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# Achieving a Desired Esthetic Outcome for a Single-Tooth Implant Restoration with Tissue Excess Using a Multidisciplinary Treatment Approach: A Clinical Report

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**Keywords**
Cast-scraping procedure; emergence profile; implant positioning.

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Accepted June 14, 2010

doi: 10.1111/j.1532-849X.2011.00697.x

## Abstract

Achieving ideal emergence profile and restoration contours for implant-supported prostheses in the anterior esthetic zone is a prime requisite. In this report, the patient presented with decreased restoration space and unfavorable tissue contours for an implant restoration. Correction of space deficiency and reshaping of excess bone height and soft tissue were planned and executed carefully prior to definitive restoration of a maxillary anterior missing tooth with an implant-retained prosthesis. Post-treatment evaluation of the papillary levels and soft tissue profile helped in assessing maintenance of the restored emergence profile.

With a rise in esthetic consciousness and demands of patients, the treatment of a single missing maxillary anterior tooth in the esthetically prominent area has become more challenging. Today, a missing tooth can be replaced by any one of three prosthodontic treatment modalities: conventional fixed partial denture, resin-bonded prosthesis, and single-tooth implant.[1] Pretreatment evaluation of space available for the restoration, volume of bone, and soft tissue are crucial diagnostic parameters for achieving a restoration with proper biologic contours.[2] The pretreatment contour of the available bone and soft tissue is the decisive indicator of the final esthetic result. Augmentation of deficient bone volume is a well-established modality in implant dentistry[3]; however, some unusual clinical scenarios, such as excess of vertical bone volume coupled with thick flat periodontal biotype, make achieving the ideal emergence profile difficult. An excellent esthetic outcome is dependent not only on the materials and techniques used, but also on the combined efforts of a multidisciplinary team.[4] This clinical report describes a patient treatment where the combined efforts of the orthodontist, periodontist, and prosthodontist were significant in overcoming the factors precluding implant placement, achieving an excellent esthetic result.

## Clinical report

A 22-year-old woman presented for consultation regarding replacement of her maxillary left central incisor. The tooth was extracted following endodontic complications 4 years previously. The patient reported dissatisfaction with the interim removable partial denture she had been wearing for 1 year, owing to discomfort and poor esthetics. Various treatment alternatives were discussed with the patient, and replacement of the missing tooth was planned with an implant-retained prosthesis.

Diagnostic cast measurements revealed the mesiodistal width of the contralateral central incisor to be 8 mm while that of edentulous space was only 5 mm. As the restorative space available for a properly contoured restoration was inadequate (space deficit of 3 mm), orthodontic treatment was required to regain the original arch length of the edentulous span (Fig 1). The patient refused to undergo treatment with a fixed orthodontic appliance; hence, a removable orthodontic appliance was fabricated incorporating two finger springs initially, for distalization of the maxillary lateral incisors. After closure of spaces distal to the maxillary lateral incisors (6 weeks later), another finger spring was incorporated into the appliance to close the space distal to the maxillary right central incisor. Redistribution of spaces in the maxillary anterior region resulted in a 3 mm mesiodistal space gain, sufficient for restoration of the maxillary left central incisor with an implant-retained prosthesis (Fig 2).

Radiographic assessment with a periapical radiograph of the site, taken after placement of a 4 mm ball bearing, was completed[5] (Fig 3). Bone sounding with a Wilson caliper[6] and palpation of the proposed implant site revealed bone width at

 

**Figure 1** Inadequate space available for restoring maxillary left central incisor.

the crestal level of the adjacent central incisor inadequate to place a conventional 3.75 mm diameter implant. The patient refused to undergo a horizontal bone augmentation procedure, citing economic constraints and unwillingness for secondary surgery. A decision to place a 2.4 mm wide and 13 mm long mini-implant (Hi-tec, Herzlia, Israel) was made. A surgical template fabricated using a vacuum thermoformed sheet (Easy Vac Gasket, 3A Medes, Gyeonggi-do, South Korea) over the cast duplicated from the diagnostic wax-up of the edentulous site was used to guide implant positioning during surgery and highlight the proposed gingival margin.[7]

After evaluation of the soft tissue profile, it was noted that the tissues overlying the edentulous ridge were of the thick flat periodontal biotype. This type of tissue is dense and fibrous in nature with minimal height difference between the highest and lowest points on the proximal and facial aspects of the marginal gingiva.[8] Recontouring the excess height of osseous and soft tissue was essential to achieving a natural emergence profile. In accordance with the treatment plan, a full thickness flap was raised. The crestal bone level of the adjacent central incisor was evaluated, and the osteotomy site was marked to guide recontouring of the bone level. A round bur (Hi-tec implant kit) was used to scallop the crestal bone at the implant site, in accordance with the facial plate of the adjacent central incisor (Fig 4). An osteotomy was performed to place a 2.4 mm wide, 13 mm

**Figure 2** Postorthodontic treatment. Note the sufficient space gained for restoring maxillary left central incisor.

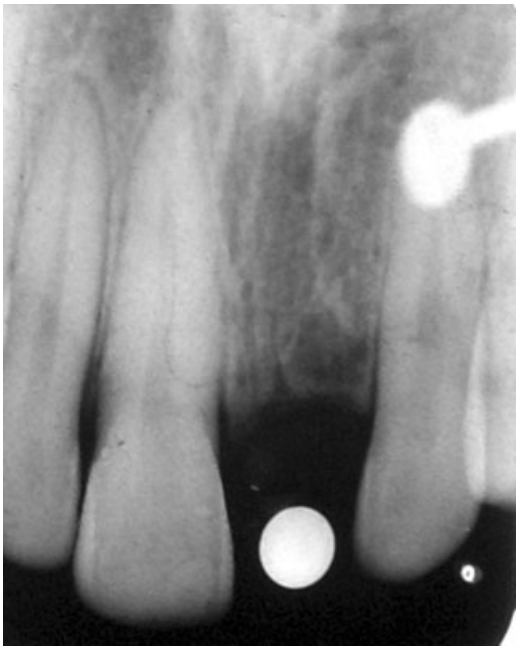

**Figure 3** Periapical radiograph with 4 mm ball bearing.

long mini-implant (Fig 5). After placement of the implant, a Periotest device (Siemens, Bensheim, Germany) was used to measure primary stability, which showed a numerical value of +3, sufficient for immediate loading.[9] The full-thickness soft-tissue flap was thinned and sutured back in place.

A working cast was marked 1 mm wide around the implant site (Fig 6A) and scraped to a depth of 1.5 mm with a round bur (Fig 6B), for fabrication of an interim prosthesis (Protemp 4; 3M ESPE, Seefeld, Germany). Sequential molding of the gingival level was planned by periodic evaluation and refabrication of the interim prosthesis. The presence of thick flat periodontal biotype tissue not only aided our treatment progression, but also made the outcome more predictable. The first interim prosthesis was evaluated 4 weeks later (Fig 7A). The planned emergence profile was yet to be achieved, as the gingival margin was lower than the adjacent teeth, and the interdental papillae were blunt (Fig 7B). Therefore, the above scraping procedure was

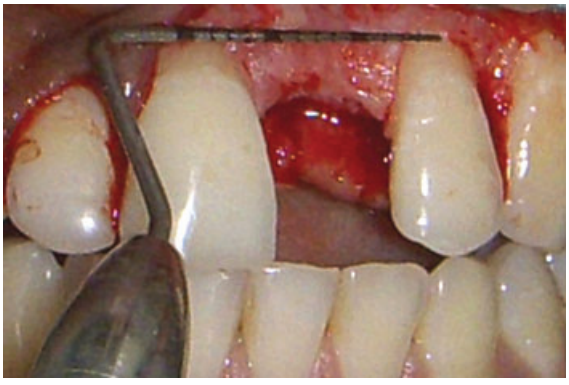

**Figure 4** Scalloping of excess bone height at implant site.

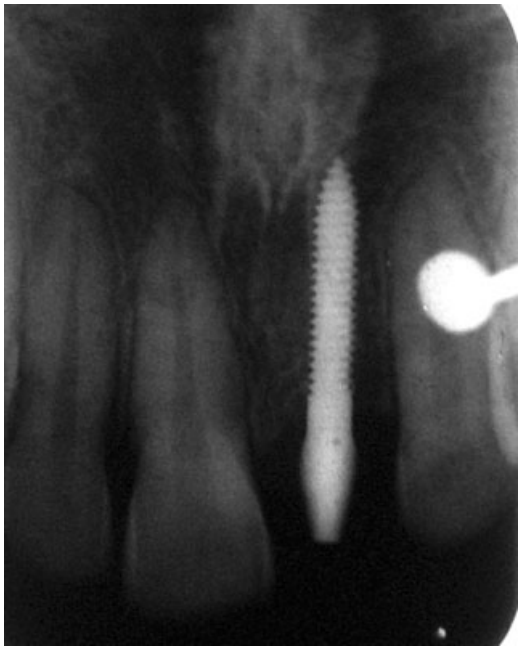

**Figure 5** Periapical radiograph with mini-implant in place.

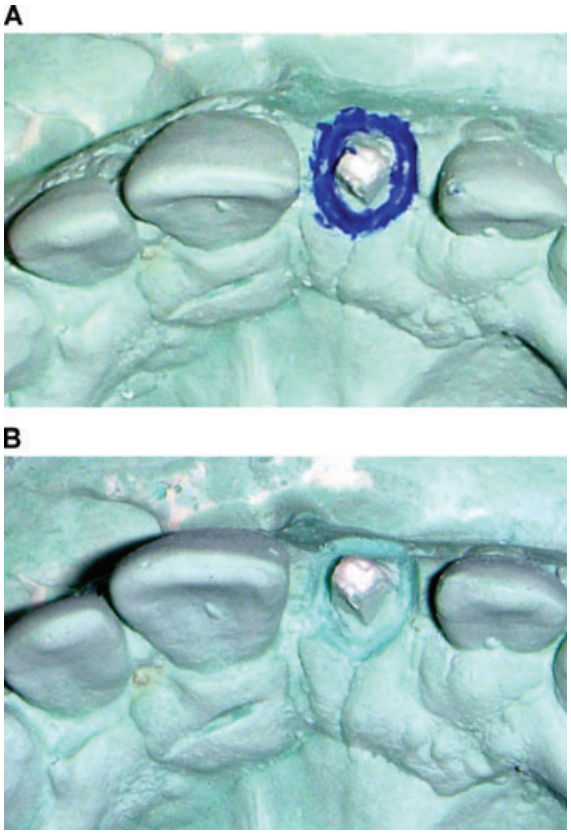


**Figure 6** (A) Periimplant area marked on working cast. (B) Periimplant area scraped to fabricate interim prosthesis for soft tissue molding.

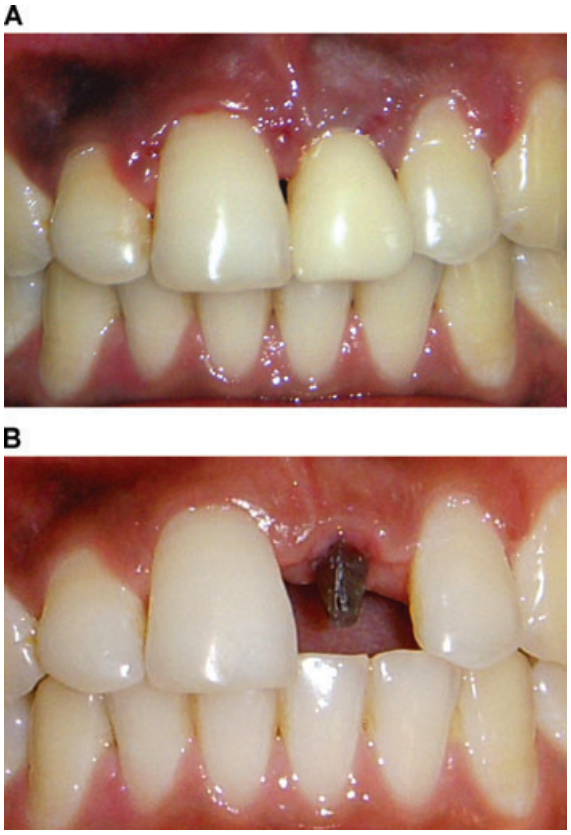


**Figure 7** (A) Incomplete molding of soft tissue at 4 weeks. (B) Gingival margin lower than the adjacent teeth with blunt interdental papillae.

repeated on a new working cast, and a new interim prosthesis was fabricated for achieving a properly contoured papilla (Fig 8A). According to Tarnow et al,[10] regeneration of the papilla is clinically achievable if proximal contact of the restoration is within 5 mm of the proximal crestal bone level; therefore, the proximal contact of the new interim prosthesis was kept 5 mm away from the bone level (Fig 8B).[10] Follow-up at 8 weeks revealed sharp, well-formed interdental papillae, and an ideal emergence profile was achieved as envisaged (Fig 9).

At the 6-month follow-up, a decision to fabricate a definitive prosthesis was made. An esthetically pleasing ceramometal prosthesis was fabricated and cemented (Fig 10). The bone and soft tissue profiles were assessed 3 months after definitive restoration and found to be satisfactory. The Jemts papillary index was employed to grade the papillae levels, and index score 3 (papillae filling the entire interproximal space) was observed between the restoration and adjacent natural teeth.[11] The patient was pleased with the treatment outcome and reported increased confidence levels and better speech articulation.

## Discussion

Implant restoration in the esthetic zone requires precise coordination between all members of the dental team. This coordinated approach to treatment is exemplified in the treatment described, which required the expertise of an orthodontist,

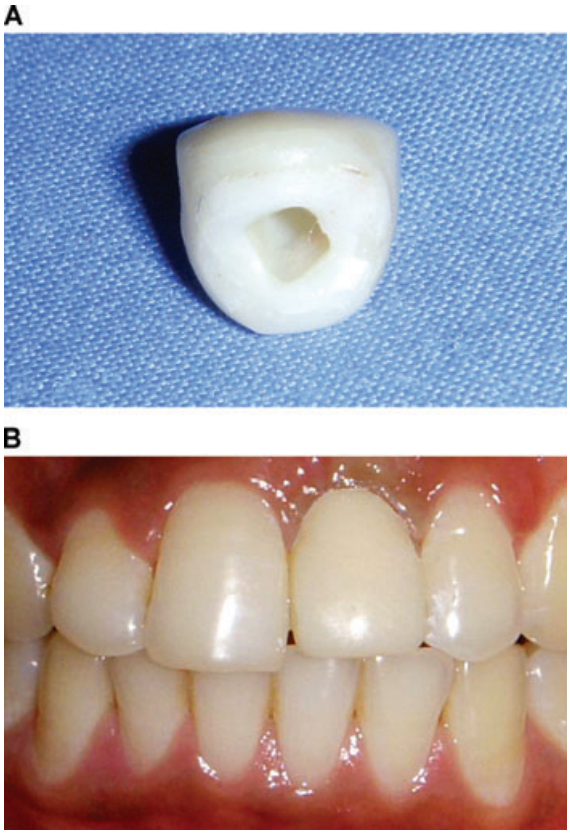


**Figure 8** (A) Polished tissue surface of the interim prosthesis refabricated at 4-week recall appointment. (B) Interim prosthesis with proximal contact within 5 mm of crestal bone.

periodontist, and prosthodontist. Missing teeth often result in the drifting of adjacent teeth, making restoration difficult. Poor long-axis alignment and inadequate pontic space are common problems when drifted teeth are planned for inclusion in a restoration.[12] By orthodontic treatment one can redistribute space so as to achieve proper alignment and adequate restoration space.[13] Space gain using removable appliances is a good alternative preferred by adult patients, who are reluctant to undergo fixed orthodontic therapy.

**Figure 9** Soft tissue molding completed at 8 weeks. Note the ideal gingival margin level and sharp, well-formed interdental papillae.

**Figure 10** Definitive restoration in place.

Conventional fixed prostheses are no longer primarily indicated in patients with noncarious or nonrestored adjacent anterior teeth.[14] Long-term studies on resin-bonded prostheses have found high failure rate with these prostheses.[15,16] Consequently, replacement of an anterior single tooth by an endosteal implant-supported prosthesis has become a widely practiced clinical procedure.[17,18] Surgical placement of implants is dictated by availability of bone and anatomical limiting structures.[19] The choice of placing a mini-implant in this patient was made after a systematic review of the risk versus benefit of bone augmentation procedure.[20,21] Various authors[9,22-24] have established that the use of mini-implants is an alternative to the conventional implantation procedure in specific situations where overload factors are carefully assessed and minimized. In this case the patient was unwilling to undergo a bone augmentation procedure, and our assessment of the implant site revealed that it was possible to minimize overload on the implant; therefore, we decided to place a 2.4 mm diameter mini-implant.

In the anterior esthetic zone of the oral cavity, acceptance of the prosthesis not only depends on proper positioning of the implant, but also on bone and soft tissue contours that support a natural emergence profile, maintaining an adequate sulcus depth.[25] The predictability of esthetic success depends on the tissue discrepancy present at the initiation of treatment. Evaluation of the discrepancy between the bone level at the proposed implant site and the bone level of the adjacent teeth is essential to plan desired esthetic contours of the restoration. Apicocoronal positioning is the most critical aspect and bone discrepancy at this site must be minimal.[25] There are uncommon clinical situations presenting with excess tissue height, and these require a bone scalloping procedure to allow placement of the implant in an optimal esthetic position. A bone scalloping and soft tissue thinning procedure was necessary in our patient, who presented with an unusual excess of bone and thick flat periodontal biotype. Postoperatively, an ideal soft tissue emergence profile was achieved with the aid of an interim prosthesis evaluated and recontoured at specific time intervals. Recontouring of the working cast facilitated application of controlled pressure around the tissue surface of the provisional restoration. This served the purpose of sculpting the tissues around the abutment to achieve the planned emergence profile. The creation of a sharp interdental papilla required sequential additions to the gingival surface of the interim prosthesis, whose tissue

surface served to support the periabutment soft tissue and act as a scaffold around which tissues molded themselves.

The tissue surface of the interim prosthesis was highly polished. This prevented plaque accumulation and permitted the patient to maintain meticulous hygiene. This was an important factor to evaluate on recall visits and repolish the surface if required. It is necessary to explain to the patient the critical requisite of maintaining hygiene around the site during the entire period of provisionalization.

Various techniques[26,27] have been reported to sculpt periimplant soft tissue for esthetic results. Our technique has the following significant benefits over previously published techniques:

1. Less chairside time was needed, as the scraping and fabrication sequence of interim prostheses was done indirectly on a working cast.
2. Indirect fabrication of the interim prosthesis permitted precise control over the amount and area of the cast scraped, as per the operator's decision of the site and amount of tissue displacement needed.
3. Observation of the tissue response was possible over sequential recall visits. The operator can elect to add or subtract from the interim prosthesis based on tissue response and can also maintain proximal contact at the planned level to ensure regeneration of the papilla.

The multidisciplinary team approach to this clinical scenario resulted in a satisfactory management of the numerous restorative challenges, such as inadequate space and excess tissue bulk at the edentulous site. An excellent esthetic outcome was obtained, and maintenance of the interdental papillae at index score 3 was observed at the 1-year recall.

## Summary

A step-by-step multidisciplinary approach is used to mold existing tissues to achieve an esthetic result in implant-supported prostheses in the esthetic zone. Adaptation of the treatment plan to comply with the patient's needs and expectations is essential. Post-treatment evaluation of the prosthesis must be designed to appraise not only osseointegration and crestal bone levels, but also the position of the interdental papillae and emergence profile.

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