Management of Buccal Gap and Resorption of Buccal Plate in Immediate Implant Placement: A Clinical Case Report

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Abstract:
When a dental implant is placed into a fresh extraction socket, a space between the implant periphery and surrounding bone occurs. A gap can occur on any aspect of an immediately placed implant: Buccal, lingual or proximally. The objective of immediate implant placement is to provide an osseointegrated fixture suitable for an aesthetic and functional restoration. Bone fill in the gap between the implant and the peripheral bone is important. Surgical management of the buccal gap to obtain an optimal result is controversial and confusing with respect to the best techniques to achieve the following: Optimal bone fills in the gap, most coronal level of bone-to-implant contact, and the least amount of buccal bone loss and soft tissue recession. This clinical case report illustrates the management of the buccal gap and reducing buccal plate resorption when contemplating immediate implant placement.

Key Words: Bone graft material, buccal gap, immediate implant

Introduction
Smile is an everlasting embellishment. Extracting any tooth can be a traumatic experience for a patient especially when the tooth is affecting the aesthetics. It is always desirable for the patient to receive a replacement of the lost tooth immediately.

A dental implant can be placed in the tooth socket immediately after extraction. When a dental implant is placed into a fresh extraction socket, a space between the implant periphery and surrounding bone occurs. A gap can occur on any aspect of an immediately placed implant: Buccal, lingual or proximally. This space between the implant periphery and surrounding bone is called the gap or jumping distance. The gap consists of two dimensions: Horizontal defect width and vertical defect height. The term “jumping distance” refers to the ability of bone to bridge the horizontal gap and fill the void. The main objective of immediate implant placement is to provide an osseointegrated fixture suitable for an aesthetic and functional restoration. Bone fill in the gap between the implant and the peripheral bone is important. The buccal aspect of an implant is of great concern, especially in the aesthetic zone, because the buccal bony plate is usually thin and its resorption can result in soft tissue recession. The objective of the surgical management of the buccal gap is optimal bone fill in the gap, most coronal level of bone-to-implant contact and the least amount of buccal bone loss and soft-tissue recession.

Extraction site classification for developing site-specific treatment designs depending on the gingival margin level and the bone around the tooth to be extracted was suggested by Salama and Salama as all extraction site are not the same. The unswerving relationship of the location and shape of the papilla to position of the interproximal bone surrounding a tooth or implant was demonstrated by Tarnow et al. and Salama et al.

The height and width of the alveolar ridge changes dimensionally when the tooth is extracted. The height of the bony wall is seen to be reduced more on the buccal than on the lingual aspect of the extraction socket. It has been well documented that major changes of the alveolar process takes place within the first 6 months following a tooth extraction. This reduces the width of the alveolar ridge and vertical height. The reduced height and width of the alveolar ridge affects with the placement of dental implants and also influences the prognosis of the prosthesis with regards to esthetics. To assure the proper emergence profile and the optimal esthetic, the implant should be placed more palatally and apically in the extraction socket. Complications get exaggerated when the implant is placed more buccally in a fresh extraction socket. A thin periodontal phenotype emphasizes the esthetic complications. An additional surgical intervention may be required to remediate the surrounding soft tissue either before during or after the implant placement.

The dual zone has two zones: (a) tissue zone and (b) bone zone.
(a) The tissue zone ranges from the free gingival margin (0 mm) to the labial crest of the bone mid-facially.
(b) The tissue apical to the osseous crest is the bone zone.

The contour of the ridge can change after the removal of tooth, implant placement and bone grafting, and provisional restoration. This article provides a clinical illustration for the management of the buccal gap and resorption of the buccal
Management of buccal gap in immediate implant placement in the anterior region.\textsuperscript{10}

**Surgical and restorative specific tissue preservation protocols**

For an immediate implant placement and provisional restoration, the most critical part of the surgery is an atraumatic tooth removal without flap elevation – especially in the esthetic zone. The buccal-palatal dimensions are the thinnest due to the buccal bone plate and soft tissues.\textsuperscript{11}

The rationale of this procedure is to preserve the left over blood supply. The blood supply from the periosteum and endosteum enhance the optimal healing potential. The third blood supply which gets eliminated with tooth removal is from the periodontal ligament. In the gap between the implant and buccal bone, to graft the bone and tissue zones, autogenous, allograft, xenograft, and synthetic bone substitutes and/or materials can be used. The graft material acts as a scaffold which maintains the blood clot for initial healing and the hard and soft tissue volume.\textsuperscript{11}

To shield, contain and conserve the blood clot and bone graft material during the curative phase of the treatment, the temporary restoration subsequently can act as a “prosthetic socket sealing” device.\textsuperscript{12}

**Treatment options with and without flap elevation**

**With flap elevation**

A submerged protocol usually requires flap advancement to attain primary closure over an immediate implant. If a non-submerged protocol is utilized, the flap is typically replaced adjacent to the healing abutment or temporary crown or the gap can be left uncovered. If a permanent abutment is used, it will not have to be removed (avoids disrupting the junctional epithelium) and thereby may help reduce recession.\textsuperscript{13,14}

**Without flap elevation (flapless)**

The amount of osseous resorption is usually greater over the buccal aspect of roots than interproximally as the bone is thicker. Disturbance of the periosteum inhibits the blood supply to the bone, and it takes several days before normal bone vascularization is resumed. Pertinently, several authors suggested that avoidance of flap elevation reduced bone loss and recession after tooth removal and immediate implant placement in humans.\textsuperscript{15} In contrast, other human\textsuperscript{16} and experimental studies\textsuperscript{17} determined that even with a flapless approach the amount of bone loss was similar with and without flap elevation. Despite these conflicting data, if the tissues are left undisturbed (no flap elevation) there is a better chance to have less soft tissue recession. This concept is also supported by the finding that even if there is bone loss it does not necessarily result in alterations of the gingival contour as seen in periodontal patients.

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**Case Report**

A 54-year-old female came to the Department of Periodontology and Implantology at College of Dental Sciences and Research Centre, Ahmedabad with a dislodged prosthesis in relation to the upper left lateral incisor. The patient desired the replacement of the tooth. The intraoral periapical radiograph revealed a root piece of the upper left lateral incisor with periodontal ligament widening (Figure 1).

Patient was advised to start with an antibiotic coverage (combination of Amoxicillin 500 mg and Clavulanic acid 125 mg) a day prior to surgery. Local anesthetic agent was injected at the site of surgery. A 15 no. scalpel blade was used for sharp dissection of the supracrestal fibers and the tooth was removed atraumatically. The socket was debrided with a bone curette. The elevation of the flap is not mandatory for extraction of the tooth or immediate placement of the implant and intact buccal bone plate was found after extraction of the tooth.

The implant used, in this case, was a two-piece implant (Myriad Plus) with a diameter of 3.8 mm, diameter with 13 mm length. The initial osteotomy site was prepared with D2.0 mm pilot drill up to the length of 13 mm. The depth and axis/direction of drilling is decided by the pilot drill. Drill speed with the pilot drill was kept to 1500 RPM. This drill was made 3 mm to 4 mm apical to the free gingival margin and palatally to optimize the esthetics (Figures 2 and 3).
Following the pilot drilling up to a depth of 13 mm, the osteotomy site was progressively widened with the D3.3 mm drill with a speed of 1000 RPM up to the same depth. Implant of diameter D3.8 mm was inserted in the prepared osteotomy site with the torque ratchet. The torque ratchet was used for the final tightening with an optimal insertion torque between 35 and 45 Ncm.

The buccal gap between the buccal plate and the implant was filled with a bone graft material (Perioglas) (Figure 4). To maximize the volume of graft material that can be placed, the graft material was packed and condensed against the buccal plate and the implant up to the most coronal aspect of the free gingival margin. Hence, the buccal gap and the resorbed buccal plate were managed.

Sutures were taken on the surgical site for complete closure. Abutment was placed and sealed with temporary cement (Figure 5).

Implant was immediately loaded with a provisional restoration (Figure 6).

Figure 4: Buccal gap is seen between the implant and buccal plate. The buccal gap is filled with a bone-graft material (Perioglas).

Figure 5: Sutures are taken and abutment is placed.

Figure 6: Immediate provisional prosthesis.

The patient was prescribed the anti-inflammatory drug and 0.2% Chlorhexidine mouthwash and was instructed not to brush in that area for next 3 days. Postoperative examination was performed 1 week later.

Discussion
Management of the buccal gap and reducing buccal plate resorption are important considerations when contemplating immediate implant placement. Procedures to handle the gap when the buccal plate is intact have varied depending on whether the implant was placed with or without flap elevation. In addition to these methodologies, soft-tissue augmentation (e.g. connective tissue graft) can be provided on the buccal aspect depending on the aesthetic demands of the case. In general, in the aesthetic zone it is preferable not to elevate a flap if the buccal plate is intact. Some techniques can be done alone (i.e., adding a biomaterial) or in combination with other procedures (biomaterial filler plus a barrier). Studies have clarified that if the gap is <2 mm then no additional therapy is needed to enhance gap fill. However, concomitant resorption of bone occurs and the magnitude of this alteration is related to buccal plate thickness, implant positioning, and whether a flap is elevated. Some authors suggest adding a biomaterial to inhibit horizontal bone resorption. It appears that a certain amount of crestal bone loss occurs after an extraction due to loss of blood supply when the periodontal ligament is eliminated. Differences in findings between studies with respect to gap fill can be attributed to different gap sizes, dissimilar thicknesses of the buccal plate and implant positioning, and various surgical modalities.

Conclusion
The principles that must be considered for achieving esthetic success with immediate implant placement into extraction sockets are:
(a) Atraumatic tooth removal without flap elevation.
(b) Placement of a bone graft in the residual gap around the implant and the immediate fresh extraction socket.

These principles helped to manage the buccal gap and resorbed buccal plate in immediate implant placement.

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