“Restoration Of Traumatically Fractured Anterior Teeth: A Case Report”
A Sharma, R Bhanot, S Mittal, P Bansal, D Kapoor

Citation

Abstract
Restoration of teeth becomes more complex when the involved teeth have previously undergone trauma, fractures, endodontic-access preparation, canal instrumentation and other idiopathic causes. Excessive loss of dental hard tissues create difficulties for the esthetic outcome of subsequent prosthetic restorations. In such instances, an interdisciplinary approach is necessary to evaluate, diagnose and resolve esthetic problems using a combination of endodontic, periodontic and prosthetic treatments. This case report describes the interdisciplinary approach to restore function and esthetics of severely damaged treated teeth by means of metal ceramic restorations after glass fibre post and composite core and crown lengthening procedure. Coordinated prosthetic, endodontic and periodontal treatments with careful consideration of patient’s expectations and requests were critical for a successful outcome and patient satisfaction. Therefore the importance of the preprosthetic surgical and endodontic interventions is emphasized.

INTRODUCTION
Modern dentistry aims at conservation of remaining tooth structure. This procedure becomes more complex when the involved teeth have previously undergone trauma, extensive fractures, endodontic-access preparation, canal instrumentation and other idiopathic causes. These problems result in loss of tooth structure and consequent reduction in tooth resistance to masticatory forces. The restoration of endodontically treated teeth with root canal dowel is usually indicated when crown retention is required. The main purpose of this procedure is to provide retention for the core, which has replaced lost coronal tooth structure. Surgical lengthening of clinical crowns is one of the most commonly used procedures in contemporary periodontics. Indications include unesthetic gingival architecture as a result of altered passive eruption, lack of sufficient length of a clinical crown. It ensures a tooth preparation for fixed restorations with retentive and resistance form and the need to develop a ferrule for pulpless teeth restored with dowels. Excessive loss of dental hard tissues poses difficulties for the esthetic outcome of subsequent prosthetic restorations. In such instances, an interdisciplinary approach is necessary to evaluate, diagnose and resolve esthetic problems using a combination of endodontic, periodontic and prosthodontic treatments. This case report describes the interdisciplinary approach to restore function and esthetics of maxillary right central and lateral incisors with severe coronal destruction. The crown lengthening procedure was done after the endodontic treatment and the teeth where restored using glass fibre post and composite core built-up which was later rehabilitated using metal ceramic restorations.

CLINICAL REPORT
A 23-year-old male came to the Department of Prosthodontics with the history of trauma to face and fractured maxillary right central and lateral incisors involving pulp. The chief complaint was masticatory difficulty, loss of esthetics and wanted immediate restoration and preservation of his teeth. Treatment planning was done after a thorough clinical examination. The patient was in good general health and the medical and dental histories were non-contributory. (Fig 1)

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Irreversible hydrocolloid impressions (Alginoplast, Bayer, Leverkusen, Germany), were made and diagnostic casts were obtained. Evaluation was done after analysing the mounted diagnostic casts and radiographs. A multidisciplinary treatment plan was devised that consisted of endodontic treatment, crown lengthening and glass fibre post, composite core built up and restoration by metal ceramic crowns with fixed connector.

Root canal treatment for teeth 11, 12, was planned. Following rubber-dam isolation, aforementioned teeth were prepared for root canal treatment. Gates Glidden drills (Maillefer, Ballaigues, Switzerland) in sizes 2 and 3 were used to obtain straight access in the middle and the coronal third of the root canals. The root canals then were stepback prepared to different sizes of files (Flex R file, Union Broach, York, Pa). Silicone stoppers were placed around the file shaft to control the working length of the files and the accuracy of the internal canal dimensions were ensured.

After intermittent rinsing with 2.5% sodium hypochloride, the canals were dried with paper points (Union Broach) and the roots were obturated with lateral condensation of gutta percha and AH-26 eugenol-free sealer (De Trey, Konstanz, Germany). The master gutta percha point was coated with sealer and seated in the canals to the working length. A finger spreader (Kerr, Romulus, Mich) was inserted into the canal to a level approximately 1 mm short of the working length. Lateral condensation with non standardized fine gutta percha points (De Trey, Konstanz, Germany) was performed until all canals were obturated at the following appointments. (Fig2.a,b)

The prognosis of these teeth and the retention of the definitive restorations would have been questionable without
the support provided by dowel and core foundations. Several investigators have reported that dowels placed in endodontically treated teeth with severe coronal destruction increase fracture resistance.\textsuperscript{17,18,19,20} Patient’s concern for esthetics was the primary factor in the decision to restore maxillary anterior teeth. Fabrication of metal-free ceramic crowns over ceramic dowel-core systems was a treatment option but not selected due to higher cost and edge-to-edge incisal relationship might be a risk for the long-term prognosis of the restorations.\textsuperscript{21,22} Glassix fibre post (Nordin dental Co. Switzerland) and composite core foundations were chosen to support metal ceramic restorations. Glass fiber post with the lower Young’s modulus exhibited the lowest stress concentration in the root around the end of the post, thereby indicating a lower possibility of root fracture.\textsuperscript{23}

Two-thirds of the total canal length of 11 was used for the post. A calibrated reamer of low-speed hand piece was applied along the entire length. A proper-sized Glassix Fiber Post was selected according to canal thickness and then cut at the required length. The post was adjusted into the canal. The preferred adhesive technique is dual-cure resin cementation [Calibra Esthetic Resin Cement, Dentsply] of the post and the composite core construction because of the similarity of the physical properties. The working field was isolated. The root canal surface was etched with 37% phosphoric acid solution for 15 seconds, rinsed thoroughly, and dried with paper points. Equal parts of dual-curing, Hydrophilic Bond and Activator were mixed and applied into the root canal with an endodontic instrument. A thin, uniform coat of bonding resin was applied over the post. Equal parts of translucent [allows maximum light transmission] shade, Base paste and Catalyst of the dual-cure resin cement were mixed and was spread on the surface of the fiber post and then into the post preparation with lentulo spiral. The post was carefully seated immediately, a 10 second light exposure “pre-cure” of excess cement was done and the “gel” cement was removed with the help of blunt instrument. The post was stabilized for approximately 6 minutes from the beginning of the mixing for the self cure to set. Once the posts were stabilized, all the accessible areas of the post for 20 seconds each, were light cured with visible light curing unit (470nm) (Fig3). Coronal part was built-up with composite core ( Multicore HB, Ivoclar/Vivadent AG, Liechtenstein) material. (Fig-4,5).

Periodontal surgery was performed along tooth 12 to expose additional tooth structure for retention of the final restorations.\textsuperscript{24} After local anesthesia infiltration in labial sulcus and palate, internal bevel incision was given 1mm from the crest of the gingiva of 12 using #15 blade . A #12 blade was used to make secondary incision from the gingival sulcus to alveolar crest. Care was taken to maintain the biological width. A third incision was made with an Orban interdental knife, following the morphology of alveolar crest and the collar of tissue was removed as one mass. Palatally, a scalloped inverse bevel incision using a number 15 blade was made, again following a scalloped pattern. Slight rounding of interdental bone was done on mesial and distal aspect with round bur without disturbing the supporting bone .This osteoplasty was sufficient for exposing 3 mm of.
the sound tooth structure coronal from the alveolar crest along the tooth circumference. (Fig4) The operated site was sutured and periodontal dressing was given. Patient was recalled after a week and sutures and coe pac was removed. The root canals of teeth 12 were prepared for glass fibre post and composite core built up with the same procedure as mentioned above. Both the maxillary teeth were prepared with a 1.5mm ferrule in order to ensure long term post and core permanence beneath the crown restoration,25(Fig 6) without sharp line angles for the planned metal-ceramic restoration.(Fig 5). 

**Figure 6**
Fig5.Composite core built-up with 11&12; prepared abutments

![Figure 6](image)

The color of the definitive restorations was already defined. After the teeth preparations, gingival retraction was done with #00 size [Ultra Dent Product, Utah, USA]; and an impression with polyvinyl siloxanes (Aquasil soft putty and Aquasil LV, Dentsply Intl) was made using putty wash technique in a rim lock impression tray. Impression was poured and master cast fabricated. impression was made with polyvinyl siloxane [Aquasil, Dentsply Caulk]. Provisional restoration was fabricated and luted using eugenol-free zinc oxide cement [Rely X Temp NE, 3M ESPE]. Impression was poured and master cast fabricated. A quick-setting rigid vinyl polysiloxane interocclusion registration material (Regidur-i; Bielefelder Dentsalsilicone, GmbH & Co, KG) was used to record the maxillomandibular relationship. Casts were mounted on a semi-adjustable articulator using a face-bow transfer. Three coats of Tru-Fit [Taub Tru-Fit Die Spacer Kit USA.Geo. taub Prod.] were applied on the dies to provide relief to provide space for cementation and improve the seating of casting. Wax pattern for the retainers where fabricated with blue casting wax [Harvard Dental GmbH, Germany]. The pattern was invested in the phosphate-bonded investment (Bellawest T;BEGO) and cast in a base metal alloy (Wiron 99; BEGO). The metal framework for the fit, occlusion and positioning of crowns was tried. Porcelain (Vita WMK 68; VITA Zahnfabrik, Bad Sackingen, Germany) was fired according to the manufacturers recommendations. Bisque trial was done and patients approval was taken prior to the final cementation of the fixed partial denture. (Fig 7-8) Masticatory function and optimal esthetics were obtained and maxillomandibular relationship enhanced to a certain degree by fabrication of definitive metal ceramic restorations. Definitive treatment outcomes in terms of function and esthetics satisfied the expectations of both the patient and the interdisciplinary team. Fig7.Extraoral view of the metal-ceramic crowns
SUMMARY

Undoubtedly, root fracture is one undesirable incident to both patients and dentists alike. The probability of root fracture in endodontically treated teeth is higher than that of vital teeth. One cause to the root fracture of endodontically treated teeth is stress concentration around the end of the post. For composite resin cores with prefabricated posts, a frequently occurring fracture mode is the horizontal root fracture which is repairable. For cast posts and cores, it is vertical root fracture which then leads to the extraction of teeth. On the other hand, it has been suggested in many researches that composite resin cores with prefabricated posts have significantly lower fracture strength than cast posts and cores. This clinical report describes an interdisciplinary approach for the rehabilitation of fractured teeth by endodontic treatment, periodontal surgery, glassix fibre post insertion, core build up and fabrication of metal ceramic fixed partial dentures of a patient which was satisfying both esthetically and functionally. Compromised clinical crown status of the patient was improved and sufficient clinical crown length was obtained by means of crown lengthening procedures and fibre-core restorations. Teeth with severe coronal destruction and insufficient clinical crown length limit the success of the final prosthetic restorations. The treatment options may vary considerably depending on the above mentioned factors. The prosthetic treatment usually includes complete coverage metal ceramic crowns for functional and esthetic rehabilitation and protection of the remaining teeth. Coordinated prosthetic, endodontic and periodontal treatments with careful consideration of patient expectations and requests were critical for a successful outcome and patient satisfaction. Therefore the importance of the preprosthetic surgical and endodontic interventions was emphasized.

References

Author Information

Akshey Kumar Sharma  
Professor And H.O.D, Department Of Prosthodontics, Dasmesh Institute Of Research And Dental Sciences

Rajesh Bhanot  
Professor, Department Of Prosthodontics, Dasmesh Institute Of Research And Dental Sciences

Sunandan Mittal  
Professor And H.O.D, Department Of Endodontics, Dasmesh Institute Of Research And Dental Sciences

Pardeep Bansal  
Reader, Department Of Prosthodontics, Dasmesh Institute Of Research And Dental Sciences

Dheeraj Kapoor  
Senior Lecturer, Department Of Prosthodontics, Dasmesh Institute Of Research And Dental Sciences