PULP FICTION

A Quarterly Newletter

By Westside Endodonics

SUMMER 2015

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Greetings!

Greetings….It's almost officially summer!!! Hopefully the mild spring temperatures have just been a teaser for a great warm summer ahead! This is yet another odd numbered year which means it is the year of the ESE, the European Endodontic Congress in Barcelona Spain from September 16-19. It is always a fun and informative congress should you feel like taking a European vacation this fall. For more info, check out the website www.e-s-e.eu/ese-biennial-congress. This year we are please to announce that we will be taking our referring doctor, Leslie Mitchell and her spouse with us! Winemaking, fishing and travelling up to my roots in British Columbia will pretty much tie up my summer days! Hope you all have a safe funfilled summer! Enjoy your summer edition of Pulp Fiction 2015!

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Inside this issue:

- Message from Dr Singh
- Management of Sodium Hypochlorite Injuries
- Internal Root Resorption
- Treatment of Necrotic Immature Permanent Incisors
- Middle Mesial Canals in Mandibular Molars

Management of Sodium Hypochlorite Injuries

The use of irrigants during endodontic treatment is a proven way to achieve overall cleanliness and disinfection of the root canal system. Sodium hypochlorite (NaOCl), the most widely used irrigant, has a concentration ranging from 0.5% to 5.25%. It is bacteriocidal with the capacity to dissolve organic matter, dislodge debris from the root canal system and provide a degree of lubrication during root canal shaping. Despite its many advantageous properties, care must be taken when using and handling NaOCl because it is caustic to the vital tissues, and related injuries are a recognized risk.

Safety measures include wearing appropriate personal protective equipment, ensuring the use of a well-sealed rubber dam and utilizing high-volume suction. Such precautions help avoid injuries to the skin and eyes, as well as ingestion or even aspiration by the patient. There is also a risk that NaOCl might be extruded into the periradicular and soft tissues, resulting in an intense inflammatory response and extensive tissue damage. It is vitally important that all dentists and endodontists be well informed regarding the management of patients if an extrusion of NaOCl occurs.

Farook et al from Northwick Park Hospital, United Kingdom, developed guidelines to assess and manage patients with NaOCl extrusion injuries. Table 1 shows the findings from the patient examination and the associated grading of the injury.

After the injury has been properly ass
essed, the following treatment guidelines are recommended. For mild and moderate injuries, immediate treatment includes

- irrigating the root canals with copious amounts of water or saline to dilute the NaOCl in the tissues
- leaving the canal open to drain
- prescribing nonsteroidal anti-inflammatory drugs or narcotic analgesics
- applying cold compresses

During the first 7 days following NaOCl injury, treatment should include applying warm compresses to stimulate local circulation. Once soft tissues have stabilized and show signs of healing, endodontic treatment should be completed, preferably with an alternate irrigant.

For severe injuries, immediate treatment includes

- making a referral to an oral and maxillofacial surgeon
- assessing the need for intravenous steroids and antibiotics
- imaging using either magnetic resonance imaging or computed tomography

Treatment for severe injuries may also require consultation with a plastic and reconstructive surgeon.

Table 1. *Summary of findings from history and examination and associated grading in cases of NaOCl extrusion*

Symptom	Grade of injury		
	Mild	Moderate	Severe
Pain (visual pain score)	0–3	4–6	7+
Swelling	<30%	30%–50%	>50%
Ecchymosis	Localized	Diffuse	Diffuse
Other	No ulceration No necrosis	Intraoral ulceration	Intraoral ulceration Intraoral necrosis Airway compromised Neurovascular deficit
Pathway	GD/endodontist	OMFS	OMFS

GD, general dentist; OMFS, oral and maxillofacial surgeon.

Conclusion
The extrusion of NaOCl into the periradicular tissues during endodontic treatment is a rare occurrence. Nevertheless, an NaOCl accident is potentially serious and can lead to significant morbidity for the patient. Prior to root canal treatment, tooth assessment can identify any factors that may predispose the tooth to extrusion injuries, so adequate preventive measures can be undertaken by the practitioner.

Farook SA, Shah V, Lenouvel D, et al. Guidelines for management of sodium hypochlorite extrusion injuries. Br Dent J 2014;217:679-684.

Internal Root Resorption

Root resorption is defined as a condition associated with either a physiologic or pathologic process resulting in loss of dentin, cementum or bone. Mittal et al from Dasmesh Institute of Research and Dental Sciences, India, recently summarized the available knowledge of internal root resorption, an anomaly resulting from the progressive destruction of intraradicular dentin and dentin tubules due to osteoclastic activities. Various etiological factors have been suggested as contributory to internal root resorption. Among them:

- traumatic injury
- iatrogenic dental injury
- pulp infection
- orthodontic treatment

Radiographs used to diagnose internal resorption reveal a round-to-oval radiolucent enlargement of the pulp space. The margins appear smooth and clearly defined. Clinically, the condition is usually asymptomatic; however, there may be a visible pink spot that represents the granulation tissue showing through the resorbed area.

Perforating internal resorption may complicate the prognosis of endodontic treatment due to a weakening of the remaining dental structure and possible periodontal involvement, but prognosis for the tooth can be influenced by the biomaterial employed in treatment. Mineral trioxide aggregate (MTA) is most commonly used because of its biocompatibility, sealing ability and potential induction of hard tissue formation, followed by root filling with a warm gutta-percha obturation technique.

Conclusion
Internal root resorption is a relatively uncommon phenomenon that starts within the root canal and destroys the surrounding dentin structure. It is easy to stop the process of internal root resorption by performing conventional endodontic treatment. Thus, early diagnosis and proper treatment should lead to a successful outcome with a favorable outlook for long-term tooth survival.

Mittal S, Kumar T, Mittal S, Sharma J. "Internal root resorption: an endodontic challenge": a case series. J Conserv Dent 2014;17:590-593.

Treatment of Necrotic Immature Permanent Incisors

Proper management of the necrotic immature permanent incisor following traumatic injury is critical for its long-term survival. Traditionally, apexification with calcium hydroxide [Ca(OH)2] paste has been highly successful, but requires several visits over a number of months to complete. An alternative method, using mineral trioxide aggregate (MTA) as an apical plug, has gained significant popularity because it decreases the overall treatment time necessary to establish a hard tissue barrier at the open apex of the traumatized tooth.

Lee et al from Taipei City Hospital, Taiwan, compared clinical outcomes in 40 children (18 female, 22 male; ages 6.5 to 10 years) with necrotic immature permanent incisors treated with Ca(OH)2 or MTA to develop apical hard tissue barriers and potentially achieve additional root length.

Forty necrotic immature incisors with open apices ranging from 1 mm to 3.5 mm in diameter were evaluated. The 40 teeth included

- 32 maxillary central incisors
- 4 maxillary lateral incisors
- 4 mandibular central incisors

Twenty incisors had root apices less than 2 mm wide; the other 20 incisors had root apices between 2 mm and 3.5 mm wide. The 40 incisors were evenly allocated to 4 groups according to patient age, type of tooth and width of root apex. Each group underwent a different treatment modality:

- Group 1 teeth were treated with ultrasonic filing and MTA placed in the apical root canal.
- Group 2 teeth were treated with ultrasonic filing and Ca(OH)2 medication.
- Group 3 teeth were treated with hand filing and MTA placed in the apical root canal.
- Group 4 teeth were treated with hand filing and Ca(OH)2 medication.

After the ultrasonic or hand filing procedures, each of the 40 treated canals was dried with 3 paper points and loosely packed with Ca(OH)2 in the coronal root canal as an intracanal medicament for 7 days. Access was sealed with intermediate restorative material. During the second visit, each canal was irrigated with a sodium hypochlorite solution and dried with 3 paper points. Each tooth continued to receive the same treatment as was performed at the first visit until clinical symptoms and signs associated with the necrotic pulp subsided.

A paste of MTA and sterile water was placed in the apical part of the root canal of incisors in groups 1 and 3. A well-mixed Ca(OH)2 paste was placed in the root canal of incisors in groups 2 and 4. Radiographic evidence of the formation of an apical hard tissue barrier showed the teeth to be endodontically restored.

Group 1 incisors needed the shortest mean duration (5.4 plus or minus 1.1 weeks) for apical hard tissue barrier formation, followed by group 3 incisors (7.8 plus or minus 1.8 weeks), group 2 incisors (11.3 plus or minus 1.3 weeks) and group 4 incisors (13.1 plus or minus 1.5 weeks). Group 1 incisors had a significantly shorter mean elongated root length (2.1 plus or minus 0.2 mm) after treatment than group 2 incisors (3.5 plus or minus 0.3 mm; p less than .001); group 3 incisors had a significantly shorter mean elongated root length (2.1 plus or minus 0.1 mm) after treatment than group 4 incisors (3.7 plus or minus 0.3 mm; p less than .001).

Conclusion
Necrotic open-apex immature incisors treated with ultrasonic filing plus MTA placement needed the shortest mean duration for apical hard tissue barrier formation. For elongation of apical root length, Ca(OH)2 treatment was better than MTA, regardless of which instrumentation method was used.

Lee L-W, Hsieh S-C, Lin Y-H, et al. Comparison of clinical outcomes for 40 necrotic immature permanent incisors treated with calcium hydroxide or mineral trioxide aggregate apexification/ apexogenesis. J Formos Med Assoc 2014;doi:10.1016/j.jfma.2014.06.005.

Middle Mesial Canals in Mandibular Molars

A detailed knowledge of the pulp canal anatomy is necessary to find and then effectively clean and shape the entire root canal system. Mandibular molars are the most frequent tooth type to be endodontically treated. Traditionally, mandibular molars are described as 2-rooted teeth with 2 canals in the mesial root and 1 or 2 canals in the distal root.

However, studies have shown several variations in the anatomy of mandibular molars, thought to be determined by race and genetics. These variations include

- a separate distolingual root
- C-shaped anatomy of the roots and/or canals
- an isthmus between the mesiobuccal and mesiolingual canals
- a third canal in the mesial root, known as the middle mesial canal (MMC)

The prevalence of the MMC ranges up to 36% depending on how the mandibular molar is examined. However, clinical studies on negotiable MMCs show results different from those of studies involving extracted teeth. An in vitro investigation showed that use of a dental operating microscope can increase the number of located and negotiated canals.

The primary aim of a retrospective study conducted by Nosrat et al from the University of Maryland was to evaluate the incidence of negotiable MMCs in mandibular first and second molars using a dental operating microscope for magnification. The authors also attempted to correlate the incidence of MMCs with other variables.

All canals were then obturated using cold lateral compaction of gutta-percha in the apical third followed by vertical compaction of thermoplasticized gutta-percha. Differences in the incidence of MMCs were compared using the chi-squared and Fisher exact test. Statistical significance was set at p less than .05.

During the 21-month period of the study, 75 mandibular first and second molars were treated in patients with a mean age of 35 years. Of these, 20% of the molars had negotiable MMCs. The incidence of MMCs in mandibular molars was

- 32.1% in patients 20 years old or younger
- 23.8% in patients 21 to 40 years old
- 3.8% in patients older than 40 years old

Analysis of data revealed a significant difference in the distribution of MMCs among the different age groups (p less than .05).

Conclusion

Using magnification and careful tactile search techniques, the incidence of MMCs in mandibular molars was found to be higher than previously reported. The probability of finding and negotiating an MMC in younger patients is significantly higher than in older patients. Use of an operating microscope appears to be key to locating and negotiating MMCs.

Nosrat A, Deschenes RJ, Tordik PA, et al. Middle mesial canals in mandibular molars: incidence and related factors. J Endod 2015;41:28-32.