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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 creates 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 fiber post and composite core and crown lengthening procedure. Coordinate 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.

Keywords Crown fracture; Glass-Fibre-Reinforced composite; Endodontically treated teeth

Introduction Modern dentistry aims at conservation of remaining tooth structure and restoring it back to its normal function and esthetics. Esthetics take a front seat and are of utmost importance when anterior teeth are involved. This procedure becomes more complex when the involved teeth have previously undergone trauma, extensive fractures, endodontic-access preparation, canal instrumentation and other idiopathic causes (Asmussen et al., 1999; Purton and Payne, 1996; Purton et al., 1998). These problems result in loss of tooth structure and consequent reduction in tooth resistance to masticatory forces (Assif and Gorfil, 1994; Burgess et al., 1992; Sorensen and Engelman, 1990; Sorensen and Engelman, 1990). The restoration of endodontically treated teeth with root canal post is usually indicated when crown retention is required (Purton and Payne, 1996; Sorensen and Engelman, 1990; Federick, 1974; Cohen et al., 1995; Holmes et al., 1996; Shillingburg et al., 1982). The main purpose of this procedure is to provide retention for the core, which has replaced lost coronal tooth structure (Sorensen and Engelman, 1990; Sorensen and Engelman, 1990). Optimum crown length ratio is of prime consideration in cases going for post and core. In cases of less available clinical crown, surgical lengthening of clinical crowns is one of the most commonly used procedures in contemporary periodontics (Fabio et al., 1999). 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 post (Eismann and Radke, 1976; Sorensen and Engelman, 1990; Coslet et al., 1977).
Excessive losses of dental hard tissues pose difficulties for the esthetic outcome of subsequent prosthetic restorations (Chiche and Pinault, 1994). 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 and left central and lateral incisor along with mandibular right and left lateral incisor 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 full coverage restorations.

Case Report
A 29-year-old male came to the Department of Prosthodontics with the history of trauma to face and fractured maxillary right and left central incisors and maxillary and mandibular lateral incisors involving pulp (Figure 1a and Figure 1b). The chief complaint was loss of esthetics. The patient 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 history was non-contributory. 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, periodontal intervention followed by full coverage prosthetic post endodontic restoration.

Root canal treatment for teeth 11, 12, 21, 22, 32, 42 was planned. Pulpal anaesthesia of central and lateral of both sides was achieved using 2% Lignocaine (1:100 000 adrenaline). Following rubberdam isolation, aforementioned teeth were prepared for root canal treatment. Glyde path and patency was achieved using no. 6, 8, and 10 k files. Three, working-length radiographs were taken at different angulations with a file placed in each canal to rule out any extra or missed canal. Working length was confirmed with electronic apex locator (Raypex 5). Working length of 11 and 21 was 21.5 mm, 12 and 22 was 19.5 mm and of 32 and 42 was 18.5 mm. Cleaning and shaping was performed using a crown down preparation with Protaper series of NI-TI rotary instruments (Maillefer, Dentsply, Ballaigues, Switzerland) under profuse irrigation with 3% sodium hypochlorite solution. After drying the root canals with sterile paper points, (Maillefer, Dentsply, Ballaigues, Switzerland) obturation was carried out with protaper gutta percha cones (Maillefer, Dentsply, Ballaigues, Switzerland) using AH plus sealer and access cavity was temporarily restored with cavit.

The prognosis of these teeth and the retention of the definitive full coverage restorations would have been questionable without the support provided by post and core foundations. Several investigators have reported that post placed in endodontically treated teeth with severe coronal destruction increase fracture resistance (Meng et al., 2007; Tan et al., 2005; Al-Wahadni and Gutteridge, 2002; Joseph and Ramachandran, 1990). 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 post-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. Glass 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 (Daizo et al., 2008).

Two-thirds of the total canal length (central incisors 16.5 mm, lateral incisors 14.5 mm) was used for the post (Figure 2). 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 dualcure resin cementation (Calibra Esthetic Resin Cement, Dentsply) of the post and the composite core construction because of the similarity of the physical properties. The root canal surface was etched with 37% phosphoric acid solution for 15 seconds. A thin 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. Once the posts were stabilized, all the accessible areas of the post were light cured for 20 s each, with visible light curing unit (470 nm). Coronal part was built up with composite core (Multicore HB, Ivoclar/Vivadent AG, Liechtenstein) material.

Due to insufficient clinical length of the available crown periodontal intervention for increasing crown length was decided. Periodontal surgery was performed to expose additional tooth structure for retention of the final restorations (Allen, 1993). 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. The operated site was sutured and periodontal dressing was given (Figure 3). Patient was recalled after a week and sutures and coe pac was removed.

Figure 2 Two-thirds of the total canal length (central incisors 16.5 mm, lateral incisors 14.5 mm) was used for the post

Figure 3 The operated site was sutured and periodontal dressing was given

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. Provisional restoration was fabricated and luted using eugenol-free zinc oxide cement (Rely X Temp NE, 3M ESPE). A quick-setting rigid vinyl polysiloxane interocclusion registration material (Regidur-i; Bielefelder Dentsilicone, GmbH & Co, KG) was used to record the maxillomandibular relationship. Casts were mounted on a semi-adjustable articulator using a face-bow transfer. Masticatory function and optimal esthetics were obtained and maxillo-mandibular 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 (Figure 4).

Discussions

The most vivid of our entire facial feature is the smile as it is an extension and expression of the person as a whole. The smile is one of the most expensive forms of nonverbal communication and reflects the virtue of qualities of person's character. Specific conditions that initiate a need for esthetic treatment are like discoloration due to extrinsic or intrinsic staining, anomalies due to developmental disturbances, abnormal spacing between teeth, and trauma.

Undoubtedly, 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 (Newman et al., 2003; Chan and Bryant, 1982). 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.

Cast posts and cores are commonly used because of their superior mechanical properties. However, if a ceramic crown is chosen as the final restoration, the colour and opacity of the post may lead to discoloration and shadowing on the gingival and cervical areas of the tooth. To solve this esthetic problem, tooth-coloured fibre and zirconium post systems were introduced; these are capable of resisting occlusal loads and have light transmission characteristics similar to those of natural teeth. In addition, these materials allow us to restore the tooth with minimal sacrifice of additional tooth structure. Improvements in esthetic materials allow excellent results in restoration of damaged teeth. However, because of the poor mechanical strength of composites, various approaches have been attempted to strengthen them, including reinforcing their resinous matrix with fibres or glass-fibre posts.

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.

Conclusions
We describe multidisciplinary management of a dental trauma, leading to conservation of the tooth and its permanent restoration. We suggest that using glassfibre-reinforced composite root canal posts and composite materials can be a simple and efficient procedure for the treatment of anterior traumatized teeth with excellent esthetic and functional results.

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