

Restoration of fractured immature maxillary central incisors using the crown fragments

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Abstract

Two immature maxillary central incisors with complicated fractures of the crowns were treated using the calcium hydroxide pulpotomy technique. Restoration of the crowns was accomplished by replacing the crown fragments using the acid etch technique. Follow-up at 36 months showed vital and functional pulp manifested by dentinal bridge formation at the amputation site and completion of root formation.

Complicated crown fractures involve the enamel, dentin and pulp.¹ Pulp exposure generally is followed by symptoms such as pain, sensitivity to thermal changes and mastication, and if not treated, leads to pulpal necrosis and periapical changes. Physical trauma is aggravated by the esthetic disfiguration which is a major concern of both children and their parents.¹

Fractures of anterior teeth are quite common; 5-13% of all injuries to permanent anterior teeth are complicated fractures.² It is therefore of interest to have simple yet reliable techniques of managing fractures of young permanent teeth.

Treatment of the complicated crown fracture presents itself in 2 stages: (1) treatment of the injured pulp, and (2) performance of an esthetic restoration of the fractured tooth.

Literature Review

Treatment of complicated crown fractures implies either direct pulp capping, partial pulpotomy, pulpotomy, or partial pulpectomy.^{1,3-5} In teeth with open apices, the main objective of the treatment is to preserve the vitality of the pulp in order to allow continued development of the root and closure of the apex. Immature teeth with open apices and good blood supply to the pulp will have a good chance of healing when treated by the pulpotomy method.^{4,6}

Pulpotomy is defined as the surgical removal of the coronal portion of the pulp. The normal pulp tissue in the root canal then is treated with a medicament at the amputation site.⁷ Calcium hydroxide is the dressing recommended for the immature permanent tooth because of its ability to induce formation of a calcified bridge at the site of the amputation and leave a healthy pulp tissue.⁶⁻⁸ Hallett and Porteous⁹ who assessed the vital pulpotomy technique found a success rate of 72%, while Fuks et al.¹⁰ found a 92% success rate.

Restoration procedures of anterior fractured teeth are based mostly on the acid-etch techniques, using filled and unfilled resins activated by ultraviolet,^{11,12} visible light,¹³ or chemical catalyst activation.¹⁴ The missing portion of the tooth can be reconstructed by one of the existing resins whose properties are superior to the silicates and acrylics used in the past. According to Sheykhholeslam et al.,¹⁵ the retention of such a restoration was 93%. From the esthetic point of view, marginal staining, discoloration, or lack of marginal integrity were the major problems. In order to overcome the above disadvantages, a number of clinicians attempted to use the tooth fragment to restore the fractured crown.¹⁶⁻¹⁸

Case Report

A 9-year-old boy presented to the emergency dental clinic of Tel Aviv University Dental School. One hour earlier, the patient was hit by a schoolmate and his two maxillary central incisors suffered complicated crown fractures. The child brought the 2 broken crown fragments with him. Clinical examination revealed widely exposed pulp chambers on both incisors (Fig 1). No mobility of the injured teeth was recorded. Radiographic examination revealed 2 young central incisors with open apices (Fig 2). The pulpotomy technique was carried out under local an-

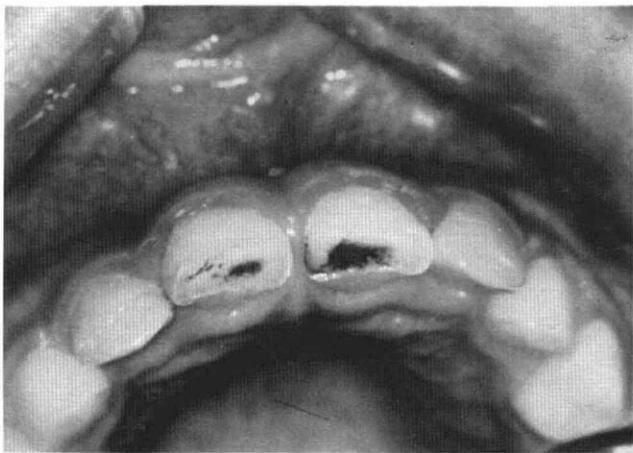


FIG 1. Clinical appearance of 2 upper maxillary central incisors with complicated crown fracture.

esthesia and rubber dam. Amputation was performed with a diamond bur in a high-speed handpiece, with abundant water stream. The wound was rinsed with saline and when bleeding ceased, a calcium hydroxide preparation^a was applied. The crown fragments were prepared in the following manner:

1. Remnants of the pulp were removed from the broken incisal parts and a small retentive preparation was made in the pulp cavity.
2. All margins of the teeth and the crown fragments were beveled to 45°.
3. Enamel surfaces were acid-etched using a 37% ortho-phosphoric acid solution^b for 60 seconds, rinsed, and dried thoroughly.
4. Bonding and self-curing composite^c were applied

^a Calxyl—Dental Preparation, Otto & Co., Frankfurt, Main W. Germany.

^b Concise—Type II Composite Resin, Dental Products 3M, St. Paul, MN 55144, USA.

^c Concise—Type II Composite Resin, Dental Products 3M, St. Paul, MN 55144, USA.

FIG 2. Radiographic view of the fractured teeth; note the open apices.

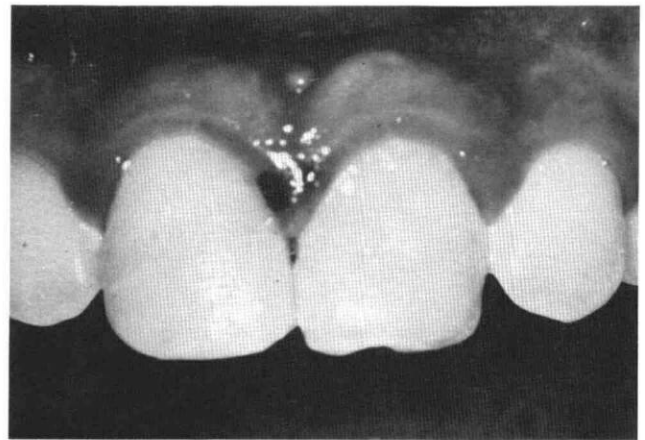


FIG 3. The restored incisors.

- to all treated surfaces and the parts were approximated by hand to the original position.
5. After polishing, an esthetic result was achieved (Fig 3).
6. The teeth were followed clinically and radiographically at 1, 3, 9, 18, and 36 months. There were no clinical symptoms such as pain or discomfort; normal response to cold was recorded, and radiographic evidence of coronal dentinal bridge and apical closure with normal periapical structure was observed (Fig 4).

After 36 months, a yellowish line appeared at the junction between the parts, but the general esthetic outcome was good (Fig 5).

Six months later, the boy received another blow and tooth 11 sustained a fracture of the replaced part which was lost. The tooth showed normal vitality and the fracture area was restored by resin.

Discussion

There are only a few case reports in the literature which describe the use of the crown fragments

FIG 4. Radiographic follow up after 36 months. Note the dentinal bridge and the closure of the apices.



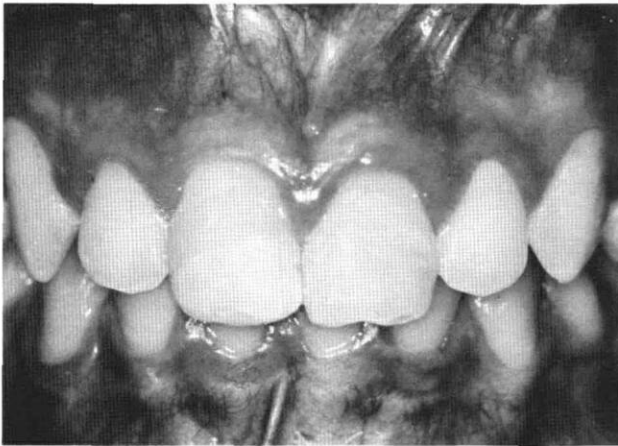


FIG 5. Clinical appearance of the treated and restored teeth after 36 months.

to restore a fractured tooth. In the cases cited, root canal treatment was performed. In the present patient the pulp canal tissue was preserved. Preserving vital pulp tissue offered a number of advantages crucial for teeth that have uncompleted roots.

1. It allowed continued growth of the root and closure of the apex.
2. It allowed continued apposition of secondary dentin on the root canal walls to achieve the final wall width.
3. Teeth with vital dentin are considered less brittle than pulpless teeth.
4. The color and translucency of the teeth were kept closer to normal.

These advantages could be shown after 36 months of follow up, whereas most other descriptions failed to record the long-term fate of the treated teeth. Apparently, the pulp amputation was not very deep and with normal eruption, enough pulp tissue remained supragingivally to respond to vitality tests at recall visits.

Potential failures of the pulpotomy technique include pulpal necrosis, internal resorption, and pulp canal obliteration.^{5,19} Therefore, some authors^{9,20} advocate complete root canal treatment once the root closure has been achieved. Bodenham²¹ and Krakow²² believe that complete root treatment is recommended only in cases where a post and core are needed for adequate restoration of the tooth. Cvek⁵ reported that 58 of 60 teeth with complicated crown fracture healed successfully after being treated by partial pulpotomy or pulp capping. Thus, in his opinion it is unnecessary to perform a pulpectomy routinely.

With a cooperative patient who will be monitored periodically and needs no crown preparation, there seems to be no necessity to consider root canal treatment. The patient will be seen on a regular basis, so

with the appearance of any clinical signs such as discomfort, loss of vitality, radiographic signs of resorption, or periapical lesion a full root canal treatment could be performed immediately.

In selected cases, such as presented here, the restoration of the crown can be performed with the fractured fragments of the tooth. The tooth fragment provides a more esthetic and durable restoration than could be obtained by using composite resins. The incisal edge of the enamel is more resistant to abrasion than a resin restoration, and staining does not occur except at the junction of the 2 portions.

Summary

Two maxillary central incisors with complicated crown fractures in a 9-year-old boy were treated and restored. The teeth had open apices, pulpotomies were performed, and a calcium hydroxide preparation was applied to the pulp stumps. After 14 months, the apices were closed and the periapical region was intact. The crown fragments were used to restore the fractured crowns using the acid-etch resin technique. The esthetic appearance achieved by this method was very good. The coronal part of the teeth maintained their translucency which does not happen when the teeth are restored with composite material. This method of restoration is recommended for those instances in which the crown fragments are present and are large enough for manipulation. Continued monitoring of the patient is essential.

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Quotable Quote: new drug gives hope to AIDS patients

The Department of Health and Human Services has cleared for limited and carefully controlled use on AIDS patients an experimental drug called azidothymidine (AZT). This drug is being acclaimed as the first medication to show any significant results against the incurable, and so far fatal, disease.

AZT is not a cure for AIDS, but has shown sufficient promise in clinical trials that ethical considerations dictate its broader use. It was found to impede the growth of "retroviruses," of which the AIDS agent is one.

For now, only individuals whose AIDS affliction is coupled with an AIDS-related pneumonia will be eligible for AZT and only if treatment begins within 90 days of the first pneumonia attack.

Dr. David Ostrow, AIDS researcher and scientific director of Chicago's AIDS prevention program, urged caution saying, "This is not a cure, and we don't know the side effects or the long-term effects."