

Dental Implants

The goal of dental implantology:

To provide foundation for retention and support of the prosthesis to replace missing teeth, eyes, ears... and other maxillofacial prosthesis.

(The foundation that carries the prosthesis without being seen, the prosthesis that is retained and supported by implant(s) is what is seen)

Important factors for success of dental implantology:

- Types of implant loading
- Available prosthetic technique
- Available types of prosthesis

Implant loading:

- The duration of time between implant fixture insertion and functional loading (between the insertion of fixture in the bone and the insertion of a functional prosthesis)
- 3 types of loading:
 - 1) Delayed
 - 2) Intermediate (Early)
 - 3) Immediate (insertion of the fixture and the prosthesis at the same time)

Implant loading time is directly proportional to the success rate (Immediate loading has the lowest success rate). But it is scientifically approved that immediate loading is still a choice to be used.

Immediate placement vs. immediate loading:

Immediate placement: is the insertion of fixture (implant) immediately after extraction.

Immediate loading: insertion of the prosthesis immediately after insertion of the fixture.

If we decide to do immediate placement and immediate loading, this will give us the least success rate (very high failure).

- Implants are more prone to occlusal forces and loading problems (occlusal overloading) than natural teeth; due to lack of the viscoelastic relation between the implant and the bone (*PDL in natural teeth*; dissipate and control forces). The way by which implant is fixed inside the bone is more like ankylosis. So, natural teeth are more tolerant to high occlusal loading than implants.
- That's why it is very important to plan your loading protocol, occlusion, direction of force used in implantology. If not properly planned, the result will be a soft tissue (connective tissue) between the implant and the bone. That means movement of the fixture and absolute failure (the fixture should be removed).
- The goal of our planning to increase the success of implant is **to reduce the force**. This can be achieved by:
 1. Reducing the occlusal table (decrease the force magnitude).
 2. Increase the number of implants (improve force distribution)
 3. Balanced occlusion
- Also, we aim to **improve force direction**: forces are directed along the long axis of the tooth. This can be achieved by:
 1. Vertical placement of the fixture inside the bone.
 2. Distribution of forces to be vertical on the prosthesis.
 3. Avoid cantilevering action.
- The last thing to **improve the support area**:
 1. Type of bone.
 2. Increase # of implants.
 3. Implant surface that is more compatible with bone (better contact with bone means better supporting area)

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- Cantilevering action will lead to failure.
- Overloading (forces applied to the implant exceed its tolerance) will result in:
 1. Bone resorption around the fixture and its movement.
 2. Fracture of the prosthesis (has been overcome nowadays with the development in materials used in implants – pure Titanium: NOT 100% titanium; commercially pure titanium with very low percentage of trace elements)
 3. Implant fracture.
 4. Screw loosening, distortion and/or fracture.
 5. Tooth and prosthesis wear.
 6. Chipping of ceramic.

****Try to think systematically: Implant contains fixture inside bone connected to prosthesis by screw and the implant as a unit occludes with the natural dentition...**
any part of this formula could be affected by overloading.

Prosthetic consideration and planning:

When we do planning for the prosthesis, we must take the following into consideration:

- The present teeth: their #, position, health of periodontium, angle of roots...

If the roots of adjacent teeth are angulated towards the edentulous space of a missing tooth that will be replaced by an implant, it will damage the adjacent roots.

- The edentulous space: dimensions, esthetic analysis, occlusal analysis...

If the present bone thickness is 2 mm and the smallest implant was 3.5mm in diameter, no implant can be used & further steps must be planned (ridge augmentation, bone grafting...)

Esthetic analysis: shape and emergence profile, smile line, lip line, shade...

If a patient with a missing lateral and the central & canine moved towards each other causing partial loss of space, implant placement in this case will compromise esthetics by creating narrow lateral with no emergence profile.

Patients with high lip line need high levels of care about the gingival contour and cervical area of the implant; any bone resorption around the implant will lead to metal show. In these cases ceramic abutments can be used instead of metal ones.

Occlusal analysis: interarch space, pts with bruxism (implants lack viscoelasticity of PDL), occlusal relation (class II div II usu. presents with occlusal trauma to the lingual surfaces of the upper incisors that may lead to bone resorption around implants)

- Aesthetic determinants:

1. Gingival health, type and contour.
2. Interdental closure, size, shape and angulation of the teeth.
3. Occlusal plane.
4. Ridge contour (knife edge ridge needs modification before implant placement to avoid exposure of the fixture).
5. Type of implant (ceramic implants – no enough studies on them) (different systems with different implant dimensions and different surface coating can be used)

The space between implants is very important, there is a limit by which gingiva can support itself, it ranges between 3-6mm depending on the structure it surrounds (teeth, implants...). If more space are present, bone resorption and unesthetic gingival contour will result.

Adequate history, examination and treatment planning will lead to successful results.

Components used during prosthetic treatment:

1. Impression coping with screw
2. Implant analogue
3. Abutment with screw
4. Crown

(The first part of this lecture is written by: Hiba Hammad) ☺

Impression making

In order to take an impression for an implant we need certain components:

1-Impression coping: it can be color coded according to the size. it is used for the sake of making impressions .

2-Implant analogue: that already manufactured to mimic implant's fixture, the implant analogue will be inserted in the model while the fixture is inserted in the bone inside the patient's mouth.

3- Abutment: placed it inside the pt mouth on the fixture, it looks like a prepared tooth that will receive the final prosthesis.

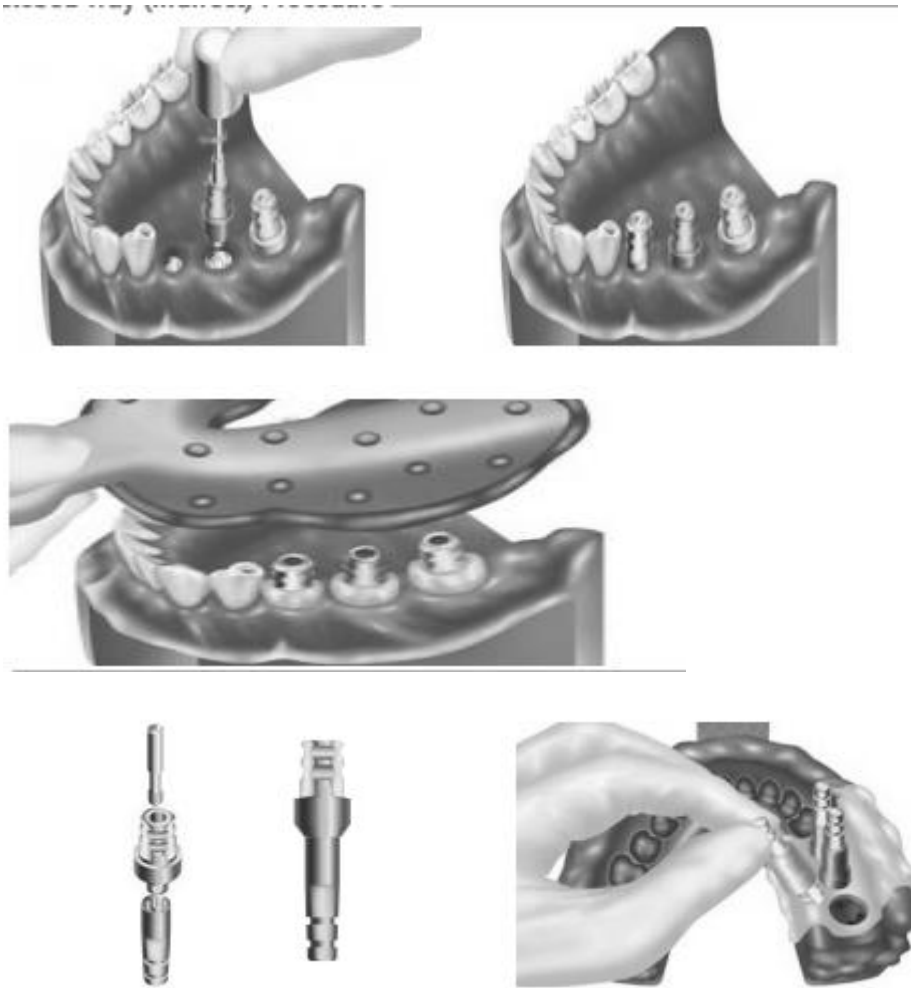
Steps of impression making:

- 1- We remove the abutment or the attachments from the patient's mouth leaving behind the fixture inside the bone.
- 2- Place the impression coping of the suitable size over the fixture and screw it in place.
- 3- Load the tray with impression material and make the impression.
- 4- Take the impression out of the patient's mouth and remove the impression coping from the patient's mouth by screwdriver , put the impression coping on the corresponding site on the impression and attach the implant analogue with the coping by screwing action ,they will be like a one unit .
- 5- Pour the impression with stone, you will get the cast that holds inside the implant analogue and the coping will be exposed out of the stone.
- 6- The metal coping will be screw out from the cast and a suitable abutment will be chosen by the technician who will continue the crown fabrication.

Note: before pouring the impression with stone the technician has the choice to pour a thin layer of special type of silicon that has the same color of gingiva "Gingivast" then he continue the pouring with stone, this will give more esthetic result, better visualization for his work he can remove this peice of silicon and see better then put

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it in its place, and there is no need for ditching that looks like what we used to do in fixed prosthodontics.



Once the patient did his first surgery and fixture placement, the surgeon put the cover screw which is a piece that is sutured above fixture, then wait for the loading period to finish, then he will go for the second surgery where the cover screw will be screwed out and a gingival former will be put in place around the edges of the fixture to have the proper gingival growth and contour. We wait until gingival healing to take place.

After that we remove the gingival former, and place the abutment over the fixture with ratchet that must be screwed under 35 newtons only if it exceeds this force will make cracks or failure or breakage for implant or screw.

The crown will be cemented (with any of the cements we use in fixed prosthodontics) over the abutments. All excess cement in the sulcus must be removed because it is very harmful it makes bone resorption in no time.

Note: pink ceramic is a type of ceramic that is used to cover the recession parts of the tooth to achieve better esthetic results.

Impression techniques

A- Closed tray

It's a normal tray without any modification, you load the impression material and take the impression, once you remove the impression out of the patient's mouth, the impression coping is left intraorally and must be screwed out and placed in its place inside the impression. This technique can be used either for implant level or abutment level.

Very important question you will diffidently encounter when you face VIVA exams or Boards as well :

What are the indications for closed tray impression technique?

- 1- Limited mouth opening
- 2- Distal implant, like an implant replacing the second molar.
- 3- Parallel implants, because if they are not parallel the impression material is going to tear.
- 4- Gagging patient, because you have to remove the impression very quickly, they can't tolerate second steps of impression or handling things intraorally.

Contraindications:

- 1- Very deep implant inside the bone, because once you insert the impression coping it will be hidden inside the bone and very minimal part of it will be exposed intraorally, can't be captured through the impression. Moreover the impression coping has certain indentations around its surface and once you remove it, it must have one path of insertion inside the impression like puzzle pieces, if these indentations are hidden, you will never find a way to load the impression coping inside the impression.
- 2- Not parallel implants.

B- Open tray:

It is used only on implant level: when the tray is placed inside the pt's mouth and since it has perforations in the places opposing the implant site so it will appear as tray with perforations and from these holes the screws of the impression coping are coming out of these holes, the difference is that the impression coping used here is long but the copings of the close-tray are shorter, of course we need them to be tall in open tray so that they can come out from the holes of the tray.

-We place the impression coping ,and then perforate the tray in the area opposing to it , do border molding then we take the impression, now when we try to remove the impression you will notice the impression coping have a large under cuts , so here if you tried to take the impression it will tear so you can't do what we do in the close tray (remove the impression then remove the coping and attach it to the implant analog and place it back in the impression)what we do here is that we remove the screw of the impression coping 1st (then we remove the tray so now the coping will come out with the impression.) and nothing is left inside the patient's mouth.



Indications:

- 1- Deep implants because it has long impression coping.
- 2- Not parallel implants

Disadvantages:

Very technique sensitive, you will screw the implant analogue over the impression coping if you have excessive force you will tear the impression and loose the place you tried to store from the first place.

The second classification of impression making:

A- Implant level: it's the same technique we described above, the one where you end up with a model containing the implant analogue.

More common and the most accurate

B- Abutment level:

When the patient comes with a fixture in his mouth, they choose an abutment inside the clinic and attach the abutment in the patient's mouth directly and prepare and adjust the abutment as if it is a natural tooth using burs, and then we take an impression as if it is a natural prepared tooth, but the major difference between packing the retraction cord around a natural tooth and a metallic foreign abutment will not be the same, and even the attachment you will get in PDL around the implant is going to be **hemidesmosomal** attachment, not like the natural tooth, this attachment is not a real one like the collagen which is inserted and integrated to the natural tooth, hemidesmosomal attachments are going to be superficially adhered to the implant.

Then you take the impression to the lab, you pour it and here you don't have to remove or attach anything since the model will be only stone, no implant analogue inside it, the technician now does the wax up, metal casting, ceramic, then you cement the crown.

The second part is done by: Dr-Misk Wahdan :P

Best of luck seniors... I wish you a good life full of great achievements, excellence and pleasure.