

Molar Restorations Supported by 2 Implants: An Alternative to Wide Implants

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A b s t r a c t

The single-tooth restoration has become one of the most widely used procedures in implant dentistry. Improvements to the abutment-implant interface design, wider implant platforms and the increased use of cemented restorations have greatly enhanced this procedure. Nonetheless, limitations in the volume of underlying bone and heavy occlusal loads, with or without parafunctional habits, still contribute to occasional disappointments in restoration stability.

The use of 2 implants to restore a molar has been shown to eliminate problems associated with bone volume and prosthetic stability. One of the most significant barriers to the widespread use of this concept has been the limitation of the size of implants and their associated prosthetic components. This paper presents the use of 2 implants to replace a single molar using implants and prosthetic components in the Astra Tech Dental Implant System.

MeSH Key Words: dental implantation, endosseous/methods; dental implants, single-tooth; dental prosthesis, implant-supported/methods

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The single-molar implant-supported restoration has historically presented a challenge in terms of form and function. The mesiodistal dimensions of a molar exceed that of most standard implants (3.75 to 4 mm), creating the possibility of functional overload resulting in the failure of the retaining components or the failure of the implant.¹ Another result of these dimensional discrepancies affecting molar restorations on standard implants (**Figs. 1a, 1b, 2a, 2b**) is unfavourable contours leading to poor esthetics and hygiene.²

In recent years, improvements in component stability have been derived from wider implant platforms, stronger screws, higher torque forces applied to retaining screws, larger hex designs on flat-top implants and the development of internal connections such as cones, internal hex and octagon configurations and combinations of these. These improvements have contributed to greater success with molar restoration.³

Wide-diameter implants are limited in their ability to fit in bone receptor sites that are narrow buccolingually, and there have been reports of greater crestal bone loss compared to standard-diameter implants.¹ Additionally,

most single-implant restorations on wider implants still tend to loosen, resulting in component failure.³ In the posterior region of the oral cavity, bone volume and density are often compromised. Occlusal forces are greater in this region and, with or without parafunctional habits, can easily compromise the stability of the restorations.⁴

Wider-diameter implants have a genuine use in smaller molar spaces (8 to 11 mm) with a crestal width greater than or equal to 8 mm.¹ Clinical parameters governing the proposed restoration should be carefully assessed in light of the availability of implants and components that provide a myriad of options in diameter, platform configurations and prosthetic connections.³ Many of the newer systems for these restorations are showing promising results in recent clinical trials.^{3,5,6} Most documentation in the recent literature is for the Brånemark System, Astra Tech, ITI-Straumann and Endopore, and there is some for Friident, Calcitek and Implant Innovations.³

It has been suggested that it would be an advantage in many situations involving larger teeth if the uniform occlusal-apical dimensions of wide-bodied implants had a tapering root to allow for additional flexibility in the



Figure 1a: Occlusal view of maxillary right first molar on standard Brånemark implant with standard abutment (Nobel Biocare).



Figure 1b: Radiographic view of Fig. 1a.



Figure 2a: Buccal view of maxillary left first molar on standard Brånemark implant restored on a Cera-One abutment (Nobel Biocare).



Figure 2b: Radiographic view of Fig. 2a.



Figure 3: Standard Astra Tech 3.5-mm Tioblast implant.

placement of these implants and if the occlusal contours of the implant were oval rather than circular.⁷ It has further been suggested by Davarpanah and others,¹ Balshi and others,⁴ English and others⁷ and Bahat and Handelsman⁸ that the use of multiple implants may be the ideal solution

for single-molar implant restorations. Most standard implants and their associated prosthetic components, when used to support a double implant molar restoration, will not fit in the space occupied by a molar unless the space has been enlarged (12 mm or larger).⁴ It is the opinion of the author that the concept of using 2 implants requires the availability of a strong and stable implant having a minimum diameter of 3.5 mm. Additionally, the associated prosthetic components should ideally not exceed this dimension.

The development of the 3.5-mm-diameter implant (Fig. 3) by the Astra Tech Dental Implant System (Molndal, Sweden) has provided an opportunity to achieve functional stability and contours for double implants in all normal molar spaces, and suggests a solution to the need for an oval implant for molars as described previously. This implant design is a parallel-sided screw-type fixture with a titanium dioxide blasted surface. The prosthetic components seat into a conical receptor. Components for screw and cementable restorations are available.³



Figure 4a: Buccal view of 2 standard 20-degree abutments on 3.5-mm Astra Tech implants for restoration of mandibular right first molar.



Figure 4b: Buccal view of the restoration.

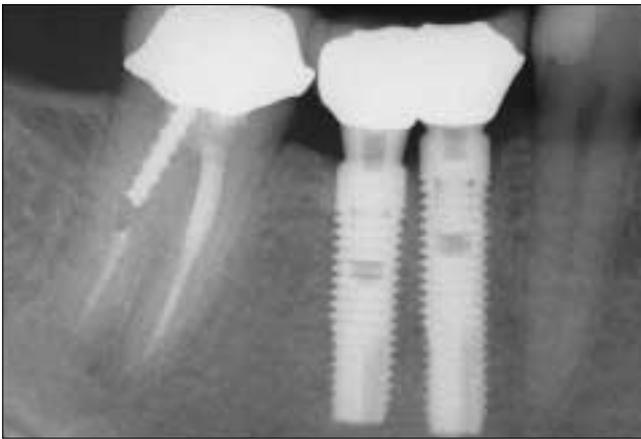


Figure 4c: Radiographic view of the restoration.

Case Report

The first case (Figs. 4a, 4b, 4c) illustrates the replacement of a mandibular right first molar.

Two Astra Tech 3.5-mm-diameter standard implants were placed in a long-standing edentulous space that had been previously restored with a resin-bonded bridge. The mandibular right second molar required a traditional full crown restoration due to carious breakdown and subsequent endodontic treatment.

The mesial implant was placed buccally to enable engagement of cortical bone. The distal implant was placed lingually for the same reason. A healing period of 4 months was observed before restorative procedures were undertaken. Standard conical abutments with a 20-degree taper were selected to allow for a screw-retained restoration. Due to the dimensions and parallel-sided design of these implants along with abutments that did not exceed the outer aspect of the implant body, an adequate bony septum was maintainable and a healthy soft tissue response between the implants could be achieved. A metal ceramic crown was fabricated with appropriate contours to facilitate oral

hygiene. As well, the inter-implant space (hygiene portal) was designed to allow for the use of an interproximal brush. Occlusion was equilibrated to the established pattern of the patient. The screw-retained nature of this implant system provides adequate space to establish a stable metal substructure to support the ceramics and to allow oral hygiene access.

The second case (Figs. 5a, 5b, 5c) illustrates a maxillary left first molar replacing a tooth that was lost due to a fracture. Two Astra Tech 3.5-mm-diameter standard implants were placed immediately following extraction with a simultaneous sinus graft procedure. A 9-month healing period was observed before restorative procedures were undertaken. As in the previous case, standard 20-degree abutments were selected and a metal ceramic crown was fabricated. Additionally, the lingual aspect of the lingual cusp was left in metal because of the limited space for ceramic material and to maintain the lingual contour in harmony with adjacent teeth. The double implant support of this restoration may be especially significant for long-term stability in this case due to the history of bruxism, which contributed to original loss of the tooth. A maxillary acrylic resin occlusal guard was provided.

The third case (Figs. 6a, 6b, 6c) illustrates an alternative way to restore a missing mandibular right first molar. In this example, a custom gold mesostructure was fabricated in the laboratory and secured with 2 screws to standard 20-degree abutments. Subsequently, a porcelain-metal crown was cemented over this structure. In this case, the hygiene contours were established in the mesostructure and the crown margins were left supragingivally.

Discussion

When indicated, the placement of 2 implants to support a single-unit restoration may provide a more stable foundation.^{1,4} The implant positions may be parallel, offset buccolingually or overlapped mesiodistally and may exhibit various angles in relation to one another. Double implants



Figure 5a: Buccal view of 2 standard 20-degree abutments on 3.5-mm Astra Tech implants for restoration of maxillary left first molar.



Figure 5b: Occlusal view of the restoration.



Figure 5c: Radiographic view of the restoration.



Figure 6a: Buccal view of custom-cast gold abutment (splinted) on 2 standard 20-degree abutments on 3.5-mm Astra Tech implants for restoration of mandibular right first molar.



Figure 6b: Occlusal view of the restoration.



Figure 6c: Radiographic view of the restoration.

create greater surface area of bone contact and individually are easier to place optimally than their wider-diameter counterparts.^{1,4,7,8} The retention and stability of crestal bone levels in this treatment method are as predictable as other applications in the Astra Tech System.^{9,10} Soft and hard tissue responses are routinely excellent with this type

of implant, and minimal effort is required to achieve these good results.^{9,10}

Restorations can be designed for screw or cementable retention. The latter may be accomplished with individual prefabricated abutment posts, which can be modified as required, or custom-cast abutments, which may be of a

splinted design (Fig. 6a). The mesial and distal embrasure areas and the inter-implant space (hygiene portal) may be designed to allow passage of floss and threader or small interdental brushes. Restorative materials may be metal-ceramic, all-metal or all-ceramic depending on functional and esthetic needs.

The clinical cases illustrated are part of a group of 20 individual double-implant molar restorations provided to 19 patients (one patient having 2 separate restorations) between 1994 and 2001. Of this group, 16 were mandibular restorations and 4 were maxillary. All restorations are currently in function and none has exhibited any prosthetic complications or any adverse soft or hard tissue responses to date. In general, all implants were placed according to the manufacturer's specifications, with associated bone regeneration procedures to minimize irregular crestal bone discrepancies. A post-surgical period of 4 to 9 months was observed depending on bone quality and the regenerative procedures performed at the time of surgical placement. Standard prosthetic procedures were then followed for either screw-retained or cementable restoration. Occlusal contacts were adjusted to conform to the patient's acquired centric occlusion and lateral excursions. Access openings in the screw-retained restorations were sealed with a composite material. Cemented crowns were luted with a provisional cement (Temp Bond, Kerr Manufacturing, Orange, CA, USA). Radiographs were taken immediately post-operatively and, whenever possible, at 1-year intervals.

The postulated advantages of using 2 implants to support a molar restoration instead of a wide-diameter implant are several. There is wider support of the restoration in both the mesial-distal and the buccolingual dimensions. The dentist has greater flexibility to maximize placement in compromised bone receptor sites without perforation of the cortical plates, and thus there is better subsequent retention of crestal bone levels. The use of 2 implants diminishes the potential of the restoration to loosen under normal or parafunctional forces. The double implant may lessen the possibility of occlusal overload. It allows for greater flexibility in restorative style: cement or screw retained. The possibility of increased cost may be outweighed by the reduced likelihood of failure of the implant or the restoration based on the reported complications described earlier. Finally, the double implant requires no special components or procedures that are not normally used in other restorative applications.

Conclusion

The procedures described in this paper for restoring a molar with 2 implants provide clinicians with options other than the use of wide-body implants in treatment situations that have previously been associated with unexpected problems related to osseous and restorative integrity over time. ♦

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