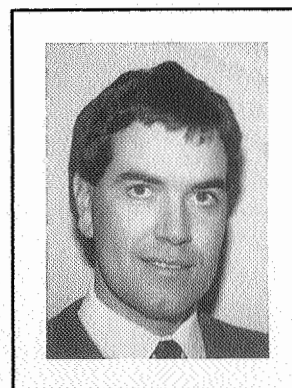


New developments in genioplasty: functional versus cosmetic

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ABSTRACT: Since the orthodontist is frequently the first clinician to be consulted for dentofacial deformity, an awareness of potential surgical procedures available to correct such deformities is imperative. Despite the fact that isolated genioplasty is becoming rare, the role the procedure plays in corrective jaw surgery is not diminished. Functional and cosmetic aspects must be considered in case planning and the flexibility of the procedure lends itself well to deformity correction in all three dimensions.

Reference: Aust.Orthod.J.11(1):3-6

MeSH words: maxillofacial development; chin; surgery/oral; surgery/plastic

Key words: reduction genioplasty, augmentation genioplasty, functional genioplasty

INTRODUCTION

The development of modern surgery and anaesthesia has lead to sophisticated operative techniques designed to correct congenital and acquired deformities. Deformities of the maxillofacial skeleton which are superimposed upon dentoalveolar malrelationships require the combined efforts of the orthodontist and maxillofacial surgeon. The goal of combined treatment is to establish harmonious facial balance and a stable functional dental occlusion. When deformities are corrected so that there is equilibrium among all the hard and soft tissues of the face, the correction of the dysfunction carries with it an improved cosmetic result.

The orthodontist is frequently the first clinician consulted for evaluation of a malocclusion and the often concomitant dentofacial deformity. An understanding of available surgical techniques and their indications enables the clinician to provide an efficient and co-ordinated treatment plan. With this in mind it is the aim of the present paper to review the current concepts involved in surgically altering the chin form.

HISTORICAL ASPECTS

In the classic sense the term genioplasty describes operations designed to alter the form and function of the anterior mandible and overlying soft tissues.

The genioplasty was first described by Hofer (1942), where chin deformity was treated. At that time concern about wound infection from oral organisms lead to the operation being performed through an external submental incision. Whilst early workers were unable to offer a full array of orthognathic procedures it was clear that chin form could be altered with reasonable predictability.

Trauner and Obwegeser (1957) described a modification of the genioplasty were a sub-periosteal exposure of the mandible could be performed through the anterior mandible. Bony cuts were performed whereby that portion of the mandible adjacent to the lower border

was sectioned inferiorly and pedicled on the genial musculature. Michelet et al. (1974) described a surgical procedure consisting of a horizontal osteotomy of the anterior mandible with construction by segmental osteotomies of a superior tenon and an inferior lingual mortise osteotomies. Wolford and Bates (1988) using Michelet's basic principle of design developed additional modifications that are versatile and useful in repositioning of the osseous chin in all three dimensions. (Figure 2).

Various procedures have been described in the literature whereby soft tissue surgery to overlying structures can be performed to decrease tissue bulk (mentoplasty) or augment with alloplasts via subperiosteal approaches. These procedures, especially implants utilised mainly for cosmetic reasons, have not been ideal because of the disadvantages of buccal cortex resorbing, implant migration and foreign body reactions. (Peled et al. 1986, Dann and Epker 1977). By repositioning the inferior mandibular symphysis a more stable and natural appearance may be attained. The osteotomy allows the preservation of the normal contour of the bony and soft tissue chin.

During the last decade improvement in the ability to properly assess the complexity of dentofacial deformity and the availability of several surgical procedures based on sound biological and scientific principles has meant that the genioplasty is most often performed in conjunction with other corrective jaw procedures.

FUNCTION versus COSMETICS

In the past surgery on the chin has been thought of primarily in the context of cosmetics. However Precious and Delaire (1985) have described the functional genioplasty as an example of an operation which can bring about a beneficial change in function by altering the position and form of the chin and its associated myocutaneous structures.

Excessive vertical dimension of the anterior mandible contributes to the vertical excess of the anterior face. The lips become incompetent in repose and no longer oppose the thrust of the tongue which can interpose itself between the teeth. In order to occlude the lips active contraction of the perioral musculature is necessary and this in turn manifests as flattening of the soft tissue

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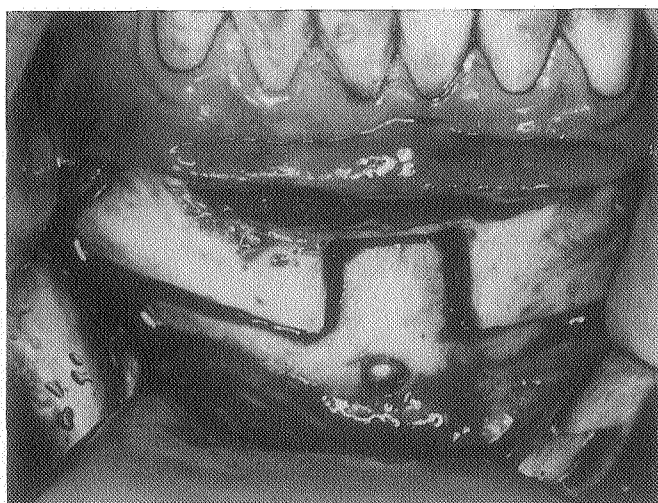


Figure 1. A view of the chin surgical anatomy displaying labial plate, bony reference lines and osteotomy cuts

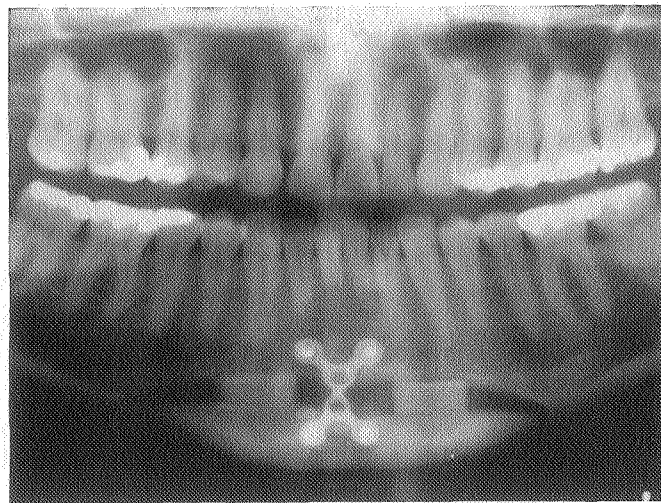


Figure 2. Post-surgical view of vertical chin augmentation using porous hydroxylapatite and titanium miniplate



Figure 3. Chin positioned in the preplanned position using a bicortical titanium screw



Figure 4. Pre surgical lateral cephalometric view of chin

contour of the chin. This act of circumstances can become chronic and leads to functional habits which produce clinical problems the precise definition of which represents the indications for surgical intervention.

Precious and Delaire (1985) outlined the following indications for functional genioplasty.

1. Vertical excess of the lower anterior facial height in which the following clinical signs and radiographic findings are present

A. Clinical signs:

(i) Lip incompetence when the lips are in repose and there exists a normal relationship of the maxillary incisor tooth to the upper lip.

(ii) Open mouth posture with interposition of the tongue between the teeth.

(iii) Elevation of the mental soft tissues in order to obtain lip closure.

(iv) Thinning of the alveolar bone overlying the facial surfaces of the roots of the anterior mandibular teeth.

(v) Flattening of the contour of the anterior surface of the soft tissue profile of the chin.

B. Radiographic findings:

(i) ANS-Me distance which constitutes more than 55% of the total anterior facial height in the absence of vertical maxillary excess.

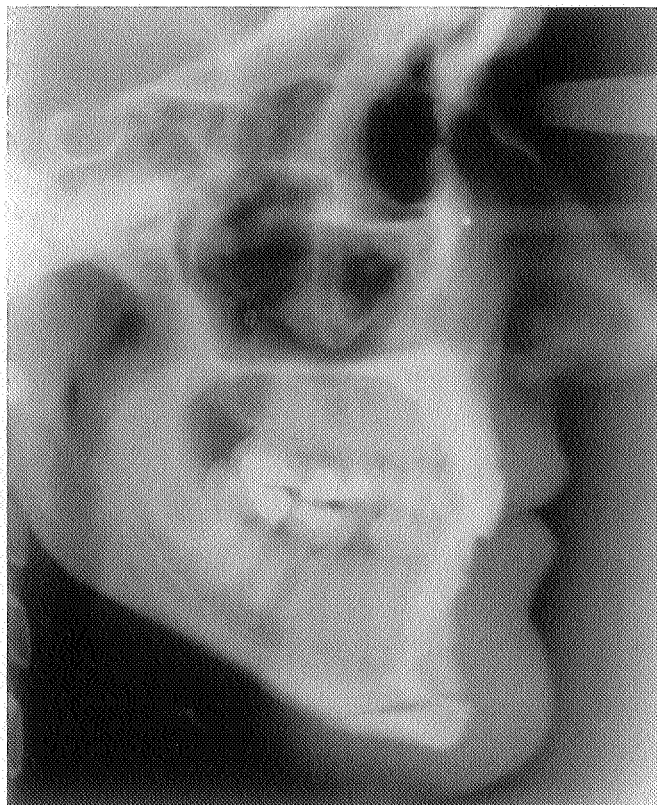


Figure 5. Post surgical lateral cephalometric view showing chin positioning and fixation screw

(ii) ANS-Me distance which persists in constituting more than 55% of the total anterior facial height after either predicted or actual appropriate correction of vertical maxillary excess, open bite or anteroposterior dentofacial deformities.

2. Residual and associated deformities of cleft lip and palate where superior repositioning of the mental osseous and myocutaneous tissues can aid in both achievement of lip competence and development of the upper lip.

3. Requirement for a complementary procedure to adjust lower facial height in conjunction with other maxillo/mandibular osteotomies.

4. As an aid in stabilisation of orthodontic treatment results by normalising the osseous and myocutaneous elements of the lower face.

5. As a complementary procedure with partial anterior glossectomy to aid in the management of dental open bite.

OPERATIVE TECHNIQUES

The full evaluation of any clinical presentation of jaw deformity involves all aspects of history, examination and special tests. A detailed discussion of the clinical, cephalometric and model analysis is beyond the scope of the review. The operative techniques currently available offer a wide range of versatility with few operative risks and post-operative complications (Lindquist and Obeid 1988). The anterior mandibular anatomy of importance to the surgical treatment planning include the apices of the anterior sextant of teeth, the mental foramina and neurovascular bundles (Figure 1).

The biological basis for the success of the success of the horizontal osteotomy of the inferior border of the

mandible has been demonstrated by Storum et al (1988). Circulation to the dental pulps of lower anterior teeth was also not discernibly affected when accomplished a minimum of 8mm below root apices.

After infiltration with local anaesthesia the bony chin is approached via an incision in the mucosal surface of the lower lip. The incision is designed to protect the attached gingivae, the neurovascular bundles and to enable two layered soft tissue closure after the osseous surgery. Extra-oral approaches to the chin via submental incisions are contraindicated in well planned elective procedures.

Once the bony chin is exposed reference lines are accurately placed and measurements are made to enable the surgeon to perform precise osteotomy cuts. The cuts are designed to reproduce the pre-planned surgical movements or clinical and cephalometric criteria. The osteotomy cuts are completed and the distal segment is placed in the desired position and fixated using either transosseous wires, screws (Figure 3) and/or miniplates.

The various genioplasty techniques are described on the basis of the movement required.

(i) Reduction Genioplasty

(a) Vertical reduction is generally carried out by excision of a bony segment between the lower border and alveolar portion of anterior mandible. Cuts can be designed so that superior repositioning of the chin is exactly as designed during cephalometric planning.

(b) Horizontal reduction is performed by sliding the lower border of anterior mandible posteriorly. Bone cuts for this osteotomy can be angled so as to vertically augment lower face height by angulation of the bony slide.

(c) Lateral reduction is a rare procedure and can be carried out to provide a more tapering chin morphology. Midline bony furrows can be removed using this technique.

(d) Soft tissue debulking can be carried out to reduce soft tissue thickness however the results tend to be unpredictable and unless the local functional problems are addressed the deformity may well recur.

(ii) Augmentation Genioplasty

(a) Vertical augmentation applies the same principles as reduction except that the inferior bony fragment is moved inferiorly. The resultant space created necessitates the use of a biocompatible graft.

(b) Horizontal augmentation involves the sliding osteotomy cuts designed to maintain anterior repositioning of the chin.

(c) Lateral augmentation involves horizontal and midline osteotomies of the chin with expansion of the down fractal segment (Thomson 1985).

(d) Onlay procedures have been used extensively by surgeons to augment chins where both allografts and autografts are employed.

The grafts are placed in a subperiosteal pocket and the overlying tissues closed. Procedures using host bone have generally been unstable with resorption causing loss of the majority of augmentation planned.

Alloplastic materials used include proplast and silastic. Both materials have been demonstrated to cause labial bone plate resorption under the alloplast with involvement of lower incisor teeth particularly and loss of augmentation.

Now materials such as hydroxylapatite offer superior biocompatibility and with improved fixation may well lead to new applications of this technique (Wolford et al 1987).

SUMMARY

The decision needs to be made as to whether there is a true chin deformity as an isolated problem or a component of a more major disproportion. With the knowledge of what the combined orthodontic and orthognathic

treatment can achieve the patient can be offered the choice of treatment that best achieves and maintains the planned treatment objective.

The advances in orthodontics and maxillofacial surgery over the last two decades has lead to a revolution in the way clinicians evaluate and manage dentofacial deformity.

The genioplasty is a simple operation that can contribute to correction of both functional and cosmetic aspects of dentofacial deformity. The operation permits improvement in form and normalisation of functional habits by either establishing or restoring harmony among the osseous, dental, muscular and cutaneous elements of the lower anterior face. The orthodontist is frequently the first clinician consulted for a malocclusion and an awareness of the often concomitant skeletal deformity is invaluable in offering the patient the most beneficial treatment alternative.

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