Clinical Report

Customized cast-screw-retained bar fabrication for implant overdenture: An alternative technique

S. K. Bhandari, T. Ravindranath, Shabina Sachdeva, Shraddha Gurlhosur, S. S. Bhasin
Department of Dental Research and Implantology, Institute of Nuclear Medicine and Allied Sciences, Min of Defence (DRDO), Brig S.K. Mazumdar Marg, Timarpur, Delhi - 110 054, India

For correspondence
Lt Col. S. K. Bhandari, Department of Dental Research and Implantology, Institute of Nuclear Medicine and Allied Sciences, Delhi - 110 054, India. E-mail: ltcolbhandari@yahoo.co.in

Implant overdentures are an effective treatment modality for rehabilitating edentulous patients and there are various attachment mechanisms between the implants and the overlying dentures such as bar and clip, ball and socket, and magnet and keeper. The bar and clips system has been used over years to retain and support implant-supported overdenture. Majority of them are available as preformed patterns that are expensive and provide little scope for clinical adjustments. A new alternative technique has been devised that involves the custom designing of the screw-retained bar pattern in readily available materials, followed by the casting in desired metal and chairside incorporation of the retentive clips.

Key words: Customized cast, screw retained bar

INTRODUCTION

The bar and clip systems is one of the most effective mode of retention and support for the implant overdentures. It was introduced around half a century back in 1950 when a Swiss Prosthodontist, Eugene J. Dolder[1,2] designed a pear-shaped preformed gold bar with a matching gold sleeve with the major and minor diameters as 3 mm and 2.2 mm, respectively. It is available in segments with a length of 50 mm and can be cut as desired and soldered to the implant abutments to form a bar. The bar splints the implants and helps to retain the overlying denture. Another popular bar was that developed by Swiss dental laboratory technician Hader H.[3] in the late 1960s and was named as the Hader bar and rider system. It is a rigid rectangular bar resembling a keyhole in cross section and has a round superior aspect and an apron below, where the apron acts as a stiffener to improve the strength of the bar and limit its flexibility. It is available as castable plastic patterns (with a diameter of approximately 1.8 mm and a length of 50 mm) and plastic clips / sleeves. These can be waxed to the abutment copings and the entire assembly is cast as one single unit in the desired metal. In 1992, English, Donnel and Staubli[3] introduced the EDS bar system; this system was a modification of Hader bar, with only a height of 3 mm height in contrast to the original 8.3 mm. Metal / nylon / plastic sleeves can be used with these bar systems. The flanges of the sleeve flex over the bar when the overdenture is seated to provide retention to the system. These bars can be either cement-retained or screw-retained. All these preformed bar systems are either precious metal bars or plastic castable bar patterns[4] in specific shapes and sizes and can be used in only those situations that suit their specifications, leaving little scope for adjustments.

Considering the high cost of the preformed precious bar forms and their predetermined designs, which limits their flexibility for a range of patient needs and desires in varied clinical situations, an alternate technique of custom designing of a screw-retained bar was performed using readily available materials such as autopolymerizing resin, blue inlay wax and Ni-Cr alloy.

TECHNIQUE[5]

1. Expose the head of the implants by removing the healing cap / cover screw. The diameter of the head is measured either using a caliper or is documented from the manufacturer's catalogue.
2. Prepare an acrylic rod confirming to the diameter of the implant head by mixing the autopolymerizing resin polymer and monomer and rolling it or by taking a metal / plastic rod of same diameter and making an alginate impression of it and then pouring it with autopolymerizing resin to obtain a uniformly thick acrylic rod.
3. The height of abutment and prospective bar are determined in accordance to the available

vertical space, which should be sufficient to give adequate clearance and sufficient bulk for the fabrication of a subsequent complete denture, favorable arrangement of teeth and oral hygiene procedures.

4. The acrylic rod is now cut to the desired height and number to form the future abutment portion of the bar system.
5. For external hex implants, a hole is prepared on the fitting surface of the prepared pattern of the abutment (using an acrylic trimmer), which is greater in diameter and height than the hex, without touching the margins. This is done so that abutment when seated over the implant is loose and the marginal fit is not compromised.
6. The internal thread area of the implant is blocked with cotton or petroleum jelly. Lute the fitting surface on the abutment with autopolymerizing resin and seat it over the exposed implant head (in sandy stage) taking care of the margins. Take it out and place back two to three times (in dough stage) to avoid it's interlocking with the implant. Shape it in a form of a prepared abutment with taper of 3-5 [Figure 1].
7. Measure the thread diameter of the implant locking screw. Pick a drill of the same size or smaller size, and from the fitting surface of the formed abutment, make a hole through and through long axis of the inner thread of the implant. Make sure that the diameter of the hole is the approximately same as that of the implant locking screw. Place the abutment over the implant and try the fit with the locking screw and adjust accordingly.
8. Measure the height and the diameter of the locking screw head and using a drill of approximately same diameter, make a hole from the superior surface of the prepared abutment in such a way that the long axis and the centre of both the holes coincide and the depth of the second hole (superior) is kept equal to or greater than the height of the abutment screw head.
9. Apply blue inlay wax on the margins of the abutments and seat it over the implant head with digital pressure and lock the abutment with the screw [Figures 2, 3].
10. Keeping the abutment in place the marginal fit, the parallelism of the abutments, the height and the taper (3-5) is rechecked and corrected.
11. With the abutments in place, the available vertical and horizontal space is re-evaluated and the selection of the proposed bar dimensions and location is reconfirmed (diameter, cross-sectional shape and location). At least 1.5-2 mm of space was provided between the undersurface of the bar and mucosa to allow for the oral hygiene procedures.[6]
12. In this technique, we fabricated a bar having a round cross section and diameter of 1.5-2 mm using an autopolymerizing resin. The desired length of this bar pattern is cut and luted to the selected location between the customized abutments using autopolymerizing resin. The resin bar pattern should be kept parallel to the edentulous ridge [Figures 2, 3].
13. The entire one-piece assembly of the bar and abutment pattern is checked for a passive fit and adaptation at the margins and is then unscrewed and is immediately cast in the desired metal.[7] We performed the casting using the Ni-Cr alloy [Figures 4, 5].
14. The customized screw retained bar is finished and polished (electrolytic polishing was used to yield high surface luster) and is finally screwed onto the implant abutments [Figure 6].
15. The construction of the bar retained and supported denture was carried out following the conventional steps and procedures [Figure 8].
16. Prefabricated retentive clips are incorporated chair side onto the fitting surface of the denture for retention [Figure 7].

Advantages

1. The materials used for the fabrication of the bar and abutment is an autopolymerizing resin and blue inlay wax and Ni-Cr alloy, which are reasonably priced, readily available and user friendly in contrast to the precious prefabricated bars.
2. The choice of cross-sectional shape of the bar is round in contrast to the oval or keyhole shapes of the prefabricated systems such as Dolder and Hader Bar, and this produces a greater degree of freedom for rotation and has lesser bulk and occupies less space; therefore, it can be effectively used in situations with decreased vertical dimension and also allows a metal superstructure with a smaller height. The ultimate selection of cross section and diameter will, however, also depend on the selection of metal.
3. With the screw retained bar, there is a definite advantage of easy retrievability as compared to cement retained and it also provides adequate retention and resistance form even with a lower height of abutment.[8]
4. The customized screw retained bar can be made compatible with any available implant system.

Disadvantages

1. Greater operator skill is required.
2. More time is required.
3. More chances of distortion during investment and casting as against the soldered prefabricated ones.

Figure 1: Fabrication of autopolymerizing resin patterns of abutments over implants

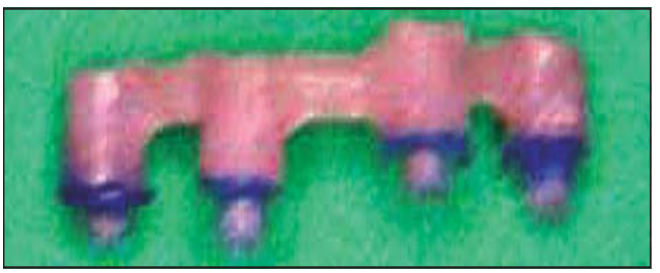

Figure 2: Facial view of the completed pattern of the bar assembly

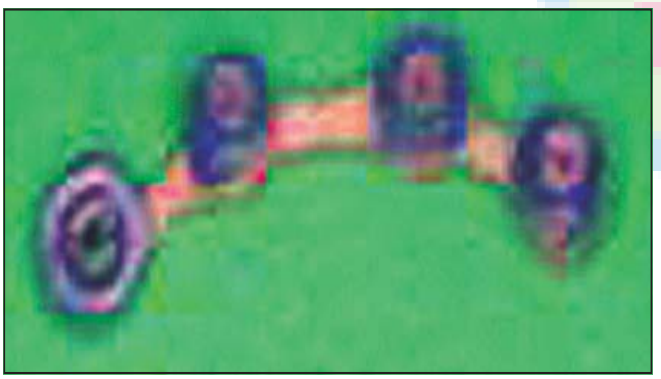

Figure 3: Fitting surface of pattern of the bar assembly showing blue inlay wax at the margins

Figure 4: Try-in of the final bar assembly pattern that is ready for casting

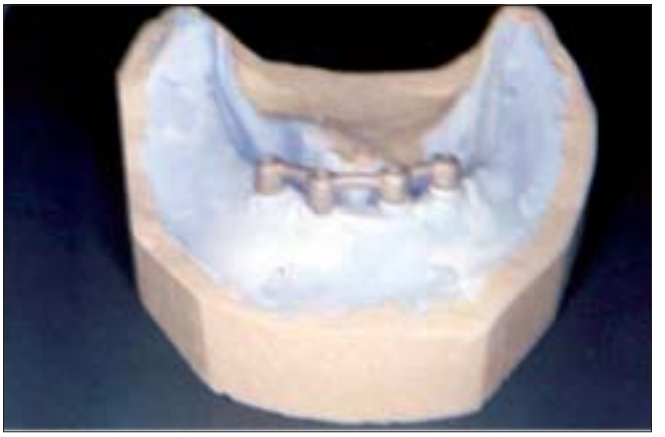

Figure 5: Cast-screw-retained bar assembly

Figure 6: Cast-screw-retained bar assembly fitted on the implants

Figure 7: Tissue surface of the mandibular denture showing retentive clips

Figure 8: Bar-and-clip-retained mandibular complete denture

CONCLUSION

An alternative technique for the fabrication of a customized cast-screw-retained bar for implant overdentures has been presented. When this cost-effective, easy and simple technique is performed, the door to a wider range of clinical situations is skillfully opened, where bar and clip can be used more effectively to retain the implant overdentures.

REFERENCES

1. Eugene DJ. The bar joint mandibular denture. J Prosthet Dent 1961;11:689-706.
2. Winkler S. Essentials of complete dentures prosthodontics. 2nd ed. Ishiyaku Euroamerica Publishers: 1996.
3. Misch CE. Contemporary Implant Dentistry, 2nd ed.
4. English CE. Bar patterns in implant prosthodontics. Implant Dent 1994;3:217-9.
5. Winkelman R, Orth K. Dental Implants- Fundamental and advanced laboratory technology: 1994; 69-105.
6. Shigli K, Angadi G, Deshpande D. Application of abutments in implantology. Jr. of Indian Prosthodontic Society 2004;4(2):7-15.
7. McDonnell T, Houston F, Byrne D, Gorman C, Claffey N. The effect of time lapse on the accuracy of two acrylic resins used to assemble an implant framework for soldering. J Prosthet Dent 2004;91:538-40.
8. Richard M .Palmer, Brian J Smith, Leslie C Howe: Implants in Clinical Dentistry 2002.

Source of Support: Nil, **Conflict of Interest:** None declared.