Tutorial

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Orthognathic Surgery - A Clinical Update

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Orthognathic surgery is defined as those surgical procedures which are performed in order to correct skeletal jaw deformities. Individuals may have either a functional or cosmetic deformity, and the skeletal dysplasia may be in either the maxilla or mandible.

Surgical correction of the skeletal deformity will provide a more functional dental arch relationship while at the same time improving facial cosmesis, but may have a positive or negative impact on speech physiology. Because surgery is aimed at correction of both the skeletal and dental relationship, and because of the impact on speech, preoperative and postoperative orthodontic and speech evaluation or treatment is usually required. The pre-surgical orthodontic treatment phase allows the teeth to be aligned in a position which complements the surgical correction, while postoperative orthodontic treatment is designed to stabilize the final result. Therefore it is imperative that the orthodontist and oral and maxillofacial surgeon formalize a joint treatment plan in order to provide the optimal result.

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The teeth attempt to compensate for the skeletal dysplasia by rearranging themselves so that contact is maintained. For example, in prognathism (mandibular protrusion) the lower incisors adapt by tipping their incisal edges backward to maintain contact with the upper maxillary incisors. Therefore pre-operative orthodontics involves decompensating the dentition, that is, removing the natural compensations which the dentition has created during the jaws' abnormal growth. This orthodontic decompensation of the dentition increases the severity of the deformity, however this will allow the maximum movement of the jaw at the time of surgical correction.

In order to stabilize the jaws after surgery, intermaxillary fixation (wiring the upper and lower jaws together) is required. This is accomplished usually with a stabilizing acrylic splint which is placed between the jaws at the time of surgery. Most orthognathic surgical procedures require intermaxillary fixation for a period of six weeks.

The oral articulators are often forced to compensate for skeletal dysplasia. Successful compensations result in acoustically (and cosmetically) accurate speech. Unsuccessful or aberrant compensations result in speech distortions. When an individual with a skeletal dysplasia makes an unsuccessful compensation or makes no compensation, the oral myologist or speech pathologist may be consulted to assist the patient to make successful compensations.

Trial speech therapy prior to orthognathic surgery may help the patient make acceptable compensations. However, the clinician must be able to recognize when the structural disparity prohibits acoustically accurate speech.

Maxillary Osteotomies

Osteotomies of the maxilla may take several forms. The most common osteotomy is a Le Fort

I osteotomy, named after a French surgeon-anatomist, Rene Le Fort. In 1900, Le Fort reported on experiments designed to demonstrate sites of fractures of the facial skeleton, hence the Le Fort's classification of maxillary fractures. These early experiments have provided guidelines for the modern surgeon in selecting specific techniques for orthognathic surgery.

The Le Fort I osteotomy is a procedure which mobilizes the entire alveolar process of the maxilla. The entire procedure is done intraorally. The soft tissue incision is made in the upper vestibule of the maxilla, with the bony cut crossing the nasal

floor and septum of the nose at or near the anterior nasal spine. In addition to the position of the teeth being altered, soft tissue changes of the base of the nose, upper lip, and nasal cavity are seen. The Le Fort I osteotomy is often used to advance or impact the maxilla. Advancement of the maxilla is required in those individuals who demonstrate midfacial retrusion; commonly seen in patients with a repaired cleft lip and palate. Maxillary impaction surgery, on the other hand, is utilized when the patient demonstrates vertical maxillary excess and therefore has a toothy smile.

Figure 1. Facial and dental views of patient before (left) and after (right) three-piece maxillary osteotomy. The maxilla was impacted in three separate pieces, with more impaction posterior than anterior, for a problem of vertical maxillary excess and skeletal openbite.

The Le Fort II osteotomy is more extensive in scope, with both the soft tissue and bony incisions extending across the nasal bridge, orbital floor, and lateral walls of the maxilla. The patient who presents with midfacial retrusion accompanied by a flattening of the cheeks and orbital floor area, would benefit most from this procedure. Therefore the Le Fort II maxillary osteotomy can correct midfacial retrusion while simultaneously improving a flattened upper midface.

The Le Fort III osteotomy is most extensive of all Le Fort osteotomies and involves movement of the entire midface. This procedure is used primarily in patients with craniofacial syndromes such as Crouzon's, Apert's or Pfeiffer's Syndromes. These patients usually have midface retrusion accompanied by other craniofacial malformations.

Segmental osteotomies, whether posterior or anterior, of the entire maxillary arch may be performed. This is usually accompanied by surgical removal of teeth, usually the first bicusps, in order to permit the bony cuts to be made and allow for repositioning of the various segments.

A maxillary advancement may have a profound influence on the oral speaking environment. The advancement resolves the pseudoprognathic relationship and provides a normal-sized oral cavity for the tongue to make more normal contacts with the maxillary dentition and hard palate. As a result the protrusive tongue distortions of the sibilant sounds "s" and "z" may resolve spontaneously.

In patients with repaired cleft palate, a concern is that a maxillary advancement will enlarge the nasopharynx and may compromise velopharyngeal competence. While there appears to be very little risk of compromising velopharyngeal competence in a noncleft individual, this is a real risk that must be addressed in the cleft palate population. Velopharyngeal function should be carefully analyzed preoperatively with pressure-flow instrumentation, lateral radiography or video-fluoroscopy and nasal endoscopy. Any hint of nasal air escape preoperatively indicates almost certain compromise of velopharyngeal competence post-operatively. In such cases the patients and parents should be advised of this possibility and the probable need for a cor-

rective pharyngoplasty in the future. Obviously much depends on the extent of the velopharyngeal incompetence, the amount of maxillary advancement, the compensation of the velopharyngeal muscles postoperatively, the amount of relapse of the maxillary segment and possibly the type of velopharyngeal closure pattern.

Mandibular Osteotomies

Orthognathic surgery for mandibular deformities involves repositioning the mandible in an anterior or posterior direction, although movements in a vertical or horizontal plane can be accomplished.

Mandibular protrusion or prognathism is most often associated with a Class III dental malocclusion. Surgical correction may be performed either extraorally via a small incision below the angle of the mandible, or intraorally where the incisions are made in the posterior buccal vestibule. In either case the operative procedure is a vertical oblique osteotomy designed to section the ramus in a vertical direction, and by sliding the posterior segment (portion containing the condyle) lateral to the anterior segment (portion containing the teeth) the mandibular protrusion is reduced. Intermaxillary fixation is applied after the placement of the interpositional splint, for six to eight weeks.

Mandibular retrusion or mandibular retrognathia is most often associated with a Class II dental malocclusion. Patients with this deformity may also have an associated microgenia (deficient chin). Surgical correction is accomplished by a sagittal splint osteotomy as the procedure of choice. The ramus is split from the posterior body of the mandible in a sagittal plane, and the distal segment is slid forward. Interosseous fixation wires are common in order to hold the bony segments in position. The interpositional acrylic splint is placed, and intermaxillary fixation is maintained for six to eight weeks.

A lip incompetence may result from untreated mandibular prognathism, retrognathism or vertical maxillary excess. The anterior maxillary and mandibular dentition can be so far apart as to not allow the lips to close easily at rest or for speech. With

Figure 2. Facial and dental views of patient before (left) and after (right) surgical advancement of the mandible. The preoperative mandibular retrusion in this patient interfered with speech and mastication.

the lips apart at rest, the individual may be mislabeled as a "mouth breather". Further the assumption may be made that she/he has nasal airway interference. Obviously nasal airway obstruction should be ruled out by medical evaluation of the nasal and pharyngeal cavities and nasal airway patency should be tested with pressure flow instrumentation.

A lip incompetence for speech may prohibit lip closure for "p, b, and m" in rapid connected speech. The compensation is usually a substitution of labio-dental closure for bilabial contacts. This is usually acoustically accurate. Cosmetically, however, too much dentition is visible during speech. Sometimes this can be corrected by slowing the speaking rate to allow the lips additional time for the increased range to be covered. This is usually more easily treated after surgery.

Modification of the chin may be needed in conjunction with either the maxillary or mandibular osteotomy. A sliding genioplasty to augment or reduce the lower face height or horizontal position of the chin is common, and is done intraorally through an anterior vestibular incision. Augmentation of the chin may also be performed utilizing a silicone or proplast implant when indicated.

Summary

Surgical correction of dentofacial deformities may produce dramatic results. It is essential that a thorough pre-operative evaluation be performed. Therefore a close working relationship between the oral and maxillofacial surgeon and the ortho-

dontist is essential, however consultation with other professionals is mandatory. Among these are the general dentist, family physician, psychologist, speech clinician and myofunctional therapist.

An overview of orthognathic surgery has been presented in order to familiarize the myofunctional clinician with these procedures, so that functional patterns both prior to and after surgical repositioning can be properly evaluated and treated.

BIBLIOGRAPHY

- Bell, W.H., Proffit, W.R., and White, R.P.: *Surgical Correction of Dentofacial Deformities*, Volumes I and II. Philadelphia, Saunders, 1980
- Epker, B.N., and Wolford, L.M.: *Dentofacial Deformities: Surgical-Orthodontic Correction*. St. Louis, Mosby, 1980.
- Epker, B.N., and Wolford, L.M.: Middle third face osteotomies. *J. Oral Surg*, 33: 491-514, 1975.
- Mason, R.M., Turvey, T.A., and Warren, D.W.: Speech considerations with maxillary advancement procedures. *J. Oral Surg*, 38: 752-758, 1980
- Walker, G.F.: A new approach to the analysis of craniofacial morphology and growth. *Am. J. Orthod.*, 61: 221-230, 1972.
- West, R., and Epker, B.N.: Posterior maxillary surgery: its place in the correction of dentofacial deformities. *J. Oral Surg*, 30: 562-575, 1972.