

## CASE REPORTS

# Survival of the Endodontic Endosseous Implant

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**The endodontic endosseous implant (EEI) enjoyed wide use in the United States after it was introduced in the 1960's. For various reasons including incorrect case selection, improper use of the materials, and poor preparation for the implant a high number of failures resulted. Following opposition by some members of the dental community, the procedure fell into disuse. The authors of this article had treated a number of cases with the endodontic endosseous implant from 1965 to 1975, many of which did fail. However, we have noted some remarkable very long-term successes with the technique, two of which are presented here. We suggest that the endodontic endosseous implant should not be discarded totally, but, with further research to improve the materials and technique, it still may be used in carefully selected cases.**

The endodontic endosseous implant experienced a meteoric rise in the United States shortly after its introduction in the 1960's (1), but this was followed by a precipitous drop in usage and interest within 10 yr (2). It was originally used extensively in Europe as described by Orlay (3) and others (4). An article by Frank (5) in 1967 was considerably more precise and sophisticated, thus more in line with American endodontic principles.

The interest in implants goes back several centuries and has been a subject of interest and investigation for the past 40 yr (6-8). Despite improvements in design and metallurgy, most implants of the early period displayed high percentages of failure. Great hope was held for the endodontic endosseous implant (EEI), because it avoided the greatest site of routine implant failure at that time—epithelial downgrowth along the supracrestal portion of the fixture. This problem was avoided by placing the EEI directly through the canal of the tooth into the periapical tissues as an extension of the already present root length, as opposed to placement into bare, edentulous bone where alveolar process resorption had already transpired (5).

The major indications for this procedure were (5): (a) periodontal bone loss, particularly the involvement of a single tooth, where extraction and replacement would cause complicated procedures (Fig. 1) and (b) a horizontal fracture of a tooth that required removal of the apical segment, and the

remaining coronal portion was too weak to remain due to an unfavorable crown to root ratio (Fig. 2). Unusual, aggressive lateral root resorptive lesions were treated similarly by surgical removal of a portion of the root.

The first indication was the most widely used, but fell into disfavor due to the problem of gaining a satisfactory apical seal with the implant. The teeth so treated usually became more stable with the added root length, but many failed for endodontic reasons. Unless the canal exited exactly at the tip, the apical preparation was not perfectly round (9) and, therefore, could not be sealed by the round, rod-shaped metal (Fig. 3). Although mobility decreased, a periapical lesion often developed. Similar problems occurred when ribbon-shaped or multiple apical foramens, among other possibilities, were present. Unfortunately, these situations often are impossible to detect by examination.

The EEI was recommended as an occasionally indicated procedure (9), not intended to be applicable to every case involving mobile teeth with periodontal involvement, particularly those with little or no bone remaining. An adequate amount of bone was required to avoid communication of the implant with the oral cavity. Too frequently the EEI was used for terminal cases with little chance for success.

The problems of trauma producing resorptive defects or root fracture were treated more recently according to the methods of Andreasen and his colleagues (10-12) and Frank and Weine (13) by using calcium hydroxide to achieve recalcification. Surgery was unnecessary in this modality. Apical segments of fractures could be left untreated whereas the coronal portion received calcium hydroxide placement and then routine endodontic treatment. Resorptions could similarly be arrested and often reversed.

Articles decrying the use of the EEI were written (14), describing the misuse, abuse, and ultimate failures. Many of the newer treatments were less aggressive, less invasive, and did produce desirable results. The use of the EEI decreased to virtually nil. Even so, several reports of treatment have still surfaced, describing successful cases (15-17). For the most part, these case histories were of relatively short-term success only (5 yr or less). Longer term success was not established for the EEI.

The authors of this article are two separate practitioners, limited to endodontics, who treated many teeth with the EEI from 1965 to 1975, and continued very limited usage through the 1980's. Many failures resulted from the reasons stated above, despite the best attempts at clinical treatment. Treat-

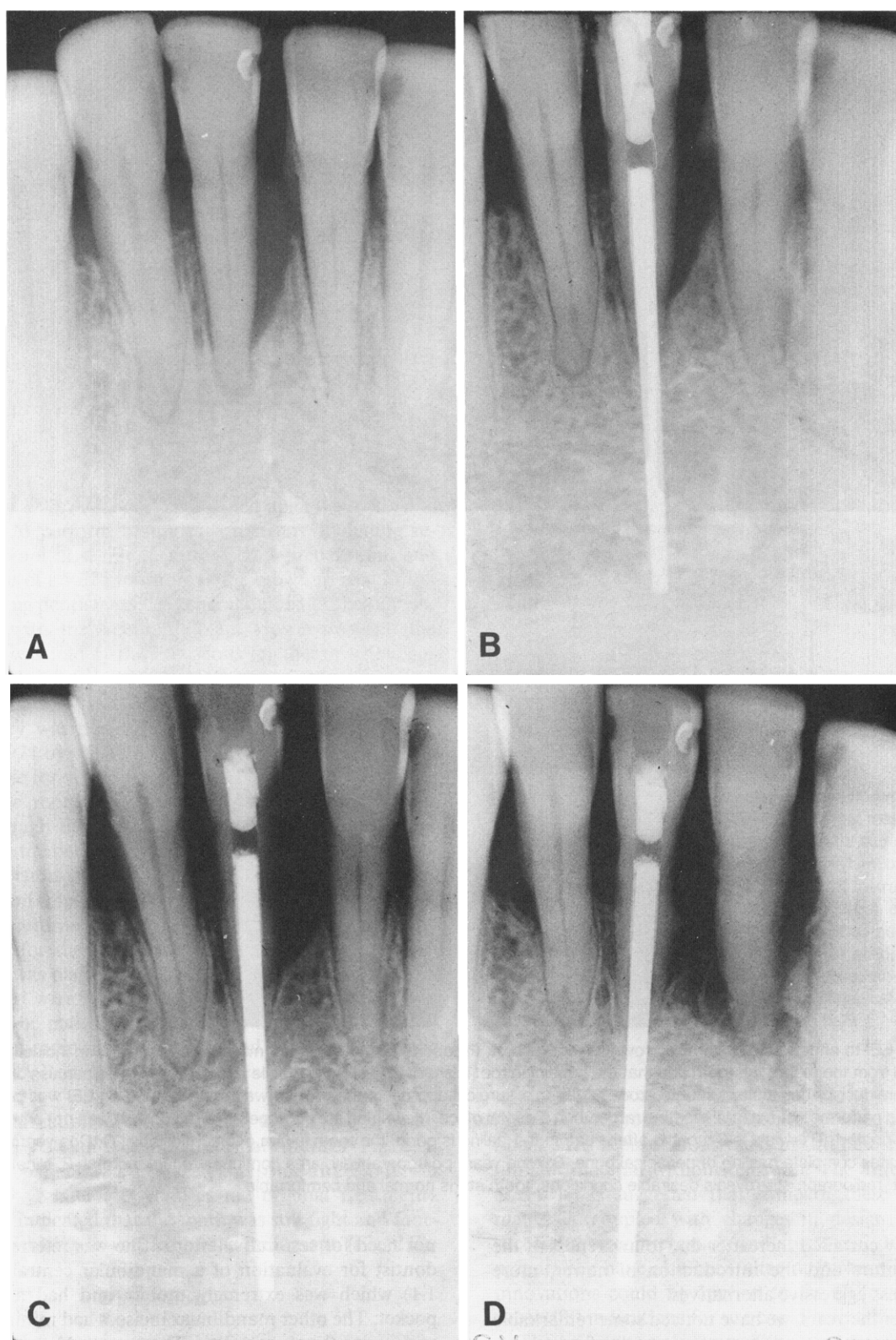


FIG 1. Use of the endodontic implant to retard periodontal breakdown sequence. *A*, Radiograph of mandibular incisor area indicating severe bone loss on the mesial surface of one of the teeth. The tooth has advanced mobility. The distal surface has bone support well into the middle third of the root, as do the other incisors. Extraction and replacement of this tooth would be quite complex. *B*, Immediate postoperative radiograph following placement of the EEI. The tooth is much less mobile immediately, with no splinting performed. *C*, One-year recall radiograph indicating minimal additional bone loss. The tooth is stable. *D*, Fourteen years later, radiograph indicates little more bone loss on the treated tooth, but there has been considerable breakdown associated with the adjacent tooth. The tooth with the EEI is much less mobile than the others.

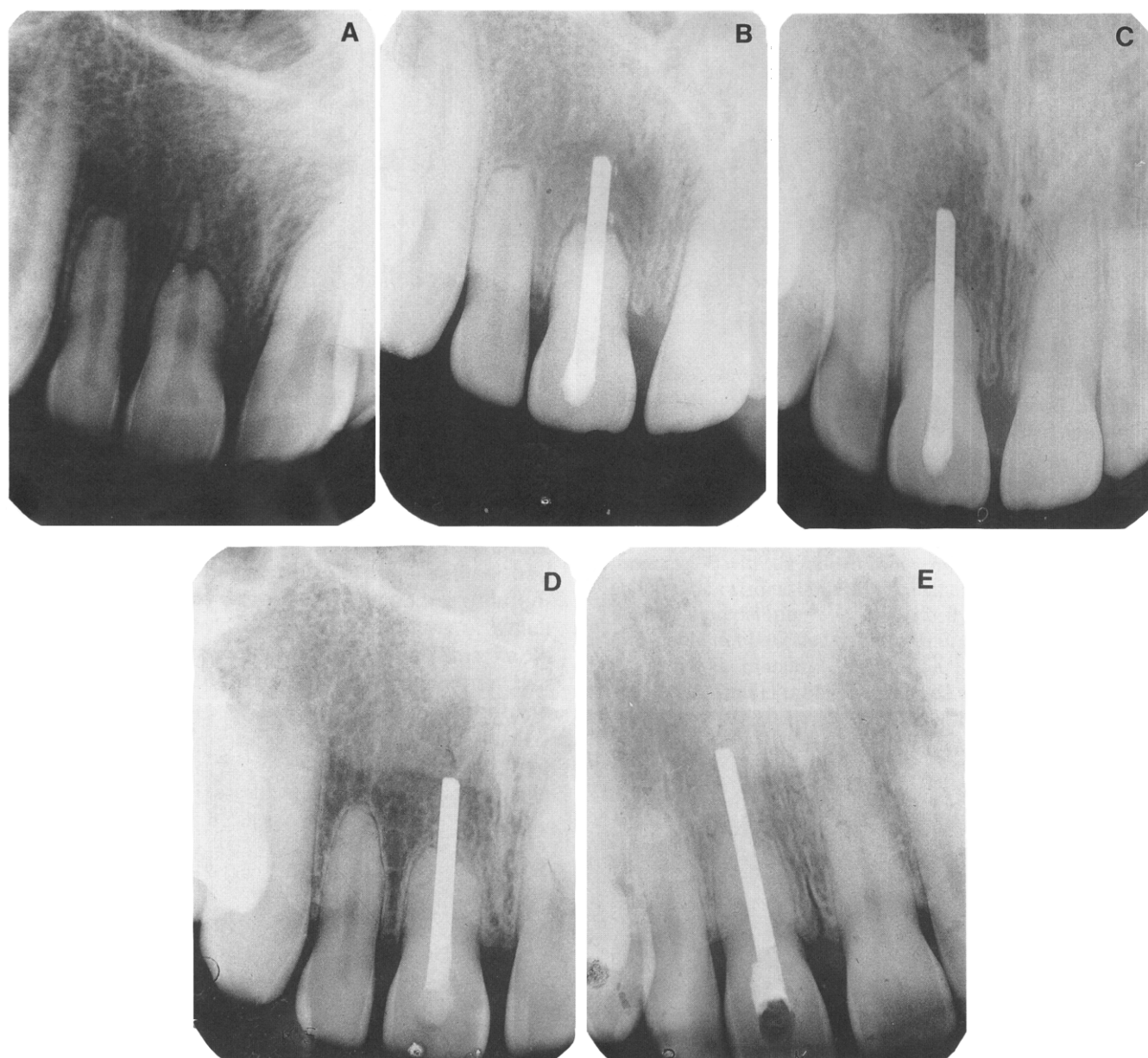


FIG 2. Use of the EEI to offer a more favorable crown to root ratio. *A*, Preoperative radiograph of maxillary central incisor, indicating that the root tip has separated from the rest of the tooth and that the remaining root is short. The tooth is mobile and sore, tender to percussion and palpation. The adjacent lateral incisor has a short, blunted root. *B*, Using a surgical approach, the root tip was removed and an EEI was placed. Because the treatment was performed at a dental meeting rather than a dental office, the immediate postoperative radiograph was not processed properly and could not be printed. This view is 3 months after treatment. Healing is good, the tooth is firm and comfortable. *C*, One year after treatment, radiography indicates complete healing of periapical bone. *D*, Nine years postoperatively, area continues to look normal. *E*, Nineteen years after original treatment, radiograph still reveals desirable conditions, tooth still is normal and comfortable.

ment was largely curtailed thereafter due to awareness of the frequency of failure and the introduction of newer, more successful and less aggressive alternatives.

However, over the years, we have noticed some remarkable successes. This article presents two case reports of very long-term duration, indicating the potential for success with the EEI.

#### CASE REPORT 1

The patient was a 48-yr-old female, medical history negative, presenting with a full dentition and a history of no caries

nor need for restorative efforts. She was referred by a periodontist for evaluation of a mandibular central incisor (Fig. 1*A*) which was extremely mobile and had a deep mesial pocket. The other mandibular incisors had minimal bone loss and insignificant mobility. These teeth showed plaque formation and gingival redness.

An EEI was placed in order to stabilize the tooth and retard periodontal breakdown (Fig. 1*B*). One year later, an examination revealed minimal mobility of the treated tooth and no further loss of bone (Fig. 1*C*). The patient was referred back to the periodontist for further therapy to remove plaque and receive home care instruction.

The patient disappeared. She failed to respond to telephone calls or written requests to return. Likewise, she did not return to the periodontist until 14 yr after original treatment. A radiograph at that time (Fig. 1D) revealed minimal additional bone loss associated with the treated tooth, although considerable breakdown had occurred on the other incisors. The periodontist reported that there was extreme mobility on all of the anterior teeth with the exception of the treated tooth, which he said "was remarkably stable."

No other recalls were possible because the four incisors were extracted and replaced by a prosthesis.

## CASE REPORT 2

The patient was a 17-yr-old male, medical history negative, who had worn orthodontic appliances for 4 yr. The maxillary right central incisor (tooth 8) was quite mobile and sore, with tenderness to percussion and palpation. Radiographic examination revealed that the apical portion of tooth 8 had separated from the remainder of the tooth and that the maxillary anterior teeth seemed short with blunted apices (Fig. 2A). It was decided to perform a surgical procedure including removal of the apical segment, intraosseous preparation, and the placement of an EEI to improve the crown to root ratio.

The referring dentist was the general dentist of the patient, who agreed with the treatment plan. However, when the orthodontist was told of the intentions for therapy, he complained bitterly and predicted dire consequences for such treatment.

The surgery was performed at the Chicago Mid-Winter Meeting in 1971 by the authors and the tape of the procedure is still available for viewing. A mucoperiosteal flap was raised, the tip of the root was located and removed. Access was prepared through the lingual of tooth 8 and preparation of the canal and the periapical bone was carried out, 5 mm past the apical portion of the tooth to a size #120. A properly fitting vitallium implant was selected, tried in, and cemented. The flap was returned and then sutured to place. An overlay acrylic splint for the maxillary teeth had been prepared in advance and was placed (5).

The sutures were removed 5 days later and healing was uneventful. The patient was recalled 3 months later for examination and radiographs. The flap had healed well and the tooth was firm. Radiographs revealed excellent healing (Fig. 2B).

Recall examinations were conducted at periodic intervals for the next 9 yr, with continued normal findings (Fig. 2, C and D). The patient was not seen for some time, but was contacted 10 yr later (19 yr after the original treatment). Examination indicated that the tooth was still tight and functioning well, which was verified by the radiograph (Fig. 2E).

## DISCUSSION

Observation of the cases presented, and other similar treatments that would have been redundant had we described them here, indicates that perhaps the EEI was not as bad as most experts believed. Although we strongly agree that the calcium hydroxide and similarly designed methods of alternative therapy for trauma are superior, perhaps the EEI should still be retained for the rare case that presents that could be better treated by that method.

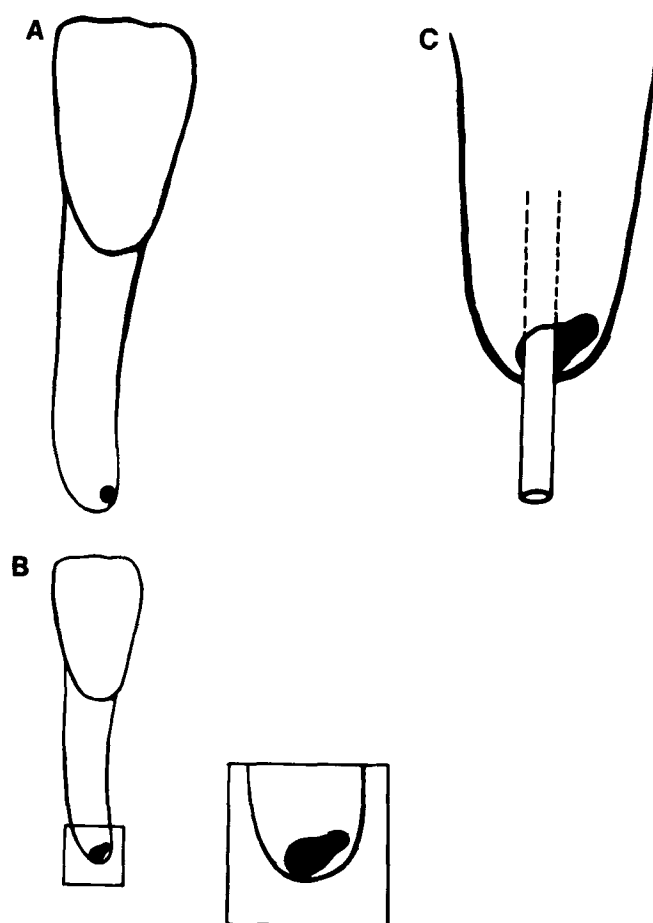


FIG 3. Diagrammatic representation demonstrating the reason for endodontic failure when using the EEI. A, Most teeth, particularly the mandibular incisor, have the canal exiting at a site not exactly at the tip of the root, but slightly eccentric. B, When this site of exit is enlarged, particularly with the wide and stiff instruments used with implants, a teardrop shape is developed (left). A closer view (right) shows that this shape is extremely difficult to seal with any filling material, solid or compactible. C, When the solid, round implant is placed, there is no possibility for the prepared canal to be sealed. In fact, the original canal is totally unfilled. Periapical breakdown often follows, even if the treated tooth remains tight.

The latest areas of research in implants have produced materials with considerable potential. Viable connective tissue fibers have been demonstrated in intimate contact with the implant material without rejection. The article by Larsen et al. (16) has suggested that some of these newer implant materials, coupled with changes in design, may allow for successful osteointegration and apical seal. Methods of bone preparation have also been altered. Perhaps if some of these innovations could be applied to the EEI, a greater area of successful indications for use could be established.

The original article stressed the need for meticulous placement and testing of the implant. Maximum contact at the tip of the root by the implant and no contact whatever at the apical ledge of bone by the implant were needed. The need for existing bone was also listed. Often these requirements were not met. Little wonder that these cases failed so frequently. It was a very technique-sensitive procedure.

An article by Cranin et al. (18) claimed a 91% success rate

for endodontic implants after 5 yr. A review of our own cases did not reveal a success rate nearly that high. Many teeth were still present in the patients' mouths, but demonstrating various states of pathosis (Fig. 3C).

Retrospective studies are always difficult to interpret. The successful cases presented here were taken from a huge number of teeth so treated. Despite our attempts to monitor these cases carefully, teeth treated 17 to 27 yr ago are difficult to follow on a continuous basis. Movement of patients and expiration decrease the available pool. Some untreated teeth with similar problems have remained essentially acceptable on a clinical basis, too.

Accepting these caveats, we still maintain that the total and complete rejection of the EEI without further examination or attempts at improvement would be unfair to the occasional patient who could benefit from such methods of treatment.

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