



Test 224
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Replacing Two Mandibular Incisors With One Implant: A Commentary

This commentary addresses replacing 2 mandibular incisors with one implant to support 2 crowns. Two techniques are compared: cantilevered pontic vs 2 crowns geminating off the implant.

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There are several restorative options for replacing 2 adjacent mandibular incisors that were previously extracted (delayed option) or have a hopeless prognosis (eg, caries) and require removal and immediate implant placement (immediate option). These procedures include a removable partial prosthesis, a fixed restoration retained by abutment teeth, 2 mini-diameter implants, or one narrow implant with 2 crowns.

If adequate bone is present, the use of one or 2 dental implants would be ideal for replacing 2 missing mandibular incisors in patients who desire a fixed dental prosthesis but do not want adjacent teeth prepared for crowns or teeth splinted with a resin-bonded fixed partial denture. The placement of 2 mini implants can be avoided by employing one narrow implant to support 2 crowns. This type of construct could consist of an implant with a cantilevered pontic crown or 2 crowns geminating off the implant. Both methods have advantages and disadvantages.

The authors are unaware of any studies that assessed replacing 2 mandibular incisors with one implant with 2 crowns. Therefore, this commentary was constructed to address surgical and prosthetic issues that need to be considered when replacing 2 mandibular incisors with one dental implant that bears 2 crowns. Remarks based on the literature are footnoted. Other recommendations are the opinions of the authors.

Reasons for Using Only One Implant to Replace 2 Teeth

There are several scenarios in which a single implant is an appropriate therapeutic choice for replacing 2 mandibular incisors:

- If there is a lack of mesio-distal (m-d) space to accommodate 2 narrow implants or if it is not desirable to use 2 mini implants
- When only one of the 2 sites to be restored has adequate bone to retain an implant
- Narrow implants are generally made of 2 pieces with a diameter that is 2.9 to 3.5 mm.¹ A narrow dental implant (≥ 2.9 mm) can accommodate an angulated abutment to correct misangulations related to implant placement. In contrast, mini implants that are less than 2.9 mm wide consist of one solid piece, and this precludes using an angulated abutment to manage positional errors or accommodate a large horizontal discrepancy between implant location and final prosthetic tooth position.^{1,2}

A single implant also may be an appropriate therapeutic choice for replacing 2 mandibular incisors because there is limited evidence regarding the long-term survivability of mini implants when they are used to support a fixed prosthesis.^{3,5} Additionally, as previously indicated, no studies have assessed the survivability of prostheses with one narrow implant (diameter ≥ 3.3 mm) supporting 2 crowns in the mandibular anterior region, although the authors have used this technique (diameter ≥ 3.3 mm) more than 20 times and found that it provides a predictable and durable restoration.

Sizes of Mandibular Anterior Teeth and Space Needed to Accommodate 2 Implants

The m-d width of mandibular lateral and central incisors is, respectively, 6.31 mm and 5.68 mm in males and 5.98 mm and 5.55 mm in females.⁶ The length of mandibular lateral and central incisors is, correspondingly, 12.75 mm and 12.58 mm in males and 11.56 mm and 10.99 mm in females.⁷ At the CEJ, incisors are approximately 3.5 mm thick.⁸

Replacing 2 incisors with 2 narrow dental implants may be difficult due to lack of m-d space. For example, to place 2 narrow implants that are 3.3 mm wide, the minimal m-d space needed is 12.6 mm. If a narrow implant has a 3.3-mm diameter and 2 are inserted, then 6.6 mm is required mesio-distally. This number will vary depending upon the width of the implants selected for placement (eg, a pair of 3.2-mm implants requires 6.4 mm). To avoid losing bone between 2 non-platform-switched implants, their distance should be 3 mm apart,⁹ and the space between an implant and a tooth ought to be 1.5 to 2 mm.¹⁰ Platform-switched implants can be placed a little closer.¹¹

If implants are inserted too close to each other or an adjacent tooth, it can result in excessive inter-implant bone resorption, loss of papilla, increased recession, poor aesthetics, incorrect crown contours, and food retention. When there is a lack of room mesio-distally to accommodate 2 crowns, additional space can be attained with a slight proximal reduction of adjacent teeth.

Bone Contour

Anatomic variations found in the mandibular anterior region can present surgical challenges. These situations include narrow ridges in a small, partially edentulous area; buccal undercuts; and unfavorable ridge trajectories related to tooth position. Therefore, it is advisable to obtain a CBCT scan prior to extracting teeth (immediate option) or, if there is an edentate ridge (delayed option), to ensure that the ridge is adequate to accommodate an implant that will support 2 crowns. At a minimum, there should be at least 1 mm of bone buccally and lingually surrounding an implant after it is inserted.¹²

Based on the authors' experience, it is advisable to have a 7-mm-wide ridge to facilitate placing an implant in the cingulum area. If the scan indicates that there is a thin ridge (bucco-lingually), the clinician should raise a flap, extract the hopeless teeth, and perform guided bone regeneration. The authors prefer using a d-PTFE barrier because it facilitates bone formation without having to attain primary closure over a barrier, and it helps increase the zone of keratinized tissue.¹³ After 4 to 6 months, it is prudent to rescan the grafted site to assess the bone graft and plan for implant placement. From another perspective, if there is a thin ridge in a narrow, partially edentulous area, it is advisable not to proceed with an extensive alveoplasty to obtain a thicker ridge (located more apically) because it compromises the aesthetic result. Furthermore, prior to implantation, a compromised ridge should be grafted to increase its width to ensure adequate bone is present as opposed to placing an implant and bone grafting simultaneously. This reduces the risk of having an implant not fully encased in bone.

Site of Implant Placement and Choice of Prosthesis Design

The position of roots adjacent to the site to be restored often dictates prosthesis design (cantilever vs geminating crowns). If the roots of teeth adjacent to the edentate area (or immediate implant site) converge toward the restorative site, this may preclude placing an implant close or parallel to a contiguous tooth. Accordingly, the implant should be placed into the center of the edentate site to support 2 geminating crowns (Figures 1 to 9). On the

other hand, if the adjacent roots are straight, the implant should be placed parallel and closer to a tooth and have a cantilevered pontic, which provides a more aesthetic result (Figures 10 and 11).

In both prosthetic scenarios (cantilever vs geminating crowns), a screw-retained prosthesis is preferred. This allows for prosthesis retrievability and avoids excess subgingival cement. Pertinently, it is easier to remove superfluous cement around a cantilevered pontic than geminating crowns. When a screw-retained restoration is planned for a cantilevered prosthesis, the implant should be placed as parallel as possible to the adjacent teeth to facilitate a line of draw for the prosthesis. If the implant tilts mesially or distally, it may affect the restoration's path of insertion and impact the clinician's ability to establish proper interproximal contact areas and embrasure dimensions. Note that there are no data comparing the survivability of cemented vs screw-down prostheses with respect to 2 crowns off one implant.

Concerning the availability of alveolar bone, if only one of the 2 incisor sites to be replaced has adequate bone to support an implant, this would favor a cantilevered pontic design. Nevertheless, the deficient site should be grafted to prevent recession.

Horizontal Cantilever

Placing a cantilevered pontic off 2 dental implants is considered a viable procedure if the implants are of adequate size, the patient is not a bruxer, and pontic dimension is modest.¹⁴⁻¹⁷ However, there are scant data concerning the utility of a single crown cantilevered off one implant. In this regard, Hälgl et al¹⁶ reported that 8 such constructs fared well. Other authors suggested that a cantilever could be used off one implant in the maxillary anterior region.^{8,18,19}

Ostensibly, reduced masticatory forces in the anterior teeth facilitate placing a one-tooth cantilever in this location. Pertinently, the mandible is a Class III lever, and the forces generated on teeth vary with location.²⁰ Occlusal forces are greatest posteriorly and decrease proceeding anteriorly—molars (475 to 749 N), premolars (424 to 583 N), and canines (323 to 485 N). Molars have 3 times greater biting force than incisors.²⁰ The findings

that there is a reduced occlusal force anteriorly²⁰ and that dental implants can withstand occlusal forces better than natural teeth²¹ are concepts that can be advantageously applied in the mandibular incisor area.

In the literature, there is meager mention of employing a cantilevered mandibular incisor.^{18,22} Nevertheless, the authors of this article have found this construct to be useful. It is recommended to keep the pontic size \leq 6 mm, and there needs to be adequate connector thickness between the abutment and pontic. In addition, the pontic should not occlude with the maxillary dentition in centric, protrusive, or lateral excursions.

Aesthetics

When comparing the appearance attained with a cantilevered pontic vs geminating crowns, the best aesthetics are achieved with a pontic cantilevered off the implant crown. This is due to 2 factors related to interdental space and papillary appearance.

First, with a cantilevered pontic, the interdental area can be maximized bucco-lingually to look like the indentation between natural teeth. In contrast, the implant body limits the depth of the interproximal area between 2 geminating crowns, so it is less defined (Figure 8 vs Figure 11).

Second, the embrasure space between an implant and a cantilevered pontic is more natural. This facilitates attaining greater natural papillary height than between geminating crowns, but the papilla is usually blunted.

The position of roots adjacent to the site...dictates prosthesis design....

Therefore, if a patient has a smile line that shows the mandibular gingiva or there is a concern regarding papillary height between the implant and the cantilevered crown, its height can be enhanced. This is accomplished by augmenting the gingiva in the pontic area (eg, via connective tissue graft) and developing an ovate pontic that is usually placed 2 mm within the issue.^{23,24}

Ovate pontics give the appearance of the crown emerging from the tissue. This does not correct the lack of tissue interproximally, but it does create an illusion of a papilla. In contrast, with geminating crowns, there will be no natural papilla between the crowns. With this prosthetic design, the best aesthetics will be achieved by either creating long, broad, wide contacts with small embrasure space or by using pink ceramic to construct a papilla (Figure 8 vs Figure 11).

To enhance aesthetics when 2 crowns geminate off one implant, the implant should emerge from the lingual or cingulum area (screw-retained design). Also, the sink depth (ie, the distance from the implant platform to the gingival margin) of the implant should be greater than usual. (The normal distance is around 3 mm.) It should be 5 to 6 mm to create enough running room for prosthetic materials that will extend mesially, distally, and facially.

Several other factors affect papillary height. For example, if teeth Nos. 24 and 25 are extracted, the papillary height between an implant and a cantilevered pontic will usually be shorter than adjacent papillae because there are no supracrestal fibers from a neighboring natural tooth to maintain its height.^{25,26} However, papillary height on the distal of teeth Nos. 24 and 25 will be normal since the papillae are supported by supracrestal fibers from adjacent teeth (eg, teeth Nos. 23 and 26).

Hygiene

When there is a cantilevered pontic or geminating crowns, optimal hygiene can be attained with brushing and the aid of various interproximal cleaning devices (eg, dental floss, Proxabrush). A cantilevered pontic's subpontic area needs to be flossed. If 2 crowns geminate off one implant, there will be a small cantilever on the mesial and distal of the crowns, and they need to be flossed. In the authors' opinion, hygiene is considerably easier with one cantilevered pontic.

Complications

Several complications can be encoun-



Figure 1. A radiograph of teeth Nos. 24 and 25, which are to be extracted due to periapical pathosis.



Figure 2. Post extraction, the ridge is defective.



Figure 3. A bone graft was placed to augment the ridge.



Figure 4. A clinical photo of a healed ridge. Teeth Nos. 24 and 25 were previously extracted.

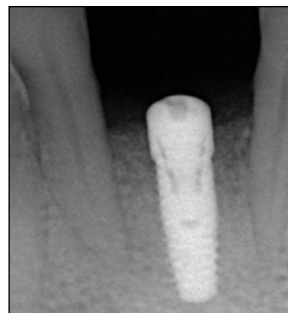


Figure 5. An implant was placed into the center of the edentate area. Note the root of tooth No. 26 is slanted mesially.



Figure 6. The sink depth was 5 mm.

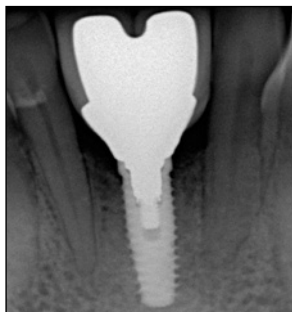


Figure 7. There are 2 geminating crowns off one implant.



Figure 8. A clinical photo of a prosthesis with pink porcelain (site Nos. 24 and 25).



Figure 9. A clinical photo demonstrating the use of a screw-retained prosthesis.



Figure 10. A radiograph of an implant with a cantilevered pontic (site Nos. 24 and 25).

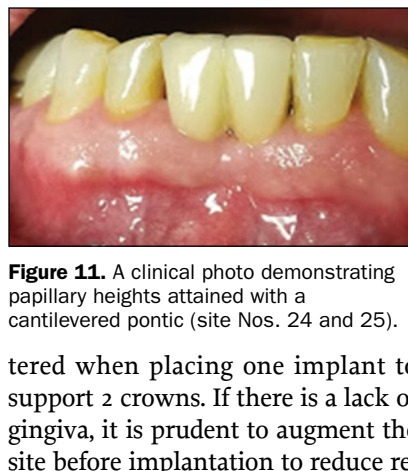


Figure 11. A clinical photo demonstrating papillary heights attained with a cantilevered pontic (site Nos. 24 and 25).

tered when placing one implant to support 2 crowns. If there is a lack of gingiva, it is prudent to augment the site before implantation to reduce recession and provide a site that can be brushed with comfort.²⁷ Furthermore, since there usually is a large discrepancy between the diameter of the implant and the shape of the definitive

restoration, keratinized tissue may be needed to facilitate tissue sculpting.²⁸

Zurdo et al²⁹ reported that after 5 years, cantilevered prostheses (2 implants plus a pontic) manifested more prosthetic issues than implant-supported constructs without a cantilever. They noted that 28% of cantilevered prostheses vs 14% of non-cantilevered implant prostheses had porcelain fracturing or screw loosening. These minor problems were repairable and did not jeopardize prosthesis survival. Post-prosthesis insertion, the most common complication is the clinician's inability to remove a luting agent due to the shape of the prosthetic design, which is a predisposing factor for developing peri-implant disease.³⁰

A recent systematic review

Table 1. Comparison of Features Related to Implant Prosthesis Design

FEATURE	CANTILEVER	GEMINATING CROWNS
Prosthesis design	One implant, cantilevered pontic	One implant, 2 geminating crowns
Implant position	Close to the adjacent tooth, parallel to adjacent roots	Center of edentate site, implant placed in the middle of ridge to avoid adjacent roots
Width of ridge	Recommended width: 7 mm	Recommended width: 7 mm
Surgery	Harder (implant placed close to the tooth and at cingulum for screw-retained prosthesis)	Easier (implant placed at cingulum for screw-retained prosthesis)
Prosthetics	Easier (need to develop one emergence profile)	Harder (need to develop 2 emergence profiles, may need tissue sculpting)
Adjacent roots	Straight	Converging apically on edentate site
Preferred retention	Screw-down prosthesis	Screw-down prosthesis
Implant sink depth	3 mm	5 mm to 6 mm
Cement removal	Easier	Very difficult
Aesthetics	Better aesthetics	Reasonable (with this option, more likely to need pink ceramics)
Oral hygiene	Easier	More difficult
Keratinized tissue	Necessary	Necessary

addressed the survivability of narrow-diameter implants (3.3 mm to 3.5 mm) and concluded that these 2-piece implants could be employed in the load-bearing posterior region. Their survival rates were between 88.9% and 100%, and a meta-analysis indicated there was no statistically significant difference in their survival rate compared to conventional implants.¹

With respect to the incidence of implant fracture, another systematic review indicated that the mean incidence of implant fractures was 1.6% of implants (n = 44,521) placed over the 8-year observation period. It noted that there was no tendency of increased fracture rates among narrow implant diameters when compared to conventional implants.³¹

There are no data in the literature concerning the fracture rate of a narrow implant used to support a cantilever in the mandibular incisor region. The authors have not encountered this problem in the 20 cases they performed.

CONCLUSIONS

Utilization of a single implant to support 2 crowns to replace 2 missing mandibular incisors is a surgical and prosthetic endeavor that requires careful treatment planning because there are space limitations both mesio-distally and bucco-lingually. Implant placement can be challenging due to a

narrow mandibular ridge and lack of inter-dental space, so it is prudent to use a surgical guide to facilitate accurate implant placement.

A screw-retained prosthesis with a cantilevered pontic provides the best aesthetics. This dictates that a 7-mm-wide ridge be used to facilitate the placement of implants in the cingulum area. If this is not available or cannot be attained, other types of restorations should be considered. Ultimately, when confronted with the loss of 2 mandibular incisors, treatment planning should incorporate thought with respect to replacing the 2 missing teeth with one implant. Table 1 summarizes pertinent facts that need to be pondered when placing one implant to replace 2 mandibular incisors. ♦

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Learning Objectives: After reading this article, the individual will learn: (1) the criteria for deciding to insert one implant to replace 2 mandibular incisors, and (2) the difference in technique and outcome between using a cantilevered crown vs 2 geminating crowns from one implant. **Subject Code:** 690.

- The gemination of crowns refers to what technique?**
 - Cantilever.
 - 2 crowns off one implant.
 - 2 implants supporting one crown.
 - None of the above.
- Cantilevered crowns off one implant is often performed in what region(s) of the mouth?**
 - Posteriors.
 - Mandibular anteriors.
 - Maxillary laterals.
 - Both b and c.
- When placing an implant to support a cantilevered crown off one implant, what is the position of the edge of the implant?**
 - In the center of the edentate area.
 - 1.5 mm away from one adjacent tooth.
 - 3 mm away from the edge of the adjacent tooth.
 - Buccal to adjacent teeth.
- What are the benefits of using a cantilevered pontic vs geminating crowns?**
 - Better interproximal definition.
 - A larger papilla between the pontic and implant.
 - A smaller distal papilla to replace teeth.
 - Both a and b.
- What is the ideal width of a mandibular ridge to accommodate a screw-retained prosthesis when the implant is placed in the cingulum area?**
 - 4 mm.
 - 5 mm.
 - 6 mm.
 - 7 mm.
- What is the width of a male mandibular lateral incisor?**
 - 5.4 mm.
 - 5.6 mm.
 - 5.8 mm.
 - 6.31 mm.
- According to the literature, upon dental implant insertion, what is the recommended minimum amount of bone that should be present around an implant?**
 - 0.5 mm.
 - 1 mm.
 - 1.5 mm.
 - 2 mm.
- Which is a main advantage of a narrow implant vs a mini implant?**
 - It is solid.
 - An angulated abutment can be used.
 - It must be screw-retained.
 - It is a one-piece implant.
- If a screw-retained implant crown is to be placed, why should the implant be placed parallel to the adjacent teeth?**
 - For a better emergence profile.
 - For a better path of insertion.
 - For crown passivity.
 - For a large papilla.
- Which type of prosthesis described in this article ends up having an acrylic interdental papilla between the incisors?**
 - 2 geminating crowns off one implant.
 - A cantilevered crown off one implant.
 - 2 mini implants.
 - A tooth connected to an implant prosthesis.

ANSWER SHEET Test 224, beginning on page 62

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