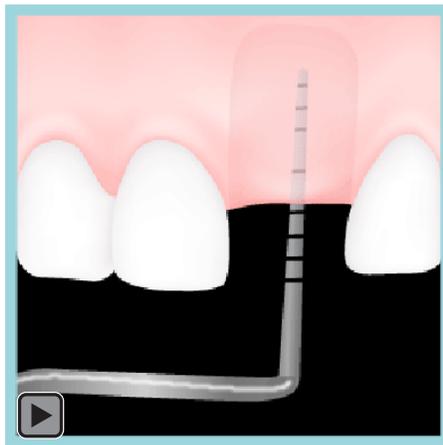


An Alternative Method for Flapless Implant Placement and an Immediate Provisional Crown: A Case Report

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Abstract

Aim: The aim of this case report is to present a description of bone mapping as an alternative method to determine the dimensions of bone prior to placement of a flapless implant and an immediate provisional crown.

Background: The use of a temporary removable partial denture (RPD) or “flipper” during healing following an extraction is not acceptable for some highly demanding patients. As a result, flapless implant placement is gaining popularity because it offers some advantages such as less bleeding, less swelling, and the protection of soft tissue contours.

Case Report: A 65-year-old woman missing a maxillary left lateral incisor was treated using flapless implant placement and an immediate provisional acrylic crown. Under local anesthesia, the bone anatomy was mapped by inserting a standard periodontal probe in the gingiva. By using the recorded measurements, the thickness of soft tissue was removed from the cast. A surgical guide based on this adjusted model was fabricated prior to surgery. The guide was seated on the teeth when actual surgery was performed to facilitate bone drilling and then the implant was placed. Utilizing the previously fabricated acrylic tooth index, the temporary acrylic crown was fabricated on the adjusted temporary metal abutment and delivered to the patient the same day.

Summary: In this case report the missing maxillary left lateral tooth was restored using flapless implant

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placement and an immediate provisional single crown. The dimension of the bone at the implant recipient area was determined by an alternative bone mapping method.

Clinical Significance: This case report suggests the use of flapless implant placement using the bone mapping method and immediate provisional crowns for single crowns when esthetics are a high priority and preserving ideal soft tissue contours and papillary heights are critical.

Keywords: Dental implant, bone mapping, provisional crown, flapless surgery

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Introduction

The establishment of peri-implant soft tissue contours with intact papillae and gingival margins is a major esthetic concern, especially for patients whose maxillary anterior gingiva is visible when they smile or speak.¹ Recent studies have shown flap elevation often results in gingival recession and bone resorption around natural teeth.² The flapless implant placement has recently become a popular method to minimize the possibility of post-operative peri-implant tissue loss and to overcome the challenge of soft tissue management during or after surgery.³

Careful diagnosis and treatment planning are critical for predictable outcomes, especially for flapless implant placement. Evaluation of the dimensions of the available alveolar bone is an important prerequisite for success. Bone evaluation with the help of panoramic and/or periapical radiographs may be insufficient as it only provides two-dimensional information about the implant recipient area.⁴ A more accurate assessment of the bucco-lingual dimension of the alveolar ridge is needed for proper treatment planning. The bucco-lingual ridge width can be evaluated by computed tomography (CT).⁵ A less costly alternative than CT is ridge mapping using a caliper under local anesthesia.^{6,7} The tips of the caliper are used to penetrate crestal, buccal, and lingual soft tissue layers to determine the bucco-lingual width of the underlying bone as well as the thickness of the vertical soft tissue on the underlying alveolar crest. This is a chairside procedure that provides instant information for the surgeon and may obviate CT scanning for this purpose.⁷

This report presents a clinical case of a single-tooth implant in the maxillary anterior region in which flapless implant surgery and placement of an immediate provisional acrylic crown was done after using a bone mapping procedure.

Case Report

Diagnosis

A 65-year-old woman with a missing maxillary left lateral incisor presented for restorative treatment. The tooth was extracted four months previously due to a root fracture following endodontic treatment. The health history and clinical examination revealed no significant periodontal or medical complications, and a panoramic radiograph showed initial bone healing had already occurred.

Treatment

Restorative treatment options presented to the patient included an implant-supported single tooth crown, fixed bridgework, or a removable partial denture (RPD). The patient chose the implant-supported single tooth crown option and conveyed written informed consent prior to the onset of treatment.

Study casts were from preliminary alginate impressions for both the maxillary and mandibular arches on which two vacuum adapted stents were made. One stent served as a surgical guide made with 0.40" thick Pro-form Temp Splint/Surgical Tray material (Keystone Industries, Myerstown, PA, USA). This was fabricated on the maxillary study cast after attaching an acrylic maxillary left lateral tooth in the edentulous space of the cast

with sticky wax. After the stent was made and trimmed to size, the edentulous space for the missing maxillary left lateral tooth was filled with temporary acrylic to be used as a bone drill guide. A second stent was fabricated of the same but thinner material (0.20") to be used later for the fabrication of an immediate provisional crown.



Figure 1. The bone anatomy was mapped by inserting a standard periodontal probe through the gingiva to determine the dimensions of the bone.

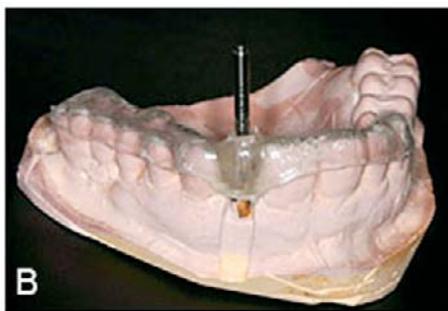


Figure 2. A. By using the recorded measurements, the volume of the soft tissue was removed from the study model. **B.** The previously fabricated surgical guide was seated, and drilling was performed through the guide and temporary acrylic in the edentulous space.

Under local anesthesia a standard periodontal probe was used to penetrate the alveolar mucosa to the bone to obtain three pairs (two buccal, two lingual, and one crestal) of measurements in mm to map the bone anatomy (Figure 1).

Stone was removed from the same edentulous area of the study cast to the same depths as the soft tissue measurements. This was accomplished by marking the points of the soft tissue measurements on the study model with holes corresponding with the appropriate soft tissue depths using a 1 mm diameter straight fissure bur and then confirming with a periodontal probe (Figure 2a). Stone was then removed by connecting the depths of the holes which represents the soft tissue thickness to the level of alveolar bone.

Based on this adjusted model and previously fabricated surgical guide, the model was drilled through the incisal edge of the guide and the temporary acrylic in the edentulous space of the missing lateral incisor. This was done to determine the proper position and angulation of the implant to be placed within alveolar bone (Figure 2b).

The surgical guides were disinfected prior to surgery. The guide with the drill hole was seated on the teeth. Using the implant twist drill the soft tissue was punched at the planned implant site through the drill guide hole. This was done to eliminate the need for flap elevation in an effort to preserve the existing soft and hard tissues and to minimize postoperative bleeding and soft tissue swelling. After drilling the hole in the alveolar bone, the implant (3.5 x 13 mm, Astra Osseospeed, Molndal, Sweden) was inserted (Figures 3a and b).

The metal temporary abutment was seated on the implant and adjusted (Figure 4a). The second stent was used to fabricate an acrylic provisional crown using the traditional provisional crown fabrication technique (Figure 4b).

The temporary acrylic crown was adjusted, polished, and delivered to the patient the same day (Figures 5a and b).



Figure 3. A. The surgical guide was seated on the teeth, the actual surgery was performed. **B.** The implant was placed without flap elevation.



Figure 4. A. The metal temporary abutment was seated on top of the implant and adjusted. **B.** An acrylic provisional crown was fabricated using the second stent to form the crown by injecting acrylic on the abutment, seating the guide and allowing the material to set.



Figure 5. A. The temporary acrylic crown was delivered to the patient the same day. **B.** A periapical radiograph of the implant.

At the 3-month recall visit, the implant was stable with an implant stability quotient of 69 as determined by resonance frequency analysis (Osstell Mentor, Integration Diagnostics, Goteborg, Sweden). Periapical radiographs revealed no periapical radiolucencies. There was

no evidence of bleeding on probing or pathologic probing depths. The peri-implant soft tissue level appeared stable, and the interdental papillae were preserved which contributed to an optimum final esthetic result.

Discussion

In this case report the flapless implant placement using bone mapping and an immediate acrylic provisional crown was described in the anterior maxilla.

Flapless implant surgery is becoming an alternative protocol for dental implant placement. Advantages of the flapless implant surgery include: less surgical trauma, decreased operative time, rapid post-surgical healing, fewer post-operative complications, increased patient comfort, and preservation of the gingival margin of the adjacent teeth and interdental papillae.⁹ However, flapless implant placement has required the use of CT scans in the past to evaluate the alveolar bone before implant placement.⁹ Use of CT scanning adds substantial costs for an implant procedure. As a result, pre-operative bone mapping has been used as an alternative bone evaluation method by some clinicians, especially for patients with limited financial resources.

The dental literature includes only a few studies of bone mapping using different instrumentation such as endodontic files or calipers to measure alveolar bone.^{7,10,11} Rocci et al.¹⁰ placed 97 maxillary implants using flapless surgery and delivered immediate prefabricated provisional restorations in 46 patients. The patients who received 25 fixed partial prostheses and 27 single-tooth restorations were followed up for three years in that study. Under local anesthesia they mapped the alveolar bone by inserting endodontic files with rubber stops. Like the present study they used the recorded measurements to remove an equivalent amount of the soft tissue from the implant area of the stone cast upon which a surgical guide was then fabricated. The implants were placed using these surgical guides. Their results showed the cumulative survival rate of 91% after three years.

Chen et al.⁷ aimed to compare ridge-mapping measurement before surgical flap reflection and measurement using images generated by cone beam computerized tomography (CBCT) to direct caliper measurement following surgical exposure of the bone. A study model was made

from an alginate impression and a clear acrylic stent was fabricated. Three pairs of buccal/lingual measurement points were defined at the site for implant placement and marked on the study model. CBCT was performed to measure the dimensions of the bone. The 16 patients with 25 implant sites provided 75 measurement positions, but only 64 measurement positions were evaluated due to technical difficulties. Comparisons of bucco-lingual ridge width using ridge-mapping versus direct caliper measurements showed that 94% and 89% of pairs of measurement deviations were within ± 1 mm among their two examiners while the corresponding data of CBCT were 70% and 55%. They concluded CBCT image measurements provided lower levels of agreement than ridge-mapping measurements because of the more frequent and larger magnitudes of deviations compared to direct caliper measurements.

Perez et al.¹¹ compared the accuracy of linear tomography and direct ridge mapping for determining alveolar ridge dimensions. One site of the posterior mandible was selected for evaluation in each of five cadaver heads. Vacuum-formed stents made from models of cadaver ridges were used to identify three sets of measurement points of each specimen. Linear tomograms were taken of selected sites and ridge mapping measurements were made with calipers. They found no significant differences between linear tomogram and ridge mapping for ridge width measurements.

Summary

In this case report the missing maxillary left lateral tooth was restored using flapless implant placement and immediate provisional single crown. The dimension of the bone at the implant recipient area was determined by an alternative bone mapping method.

Clinical Significance

This case report suggests the use of flapless implant placement using the bone mapping method and immediate provisional crowns for single crowns when esthetics are a high priority and preserving ideal soft tissue contours and papillary heights are critical.

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