

## **Orthodontics and orthognathic surgery**

Orthognathic surgery is concerned with the correction of dento-facial deformity. In the vast majority of cases a combined surgical and orthodontic approach is required to achieve an optimum result.

### **Indications for Orthognathic Surgery**

- ✓ Severity of skeletal and dental malocclusion
- ✓ When growth modification can not be achieved
- ✓ Esthetic and psychosocial considerations
- ✓ Good general health status (mild, controlled systemic disease)
- For patients whose orthodontic problems are so severe that neither growth modification nor camouflage offers a solution, surgery to realign the jaws or reposition dentoalveolar segments is the only possible treatment.

Surgery is not a substitute for orthodontics in these patients. Instead, it must be properly coordinated with orthodontics and other dental treatment to achieve good overall results

### **The patient's perception of the problem**

- appearance
- masticatory difficulties
- speech
- traumatic overbite
- temporomandibular joint dysfunction

### **CAMOUFLAGE VERSUS SURGERY**

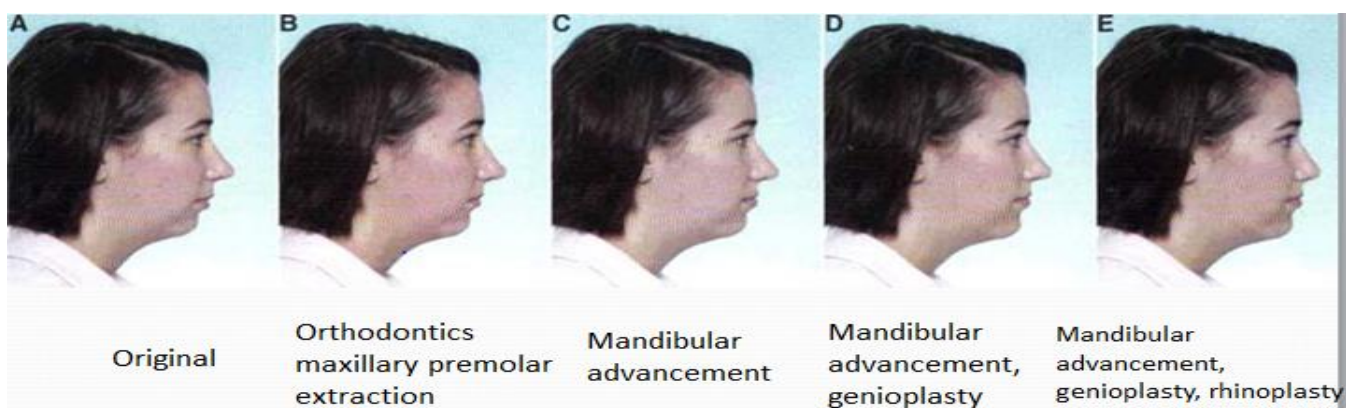
- The decision for camouflage or surgery must be made before treatment begins, because the orthodontic treatment to prepare for surgery often is just the opposite of orthodontic treatment for camouflage
- It is a serious error to attempt camouflage on the theory that if it fails, the patient can then be referred for surgical correction. At that point, another phase of "reverse orthodontics" to eliminate the effects of the original treatment will be required before surgery can provide both normal jaw relationships and normal occlusion.

## Extraction of Teeth and the Camouflage/Surgery Decision

- The critical importance of deciding on camouflage or surgery at the beginning of treatment is illustrated by the difference in extractions needed with the two approaches
- In camouflage, extraction spaces are used to produce dental compensations for the jaw discrepancy and the extractions are planned accordingly.
- Some degree of dental compensation accompanies most skeletal jaw discrepancies, even without treatment.
- If the jaws are to be repositioned surgically, this dental compensation must be removed. Otherwise, when the teeth are placed in normal occlusion, the jaw discrepancy will not be totally corrected, and dental interferences make it almost impossible to put the jaws in their proper relationship to each other

## Computer Simulation of Alternative Treatment Outcomes

- It always has been a moral and ethical imperative to allow the patient to make important decisions about what treatment he or she will accept
- Computer image predictions are particularly valuable in helping patients decide between camouflage and surgery, and in planning surgical treatment.
- The patient can view the impact on the soft tissue profile of orthodontic camouflage versus surgery when these are realistic treatment alternatives
- also view the effect of varying amounts of surgical change—more or less mandibular advancement, for example, or the effect of genioplasty or rhinoplasty in addition to change in jaw position.



The characteristics of a patient who would be a good candidate for camouflage treatment are:

- Too old for successful growth modification
- Mild to moderate skeletal Class II or mild skeletal Class III
- Reasonably good alignment of teeth (so that the extraction spaces would be available for controlled anteroposterior displacement and not used to relieve crowding)
- Good vertical facial proportions, neither extreme short face (skeletal deep bite) nor long face (skeletal open bite)

***Camouflage treatment designed to correct the occlusion despite jaw relationship problems should be avoided in :***

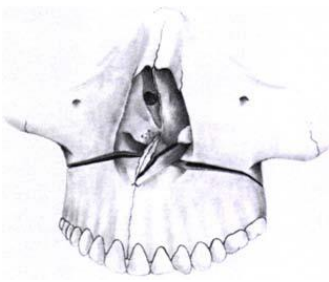
- *Severe Class II , moderate or severe Class III , and vertical skeletal discrepancies.*
- *Patients with severe crowding or protrusion of incisors in whom space created by extractions will be required to achieve proper alignment of the incisors.*
- *Adolescents with good growth potential (in whom growth modification should be tried first) or non-growing adults with more than mild discrepancies (in whom orthognathic surgery usually offers better long-term results ).*

## **COMMON SURGICAL PROCEDURES**

As aesthetics are of major importance, where possible an intra-oral approach should be used to avoid unsightly scars. Segmental procedures have an increased morbidity, as damage to the teeth or disruption of the blood supply to a segment is more likely.

### **Maxillary procedures**

- **Segmental procedures** The Wassmund technique involves movement of the upper premaxillary segment of incisors and canines as a block,
- **Le Fort I** This is the most widely used technique. The standard approach is a horseshoe incision of the buccal mucosa and underlying bone, which results in the maxilla being pedicled on the palatal soft tissues and blood supply.
- **Le Fort II** to achieve mid-face advancement
- **Le Fort III** the whole mid-face including the zygomas is separated from the cranium



**Le Fort I**



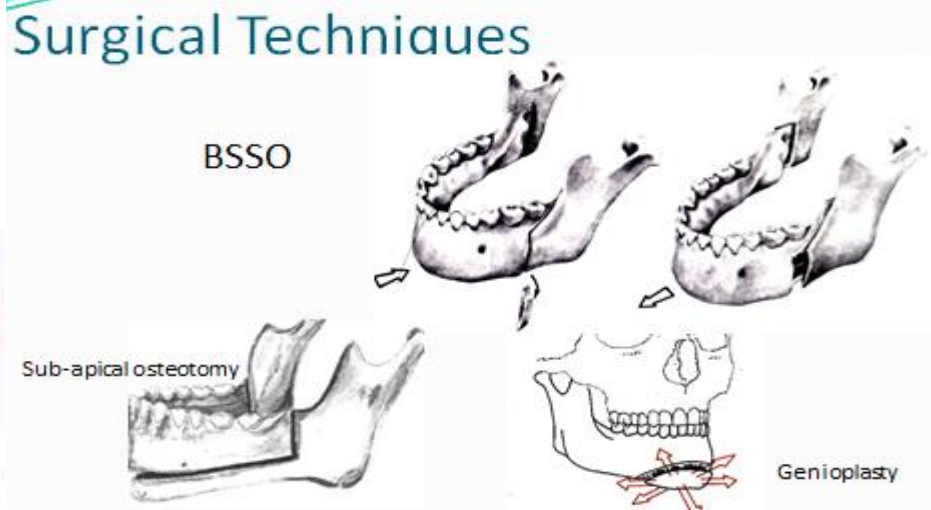
**Le Fort II**



**Le Fort III**

**Mandibular procedures**

- **Vertical subsigmoid osteotomy**
- **Sagittal split osteotomy**
- **Sub-apical osteotomy**
- **Body osteotomy**
- **Genioplasty**



**Documentation**

**Standard records should include:**

- **a detailed description of the patients' concerns**
- **facial and dental photographs**
- **dental study casts usually based in centric occlusion**
- **an orthopantomogram (OPT) and lateral cephalogram, with a postero-anterior (PA) cephalogram for those patients presenting with an asymmetry**
- **a detailed dental history and examination**
- **a detailed medical history and examination**

## **Timing of Surgery**

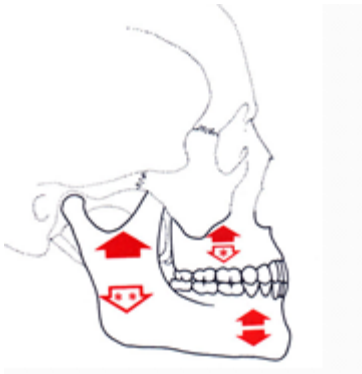
- **Usually done when all growth is complete**
- **Assessed by superimposition of serial lat cephs**
- **Can be performed when growth is not yet complete in cases of psychosocial problems or great severity when function is compromised (i.e. breathing, chewing**

## **Correction of A-P relationships:**

- **maxillary advancement**
  - **retraction of anterior maxillary segment**
  - **mandibular advancement**
  - **mandibular setback**
  - **double jaw surgery**
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- **The maxilla and mandible can be moved anteriorly and posteriorly**
  - **Anterior movements of the mandible greater than 10 to 12 mm create considerable tension in the investing soft tissues and tend to be unstable. Anterior movement of the maxilla is similarly limited to 7-8 mm in most circumstances.**
  - **Posterior movement of the entire maxilla, though possible, is difficult and usually unnecessary. Instead, posterior movement of protruding incisors up to the width of a premolar is accomplished by removal of a premolar tooth on each side, followed by segmentation of the maxilla.**
  - **Although the maxilla can be advanced more than it can be retracted, the possibility of relapse or speech alteration from nasopharyngeal incompetence increases with larger movements.**

## **Correction of Vertical Relationships**

- ✓ **maxillary impaction/intrusion**
- ✓ **maxillary extrusion**
- ✓ **mandibular ramus surgery**



The surgical movements in the vertical dimension are indicated by the red arrows on this diagram of the skull. The maxilla, mandibular angles, and chin can be moved upward reliably, while downward movement of the maxilla by bone grafting is less predictable (*arrow with single asterisk*). Downward movement of the chin is possible in combination with slight advancement. Lengthening the ramus (*arrow with double asterisks*) stretches the muscular sling and usually results in relapse

## Distraction Osteogenesis

- Distraction osteogenesis is based on manipulation of a healing bone, stretching an osteotomized area before calcification has occurred in order to generate the formation of additional bone formation and investing soft tissue
- Distraction osteogenesis is useful for the correction of severe deformity in the growing child and it is hoped will help to reduce the number of surgical procedures previously required to treat these children.

The advantages of distraction are that

(1) larger distances of movement are possible than with conventional orthognathic surgery, and the forces also act upon the surrounding soft tissues leading to adaptive changes termed distraction histogenesis

(2) deficient jaws can be increased in size at an earlier age.

- The great disadvantage is that precise movements are not possible. With distraction, the mandible or maxilla can be moved forward, but there is no way to position the jaw or teeth in exactly a pre-planned place,

## **Orthodontic Appliance Considerations**

- **In contemporary surgical-orthodontic treatment, a fixed orthodontic appliance has three uses: to**
  - (1) accomplish the tooth movement needed in preparation for surgery;**
  - (2) stabilize the teeth and basal bone at the time of surgery and during healing; and**
  - (3) allow the necessary postsurgical tooth movement while retaining the surgical change**

## **Pre Surgical Orthodontic Objectives**

- ✓ **To level and align the arches and make them compatible so that the teeth do not interfere with placing the jaws in their planned relationship**
- ✓ **to resolve crowding and/or spacing**
- ✓ **to establish anteroposterior and vertical position of incisors (decompensate) to place teeth relative to their own supporting bone**
- ✓ **It is important to forewarn the patient that the presurgical orthodontic phase may make their appearance worse as any dento-alveolar compensation is reduced**
- ✓ **Presurgical orthodontics usually takes between 12 and 18 months depending upon the complexity of the case**

## **Preparation for Surgery**

- **Removal of third molars 6 months before mandibular osteotomy**
- **Check for any TMJ problems**
- **Manipulate models mounted in an articulator to check for interferences and occlusion**
- **Model surgery is often carried out to determine the amount and site of bone removal and to fabricate inter-occlusal wafers Splint fabrication (1 or 2 splints usually 1 to 2 weeks before surgery**

## **Post Surgical Orthodontic Treatment**

- **4-6 weeks: reinitiate orthodontic tx (after range of motion and stability are achieved) remove splint**
- **change to light wires and light vertical elastics**
- **treatment usually completed in 4 to 12 months (average 6 months)**

## Relapse and Stability

- Rigid fixation has improved stability
- Stability is mostly influenced by the pattern of rotation of the mandible as it is advanced
- Advancement of maxilla and/or mandible will stretch soft tissues promoting relapse
- The more advancement needed, the greater the probability for relapse
- patient is compliant with all aspects of treatment, particularly postsurgical wear of elastic traction

### Surgical-Orthodontic Treatment: A Hierarchy of Stability



\* short or normal face height only

- ❖ In this context, very stable means better than a 90% chance of no significant postsurgical change; stable means better than an 80% chance of no change and major relapse quite unlikely; problematic means some degree of relapse likely and major relapse possible.
- ❖ It is interesting to note that the key procedures in surgical treatment of Class II problems (superior repositioning of the maxilla , mandibular advancement and their combination) are quite stable. In Class III treatment, maxillary advancement is the most stable procedure, while downward movement of the maxilla and mandibular setback remain problematic).