Removal of retained gutta-percha points after complete replacement resorption of maxillary incisors assisted by cone-beam computed tomography

ABSTRACT

Upon traumatic dental injury, complications such as replacement and inflammatory resorption may occur. When complete replacement resorption takes place, complete root resorption and loss of the tooth is unavoidable. Whilst an implant is often the treatment sought for replacing such missing teeth, the retained gutta-percha material used for root canal filling is often left behind inside the bone. There has not been any universal guideline on how to manage removal of retained gutta-percha points after complete replacement resorption of a traumatized tooth. This case report outlines a novel approach for the removal of two retained gutta-perchas with the assistance of cone-beam computed tomography, after complete replacement resorption of teeth 11 and 21 took place.

Key words: Cone-beam computed tomography; Gutta-percha; Incisor

Introduction

With advances in imaging technology, new equipment and apparatus have been added to the armamentarium of dental radiology. Digital radiography, densitometry, cone-beam computed tomography (CBCT), magnetic resonance imaging, ultrasound and nuclear techniques are some examples \(^1\).

Cone-beam computed tomography is based on the principles of computed tomography (CT), but the X-ray beam from the source is in the form of a cone \(^2\). The major advantage over conventional CT is a reduction of radiation exposure \(^3,4\). Some studies also concluded that the image quality of CBCT was superior to conventional CT \(^5,7\).

Currently, CBCT has been used for several clinical and investigational studies in endodontics \(^8\). Its potential indications extend to diagnosis and localization of pathosis from endodontic and non-endodontic origins, differentiating between periapical granulomas and cysts, assessment of root canal morphology, evaluation of root and alveolar fractures, identification of various forms of external and internal root resorption, and presurgical planning in root-end surgeries \(^8,10\).

When large areas of periodontal ligament (PDL) are lost or damaged during
traumatic injury, healing may occur from the alveolar side of the socket and lead to a union between the root surface and the alveolar bone, and disappearance of the PDL space. This fusion (ankylosis) and the progressive replacement of tooth substance by bone is known as replacement resorption. Much of the dental literature suggests that replacement resorption cannot be arrested or repaired. Proposed management strategies range from intentional replantation with/without Emdogain, transplantation, and decoronation. Replacement resorption leads to the complete loss of the ankylosed root; usually this ensues within 3 to 7 years in children, but in adults it occurs more slowly, often allowing the tooth to function for many years. As these teeth were commonly involved in the dental trauma and had been root-treated earlier, a segment of the root filling may be retained after undiagnosed and complete resorption of the root.

This case report presents how CBCT and the Er,Cr:YSGG laser can assist in the successful management of retained gutta-percha points for two endodontically treated maxillary incisors, which had undergone replacement resorption after a traumatic injury.

**Case report**

A 33-year-old man was referred for the management of some gutta-percha points present at the 11 and 21 region (Fig 1), the teeth having been exfoliated a few months ago. The patient reported having had a traumatic injury to the upper central incisors more than 20 years earlier. He attended his dentist for examination, whereupon root canal treatments for 11 and 21 were performed. He had no further complaints till a few months ago, when both 11 and 21 became mobile and were later exfoliated. A periapical radiograph taken by the referring dentist (Fig 2) revealed that there were two gutta-percha points retained at the saddle areas of these teeth. The referring dentist had tried to remove the gutta-

![Figure 1](image1.jpg)  Preoperative X-ray on the day of examination

![Figure 2](image2.jpg)  Preoperative X-ray by referring dentist
percha points by implant osteotomy using the implant drills and endodontic files, but without success (Fig 3). Apparently, these instruments were directed at the medullary portion of the alveolus.

On clinical examination, there were no signs of inflammation. The patient underwent CBCT (Uni3D; E-Woo Technology, Giheung-gu, Korea) to aid location of the gutta-percha points lodged in the buccal cortical plate (Fig 4).

A surgical approach to remove the gutta-percha points was planned. Buccal and palatal infiltration was given, and a 2-sided full-thickness flap was raised. Bone ablation was carried out using an Er,Cr:YSGG laser (Waterlase MD; Biolase, San Clemente (CA), USA) to expose the two ends of the gutta-percha point (Fig 5) under magnification (OPMI Pico Microscope; Carl Zeiss Meditec Inc., Jena, Germany). The gutta-percha points were removed (Fig 6). Simple interrupted sutures were placed. Healing was uneventful and the sutures were removed 7 days after the surgery. The patient was referred back for implant placement.

**Discussion**

Replacement resorption is an uncommon complication following dental trauma and affects 2.5% of all luxation injuries of the permanent dentition 17. There is no universally agreed strategy to manage this condition; some suggest leaving it in situ and reviewing its progression periodically, allowing the tooth to perform its esthetic and occlusal functions until it exfoliates, which was also the approach in this patient.

A variant of this approach was to decoronate the tooth, leaving the root with intact root canal filling to become slowly resorbed. Extraction of the resorbing root was an earlier suggestion, which entailed a transalveolar approach causing much removal of bone and a subsequent bony defect. Nowadays, this practice is no longer recommended.

Management by intentional replantation, resection of the ankylosed sites, and Emdogain 18 was suggested. However, the exact extent of the ankylosed area can only be estimated. Transplantation is another option, but is costly and requires extensive surgery 18. Treating the ankylosis of permanent teeth by surgical luxation has been proposed 19, but may result in damage to the tooth.
As treatment of the replacement resorption of the maxillary incisor in this case resulted in two gutta-percha points retained in the alveolus, it was important to evaluate their toxicity versus that of endodontic filling materials, especially if present in vital tissues. Studies have shown that the brand of gutta-percha, its size, and its surface characteristics may result in different levels of inflammatory response and irritation. This suggests that exposure of an overfilled gutta-percha point to the periapical area may menace surrounding tissues, resulting in inflammatory reactions. Any toxicity could be from leakage of zinc ions (a major component) into surrounding tissues. Aside from the above, gutta-percha points may also be displaced through the buccal cortical bone and reach adjacent soft tissues between the periosteum and the buccal submucosa.

At present, there is no evidence to suggest that the root canal filling, which is originally present in the resorbing root, does not give rise to foreign body reactions when retained in the bone after complete resorption of the root. To prevent rejection reactions of a retained root undergoing replacement resorption, one current approach entails decoronation of the tooth. This involves completely removing the existing root canal filling, rinsing the empty root canal thoroughly with saline, and intentionally filling it with blood to promote additional internally derived replacement resorption.
According to Hupp 24, bone healing onto the surface of an implant must occur before any soft tissue forms between the bone and implant surfaces. This depends on: (1) having a relatively short distance between the bone and implant; (2) presence of viable bone at or near the surface of the bone along the implant; and (3) an implant surface free of contamination by organic or inorganic materials. If the gutta-percha points in this case were to be left unmanaged during implant placement, it is possible that the implants would come into close contact. The gutta-percha points may also contaminate the implant surfaces and elicit host defense mechanisms, resulting in lesions of bone around the implant, which may impair bone healing onto the surface of the implants. All these factors may contribute to the failure of implant osseointegration.

Owing to the possible irritation of vital tissues and impairment of dental implant osseointegration by the retained gutta-percha points, their removal is recommended. Precise localization of the gutta-percha point is indispensable to avoid unnecessary and traumatizing exploratory surgery (raising a full-thickness flap and the cutting of a small window through buccal bone) 25. Conventional radiographic localization entails taking multiple radiographs from different angles and using the buccal object rule to locate the radiopaque gutta-percha 26. With the introduction of CBCT, more accurate localization of the foreign materials is feasible.

Each of these modalities has its own pros and cons. The optimal treatment regimen is still open to debate. Fortunately, this condition (replacement resorption) does not occur frequently and hence each case may or, indeed, should be managed on its own merit.

References