Managing the spaghetti phenomenon: A Case Report

Sarika Chandra1, Sylvia Mathew2, Jenani Sathishwaran3, Sejal K.M.4

1Post Graduate student, 2Professor and Head, Department of Conservative Dentistry and Endodontics, MS Ramaiah Faculty of Dental Science, Bangalore, Karnataka, India
3Post Graduate student, 4Reader, Department of Oral and Maxillofacial Surgery, MS Ramaiah Faculty of Dental Sciences, Bangalore, Karnataka, India.

Corresponding Author:
E-mail: sarikachandradr@gmail.com

Abstract:
The goal of endodontic treatment is to provide a hermetic seal, which aids in the elimination of disease causing microorganisms. However, a procedural error during treatment may jeopardize the outcome. The case report presented here is on the management of the ‘Spaghetti phenomenon’ which is the result of gross overfilling of the root canal. Retrieval of the material which had extruded beyond the apex in this case was impossible in the orthograde manner, which is why surgical intervention had to be undertaken. Visualization of the extent of the lesion was greatly enhanced by the use of advanced diagnostic techniques such as Cone Beam Computed Tomography.

Key-words: Overfilling, Procedural errors, Thermoplasticized gutta percha

Introduction
The main objective of endodontic treatment is to provide an impermeable seal of the root canal system with an inert, biocompatible and dimensionally stable filling material. This filling material should be limited to the root canal without extending to the periapical tissues or other neighboring structures (1). Procedural errors can occur during any stage of treatment whether its gaining access, instrumentation, obturation or post-space preparation. Procedural errors by themselves do not necessarily jeopardize the outcome of treatment unless a concomitant infection is present.

Unfortunately disabling complications to the alveolar bone, neurovascular bundle and maxillary sinus following inadvertent overextension of root canal-filling materials have been reported and cited in literature. Gutta percha is the most commonly used core material for obturation and due to its low toxicity it has withstood the test of time. Although warm vertical compaction techniques according to Clinton et al have a higher probability of closure of the lateral and accessory canals, they also result in a greater risk of the material being extruded into periradicular tissues (2).

The prognosis for an endodontically treated tooth with overfilling depends on the response of the periradicular tissue to the canal obturation material which is a consequence of the complex, and at times unpredictable interaction between the materials and the host defences. Only a 76% success rate has been found in cases where overfilling of the root canal system has been performed (3). The extrusion of a large volume of obturation material beyond the tooth apex giving a spaghetti-like appearance is termed the “Spaghetti phenomenon”. According to the American Dental Association, overfilling by more than 2mm past the radiological apex represents a technical error ascribable to over-instrumentation, inadequate measuring, or a lack of an apical stop.

Case History
A 58 year old, female patient reported to the department of Conservative Dentistry and Endodontics, MS Ramaiah Faculty of Dental Sciences, Bangalore with the chief complaint of swelling and long-standing intermittent pain in the anterior palatal region of the upper jaw. The patient gave history of root canal treatment 19 years ago. A few weeks after the treatment, the patient experienced severe pain associated with the same 2 front teeth for which she had undergone root canal treatment. The operating dentist prescribed her antibiotics and analgesics. The medication provided some relief but the patient continued to experience some pain and discomfort sporadically. The patient also gave a history of some discharge accompanied by foul taste in her mouth. The patient finally decided to come to the dental hospital after she felt the size of the swelling had become significantly large (Figure 1).

A pre-operative radiograph showed root canal treated 11 and 21 (Figure 2). There was extrusion of the radiopaque obturation material beyond the apex of 11 characteristic of the “spaghetti phenomenon”. There was a large periapical radiolucency extending from the distal aspect of 13 to the mesial aspect of 21 as evident on the cone beam computed tomographic scans. The size of the lesion as measured on the Cone Beam Computed Tomographic (CBCT) software was estimated to be
15.5 mm mesiodistally and 14.5 mm labio-palatally. Labial and palatal perforation were evident on the CBCT image scans (Figure 3).

Surgical intervention was decided upon as the mode of treatment. The patient was a known case of Diabetes Mellitus and Hypertension from the past ten years and hence physician consent was obtained and the premedication required to be taken before scheduling the patient for surgery. As the lesion was large in size, placement of bone graft was imperative for the filling of the cystic cavity.

Local anaesthesia was administered and a sulcular incision made from the mesial aspect of 14 to mesial aspect of 23 (Figure 4). Two vertical releasing incisions were made using blade #15. The flap was raised using a periosteal elevator. Labial perforation was visualized at the apex of 11 and 12. Curettage was completed and all the granulation tissue was carefully removed from around the root apices (Figure 5). As anticipated from the pretreatment scans, palatal perforation was present. The bony cavity was irrigated with saline and Carnoy’s solution was applied for the elimination of any epithelial remnants or microcysts.

Apicoectomy was undertaken with 11 and 12. Root resection was followed by placement of Mineral Trioxide Aggregate (MTA) as the retrofilling material. Allograft as bone slices of patella bone was obtained from the MS Ramaiah Tissue Bank. The bone slices were placed in antibiotic concoction for 15 minutes and milled to fine granules. Platelet Rich Fibrin (PRF) was prepared by centrifuging the patient’s blood. The milled bone was mixed with the PRF (Figure 6). A collagen membrane was placed palatally over the mucosa and the bony cavity was packed with PRF and bone graft. Another collagen membrane was placed labially (Figure 7) and the flap was then approximated and sutured in place. COE pack was placed labially and palatally. A stent was fabricated to obliterate the dead space and also to prevent graft loss through the palatal sinus. The patient was prescribed analgesics, antibiotics and a chlorhexidine based mouthwash after completion of the surgery.

The patient was called for clinical and radiographic follow-up after a period of 1 week (Figure 8). The sutures were removed after 2 weeks and the use of stent discontinued. The patient was called for a weekly follow-up on a regular basis for a period of 3 months.
Discussion

The current practice of maintaining apical patency and the popularity of thermoplasticized gutta percha filling techniques in conjunction with sealers have increased the likelihood that overfills can involve the neurovascular anatomy. The consequences involving the neurovascular anatomy can be anaesthesia, dysesthesia or parasthesia depending on the degree of nerve injury which has been classified by Seddon. Root canal sealers are cytotoxic and irritating to the peri-radicular tissues, especially formaldehyde based sealers. Gutta-percha may act as a foreign body or hapten, but it is more biocompatible with the periradicular tissues than are root canal cements. However, the presence of a persistent biofilm on the surface of the extruded obturation material as demonstrated by Noiri et al by
the use of a scanning electron microscope is responsible for persistent periapical inflammation\(^{(7)}\). Biofilms are remarkably resistant to the action of phagocytes and the filling material may in turn cause a foreign body giant cell reaction \(^{(8)}\).

This is a unique case of “spaghetti phenomenon” with a long-standing history of nineteen years. Fortunately for the patient, the extruded material did not impinge or cause damage to any of the neurovascular structures. The cystic lesion caused due to the foreign body reaction seems to have steadily grown in size with recent exacerbation in size due to the patient’s uncontrolled diabetes mellitus. The lack of an apical seal or the use of undue force and velocity during condensation of gutta percha may have been the reasons for the occurrence of this phenomenon. As early as 1978, Tronstad demonstrated that a plug of clean dentin fillings could provide an apical matrix that was well tolerated by the tissues and would provide an apical barrier that would allow the canals to be well sealed yet protect against impingement of filling materials on the periodontal tissues\(^{(9)}\). Thus an apical matrix of either clean dentinal shavings, Calcium hydroxide, Biodentine or MTA must be placed before condensing thermoplasticized gutta percha in order to prevent extrusion of the material. The use of a hybrid technique when using thermoplasticized materials involves a cold condensation of gutta percha apically followed by a thermomechanical compaction, providing a safer barrier for limiting the extrusion of material \(^{(10)}\).

A labial approach was made and all the granulation tissue was curetted. After achieving hemostasis of the bony cavity, apicoectomy was undertaken. 3mm of the root apex was resected followed by retropreparation. Retrofilling was done using MTA. Studies evaluating MTA as a retrofilling material have shown less periapical inflammation, presence of a fibrous capsule and formation of new cementum layer in contact with the material surface in many cases \(^{(11)}\).

A collagen membrane was placed palatally followed by placement of bone graft and PRF inside the bony cavity. PRF first used by Choukroun et al in France, is a scaffold and a powerhouse of growth factors, which can be used to promote wound healing, bone growth, graft stabilisation, wound sealing and haemostasis. Dohan et al. proved a slower release of growth factors from PRF than PRP and observed better healing properties with PRF \(^{(12)}\). Allograft obtained as patella slices were used in this case. Bone allografts allow the selection of blocks with a predefined configuration and a corticocancellous composition\(^{(13)}\).

Conclusion
Exercising caution while endodontic treatment is extremely important. Mishaps caused during the course of treatment can lead to deleterious effects, which may severely handicap the patient. There is continuous advancement in the field of material science. As clinicians we must evolve with the times and incorporate newer materials in our practice. However, a proper understanding of how each material must be used is more important that just using the materials. Therefore, when armed with proper knowledge, the use of advanced materials can result in extremely successful endodontic treatment.

References: