International Journal of Biomedical Research
ISSN: 0976-9633 (Online); 2455-0566 (Print)
Journal DOI: https://doi.org/10.7439/ijbr
CODEN: IJBRFA
Review Article

Hot tooth – A challenge to endodontists

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***Article History:**
Received: 17/11/2018
Revised: 26/11/2018
Accepted: 04/12/2018
DOI: https://doi.org/10.7439/ijbr.v9i12.4966

Abstract

The successful management of pain has been one of the cornerstones of endodontic practice and dentistry worldwide since time immemorial. Achieving profound pulpal anesthesia not only helps patients overcome their fears and displeasures towards dentistry but also favors the dentists who will be less stressed worrying about the patient's reaction or sudden movement during the treatment procedure. But, achieving adequate anesthesia in patients with a hot tooth, which is a tooth with irreversible pulpitis, can be a challenge. This article describes the hot tooth, reasons for anesthetic failure and some of its management strategies.

Keywords: Anesthesia; hot tooth; supplemental injection; irreversible pulpitis.

1. Introduction

Although local anesthetics are highly effective in producing anesthesia in normal tissue, local anesthetics commonly fail in endodontic patients with inflamed tissue [1]. For instance, the inferior alveolar nerve (IAN) block is associated with a failure rate of 15% in patients with normal tissue [2], whereas IAN fails 44-81% of the time in patients with irreversible pulpitis[3]. Similarly, it has been reported that the failure rate of a maxillary infiltration injection is as high as 30% in teeth with irreversible pulpitis[2]. Inability to achieve anesthesia in patients with irreversible pulpitis remains a significant barrier to successfully treating patients through endodontics. The successful use of local anesthesia has changed the emotional appeal of clinical dentistry from being a painful and dreadful experience to being a much less painful and pleasant experience. Moreover, optimum pain management results in building up trust and facilitates the entire procedure. However, local anesthetics commonly fail in endodontic patients with a hot tooth [4]. The term "hot" tooth generally refers to a pulp that has been diagnosed with irreversible pulpitis, with spontaneous, moderate-to-severe pain. A classic example of one type of hot tooth is a patient who is sitting in the waiting room, sipping on a large glass of ice water to help control the pain. In endodontic terms, hot tooth certainly does not mean a tooth of extreme attractiveness or even a tooth that is undergoing an exothermic reaction in which its temperature is well above the normal body temperature. But, it generally refers to a pulp that has been diagnosed with irreversible pulpitis (Symptomatic Irreversible Pulpitis) with spontaneous, moderate-to-severe pain [5].

2. How to identify hot tooth???

2.1 Most common sites of occurrence:

- Primary and permanent teeth
- Sites of recent or defective restorations
- Sites of recent trauma
- Mandibular molars are more challenging to anesthetize.
- Patients with anxiety about dental treatment or patients who have been in pain for several days usually require a more sophisticated approach.

Table 1: Clinical signs & symptoms to identify hot tooth:

Signs	Symptoms
Deep restorations or caries	Pain when biting and in response to percussion test.
Coronal fracture lines	Increased sensitivity to temperature extremes.
Increase in tooth mobility	Earlier presentation: often intense, lingering pain in response to cold. Later presentation: intense pain in response to heat; relieved by cold water.
Thickening of the periodontal ligament	Pain may be spontaneous and poorly localized (e.g., entire left side is painful), often radiating from ear to temple for maxillary teeth.
	Pain may wander to opposing arch but never over the midline.

2.2 Hypotheses to explain the inability to anesthetize hot tooth [6,7]

Although the exact mechanism of this clinical situation is unknown or incompletely understood several hypotheses have been advocated:

Table 2: Hypotheses to explain the inability to anesthetize hot tooth

Hypothesis	Probable mechanism
1) Ion trapping	Low pH is responsible for ion trapping of local anesthetic. According to this hyphothesis, low tissue pH shall be responsible for a greater proportion of the local anesthetic being trapped in the charged acid form of the molecule and thus unable to cross cell membrane. However ion trapping is for infiltration injections only, block injections are likely to involve acidotic tissues.
2) Altered Membrane excitability of peripheral nociceptors	Nerves from inflamed tissue shows decreased excitability threshold and altered resting potential. Studies show that lower excitability thresholds are responsible for transmission of impulses even with action of local anesthetic.
3) Tetrodoxin resistant channels	It is confirmed that, Tetrodoxin resistant channels (TTXr), a class of sodium channels resist the action of local anesthesia. Increased expressions of sodium channels in pulp are responsible for anesthetic failures in hot tooth. TTX r channels are resistant to lidocaine, thereby causing incomplete anesthesia.
4) The Central core theory	This theory states that the nerve situated outside of the nerve bundle supply molar teeth while the nerve situated inside the nerve bundle supplies the anterior teeth. The anesthetic solution may not diffuse into the nerve trunk to reach all the nerves to produce an adequate block even if deposited at the correct site. This theory may only be applicable for the higher failure rates in the anterior teeth with IANB and not for the posterior teeth.
5) Central sensitization	Central sensitization may contribute to local anesthetic failures. Increased Sensitization may amplify incoming signals from sensory nerves. In central sensitization, there is an increased response to peripheral stimuli and because of this, the IANB may permit for sufficient enough signaling to occur thereby leading to the perception of pain.
6) Psychological factors	Patient anxiety is one of the factor for local anesthetic failure. It is understood that apprehensive patients have a reduced pain threshold and more likely to complain pain during the time of endodontic treatment.

3. Reasons for anaesthetic failure in patients with hot tooth [1]:

Anesthetic failures after inferior alveolar nerve block (IANB) have been reported to be between 44% and 81% [8-11]. In cases of irreversible pulpitis, the rate of success is reported to be as low as 20% [12]. Similarly, the failure rate of a maxillary infiltration injection is as high as 30% in teeth with irreversible pulpitis[13].

1) Conventional anesthetic techniques do not always provide profound pulpal anesthesia, and patients with pre-existing hyperalgesia may be unable to tolerate any noxious input [14].
2) Inflamed tissue has a lower pH, which reduces the amount of the base form of anesthetic that penetrates the nerve membrane. Consequently, less of the ionized form is available in the nerve to achieve anesthesia. This explanation however does not account for the mandibular molar with pulpitis that is not readily blocked by an inferior alveolar injection administered at some distance from the area of inflammation [14,15].
3) Another theory is that, the nerves arising from the inflamed tissue have an altered resting potentials and reduced thresholds of excitability [15-17] because of which, the prevention of transmission of nerve impulses by the anesthetic agents is impeded[16,17].
4) Another factor might be the tetrodotoxin resistant (TTX-R) sodium channels. These channels are relatively resistant to local anesthetics [17,18], sensitized by prostaglandins[19] and are increased in inflamed dental pulp[20,21]. They are four times as resistant to blockade by lidocaine and their expression is doubled in the presence of prostaglandins E2 (PGE2) [22]. The sensitization of these channels by prostaglandins suggests that, rapid-acting non steroidal anti-inflammatory drugs (NSAIDs) may be useful in pretreatment to enhance the efficacy of local anesthetics in patients with odontogenic pain [23].
5) Sensitization of TTX-R channels by prostaglandins also lowers the activation threshold of voltage-gated sodium channels (VGSCs) and hence increases the amount of sodium ions that flow through the channel [21,25].
6) Activation of nociceptors in the presence of inflammation is one of the strongest theories explaining the reduced efficacy of anesthesia [26,27]. Inflammatory mediators reduce the stimulation threshold in nociceptor neurons to a level at which the slightest stimulators

induce a severe neurogenic response. This inflammatory process occurs as a result of the production of prostaglandins (PGs) as the end point product of the metabolism of arachidonic acid through the cyclooxygenase pathway (COX). Prostaglandins (PGs) then result in increased sensation of pain by increasing the sensitivity of the nerve endings to bradykinin and histamine.

7) Finally, patients in pain often are apprehensive, which lowers the pain threshold [14].

Table 3: Considerations for ensuring complete anesthesia during endodontic care [28]

Factor	Consideration
1) Anatomical Factors	The goal of local anesthesia for root canal procedures is to anesthetize the pulpal neurons and the periapical area. This is best achieved by delivery of the local anesthetic at the root apex.[29] However, the cortical bone of the body of mandible can essentially block the anesthetic during a local infiltration at the root apex, hence, block anesthesia is recommended as a more predictable approach, but it requires a better understanding of the deep anatomy of the jaw. The maxillary cortical bone is generally thinner; diffusion of the anesthetic through this bone is more readily achievable. For this reason, infiltration in the maxilla achieves a higher success rate than the mandible.
2) Maxilla	In the maxilla, where infiltration anesthesia achieves a high success rate, failures commonly occur in teeth with roots with severe palatal curvatures, premolars and the palatal root of maxillary molars, where the root is an average of 10.69 mm lingual to the buccal plate [30]. In order to effectively anesthetize the palatal root of molars, a Posterior Superior Alveolar (PSA) nerve block is necessary, in addition to the 1 cartridge of buccal infiltration. Administration of a few drops of anesthetic palatally is also recommended to prevent discomfort from the rubber dam clamp that impinges on the palatal tissue.
3) Mandible	Local anesthesia in the mandible fails primarily because of inadequate proximity of the needle tip to the main trunk of the Inferior Alveolar Nerve (IAN). Poor understanding of the anatomy of the pterygomandibular fascial space, along with other problems among mandibles like needle deflection & anatomical variability, cause 10% to 15% failure with conventional blocks. Alternatively, other block techniques like Akinosi and/or Gow-Gates [31,32], should be performed for the additional round of anesthesia.
4) Inflammation Factors	Administering anesthetic injections into a site of inflammation or abscess is contraindicated. Not only can the abscess spread as a result of the injection, but it will dilute and transport the anesthetic faster, rendering it less effective. It is better to use blocks for sites of inflammation and infection so the nerve can be anesthetized proximal to the area of infection. For the maxilla, PSA techniques are preferable. Intraosseous anesthesia distal to the site of the infection is also beneficial in such situations.
5) Psychological Factors	Local anesthesia failures are more common in highly anxious patients. High anxiety levels can potentially reduce the pain threshold and cause local anesthesia failures.[29] It is important that clinicians focus on patient relaxation through active listening, warmth, empathy, and a caring bedside manner. In cases where past dental experiences have created phobias, pharmacological prophylaxis in conjunction with local anesthesia is greatly beneficial. The use of nitrous oxide or an oral sedative is recommended in highly anxious patients.
6) Adjunct Forms of Anesthesia	At present, technological advances enabled to predictably and efficiently deliver intraosseous anesthesia to the maxilla and mandible of those patients who cannot be anesthetized with conventional methods. Intraosseous anesthesia procedures are invasive & should be used as an adjunct form of anesthesia when conventional anesthesia fails. In case of failure of conventional anesthetics, intraligamentary injection could be attempted. If the intraligamentary injection also fails to provide adequate anesthesia, intraosseous anesthesia should be attempted first, prior to resorting to intrapulpal injections. Intrapulpal anesthesia is highly traumatic to the patient and should be avoided if possible.
7) Testing Prior to Treatment	Response of the tooth, in any way to cold or an electric pulp tester prior to initiating an access opening, after administration of anesthesia and its onset, indicates that the root canal therapy should not be attempted. Initiation of Additional and adjunct forms of anesthesia and the retesting of tooth to determine the effectiveness of the anesthesia prior to access is the most important factor for painless root canal therapy. Vitality testing prior to access opening is a potentially reliable method for estimating pulpal anesthesia.
8) Duration of Anesthesia	Duration of effective pulpal anesthesia for Xylocaine 2% with 1:100,000 Epinephrine is no more than 60 minutes, whereas tissue anesthesia can be anywhere from 180 minutes to 300 minutes for the same dose [29]. This means that prolonged treatments may result in diminished pulpal anesthesia and increased pain later in the procedure, especially during the obturation phase. It is important that the patient receive the practitioner's undivided attention during the root canal treatment, and that interruptions be minimized.
9) Anesthetic Type	The key to success is a clear understanding of the anatomical, local, and psychological factors associated with each individual patient versus the type of anesthetic used. While combining an anesthetic with lower pKa like Mepivacaine 3% with a traditional Lidocaine 2% with 1:100,000 Epinephrine, or Articaine 4% with 1:100,000 Epinephrine, offers some added value. The anesthetic will only work if it is deposited in close proximity to the nerve bundle or close to the apex of the tooth planned for anesthesia.
10) Anesthetic Volume	A higher volume of anesthetic is necessary to reach and maintain pulpal anesthesia for the duration of time it takes to perform root canal therapy. For mandibular molars, at least 2 cartridges of anesthetic should be delivered for a mandibular block, and an additional cartridge of anesthetic is also recommended for local infiltration. For maxillary molars, a minimum of 2 cartridges are necessary: 1 cartridge for a PSA block and another for local buccal and lingual infiltration. For maxillary anteriors and most premolars, often a single cartridge is adequate if the procedure can be completed within 1 hour.

4. Management strategies in patients with a hot tooth [5,7]:

Even after giving a proper anesthesia, if the patient responds pain, two treatment strategies could be considered:

I) Supplemental Injections

II) Change in the Anesthetic solution.

I. Supplemental injections

Most of traditional injections might not work every time, so the clinician should go for alternative supplemental injection for managing pain. There are several alternative supplemental injection techniques available in the field of dentistry.

A. Intraligamentary(Periodontal ligament) Injection
B. Intraosseous Injection
C. Intraseptal anesthesia
D. Intrapulpal Anesthesia
E. Mandibular Buccal Infiltration Injection with Articaine
F. Preemptive Strategies to Improve Success of the IANB Injection

A. Intraligamentary(periodontal ligament) injection

Periodontal ligament (PDL) injection is still one of the supplemental injections for reducing pain in endodontics. It has been reported that supplemental PDL injection shows 50-96% of cases with successful anesthesia for endodontic procedures [33-36]. But, most of the times, a re-injection is advisable for good result [35,36].

Duration: The duration of pulpal anesthesia to be around 15 min for single rooted teeth and rather less for lower molar [37].

Table 4: Factors influencing efficiency

Anesthetic Solution	The presence of vasoconstrictor like adrenaline shows increased efficacy of PDL injections. The combination of lidocaine with adrenaline shows 91.6% success rate for PDL injection whereas without the vasoconstrictor the success rate shows only 42%.
Operative Procedure	The least success rate of PDL injection is for endodontic procedures and the greatest for exodontias.
Type of Tooth	It is reported that type of tooth also determines the efficiency of Intra ligamentary injection. Studies shows that the least success for pulpal anesthesia with mandibular lateral incisors.
Armamentarium for Intraligamentary injection	Traditionally, PDL injections are usually given by using either standard dental anesthetic syringe or a high pressure syringe. Recently, the development of computed controlled local anesthetic delivery system (Milestone Scientific, Livingston, NJ, USA) has been found to be able to deliver a PDL injection.
Intraosseous Injection	Due to the thickness of the cortical plate in posterior mandible, infiltration injection with lidocaine solutions are not effective for posterior mandible. In such situations intraosseous injection is an alternative. The use of intra- osseous anesthesia was described by Lilienthal.
Onset of Anesthesia	Onset of anesthesia is rapid. There is no waiting time required for the onset of anesthesia.
Site of Injection	The injection is recommended to give on distal to the tooth to be anesthetized except for maxillary and mandibular second molars. For maxillary and mandibular second molar, mesial side is preferred.

Advanced armamentarium for intraligamentary injection:

(1) Computer controlled local anesthesia delivery system:

The first Computer Controlled Local Anesthesia Delivery (C-CLAD) system, also known as Wand Plus and then CompuDent, was introduced in 1997.

Components of CompuDent system and their functions:

i. **A base unit** - contains a microprocessor and connects to both the foot pedal and the end of the hand piece assembly that accepts the local anesthetic cartridge. The microprocessor controls a piston that expresses local anesthetic by pushing the local anesthetic plunger up into the cartridge. The anesthetic solution is then forced into the tissue.

ii. **A foot pedal** - The base unit pressing lightly on the foot pedal activates a slow injection rate (0.005 ml/s) appropriate for needle insertion, PDL injection, and palatal administration. Heavier pressure on the pedal increases injection speed to deliver the entire content of the cartridge in 1 min (i.e., 0.03 ml/s) which is normally used for buccal infiltration.

iii. **A disposable hand piece assembly.**

(2) Single tooth anesthesia (STA) system:

Introduced in 2007 which adds dynamic pressure sensing technology and provides continuous feedback to the user about pressure at the needle tip to help identify ideal needle placement for PDL injections.

(3) Comfort control syringe:

Components of Comfort control syringe and their functions:

a) **A base unit**

b) **A syringe** - injection and aspiration - can be controlled directly from the syringe, possibly making its use easier to master for practitioners accustomed to the traditional manual syringe.

c) **No foot pedal**

A comparison between the traditional dental syringe and the comfort control syringe revealed no meaningful differences in ease of administration, injection pain and efficacy and acceptance by patients [43].

The comfort control syringe has five different basic injection rate settings designed for specific injections: Blocks, infiltrations, PDL, intra-osseous and palatal. Each rate is selected by the push of a button.

Three features of C-CLAD support the assertion that there may be less pain on injection.

i. Ability to administer small amounts of local anesthetics continuously during needle insertion.
ii. Steady infusion of the anesthetic may reduce discomfort.

iii. Reduced force for needle insertion has improved comfort.

B. Intra-osseous Anesthesia

The use of intra-osseous anesthesia was described by Lilienthal [44]

Duration: The onset of intra-osseous anesthesia is rapid [45-47]. The onset of anesthesia ranged from 10 s to 120 s. The success falls off rapidly over one hour.

Factors influencing efficiency:

i. ***Anesthetic solution:*** The efficacy of intra-osseous injections is poor in the absence of vasoconstrictor. Repogle *et al* reported less than 50% success in mandibular first molars when a plain 3% mepivacaine solution was injected compared to 74% success with lidocaine and adrenaline [46].

ii. ***Type of tooth:*** The efficacy of the intra-osseous technique varies between teeth. Coggins *et al* reported a 75% success rate with mandibular first molars compared to 93% success with maxillary first molars [47].

Devices for Intra-osseous Anesthesia:

a) Stabident:

Includes a solid 27-guage perforator needle with a simple beveled tip and a plastic base designed to fit a latch-type-slow speed contra-angle hand-piece. The operator uses the perforator to create a small tunnel through the attached gingiva, periosteum, and alveolar bone. The typical insertion point is on the attached gingiva, 2 mm below the facial gingival margin, and midway between the tooth of interest and an immediately adjacent (preferably distal) tooth. Penetration is made using short bursts with light pressure to deposit anesthetic solution into the cancellous.

b) X-tip:

This was designed to solve the primary technical difficulty encountered with stabident system - finding the hole and inserting the needle.

Comprises of:

i. ***Driller (perforator):*** The drill leads the guide sleeve through the cortical plate into the cancellous bone. The drill portion is then removed, leaving the guide sleeve in place.

ii. ***Guide sleeve:*** It is of 25-guage that fits over the 27-guage drill & used to direct the needle into the cancellous bone to deposit the anesthetic solution.

iii. An ultra-short ***needle*** of the same diameter.

c) Intra Flow:

It is designed as an all-in-one system that allows the user to perforate the bone and deposit anesthetic solution in a single intra oral step.

It is essentially a dental hand piece equipped with an injection system build into the body.

Comprises of:

i. ***Perforator:*** It is hollow 24-guaged & is used to penetrate the bone and infuse the local anesthetic solution.

ii. ***Transfuser:*** Anesthetic from the dental cartridge is routed to the perforator by a disposable transfuser that also serves to cover the switch used to select between perforator rotations and anesthetise infusion modes.

Clinical uses:

1) Anesthesia of single tooth.
2) Primary method of pain control or as a supplementary technique.

In mandibular molars with irreversible pulpitis, patients requiring endodontic treatment in whom conventional local anesthetic injection fail to provide adequate pain relief for assessing the pulp [48-50]. A supplement intra-osseous injection of 2% lidocaine with 1:100,000 provided complete anesthesia in 82-89% of these subjects. This method may be helpful in treating children and adolescents.

Side effects and complications:

1) The most common effect is tachycardia from the injected vasoconstrictor. The heart rate accelerates within seconds after injection and remains elevated for several minutes thereafter [51]. The injection of the solution containing epinephrine should be limited in patient with cardiac disease.
2) Separation of the perforator or drill needle. Post injection, hyperocclusion is relatively common.
3) Moderate post injection pain.
4) Dentinal tooth damage and osteonecrosis of bone.

C) Intrapulpal anesthesia

In about 5-10% of mandibular posterior teeth with irreversible pulpitis, supplement injections even when repeated do not produce profound anesthesia. Pain persists when pulp is entered. This is an indication for an intrapulpal injection.

Factors influencing efficacy:

Although some authors claim that efficacy is dependent upon the anesthetic solution, a recent double-blind study has shown that intrapulpal anesthesia may be obtained just as effectively by injecting saline compared to a local anesthetic solution.

D) Mandibular buccal infiltration with articaine

An infiltration of articaine after an IANB if the patient has pain after a clinically successful IANB (lip numbness), helped in providing profound pulpal anesthesia.

E) Strategies to improve success of the IANB injection

1) Use of fast acting anti-inflammatory drugs
2) Reducing pulpal level of inflammatory mediator PGE2
3) Injectable NSAID ketorolac, when injected intraorally or intra muscularly produce significant analgesia in patient with severe odontogenic pain.
4) Intra-osseous injection of 40 mg methyl prednisolone in patients with irreversible pulpitis resulted in less pain.

Table 5: Strategies to improve success of the IANB injection

Supplemental injections	Advantages	Disadvantages
Intraligamentary (periodontal ligament) anesthesia	1) Smaller doses are required (0.2 ml/root). 2) Overcomes failed conventional anesthesia.[33] 3) Limited soft tissue anesthesia. 4) Mandibular anesthesia in patients with bleeding disorders.[34]	1) Produce bacteremia (endocarditis).[35] 2) There is rapid entry into circulation (cardio vascular effects).[36] 3) Pre- and post-injection discomfort.[37] 4) May damage periodontal tissues and pulp.[25] 5) Injection equipment may be damaged. [24,29,30]
Intra-osseous anesthesia	1) Smaller doses are used. 2) The amount of soft tissue anesthesia produced is less.[43] 3) Overcome failure after conventional techniques.	1) Technically more difficult. 2) Specialized equipment may be required. 3) Rapid entry of local anesthetic and vasoconstrictor into the circulation. 4) Post-injection discomfort.
Intrapulpal anesthesia	1) As mentioned above the method does not require a local anesthetic. 2) The method provides a useful means of overcoming failure in teeth where conventional techniques have been unsuccessful. 3) Although theoretically this technique uniquely could provide single-tooth anesthesia, the fact that it is normally administered after failure of another method precludes this possibility in most cases. 4) The systemic effects of intrapulpal anesthesia appear to be negligible.	1) The injection may be painful. 2) Limited application as it involves pulpal exposure. 3) Not indicated as a primary method.

II. Change in anesthetic solution

A lot of different anesthetic solutions are available for aiming to achieve profound anesthesia to the patient.
Ex: Hyaluronidase can be used for managing a Hot tooth condition, but because of adverse effects such as increased pain and trismus, it was not recommended.

Commonly used anaesthetics

a) 1.4% Articaine

Anesthetic efficiency of 4% articaine with 1:100,000 epinephrine shows higher anesthetic efficiency than using 2% lidocaine with 1:100,000 epinephrine when used as buccal infiltration [50,51]. Mechanism of action is that articaine contains a thiophene group, which increases its lipid solubility. Lipid solubility determines the extent of molecules penetration into the nerve membranes. Therefore, articaine diffuses better through soft tissues than do other anesthetics, thereby causing better anesthesia.

b) Mandibular Buccal infiltration with articaine

Mandibular buccal infiltration with 4% articaine could be considered as a supplemental injection technique. Studies shows that buccal infiltration of 4% articaine shows higher anesthetic efficiency as compared to 2% lidocaine solution.

c) 0.5 M Mannitol

Combination of 0.5 M Mannitol and lidocaine with epinephrine in Inferior Alveolar Nerve block shows higher anesthetic efficiency compared to lidocaine and epinephrine alone.

5. Conclusion

Anesthetizing the "hot" tooth, a condition generally indicating an irreversible pulpitis, can be one of the most frustrating problems for any dental practitioner. Whenever possible, prescribing antibiotic therapy to reduce inflammation and allowing the site to settle down may constitute the best course of action. Painless root canal therapy can be performed in all cases if particular attention is paid to the local anatomical, physiological, and psychological needs of each individual patient. Performing pulp testing after administration of anesthetics and prior to starting a procedure is necessary to confirm the depth of pulpal anesthesia. Furthermore, administering an adequate dose of anesthetic is important for performing the procedure painlessly for the entire duration. Making painless treatment a priority in the clinical practice, learning about the factors that cause anesthetic failure, and managing those instances effectively will enable all practitioners of good conscience to perform virtually painless root canal therapy at all times and in all patients. Providing profound anesthesia is the ultimate goal of every dental practitioner. However, the clinician who treats patients diagnosed with a hot tooth (irreversible pulpitis) often finds achieving adequate pulpal anesthesia to be a challenge. Hence, the clinician should have fall back strategies to attain good pulpal anesthesia when failure of the traditional techniques are encountered. This will boost the confidence of the clinician to impart and provide a relatively pain free treatment for the patients having a hot tooth.

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