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**Replacement of a molar with two narrow-diameter dental implants**

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Abstract

Dental implants have demonstrated a high degree of success in the restorations of teeth in partially or completely edentulous patients. However, when the buccolingual width of the edentulous crest is insufficient for the placement of standard sized implants, the use of two or more smaller diameter implants should be considered to avoid the need for invasive reconstruction techniques such as grafting procedures. The present case report describes the replacement of a single mandibular first molar with two narrow-diameter implants, in a 41-year-old male patient. No postoperative complications were reported in the 3-year follow-up period. The placement of two narrow-diameter implants replacing a missing mandibular molar could eliminate the mesiodistal bending, double the support capacity in the buccolingual direction, and minimize stress on the implants.

Keywords: Edentulous molar space, narrow atrophied ridge, narrow-diameter implants

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**Introduction**

Evidence suggests that replacement of missing teeth by dental implant restorations is a successful treatment modality. However, an atrophic mandibular edentulous space could pose a significant challenge to successful oral rehabilitation with dental implants due to inadequate buccolingual dimensions. Regular sized dental implants ensure an adequate bone to implant contact. However, narrow edentulous ridges require the use of small-diameter implants to avoid invasive reconstruction techniques.<sup>[1]</sup> Conventionally, the low rate of complications, in addition to higher long-term success rates make implant restoration a reliable solution to treat the posterior partial edentulism. Sometimes, however, using only one freestanding implant to support a fully functioning molar can be questioned with reference to the possible bending overload situation as well as representing a biomechanical challenge. One way of countering the potential overload in this situation is to direct the occlusal forces to a centric position on the tooth, thus reducing the bending on the implant. Alternately, this situation can be addressed by supporting a single molar with two smaller diameter implants. This can basically eliminate the mesiodistal bending and double the support capacity in the buccolingual direction, with an added advantage that these smaller diameter implants can be placed in narrow deficient ridges.<sup>[2]</sup> This case report evaluates the clinical outcome of the placement of two narrow-diameter implants replacing a missing mandibular molar.

**Case Report**

A 41-year-old male patient reported with a chief complaint of a missing lower left back tooth for 6 years. The tooth had been extracted 6 years back owing to extensive carious involvement and a poor endodontic prognosis. The patient was systemically healthy. His periodontal status was stable. Clinical examination [Figure 1] and study model analysis of the edentulous site revealed a mesiodistal dimension of 10 mm and a crown height length of 6 mm. Ridge mapping revealed a buccolingual dimension of 5 mm at the mesiodistal midpoint of the edentulous space. Considering that a minimum of 0.5 mm of bone should be present on each of the buccal and lingual aspects of an implant,<sup>[3]</sup> the buccolingual width of 5 mm was deemed insufficient for placement of a regular diameter/wide-diameter implant although the mesiodistal envelope for implant placement was sufficient. The patient was not willing to undergo further surgical procedures for ridge augmentation. Hence, a treatment plan was outlined that included the placement of two narrow-diameter implants, so as to obtain sufficient implant bone surface area to compensate for the deficiency in implant diameter.<sup>[3]</sup> On radiographic examination [Figure 2], the available bone height in the first molar region was found to be 15 mm from the crest of the ridge to mandibular canal region. It was decided to place two narrow single-stage implants of 2.5 mm diameter and 13 mm length each.

Figure 1: Preoperative clinical picture of the mandibular molar area

Figure 2: Preoperative radiograph of the edentulous site to be treated

**Surgical technique**

Following a perioral skin preparation with an antiseptic solution and a presurgical rinse with 0.2% chlorhexidine, local anesthesia (2% xylocaine with 1:80,000 adrenaline) was administered at the surgical site. A midcrestal incision was given at the edentulous site, and full thickness mucoperiosteal buccal and palatal flaps were reflected [Figure 3]. Two osteotomy sites of 2 mm diameter were prepared under copious saline irrigation up to a depth of 13 mm using a pilot drill of 2 mm. Two narrow implants (2.5 mm diameter, single stage) were inserted into the osteotomy sites using a hand wrench [Figure 4] parallel to each other and to the adjacent teeth. The mucoperiosteal flaps were then secured with interrupted sutures [Figure 5], and a postoperative radiograph was taken [Figure 6]. Antibiotics (500 mg amoxicillin thrice daily) and analgesics (100 mg aceclofenac twice daily) were prescribed for 5 days postoperatively. The patient was instructed to rinse with 10 ml of 0.2% chlorhexidine mouthwash twice daily for a week. The sutures were removed after 7 days. Elastomeric impressions were taken and an implant supported provisional acrylic crown was fabricated. This was followed by a metal ceramic fixed prosthesis [Figure 7] 4 months after implant surgery. The patient was instructed regarding maintenance of oral hygiene by means of dental floss and interdental brush. The patient was recalled at 1 month, 3 and 6 months postsurgery for clinical and radiographic evaluation of the implant site and assessment of oral hygiene maintenance. The patient has been monitored for the past 3 years at recall visits and has been comfortable with the prosthesis. Radiographic evaluation has indicated a stable periodontal condition with minimal crestal bone loss [Figure 8].

Figure 3: Mucoperiosteal flap elevation and exposure of surgical site

Figure 4: Insertion of implants into osteotomy site

Figure 5: Postoperative picture of the implants

Figure 6: Immediate postoperative radiograph

Figure 7: Fixed prosthesis

Figure 8: Three-year postoperative radiograph

**Discussion**

Dental implants are intended to replace the missing roots of a tooth. In the case of a molar, a single implant may not achieve the crown root ratio of the original tooth subjecting the implant to increased occlusal forces. Owing to this reason, prosthesis mobility and screw loosening are the most frequent complications associated with single implant molar restorations.<sup>[4]</sup> Another disadvantage of a wide-diameter implant is that if the implant fails to osseointegrate, a wider implant for replacement may not be available. In addition, many ridges may not have an adequate buccolingual dimension for placement of a wide-diameter implant, as in the present case.

In the present case, the primary implant stabilization was achieved immediately following placement of the implants. Considering the narrow buccolingual ridge dimension, two narrow-diameter implants were used to replace a single missing molar. No postoperative complications were reported in the 3-year follow-up period. In the narrower ridge, studies have suggested the placement of two or more narrow-diameter implants when possible, to obtain sufficient implant bone surface area to compensate for the deficiency in the width of the implant.<sup>[1],[3],[5]</sup> This mode of treatment provides increased surface area for osseointegration and reduces lateral forces and bending movements that result from the use of single implants. Two implants also eliminate the inherent mesiodistal cantilever and reduce the potential for overload, spreading occlusal loading forces more effectively. It also decreases the rotational forces around the implant axis thus preventing loosening.<sup>[6]</sup>

Balshi *et al.*, 1979 compared the use of two implants to replace single missing molars to the use of a single-standard implant or a wide-diameter implant and found that the use of two implants to replace a single molar provides more surface area for osseointegration and distributes the occlusal forces over a larger area within the bone compared to one wide-diameter implant of the same length.<sup>[6]</sup> Romeo *et al.*, Olate *et al.* (2010), Vigolo *et al.*, and Buser *et al.* (1997) showed a satisfactory success rate using small-diameter implants, similar to that of standard-diameter implants. Chiapasco *et al.* (2006) concluded that the reported crestal bone loss figures around narrow implants were within the acceptable range.<sup>[7]</sup> Wolfinger *et al.*, 2011 analyzed retrospectively the survival rate of implants used in pairs to support a single molar crown over a long-term follow-up period of 3–12 years and found that two implants for the replacement of a single molar had a higher survival rate and fewer complications when compared to single implants.<sup>[6]</sup>

Brian (2011) presented a case report where the author used two smaller diameter (3.0 mm × 2 mm) single-stage implants for replacement of the mandibular molar. The author stated that multiple small-diameter implants can increase the long-term prognosis of the prosthesis by increasing surface area and reducing screw loosening.<sup>[8]</sup>

There is a minimal cost difference in placing a regular implant or two narrow-diameter implants. Although it has been demonstrated that the single-implant, single-molar restoration is an ideal treatment protocol, it appears that the use of two implants to replace a single molar provides biomechanical advantages in deficient ridges.

A drawback with two implants, however, is the need for a minimum of 12 mm of mesiodistal space to accommodate both the implants, and this is not always available. Nevertheless, when using narrow implants, two implants could be used even when the distance between the adjacent teeth are rather limited.

The present case report described the feasibility of the replacement of a single mandibular molar by the placement of two narrow-diameter implants. There is, however, a need for further long term studies to confirm the results presented here and reaffirm the predictability of the procedure.

**Conclusion**

Replacing a single missing mandibular molar with two narrow-diameter dental implants might serve as a viable treatment option and a beneficial approach in specific situations.

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**Conflicts of interest**

There are no conflicts of interest.

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**Figures**

[Figure 1], [Figure 2], [Figure 3], [Figure 4], [Figure 5], [Figure 6], [Figure 7], [Figure 8]

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