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Improved reconstruction of an implant-retained auricular prosthesis using CAD/CAM technology

Maxillofacial defects and facial deformaties may cause significant psychosocial issues in affected individuals as social interactions essentially depend on the structural and functional integrity of the head and neck area.[1,2] Maxillofacial prosthetic restorations are used to improve the life quality of those patients.[2,3] In dentistry, several traditional surgical and restorative options were challenged and replaced with newer methods, and there is no exception for maxillofacial restorations.[4,5] The use of advanced digital methods such as CAD/CAM and rapid prototyping allowed more precise and esthetic outcomes with maxillofacial restorations by eliminating issues associated with traditional methods such as hand-sculpting wax patterns, investing/processing procedures.[4,5] This report depicts a sequential process of fabricating an implant-retained auricular prosthesis by using CBCT, CAD/CAM, rapid prototyping, and spectrophotometry. In this case, a 3-dimensional (3-D) ear model was designed and fabricated by using the data of the intact ear with an 3-D planning software and printer.

A 26-year old male patient with an auricular prosthesis retained by two implants on the right side presented to our faculty practice. He stated that he received an auricular prosthesis after having two implants in the right mastoid bone 3 years ago. At this moment, his chief complaints were the poor esthetics and marginal fit of his prosthesis.

The steps below were strictly followed to fabricate a new implant-retained auricular prosthesis. The patient's head was scanned with a cone-beam computed tomography (CBCT) machine. After 3-D reconstruction of the head and neck (3D Doctor, Able Software Corp., Lexington, MA), the surface contours of the face were carefully examined. The auricular prosthesis was virtually designed by means of a 3-D modeling software (Rhinoceros, McNeel North America, Seattle, WA). After marking the midline of the face as the reference axis of symmetry, the image of the intact ear was extracted, mirrored, and placed on the affected side (Fig. 1). By utilizing some tools incorporated in the software, the margins were merged with the surrounding skin. The presence of a patent auditory canal helped the mirrored ear positioning and the retention of the prosthesis by an extension. The final design of the ear file was imported into the 3-D printing software (EnvisionTEC Inc., Dearborn, MI) to create the tangible ear model. Then, the 3-D ear model was fabricated with a 3-D printer by using a rapid prototyping method.

After the fabrication of the ear model, it was duplicated in sculpting wax to adapt to the patient's defective site. A silicone elastomer (Cosmesil M511, Principality Medical, Newport, UK) was processed according to the manufacturer's directions to fabricate the definitive auricular prosthesis. A skin color matching system
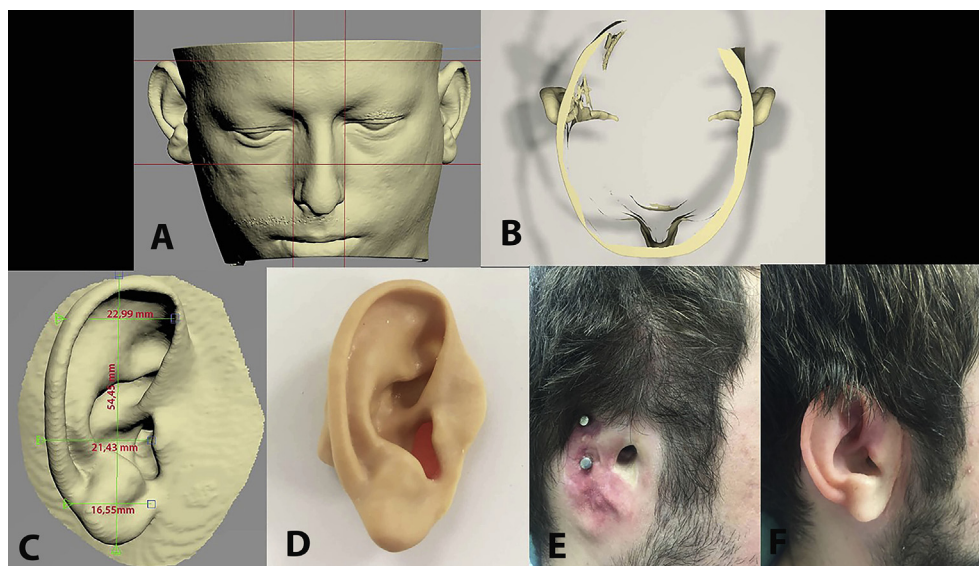
Figure 1 The frontal (A) and horizontal (B) images of the head after the intact ear was extracted, mirrored, and placed on the affected side. The 3-D ear model was designed (C) and fabricated (D) with a 3-D printer. The lateral views of the patient with missing right ear (E), and after the implant-retained auricular prosthesis was delivered (F).

(Spectromatch Pro, Belvedere, UK) was used to select a suitable color that fit the patient's skin tone. The definitive auricular prosthesis was placed on the right side of the patient with the help of the hollow canal extension and the magnetic implant attachments. The patient was satisfied with the final outcome, and he did not have any functional and esthetic problems in the follow-up period of two years.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

Acknowledgments

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jds.2019.02.002.

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