Implant dentistry

The main focus will be about the surgical procedure for dental implants.

First of all you should come up with a treatment plan for your patient, and this is done after taking medical and dental history for the patient “as in any other dental procedure”, but there are some specifications regarding dental implants.  
Starting with the clinical examination; there are many factors to be assessed including; alveolar ridge “shape, availability of bone, bone type, mucosal type”, spaces between the roots.  
Then we need radiographic investigations:  
Periapical X-rays: can be used to assess single teeth, broken teeth, shape of the apices of roots, presence of pathology.  
Panoramic X-ray: it shows both jaws including the vital structures “sinuses, mental nerve, ID nerve”, it’s two dimensional. However it’s the most commonly used, and it’s enough for 90% of the cases.  
Cone beam CT (CBCT): used when further investigations are needed, its problem is high dose of X-ray beams. However, it’s very precise “3D”, it helps with knowing the shape of the ridge and availability of bone, the presence of concavities.  
In the posterior mandible, for example, the ridge looks thick and there seems to be good amount of bone, but as soon as you start drilling you will discover that you made a perforation due to the presence of concavity in that area.

You should also have a good idea about the bone width, height and anatomical limitations.

Surgical guide template:   
There are two techniques for placing a dental implant:  
1-Free handed placing  
In most cases we use this technique  
2-Manual template or computer generated template placing  
In complicated cases we use this technique.  
a-Manual template: we do setting of teeth on the patient’s cast, then we construct something like a night guard on top of the cast, then holes are done on the night guard, and we transfer this “night guard” into the patient’s mouth and we use the holes to guide the implants placement. “it’s not very precise” (it’s also called “prostheses driven guide”).  
b-Computer generated template: can be done by:  
-Surgical drill guide: the first guide comes with a narrow diameter, then the other guide is wider by 0.03 mm then we use a wider one and so on.   
-Surgical navigation: it’s mostly used in neurosurgery, the surgery is done while you are following the CT scan for the patient and guided by the computer.  
-Robotics: again mostly used in neurosurgery.  
Many software were developed to help in dental implants, and according to the program you put the implant “by following the CB-CT” to know how to angle the implant and the thickness of the alveolar bone at any given place.  
A stereolithographic model will be built by the software with a guide to assist you in putting the implants the right way.  
While using these softwares a flap is not needed.

Advantages of computer generated templates:  
1-Much easier for the both the dentist and the patient  
2-More predictable outcome.  
3-There is low tendency of bone resorption because there was no mucosa deflection.  
However it has its limitations:  
1- It’s very expensive.  
2- The process is time consuming “taking a CB-CT and building a guide and doing good treatment plan”.  
  
So in general in complicated cases only we use computer generated templates, while 90% of the cases are done free handed.

Note: In general computer generated templates are accurate, but there are some reported cases were the amount of error reached 3-4 mm “a huge number” so you mustn’t work “fully blinded”.  
  
You can use probes and endo rings to measure the width of the mucosa and the ridge.  
  
Panorama radiograph also helps in relating the implant to other vital structures “like the maxillary sinus and ID nerve” and this helps in determining the length of the implant. Implants come in different lengths and widths;  
Lengths range : 6-16mm “more length results in more primary stability, and long term success also can be better (with a lot of controversy regarding the very long implants “16mm”), so 12-13 length is the best.   
But if you had to put implants that are 6-8 mm long, you can increase the success rate by distributing the load better on the implants “instead of each implant having one prostheses, prostheses can be connected with each other on multiple implants to distribute the forces better”.  
Diameters range : 3-6mm “more diameter results in more strength, more surface area, more osseointegration, more resistance to the axial load (because the axial load resistance is usually determined by the thickness of the first millimeters of the implant), and the emergence profile for the prostheses will be better (it’ll look better)”. However, it can be dangerous if the diameter is very big and there is no enough bone, then this will result in very thin bone around the implant which will end up being resorped, so there should be a minimum of 1mm labially and lingually to the implant.  
In anterior areas “the esthetic zone” the space for implants is very limited, so usually smaller “2.8-3mm” diameters are chosen.  
  
Notes: 2mm space should be left from the ID nerve.  
Don’t forget about magnification in panoramic radiographs.   
When making a flap the papilla should be avoided, to minimize the recession.  
Keeping keratinized mucosa above the implant is essential which will resist infections.  
Local anesthesia, sedation, and generalized anesthesia can be used.  
Prophylaxis can be given to avoid infections.  
Dental implants should be done in aseptic conditions “Surgical gloves should be used, the patient can be asked to rinse his mouth with CHX

Preparing for implant:  
We start drilling by a “starter or starting drill” which is a sharp drill.  
Then “twisting drills are used” which begin small and increase in size gradually, and using these drills should be under vigorous irrigation “temperature above 47 will lead to bone necrosis”, the drills have high torque and low speed “1000-1500 rpm”.

In places where the bone is mostly cancellous “like the posterior maxilla” there are some tricks to provide better osseointegration. For example: using bone condenser, or under-preparing the “implant  
hole” (i.e. reach 3.5 mm drill in 4mm implant).  
Cortical areas are more susceptible to overheating.  
  
There are many implant systems nowadays, they have multiple shapes and types. Some can be parallel and the others are tapered “have more primary stability”  
  
There are many types of implants:  
1- external hex: the implant is in butt-joint with the abutment, but it has a problem that it’ll become loose.  
2- internal hex: there is a hexagonal shape inside the implant that resist rotation “more successful”   
  
Refer to the slides to see the tools used to put the implant in its place  
  
Notes: distance between implants 3mm, between implant and tooth 1.5mm.  
During the period while osseointegration is happening a “cover screw” is put on the implants.  
After putting the implants x-ray can be taken to determine the parallelism of implants.  
  
Postoperative care:  
x-ray, mouthwash, if he wears a denture, a soft relining material is used

Immediate implantation   
Immediate implantation: putting an implant after the extraction of the tooth to be replaced, the primary stability in this case depends a lot on the apical part of the implant “in some cases bone graft may be used”.  
  
  
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