

Dento-facial Deformities (The Surgical Principles)

❖ General Strategy :

1. Assessment & Planning
 2. Choice of Surgical Procedure
 3. Surgical Management
 4. Patient Management
 5. Continuing care & Follow up
- We assess the patient, and according to (our assessment, the complain of the patient and the records that we did) we should start thinking about our treatment plan.
 - Once we put our treatment plan, we should discuss it with our patient and inform him/her with the results of the treatment plan.
 - Then we start our work, as surgeon we need to choose which surgical procedure we should do in this case.
 - Then we start preparing our patient physically because orthognathic surgery is a major surgical procedure that might last for couple of hours, sometimes 3 hours and sometime 6-8 hours under general anesthesia, which means that you have to prepare your patient.
 - You have to prepare your patient in terms of checking his fitness to the general anesthesia in general and his fitness to this certain procedure.
 - Also you prepare your patient by telling him all the possible complications and the side effects of this procedure and how long he will stay in the hospital.
 - The patient should understand all of these steps in details before doing any surgery.
 - Once we finish this surgery we should consider how long the patient will stay in the hospital, what he will require, what IV fluids he should take and what are the complications.

☑ **Orthognathic Assessment**

1. History
 2. Clinical examination
 3. Radiographic examination
 4. Records
 5. Photographs
 6. Study models
- You should keep all these records, so in the future you can follow up your patient and you can study the case before and after.

✓ **History**

1. Situation
 - Status of the patient at the time of surgery
2. Motivation
 - If the patient is motivated toward the surgery or not
 - We shouldn't push the patient to do the surgery
 - Sometimes the patient is just pushed by his family to do this kind of surgery
 - The patient should be self-motivated to do the surgery
3. Expectation
 - The most important point
 - We have a major problem in terms of expectations, because orthognathic surgery is almost a plastic surgery, and in this type of surgery patient's expectation is very high, so whatever you do, patients will be dissatisfied and sometimes they have depression after the surgery
 - So we should study the expectation of the patient very carefully
4. Implication
 - The patient should understand all of the details and what are the changes that might occur after the surgery

✓ **Clinical examination**

We have to study the face in terms of :

1. All facial proportions (Vertical, Horizontal and Lateral)
2. Lips
3. Nose
4. Nasolabial angle
5. Chin

6. Occlusion
7. TMJ problems
 - So we do a complete assessment for the patient

✓ **Radiographs examination**

1. Lateral Cephalometric
2. OPG
3. Periapicals
4. TMJ views
5. CT scan

✓ **Records**

1. Study Casts
2. Tracing or Digitization
3. Photographs

☑ **Planning**

1. Clinical
2. Radiographic
3. Model Surgery

✓ **Model surgery**

- Any surgical procedure in terms of orthognathic surgery should be done on models (casts) and articulators first to study the movements before doing the surgery
- We do it in the lab and make sure that everything is according to the plan before applying the surgical procedure on the patient
- We do the models in order to :
 1. Plan Operative Movements
 2. Practice Operative Movements
 3. Assess Dental Interferences
- If there is any dental interference we treat it immediately or we refer the patient to the orthodontic department

4. Construct Wafers

- If you want to move the maxilla you must construct wafers to know exactly how to move the maxilla and how much

5. Plan Fixation

- You plan how to do fixation and where to place the mini plates and screws

✓ **Preoperative policy**

- Before doing orthognathic surgery, the orthodontist and the surgeon have to discuss the changes that they need to do to get the best result
- Orthodontist have to do correction, closing of the spaces, elimination of dental interferences and leveling
- So the role of orthodontist is to :
 1. Eliminate Dental Compensation
 2. Properly Manage Transverse Discrepancies
 3. Identify and Manage Tooth Size Discrepancies
 4. Assure proper leveling and root divergence in segmental cases
 5. Prepare the Patient Psychologically

☑ **Choice of surgical procedure**

- we do orthognathic surgery for :
 1. Mandible
 2. Midface
 3. Bimaxillary surgery
 - We move both mandible and midface
- 4. Segmental surgery
 - We don't move the whole mandible or the whole maxilla we just move small segments
- When we talk about orthognathic surgery, we have 2 or 3 surgical procedures that are very common
- We have almost 15 surgical procedures but we will only talk about the most common procedures to see and practice
- Any major surgical procedure should include :
 1. Preoperative care
 2. Postoperative care

✓ **Preoperative care**

1. History & Examination
 - You have to take a full history, medications, diseases and hospitalization
2. Full blood investigation & Urinalysis
3. Blood Ordering
 - Because in orthognathic surgery the patient always loses a significant amount of blood, and some of them might need blood transfusion
4. Antibiotics
 - Usually we give the patients antibiotics before the surgery and sometimes we give steroids
5. D.V.T. Prophylaxis (deep vein thrombosis prophylaxis)
 - To avoid thrombosis especially if we have a long surgical procedure

✓ **Postoperative care**

After we finish the procedure (if it's either for mandible, maxilla or bimaxillary) we must check :

1. Airway
 - The most important point in the follow up of the patient is the air way
 - Because our surgery is taking place in the oral cavity and when we are moving the maxilla we are moving the base of the nose , so the 2 sources of air (the mouth and the nose) are affected
 - So observation of the airway is very important
 - Usually patients who need bimaxillary surgery, we enter them to the ICU because they need a very intensive observation mainly for the airway
2. Fluid Balance
 - As any long procedure, you have to give fluids and check the fluid balance
3. Occlusion and Fixation
 - You have to check that occlusion and fixation are as we planned 100%
4. Pharmacology
 - If the patient needs painkillers , antibiotics or steroids to reduce edema
 - For long procedure we can give antiemetics
 - We should know if the patient has any GI problems
5. Nutrition (how will they eat)
 - We encourage to give them IV fluids and liquid diet
6. Oral Hygiene
 - The patient should have a very good meticulous oral hygiene

- You should teach your patient how to clean his mouth, because all of these wounds are inside the mouth and if there is any infection in the mouth it will transfer to the plate then to the site of surgery
- So the patient has to keep a good oral hygiene to prevent any kind of infection

❖ **Mandibular procedures**

1. Sagittal Split osteotomy
2. Vertical Subsigmoid
3. Subcondylar
4. Inverted L
5. Body Osteotomy
6. Genioplasty
7. Anterior Mandibulotomy

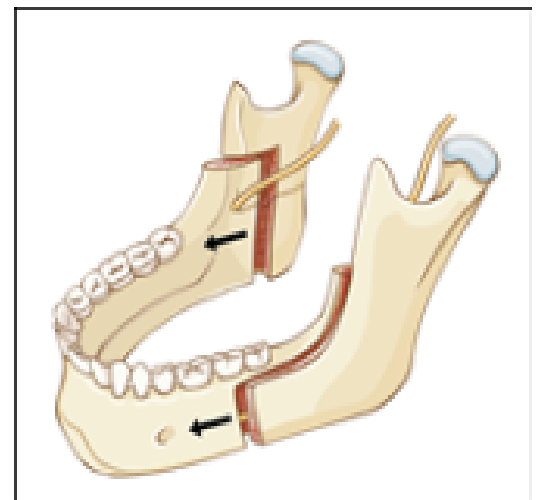
- The most common procedures are sagittal split (BSSO) and genioplasty
- Other procedures are rare because their indications are limited
- Most of the deformities that are related to the mandible can be solved by sagittal split osteotomy or genioplasty

❖ **Sagittal Split Osteotomy**

- We call it Bilateral sagittal split osteotomy (BSSO)
- Bilateral → it is done on the right side and on the left side
- Sagittal split → we are cutting in a curve not in straight line to split the bone
- Osteotomy → cutting in bone
- The first one to talk about BSSO is Obwegeser
- So the father of orthognathic surgery is Obwegeser
- It is a very common procedure because it's versatile (versatile means that you can move the mandible in many directions)
- You can move the mandible forward, backward, right, left, upward and downward
- So it gives you most of the movements that you need to correct the dento-facial deformities
- Can be rigidly fixed (when you finish your procedure you can add 2 mini plates one to the right side and the other to the left side)
- This procedure is done by intraoral approach , you don't need to open any

extra-oral wound so there is no scarring

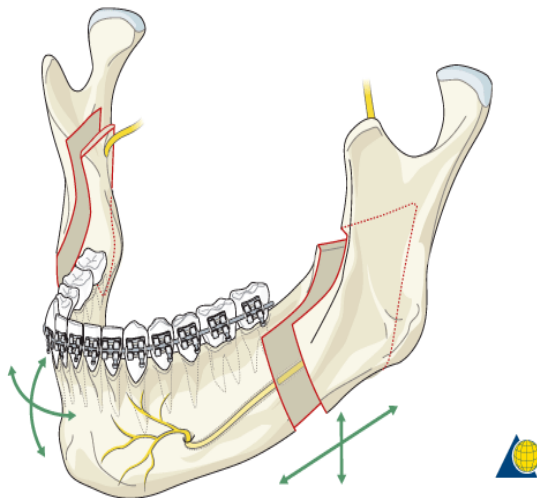
- The main problem in this procedure is ID paresthesia (24%- 40% which is very high), because I am splitting the mandible in 2 halves , and what is left in the middle is the nerve (inferior alveolar nerve)
- So the risk of injury to the inferior alveolar nerve in this procedure is very high
- It is not an easy procedure and there are some technical difficulties :
 1. Bad split (I tried to split the mandible in 2 pieces but one of these pieces might get fractured)
 2. Proximal segment malposition
 3. ID paresthesia
- This procedure is done under general anesthesia through intra oral approach
- Steps :
 1. Put the patient under general anesthesia
 2. Usually during general anesthesia we give local anesthesia for 3 reasons
 - a. Hemostasis
 - b. Control and reduce post-operative pain
 - c. Dissection (when you give LA you can dissect the tissues between the anatomical structures so it becomes easier)
 3. Start with the flap: it's a mucoperiosteal flap extending behind the wisdom tooth to the external oblique ridge and anteriorly to the lower 6
 4. We expose the bone
 5. We do 3 cuts for BSSO:
 - a. Horizontal cut
(from the medial surface of the ramus of the mandible above the ligula)
 - b. Vertical cut
(in the body of the mandible)
 - c. Third cut (sagittal or curved cut)
(connecting between horizontal and vertical cuts)
 6. Here we get the mandible as 2 pieces;
 - a. First segment (proximal segment) ..
condyle with coronoid and part of the body
 - b. Second segment (distal segment) ..
body of the mandible and posterior teeth



7. Repeat the same steps on the other side of the mandible because it's a bilateral procedure, after that we get the body of the mandible with the 2 nerves (ID nerves) separated from the 2 ramuses and condyles

- Notes :

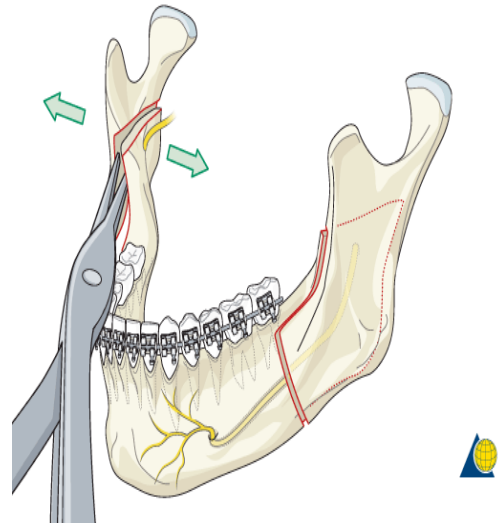
- ID nerve enters the mandible through the lingula, so you have to identify the lingula to do the horizontal cut above it then we do the vertical cut then we split
- If we do the horizontal cut above the lingula, ID nerve will remain in the yellow piece (will be kept in the splitted part of bone)
- If we do the horizontal cut below the lingula, ID nerve will be between the 2 pieces
- So cutting at the level of the lingula or below it put us at high risk of cutting the nerve
- So always you open a flap, and before doing the horizontal cut you have to identify the lingula (small piece of bone), then you do the horizontal cut above it
- Horizontal cut → vertical cut → connect them by the sagittal cut → split the bone
- Cuts are done either by burs (in the past) or surgical saw (nowadays)



8. Bring the osteotome and start splitting to separate the proximal from the distal piece.

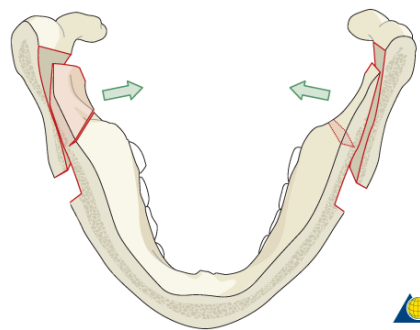
- Notes ..

- Cuts are done only in the cortex, we don't go deep through the cancellous bone , we only cut the cortex
- Once you cut the cortex and put the osteotome and start splitting , the cancellous bone will separate
- We don't go deep inside the cancellous bone because if you go deep you will hit the nerve



- Note ..

- After splitting we will have a buccal segment alone and a lingual segment with the mandible (with the anterior mandible)
- So we have a distal segment (away from the condyle) and a proximal segment :
 1. Distal segment → jaw with teeth
 2. Proximal segment (closer to the base of the skull) → Head of the condyle and the ramus



9. After splitting bilaterally we can move the mandible forward, backward
- but if you want to move the mandible backward you may have bone interference , so if you want to move the mandible backward 5-6 mm you have to cut 5-6 mm and there is no need for a bone graft
 - We always cut in sagittal way to get bone touch when moving the 2 pieces of bone , because if we have bone touch we will have bone healing and rarely we use a bone graft
10. Once we finish we need to do fixation , they used to use wires in the past but now they are using mini plates and screws , and now the most commonly used one is the mini plates (the standard is : titanium mini plates) .
- In BSSO we use one on the right side and one on the left side on the superior border because of the tension lines
- Once we finish we check the occlusion
 - if we are using rigid fixation (mini plates and screws) we don't need to do rigid IMF (intermaxillary fixation)
 - we don't use rigid IMF (by using wires) except if we are not using the plates and we are fixing the bone by wires or in cases of bad split and multiple fractures
 - nowadays we only put elastic bands as a guidance to guide the patient where to bite
 - sometimes we don't need even to use elastic bands
 - sometimes we don't even to use IMF
 - IMF in trauma we can put arch bars or we can put screws on the upper and screws on the lower and connect them by elastic bands and if we need rigid fixation in rare cases we can use wires

- Notes (IMF) ..
 - It's either rigid by wires or somewhat flexible by elastics
 - If we used wires for fixation we must use IMF and the rigid one (by wires)
 - If we used mini plates no need for rigid IMF we use elastic bands
 - Some cases don't need IMF at all
 - The goal of IMF: usually it's used in addition to the mini plates as a guiding elastics to overcome the action of the muscles that tend to pull the jaw in its original position, so IMF elastic bands allows some sort of movement and guide the muscles to occlude in the new position
 - IMF is a must where wires are used for fixation
 - It's not a must in case we use mini plates and screws
 - Rigid IMF (wires) are used beside mini plates and screws in cases of complications like bad split where we get multiple fractures during splitting to aid in healing

- Complications of BSSO:
 1. Paresthesia in lips due to pressure on inferior alveolar nerve (most of the cases are temporary paresthesia but this temporary paresthesia can last for 3 weeks, months or years)
 2. Paresthesia or anesthesia if we did complete cut to the nerve (small percentage of cases end up with complete loss of sensation due to complete cut to the nerve)
 3. Fractures or bad split (undesired fracture of the mandible during osteotomy in the buccal or lingual segments)
 4. Relapse at long term (especially if you move the mandible for a large distance)
 - In BSSO you can move the mandible up to 7-8 mm not more than that , if you move it more the muscle's pull will be very high then we will have a relapse

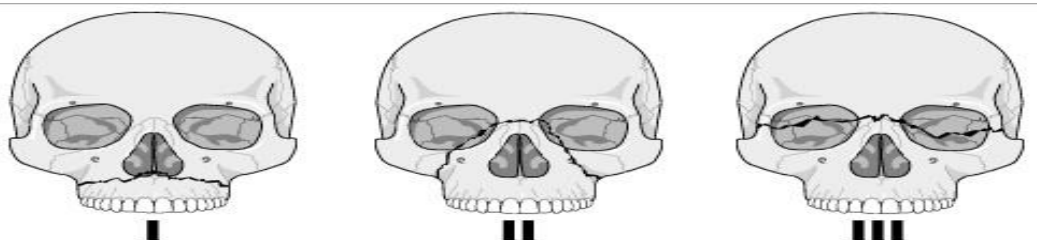
❖ Genioplasty

- Another procedure that is done in the mandible is genioplasty
- We do a small wedge cut in the bone of the chin, once we cut this piece we can move it (cuts are made through the chin then variable movements can be done to this chin piece)
- We can move the chin forward , backward , upward (by removing some bone), downward (sometimes we put a bone graft) , we can move it to the right a little bit or to the left a little bit
- We can do Reduction , Augmentation , Forward Slide or Backward Slide movements
- There is a very high risk of mental paresthesia because we are in intimate relation with mental nerve (if we only do retraction to the mental nerve we exert a pressure on the nerve that will cause paresthesia)
- Care with Incision not to cut the nerve during your incision
- When you cut the bone you must be careful not to do cut to the apices of the teeth , if we do a high cut at the level of apices this will cause Apicectomies
- We do an incision, we elevate a mucoperiosteal flap, we expose the bone, search for the nerve (because we do our cuts between the two mental nerves) then determine the cuts
- A patient with an increased lower facial height, we need to reduce the vertical height by 5-6 mm ..
We measure 5-6 mm → make 2 cuts → remove the piece of bone in between → move the chin upward → do fixation
- We have 2 main problems in genioplasty
 1. Retraction of mental nerve → risk of paresthesia
 2. The upper cut might be near the roots → risk of apicectomy
- It is an intra-oral procedure
- We do it usually under general anesthesia
- Can be done under local anesthesia and sedation
- This is a very simple procedure compared to other procedures : like BSSO or Lefort I
- Recovery is much more easier , couple of days and the patient will be fine
- Once we finish we do fixation by mini plates and screws
- After any orthognathic surgery we should have a rigid fixation (because any 2 pieces of bone with mobility will not heal)

- In genioplasty we don't need 2 cuts in all cases we might need only one cut
 1. if we need to move the chin forward → we need one cut to move the lower piece forward
 2. if we want to move the chin backward → we need one cut to move the lower piece backward
 3. if we want to move the chin downward → we need one cut to move the lower piece downward and fill the space (if it's large) with a bone graft
 4. if we want to move the chin upward → we need 2 cuts to remove a piece of bone
 - To cut these 2 cuts as a wedge or a block it depends on the end result that you want (if you want to move the chin as a block we take a block of bone, if we want to move the chin backward and upward we have to do a wedge cut)

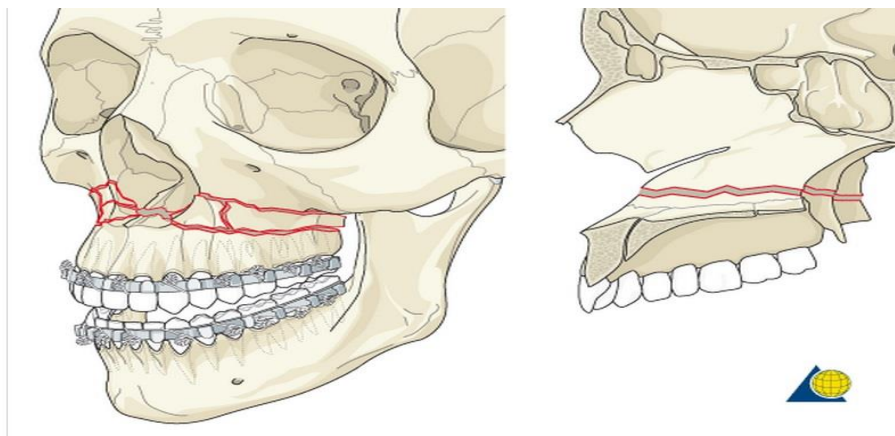
❖ Midface procedures

- Midface procedures include :
 1. Segmental osteotomy
 - we can take premaxilla alone and move it anterior or posterior
 2. Le Fort I osteotomy
 - like le fort I fracture
 - to move the maxilla alone as one piece
 3. Le Fort II osteotomy
 - like le fort II
 - pyramidal in shape extending to the floor of the orbit
 - we do it when there is a midface deformity
 4. Le Fort III osteotomy
 - all of the face is deformed
 - we can move all the face with the zygomatic arch as one piece
- The most common of all of these : is Le Fort I osteotomy
- Segmental osteotomy is also common but the most common is Le Fort I osteotomy
- Almost always dento-facial deformities are solved by Le Fort I osteotomy



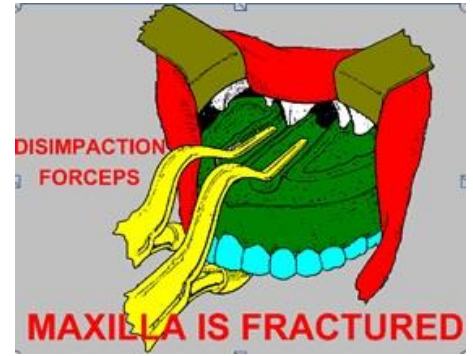
❖ Le Fort I osteotomy

- Versatile (we can move the maxilla in many directions)
 1. we can move the maxilla upward we call it impaction
 2. we can move the maxilla downward we call it disimpaction
 3. we can move it forward and backward
 4. we can change in vertical and horizontal axis (in all directions)
- As we said in the mandible, we can move the maxilla up to 7-8 mm and it will still be safe and the relapse rate is low, but more than 7-8 mm relapse will be high
- It is done through intra oral approach
- Steps :
 1. We start with a mucoperiosteal incision extending from the 6 on the right side to the 6 on the left side
 2. Mucoperiosteal flap is reflected exposing the ant wall of the maxilla ,the 2 infraorbital nerves and the nasal cavity
 3. we start the bone cut , bone cut is typical to le fort 1 fracture
 4. We start cutting from the lateral nasal wall (in the anterior region the cut should be high due to the long root of the canine, after we cross the canine we lower the line) going backward (crossing the posterior wall of maxilla and the maxillary sinus) till the pterygoid plate
 5. We separate lateral nasal wall (left side and right side) then we separate the nasal septum in the middle
 - pterygoid plate is between maxilla and base of the skull we separate them using a curved osteotome called pterygoid osteotome
 6. Now the maxilla is totally separated from the base of the skull and is only attached to the soft tissues of the palate



7. There is a tool called nasal septal osteotome has 2 forks inserted in the nasal septum and start cutting until you feel that there is no resistance, then we start separation, we apply a disimpaction forceps on the nasal floor and down fracture

- when you do a down fracture you will see (nasal mucosa, mucosa of the sinus, maxillary sinus) and we are above the maxillary sinus



- We always use a nasal intubation
- When you down fracture you will get a mobile maxilla
- If you want to move the maxilla upward you have to cut bone usually from the nasal septum to avoid resistance
- If you want to move the maxilla downward for a large distance, it's preferable to use a bone graft
- Backward movement is difficult and almost impossible in Le Fort 1, because of the presence of pterygoid plates and the maxillary artery
- It's easy to move the maxilla forward but it is very difficult to move it backward
- You can move it downward but you have to use a bone graft , upward you can move as much as you want but you have to trim bone
- The most stable movement and less relapse in Le Fort I is for impaction (upward movement)
- When we finish and put the maxilla in the final position we put plates (2 on the right side and 2 on the left side)
- Complications of Le Fort I osteotomy :
 1. Bleeding
 - source of bleeding in Le Fort I osteotomy is from :
 - a. pterygoid plexus of vein
 - b. descending palatine artery (especially when you do a down fracture)
 - c. maxillary artery
 2. Nerve Damage , 25% at first year
 - mainly infra orbital nerve

3. Skull Base Fracture

- if we are not careful when doing the pterygoid cut

4. Nasolabial aesthetics (alae, tip, septum)

- when you move the maxilla the nose will move specially if you are doing impaction
- once we do impaction , nasal septum will deviate either to the left or to the right side, so there will be a change in the tip of the nose and change in the shape of the nose
- that's why we cut from the nasal septum the same amount we want to impact the maxilla
- in many cases when we do impaction the base of the nose will become wider, that's why we do something called "stitch suture" to get the 2 lateral nasal septum closer to each other in order to reduce the widening to improve the nasioabial esthetic

5. Non vital teeth 8%

- if you cut the roots especially in the anterior area

6. Sinusitis up to 50%

- if you enter inside the sinus

7. Loss of sulcus depth

- if you move the maxilla upward

8. Velopharyngeal incompetence

- especially if you move the maxilla backward, so we will change the angle of the soft palate and it might cause velopharyngeal incompetence

9. Relapse

- it's higher when we do bone fracture forthe maxilla

❖ **Bimaxillary osteotomy**

- we do osteotomy for both mandible and maxilla at the same time
- Indications :
 1. cases where there is a defect in both maxilla and mandible
 2. cases where there is a defect in one jaw but it's very severe , so we try to compensate and distribute the defect between maxilla and mandible
- We move the mandible and the maxilla at the same time
- When we finish we have to take an x ray
- In the slides there is an x-ray for a patient who undergoes a genioplasty, BSSO on the right side, BSSO on the left side and Le Fort 1.
- He has a lot of mini plates that we don't need to take them out unless they are infected. However it's better to leave the mini plates because there is a certain amount of titanium that goes inside the blood stream from the titanium plates but this amount of titanium increases during insertion or removal of these mini plates. So once they are in their place and there is no complain or infection we leave them.

❖ **Osteogenesis distraction**

- Patients with dento-facial deformities we treat them mostly by orthognathic surgery, but in special cases we treat them by osteogenesis distraction
- Distraction : means separation
- We remove one segment, we do the same cuts whether it's Le Fort I or II or III or in the mandible then we put distraction devices (intraoral or extraoral) and we start moving
- Indication :
 1. Severe Class III > 15mm
 2. Cleft palate (patients with cleft palate have deficiency in maxilla and fibrosis in soft tissue, so once we move the maxilla forward we will have a relapse)
 3. Craniofacial Syndroms
 4. Young Patients
 - orthognathic surgery is done after growth, once the growth stopped we start with orthognathic surgery
 - we can do orthognathic surgery for the maxilla before the mandible because its growth stops at about 16 years old

Done By
☺ Rand Al-Kilani ☺

من روائع سيد قطب

لا حياة لفكرة لم تتقمص روح إنسان ، ولم تصبح كائنا حيا دب على وجه الأرض في صورة بشر ..
كذلك لا وجود لشخص في هذا المجال لا تعمر قلبه فكرة يؤمن بها في حرارة وإخلاص ..
إن التفريق بين الفكرة والشخص كالتفريق بين الروح والجسد أو المعنى واللفظ
عملية - في بعض الأحيان- مستحيلة ، وفي بعض الأحيان تحمل معنى التحلل والغناء ..
كل فكرة عاشت قد اقتاتت قلب إنسان ، أما الأفكار التي لم تطعم هذا الغذاء المقدس فقد
ولدت ميتة ولم تدفع بالبشرية شبرا واحدا إلى الأمام ..

لا تنسونا من صالح دعواتكم
سامحونا إن قصرنا أو أخطأنا في حقكم يوما
وبالتوفيق فيما تبقى