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Research Article

Role of Corticobasal Implants in the Rehabilitation of Dentoalveolar Trauma

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Abstract

Introduction: Management of dentoalveolar trauma often poses a unique challenge in terms of a need to replace both dental and bony hard tissues. In cases with loss of bone along with tooth the crestal implant-based management is often delayed due to insufficient bone. Corticobasal implants offers a comprehensive management for such conditions.

Materials and Methods: Three cases of dentoalveolar trauma were managed and rehabilitated successfully at our centre using corticobasal implants. No adjunctive bone reconstructive or regenerative procedure, such as bone grafting or distraction were carried out to facilitate implant placement.

Conclusion: Corticobasal implants are efficacious as well as versatile in the dental replacement and rehabilitation of those dentoalveolar trauma cases, which are complicated by a compromised bony foundation.

Keywords: Dentoalveolar Trauma; Corticobasal Implants; Bone Augmentation; Adjunctive Procedures; BECES Implants; Bendable Implants

Introduction

Dentoalveolar trauma has a significant incidence [1] and is commonly observed secondary to road traffic accidents, sports related injuries, interpersonal violence, industrial and miscellaneous falls, and accidents [2]. Depending on the severity and peculiarity of the aetiology, this condition presents with a wide spectrum of clinical features ranging from subluxation of teeth, contused lacerated wounds of varying severity of the adjoining soft tissues, tooth and bone fractures and often loss of tooth and or bone of varying extent. The extent of injury determines the clinical challenges faced, which may necessitate replacement of tooth, bone, or both. Dentoalveolar injuries result in both aesthetic and functional deficits and warrant a need to address both these issues, in the shortest possible time and to the best possible preinjury state or even better. The various options in the management of cases which involve loss of dental and bony hard tissues due to trauma are a removable partial denture, a tooth supported fixed partial denture, or an implant based fixed partial denture. Several factors influence the choice of treatment. However, the one important factor especially in cases involving the aesthetic zone, is the rapidity and minimality with which the appearance can be restored to the pre-traumatic state. Implant based replacement of the missing teeth is the gold stan-

dard of care, however, the loss of bone necessitates adjunctive procedures to augment the lost hard tissues, along with the mandatory latency in the two stage crestal implants is a significant limitation delaying definitive rehabilitation. Also, the prolonged remodelling of alveolar bone following trauma makes early placement of crestal implants unpredictable and may jeopardise its longevity [3].

Corticobasal implants offer a simple and rapid solution to all the above limitations, thereby offering the patients an attractive option for immediate rehabilitation [4]. Our study includes three cases of dentoalveolar trauma which were managed by using smooth surface, immediate functional loading strategic implant marketed under the trade name BECES manufactured by Ihde Dental/Simpladent, Germany (Figure). It is a smooth surface, single piece, bendable implant made from Ti6AI4V ELI alloy.

Figure

Of the three cases, two were of partially healed residual alveolar ridge after tooth and bone loss secondary to trauma and one was a case of immediate rehabilitation after traumatic tooth loss.

Aim of the Study

It was aimed to assess the role and effectiveness of corticobasal implants in the rehabilitation of patients with dentoalveolar trauma and to compare our results with standard published data of similar cases managed using crestal and other non-implant-based treatment options.

Objectives of the Study:

1. To assess the feasibility of placement of corticobasal implants in dentoalveolar trauma patients presenting with loss of hard tissue.
2. To assess the need for adjunctive bone augmentation procedures prior to implant placement.
3. To assess the time taken for rehabilitation vis-à-vis other methods.
4. To assess the aesthetic and functional outcome.

Materials and Methods

A total of three cases presenting with tooth loss secondary to dentoalveolar trauma were managed at our centre from May 17 to June 18. All three patients presented with a history of facial trauma and maxillofacial injuries sustained in Road Traffic Accidents (RTAs). Standard preoperative blood and urine investigations were carried out. Orthopantomogram (OPG) was the radiological investigation of choice and for subsequent follow up reviews as well. Non-Contrast Computerized Tomography (NCCT)/Cone Beam Computerized Tomography (CBCT) were also used based on clinical merit. The details of the cases are as follows.

Case 1: A 38-year-old male patient sustained facial injuries in an RTA, in which the car that he was driving, collided against a road divider. He reported to the hospital with copious bleeding from the mouth and missing upper front teeth. There were no other maxillofacial injuries or injuries to other parts of the body. On clinical and radiological examination, he was diagnosed as a case of contused lacerated intraoral wound of the upper lip and anterior maxilla with avulsion of four maxillary anterior teeth 11, 12, 21 and 22, along with loss of alveolar bone in the same region nearly up to the piriform rim and loss of buccal cortex (Figure 1a and 1b). Occlusion, TMJ and mouth opening were within normal limits. The wound was debrided, and all broken fragments of the alveolar bone were removed, and the sharp bony edges were trimmed and smoothened. The wound was closed and allowed to heal for a month (Figure 1c).

After a period of approximately one month, after reasonable soft tissue healing, the patient was taken up for implant-based rehabilitation of the lost hard tissues using the corticobasal implants. Four BECES implants were placed in the premaxillary region extending

from 11, 12, 21, 22 (Figure 1d). These were engaged in the cortical bone of the nasal floor and the nasomaxillary buttresses bilaterally. Flapless implant placement was carried out. As the patient's natural teeth had been excessively proclined with a diastema, the orientation of the implants was maintained to establish an edge to edge incisal relation with the corresponding mandibular teeth. Impressions were made after placement of transfer caps using medium body silicone impression material. Post insertion OPG was taken to verify the positions of implant placed (Figure 1e). A provisional permanent porcelain fused to metal (PFM) prosthesis was fabricated, tried, and seated using fast setting GC Fuji Plus glass ionomer cement (Figure 1f). The excess cement was meticulously removed, and the patient was given necessary hygiene and usage instruction. As a protocol a water pick was advised to ensure maintenance of optimal hygiene. Oral antibiotics and pain killers were prescribed for the first five days post operatively. Post insertion OPG was taken to check the seating of the prosthesis and residual cement on the intaglio surface of the prosthesis (Figure 1g). Review was carried out at 01, 03, 06 and 12 months following the procedure. Stability of the implants and prosthesis, occlusion, hygiene, and functionality were assessed at the recall visits. The patient was given an option to change the prosthesis but he decided to persist with the preliminary.

Case 2: A 34-year-old female patient sustained severe maxillofacial injuries when the autorickshaw she was travelling in was hit by a truck. She reported with bleeding from multiple sites on the face, mouth and nose, and inability to open her mouth. Clinically and radiologically she was diagnosed as a case of Le fort l fracture of the

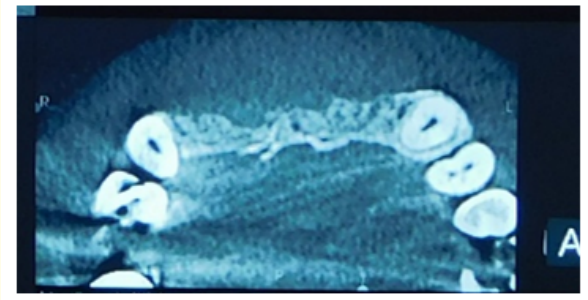

Figure 1a

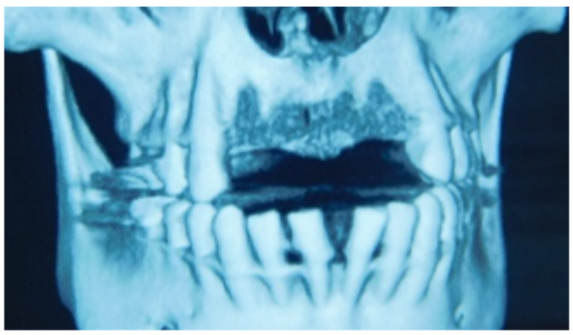

Figure 1b

Figure 1c

Figure 1d

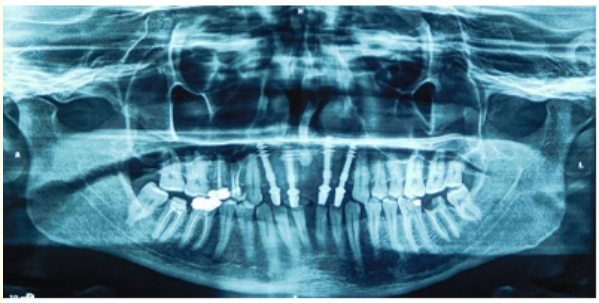

Figure 1e

Figure 1f

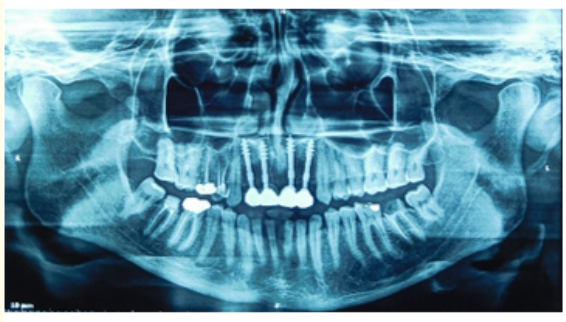

Figure 1g

maxilla and compound communited fracture of the right parasymphysis of the mandible, accompanied by compound dentoalveolar fractures of the premaxillary and mid-symphyseal regions, involving teeth 11, 12, 21, 22 and 31, 32, 41, 42 (Figure 2a). The patient was taken up for open reduction and internal fixation (ORIF) of the maxillofacial fractures under general anaesthesia. The fractures of the maxilla and mandible were reduced, stabilized, and fixed using 2mm profile Titanium minibone plates and screws (Figure 2b).

Thereafter, the patient was recalled after one month for review and rehabilitation of the residual dentoalveolar deformity (Figure 2c). She was taken up for implant based dental rehabilitation using corticobasal implants and PFM prosthesis. In the maxilla, four 3.6 mm thick and 20 mm long BECES implants were placed in the premaxillary region to restore the 11, 12, 21, 22 dentoalveolar segment (Figure 2d). These implants were anchored in the nasal floor and the nasomaxillary buttresses, successfully bypassing the ORIF hardware. In the mandible, to restore the arch form and create space for an aesthetically acceptable prosthesis, the teeth 33,43 adjacent to the edentulous segment, were extracted. This enabled us to place three 3.6 mm thick and 17 mm long BECES implants in the region (Figure 2d and 2e) and restore the residual deformity with an acceptable functional and aesthetic outcome within 72 hours following placement of the implants. A PFM prosthesis with gingival porcelain was employed to replace the lost teeth for dental rehabilitation (Figure 2f-2h). Review was done as per standard protocol as mentioned for Case 1.

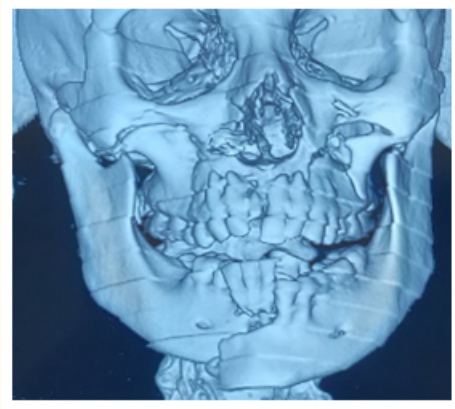

Figure 2a

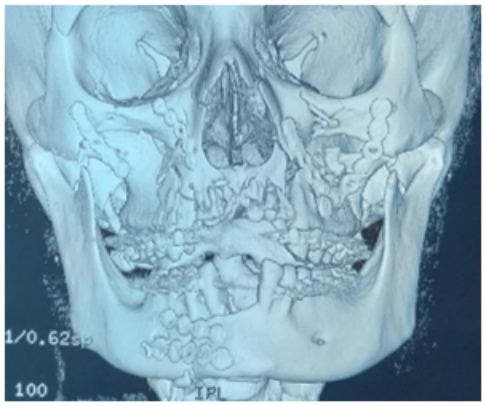

Figure 2b

Figure 2c

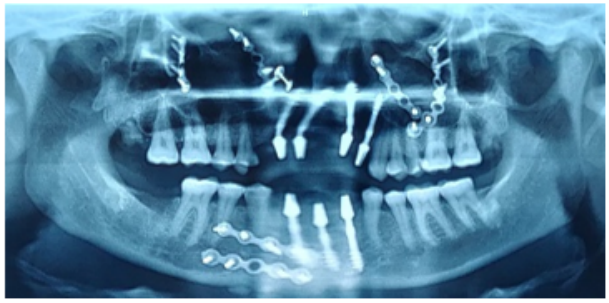

Figure 2d

Figure 2e

Figure 2f

Figure 2g

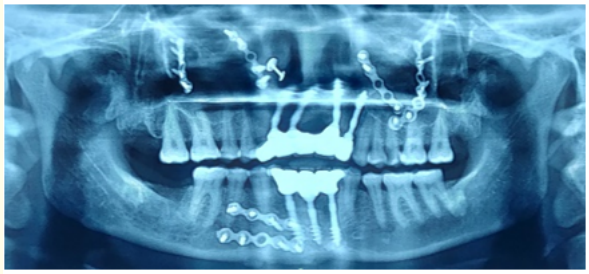

Figure 2h

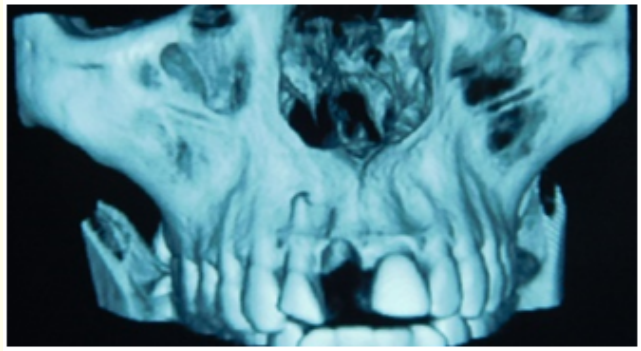

Figure 3b

Case 3: A 28-year-old female patient sustained facial injuries in an RTA when her two-wheeler collided with another. She presented with abrasions on the face and a missing upper right central incisor tooth. On clinical and radiological examination, she was diagnosed as a case of traumatic loss of crown of 11 (Figure 3a and 3b). The fractured tooth root was extracted and simultaneously a 3.6mm thick 20 mm long BECES implant was placed after preparing an osteotomy (Figure 3c). The implant was directed postero-laterally to engage the nasomaxillary buttress and subsequently bent to align it with the curvature of 21. Impression was made (Figure 3d) and a PFM prothesis was fabricated and inserted within 72 hours (Figure 3e and 3f). The review protocol was the same as for the previous cases.

Figure 3c

Figure 3a

Figure 3d

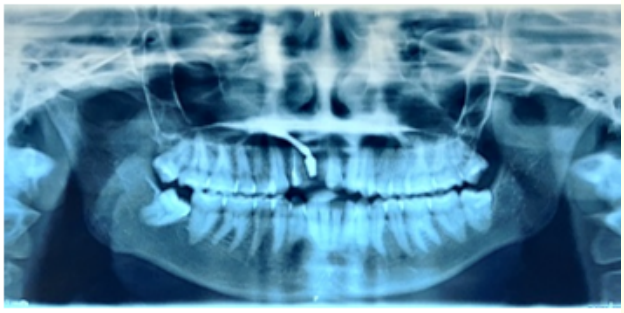

Figure 3e

Figure 3f

Results

All the three cases were managed successfully using BECES corticobasal implants of varying lengths. No adjunctive procedures were undertaken to augment the bone loss resulting from trauma. The 72-hour protocol was followed in all cases i.e. the implants were functionally loaded with provisional permanent PFM restorations within 72 hours of implant placement. The review visits were uneventful in all the three cases. There was no mobility exhibited by either the implants or the prosthesis, in any of the three cases. The cases have been under follow up for the past three years and have not presented with any functional and or aesthetic complaints.

Discussion

Loss of teeth and alveolar bone are common in maxillofacial trauma. Juneja and co-workers reported an incidence of approximately 68% for traumatic dental injury [5]. Despite such a high incidence, many a times dental rehabilitation is both delayed as well as suboptimal, because management of the bony and other soft tissue injuries take precedence owing to their grotesque appearance, associated pain, and deranged function. To make matters worse, the loss of bony foundation further delays the definitive dental rehabilitation of these patients.

The various options available to restore dentoalveolar hard tissues range from an acrylic removable partial denture, a cast partial denture, a tooth borne fixed partial denture (FPD) and an implant borne FPD. In most cases, implant based fixed prostheses is the most obvious choice for several reasons such as patient preference for a fixed prosthesis, obviation of the need for alteration of adjacent tooth structures, physiologic load transmission and an optimal restoration of both aesthetics as well as function. However, many a times there isn't enough bone available for placement of crestal implants. Since the crestal implants are placed in alveolar bone, cases with severe dentoalveolar trauma are difficult to manage with these. Therefore, bone augmentation procedures like grafting to increase the alveolar bone height, alveolar distraction osteogenesis or ridge split are indicated to create the required bone volume [6]. Adjunctive bone augmentation procedures increase the treatment duration, add to the cost, and they also subject the patient to an additional surgical intervention. In addition, the effectiveness and predictability of these augmentation procedures may be uncertain [7]. Secondly, the augmented bone undergoes remodelling for prolonged periods, thereby risking marginal bone loss and consequent periimplantitis in crestal implants.

The corticobasal implants used in our cases are anchored deep in the $2^{nd}/3^{rd}$ cortical bone away from the crestal alveolar bone [8,9]. Since these implants are anchored in the basal bone, they obviate the need for an additional adjunctive surgical procedure to rebuild the lost alveolar bone, thereby reducing the overall treatment time and cost.

Secondly, as per protocol the corticobasal implants are to be functionally loaded within 72 hours [7-9] following implant placement to optimally harness the primary stability. Therefore, the prosthetic rehabilitation is completed within 72 hours. This is in sharp contrast to the crestal two stage implant procedures, which necessitate a mandatory latency of 3 to 6 months after implant placement, prior to prosthetic rehabilitation. Therefore, in dentoal-

veolar fractures resulting in loss of tooth and bone, the total treatment time with crestal two stage implants takes months which is significantly more as compared to corticobasal implants. The bendability of these implants significantly eases their placement, as it enables the operator to anchor the implant in the cortical bone while bypassing critical structures like the maxillary sinus, inferior alveolar nerve and the ORIF hardware [9], thus making their use much more versatile. The remote location of the cortical bones in which the implant is anchored immunes them to any subsequent bone remodelling at the traumatized dentoalveolar region. This ensures retention of primary stability and uninterrupted subsequent healing and implant osseointegration. Therefore, the conventional assessment criteria of marginal bone level/loss are irrelevant to BECES corticobasal implants as alteration in marginal bone level do not affect the stability or longevity of the implant/prosthesis directly [7-9].

Conclusion

The corticobasal implants are a very effective and versatile treatment option in the dentoalveolar rehabilitation of trauma cases presenting with tooth loss especially in cases with a deficient bone foundation. These implants are capable of completely obviating the need for adjunctive augmentation procedures and significantly reduce the treatment time and cost. They however are technique sensitive and require planning and skill to produce optimal clinical results.

Conflict of Interest

No known conflict of interest.

Funding Information

Nil.

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