

Rehabilitation of a Case of Traumatic Injury with Implant/ Post Supported Fixed Dental Prosthesis

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Abstract: Management of traumatic injuries often requires multidisciplinary approach, varying from simple restorations to extensive rehabilitation of multiple missing teeth and oral structures. Fractured teeth can be restored to function with the help of dowels and crowns, whereas avulsed and missing teeth are replaced by fixed dental prosthesis or removable partial denture. Implants are good adjuvant in rehabilitation of missing teeth.

This case report describes a multidisciplinary management to restore the esthetics and functions following a dental trauma. A 24 year old male reported with missing /avulsed maxillary and mandibular incisors, fractured canines and premolars. The maxillary arch was rehabilitated with implant supported fixed dental prosthesis and the mandibular arch with cast post and core and porcelain fused to metal fixed dental prosthesis following orthodontic extrusion. The extrusion was performed with the help of a special custom cast device. This could help in the preservation of the natural root system and related periodontal architecture and also maintained adjacent tooth structure while retaining the options for future implant reconstruction. Such coordinated treatment proved to be effective for the establishment and maintenance of a pleasant smile.

Keywords: Crown root fracture, custom cast device, orthodontic extrusion, post and core, endosseous implants

I. Introduction

Traumatic injuries are the major cause of tooth loss in anterior region [1]. Traumatic injuries often results in simple tooth fractures to severe dentoalveolar fractures, with resultant loss of tooth and supporting structures. Tooth fracture and displacement of the tooth or even avulsion is a common occurrence in such injuries [2]. The management often requires multidisciplinary approach. Fractured or mobile teeth can be stabilized intraorally and restored to function with the help of crowns. Extracted or lost teeth can be replaced by implant crowns, fixed dental prosthesis or by a removable prosthesis [3,4,5].

This case report outlines the management and rehabilitation of grossly destructed maxillary and mandibular anterior teeth using a multidisciplinary approach that is, extraction of unrestorable teeth, followed by implant supported prosthesis in maxillary arch, orthodontic extrusion, conservative endodontic and periodontal therapy and final restoration using cast metallic post core system and fixed dental prosthesis in mandibular arch.

II. Case Report

A 24 year old male reported with history of trauma to the Department of Prosthodontics, Govt. Dental College, Kozhikode. History revealed that the patient sustained a motor bike accident. Apart from multiple injuries to other parts of the body, dental examination revealed missing 11, 12, 21, 22, fractured 13, 14, 23, 24, in the maxillary arch and luxated 31, 32, 41, 42, and fractured and intruded 33, 34, 43, 44, and 45 in the mandibular arch. (Fig-1,2) History revealed that the patient had undergone extraction of grossly fractured 13, 14, 23, 24 teeth in a local private dental clinic. Extraction of the luxated 31, 32, 41, 42 were done at Department of oral and maxillofacial surgery.

The advantages and disadvantages of various treatment modalities were explained to the patient. A treatment plan involving implant supported fixed prosthesis in the maxillary arch for replacing 11, 12, 13, 14, 21, 22 23 and 24 teeth, Endodontic therapy followed by orthodontic extrusion of 33, 34, 43, 44, and 45 and restoration with post core and porcelain fused to metal fixed dental prosthesis was finalized. Informed consent of the patient was obtained.

Endosseous implants (TOUAREG S ADIN, Israel) were placed in the 13, 14, 21, 24, 25 regions of the maxillary arch followed by a healing period of 3 months (Fig-3). An acrylic removable provisional prosthesis was fabricated to be used during the healing phase (Fig-4)

Root canal therapy was performed on 33, 34, 43, 44, and 45. The root canals were obturated using lateral condensation gutta percha technique. After this orthodontic extrusion of 33, 34, 43, 44, was done. Due to

the lack of sufficient anchorage, conventional orthodontic treatment was not feasible for the orthodontic extrusion. Hence a custom cast extrusion device was fabricated and cemented on to the mandibular posterior teeth.

2.1. Fabrication of custom cast device:

Maxillary and mandibular casts were made from the corresponding irreversible hydrocolloid impressions. The casts were articulated in a mean value articulator. The undercuts in the molar region of the mandibular cast was blocked using block out wax. The tissue defect in the lower anterior region was filled with softened wax, leaving a gap of about 5mm with the opposing maxillary arch. Then the cast was duplicated in reversible hydrocolloid and a refractory cast was made. (Wirovest BEGO-Germany). The buccal and lingual surfaces of the molars were covered with 1mm thickness wax without interfering with the occlusion. (Figure-5,6). A 3mm sprue wire was connected from mesial of 46 to the mesial of 35 on the other side, passing through the edentulous ridge. Hooks were placed on to the bar corresponding to the 33, 34 and 43, 44 teeth which were planned to be extruded, taking care to prevent interference with occlusion (Figure- 6). The pattern was invested and cast and finished in chrome-cobalt alloy (figure-8).

Post space preparations were done on teeth 33, 34, 43, 44 following endodontic treatment. (Figure-9) The root space was enlarged to the size of No: 4 peeso reamer to a depth of approximately 10mm, leaving a minimum of 4mm gutta percha at the apex.

The custom cast device was then cemented to the mandibular posterior teeth using type I Glass ionomer cement (GC Fugii I) A 'J' shaped hook was fabricated using a 21 gauge stainless steel orthodontic wire and was cemented into the post space using zinc phosphate cement.(Figure-10).The 'J' hook was then cemented to the corresponding hook in the custom cast device. (Fig-11) Rapid extrusion was achieved with the help of elastics in about 2 months. (Figure 12)

After establishment of sufficient extrusion, the cast device and "J" hook were removed. Gingivectomy was done to expose the root margins up to a depth of 2mm. Root canal impression was made and custom cast post and core were fabricated and cemented with Type I Glass ionomer cement. (GC Fugii I) (Figure-, 13,14) A provisional prosthesis was fabricated and cemented with eugenol free temporary luting cement. (Rely X Temp NE- 3M) The prosthetic phases for implants in the maxillary arch were started after 3 months. Gingival formers were removed and replaced with impression posts. A custom fabricated tray was prepared by using autopolymerising acrylic resin with 2mm spacer. After securing impression posts in patient's mouth, polyether impression material was injected around the impression posts and impression was made. Casts were prepared in type IV Gypsum (Ultra Rock)

The impression of the teeth preparations in the mandibular arch was made using poly vinyl siloxane impression material (AFFINIS, Coltene), using a double step putty wash technique. A tentative jaw relation was taken and casts were articulated in mean value articulator. Abutments were selected and height of the abutments were adjusted (Fig-15,16.)

Copings were fabricated in wax over the implant abutment and on the prepared teeth. Copings were cast in Chrome- Cobalt alloy. Metal try in and Bisque try in was done to verify the fit. Occlusion was assessed and occlusal adjustments were done as required (Fig-17, 18)

In the maxillary arch, cement retained implant supported fixed prosthesis was fabricated and luted using Type I Glass ionomer cement (GC Fugii I) In the mandibular arch the fixed dental prosthesis was made with porcelain fused to metal and was luted using type-I Glass ionomer cement (Fig-19,20). Oral hygiene instructions were given.

Recall visits were done at 1 month, 2 month followed by every 6 months. During each recall, the oral hygiene maintenance, periodontal status, the fit of the prosthesis were evaluated.

III. Discussion

Injury to orofacial structures can lead to displacement of permanent anterior teeth. Rotation and intrusion are more common after injury to the teeth. The combination of intrusive luxation of one teeth and avulsion of another is rare ^[2].It was found that there was decreased incidence of ankylosis when orthodontic technique was used to reposition the intruded permanent teeth ^[2].

In this case the maxillary anteriors 11, 12, 21, 22 were avulsed at the accident site, and 13, 14, 23, 24 sustained complicated root fracture and were considered nonrestorable and were extracted. Using standard surgical procedure, endosseous implants were placed in the maxillary arch and were successfully restored using implant supported fixed prosthesis. In the lower arch 31,32,41,42 were luxated and hence extracted. 33, 34,43,44,45, were fractured and, were endodontically treated and orthodontically extruded, and restored with cast post and fixed prosthesis.

Biological width is one of the most important factors to be considered while restoring teeth in order to avoid periodontal problems and ultimate failure of the restoration. In a healthy periodontium, this width usually measures approximately 2.04mm. Crown lengthening can be achieved either by orthodontic extrusion followed by conservative periodontal therapy or by surgical techniques alone. Orthodontic extrusion followed by

periodontal therapy is an excellent alternative to the traditional periodontal surgery alone for crown lengthening [6,7]. Ingber J S was the first to suggest the use of forced eruption to restore non restorable or hopeless teeth [8,9]. One of the major limitations of orthodontic extrusion is that, after the procedure, conservative periodontal surgery may be necessary to correct any discrepancy [10,11]. On the other hand surgical crown lengthening alone may sometimes compromise the function of adjacent teeth and may also hamper the biologic width [12]. A cast metal post was selected for this case because of its ability to preserve existing tooth structure, excellent fit to the canal, biocompatibility, high mechanical strength and less expense [7].

IV. Conclusion

Restoration of traumatized teeth requires a close collaboration between the different dental fields to avoid further loss of teeth. Wide acceptance and predictability of dental implants play an important role in the rehabilitation of lost teeth. Orthodontic extrusion could preserve natural teeth and thus could help preserve the alveolar bone [13, 14]. Providing a fixed dental prosthesis in the mandibular arch reduced the overall treatment costs. This clinical report described an interdisciplinary approach with Surgical, Periodontic, Orthodontic and Prosthodontic intervention for the successful rehabilitation of a patient with dental trauma due to a road traffic accident. The patient was advised to follow daily oral hygiene and regular check up. Coordinated treatment with careful consideration of patient expectation and request proved critical for the successful outcome and patient satisfaction.

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Fig-1 preoperative – intraoral

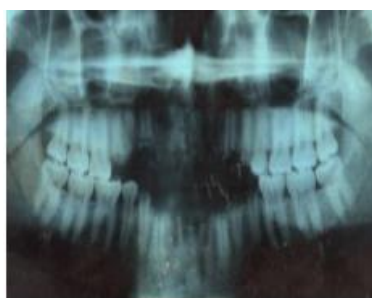


Fig-2 preoperative OPG



Fig-3 Implants with healing caps in maxillary arch



Fig-4 Acrylic removable provisional Prosthesis

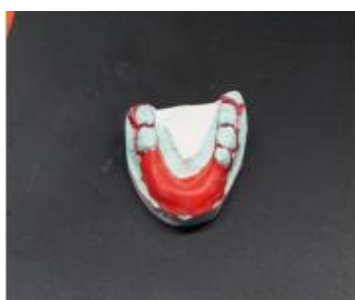


Fig-5 Wax up



Fig-6 Mandibular cast



Fig-7 Hooks placed on the bar pattern Corresponding to 33, 34, 43, 44.



Fig-8 Device cast in chrome – Cobalt alloy



Fig- 9 post space preparation



Fig- 10 'J' hook cemented into Post space



Fig- 11 'J' hook attached to custom cast device



Fig- 12 Extrusion by elastics



Fig-13 Impression for cast post



Fig-14 Post and core Cemented



Fig-15 Tentative jaw relation



Fig-16 Abutments height verified



Fig-17 Prosthesis prior to glazing



Fig- 18 Mandibular FDP after glazing



Fig- 19 Prosthesis after cementation



Fig-20 Post operative OPG