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A. K. Bobby Mallik, D.M.D.

3719-B University Commons
Durham, North Carolina 27707
919-493-5332
www.durhamendo.com

Practice Limited to Endodontics

Effect of Preoperative Oral NSAIDs in Success of Inferior Alveolar Nerve Block

The failure rate of the inferior alveolar nerve block (IANB) in patients presenting with irreversible pulpitis (IP) varies from 44% to 81%. However, the exact reason for failure of the IANB in these patients remains unclear. Several hypotheses have been suggested:

- the lowered pH caused by inflammation and infection
- anatomical conditions (i.e., accessory innervations)
- tachyphylaxis of anesthetic solutions
- central sensitization
- activation of nociceptors that express a tetrodotoxin-resistant class of voltage-gated channels resistant to local anesthetics

Whether nonsteroidal anti-inflammatory drugs (NSAIDs) given preoperatively could have a positive effect on pain control during dental procedures for patients with irreversible pulpitis is still unclear. Several randomized controlled trials have been conducted to find the answer, but their outcomes vary. A systematic investigation by Li et al from Sichuan University, China, assessed the effect and safety of preoperative oral NSAIDs in the success of IANB using current clinical evidence.

Study selection, risk of bias assessment and data extraction were delivered in duplicate by a pair of calibrated reviewers. Disagreements between the reviewers were resolved through discussion, and unresolved issues were brought to a third reviewer for consensus.

A total of 137 citations were identified through electronic and hand searches. After screening titles and abstracts, 7 of 15 studies, all of which were in English, were eligible.

Evidence showed that 600 to 800 mg of ibuprofen significantly increased the success rate of IANB ($p = .002$) with moderately reliable results. A dose of 75 mg of indomethacin was as significantly effective ($p = .005$) as 8 mg of lornoxicam ($p = .0004$) and 50 mg of diclofenac potassium ($p = .003$). Ketorolac, ibuprofen and acetaminophen

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together, and acetaminophen alone showed no statistical significance compared with placebo. No serious adverse events were reported.

Conclusion

At present, high-quality clinical evidence concluded that preemptive administration of oral NSAIDs might have some beneficial effects on the success of IANB on patients who present with irreversible pulpitis.

Li C, Yang X, Ma X, et al. Preoperative oral nonsteroidal anti-inflammatory drugs for the success of the inferior alveolar nerve block in irreversible pulpitis treatment: a systematic review and meta-analysis based on randomized controlled trials. Quintessence Int *2012;43:209-219.*

Use of Soy Milk To Transport Avulsed Teeth

The reported incidence of tooth avulsion is approximately 1% to 16% of all traumatic injuries to the permanent dentition. The long-term prognosis of the replanted tooth depends on the measures taken at the time of the accident and the period immediately after avulsion.

Depending on the extra-alveolar time and the storage/transport medium, pulp necrosis and degeneration of the cementum and periodontal ligament (PDL) cells may occur, leading in turn to inflammatory root resorption and replacement resorption (Figure 1), the major causes of tooth loss.

The ideal storage medium should preserve cell vitality, adherence and clonogenic capacity, and should be readily available at the site of the accident. To date, several types of media have been used to store avulsed teeth. These include saliva, milk, Hank's Balanced Salt Solution (HBSS), Save-A-Tooth system (Phoenix-Lazerus, Shartlesville, PA) and ViaSpan (DuPont Pharmaceuticals, Wilmington, DE).

Milk is regarded as a convenient storage medium for an avulsed tooth because it is easy to obtain in the event of an accident and can maintain the viability of PDL cells for several hours. In addition, milk has a physiologically compatible pH and osmolality, many essential nutrients, and growth factors.

Soy milk is an aqueous solution rich in protein, amino acids, vitamins and minerals essential for cell nutrition and maintenance. It also has a physiological pH and is gradually becoming available to a wider population. A recent study showed that soy milk in contact with periodontal ligament cells promoted good cell viability and was recommended as a potential storage media.

The simultaneous evaluation of various cell viability parameters may more accurately identify any possible cytotoxic effects of storage media with immortalized cells intimately related to the in vivo tissue. Silva et al from the State University of Campinas, Brazil, assessed the cytotoxicity of long–shelf-life soy milk compared with coconut water, HBSS and long–shelf-life whole milk through a multiparametric analysis employing 3T3 cells.

Plates of confluent 3T3 fibroblasts were exposed to the test media for

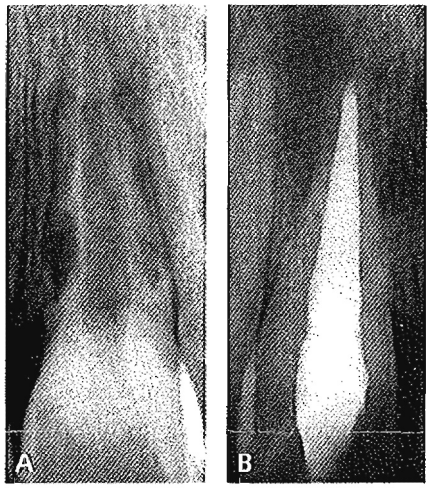

Figure 1. (A) Radiograph of incisor tooth with inflammatory root resorption. (B) Radiograph of incisor with replacement root resorption. There is loss of root structure, along with absence of a PDL space. (*Images courtesy of Dr. Frederic Barnett.*)

24 hours at 37°C with 5% carbon dioxide, and cell viability was evaluated by a sequential assessment of mitochondrial activity (XTT), membrane integrity (neutral red test) and total cell density (crystal violet dye exclusion test) on the same cells.

Statistical analysis showed that whole milk, HBSS and soy milk most effectively maintained cell viability at all tested times ($p < .05$). The least amount of viable cells was observed when using coconut water.

Conclusion

Three different viability tests show that the efficacy of soy milk in maintaining the viability of 3T3 fibroblasts is similar to that of HBSS and whole milk. Thus, soy milk appears to be a viable transport media for the storage of avulsed teeth.

Silva EJNL, Rollemberg CB, de Souza Coutinho-Filho T, Zaia AA. A multiparametric assay to compare the cytotoxicity of soy milk with different storage media. Dent Traumatol *2012;doi:10.1111/j.1600-9657.2012.01175.x.*

Effect of NaOCl Contact Time and Temperature on Infected Roots

While the microbial flora of infected root canals mostly comprise anaerobic gram-negative microorganisms, facultative gram-positive species, such as *Enterococcus faecalis*, may also be present in teeth with apical periodontitis. This species is most often associated with endodontic treatment failure. In addition to *E faecalis*, the fungus *Candida albicans* is also associated with treatment failure. Because of their high resistance to antibacterial substances, both *E faecalis* and C *albicans* have been used to test the efficacy of endodontic medicaments and irrigants.

A study by Gulsahi et al from Baskent University, Turkey, evaluated the antimicrobial effectiveness of 2.5% sodium hypochlorite (NaOCl) at 2 different temperatures and at 3 different time intervals on human roots infected with *E faecalis* and C *albicans*. A total of 112 root cylinders prepared from extracted single-rooted human teeth were infected by *E faecalis* (group A, $n = 56$) or C *albicans* (group B, $n = 56$); 3 root cylinders served as negative controls. Groups A and B were further divided into 6 subgroups according to 3 contact times (30 seconds, 1 minute and 5 minutes) with NaOCl at 2 different temperatures (25°C or 37°C). Microbial growth was assessed at 24 and 48 hours.

Statistical analysis was performed using the χ^2 test. One cylinder per group was randomly selected and evaluated under scanning electron microscopy. The results are shown in Table 1. The comparison of the microbial growth for both groups A and B treated either with NaOCl at 25°C or with NaOCl at 37°C for the same contact times showed no significant difference at both 24 and 48 hours ($p < .05$).

Conclusion

The present study revealed that 2.5% NaOCl at 25°C for 5 minutes was the most effective irrigation regimen to eliminate *E faecalis*, while 2.5% NaOCl at 37°C for 5 minutes exhibited significantly superior antifungal properties. Since only a single concentration of NaOCl was tested, further studies are necessary to investigate the ideal temperature and concentration to be used in vivo, especially on root canals known to be infected with C *albicans*.

Gulsahi K, Tirali RE, Cehreli SB, et al. The effect of temperature and contact time of sodium hypochlorite on human roots infected with Enterococcus faecalis *and* Candida albicans. Odontology *2012;doi:10.1007/s10266-012-0086-x.*

Table 1. *Efficacy of NaOCl at different temperatures and contact times on* E faecalis *and* C albicans

	Temperature (°C)	Time	24 hours		48 hours	
			Culture positive *n* (%)	Culture negative *n* (%)	Culture positive *n* (%)	Culture negative *n* (%)
Group A (*E faecalis*)	25	30 seconds	5 (62.5)	3 (37.5)	8 (100)	0^a (0)
		1 minute	2 (25)	6 (75)	8 (100)	0^a (0)
		5 minutes	1 (12.5)	7 (87.5)	2 (25)	6^b (75)
	37	30 seconds	5 (62.5)	3 (37.5)	7 (87.5)	1 (12.5)
		1 minute	4 (50)	4 (50)	7 (87.5)	1 (12.5)
		5 minutes	2 (25)	6 (75)	5 (62.5)	3 (37.5)
Group B (C *albicans*)	25	30 seconds	4 (50)	4 (50)	8 (100)	0^c (0)
		1 minute	4 (50)	4 (50)	8 (100)	0^c (0)
		5 minutes	3 (37.5)	5 (62.5)	6 (75)	2^d (25)
	37	30 seconds	7 (87.5)	1 (12.5)	8 (100)	0^c (0)
		1 minute	5 (62.5)	3 (37.5)	8 (100)	0^c (0)
		5 minutes	2 (25)	6 (75)	5 (62.5)	3^d (37.5)

Different letters indicate significant difference in vertical directions (for ^{a,b} $p < .001$; for ^{c,d} $p < .05$).

Revascularization To Treat Infected Teeth with Apical Periodontitis or Abscess

Apexification, the treatment of choice for immature permanent teeth with pulp necrosis and apical periodontitis, is performed to induce a hard-tissue barrier at the wide-open apex of the involved tooth. Traditionally, calcium hydroxide was used long-term for this purpose, but more recently, mineral trioxide aggregate (MTA) has been placed in the apical 3 mm to 5 mm of the root canal to serve as a barrier—allowing the eventual root canal filling to be placed.

The disadvantages of apexification procedures are that the canal walls remain thin, making them susceptible to fracture, and continued apical root development typically does not occur. Recently, revascularization procedures have been recommended to treat immature permanent teeth with apical periodontitis and abscess. When successful, these procedures result in increased thickening of the canal walls by deposition of hard tissue and encourage continued root development—a result that can occur only when vital cells from the apical papilla and periapical tissues are induced to repopulate the previously necrotic root canal space.

The exact type of hard tissue that eventually develops in the canal space following revascularization procedures is not known. Histologically, in animal studies, the hard tissue formed in the canal spaces has been described as bone-like or cementum-like, and continued root development has been attributed to apical cementum deposition.

To investigate the various types of tissue reactions that occurred after revascularization procedures in infected human immature permanent teeth, Chen et al from Chi Mei Medical Center, Taiwan, conducted a case series of 20 immature permanent teeth with infected necrotic pulps and apical periodontitis or abscess from 20 patients. The teeth were isolated with rubber dams, and the pulp chambers were accessed. The canals were gently irrigated with 5.25% sodium hypochlorite with minimal mechanical debridement. Calcium hydroxide used as an interappointment intracanal medicament was placed into the coronal half of the canal space.

After resolution of clinical signs and symptoms, bleeding was induced into the canal space from the periapical tissues, using K-files. The coronal canal space was sealed with a mixture of MTA and saline solution. The access cavity was filled with composite resin. The teeth were followed up from 6 to 26 months.

All teeth with either apical periodontitis or abscess showed radiographic evidence of periapical healing and clinical evidence of resolution of signs and symptoms. Five types of tissue responses to revascularization procedures were observed:

- Type 1: increased thickening of the canal walls and continued root maturation
- Type 2: no significant continuation of root development, with the root apex becoming blunt and closed
- Type 3: continued root development, with the apical foramen remaining open
- Type 4: severe calcification (obliteration) of the canal space
- Type 5: a hard tissue barrier formed in the canal between the coronal MTA plug and the root apex

Conclusion

Based on the results of this case series, the outcome of continued root development was not as predictable as previously thought, because 5 of the 20 (25%) teeth did not demonstrate type 1 repair.

Chen M Y-H, Chen K-L, Chen C-A, et al. Responses of immature permanent teeth with infected necrotic pulp tissue and apical periodontitis/abscess to revascularization procedures. Int Endod J *2012;45:294-305.*

In the next issue:

- Intrusive luxation of incisors
- Mineral trioxide aggregate in open apex teeth

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