal area. Pterygomaxillary and septal separations are then completed as in Le fort II osteotomy. Segmental alveolar osteotomies are also frequently undertaken in combination with other jaw surgery. e.g., anterior, posterior or combined anterior and posterior osteotomies. Segmental maxillary osteotomies are commonly indicated in the correction where only a portion of the maxillary dental arch requires repositioning for functional and aesthetic reasons. The choice of surgical procedures again depends on individual case and the surgeon's preference.

Outcomes after correction of maxillofacial deformities

1. Psychological aspect

A person's physical appearance is the characteristic which is most obvious in social interactions. It is not only the individuals own perception of his or her appearance which not only contributes to these psychosocial effects but also the reaction of others. To improve facial aesthetic is the most powerful motivating factor leading people for surgical correction. High degree of satisfaction has been reported following orthognathic surgery is in contrast to several studies involving corrective surgery.

2. Speech

The study by Dalstom and Vig's[6] shows that nasal acoustic coupling and nasal resistance are the only speech parameters significantly affected by orthognathic surgery. Maxillary repositioning doesn't significantly affect velopharyngeal function and it would seem that the type of orthognathic surgery performed has no long term, perceptually discernable effects upon speech.

3. Masticatory Function

The alignment of maxillo - mandibular relationships often results in improved masticatory function.

4. Soft Tissues

The survey done by Quest et al suggested that soft tissues undergo spatial changes immediately after surgery and other changes after a prolonged period. The latter may be due to functional remodeling which is not clearly understood. The used of prognostic tracings and photographs will also allow the patient to understand the procedure more readily and provide an idea of changes following corrective orthognathic surgery.

5. Temporo mandibular joints

Temporomandibular joint dysfunction (TMD) is one of the most common causes of facial pain seen in a study of 280 patients with different types of mandibular deformities. After surgery the incidence of such symptoms in the same patient group was only 11.1%. Hence orthognathic surgery should always be considered in patients with chronic facial pain resulting form TMJ dysfunction in association with dentofacial deformities.

6. Stability

It is mandatory to organize a complete treatment plan including all the morphological and functional abnormalities which are present and arrive at a corrected position of facial skeleton which not only satisfy aesthetic and functional criteria but will also be stable. The improvement in different surgical technique and methods of fixation, and a better understanding of the effects of growth and soft tissue environment on the facial skeleton have succeeded in

achieving more predictable results. The stability of the re positioned bone fragments depends on the types of skeleton pattern and the type of surgery performed.

Possible Complications

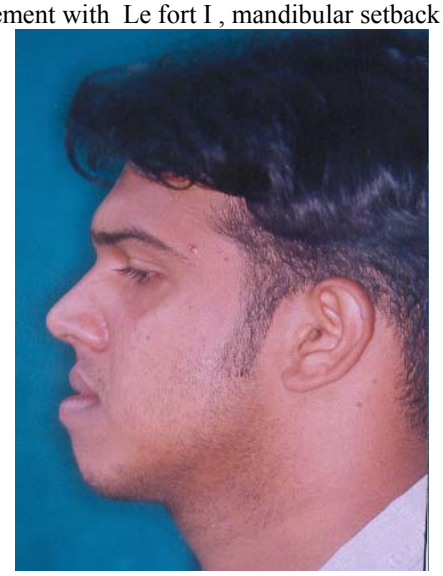
Many intra operative and post operative complications has been noticed, like oedema, haemorrhage, pain, fragmentation of the bone segments, relapse, bone necrosis, infection, delayed or malunion, disturbance of the inferior alveolar nerve or infraorbital nerves and other unexplained nerve injuries, and Oro antral fistula is rarely seen. Other serious complications are although rare but some are reported.

Conclusion

During the last few decades the profession has witnessed intense interest in the treatment of facial deformities and has been widely practiced through out world. Orthognathic surgery has become an acceptable treatment plan for patients with various maxillofacial deformities with pleasing results.

Case presentations

Fig. 1: A 22 years male complaining of prognathic mandible and retruded maxilla, corrected with maxillary advancement with Le fort I , mandibular setback with sagittal split osteotomy and Genioplasty



Pre op

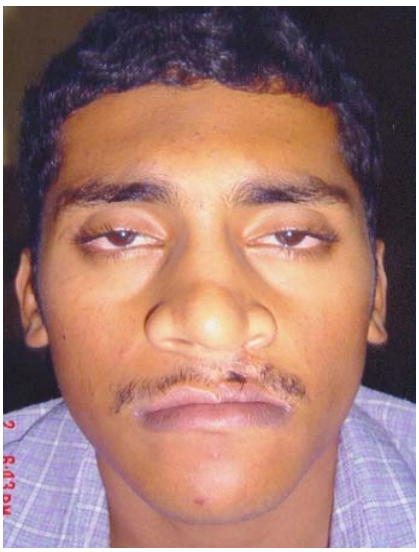
Post op

Fig. 2: A 24 years female with prognathic mandible, corrected with bilateral sagittal split osteotomy alone.

Pre op

Post op

Fig. 3: A 19 years old boy with residual cleft deformity corrected with Le fort 1 advancement osteotomy, sagittal split osteotomy and Genioplasty.



Pre op

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Fig. 4: A 20 years female with burn defects and vertical maxillary excess, corrected by Le fort1 osteotomy with superior repositioning and Genioplasty.

Pre op

Post op

Fig. 5: A 20 years female, post treated case of cleft lip and palate with severe hypoplastic maxilla ,corrected with high Le fort 1 with iliac bone graft.

Pre op

Post op

References

1. Henderson D.A. Color atlas and textbook of orthognathic surgery. The surgery of facial skeletal deformity, London wolfe 1985
2. 2. Trauner R.Obwegesser H. The surgical correction of mandibular prognathism and retrognathism with consideration of Genioplasty Oral surg 10:677-689,1957
3. Dal Pont G. Retromolar osteotomy for the correction of prognathism. J Oral Surg 1961, 19:42-47, 1961.
4. Hunsuck EE. A modified intraoral sagittal splitting technique for correction of mandibular prognathism Oral Surg 26: 250-254, 1968
5. Epker BN. Modifications in the Sagittal Osteotomy of the Mandible.J Oral Surg 35:157-159, 1977
6. Dalston RM ,Vig.Ps Effects of orthognathic surgery on speech. A retrospective study. Am J Orthod 86:291-298, 1984
7. Textbook of oral and maxillofacial surgery. By-Neel ima ANIL Malik, Jaypee publications
8. Oral and Maxillofacial Surgery, vol-2. Raymond J Fonseca.
9. Modern practice in orthognathic and reconstructive surgery- Bell W.H., Proffit WR ,et al. Philadelphia WB Saunders 1980