RESTORATION OF THE SEVERELY BROKEN-DOWN TEETH WITH CUSTOM CAST DOWEL CORE TECHNIQUE - CLINICAL CASE REPORTS

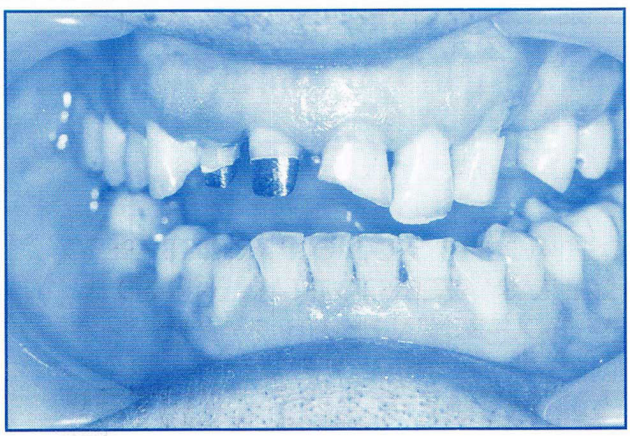
Dr. Binod Acharya, M.D.S.
Consultant Prosthodontist, Department of Dental Surgery
Kathmandu Model Hospital, Bagbazar, Kathmandu, Nepal.

ABSTRACT

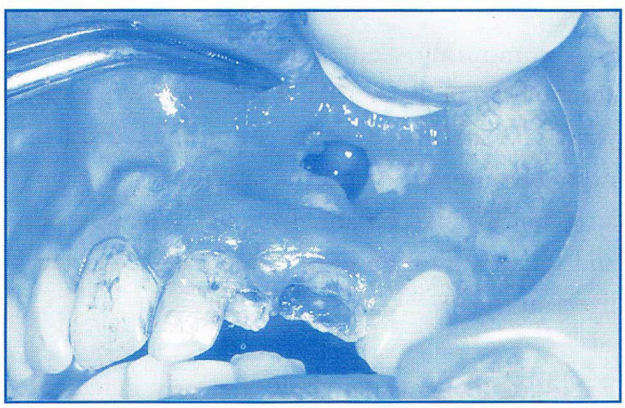
The severely broken down teeth, because of trauma, attrition, caries or parafunctional habits, need to be restored in order to give psychological as well as functional comfort to the patient. Clinical case reports are presented describing custom cast dowel core technique that enabled preservation of the remaining tooth structure, functional rehabilitation and finally restoring aesthetics by conservative/endodontic approach. Clinical considerations and treatment methods of such conditions are discussed and reported.

INTRODUCTION:

Restoration of a severely broken down teeth has been a challenge to a dentist's skills and capabilities. It demands patient's psychological and functional comfort. The severely broken down teeth, because of trauma, caries, attrition and parafunctional habits, result in an unesthetic appearance, mastication and phonation being adversely affected. It requires skill of an expert to regain and restore it in order to give psychological and functional comfort to the patient.



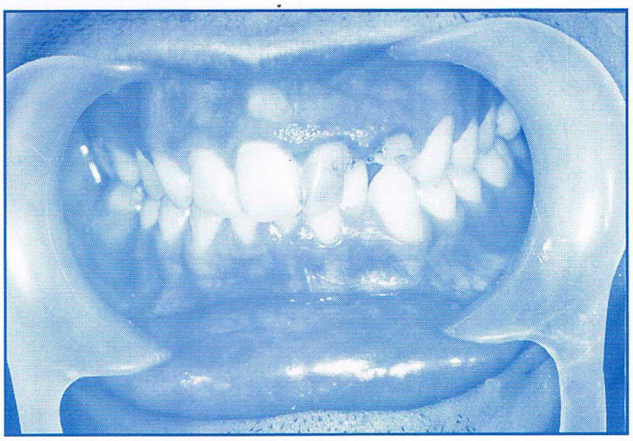
Restoration of traumatic patients with custom cast dowel core



Intra-oral view of grossly carious teeth

Many clinicians use post and core systems that are quite promising in the treatment of mutilated teeth[1,2,3,4] with an array of prefabricated post systems that are available today, we are tempted to use one of them and make our job easier but the long term success is unanswered. This has led to greater emphasis on the advantages of custom cast dowel core system[3,4] in order to restore the lost form of a tooth structure.

This technique is generally followed if the crown fracture is slightly above cemento-enamel junction exposing the pulp.



Intra-oral view of post endodontic treatment

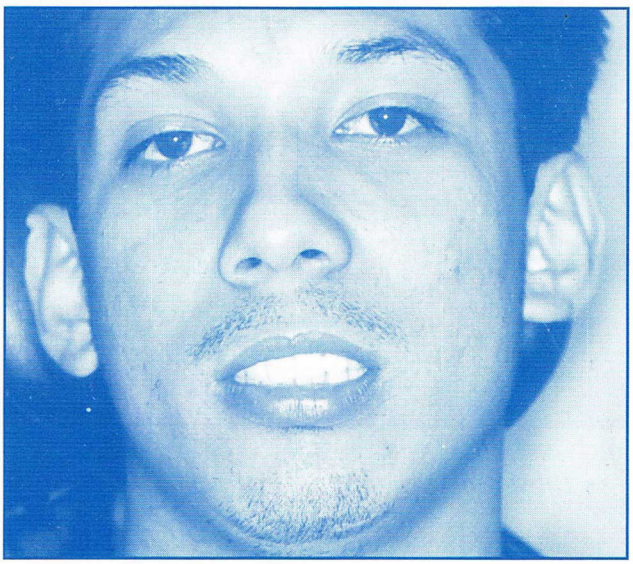
PROCEDURE:

A direct technique was followed to fabricate a dowel core pattern with the help of 'pattern resin'[5,6,7]. This technique can be used for teeth with single or multiple roots. When a dowel core was made for a premolar with two canals, a dowel of optimal length was made for the most desirable canal and the second canal accomodates a short key that served as an antirotational device.

Restoration by custom cast dowel core

The technique involved clinical and laboratory steps. After satisfactory completion of root canal therapy, the removal of gutta percha in the canals was begun with a hot endodontic condenser. The post length was determined and post space preparation was done using Peeso reamers. Two third of the gutta percha was removed from the root canal. Extracoronal preparation was done by using tooth preparation diamonds with water coolant in high speed. A flame shaped diamond was used to place a contrabevel around the external periphery of the preparation. This feature provided a metal collar around the occlusal circumference of the preparation which aided in bracing the tooth against fracture of the remaining tooth structure.

Pattern resin monomer and polymer was mixed in a dappen dish to a runny consistency. Canal was lubricated with petrolatum on a small piece of cotton on a Peeso reamer. A plastic sprue was placed

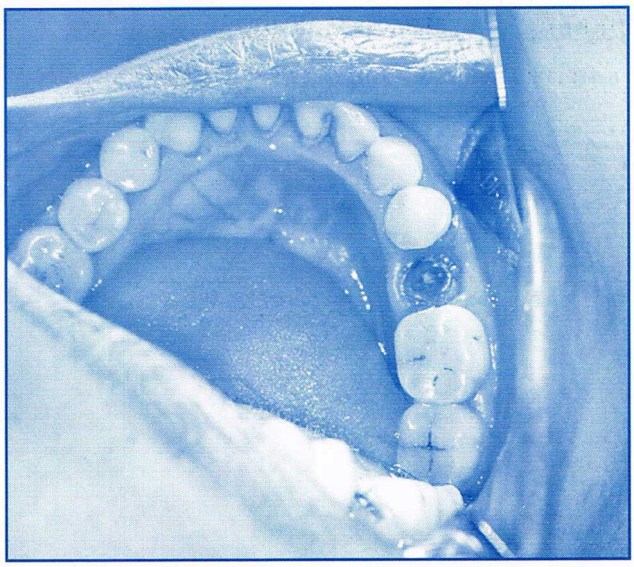


Post operative extra oral view

in the canal and pattern resin at the coronal portion of the tooth that was finger adapted in order to give a shape of a prepared tooth. When the pattern resin was reaching the dough stage, it was 'pumped' in the canal just making sure that it was not locked in any undrecuts in the canal. Once the resin was polymerized, the dowel was removed from the canal and made sure that it was extended to the apical end of the prepared canal. This was removed, invested and then casting was done. Casting thus obtained was grossly finished and adjusted for try-in in the patient's mouth. Once the adequate fit of the dowel core was achieved, tooth preparation was done. It was sand blasted in order to provide clean surface for enhanced micro-mechanical retention with the cement[8]. Then it was cemented using Type I glass ionomer cement.

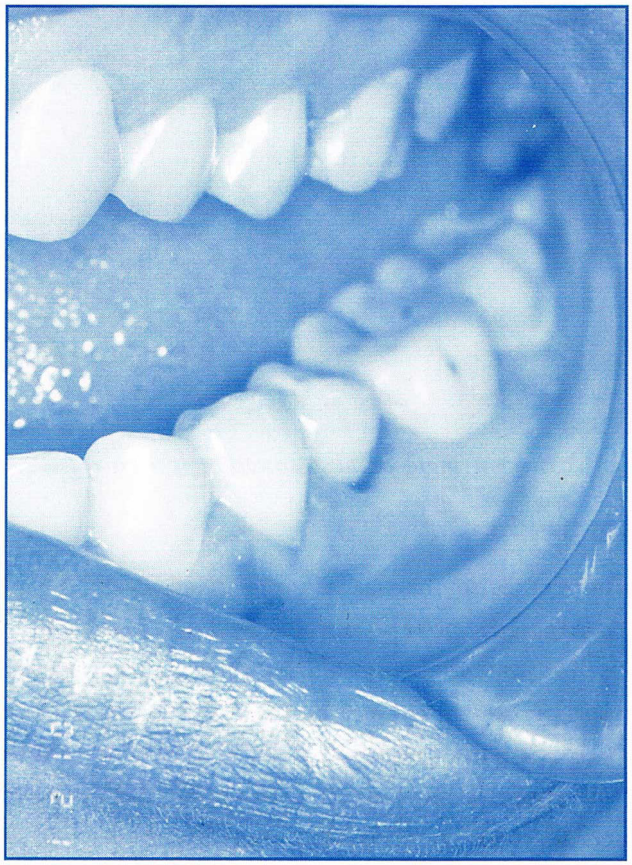
CASE REPORTS

Many patients were reported to the Department of Dental Surgery, Kathmandu Model Hospital, Kathmandu, out of which 50 of them were selected in a span of two and half years. They all complained of broken tooth/teeth due to many reasons – post root canal therapy, trauma, attrition, caries, parafunctional habits. Radiographic evaluations were done to rule out the root canal therapy, extension of caries, surrounding alveolar bone, root length, and signs of periapical pathology. Treatment plan included fabrication of custom cast dowel core followed by crowns. All the custom cast dowel core and crowns were cemented using Type I glass ionomer cement.



Intra-oral view of post root canal therapy

Restoration by custom cast dowel core

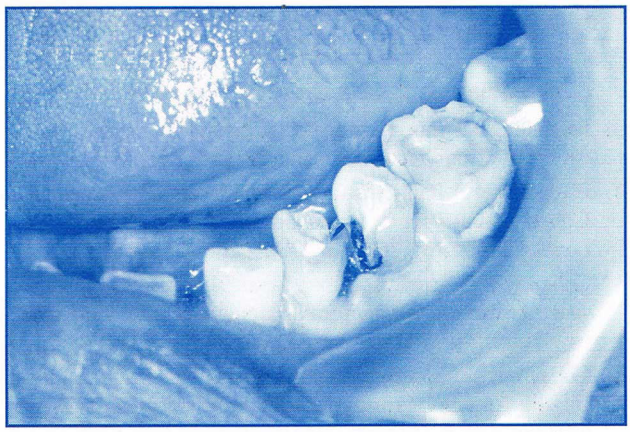


Intra-oral view of temporary crown

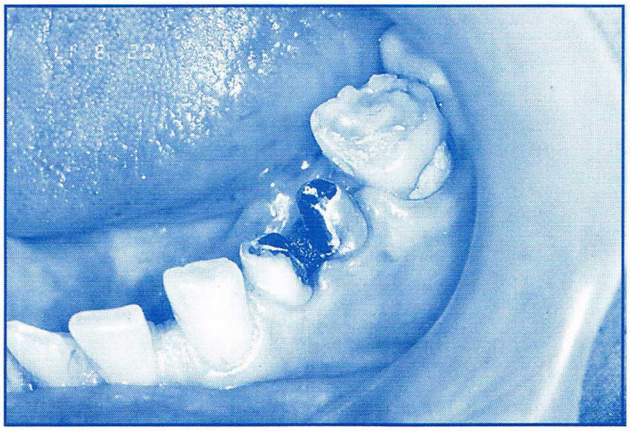
DISCUSSION

The severely broken down teeth requiring restoration either post root canal therapy or trauma becomes complicated[8,9]. In such cases, post and core become manditory[1,2,4].

In order to avoid laboratory procedure and the chair side time, manufactures have provided an array of prefabricated post systems in variety of shapes, sizes and materials[1,3,9,10]. Tapered posts and parallel posts are some of their kinds which require accessories for their placement and additional material for their cementation. Studies have shown that tapered posts exhibit wedging effect and create elevated cervical stress concentration[11]. The use of passive parallel prefabricated post system needs to sacrifice dentin in tapered canals to accommodate them. Active posts system has great potentional for root fracture[11,12]. Threaded posts have been reported to be capable of creating inordinate stress level at dentinal-thread interface[13].



Intra-oral view of post root canal therapy



Restoration by custom cast dowel core

Even if a dowel core is placed in such badly broken tooth, the root will remains susceptible to fracture without the crown incircling the tooth apical to the core. This 'ferrule effect' around the tooth protects it from fracture by the dowel from within[14]. A dowel is placed to provide the retention for a crown that ordinarily would have been gained form coronal tooth structure[15]. When a dowel is used in such severely mutilated tooth, its extension into the root must at least equal the length of the crown for optimum stress distribution and maximum retention, or the dowel should be two-thirds the length of the root, whichever is greater. A minimum length of 4 mm of gutta percha and more if possible, should remain at the apex to prevent dislodgment and subsequent leakage. If it is not possible to meet these criteria, the prognosis for the restoration will be compromised and some alternative should be explored. The longer a dowel, the greater its retention[16-19]. A tooth with a dowel that is three-quarters the length of the crown or shorter has less chance for success than a tooth that has no dowel at all[20]. However, the success rate of dowel treated teeth can increase to more that 97.5% when dowel length equals or exceeds that length of the crown[20].

A dowel increases resistance to lateral forces applied to the crown from 15%[21] to 48%[22]. Once piece dowel core system is a proven method of restoring severely broken down endodontically treated teeth. It provides the exact replica of canal configuration and better stress distribution. It has superior physical characteristics at dowel core junction. It also avoids dislodgement of core and crown from dowel in the root when minimal tooth structure remains. These are customised and can be fabricated from stainless steel, titanium, brass, Type – IV gold or a chromium – containing alloys which are non-corrosive and highly stiff materials, thus decreasing dentin deformation.

These clinical cases have been treated successfully using custom cast dowel core system and have been periodically reviewed every three months. They have shown good clinical success rate with good retention of the unit, functional rehabilitation and aesthetics.

CONCLUSION

Severely mutilated teeth, because of many reasons, always pose a clinical problem during restoration in order to give psychological and functional comfort to the patient. At times operator himself is in dilemma whether to opt for extraction or root canal treatment in such cases. With the increased awareness of conservative management, it becomes our duty to restore the severely mutilated tooth to optimum form and function. This innovative method of management of severely mutilated teeth can be considered as a viable clinical option.

REFERENCES

(1) Miller Amp W, III: Post and core systems, which one is best? *J Prosthet Dent* 1982; **48 :** 27-38.

(2) Zibert G J K, Johnson R S : A case dowel-core technique for multi rooted teeth with divergent canals. *J Prosthet Dent* 1983; **49:** 207.

(3) Cohen S, Burns R C: Pathways of the Pulp, 7th **edn.** 1998; St Louis, CV Mosby: 623-626.

(4) Trabert K C, Cooney J P: The endodontically treated tooth – restoration concepts and techniques. *Dent Clin North Am* 1984; **28:** 923-951.

(5) Bartlett S O: Construction of detached core crowns for pulpless teeth in only two sittings. *J Am Dent Assoc* 1968; 77: 843-845.

(6) Dewhirst R B, Fisher D W, Shillingburg H T: Dowel-core fabrication. *J South Calif Dent Assoc* 1969; **37:** 444-449.

(7) Shillingburg H T , Fisher D W, Dewhirst R B: Restoration of endodontically treated posterior teeth. *J Prosthet Dent* 1970; **24:** 401-409.

(8) Sedgeley C M, Messer H H: Are endodontically treated teeth more brittle? *J Endod* 1992; **18:** 332-335.

(9) Ross I F: Fracture susceptibility of endodontically treated teeth. *J Endod* 1980; **6:** 560-565.

(10) Dentsch A S, Cavallari J, Musikant B L, et al: Root fractures and design of prefabricated post. *J Prosthet Dent* 1985; **53:** 637-640.

(11) Standlee J P, Caputo A, Holcomb J, Trabert K C: The retentive and stress distributing properties of threaded endodontic dowel. *J Prosthet Dent* 1980; **44:** 398-404.

(12) Assif D, Bitenski A, Pilor A, Oren E: Effect of post design on resistance to fracture of endodontically treated teeth with complete crown. *J Prosthet Dent* 1993; **64:** 36-40.

(13) Baraban D J: The restoration of endodontically treated teeth: An update. *J Prosthet Dent* 1988; **59:** 553-558.

(14) Eissmann H F, Radke R A: Post-endodontic restoration. In Cohen S, Burns R C: Pathways of the Pulp. 7th **edn.** St Louis, CV Mosby Co, 1976: 537-575.

(15) Gelfand M, Goldman M, Sunderman E J: Effect of complete veneer crowns on the compressive strength of endodontically treated teeth. *J Prosthet Dent* 1984; **52:** 635-638.

(16) Colley I T, Hampson E L, Lehman M L: Retention of post crowns: An assessment of the relative efficiency of posts in different shapes and sizes. *Br Dent J* 1968; **124:** 63-69.

(17) Krupp J D, Caputo A A, Trabert K C, Standlee J P: Dowel retention with glass ionomer cement. *J Prosthet Dent* 1979; **41:** 163-166.

(18) Johnson J K, Sakumura J S: Dowel form and tensile force. *J Prosthet Dent* 1978; **40:** 645-649.

(19) Standlee J P, Caputo A A, Hanson E C: Retention of endodontic dowels: Effects of cement, dowel length, diameter and design. *J Prosthet Dent* 1978; **39:** 401-405.

(20) Sorenson J A, Martinoff J T: Intracoronal reinforcement and coronal coverage: A study of endodontically treated teeth. *J Prosthet Dent* 1984; **51:** 780-784.

(21) Christian G W, Button G L, Moon PC, England M C, Douglas H B: Post core restoration in endodontically treated posterior teeth. *J Endod* 1981; **7:** 182-185.

(22) Kern S B, von Frauhofer J A, Mueninghoff L A: An in vitro comparison of two dowel and core techniques for endodontically treated molars. *J Prosthet Dent* 1984; **51:** 509-514.