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The Hot Tooth

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Abstract: *The term "Hot" tooth is generally used for patients who have had a very painful tooth, and upon treatment is persistently stubborn to fully anesthetize. In some cases despite the area being profoundly "numb", on commencement of root canal treatment some residual sensation is still present. The cause behind such condition had been attributed to various theories and likewise the solution has been discussed.*

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I. Introduction

What follows is a classic scenario, in a dental clinic, a patient had visited with severe pain in his tooth. After all examinations and observations, the Dentist advised emergency opening of root canal to provide relief to the patient. But after achieving anesthesia on application of bur to the tooth, patient experienced sharp pain and after repeated attempts, requested the dentist to stop the procedure. So dentist had to withhold the treatment and provided medications to the patient. The patient never returned for treatment and Dentist had to face an embarrassing situation. The tooth presented here is called "HOT TOOTH". Though sometimes called as, hot tooth symdrome is a misnomer as it is just a symptom not group of signs and symptoms.(1)

II. What does it mean to have a "hot tooth"?

The term a "Hot" tooth is generally used for patients who have had a very painful tooth, and upon treatment is persistently stubborn to fully anesthetize. In some cases despite the area being profoundly "numb", on commencement of root canal treatment some residual sensation is still present. After isolation, access preparation is begun. When the bur is in enamel, the patient feels nothing. Once the bur enters dentin or possibly not until the pulp is exposed, the patient feels sharp pain. This can be very distressing for patients and they may loose faith in Dentist and treatment protocols. Also if such a situation occurs in children, they may develop a constant fear for dental treatment for life long. While on the other hand, Dentist has to face frustration for an unsatisfactory treatment and uncooperative patient. (1,2,3)

The diagnosis made here is irreversible pulpitis (either can be symptomatic or asymptomatic) and few theories are given to why this problem occurs. With irreversible pulpitis the teeth most difficult to anesthetize are the mandibular molars followed by mandibular and maxillary premolars, maxillary molars, mandibular anterior teeth and maxillary anterior teeth. Also, pulpal tissue has a very concentrated sensory nerve supply, particularly in chamber. So it becomes a challenge to anaesthetize a tooth with irreversible pulpitis.

III. Theories Behind Hot Tooth (1, 4)

1) Location – Not only just used in real estate, but if the area where the anesthetic is to be administered is off the target, this can lead to partial numbness or an ineffective injection.
2) Local tissue changes because of inflammation – This theory states that the area of inflammation around the inflammed tooth is causing the anesthetic to be less effective. According to this theory, the lowered pH of inflamed tissue reduces the amount of base form of the anesthetic available to penetrate the nerve membrane. Consequently there is less of the ionized form within the nerve to achieve anesthesia. It can be true only in cases of swelling. This theory does have a limitation, as it does not explain injections that are

distant area from the area of inflammation, also, it is unable to explain that why it is difficult to anesthetize a tooth with pulpitis with an inferior alveolar nerve block. (5)

3) Hyperalgesia – This theory states that the inflammation within the tooth has altered the actual nerve making it more difficult to numb. The nerve arising in an inflamed tissue have altered resting potentials and decreased excitability thresholds. These changes are not restricted to the inflamed pulp itself but affect the entire neuronal membrane extending upto central nervous system. Local anesthetics are not sufficient to prevent impulse transmission, owing to the lowered excitability thresholds. (6)
4) The nervous patient – In some cases being nervous, apprehensive or jumpy has the vicious cycle of lowering the pain threshold. Initial apprehension leads to decreased pain threshold causing anesthesia difficulties, which leads to increased apprehension, which results in loss of control and so on.
5) Time – Is some cases it may just be a time factor, as some patients take more time than others for anesthetic to diffuse and block the sensory nerves.
6) The anesthetic solution may not penetrate to the sensory nerves that innervate the pulp, especially in mandible.
7) The Central Core theory: It states that nerves on the outside of the nerve bundle supply molar teeth whereas nerves on the inside supply anterior teeth. The anesthetic solution may not diffuse into the nerve trunk to reach all nerves to produce an adequate block, even if deposited at the correct site. This theory may explain the higher experimental failure rates in anterior teeth with the inferior alveolar nerve block.(7,8,9,10)
8) TTX-resistant channels: Scientists have shown that there is a special class of Sodium channels on C fibers, known as tetrodotoxin-resistant (TTXr). In case of inflammation, neuroinflammatory reactions start and Sodium channel expression on C fibers shifts from TTX sensitive to TTX resistant creating inflammatory hyperalgesia. One of the clinically significant characteristics of these Na+ channels are relatively resistant to lignocaine. Researchers found these channels to be five times more resistant to anesthetic than TTX-sensitive channels. After a nerve block, a patient may describe profound anesthesia of soft tissue where no inflammation is witnessed. However, entering the vital pulp chamber may initiate pain. (11)

Out of the above mentioned theories theory stating about tetrodotoxin-resistant (TTXr) is the latest and most accepted one. But the problem is to manage such a condition.

IV. Management Of Hot Tooth (1, 4)

1) Patient's education:

Patient should be groomed and acknowledged about the treatment so that he is mentally aware of procedures and the fear of unknown is eliminated thus reducing anxiety.

2) Management of anxious patient:

a) Give short morning appointments followed by good morning breakfast.
b) Premedication with lorazepam 1 mg (after checking interaction with other drugs) night before sleep followed by 90 minutes prior to procedure.
c) No driving & need to be accompanied with friend/relative/escort.
d) Extremely short or no waiting time in waiting area.
e) Duration ,only as much as patient can tolerate Making sure patient feels he/she is in command.
f) Iatrosedation: Vocal sedation- Use of sentences like "I will be careful", Talk to them as you go through procedure, Avoid use of words like hurt,sharp etc, Music, Aroma, Hypnosis, Acupuncture, Relaxation techniques(deep breathing, guided imagery,progressive relaxation) will be helpful.

3) Role of premedication:

If required anti-inflammatory can be prescribed to be taken as 1 hour before the treatment.
Providing enough time between anesthetic delivery and start of procedure.

4) Before starting access preparation a small test cavity can be made to ensure effectiveness of anesthesia.
5) Additional anesthetic or supplemental injections are necessary to achieve profound anesthesia.

Infilltration: It has shown significant increase in duration of pulpal anaesthesia.Other Supplemental intraligamentary or intraosseous injections are most helpful to ensure profound local anesthesia. The Intraosseous technique allows analgesic solution to be deposited directly into the cancellous bone around the apices of the tooth. It has a rapid onset and has shown extremely favorable results when used as a supplemental analgesic for the hot tooth. Special kits have been developed that facilitate drilling a small hole through the mucosa and cortical plate to allow injection of the anesthetic solution into the cancellous bone. X-Tips consist of a drill to perforate the cortical plate combined with a guide sleeve. When the drill is withdrawn the guide sleeve is left in situ. Another system is Stabident Io delivery system.

Intraligamental are used to deposit analgesic directly into periodontal ligament space. The needle is inserted into the mesial & distal gingival sulcus and in contact with the tooth. The needle is supported by fingers and

positioned with maximal penetration between the root and crestal alveolar bone. Pressure is slowly applied to the syringe handle for 30 seconds. Backpressure has to be developed for this technique to work and blanching of the soft tissues would be sign of success.

Intrapulpal: Major drawback of the intrapulpal injection is the need for needle to be inserted into a very sensitive and inflamed pulp. The action can, therefore, be painful. Additionally, the pulp has to be exposed to give the injection and analgesic problems may have occurred prior to this being achieved. The injection has to be given under strong backpressure. In very few cases anatomic limitations may be noticed which should be managed accordingly like dense bone or accessory innervation (mylohyoid nerve branch)

Importantly, bupivacaine was found to be more potent than lidocaine in blocking TTXr channels and may be the anesthetic of choice when treating the "hot tooth".

V. Conclusion

Though any of the techniques mentioned for management of Hot tooth are not definitive but can be used simultaneously to achieve satisfactory results. Thus, studies and researches should be done to find a more reliuable way to counter this annoying scenario of irreversible pulpitis i.e. Hot Tooth.

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