

A Multidisciplinary Approach in Managing Heat-Induced Necrosis Following Thermal Removal of Gutta Percha: A Case Report

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Abstract

Background: Compromised teeth due to extensive decay usually require multidisciplinary approach. Similar to any method or technique of re-treatment and gutta percha removal that comes with a risk, thermal method is no different. Heat's effect is not limited on treated tooth only; it is transmitted into surrounding periodontium and alveolar bone.

Aim: The aim of this case report is to report clinical manifestation of heat-induced necrosis after thermal removal of gutta percha as well as endodontic, restorative, and periodontics management.

Case Report: A 25 years old smoker male patient, presented to the clinic mutilated tooth #22 which went under non-surgical root canal re-treatment by thermal method (200 to 600 C), using system B, to remove old gutta-percha followed by hand instrumentation to clean and shape the canal using H and K files. Patient presented for periodontal re-evaluation 5 weeks later. He complained of pain and mobility on tooth #22. Upon clinical examination, a sloughed whitish tissue around the cervical area of tooth #22 with Miller grade 3 mobility. One week after the patient last came for the CBCT, initial preparation was performed to #22 and restored by provisional crown using PROTEMP. Flowable and packable composite. Patient received plastic periodontal surgery (root coverage using connective tissue graft). The patient presented to the clinic for 6 months follow up after the surgery. He reported no symptoms. His overall oral hygiene was poor. Upon intra-oral examination, the tooth presented with a gingival inflammation around the area of #22 with 30% root coverage.

Conclusion: Using thermal method, System B in this case, for gutta-percha removal in non-surgical root canal re-treatment carry risk for the bone and attachment apparatus which is similar to what was represented in this case. Heat emitted by System B can reach up to 10°C which would have an adverse effect on root's outer surface.

Keywords: Heat-Induced Necrosis; Gutta Percha; Thermal Method

Introduction

Compromised teeth due to extensive decay usually require multidisciplinary approach. In many scenarios. Mutilated teeth that had endodontic treatment performed usually would need coronal support that requires the insertion of a post. This fulfills the restoration of both function and aesthetics [1]. As the placement of the post would require preparation and creation of the post space, several and different techniques can be used to remove root canal filling that is gutta percha. Organic solvent such as: refined orange oil, halothane, tetrachloroethylene, xylene, and chloroform [2] are usually coupled with mechanical means using Gates Glidden or rotaries to remove the old root canal filling [3]. Another technique is by using thermal application of a System B, a heated instrument. All of the previously mentioned methods are considered to be safe but come with dependable amount of risk. Some argue that mechanical rotaries with re-

treatment might remove excessive amount of dentin and weaken the root; it also might cause perforation if not used correctly that might jeopardize the restorability of the tooth. In case of a chemical method of removal of gutta percha such as chloroform, it was argued to be noxious substance that might carry the risk of being carcinogenic [2]. Similar to any method or technique of re-treatment and gutta percha removal that comes with a risk, thermal method is no different. Heat's effect is not limited on treated tooth only; it is transmitted into surrounding periodontium and alveolar bone [4,5].

Aim of the Study

The aim of this case report is to report clinical manifestation of heat-induced necrosis after thermal removal of gutta percha as well as endodontic, restorative, and periodontics management.

Case Report

A 25 years old male patient, self-reporting as Middle Eastern, who presented to the clinic for dental care at King Abdul-Aziz University Faculty of Dentistry (KAUFD) in Jeddah, Saudi Arabia. The patient was referred to sixth dental students for comprehensive care clinics (Figure 1). His chief complaint was: "I have pain in my lower right side." Medical history revealed that the patient was on Aripiprazole, a medication that is used to treat mood or mental disorders, and Amitriptyline, a medication that is used to treat clinical depression. His family history was clear. Social history revealed that the patient has been smoking 2 packs per day for 4 years. After reviewing the patient's dental charts, his dental history revealed that the patient had some teeth extracted under local anesthesia with no recorded complications. Upon clinical examination, extra-oral structures were recorded to be within normal limits; however, coupled with intra-oral radiographs, it was revealed that there were multiple badly decayed teeth, defective restorations, and an inflamed gingiva. His oral hygiene status was poor, and he is considered as a high caries risk patient according to Caries Management by Risk Assessment (CAMBRA), which is an approach used for patient-specific caries management [6].



Figure 1: Pre operative clinical presentation revealed multiple decayed teeth, defective restorations, and plaque accumulation.

Periodontal examination revealed that his periodontal diagnosis was dental biofilm induced gingivitis according to the new classification of periodontal and peri-implant diseases and conditions [7]. The patient started phase I treatment with oral hygiene instruction, education, motivation and smoking cessation program, followed by supra and sub-gingival scaling, caries excavation and placement of caries control

restorations. Three months after completing phase I, tooth #22 went under non-surgical root canal re-treatment by thermal method (200 to 600 C), using system B, to remove old gutta-percha followed by hand instrumentation to clean and shape the canal using H and K files. Access cavity was sealed with glass ionomer after obturation. This procedure was done in one session.

Prevention of leakage is one of the factors in which the prognosis of an endodontically treated depends on. This happens through providing a coronal restoration to seal the root canal system. Since the remaining tooth structure in this case is less than 50%, a decision was made to place a prefabricated fiber post to retain the core material [8]. One week after the completion of the endodontic re-treatment to tooth #22, gutta percha removal was done to create post space in tooth #22 using system B coupled with blue drill and matching blue post. Packable and flowable composite were used for core build up after.

Patient presented for periodontal re-evaluation 5 weeks later. He complained of pain and mobility on tooth #22. Upon clinical examination, a sloughed whitish tissue around the cervical area of tooth #22 with Miller grade 3 mobility.

The patient showed up for an appointment one week after the re-evaluation. Soft tissue dehiscence noted on tooth #22. After consulting a periodontist, endodontist, and a prosthodontist, an order for a periapical radiograph and CBCT was placed to assess the restorability of tooth #22. The radiology report stated that there was enough interproximal and palatal bone with loss of buccal plate (Figure 2-4).

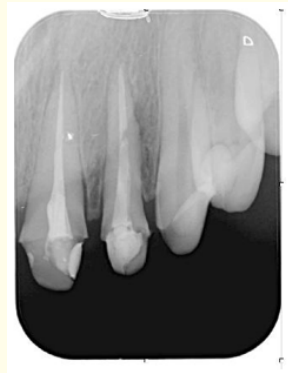


Figure 2: Radiographic presentation of the maxillary left lateral incisor one week following the re-evaluation appointment. Note the sufficient interproximal bone level.

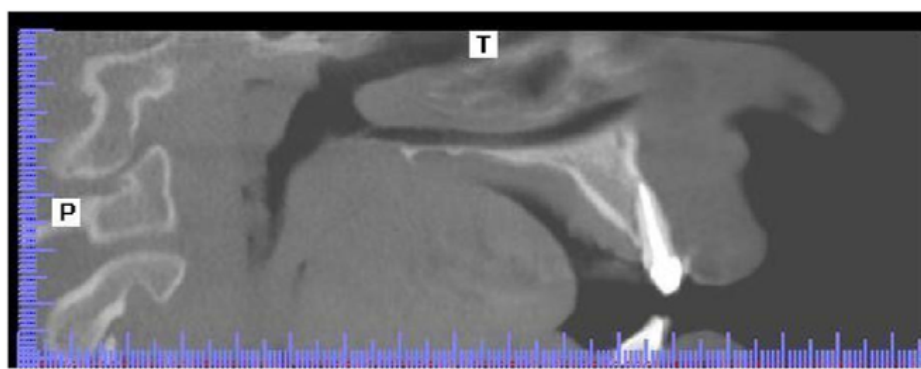


Figure 3: Coronal view of the CBCT shows complete absence of labial plate bone.

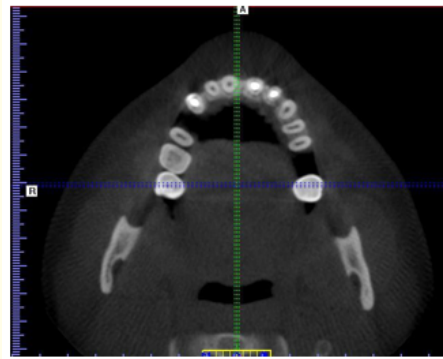


Figure 4: Axial.

A consultation was done once more after the CBCT was interpreted. A line of treatment was designed after reviewing the CBCT report and published literature that is applicable to this case by consultants of various departments. After treatment plan discussion and providing all treatment plan options, a soft tissue graft using a sub-epithelial connective tissue was suggested to be performed; however, a preparatory prosthetics procedure should be done first. These procedures were initial crown preparation and extra coronal splinting.

One week after the patient last came for the CBCT, initial preparation was performed to #22 and restored by provisional crown using PROTEMP. Flowable and packable composite were used for splinting. The tooth was splinted with #11, #21, and #23 initially for two weeks.

The patient came for follow up two weeks after splinting; yet, the tooth was still mobile as before with the same symptoms. The decision was made to re-splint again using lab made provisional crowns (Figure 5). Due to the presence of enough inter-proximal and palatal bone, it was decided to perform soft tissue graft using sub-epithelial connective tissue and non-absorbable sutures (Figure 2).



Figure 5: Teeth are splinted using lab made provisional crowns.

Surgical treatment

Numerous studies were published explaining the treatment modalities for root coverage procedures. In this presented case, the goal is to augment soft tissue and cover the exposed root coronal to the gingival margin with sub-epithelial connective tissue graft.

The treatment options were discussed with the patient and an informed consent was obtained and signed by the patient. Oral hygiene instructions were given to the patient. Non-surgical scaling and root planning were performed prior to the surgery. The patient came after 2 weeks for re-evaluation appointment before the surgical procedure.

Recipient site

Local anesthesia infiltration was administered via buccal and palatal infiltration using 1.8 ml of 4% Articaine with 1:100000 epinephrine. A sulcular incision was made with blade #15 to create a pouch. A partial thickness mucoperiosteal flap was reflected passing the mucogingival junction. Periosteal releasing incision was performed for tension free closure.

Donor site

Palatal local anesthesia infiltration using 1.8 ml of 4% Articaine, single incision technique was done from the distal line angle of the canine to the mid-palatal of the first molar. A palatal flap was reflected, and sub-epithelial connective tissue graft was obtained. The graft was prepared by de-epithelialization and hydrated with 0.9% saline solution. Palatal flap was sutured using simple interrupted suture with chromic gut suture.

At the recipient site, the graft was tunneled into the pouch using 3-0 chromic gut suture followed by a final suture using 6-0 nylon suture.

Post-operative instructions

Hemostasis was achieved. Post-operative instructions were reinforced to the patient in addition to the prescribed 0.12% CHX mouthwash and analgesics. In the follow up appointment, intra oral examination revealed plaque accumulation with minor inflammation around the surgical site with no evidence of infection and healing within normal limit. as well as the donor site.

Patient presented for follow up two weeks after the surgery. Plaque accumulation was noted, around the site of the surgery with minor inflammation and no signs of infection. The sutures were still present (Figure 6). Two weeks later, the sutures were removed.



Figure 6: Clinical picture shows maxillary left lateral incisor 2 weeks after the surgery.

The patient presented to the clinic for 6 months follow up after the surgery. He reported no symptoms. His overall oral hygiene was poor. Upon intra-oral examination, the tooth presented with a gingival inflammation around the area of #22 with 30% root coverage. Mobility test was excluded due to the presence of the splint (Figure 7). A single intra oral periapical radiograph was taken and revealed the presence of advanced vertical bony defect and loss of inter proximal bone.



Figure 7: Clinical picture that shows maxillary left lateral incisor 6 months after the surgery. Plaque accumulation, calculus deposits, and 30% root coverage was noticed.

After consultation with a periodontist regarding the recent clinical and radiographic findings, a decision was made to schedule the patient in the future for guided tissue regeneration procedure around tooth #22. However, patient completely refused to go for further periodontal surgery due to financial limitations. The decision was made to keep the patient on 1 month recall visits (Figure 8).



Figure 8: Periapical radiograph that shows maxillary left lateral incisor 6 months post-surgery demonstrating advanced vertical bone defect and loss of interproximal bone level.

Discussion

Limited amount of literature and studies have argued and reported the potential harm on the gingival tissues. One study that discussed the harm of heat on gingiva and soft tissue is 1- Chauchan., *et al.* 2015 that 2- stated that “A temperature rise of 10°C above normal body temperature (37°C) is regarded as a critical level at which periodontal tissues could be adversely affected.” Such result is consistent with studies such as: 3- Lipski., *et al.* 2004, 4- Eriksson., *et al.* 1983, Lee FS., *et al.* 1998 [9-12]. With that being said, there is still a lack of data and literature explaining the impact of heat on gingival tissue.

In this presented case, the non-surgical root canal re-treatment in addition to the post space preparation was done using thermal removal of GP by system B in combination with mechanical means using Hedstrom files, which is one of the several techniques that are used to remove the gutta-percha cone filling materials from the root canal system as proposed by Colaco., *et al.* 2015 [13].

It should be considered that the use of solvents for chemical removal of root canal filling material such as chloroform could be toxic or noxious. If it is not used correctly and with caution, mechanical removal of gutta percha by gates glidden or rotary instrument may result in tooth damage or perforation. Accordingly, this urges us clinicians to use the thermal method which is considered safe, easy, and effective in removing gutta percha filling material if followed by the manufacturer’s instructions; however, the potential effects of heat transmission to the tooth structure and surrounding periodontal tissue should not be ignored [14].

The potential harm of heat 1 the alveolar bone and the attachment apparatus is explained in this study by Eriksson., *et al.* 1983 in which vascular threshold level was reported. Also, in 2- Eriksson., *et al.* 1983, it was demonstrated that exposing the bone to a temperature 50°C for 1 minute could initiate heat induced signs of necrosis; on the other hand, bone exposed to heat of 60°C or more would lead to bone necrosis. Heat induced effects are not restricted to bone only. Congruent to what the literature had proven, the clinical presentation showed bone and soft tissue dehiscence that resulted from overheating using System B.

In addition to excessive heating, lack of facial bone which was also represented in this case plays a key role in soft tissue and bone dehiscence as reported in 3- Chan., *et al.* 2016 [15]. The presence of soft tissue dehiscence and lack of facial bone simultaneously in one case contributed to the greater presentation of gingival recession. After clinical and radiographic analysis, a decision was made for soft tissue graft using SCTG due to the enough presence of inter-proximal and palatal bone as shown in figure 2-4.

The periapical radiograph of tooth #22 showed advanced and unexpected interproximal bone loss when compared to the baseline radiographs. Compact or cortical bones of facial and lingual plates protect and hinder the destruction of the underlying cancellous bone. Due to the presence of such pattern, deep defects between the facial and lingual plates could be hardly detected on conventional radiographs. For inter-proximal bone destruction to be evident on radiographs, cancellous bone destruction should take place. With that being in prospective, a clinical reduction or resorption of 0.5 to 1.00 mm in cortical bone thickness is sufficient to make such reduction detectable radiographically [16]. The progression of inter-proximal bone is dependent on the duration of compact bone loss that is followed by cancellous bone loss in which this pattern is better visualized in subtraction radiography [17]. The duration of compact bone loss usually takes longer time in which after signs become more evident in the radiograph. After such vertical bone defect took place, Guided Tissue Regeneration (GTR) became indicated in this case to regenerate new attachment [18].

Conclusion

Using thermal method, System B in this case, for gutta-percha removal in non-surgical root canal re-treatment carry risk for the bone and attachment apparatus which is like what was represented in this case. Heat emitted by System B can reach up to 10°C which would have an adverse effect on root’s outer surface [9]; however, results could be safe and effective if the clinician would adhere to the manufacturer’s instructions of not exceeding 200°C coupled with short application time. In order to avoid such complications, the clinician or the operating dentist is advised to follow the manufacturer’s instructions regarding the temperature and duration. Also, the

clinician is advised to refer the patient to a specialist if the tooth that was operated on using heated instruments became symptomatic to rule out any unexpected complications.

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