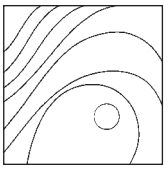
Management of Fenestration Defects During Flapless Immediate Implant Placement in the Esthetic Zone



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The success of flapless immediate implant placement is dependent on the bony architecture on the buccal aspect of the socket. The presence of a fenestration defect in the buccal cortical plate may jeopardize the esthetic outcome, especially if the clinician does not undertake adequate soft and hard tissue augmentation procedures. This article describes the use of an esthetic buccal flap design to deal with fenestration defects created during anterior implant placement immediately after extraction. This technique has been proven effective in maintaining the soft tissue architecture and allows hard tissue grafting of the fenestration defect around the implant in a postextraction socket.
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Current protocols in esthetic implant dentistry support conservative flapless placement of implants in the socket immediately after extraction of the affected tooth.[1–3] The esthetic expectations in such cases are high. The pressure on the clinician is to perfectly position the implant three dimensionally. The success of such an immediate extraction and flapless placement protocol depends on having an intact bony architecture on the buccal aspect of the socket. The thinness of this buccal bone is well documented in the literature.[4] In such situations, presence of dehiscence or fenestration defects may jeopardize the esthetic outcome, especially if adequate soft and hard tissue augmentation procedures are not undertaken by the clinician.

A fenestration defect in the residual buccal cortical plate may be present as a result of periapical pathology or may be inadvertently created during correct buccolingual placement of drills in an attempt to get the long axis of the implant in line with cingula of adjacent teeth.

Management of such defects in an intact socket conventionally required a full-thickness flap to be raised so that suitable hard tissue grafting procedures could be performed.[5] Various conservative flap designs have been documented in

the literature for the anterior zone[6]; however, they require the incisions to extend into esthetically visible areas on adjacent teeth, thereby compromising the marginal and interdental soft tissue levels that are prone to recession or scarring, especially in thin tissue biotypes.[7,8]

This article describes the use of an esthetic buccal flap design to deal with fenestration defects created during anterior implant placement immediately after extraction. This technique employs a vestibular incision and stays away from esthetically visible areas. It has been proven[9] to be effective in maintaining the soft tissue architecture and allows hard tissue grafting of the fenestration defect around the implant in a postextraction socket.

Preoperative assessment

Before undertaking this procedure to conservatively manage fenestration defects in postextraction anterior sockets, a thorough evaluation of the site is necessary. The mesiodistal dimension must be evaluated clinically and radiographically. The level of free gingival margins of the affected tooth in comparison with adjacent teeth, tooth shape, biotype, degree of scallop, and sounding of the interproximal bone levels are important points to be assessed. An incorrect esthetic risk assessment can lead to an undesirable outcome.

The esthetic buccal flap procedure

Technical considerations

Atraumatic extraction of the tooth

The extraction of the involved tooth is carried out with an atraumatic technique using periotomes and luxator elevators. The root is carefully extracted by rotating it out of the socket, taking care to avoid the fragile buccal cortical plate from developing a fracture, as that may lead to an unpredictable esthetic outcome. Following the extraction, the socket is thoroughly cleaned and curetted with bone curettes and the site is irrigated using a 1:1 concentration of povidone iodine and saline solution. This is usually done when pathologic microorganisms are expected to be present in the recipient bed.

Assessment of the socket

The integrity of the socket is assessed using a blunt explorer. The walls of the socket are probed all around, from the margin to the apex, to detect any dehiscence or fenestrations in the bone. There are three possible scenarios at this stage:

The socket walls are found to be intact with no loss of continuity along the entire length of the buccal bone. At this stage, based on preoperative planning and soft tissue profile, an immediate placement of the implant is made.

If a dehiscence is present, the socket is thoroughly curetted and immediate implant placement may be deferred to a later date. In such cases, an early placement protocol at 8 to 10 weeks would allow soft tissue healing and would provide the clinician with an opportunity to graft bone while simultaneously placing an implant and achieving a primary closure.

In the case of a fenestration defect in the apical portion of the socket leading into the labial cortical plate, an immediate placement and an esthetic buccal flap (EBF) may be planned as described in this article.

The EBF technique

Figs 1a to 1c illustrate the technique. Fig 2 shows the socket that had developed a fenestration defect after extraction of the involved tooth. A no. 15 blade was used to make an incision on the attached gingiva coronal to the fenestration defect and 2 to 3 mm apical to marginal bone. The design consists of two beveled vertical incisions along lines of tension and one horizontal incision joining the two. The incision line should rest on sound bone. The incision is similar to the Ochsenbein–Leubke incision[10] proposed for apical surgeries (Fig 3).

A full-thickness mucoperiosteal flap is raised, and the fenestration defect in the bone is detected. The remnant granulation tissue is then curetted out under direct vision. Thereafter, a root form implant of an appropriate diameter and length is chosen to be placed in the extraction socket. The osteotomy is made on the palatal wall of the socket and primary stability is achieved. The implant is placed so as to have

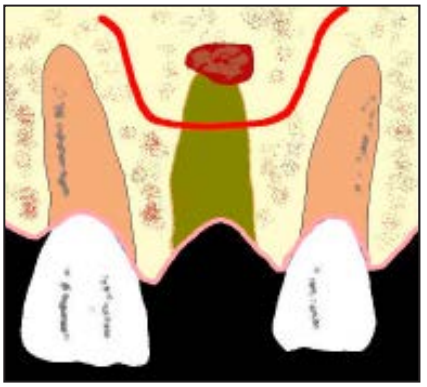

Fig 1a *The esthetic buccal flap design.*

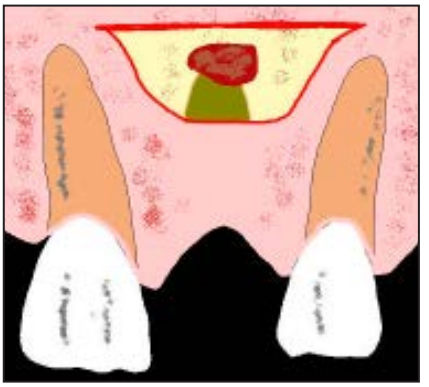

Fig 1b *Mucoperiosteal flap raised to expose the fenestration defect.*

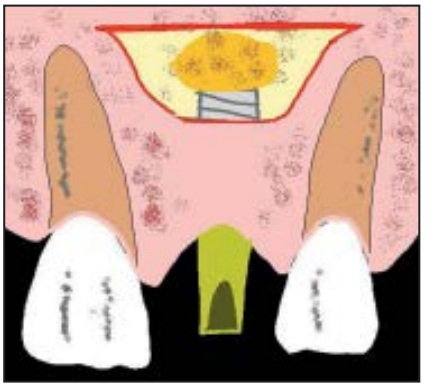

Fig 1c *Implant placement into extraction socket and grafting of fenestration defect.*

Fig 2 (left) *Site after atraumatic extraction of the tooth.*

Fig 3 (right) *Mucoperiosteal flap raised to expose the fenestration defect.*

Fig 4 (left) *Implant placement into palatal wall of the extraction socket.*

Fig 5 (right) *Placement of bone substitute material in the defect.*

a gap of 2 mm between implant and labial plate of bone. An accurate three-dimensional placement is made to achieve ideal labiolingual, mesiodistal, and apicocoronal positioning of the implant (Fig 4).

The fenestration defect is then grafted using any bone substitute material and covered with a resorbable membrane (Figs 5 and 6). The incision line is closed using interrupted sutures (Fig 7). If the jumping distance between the implant and the buccal wall of the socket is greater than 2 mm, it is grafted using the same bone substitute.[11]

At this point, based on the clinicians' experience and the patient's expectations, a decision is made about the possibility of making a provisional crown immediately over the implant (Fig 8). The definitive porcelain-fused-to-metal (PFM) restoration at 6 months shows excellent tissue response (Figs 9 and 10). If the implant is stable and the occlusion is favorable, a provisional restoration can be fabricated on the implant. Alternatively, the implant could be left submerged and a conventional loading protocol followed.

Fig 6 *Resorbable membrane covering the defect.*

Fig 7 *Tension-free suturing of flap.*

Fig 8 *Chairside provisional fabricated in composite resin.*

Fig 9 (left) *Clinical view of definitive restoration at 6 months postoperative.*

Fig 10 (right) *Radiograph at 6 months postoperative.*

Case report

The following is a case report of a patient treated using the EBF technique and needing an immediate implant placement for a central incisor.

A 24-year-old female patient reported to the clinic with pain and swelling in connection with tooth 9, which had a history of trauma 8 years earlier. The tooth was endodontically treated and a PFM crown was fabricated. The tooth was tender to percussion, and the radiograph revealed a periapical lesion with external resorption of the root. On smiling, the patient revealed excessive gingival display due to a high lip line. This placed her in an esthetically high-risk category (Fig 11).

A repeat endodontic treatment with an apical surgery had poor prognosis in this case; hence, it was decided to extract the tooth and replace it with an implant-supported prosthesis. Considering the patient's age and desire for an early restoration, an immediate placement protocol was planned.

A stone cast of existing dentition was made on which a fiber-reinforced bridge was fabricated to serve as a provisional restoration immediately after extraction.

After administration of the local anesthetic agent, the tooth was carefully extracted to maintain the integrity of the labial plate. The infected periapical tissue was thoroughly cleaned using curettes and irrigated with a 1:1 combination of povidone iodine solution and saline. Exploration of the socket walls with a blunt probe revealed that the labial plate was intact coronally. However, a fenestration was present in the apical region of the socket on the labial aspect, which seemed to coincide with the location of the periapical lesion.

A root form implant (Tapered Internal Laser-Lok, Biohorizons) was placed in the extraction socket using a flapless approach (Fig 12). Care was taken to prepare the site, maintaining a palatal position for the implant to retain a gap of approximately 2 mm between implant and labial plate. The emergence of the implant was from the cingu-

Fig 11 (left) *Preoperative view of patient's smile.*

Fig 12 (right) *Implant placement into extraction socket and esthetic buccal flap raised.*

Fig 13 (above) *Definitive crown.*

Fig 14 (right) *Postoperative view of patient's smile.*

lum of the proposed final tooth. The prosthetic platform of the implant was made to end 3 mm apical of the free gingival margin. This depth of placement, along with correct management of tissues in the provisional restorations in the prosthetic phase, will allow a good emergence profile to be created. Good primary stability for the implant was achieved and quantified in range of 35 Ncm, which is paramount for this technique to succeed. The authors, however, chose not to provisionalize on the implant at placement, as occlusal factors could have led to greater micromotion than acceptable, leading to lack of osseointegration.

Thereafter, a semilunar incision was made on the attached gingiva and a mucoperiosteal flap was raised to expose the fenestration defect (Fig 10). The incision was designed to rest on the intact marginal bone. The labial defect was grafted using calcium phosphosilicate putty (Dental Putty R, NovaBone). The jumping distance was also filled with the putty bone substitute. A collagen membrane (Proguide, Equinox) was placed over the grafted site, and 4.0 silk interrupted sutures were placed.

After the bleeding from the surgical site was controlled, the fiber-reinforced bridge was bonded on the palatal surface of the adjacent teeth. Postoperative healing was uneventful. Four months after implant placement, a second-stage surgery was performed and a closed tray impression was made to fabricate a provisional crown. A composite resin crown was fabricated and cemented over a temporary abutment. The provisional crown was undercontoured to achieve soft tissue creep for a better final outcome. Three months after placement of the provisional crown, a cement-retained PFM definitive crown was fabricated. The definitive abutment was torqued at 30 Ncm and the crown was cemented using eugenol free temporary luting cement (Figs 13 and 14).

The postoperative radiograph revealed excellent bone fill in the affected site and good bone-to-implant contact (Fig 15). The gingival level showed a positive discrepancy compared to the adjacent tooth. The tissue response was excellent and this was left as it was.

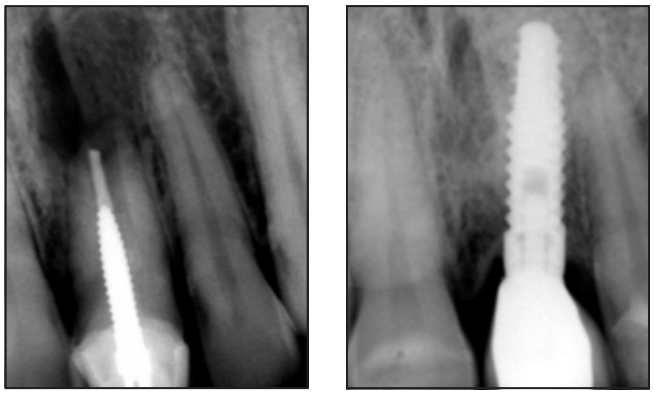

Fig 15 *Pre- and postoperative radiographs.*

Results

The final outcome in both cases was esthetically pleasing. The soft tissue levels matched those of the adjacent tooth. The cases were followed up 1 year and 2 years postoperatively. The gingival contours were found to be well maintained (Figs 13 and 14). Radiographically, the implant was surrounded by bone exhibiting a good crestal level and complete resolution of the periapical pathology (Fig 15).

Discussion

Implant placement in the esthetic zone requires not only good clinical skills but also thorough knowledge of the biological substrates involved. Implant placement can be immediate or early.[11,12] This article pertains to immediate placement of implants after extraction of the offending tooth in the esthetic zone. It has been documented in the literature that raising a flap to place an implant immediately after extraction in the esthetic zone could lead to mucosal recession of up to 1 mm. The reasons for this are still unclear, but theories point to the interruption to the periosteal blood supply of the surgical field due to reflection of the flap.[13] To overcome the mucosal recession and shorten treatment time, a flapless immediate implant placement approach was advocated.[13] The major drawback of the flapless implant placement is the inability of the clinician to visualize any defects in the residual bony architecture. These defects could be fenestration or dehiscence type. Presence of a dehiscence defect after extraction of an offending tooth almost negates immediate implant placement, and an early placement protocol is ideally advocated in these cases.[14,15,16]

Fenestration defects in the labial cortex after extraction, however, can be managed with simultaneous hard tissue grafting along with placement of the implant. The conventional technique for such fenestration defects required the clinician to raise a full-thickness flap, thereby causing greater damage to the soft tissue architecture of the site. The EBF technique employed in this article allows the clinician to complete the immediate flapless placement of the implant and then use a conservative incision reasonably away from the free gingival margin of the tooth in question. This allows the soft tissue housing around the implants to be maintained and provide a good foundation to create an esthetically pleasing result. The technique described here would be ideally indicated in patients with a high lip line where the gingival margins are visible during smiling. However, it is not a suitable technique when the defect is very large or when multiple teeth are involved.

Conclusions

EBF was effectively used in a highly challenging clinical situation to access a fenestration defect in an immediate postextraction implant placement. It has the advantages of maintaining the original form and integrity of the marginal and interdental gingivae and yet allowing effective grafting of the fenestration defect on the buccal wall of the socket.

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