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Case Report
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A Modified Radiographic Technique to Confirm the Attachment Seating in Auricular Prostheses

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Objectives Implant-retained maxillofacial prostheses have proven to be more successful than conventional adhesive-retained prostheses. Implants enhance prosthesis stability and retention through retentive attachments. However, a faulty abutment-implant interface in terms of complete seating and passive fit could be responsible for mechanical and/or biological complications. This case report describes a simple imaging method to check this adaptation.

Case: In our case, two shoulder type maxillofacial implants with 4 mm length and diameter were placed with 15 mm distance using a surgical guide. After completion of the healing course and making an impression, a metal bar attachment was made and tried on. In addition to using conventional methods to check the complete and correct seating of the suprastructure (bar attachment), a modified posterior-anterior radiograph with a 15-degree downward head tilt was taken. After confirming the seating of the attachment, the auricular prosthesis was made accordingly.

Conclusion Use of radiography to ensure the seating of intraoral implant-supported frameworks is common and accurate. However, there is no radiographic imaging method to check the fit of extraoral implant-supported substructures. This case report described a simple and effective radiographic technique for auricular implant supported by a substructure which is especially important in case of presence of thick skin around the implants, which compromises the accuracy of direct exploring.

Keywords Maxillofacial Prosthesis; Bone-Implant Interface; Radiography

Introduction

Auricular defects may result from trauma or surgical procedures, or may be congenital.[1] As compared with conventional auricular prosthesis, using implants has been proven to be advantageous to improve retention, esthetics, tissue health, prosthesis durability, and patient satisfaction.[2-5]

It has been stated that extra-oral implants are a reliable and successful option to achieve the desired patient appearance.[1] The overall 2-year survival rate and success rate of implant-supported auricular prosthesis are reported to be 94.1% and more than 95%, respectively which are higher than the corresponding values for nasal or orbital implants.[1, 6, 7]

Using bar-retained auricular prostheses improves the prosthesis retention and patient comfort. However, ensuring the passive fit and complete seating of the bar is essential especially when cast bars are used. This is because of the possible dimensional changes that occur as a result of cumulative errors in wax-up, investing, and casting phases.[8] The importance of complete seating and passive fit of frameworks in dental implant-supported prostheses has been well documented.[9-11] The misfit of framework could cause internal stresses that ensue mechanical and biological complications.[12, 13] Therefore, different techniques have been suggested to confirm the fit such as direct visual inspection by using a dental explorer or Periotest device, and more commonly, intraoral radiography.[14-16] The seating accuracy and passive fit of bar attachment on implants placed in the mastoid region are usually checked by ensuring no rocking or clicking/binding of the bar attachment while fitting.[17] This is especially important when the axes of the implants are not parallel to each other.[18]

However, no imaging technique has been introduced in the current literature being able to detect the abutment-implant and/or bar attachment-abutment junctions for extra-oral implants such as for an implant-supported bar-retained auricular prosthesis. Imaging would be especially complicated considering the various skeletal structures possibly blocking the direct and precise view of the aforementioned junctions. Considering around 6% loss rate of implants in the auricular region, [19] lack of complete seating or passive fit of the attachment might be responsible for this finding. The gap at the interface could possibly create a niche for microbial plaque accumulation which depending on the implant depth could be inaccessible for the hygiene measures to be effective. Herein, we present a new modified imaging technique to evaluate the gap at the abutment-implant and bar attachment-abutment interfaces in an implant-supported auricular prosthesis.

Case Report

A 55-year-old man with a history of auricle loss in the left side due to well differentiated squamous cell carcinoma was referred to us for rehabilitation of his auricular defect. He had no remarkable medical history and no previous radiotherapy. Considering the patient's demand for an optimal replacement for his lost ear, an implant-supported bar-retained auricular prosthesis was considered as the treatment plan.

1- In order to fabricate a surgical guide for implant placement, primary impressions of the left and right ears were made with irreversible hydrocolloid material (Alginate; Zermack, SpA, BadiaPolesine, Italy). Both

impressions were poured with type IV dental stone (Die Keen; HeraeusKulzer, Armonk, NY, USA).

2- A wax pattern of the lost ear was formed based on the shape and position of the right ear. In order to assure a symmetrical ear pattern, a try-in session was planned. An inter-occlusal wax record was made and then joined to the left ear wax model with an extra-oral wax bar. The left ear wax pattern, inter-occlusal wax record, and extra-oral wax bar were processed separately with heat-curing clear acrylic resin (Orthodontic acrylic; Great Lakes Orthodontic, Tonawanda, NY) (Figure 1).

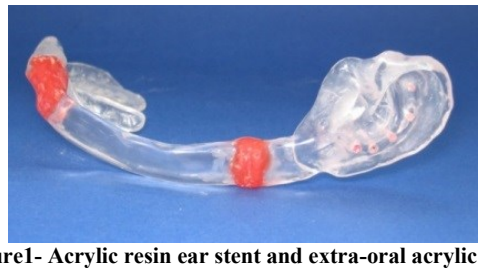

Figure1- Acrylic resin ear stent and extra-oral acrylic resin bar.

3- After placing the acrylic resin ear and extra-oral acrylic resin bar on the patient's face and the acrylic inter-occlusal record in his mouth, they were joined to each other using acrylic resin (Pattern Resin, GC America, Chicago, USA) to ensure the correct position and stability of the guide. Given the ideal position of the ear implants being under the antihelix region,20 five holes were created in the anti-helix region of acrylic resin radiographic guide using a round carbide bur and handpiece. Then gutta-percha (Dental stopping; Coltene/Whaledent, Mahwah, NJ, USA) was placed into the holes as indices for the computed tomography (CT) scan. While the patient wore the radiographic guide, CT was performed from the left ear region to determine the suitable areas for placement of the implants in terms of quantity and quality of the mastoid bone.

4- After removing the gutta-percha, the guide was sterilized with ethylene oxide before using it as a surgical guide. Two shoulder type implants with 4 mm length and 4 mm diameter (ITI extra oral implant system, Straumann AG, Waldenburg, Switzerland) were placed in the desired areas with 15 mm distance from each other.20After 4 months, the implants were exposed and the healing abutments (Straumann AG, Waldenburg, Switzerland) were connected to the implants, and 3 weeks was given for soft tissue healing.

5- Three weeks later, final impression was made using two open tray impression copings (Straumann AG, Walden burg, Switzerland) and elastomeric impression material (Affinis, Coltene Whaledent Inc., Mahwah, NJ) (Figure 2). The hair around the ear was coated with petroleum jelly (Vaseline, Chesebrough-pond's USA Co, Greenwich, CT). After removing the impression, the implant analogs (Straumann AG, Waldenburg, Switzerland) were screwed to the impression copings, and the impression was poured with type IV dental stone (Die Keen; Heraeus Kulzer, Armonk, NY, USA).

Figure 2- Final impression of the ear taken with elastomeric impression material.

6- Two UCLA plastic abutments were connected with mid bar and two terminal cantilever bars. The position of the bars was corrected according to the original wax model and then the wax pattern of the bar attachment was tried on (Figure 3). After confirming the desired seating of the attachment and ear prosthesis wax patterns, the bar attachment was cast with Ni-Cr alloy (4all®; Ivoclar Vivadent, Schaan, Liechtenstein).

Figure 3- Try-in of wax pattern of bar attachment

7- To ensure complete seating and passive fit of the suprastructure (bar attachment), it was screwed to the implants (Figure 4) and a modified posterior-anterior radiograph was taken. In this imaging technique, the patient's head was bent 15 degrees downward compared with the standard posterior-anterior radiograph. Before proceeding to the next step, the complete seating of the suprastructure was confirmed radiographically (Figure 5).

Figure 4- Cast bar attachment screwed to the implants

Figure 5- Seating of bar attachment confirmed radiographically

8- Using acrylic resin (Futura Lay P, Schutz-Dental GmbH, Rosbach, Germany), a base was made for embedding of the clips prior to completing the waxing of the left ear. For final evaluation in terms of esthetics and symmetry, it was tried on the patient's face. During flasking, silicone (Cosmesil, Principality, London, UK) was used for replacing the wax after wax elimination. After deflasking, extrinsic colors (Factor II Inc. A-2186 platinum silicone elastomer, Lakeside, AZ, USA) were used to improve the coloration. Then, the prosthesis was placed in an oven at 50°C for 15 minutes.

9- At the delivery session, the bar attachment was screwed to the implants. After inserting the plastic clips on the inner surface of the prosthesis, the prosthesis was delivered (Figure 6). Necessary hygiene instructions were given to the patient.

Figure 6- Final auricular prosthesis delivered.

Discussion

Using implants to retain auricular prosthesis has proven to be beneficial in many aspects.[2-5]The survival rate for extra-oral implants is about 94% in the mastoid region which is higher than other parts of the craniofacial region.[1, 6, 7] However, there is less than 6% failure rate which similar to dental implants might be related to lack of passive fit and complete seating of the suprastructure.[9-13]

There are various methods to confirm the complete seating and passive fit of supra structures such as using direct vision, dental explorer, and radiography.[14-16] However, there is no standard imaging protocol to confirm supra structure seating on extra-oral implants. A proper imaging method would especially be helpful for auricular prostheses when there is no access to the abutment-implant interface due to the thick skin around the implants.

Although the accuracy of impression as a critical factor for accuracy of supra structure could be tested at the wax pattern try-in session, the proceeding stages such as cumulative minimal dimensional changes during the wax-up, investing, and casting procedures could possibly affect the accuracy of the final supra structure.[8] Previous studies regarding implant-supported auricular prostheses checked the seating of the suprastructure on the implants using direct visual technique or a dental explorer. [3, 4, 17, 19] This report suggested a modified posterior-anterior radiographic technique that is taken while the patient bends his head downward in order to exclude the view of the bony structures that might block the direct view of the abutment-implant interface. This method provided a direct and easy view of the bar attachment-implant interface to ensure complete seating of the supra structure before proceeding to prosthesis final processing stage.

Conclusion

In this case report, a new radiographic method was described to confirm complete and accurate seating of the metal framework used for reconstruction of implant-supported auricular prosthesis. This method could help in achieving the required passive fit before proceeding with the treatment and prevent the adverse effects of incomplete seating of the framework which could lead to failure of the maxillofacial implants.

Conflict of Interest

No Conflict of Interest Declared ■

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