

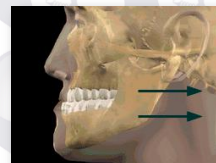
## Orthognathic (Corrective Jaw) Surgery

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## What is Orthognathic Surgery?



## Introduction

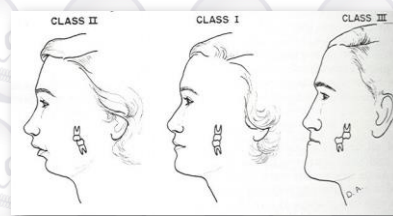
- **Ortho** (*orthos* – straight) **gnathic** (*gnathos* – jaw)
- Facial disproportion (dento-facial deformity)
- 20% of population
- **MDT approach**: orthodontist, OMFS, restorative dentist, hygienists, psychologist/psychiatrist, technician, anaesthetist
- **Aetiology** → anomalous facial development is complex & multi-factorial
  - Extremes of variation in normal development
  - Associated with recognisable syndromes

## Orthognathic Surgery

The correction of **functional** and **aesthetic** consequences of severe **dentofacial deformity** through a combination of **orthodontic**, **surgical** and possible, **restorative dentistry**

Simply its a **surgical procedure that changes the position of the jaws**

## Why Surgery?



Retruded Mandible

Protruded Mandible

- Severe Class III skeletal pattern
- Severe Class II skeletal pattern
- Long face syndrome / Anterior open bite
- Facial Asymmetries
- Craniofacial anomalies, e.g. Cleft lip and palate

## Orthodontic Indications

1. Aesthetics
2. Function
3. Stability



7

## Orthodontic Indications



8

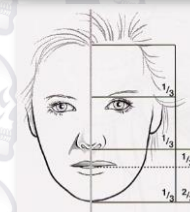
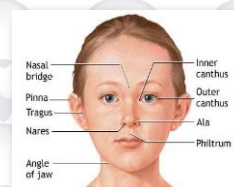
## Patient Factors

1. **Age and Sex** – influence the amount of growth remaining
2. **Race** – influence profile considerations
3. **Medical History** – contraindications for surgery
4. **Psychological** – patients perception of the problem

9

## Frontal Assessment

- **Assessment of Facial Thirds**
  - Symmetry
  - Vertical proportions i.e. Facial 1/3's
  - Mid line in relation to maxilla, mandible, nose and chin
  - Chin
- **Scleral Exposure**
  - Normally the lower border of the iris should lie behind the upper border of the lower lid
  - Scleral exposure indicates maxillary hypoplasia
- **Alar Base Width**
- **Upper Lip / Incisor Relationship**



10



11



12

## Lip / Incisor Relations

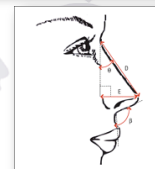
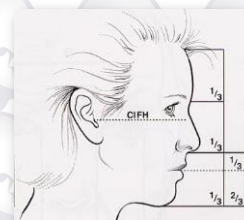
- Normal upper lip length
  - Males: 22+/- 2mm
  - Females: 20+/- 2mm
- Normal upper incisor exposure
  - 2-4mm at rest
  - Gingival margin on smiling



13

## Profile Assessment

- Vertical facial proportions
- Relative protrusion of maxilla and mandible
- Nasolabial angle
- Nasal tip elevation
- Chin throat angle



14

## Intra Oral Examination

- Periodontal and restorative state
- Extent and location of crowding
- Upper and lower incisor inclination
- Amount of labial bone
- All other aspects of routine orthodontic assessment



15

16

## Radiographic Assessment

- DPT
  - General dental status
  - Position of third molars
  - TMJ pathology
  - Root resorption
- Lateral Ceph
  - Assessment of position of maxilla and mandible relative to cranial base
  - Assessment of tooth positions relative to the maxilla and mandible
- PA Ceph
  - Asymmetry cases



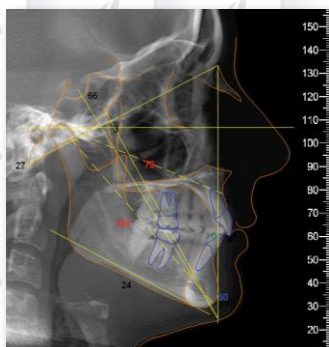
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18

- SNA 81
- SNB 78
- ANB 3
- Sn-Max pl 8
- MM 27
- Upper - Max pl 109
- Lower - Mand pl 93
- U/L angle 133
- ALFH % 55%

The greater the ANB difference, the greater the possibility of orthognathic surgery

E-line the lower lip should lie 2mm anterior and upper lip 1mm posterior to the line



19

## Questions to be Asked...

- Is this a face that needs change?
- Is there a reasonable possibility of producing a functional, aesthetic and stable result by orthodontics only?
- Is the Maxilla or mandible or both that need surgical movement?

20

## Procedure

### Initial Consultation

discuss broad outline, give information leaflets etc., ask for questions

### 2<sup>nd</sup> consultation

Answer questions, reiterate broad outline, patient writes to confirm wish to proceed

### Record Collection

Formulate detailed plan

### Joint Clinic Consultation

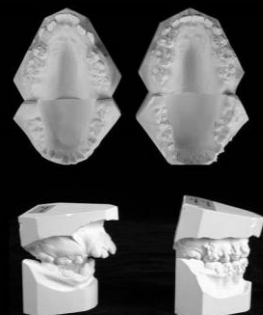
Agree preliminary plan and explain to patient, patient writes to confirm wish to proceed. Consent. Arrange third molar removal

### Pre-surgical Orthodontics

21

## Presurgical Orthodontic Management

- Dental decompensations
- Leveling of the arches
- Alignment within the arch
- Coordination of the arches



22

## 'Level' and 'Align' the Dental Arches



23

## Orthodontic Decompensation

Moving the **incisors** and **molars** to their **normal inclination** relative to their **skeletal bases**

In a severe skeletal discrepancy, the dentition often maintain some occlusal contact, compensating in their positions for the skeletal problem

24

## Why Pre-Surgical Orthodontics (Decompensate)?

- To maximise surgical movements
- To increase stability of the surgical movements
- Improve gingival health in Class III patients

25



26



- **Coordinate the Arches:**  
Maxillary arch expansion either using rapid maxillary expansion or Surgically assisted expansion



27

## Post Surgical Orthodontics

- Close residual spaces
- Improve occlusal interdigitation
- Finishing and artistic positioning
- Transition to retention phase
- Excursive to improve range of movement

28

## Surgical Aspect

29

## Treatment Objectives

1. **Function:** functional occlusion aiming to achieve normal overbite/overjet & transverse relationship
2. **Aesthetics:** normalise facial balance in 3D
3. **Long-term stability**
4. **TMJDS**
5. **Mouth opening**
6. **Sleep apnoea**
7. **Traumatic occlusion and dental health**

30

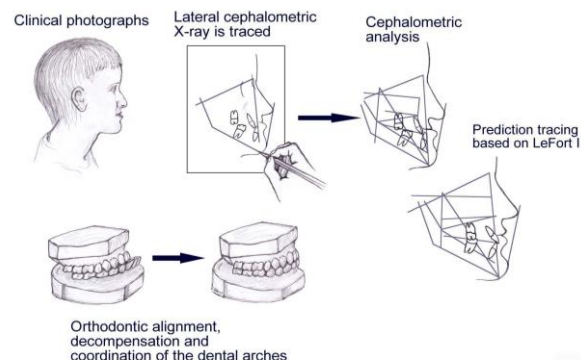


## Surgical Treatment Planning

- **Check list:** essential information for planning
  - Class I/II/III
  - Skeletal base relationship
  - Maxilla AP – hypoplastic/normal
  - Vertical Maxillary Excess (VME)
  - Upper incisor show at rest & smiling
  - Centre lines – upper dental/lower dental/chin point
  - Overjet/overbite
  - Occlusal cant
  - Naso-labial angle
  - Upper lip length
  - Alar base width

31

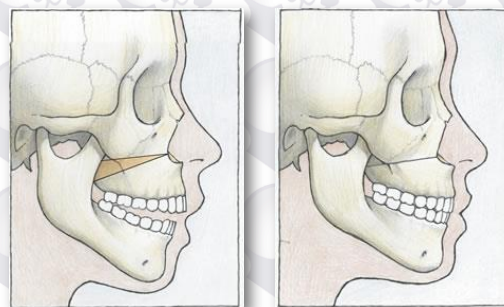
## Pre-Surgical Analysis & Workup



## Surgical Treatment Planning

- **Patter Recognition:** common examples
  - **Class III** – Maxillary hypoplasia & mandibular prognathism with an average facial height and no open bite → orthodontic decompensation, maxillary advancement and mandibular setback
  - **Class II Div 2** – Mandibular retrognathia, deep overbite, and VMD → orthodontic conversion to Class I maintaining curve of Spee, mandibular advancement to '3-point landing' establishing a CI increasing LAFH
  - **Class II** – Long face (VME), retrognathia, AOB → orthodontics, maxillary impaction (posterior > anterior), mandibular auto-rotation (+/- advancement)

33



34

## Definitive Surgical Planning

- **Determine the final position to place upper incisor tip in 3D:**
  - **Vertical:** degree of VME? Upper incisor show?
  - **AP:** position of maxilla? Naso-labial angle? Degree of lip support?
  - **Lateral:** upper centre line to facial mid-line? Lateral vs. Rotational movement?

35

## Definitive Surgical Planning

- **Determine position of the posterior maxilla:**
  - **Vertical:** can be the same as anterior, if maintaining occlusal plane but if AOB then differential
  - **AP & rotation:** must equal incisor tip
  - **Lateral width discrepancies:** SARPE, maxillary widening, mandibular narrowing

36

## Definitive Surgical Planning

- **Mandibular positioning:**
  - **Deliver to class I**
  - Consider lower centre line to facial midline/dental midline
- **Chin:**
  - Consider AP, vertical, lateral need for **genioplasty**
  - It *will* be influenced by changing occlusion

37

## Soft Tissue Considerations

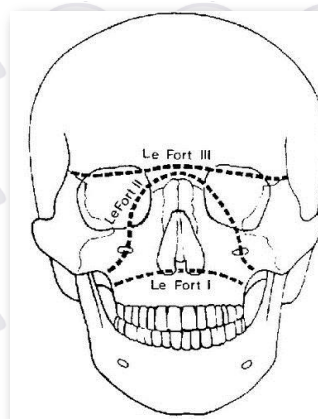
- **Nasal tip relative to A point**
  - 1:3 in LeFort I (1:2 LFII, 1:1 LFIII)
- **Upper lip**
  - 80% of advancement, 50% of setback, 10-40% of impaction, 50% of down grafting
- **Lower lip**
  - 85% of advancement, 60% of set-back
- **Chin:**
  - Pogonion moves consistently in a 1:1

38

## Maxillary Procedures

- Based on Le Fort (Rene, French surgeon 1869 – 1951) fracture lines
- **Le Fort I** most popular
- Total maxillary osteotomy through lateral wall of maxilla, lateral wall of nose & nasal septum
- Once mobilised can be moved in any dimension
- Segmentalization to correct width, occlusal plane, dento-alveolar discrepancies

39



40

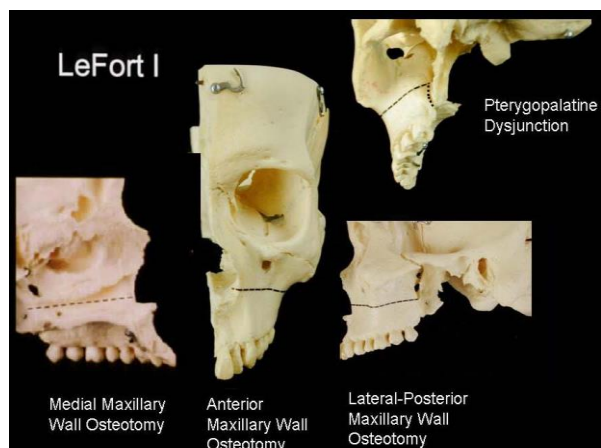
## Maxillary Procedures

- **Le Fort I**
  - Sulcus incision
  - Zygomatic buttress, IO nerve, piriform aperture & pterygo-palatine fissure
  - Floor of the nose
  - Bone cuts: from posterior aspect of zygomatic buttress (5mm above teeth) → lateral wall of sinus → base of piriform aperture
  - Division of lateral nasal walls, nasal septum from crest, pterygo-maxillary dysjunction
  - Down #, mobilisation, trimming of interferences

41



42



## Maxillary Procedures

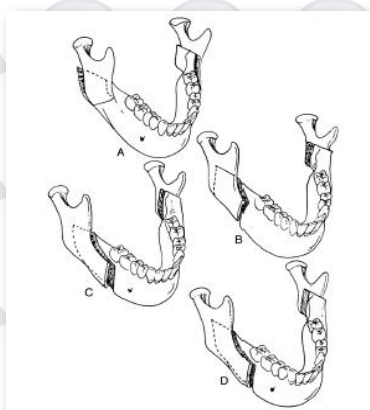
- Le Fort I variants
  - Le Fort I with mid-line expansion – midline or U-shaped or 'horseshoe'
  - Surgically assisted rapid palatal expansion (SARPE)
  - Stepped Le Fort I
  - Segmental Maxillary Procedures

Modification of the conventional LeFort I



## Mandibular Procedures

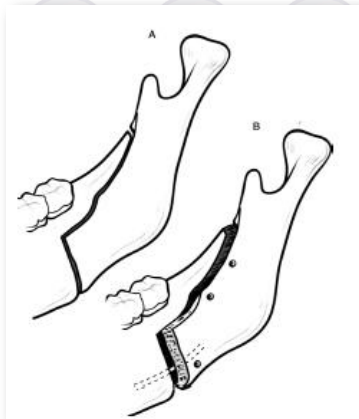
- Bilateral Sagittal Split Osteotomy (BSSO)
  - 1957 Trauner & Obwegeser ➔ 1961 Dal Pont ➔ 1968 Hunsuck ➔ 1977 Epker
  - Utilizes natural cleavage plane
  - Advancement & setback
  - Correct rotations (asymmetric adjustments)
  - Close small open bites



## Mandibular Procedures

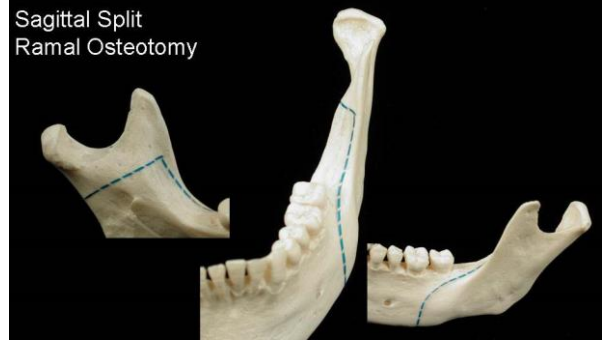
- Bilateral Sagittal Split Osteotomy (BSSO)
  - Sulcus straight incision/third molar incision
  - Lingual dissection to identify the lingula
  - Bone cuts: lingual cut ➔ external oblique ridge ➔ vertical buccal cut ➔ lower border cut
  - Fixation: plates or bi-cortical screws



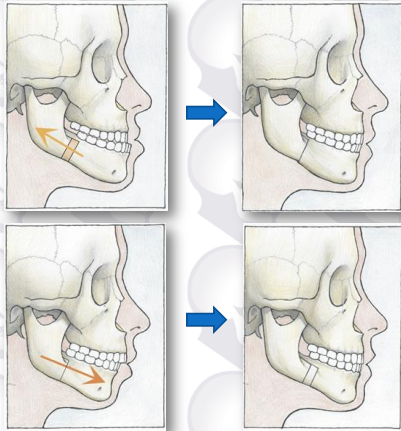


49

Sagittal Split  
Ramal Osteotomy



50

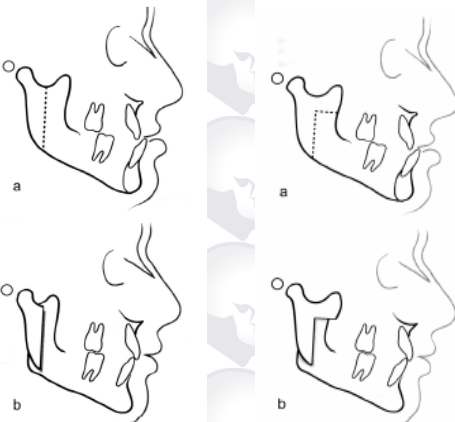


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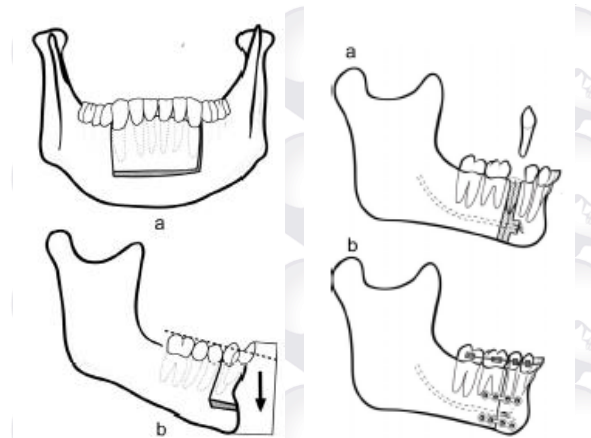
## Mandibular Procedures

- **Vertical Subsigmoid Osteotomy (VSSO)** – simplest, less used after semi-rigid fixation (needs IMF post-operatively), no ID nerve damage, more stable than BSSO in set-backs, advocated in TMJDS patients, I/O + E/O
- **Inverted-L Osteotomy** – in mandibular hypoplasia, 'bird-face' deformities
- **Total sub-apical Osteotomy**
- **Segmental Mandibular Osteotomies** e.g., Kohle's

52



53



## Complications

- **Haemorrhage** – pterygoid venous plexus, greater palatine nerve, naso-palatine vessels, maxillary artery
- **Reduced by:** LA, diathermy, hypotensive GA, table position, efficient surgery, anti-fibrinolytics, care in pterygo-maxillary dysjunction
- **Management:** diathermy/ligation, packing, haemostatic gauze, fixation, ligation of external carotid, angiography and embolization

55

## Complications

- **Unfavorable Osteotomy** – unwanted patterns (most common in BSSO),  $\leq 23\%$
- **Predisposed by:** thin ascending ramus, unfavorable bone texture, wisdom teeth, failure to divide lower border at buccal cut
- Undesirable fractures in maxillary osteotomies may propagate to base of the skull

56

## Complications

- **Nerve Damage** –
- ID nerve during BSSO, long-term varies from 3% - 25% (up to 85%)
- **Risk factors:** age, lag-screws, BSS + genioplasty
- Facial nerve VII damage rare (0.5% - 1%)
- Labial gingival and anterior palatal mucosa
- CN II, III, IV, VI, X and XII due to unfavorable fractures propagating up to the base of the skull

57

## Complications

- **Condyle Positioning** –
- Mal-occlusion will result
- Upright vs. supine patient, paralyzed vs. unparalyzed patient
- Notorious in:
  - Mandibular rotations: rotation of the condyle, winging of the proximal fragment, inability to get fragments to sit passively (excessive torquing)
  - Le Fort I impaction with interferences distracting the condyle causing an AOB on releasing IMF

58

## Complications

- **Tooth Damage** –
- Direct damage (bone cuts, screws) or due to ischemic changes
- **Soft Tissue Changes** –
- Nasal changes – alar base widens, nasal tip upturned, naso-labial angle decreases (advancement)
- Reduction of nasal septum (to prevent buckling), cinch sutures, V-Y closure

59

## Stability

- **Relapse/Migration**
- Surgical/Orthodontic
- Careful planning building in relapse
- Hierarchy of stability (Proffit, Yurvey & Phillips)
  - Maxillary impaction ➔ mandibular advancement ➔ maxillary advancement ➔ maxillary impaction with mandibular advancement ➔ maxillary advancement with mandibular setback ➔ mandibular setback ➔ increasing maxillary width ➔ inferior positioning of maxilla

60

## Stability

- **Maxillary Surgery**
- Impaction is the most stable, but stability decreases if combined with advancement
- Larger moves (>8mm) are potentially unstable
- Short period of IMF may aid stability
- **Inferior positioning of maxilla:** relapse of 30-50%, mal or non-union common, must be accompanied by grafting
- **Surgical widening:** very unstable, 6/52 support (acrylic plate or accessory bucco-labial arch wire), accompanied by grafting

61

## Stability

- **Mandibular Surgery**
- Degree of advancement/setback & fixation
- BSSO relapses forward, VSS migrates posteriorly
- Plates vs. screws – same results
- For large **advancement** (>10mm), suspension wires 1/52
- Larger moves in **setback** (>8mm) are also potentially unstable – pterygo-masseteric sling impingement (mitigated by Hunsuck modification)

62

## Stability

- **Condylar Resorption**
- 6 – 18 months post-surgery
- 2-8% incidence
- **Clinically:** Horizontal relapse with AOB, **radiologically:** flattening of condylar head with posterior shortening/angulation of neck
- **Risks:** ♀ patients, CII, high FP-M plane angle, TMJDS, large mandibular advances (<10mm), counter clockwise rotations for AOB

63

## Stability

- **Condylar Resorption**
- **Aetiology:** increased pressure on posterior surface of the condylar head thereby increasing load on the TMJ stimulating resorption
- **Management:** 'self burn out' then stabilize, an unloading splint, extra-capsular approach recommended, further corrective surgery confined to maxilla?

64

Thank You

65