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Screw-retained restoration of a facially shifted postextraction implant in the esthetic zone with immediate provisionalization

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ABSTRACT

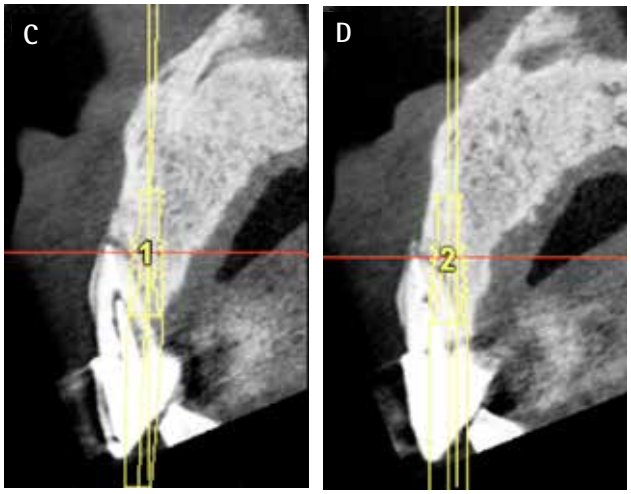
Aim The aim of this article is to describe an alternative rehabilitation of a facially shifted postextraction implant with immediate provisionalization of a screw-retained restoration.
Case report Immediate postextraction implant placement may pose significant challenges. A case is described where, despite proper risk assessment and planning, an implant shifted from the position of the prosthetic driven restoration. This resulted in different positions of immediate postextraction implants in the sites of the upper central incisors. The provisional was constructed with different access holes. The use of an angulated screw channel compensated the access holes from the original implant axis, thus making a screw-retained restoration on the palatal side feasible.
Result The use of angulated screw-retained crowns might benefit periimplant condition in the long-term by eliminating the use of cements. Although the mechanical complications are underreported, this approach is likely to yield good results and allow shifted implant in the anterior region.
Conclusions Angulated screw crowns could correct facially shifted implants in the esthetic zone. The system compensates the natural angulation of maxillary teeth, allows easy application of screw retained crowns, eliminates the risk of cement-related periimplantitis and preserves esthetics.

KEYWORDS Dental implants; Extra-short implants; Implant supported dental prosthesis; Survival rate; Dental restoration failure.

INTRODUCTION

Anterior implant restoration with immediate provisional approach is a current treatment protocol that has been adopted for many years (1-3). It is known to reduce the surgical intervention through a flapless approach and shorten the treatment period. From a biological perspective, the adequate buccal bone thickness provides nourishment to the surgical area, preserving the blood supply to the overlying periosteum (4, 5). Furthermore, bone remodeling is minimized through bone graft material deposited in the residual gaps of tooth extraction socket and implant. However, the risk of esthetic dilemma in immediate implants is well understood due to the nature of thin labial bone plate and soft tissue. (6) Therefore, various protocols such as dual zone technique and socket shield have been documented to reduce ridge collapse and peri-implant soft tissue recession, in oprder to improve esthetic result (7, 8).
Despite the best intentions, immediate implant placement in the anterior socket may pose significant challenges. The probability of apical socket perforation is high (82%) due to the anatomy of the premaxilla (9, 10). Additionally, primary implant stability may not be easy to achieve when placing the implant in a prosthetic driven location in a fresh socket of the anterior region (11). This is supported in a recent study that has shown a shift in facial direction from 3.11° to 6.78° in flapless immediate implants with or without guided surgery (12). Therefore, in this situation, application of screw-retained crown is limited, especially when the access hole of the screw channel is located on the aesthetic area. Although cement-retained restorations can be an alternative, hypothetically, the risk of biological complications is high, since it is difficult to remove excess cement in a palatally placed and slightly deeper socket of an immediate postextraction implant (12).
In the recent years, the prosthetic option known as the angulated screw channel (ASC) has been introduced

FIG. 1 Labial view of the preoperative condition (a). Labial view after crown was removed to evaluate the abutment condition (b). CBCT showing intact buccal plate on left upper central incisor and right upper central incisor with the planned Nobel Active Implant (4.1 mm x 13 mm) simulation model (c,d).



(13, 14). The system permits 25 degrees of angulation correction and avoids the screw access on the facial. Thus, the aim of this clinical report was to describe the alternative to correct facially shifted immediate implants for screw-retained restorations.

CASE REPORT

A 45 years old patient presented to our observation with the fractured crown of the upper left central incisor and grade I mobility on the upper right central incisor. Teeth were indicated for extraction (Fig. 1a, 1b). Cone beam computed tomography showed the existence of adequate buccal bone thickness and was planned to receive immediate implant and immediate provisional restorations (IIPIP) on both teeth (Fig. 1c, 1d). The procedures for postextraction implant with immediate provisionalization were performed on two different visits in order to preserve the structure of interproximal bone and soft tissue contour.

After local anesthesia, a 15c scalpel was used to cut the periodontal fibers and the tooth was extracted atraumatically with forcep (Fig. 2a). The socket was thoroughly debrided with an excavator and normal saline solution. A periodontal probe was used to verify the integrity of the buccal plate and was preserved. The implant bed was prepared with pilot drill as initial osteotomy on the palatal bone. The implant with 4.3 diameter and 13 mm length (Nobel Active, Nobel Biocare) were placed toward the palatal wall of the extraction socket to a depth of 3 mm from the gingival margin. With a 30 N torque, the implant was shifted to facial direction (Fig. 2b). Since primary stability was already achieved to receive provisional restoration, the next sequence was carried out to prevent the failure of osseointegration. The healing abutment was inserted prior to the placement of grafting material to seal the connection of the screw channel. Deproteinized bovine bone mineral (Bio-Oss, 0.25 mm size, Geistlich Pharma) was used to fill the gap. The temporary abutment was connected and a provisional restoration was prepared with a facial angulation (Fig. 2c); 8 weeks later, the same procedure was carried out on the right upper

FIG. 2 Atraumatic extraction of left upper central incisor (a). Palatal view of shifted implant into facial direction (b). Temporary abutment was connected and facing facially (c).

FIG. 3 a) Splinted provisional restoration incisor was prepared in the laboratory. (b) Occlusal view of temporary abutment connected with the provisional shell (c) Buccal view of intraoral photo immediately after surgery prior to fill it in with composites.

incisor due to increased mobility from grade I to grade II. A new splinted provisional was hollowed in the laboratory for subsequent chairside relining and to correct the facially placed provisional (Fig. 3a).

The upper right central incisor was extracted atraumatically and the implant was placed palatally inside the socket.

The provisionals were then connected intraorally with the temporary abutment inserted on the implant and relined (Fig. 3b). The splinted provisionals were removed from the implant and were contoured with composite resin following the concave emergence profile. Esthetics, fit, phonetic and occlusion were confirmed immediately after surgery. The access hole on the upper right central incisor was filled with composite (Fig. 3c). One week postoperatively, the soft tissue was assessed identifying healthy surrounding peri-implant tissue and the healing was uneventful.

In the follow up visits, the provisionals were removed showing excellent oral hygiene and the patient had no complaints about mastication, speech and occlusion. Although different implant positions were observed, the peri-implant tissue was maintained with no ridge collapse and an adequate emergence profile (Fig. 4a). Final impressions were made with a conventional approach and were processed in the laboratory using angulated screw-retained crowns (Nobel Procera implant crown with ASC function, Nobel Biocare). For final restoration, the angulated screw with angulation of 0 to 25 degrees was used to connect the implant, titanium adaptor (base) and one piece zirconia coping veneered with ceramic (VM9, VITA Zahnfabrik, Germany) allowing a screw-retained restoration for both implants (Fig. 4b). A torque of 35Ncm was applied and the patient was satisfied with the outcome (Fig. 4c, 4d). The access hole was then sealed with polytetrafluoroethylene tape and composite resin (3M Espe Filtex Z350).

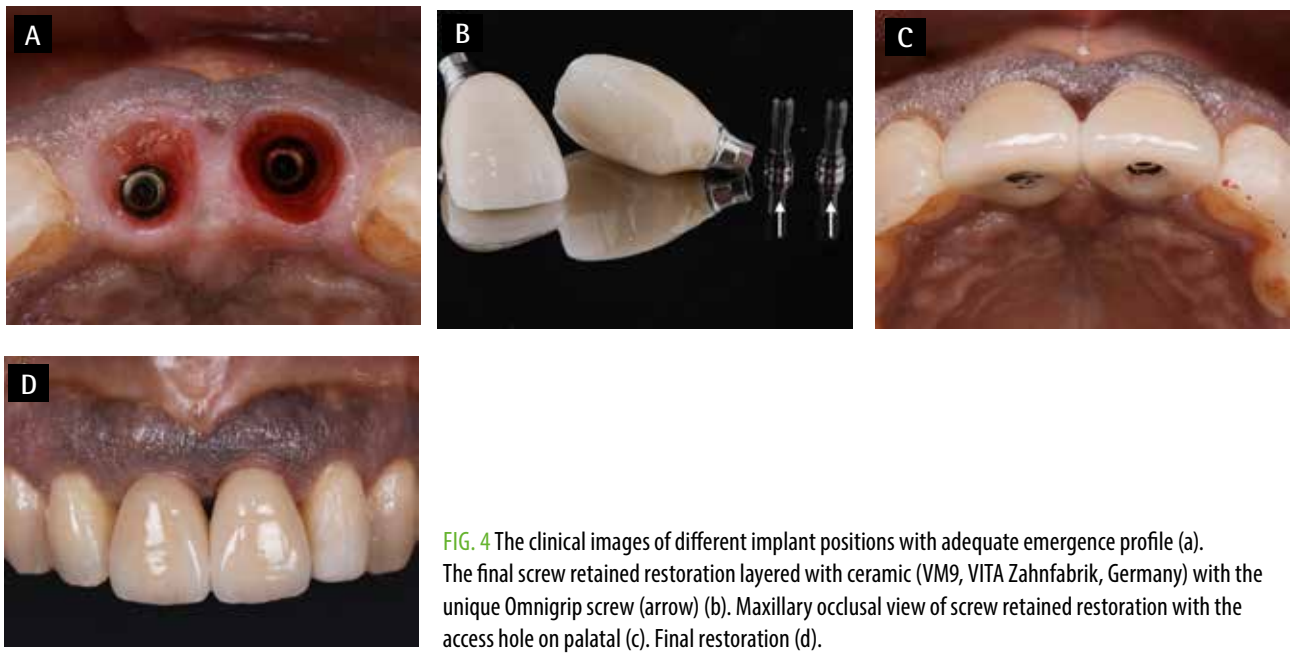


FIG. 4 The clinical images of different implant positions with adequate emergence profile (a). The final screw retained restoration layered with ceramic (VM9, VITA Zahnfabrik, Germany) with the unique Omnigrip screw (arrow) (b). Maxillary occlusal view of screw retained restoration with the access hole on palatal (c). Final restoration (d).

DISCUSSION

Immediate implant placement into post-extraction socket with provisional restoration has demonstrated an excellent long-term success (15). In this case report, limitation existed when interproximal papilla loss and black triangle was observed between the two upper central incisors of the definitive restoration. Although in the past the approach of alternating immediate implant placement and provisionalization between adjacent teeth was performed, it was documented that interproximal papillary loss may still occur even with careful execution and sufficient interproximal bone (16, 17). Therefore, to improve the esthetic outcome of this condition, it was suggested to move the cervical contact point apically or to perform papillary soft tissue reconstructions, but the patient declined this approach. A devastating consequence may arise even though several techniques and designs are proposed for immediate implants in the esthetic zone. As shown in this case report, an error occurred when the immediate implant shifted facially and esthetics was compromised because the hole access is buccally. Despite planning for an ideal prosthetic-driven location, clinical factors, such as insufficient bone quality, inadequate space, and patient factors such as limited mouth opening and also operator's skills may jeopardize the correct implant placement (18). To avoid complications and provide patient with greater satisfaction, clinicians should be careful when assessing the treatment solution of their cases. Although in the present case a cement-retained restoration could have been used to simply correct the angulation, a screw-retained restoration was preferred because because of its retrievability and less biological complications associated with excess cement (19). Hence, the ASC option enables to deliver a screw-retained restoration, even in case of implant misalignement.

Screw-retained restoration with ASC abutment permits the screw access hole to be positioned on the palatal side of the restoration. In this case report, the zirconia coping adapts mechanically to a titanium insert, without the risk of cement excess in the definitive restoration. A previous pilot study has shown no complications of the ASC abutments used in 42 implants with 5 years follow up (20). It was also stated that ASC abutments eliminate the use of non authentic components and cemented crowns (20). A recent clinical study recorded no significant difference of marginal bone loss, probing depth and mechanical complications between ASC abutments fabricated with cement or screw retained restoration (20, 21). However, screw loosening and fracture of veneer material on zirconia coping did occur in the angulated screw group (21). This can be explained by an *in vitro* study reporting that 80% of fractures in all-ceramic prosheses was found in 25° angulated channel specimens and 40% in straight channel specimens (14).

Furthermore, an interesting finding suggested the use of low elastic modulus, like hybrid abutment crowns with hybrid ceramic, for better stress distribution and possibly minimize mechanical complications (21). Therefore, if the zirconia is chosen, precautions should be taken on the minimum thickness needed circumferentially during screw head preparation (21, 22).

As new technologies and materials are constantly evolving, the immediate implant concept is expected to be revised and allow clinicians to face the new challenges ahead.

CONCLUSION

Within the limitation of the present case report, angulated screw-retained crown might provide benefits for the periimplant tissue, simplifying chairside procedure with its screw access and most importantly, can tolerate implant placement in fresh extraction sockets. Further studies should explore different types of materials and angulation used with ASC abutments, in order to evaluate the long-term mechanical performance of this special screw design and its effect on hard and soft tissue.

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