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The construction of a Mandibular fixed Complete Prostheses

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Keywords

Fixed prostheses, Denture, Mandibular

Summary

This article is about a patient with a full maxillary denture and a full mandibular denture, attached to five stereo implants. This implant supported prosthesis is fixed in the mouth, with a partly concealed metal framework. This has the important function of passively connecting the exposed implant parts, which protrude into the mouth. Such prostheses are screwed in place and cannot be removed by the patient.

Clinical report

This case is about a full maxillary denture and a full mandibular denture attached to five stereo implant. The patient is a fifty four year old male and in a healthy condition. He lost his teeth at an early stage in his life due to genetic inheritance and the drinking of impure water. Being an edentulous patient at an early age resulted in major ridge resorption on the mandibular ridge. This caused insufficient stability, support and retention of the mandibular denture, and therefore a decision had to be made to improve stability.
**Options available**

The options available were:

1. Implants with removable prosthesis
2. Implants with fixed prostheses with a denture or bridge.

The technician, prosthodontist and oral surgeon decided not to use a removable prosthesis due to the problem with the maintenance. A porcelain bridge, which is classified as a fixed prosthesis, would work out in being too expensive for the patient.

The final decision was to use a fixed prosthesis with a framework and denture attached to it. I used five stereo implants on the mandibular ridge and a full denture on the maxillary, due to its still prominent ridge.

**The technical procedure**

**Drilling stent**

Drilling stents are made by providing drill access holes and alignment guides. The stent is made with autopolymerised resin, using a duplicate of the patient’s existing denture. Block, M.S. and Kent, J.N.² stated that drilling stent has the advantage of indicating the required implant position and alignment in relation to the opposing jaw.
Fig. 1. Duplicate complete denture with holes indicating implant positions.

Fig. 2. Lingual denture parts cut away to provide drill access guides.

**Fixture installation**

In the edentulous jaws the minimum number of fixture necessary support a fixed prosthesis is four. The prosthodontist and oral surgeon decided to use five implants so that better force distribution can be achieved. Surgical installation is usually done in one visit, with the patient under sedation and either local or general anaesthesia.
The implant installation sites are exposed from soft tissue and using drills of increasing diameters, holes are prepared in the bone followed by countersinking and threading. The surgeon places fixtures of sufficient length in order to engage the maximum depth of available bone.

When fixtures have been installed, protective metal caps are screw connected to the exposed terminals of the fixtures, a precaution, which prevents bone forming in their internal threaded parts. Returned sutured soft tissue is then positioned to completely cover the installed fixtures. After this has healed the presence of the fixture is not discernible, either to the patient or to the observer.

**Fig. 3.** The surgical installation of fixtures.

**Temporary prosthesis**

The edentulous patient is pleased to have their dentures modified at the chairside with a temporary soft lining which is sufficiently extended in order to cover the baried
fixtures. There then follows a period of clinical inactivity during which time new bone forms onto the acquiescent fixtures. This interval will occupy at least 3 months for the mandibular fixtures. Surgeons will not hesitate to extend healing intervals if this is required.

**Abutment connection**

Following uneventful healing, the patient returns to the operating chair for a second and simpler surgical procedure of abutment connection. A circular punch instrument removes soft tissue to expose the cover screws, the removal of which reveals the hexagonal heads of the fixture terminals.

Plastic healing caps are attached to abutments, protecting their machined fitting surfaces from damage and the ingress of debris. A soft lined denture may be worn over the smaller cap and its abutment during the period of prosthetic treatment, which then follows.

**Implant positions**

In avoiding the metal nerve, implant in the edentulous mandible will be grouped towards the anterior part of the jaw. White, G.E.¹ stated that “it has been shown that in the edentulous jaw implants installed in a straight line are less able to tolerate cantilever loads than those arranged on a curve.” This is due to an opening effect on the screw joints from cantilever loads during function, with the consequence of adversely stressing the implants and connecting screws.
The design of the framework

According to White, G.E.¹ “Emerging from this work, is the explanation of how occlusal loads collected by cantilevers are transmitted to other framework parts to stress implants and their bone bed.” Although variables such as actual biting force, the amount and quality of bone, fixture lengths and their positions decide the clinical consequences of framework transmitted loads, some guidance for obtaining safe bearing may be obtained. Other factors being equal the shorter the cantilever the less the transmitted load.

Primary impression study cast

Primary impressions of both jaws are taken. The obtained study casts are necessary as a diagnostic aid for framework and prosthesis design and for making special trays. The abutment terminals are usually protectively covered at this time.

Fig. 4. Primary impression study cast with clinical abutments with connected protective healing caps.
Special tray construction

The objective of the final impression is to record the positions of the abutments in the mouth and transfer these to a master cast. When impression copings are incorporated in impressions, they register the individual position of abutment terminals; an arrangement, which allows a master, cast to contain abutment replicas, which are in the same position as the abutments in the mouth.

The required tray needs to be provided with an aperture for abutment cylinder access. This is made by first placing a wax block former 8-10mm wide and 12-15mm in height over the abutments. A sheet of autopolymerising resin dough is then draped overall and trimmed to the required periphery. White, G.E.¹ said that “special tray resin has proven to be a satisfactory material for this work.”

Fig. 5. Special tray with impression copings connected to the abutments using guide pins.
Impression materials

After the dentist has removed the healing caps or other cover the impression copings are connected to the abutments with guide pins. When everything is correctly arranged the pins protrude through the tray opening without tray contact. Impressions are made in impression plaster as well as in a variety of elastic materials. Impressions are removed from the mouth by unscrewing, but not removing, the guide pins.

Fig. 6. Plaster impression showing the exposed fitting surfaces of the impression copings, which connect with the abutment replicas.

Placement of the abutment replicas

Abutment replicas are attached to copings by carefully re-tightening the guide pins. Following replica connection, the cast is poured in hard stone. The guide pins must be unscrewed before the impression can be removed and the cast trimmed.
**Pattern making**

Cylinders of 4mm in height are selected as dictated by available space and abutments cleaning access considerations. Selected cylinders are then securely tightened with a screwdriver to the abutment replicas using short guide pins or slave gold screws as preferred. Then you wax up the framework. The framework must be at least 3mm from the mucosal tissue; this is for adequate cleaning access space. The framework must also be strong enough to withstand masticatory forces without fractures or permanent deformation and safety transmit these loads to its supporting implants and their bone bed. Jimenez-Lopez, V.³ stated that “The framework must have a passive fit.”

![Fig. 7. The finished pattern.](image)

Veneer-lock plastic beads provide an entirely satisfactory resin retention system.

Beads are used on the upper half on the pattern and all over cantilevers having a 2mm or more mucosa clearance.
Fig. 8. Plastic beads provide an entirely satisfactory resin retention system.

**Spruing the pattern**

Implant supported frameworks are comparatively large and a special consideration of their spruing necessary if contraction porosity is to be avoided. The greatest bulk of metal will be in the cantilevers so these must have one sprue former each. Elsewhere, the pattern is usually of smaller volume, so can have fewer sprues as necessary. Four 4.0mm diameter (or wider) round wax sprue formers of equal length are attached full diameter to the pattern. After spruing the pattern, you can invest your framework and then cast it.
Fig. 9. Sprue formers of equal length and 4mm minimum diameter are necessary.

**Framework casting and finishing**

After casting the framework, you must check the fit; the fit must be perfect and passive. Then the framework can work off and polished.

Fig. 10. Finished framework.
Then the framework is ready for trial in the mouth. Fit the framework in the mouth with one screw in an implant.

**Fig. 11.** Fit of framework in the mouth with one screw in a cantilever implant.

**Setting up of fixed prosthesis**

When an intermediate prosthesis is worn, or the space between the residual ridges is large and the implants are in helpful position, the framework can be made before the teeth are set-up. A wax occlusal rim is conveniently attached to the framework at the time of its test fitting and a registration of jaw relation made with the framework connected to the implants

The advantages and disadvantages of this method is as follows:

Advantages:

1. Regardless of bone resorption, the implant retained rim is stable during jaw registration.
2. The positions of unhelpfully sited implants and their screw access holes are revealed during setting-up and the best compromise tooth appearance obtained for consideration at the first try-in.

3. Fewer treatment visits for the patient.

Disadvantages:

1. The framework may be made without knowing the existence of abnormal jaw and/or tooth relationships.

2. The space between the residual ridges may be small, causing gross tooth interferences with the framework, which could have been avoided by the use of shorter gold cylinders and/or altered framework shape.

**Fig. 12.** Completed set-up ready for trial in the mouth.

After you have completed the set-up it is ready for trial in the mouth.

In Osseointegrated Dental Technology (1993) stated another method where you first wax up the denture before you fabricate the framework.
The advantages and disadvantages of this method is as follows:

Advantages:

1. The appearance of the teeth and their occlusion can be established before the framework is made.
2. Because fixing screws are not used, the occlusal rims and trial denture are easily inserted and removed from the mouth for chairside adjustments.
3. The patient may take the trial dentures away for assessment at home.

Disadvantages:

1. The future position of screw access holes and framework parts cannot be assessed, so tooth positions may be approved which are not technically possible.
2. The registration of jaw relationships and the try-in are assessed on based that may rest on unfavourable ridges and moveable mucosa.
3. Additional treatment visits are necessary.

**Processing of fixed complete prostheses**

The denture is processed following complete denture practice. After protective polishing caps have been attached to the cylinders, polishing can take place.

![Fig. 13. The appearance of the polished prosthesis.](image)
Fitting the protheses

The prosthesis is installed in the mouth, by screwing it on to the framework. Then you get a fully functional complete upper and implant supported lower protheses.

![Image of prosthesis]

**Fig. 14.** Finished upper and lower protheses.

Conclusion

All products that are being fabricated for the oral cavity needs to be regularly checked by the dentist for any faults that may occur over wear and tear of the material. The prosthesis has to be brought to attention to the patient that a regular service and possibility of a repair is needed. Its excellent support stability and long term treatment success are surely implications that it’s an outstanding prosthesis but patients and their protheses will surely return
References

