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Case Report

Customized cast post-and-core abutment for single tooth implants: An easy approach

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For the successful outcome of implant rehabilitation, a functional prosthesis is as significant as an uneventful surgery. A variety of abutment designs are available for the restoration of a single tooth implant. These variations are an outcome of the requirement for the better orientation of the implant to the occlusal plane and to adjust the abutment according to the given implant position and angulation. Varied clinical situations may preclude traditional abutments and require special or customized abutments. Moreover, there is a requirement to develop an alternative to resolve the frequent problem of screw loosening observed in the screw-retained abutments. This paper discusses a new and easy approach for the fabrication of a cemented custom-made cast post-and-core abutment to be used with all types of implant systems.

Key words: Cemented customized cast abutment, tooth implant

Last few decades have witnessed drastic changes in abutment design toward the improvement of dental implant systems. Implant standardization has been achieved with extensive clinical research and improvement in the metallurgical and mechanical engineering aspects, with greater understanding of implant biomechanics.^[1] The present requirement is to focus on the design of an “abutment,” which is very vital for the success of the implant retained/supported prosthesis. Abutment is defined as that portion of the implant that serves to support and/or retain prostheses.^[2] Different implant systems offer a wide range of abutment designs, sizes, modes of retention, etc. and it contributes to the overall success (peri-implant health/function/aesthetics) of the implant prosthesis. There are three main categories of implant abutments based on the method by which the prosthesis or superstructure is retained on the abutment.^[3] They are as follows:

1. Screw retained
2. Cement retained.
3. Removable attachment device (bar and clip, ball and socket, magnet).

Abutments may further be classified as straight or angled abutments based on the axial relationship between the implant body and abutment. Most of the available abutments are prefabricated, manufactured in machined form and can be modified within the limits by altering their shape and angulation to fit them into

a situation other than the routinely encountered.^[4,5] The custom-made^[4] cast abutment for an implant is produced with a greater facility for the compromised implant position and for certain challenging situations such as the frequent loosening of the abutment locking screw,^[6-9] the non availability of desired abutment and locking screws and the inadequacy of the available vertical space for restoration. A technique describing the fabrication of a customized cast post-and-core abutment is discussed below.

AIMS AND OBJECTIVES

1. To develop a technique for the fabrication of custom-made cast post-and-core abutment for dental implants.
2. The abutment design using this technique can be universally used with all types of implant systems.
3. To develop an easy, simple and cost-effective method.

TECHNIQUE

After the successful osseointegration of the dental implant [Figures 1a, b and 2a, b] (with both clinical and radiological evidences), loading has to be initiated by means of suitable abutment and prosthesis. In this technique, we aim at designing a custom-made cast

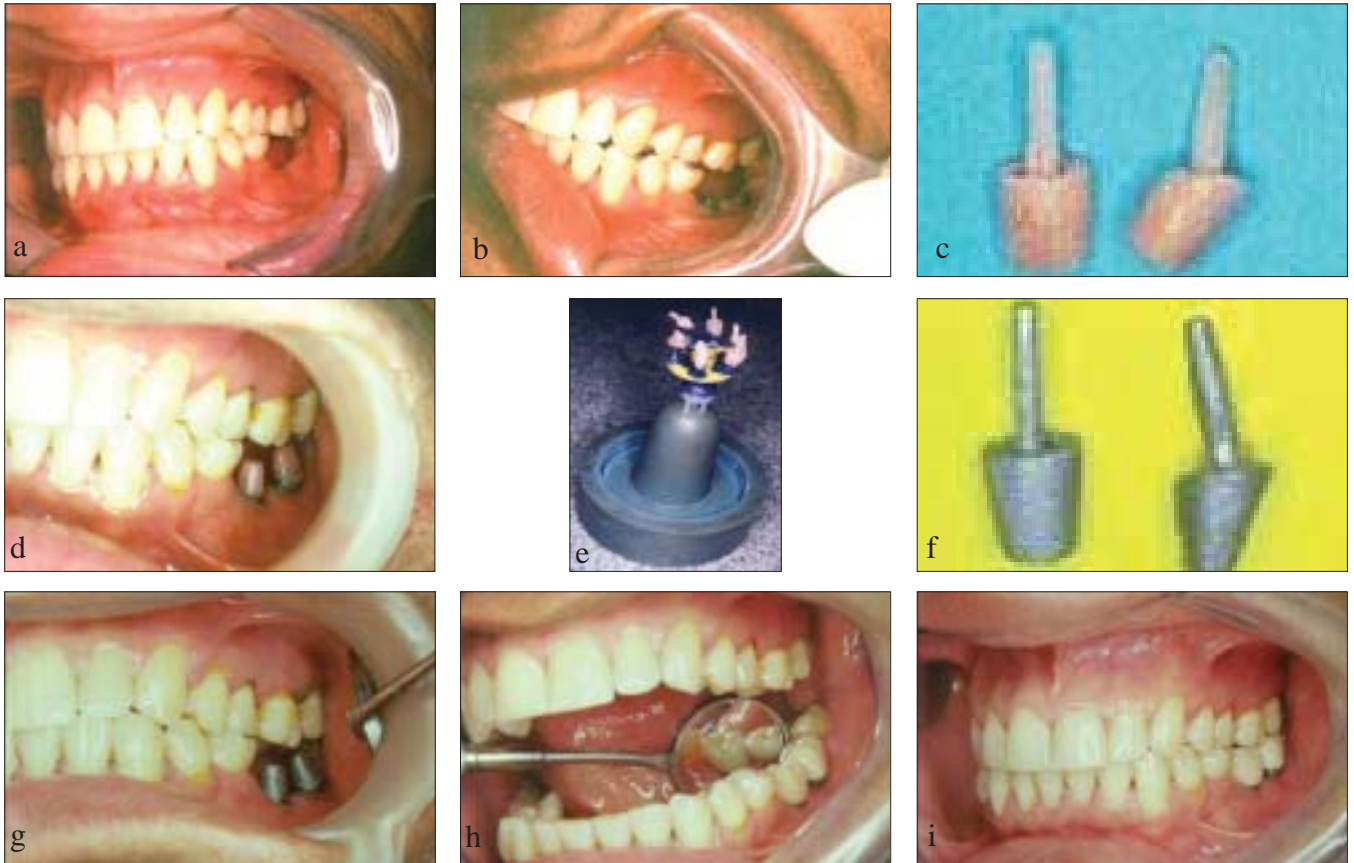


Figure 1: (a) Partially edentulous case showing the left mandibular first and second molars as absent, (b) two indigenous titanium dental implants placed in edentulous area, (c) illustration of the pattern of customized post-and-core type of abutments in self-cure acrylic, (d) try-in of customized pattern made in self-cure acrylic, (e) patterns sprued and ready for casting, (f) post-and-core type of abutment after casting in metal, (g) cemented customized cast post-and-core type of abutment, (h) final porcelain fused to the metal retainer cemented over the cast post-and-core type of abutments, (i) illustration of the missing left mandibular first and second molars rehabilitated by implants followed by the placement of the customized abutment.

post-and-core abutment in which the core has to be designed in the form of an abutment. The procedure to be followed is given below and is almost similar to that performed for a natural tooth.^[10,11]

1. Measure the available vertical space/length/height within the implant by placing a reamer to full length and record this length with the rubber stopper. This would determine the accurate length of the post to be designed subsequently.
2. Prepare a post made of an autopolymerising resin with the diameter in accordance to the approximate core diameter of the implant screw taking into consideration that the prepared post just fits into the implant. *i.e.*, neither tight nor loose. The length is marked as predetermined by the reamer and initially it is kept longer by 4-5 mm to facilitate the handling and fabrication of the core.
3. Apply petroleum jelly to the internal surface of the implant and seat the prepared post till the marked length. Wipe the area with a gauze piece and dry it with a controlled air spray in order to

leave a thin film over the exposed implant head taking into account that the post is well seated in the fitting surface and no bulk of petroleum jelly present around the post.

4. Preparation of the core is carried out with an autopolymerising resin. Acrylic resin monomer and polymer are mixed in a dappen dish and the appropriate consistency is applied around the exposed portion of the prepared post (beyond the marked length) to provide the bulk for the final preparation of the core.
5. The core can be roughly shaped with hands using finishing stones and discs and the final contouring is done with the post-and-core pattern in place. During the fabrication of the core, the one-piece unit of post and core is loosened and resealed several times in the implant while it is still in rubbery stage to prevent its interlocking within the implant [Figures 1c, 2c].
6. The height, size and angulation of the abutment/core is adjusted with respect to the given clinical

situation such as the amount of available vertical and horizontal spaces and the inclination and alignment of adjacent or opposing teeth. [Figures 1d, 2d]

7. After the pattern fabrication is complete, the length of the post is shortened by 0.5-1.0 mm in order to create space for the cementing medium.
8. The customized pattern of post-and-core abutment is now ready to be sprued and invested and the casting is carried out using the desired metal [Figure 1e].^[12] A sound casting technique is essential because any porosity or deformity could lead to a weakened cast and failure [Figures 1f, 2e].
9. The cast post and core is checked for its fitting inside the implant and necessary adjustments are made till the final seating is achieved.
10. The cast post-and-core abutment is now sandblasted in order to achieve a roughened surface, which will enhance the retention of the post within the implant.
11. Finally, the post and core is cemented within the

implant by using a luting agent [Figures 1g, 2f].

12. Impressions are now taken for the fabrication of suitable retainers and the implants are loaded there on [Figure 1h, i and 2g, h, i].

Advantages

1. This technique allows us to fabricate an abutment that is custom designed and can be applied universally to all the implant systems.
2. The design parameters such as height, width and angulation can be completely controlled by the operator as per the desired clinical requirements.
3. The cement-retained customized abutment also overcomes the common complication of screw loosening observed in screw-retained abutments.^[13]

Disadvantages

1. Greater operator skill and efficiency is required.
2. Number of sittings is increased and more time is required for fabrication.



Figure 2: (a) Preoperative photograph showing the maxillary right lateral incisor and canine as absent, (b) illustration of the placement of indigenous dental implants placed in the missing area, (c) resin pattern of post-and-core abutment, (d) try-in of the customized pattern made in self-cure acrylic, (e) post-and-core type of abutment after casting in metal, (f) cemented customized cast post-and-core type of abutment, (g) illustration of the impression made of cast post-and-core abutment cemented on implants, (h) final porcelain fused to the metal retainer cemented over the cast post-and-core type of abutments, (i) illustration of the missing right maxillary lateral incisor and canine rehabilitated by implants followed by the placement of the customized abutment

It appears that the quest for an ideal prosthetic abutment and implant connection is still in progress. With this technique, we have reached a step closer in designing an abutment that can be customized as per the requirements, which may either be a compromised implant position or the problem of abutment screw loosening. Further, the custom-made design makes this abutment compatible with all the available implant systems.

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