Immediate Placement and Restoration of a Single Implant to Replace Two Adjacent Periodontally Compromised Mandibular Incisors: A Technique Report with up to 8 Years of Follow-up

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Purpose: To investigate the cumulative survival rate (CSR) and marginal bone loss (MBL) of single implants immediately placed and restored with two-unit cantilevered fixed dental prostheses (FDPs) following the extraction of two adjacent mandibular incisors with a compromised periodontal condition. ***Materials and Methods:*** Patients in need of extraction and replacement of two adjacent mandibular incisors due to an advanced periodontal loss of attachment were treated consecutively. Following a flapless procedure, a single implant was placed at the time of extraction in one of the two fresh alveolar sockets and immediately restored with a screw-retained two-unit provisional FDP. The area of extraction was grafted using xenograft particulate material. The following elements were evaluated: the peri-implant soft and hard tissue condition at the last follow-up appointment, MBL at the last follow-up appointment at least 1 year after the delivery of the final prosthesis, and the final esthetic result. ***Results:*** A total of 20 patients were recruited between January 2014 and December 2019 in a single private practice. Each of them received a single implant and immediate provisional restoration with a two-unit cantilevered FDP. Patients were followed up for 22 to 94 months (average follow-up = 4 years) and none of the implants failed, resulting in a 100% CSR. The cumulative MBL—measured using the VixWin Platinum software—was 1.08 ± 0.35 mm. A lower MBL was observed in the presence of platform switching (0.63 ± 0.11 mm) compared to the absence of platform switching (1.27 ± 0.20 mm). ***Conclusions:*** The preliminary results obtained from this study suggest that patients who need to replace two adjacent periodontally compromised mandibular incisors can be treated with an immediately placed and restored single implant. *Int J Oral Maxillofac Implants 2025;40:51–59. doi: 10.11607/jomi.10462*

Keywords: immediate placement, immediate restoration, mandibular incisor, narrow implants, partial edentulism

Dental implants have long been used to replace missing or hopeless teeth.[1] The replacement of mandibular incisors with implants represents a challenge for the clinician due to reduced alveolar dimension, root proximity, and limited horizontal bone crest dimension.[2,3] Several issues need to be considered by the clinician when planning to replace two adjacent hopeless mandibular incisors due to advanced periodontal disease. Due to periodontal bone loss, the implant site is often not adequate in terms of bone volume.[4] Another important limitation is the limited mesiodistal space that causes implant proximity. Interimplant distance has a direct negative effect on the final esthetic result, and with difficulties maintaining proper oral hygiene in the long term, this condition may lead to peri-implantitis.[5–7]

In such cases, a functionally and esthetically acceptable rehabilitation often requires a multiphase approach with hard and soft tissue regenerative procedures that result in a long and costly treatment.[8] It is currently common practice to simplify the surgical procedures to reduce treatment time and costs while catering to the needs of our patients, providing a predictable treatment that minimizes the occurrence of postoperative complications. To achieve these goals, a therapeutic alternative has been presented for patients with advanced periodontitis affecting two adjacent mandibular incisors in which a single implant is placed immediately after extraction with simultaneous grafting and immediately restored with a cantilevered two-unit fixed dental prosthesis (FDP).

This study discusses the use of a flapless one-stage technique to treat patients with severe periodontitis of two adjacent mandibular incisors. The flapless approach combined with immediate grafting, placement, and loading avoids prolonged treatment, potential infection due to graft exposure, and high costs. Furthermore, the choice of a cantilevered two-unit prosthesis addresses the limitations of space that are inherent to the replacement of two adjacent mandibular incisors.[2] Usually the interimplant distance is a limitation, and the loss of crestal bone may result in changes that affect the

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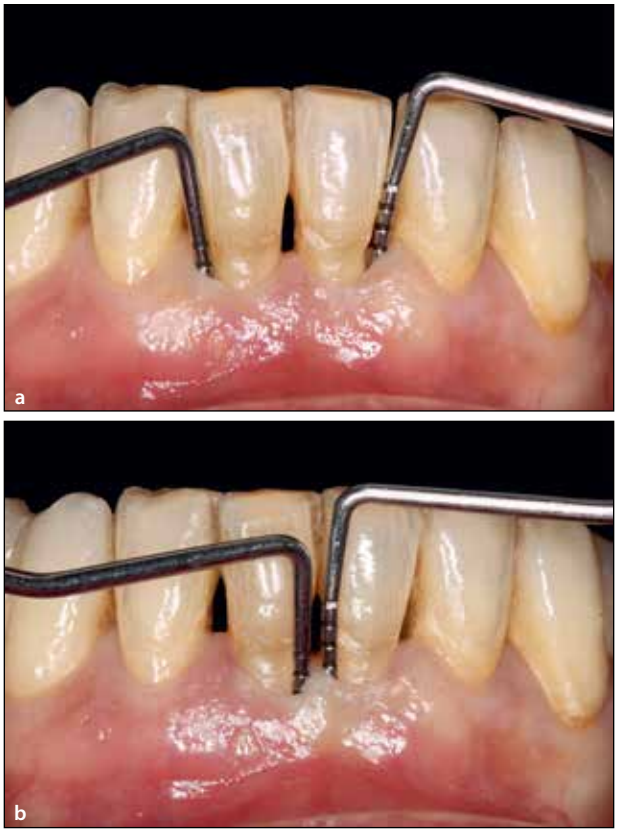


Fig 1 *(a and b)* Frontal views of the periodontally compromised mandibular incisors in need of treatment.

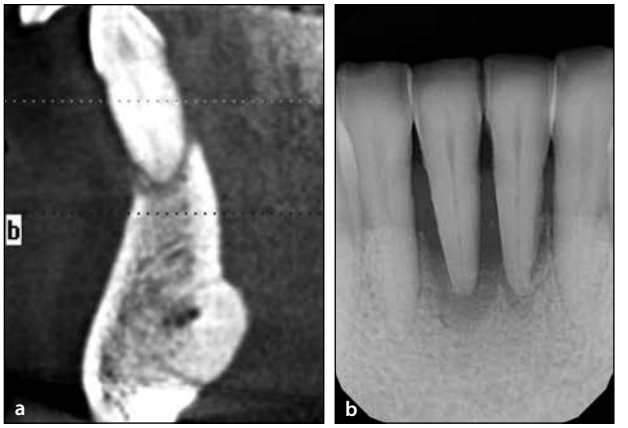


Fig 2 *(a and b)* CBCT cross section and periapical radiograph showing advanced bone loss.

height of the gingiva around the implant, impairing the development of the interproximal papilla due to overlapping of the bone resorption around each implant at the abutment connection because of the reestablished biologic width.[5] More importantly, immediate implant placement in periodontally compromised extraction sockets does not prevent further bone loss.

MATERIALS AND METHODS

Patients seeking to replace two adjacent mandibular incisors affected by localized severe periodontitis and advanced bone loss were recruited to participate in the study between January 2014 and December 2019 in a single private practice. All patients were thoroughly informed about the risks and benefits associated with the procedure and signed an informed consent form in accordance with the Declaration of Helsinki medical research protocols and ethics for investigations in human subjects. This research was granted an exemption by the local institutional review board.

The inclusion criteria were as follows: *(1)* the presence of two adjacent mandibular incisors that needed to be extracted due to advanced periodontal loss of attachment and hopeless prognosis (Fig 1); *(2)* all other teeth in good periodontal condition; *(3)* a minimum of 10 mm of bone height in the intended implant site; *(4)* minimum age *of* 20 years; and *(5)* sufficient space between the dental arches to allow placement of anatomically sized crowns. The exclusion criteria were as follows: *(1)* generalized periodontitis; *(2)* irradiated patients or patients taking medications that could affect bone metabolism (eg, bisphosphonates); *(3)* uncontrolled diabetes or other systemic diseases that constituted a contraindication to surgery. Smoking was not considered an exclusion criterion and included heavy smokers (ie, > 10 cigarettes daily). The presence of periapical lesions was also not considered an exclusion criterion if complete debridement was possible because it does not represent a contraindication to implant placement as demonstrated in previous studies.[9,10] However, implant placement was postponed if any of the following conditions occurred at the extraction site: *(1)* abscess, *(2)* draining of the fistula, *(3)* presence of pus or exudate, *(4)* missing more than 70% of the buccal plate, *(5)* and the presence of lesions in the adjacent teeth. Each patient received a complete intraoral clinical and radiographic examination including periodontal evaluation, occlusal analysis, and CBCT scanning. CBCT scans were performed and used for 3D analysis of the alveolar sites and of the tooth anatomy (Fig 2). Study casts were mounted on an articulator, and diagnostic wax-ups were created. Surgical templates and provisional restorations were produced with the aid of diagnostic wax patterns.

Surgical Procedure

All implants were placed in fresh extraction sockets and immediately restored with a two-unit cantilevered FDP. Each patient received full-mouth therapy, included scaling and root planing, 2 to 3 days before the surgery and was prescribed a 0.20% chlorhexidine rinse three

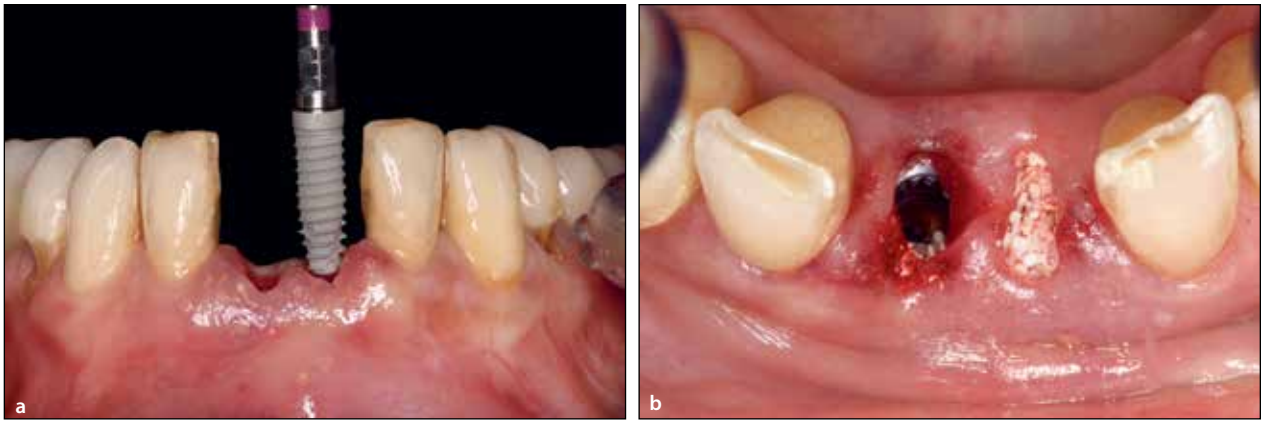
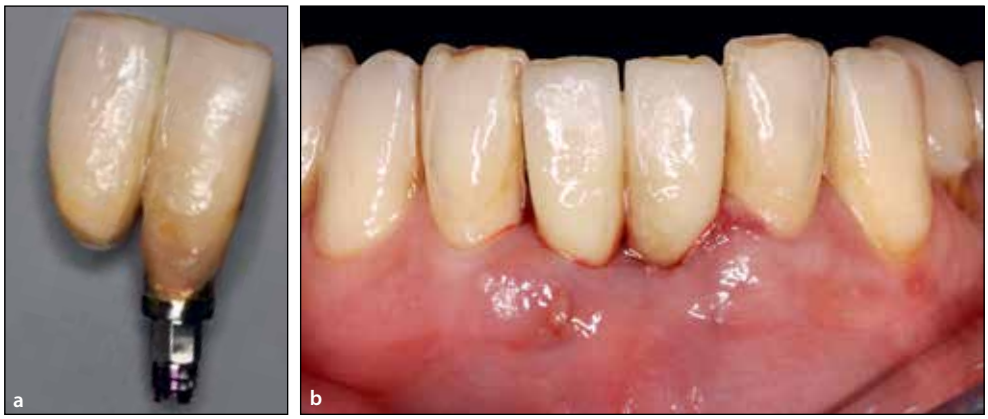


Fig 3 *(a)* Implant placement. *(b)* Occlusal view of implant site and grafted site.

Fig 4 *(a and b)* Immediate placement of the provisional screw-retained prothesis.



times a day for 14 days. Then 12 hours before surgery, each patient began a 5-day cycle of amoxicillin (1-gram tablets) twice per day. Local infiltration with 4% articaine was injected into the vestibular and lingual areas.

A flapless approach was used, and each tooth was extracted atraumatically to preserve the surrounding tissue. After extraction, a thorough debridement of the alveoli was carried out with an alveolar curette. The implant size was selected based on the amount of available residual alveolar bone. The osteotomy was prepared in accordance with the manufacturer's protocol for immediately placed implants with the aid of a vacuum shell surgical template that had a hole in the cingulum area of the intended implant site. To achieve the adequate insertion torque (>50 Ncm) for better primary stability, the osteotomies were undersized using a final drill with the same diameter as the implant but one size smaller than the actual implant length. A motorized unit (T3 Tapered Certain DCD, Biomet 3i) was used to place all implants, which had tapered microgeometry with an internal hexagonal connection and a nanoscale surface via discrete crystalline deposition of calcium phosphate as well as a microroughened collar.

Based on the CBCT analysis of the recipient alveolus size, the selected implants were 3.25 or 4 mm in diameter and 10, 11.5, or 13 mm in length. The 4-mm-diameter implants included lengths of 10 mm (n = 4), 11.5 mm (n = 5), and 13 mm (n = 2), which were all platform-switched. The 3.25-mm-diameter implants included lengths of 11.5 mm (n = 5) and 13 mm (n = 4) but were not platform-switched. All implants were placed 4 mm below the midfacial gingival margin to allow for a gradual and natural transmucosal emergence profile of the provisional prostheses. The final seating was obtained with a calibrated torque hand ratchet (Biomet 3i) to evaluate and record the final insertion torque value. The gap between the implant and the buccal alveolar ridge was always grafted, as well as the alveolus in the pontic area (Fig 3). The graft consisted of a 20:80 mixture ratio of autogenous bone chips collected during the osteotomy combined with slow-resorbing anorganic bovine bone granules (Endobon, Biomet 3i). Because a flapless surgical technique was performed, sutures were not required.

Provisional Prosthesis

The diagnostic wax-ups and CBCT scans helped produce the vacuum shell surgical templates and two-unit provisional FDPs, which consisted of a metal-reinforced acrylic resin (Fig 4). The templates and provisional

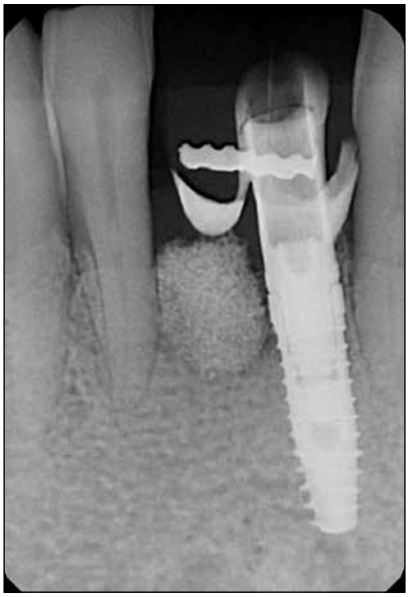


Fig 5 Immediate postoperative radiograph showing the bone substitute particles grafted in the extraction site.

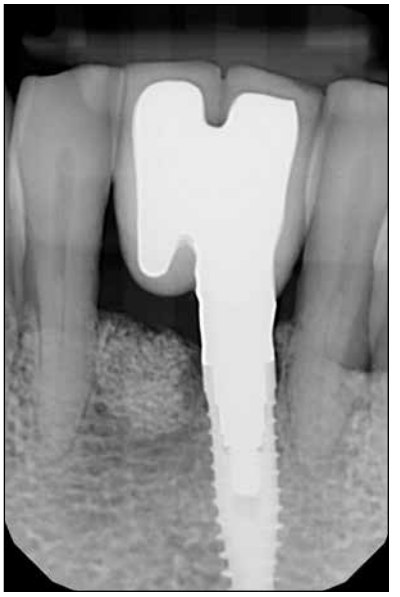


Fig 7 Periapical radiograph at the 7-year follow-up showing a stable bone level at the implant collar with the bone substitute particles grafted in the extraction site still present.

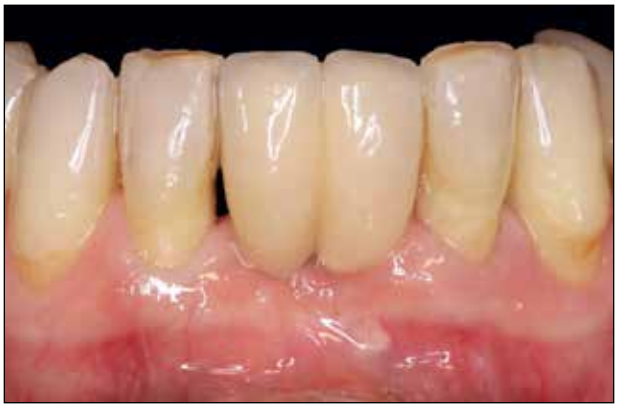


Fig 6 Final prosthesis at the 7-year follow-up.

restorations were perforated in the cingulum area of the intended implant site. The second adjacent mandibular incisor was replaced with an ovate pontic as a cantilever.

In all cases, titanium provisional abutments (Biomet 3i) were adjusted for length and angulation and then placed. A narrower titanium provisional abutment was used with 4-mm-diameter implants for platform switching (n = 11 [out of 20]). The abutment screw was torqued to 10 Ncm using a torque driver (Biomet 3i), and a periapical radiograph was taken to check the full seating of each abutment. The inner surface of the provisional FDP was hollowed out and the hole was cut to allow the temporary transfer cylinder to fit. The screw access openings were blocked to prevent resin from flowing in, and light-cured composite resin (Tetric-Flow, Ivoclar) was applied to lute the cylinder to the provisional FDP. Once the acrylic resin was set, the occlusion was adjusted in order to have no contacts with the opposing arch. The block-out material was removed, and the retaining screws were loosened to remove the provisional FDP and cylinders for further extraoral refinement and polishing. The provisional FDP was then re-placed and the retention screw was torqued to 15 Ncm using a manual wrench for final seating.

All patients were given analgesics and anti-inflammatory drugs to take every 8 hours as needed. They were instructed to consume only liquids for the first week and refrain from chewing with the incisors for the following 2 months.

Patients were examined for check-ups and hygiene maintenance once a week for the first month and monthly thereafter for the first 6 months. At each visit, the clinical conditions were monitored, and if plaque accumulation was present, a manual cleaning with curettes was performed.

Definitive Prosthesis

Between 4 and 6 months later, an implant-level final impression was taken with a pick-up coping (Biomet 3i) using a custom tray and low-viscosity polyether impression material (Impregum Penta, 3M). To minimize peri-implant bone resorption, an abutment narrower than the implant platform was selected (with platform switching) on the 4-mm-diameter implants (n = 11). All narrow-diameter implants (3.25 mm) were non-platform-switched (n = 9). All final restorations were screw retained to UCLA gold abutments (Biomet 3i), which were torqued to 20 Ncm using a calibrated torque driver (Biomet 3i) in accordance with the manufacturer's protocol. Esthetics and function were assessed in each patient using a try-in assembly prior to obtaining the porcelain-fused-to-metal definitive restoration. Periapical radiographs were taken at follow-up appointments

using an individualized film holder for crestal bone level measurements to compare to the baseline recorded on the day of implant surgery (Figs 5 to 7). Full clinical periodontal data was recorded before treatment and at follow-up appointments. Figures 1 to 7 illustrate the surgical and prosthetic protocols employed in the study along with follow-up images.

Data Recording

Mesial and distal changes in the crestal bone levels were measured and averaged at baseline from the periapical radiographs using a bite ring made from a customized wax bite block. They were recorded and compared with the one taken at the 1-year follow-up and at final follow-up appointments to determine the marginal bone loss (MBL) using the VixWin Platinum software (Gendex, Kavo Kerr).

Clinical parameters were also evaluated. Periodontal data were recorded pre- and posttreatment in every patient for the tooth to be replaced and in the adjacent dentition using a probe. The following data were recorded:

- Plaque index and bleeding on probing (BoP)
- Interdental papilla recession pre- and postoperative
- Recession on the midbuccal surface of the tooth in the intended implant site before the surgery and at the 1-year postoperative follow-up
- Mesial probing at the implant site before the surgery and at the 1-year postoperative follow-up
- Distal probing at the implant site before the surgery and at the 1-year postoperative follow-up
- Probing depth of adjacent teeth before the surgery and at the 1-year postoperative follow-up
- Keratinized tissue height before the surgery and at the 1-year postoperative follow-up
- The presence of a periapical lesion on the tooth to be replaced

Maintenance Protocol

After the delivery of the final restoration, patients were scheduled for recall visits every 4 months for clinical examination, hygiene maintenance, and radiographic evaluation of the marginal bone level. The clinical examination consisted of verification of bleeding upon gentle probing, presence of erythema, as well as swelling and/or suppuration. The manual cleaning was performed with curettes, and no ultrasonic instruments were used around the implants in order to not disturb the superficial gingival attachment. The supportive treatment consisted of 0.12% chlorhexidine rinse to be used for 3 weeks afterward.

RESULTS

A total of 20 patients (9 males and 11 females) were recruited to participate in this study. Twenty implants were placed into fresh extraction sockets in the mandibular incisor site. Implants were either platform-switched (4-mm diameter; n = 11; length: 10 mm, 11.5 mm, or 13 mm) or non- platform-switched (3.25-mm diameter; n = 9; length: 11.5 mm or 13 mm). Single implants were immediately provisionalized out of occlusion with a two-unit cantilevered and screw-retained FDP, which was fabricated into a final restoration after 4 to 6 months.

None of the implants failed, resulting in a 100% cumulative survival rate with a mean follow-up period of 4 years (1 to 8 years) from final restoration. In addition, only one complication occurred due to loosening of a prosthetic screw after 4 years, and no other adverse events were observed or reported.

All implants met the Type I (optimal health) success criteria, which were the following: no pain or tenderness upon function, no mobility, < 2 mm radiographic bone loss from initial surgery, and no history of exudate as proposed in 2008 by Misch et al[11] in the Pisa Consensus Conference.

Cumulative MBL, as determined using the VixWin Platinum software, was 1.08 ± 0.35. The effect of platform switching resulted in a lower MBL (0.63 ± 0.11 mm) when compared to the absence of platform switching (1.27 ± 0.20 mm).

Clinical Parameters

Periodontal data were recorded pre- and postoperative in every patient for the tooth to be replaced and in the adjacent dentition (Table 1). Periodontal conditions around the implant crown were evaluated at all follow-up visits by the same calibrated operator (F.A.), using an optical loupe with ×2 magnification (EyeMag Pro S, Zeiss). The gingival index[12] (GI) was recorded together with periodontal probing depth at six points with a 10-mm periodontal probe (Williams, Hu-Friedy). The GI and probing depths were measured at the 1-year follow-up and at the last follow-up. MBL was evaluated using a customized bite ring and measured with the VixWin software, which used the most coronal part of the implant collar as a reference point. MBL was recorded at the 1-year follow-up, and the mesiodistal site average was 1.01 ± 0.39, as shown in Table 2.

The peri-implant soft tissue (mucositis) and hard tissue (peri-implantitis) condition were also evaluated. Peri-implant health is characterized by the absence of erythema, BoP, swelling, and suppuration. It is not possible to define a range of probing depths compatible with health. The main clinical characteristic of peri-implant mucositis is bleeding on gentle probing; however, erythema, swelling, and/or suppuration may also be

Table 1 Baseline and Follow-up Clinical Characteristics of Included Subjects

Patient no.	BoP	Plaque index	Tooth no.	Periapical lesion	Recession (baseline)	Probing depth mesial (baseline)	Probing depth distal (baseline)	Keratinized gingiva	Probing depth mesial at 1-year follow-up	Probing depth distal at 1-year follow-up	BoP at 1-year follow-up	MBL avg
1	1	1	31	No	2	5	2	3	2	2	0	1.4
2	2	1	31	Yes	3	5	3	1	2	2	0	0.6
3	1	0	31	Yes	1	7	2	2	3	2	0	1.5
4	3	2	31	Yes	2	7	7	3	3	3	1	1.4
5	1	0	41	Yes	3	1	3	4	2	2	0	0.6
6	1	2	31	No	3	3	10	3	2	3	0	1
7	2	1	41	Yes	5	6	6	2	2	2	0	1
8	1	2	31	Yes	2	4	3	3	2	2	0	1.3
9	2	1	31	No	3	3	3	2	2	2	0	1.4
10	3	2	31	Yes	4	4	5	1	2	2	1	1.4
11	2	2	31	Yes	3	3	4	3	2	2	0	0.6
12	2	1	31	No	3	3	1	2	2	2	0	1.5
13	1	0	41	No	4	2	2	1	2	2	0	1.5
14	3	1	31	No	3	2	3	4	2	2	1	0.7
15	2	0	31	No	2	2	2	3	2	2	0	0.7
16	3	2	31	No	5	4	2	3	2	2	1	0.5
17	3	2	41	No	1	6	7	4	2	3	1	0.7
18	3	3	31	Yes	1	10	4	5	3	2	1	0.7
19	2	1	41	Yes	2	2	5	4	2	2	0	0.5
20	2	1	31	No	4	3	2	3	2	2	0	1.2

present. An increase in probing depth is often observed in the presence of peri-implant mucositis due to either swelling or a decrease in probing resistance. There is strong evidence from animal and human experimental studies that plaque is an etiologic factor for peri-implant mucositis. Peri-implantitis is a plaque-associated pathologic condition occurring in tissues around dental implants and is characterized by inflammation in the peri-implant mucosa as well as subsequent progressive loss of supporting bone. Peri-implantitis sites also exhibit clinical signs of inflammation, BoP, suppuration, increased probing depths and/or recession of the mucosal margin, and radiographic bone loss.[13] All implants presented no signs of mucositis or peri-implantitis at follow-up visits. This was most likely related to the application of the maintenance protocol that was strictly followed by the patients.

A periapical lesion on the tooth to be replaced was present in half of the cases. The following were the results (see Table 2):

- *Plaque index:* The preoperative average was 1.25 ± 0.85, and the postoperative average was 0.43 ± 0.22.
- *BoP:* The preoperative average was 2.05 ± 0.88, and the postoperative average was 0.31 ± 0.14.
- *Interdental papilla recession:* The preoperative average was –3.85 ± 1.18 mm, and the postoperative average was –0.7 ± 0.2 mm.
- *Recession at the implant site:* The preoperative average was –2.8 ± 1.19 mm, and the postoperative average was –0.5 ± 0.3 mm.
- *Mesial probing at the implant site:* The preoperative average was 4.1 ± 2.22 mm, and the postoperative average was 1.5 ± 0.64 mm.
- *Distal probing at the implant site:* The preoperative average was 3.8 ± 2.26 mm, and the postoperative average was 1.5 ± 0.38 mm.
- *Probing depth of adjacent teeth:* The preoperative average was 1.8 ± 0.76 mm, and the postoperative average was 1.3 ± 0.51 mm.
- *Keratinized tissue height:* The preoperative average was 2.8 ± 1.10 mm, and the postoperative average was 2.3 ± 1.17 mm.

Statistical Analysis

We compiled a dataset consisting of 20 records from 20 patients, which measured key outcomes of a specific technique. Given the absence of a control group and the retrospective nature of this study, we did not consider a sample size analysis necessary. We conducted our analyses using descriptive statistics and a Wilcoxon test to quantify uncertainty. All analyses were performed with the R software (R Core Team 2023, SCIRP), using the tidyverse and gtsummary packages for data preprocessing that Sjoberg et al used.[14] We set the threshold for statistical significance at a *P* value of .05.

Overall statistics

The general descriptive statistics are summarized in Table 2, as well as the Wilcoxon test (95% CI) when the CI was computable. The binomial assumption has been used for the frequencies of the sex variable.

Table 2 Statistical Analysis

Characteristics	N = 20	95% CI
Sex		
F	11 (55%)	32%, 76%
M	9 (45%)	24%, 68%
BoP	2.00 (0.79) 1.00–3.00	1.5, 2.5
Probing M	4.10 (2.22) 1.00–10.00	3.0, 5.0
Probing D	3.80 (2.26) 1.00–10.00	2.5, 4.5
Probing M at 1-year follow-up	2.15 (0.37) 2.00–3.00	2.0, 2.0
Probing D at 1-year follow-up	2.15 (0.37) 2.00–3.00	2.0, 2.0
BoP at 1-year follow-up	0.30 (0.47) 0.00–1.00	NA, NA
Average MBL	1.01 (0.39) 0.50–1.50	0.80, 1.2

Data presented as mean (SD) range.
MBL = marginal bone loss; NA = no information available; M = mesial; D = distal.

Repeatability analysis

Repeatability between the first and second MBL measurements was assessed using Spearman's correlation coefficient, whose central estimate and corresponding 95% CI are shown here: rho 0.979, lwr.ci 0.946, upr.ci 0.992.

DISCUSSION

This study included patients diagnosed with severe localized periodontitis, classified as Stage III according to the 2017 consensus workshop,[15] and a hopeless prognosis for two adjacent mandibular incisors. The standard protocol in such cases would call for a staged procedure involving three stages performed at different times: *(1)* the extraction of teeth and socket preservation, *(2)* hard and soft tissue regeneration followed by delayed implant placement, and *(3)* connection of an FDP to the implant following several months of bone healing for osseointegration.[16] Multiple surgical techniques have been proposed to preserve the alveolar envelope before or simultaneous to the placement of standard-sized implants in deficient ridges.[17] Augmentation procedures can include the use of graft material and a membrane with a soft tissue barrier.[16] In severe cases of bone augmentation, distraction osteogenesis has been shown to be an alternative option.[18]

This study described the use of a flapless one-stage technique to treat patients with severe periodontitis localized in two adjacent mandibular incisors. The single-stage approach, which combines a flapless surgery with immediate implant placement, simultaneous grafting, no membrane, and immediate connection of a provisional prosthesis, may be an advantage because it avoids the following issues: *(1)* multiple surgeries that may cause loss of hard and soft tissue, *(2)* the need for a removable provisional partial prosthesis, *(3)* prolonged treatment, *(4)* potential infection due to membrane exposure, and *(5)* higher costs. The choice of a cantilevered two-unit prosthesis addressed the limitations in space that are inherent to the anterior area of the mouth, particularly when considering two adjacent incisors.[2] If the horizontal interimplant distance is not adequate, crestal bone loss may occur, which can affect the height of the gingiva around the implant while hampering the formation of the interproximal papilla.[5] The use of a cantilevered two-unit FDP is beneficial in reducing the amount of graft material needed without neglecting the needs of the patient, all while reducing the cost.[19] Furthermore, the claim that mechanical overload of the cantilever prosthesis on implants leads to peri-implant bone resorption is controversial. The biomechanical performance of a prosthesis with extensions has been previously described as having good resistance to chewing loads confined to the axial direction.[20,21] The flexion movement resulting from an axial force applied to a given point increases with the length of the extension as well as the distance between the point of occlusal contact and the "abutment-fixture" junction.[20,21] The use of extensions and their effect on peri-implant bone levels was described by Blanes et al[22] in a prospective study on implant-supported FDPs, which found that distal and mesial extensions had no influence on MBL after an observation period of 6 years.[22] The use of a provisional prothesis with a cantilever crown is not necessarily detrimental to implant survival. Studies have reported a survival rate of 95% in implants used to support distal cantilever protheses.[19] Similar to the above results, the length of the cantilever is crucial. A clinical study demonstrated that long cantilevers induced more implant-supported prosthesis failures when compared with cantilevers shorter than

15 mm.[23] The results of the above studies indicate that a shorter cantilever length is more favorable for the success of mandibular fixed implant-supported prostheses, particularly when fewer implants are used.

In the technique described in this study, due to the horizontal dimension of the mandibular incisor, the extension of the cantilever is minimal. The occlusion design also plays an important role for implant survival using cantilevered prostheses. Moreover, occlusal overload is often regarded as one of the main causes for peri-implant bone loss and implant and/or prosthesis failure. In a single implant, the occlusion should be absent or minimal on the cantilever crown to minimize the occlusal forces on the implant and maximize the force distribution on the adjacent natural teeth. Additionally, any anterior and lateral guidance should be obtained on the adjacent natural dentition.[24,25]

Although some studies have shown that periodontally compromised patients present a potentially higher risk for implant failure than healthy individuals,[26,27] the replacement of a tooth by an implant in the anterior mandible can have a success rate close to 100% in both healed or postextraction sites.[1,28] In fact, the crestal bone height is often sufficient, and the presence of denser bone allows for easier achievement of optimal implant stability,[29,30] which has been indicated as one of the most important factors for success of osseointegration in immediate loading cases.[31–33]

In the mandibular incisor area, the mesiodistal distance between the teeth is not sufficient for the placement of two implants with adequate interimplant distance. To solve the problem arising from the presence of two adjacent implants, the placement of one implant supporting two crowns is described in this study. This may have a negative effect on the total surface of the bone-to-implant contact; however, textured-surface implants have a bigger surface area that increases the total amount of bone-to-implant contact.

The modified implant surfaces of the implants used in the present study and the high insertion torque (> 50 Ncm) may have contributed to the excellent success rate. To achieve high insertion torques, the osteotomies were slightly underprepared at each site. The closer contact between the implant and surrounding bone that results from high insertion torque values (> 50 Ncm) ensures more predictable results, as shown in previous studies,[34] making it possible to immediately load even narrow implants. Although 35 Ncm is commonly believed to be an adequate insertion torque, 2 weeks after placement there was a 40% drop in primary stability due to the osteoclastic activation that takes place in the first phase of bone remodeling upon healing, as reported by Raghavendra et al.[35] This drop would lead to a 15-Ncm value that might not be sufficient to guarantee implant stability in cases of immediate extraction placement and restoration like the present study. In 2005, Ottoni et al[32] evaluated the relationship between single-tooth implant survival and placement torque and found that a low insertion torque value was associated with a potentially high risk for biomechanical failures of immediately placed implants.[32]

Once the implants have been restored and are in function, the clinical condition of the peri-implant tissue should guide its management. Patients should be immediately enrolled in a supportive periodontal implant care program, which should include interventions for primary prevention of peri-implant diseases, such as professional supra- and submarginal plaque removal, oral hygiene motivation and coaching, as well as early detection of pathologic conditions.[36]

A few suggestions may help clinicians achieve a successful result. The technique described in this study should be limited to cases where the adjacent teeth are in good periodontal condition with adequate bone support. In addition, the use of a slow-resorbing or nonresorbable graft material is recommended to preserve the volume of the edentulous area as well as the implant site; otherwise recessions may occur, creating esthetic problems. Lastly, the provisional restoration should be left out of occlusion.

Limitations

In the present case series, there was no test or control group to compare the present technique with the conventional technique (two implants placed and restored). Although the periapical radiographs used to measure marginal bone level were always taken perpendicularly to the long axis of the implant and standardization was obtained by using a customized bite ring, a small amount of angulation change was possible, as well as some sources of error in the overall standardization procedure.[37,38]

Furthermore, the small population sample could potentially affect the positive results obtained in this study, and there is still a lack of information regarding the long-term results.

CONCLUSIONS

Within the limitations of this clinical study, the results support the use of an immediately placed single implant into the mandibular incisor fresh extraction socket and immediate loading with a two-unit FDP in cases of severe localized periodontal bone loss. A larger sample size and a longer follow-up time are needed to further validate these results.

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