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Everybody ( surgeon , prosthodontist ) is really looking forward to have better skills and better knowledge about dental implants for many reasons ; it is a model science , has a good income and the patients want it .

During the first two lectures we covered the treatment planning ( biological aspects ) , the target of this lecture and the upcoming one is the **surgical** aspect .

Surgical phase: treatment planning

Evaluation of the implant site : we need to have a good volume of bone to contain the implant , otherwise it will fail , that’s why the diameter,width and height of bone is very important

1. Clinical examination
2. Radiological examination which can really give us a good idea about bone height, width, and anatomical limitations.

In real life we have two types of cases ; simple straight forward cases when we have a good thick ridge and cases with limited bone available in the Area that need further advanced investigations.

Previously we used to take panoramic x-ray , lateral cephalogram ,and ridge mapping .

Preoperative planning can ideally be performed using 3D imaging . the latter is possible by using :

1. Conventional Computed tomography ( CT scan ).
2. Magnetic resonance imaging ( MRI) , it is more useful in soft tissues
3. Cone beam computed tomography ( **CBCT** ), it is the best modality , Can give you a very good idea about the ridge width and **shape** ; sometimes we have an undercut in the alveolus , so it aids in treatment planning by avoiding areas of bone deficiency and putting implants in more predictable places .

Several options are available for precise transfer :

1. Surgical drill guides ; most common
2. Surgical navigation : same princible of GPS ( map and sensor )
3. Robotics .

Both surgical navigation and robotics are not practical , because they are not precise and are very expensive .

Specific software applications have been developed which can directly import digital imaging into a surgical drill guide .

A **stereolithographic** technique generating a jaw bone model and a surgical guid from a CTscan , this is a standard treatment .

To sum up :

CTscan virtual model treatment plan virtual implants and future prosthesis surgical drills in 3D .

Surgical drills are like acryl seated on the teeth and soft tissues with holes that have different diameters because we use something called **twist drills** ( similar to fissure burs ) with diameters increases with work starting with the smallest diameter . errors occur even up to 6 mm which is disastrous, so u have to be careful always . smallest diameter implant = 3.2 mm , in this case 1 mm error is a disaster ,it can lead to dehiscence .

\*The last stage is insertion of dental implant .

\*The routine radiograph is a panorama , CT is not for every patient .

\*The key factor of success of dental implants is the primary stability ( fixed) because if it is mobile , there is a high chance of failure . how to achieve primary stability ? it depends on many factors , the most important one is the good availability of bone in height and width . height can be examined by the plane x-ray. however, it can give u 70-80% idea about the anatomical details of alveolus . if it is a complicated case, for example, close maxillary sinus , u might think about having a cone beam trying to tilt the dental implant or doing a sinus left procedure.

A Patient with missing lower 6 and 7 , panoramic x-ray showed the ID canal in two dimentions , if we have good height of bone we can precede without complications , but if there is no enough height then we can take a cone beam CT and have more solutions :

1. bone grafts , but in the mandible bone grafts resorb a lot
2. nerve transpositioning ; lateralization , not a practical solution , the patients don’t accept it .
3. tilting the dental implant buccally or lingually according to the position of ID canal .
4. short implant (6mm) is a very good option . however the vertical height is short so the interdental space is increased ( long crown ) , necessitating putting multiple implants ( replace each tooth ) to have good strong ridge to tolerate the load .

edentulous case , we have a fully edentulous upper and lower ridges, how many implants do we need to place in this case ?

1. 1, 2, 3 or even 4 implants then put over denture
2. 8 implants with fixed bridge , this is the standard of treatment
3. All in four ; 4 implants with fixed bridge.

However , in conventional cases if we are planning to do fixed bridge, we need at least 8mm in the upper jaw , 6mm in the lower to have good support .

Surgical stints can be done also manually on impressions .

Patient preparation

1. Local anesthesia , general anesthesia or under sedation
2. Preop antibiotic prophylaxis , broad spectrum antibiotic
3. Aseptic technique , cross infection is very important
4. Preop chlorhexidine to decrease the bacterial load , part of aseptic technique
5. Prepare the patient by cleaning the area using aprons and whatever available in the operative room
6. Cheek retractors

Soft tissue incisions

1. Classical surgical flap ( crestal flap or three cornerd …)
2. **Flapless** technique ; we don’t open the gum , we just make a punch on the alveolus , the problem is that the placement is a **blind** surgical technique , so it increases the failure rate although it has many other advantages ; less bleeding , no swelling , and less pain as well .

We made an incision from the upper six to upper six in the other side exposing the ridge . during the procedure itself , when you find bony irregularities it is better to smoothen them in order not to find difficulties during prosthesis construction , usually we use a low speed to avoid overheating of bone ,which can lead to necrosis and failure of bone formation around the dental implants increasing the patient’s morbidity ( pain, swelling ) .

We use low **speed** ( not more than 1500 ) with high **torque** ( highly resistant bur ; doesn’t stop easily ) .

We prepare the implant site by a sequential drills gradually , we start with a very small diameter then we go larger to widen the socket , by doing that we minimize the amount of heat produced , with very good irrigation and relatively low temperature . then use the paralleling pins to confirm parallelism . for titanium implants , an uncontaminated surface oxide layer is necessary to obtain osseointegration .

Non threaded implants are positioned in place by tapping , then finally the implant insertion .

Types of bone , we have 4 types , from 1 to 4 , 1 is mostly cortical , 4 is mostly cancellous , is it important ? yes it is , it affects the primary stability of insertion . usually we prefer 2 and 3 , because 1 have lower vascularity, 4 can be like a gel ; no enough primary stability . the mandible closer to 1 , the maxilla close to 4 .

Each system of dental implants has different diameters , height . however , all have almost similar features . the diameter starts from 3.2 – 6 mm . for anterior teeth , we usually need small diameter , for molars at least 4.2mm to withstand the occlusal load .

About the distance , 3mm interimplants space or 7 mm between the centers of the implants (assuming the implant diameter is 2) ,it is important because we need healthy vascular bone and we have what’s called an **Emergence Profile ,** it is like a triangle between 2 implants to have better shape and to allow cleaning and hygiene of the area .

When we take a panoramic x-ray , remember that we have magnification By simple technique we can measure it , like using a metal sphere, with known dimentions , we put it on the guide and take an x-ray, measure the dimensions of the sphere on the picture, and then we can calculate the actual height of bone .

Back to the drills used , we start from 2.2 until reaching the planned diameter, they have laser markers . we use **depth gauges** to measure the height . we also use taps and ratchet , the ratchet used to tighten implants into the prepared site . then the insertion of the implant . after that we close it with a healing cap and wait 2 to 3 months ( not an immediate implant )

There are Certain anatomical things we need to remember during insertion :

1. We need to avoid the midline to avoid the incisive foramen
2. Posterior maxilla ; quality of bone and maxillary sinus
3. 2 mm away from ID canal
4. Lingual depression under mylohyoid ridge , care should be taken to avoid perforation .
5. Ant mandible ; usually resorbed , thin and difficult to place implants here .
6. At least 5 mm ant to mental foramen
7. We need 1mm bone around the implant lingually and 1mm buccally/labially
8. 1mm away from the nasal cavity .

Post-operative care :

we take x-ray to make sure that everything is safe and away from vital structures . we can give chlorhexidine mouthwash . denture with a soft liner to prevent irritation and pain .

case in page 20 , A root canal treated tooth with failed apicectomy , so we extract the tooth and place an immediate implant instead .

another case in page 21 , failed bridge , we removed the teeth and insert implants .

case page 23 , full mouth implants ; 8 in the upper , 6 in the lower . we avoid difficult areas and place the implants in safe areas .

we have many possibilities to have bone grafting and other complicated techniques , the best way in dental implants is safe planning ; change the plan to avoid complicated procedures by following the simple surgery , if you have to , then you can go for complicated bone graft techniques .