

CASE REPORTS

Trephination for Acute Pain Management

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Surgical trephination can and does provide immediate relief of pain, surgical drainage of the infection and related fluids, and in most cases does not require supplementary administration of antibiotics and only minimal amounts of analgesics. This paper outlines the diagnosis and technique of surgical trephination.

On a daily basis endodontists treat patients presenting with various levels of pain. Generally, conservative endodontic therapy is all that is required to gain control of the situation and provide relief for the patient. However, sometimes the source of the pain is in the bone beyond the tooth and the patient presents with severe pain and or swelling. Endodontic emergencies are often unexpected and can disrupt the smooth flow of a normal office routine. Madison (1) pointed out that although the interruption in office routine is often perceived as an inconvenience by the staff and dentist, the patient is suffering and requires a caring and empathetic attitude. Resolving the emergency requires the ability to swiftly diagnose the problem and provide the appropriate treatment, all with a sympathetic attitude toward the patient.

The purpose of this paper is to aid the clinician in diagnosing an acute apical abscess and implementing the treatment necessary to rapidly resolve the patient's problem.

RATIONALE

Trepanation (trephination), defined as cutting a circular piece of cranial bone to relieve pressure (2), has been adapted in dentistry to mean cutting a hole through cortical bone into the cancellous spaces to relieve a build up of pressure due to infection or inflammation. There is evidence that trephination was used by the Egyptians as far back as 2900 BC and more recently by the Incas in South America. Sargenti popularized its revival in 1972 with his *Fistulator* (3).

Clinicians should ask themselves "what are my criteria for patient comfort?" Our answers will vary as widely as a patient's reaction to pain. Endodontics is perceived as being a painful procedure when in fact, if performed well, it rarely causes more discomfort than a simple filling. However, when problems develop, pain and swelling can get rapidly out of control. We

must ask ourselves if we are comfortable providing a patient having an acute apical abscess with only analgesics and antibiotics and then waiting sometimes days for them to become comfortable. Henry et al. (4) and Pickenpaugh et al. (5) found that the use of Pen VK or amoxicillin had no effect on the postoperative course and that 25% of patients had moderate to severe pain and swelling for 3 days, while 10% of patients had moderate to severe pain and swelling lasting 6 to 7 days. Is this acceptable treatment for an endodontist?

Trephination is indicated for the relief of severe pain of periapical origin, to establish drainage from an acute apical abscess, or to limit the spread of an existing cellulitis (6, 7). It is not indicated for the relief of pain of pulpal origin; a pulpectomy is more effective (8). Patients who require a trephination procedure are usually experiencing an acute apical abscess or an acute exacerbation of a chronic apical abscess.

In these conditions the patient is in severe, increasing pain. The tooth is usually extremely percussion sensitive and, depending on the proximity of the apex to the cortical plate, may also be extremely palpation sensitive. Most cases will be necrotic or have an existing root canal filling, although some teeth in a late-stage pulpal degeneration may still respond to vitality tests. There may or may not be a discernable radiographic area present (9). Once a diagnosis of acute apical abscess has been made, the clinician has several treatment options. Conservative endodontic treatment will clean out the tooth and remove the cause of the acute problem but will not relieve the abscess itself. Apical trephination as described by Gutmann and Harrison (6) may provide sufficient drainage through the tooth to resolve the problem. However, there are several limitations with this approach: the first being the size of the apical hole, which is generally recommended as a size #20 or #25 file. Pus is often very viscous and the amount of effective drainage that can be obtained through the apex is questionable. It takes significant time and effort to remove the existing root canal filling, all the while dealing with a patient in severe pain. The key to predictable relief of pain is to provide good drainage. Surgical trephination can do this effectively.

SURGICAL TREPHINATION TECHNIQUE

The technique can be broken into eight basic steps: diagnosis, identification of anatomical landmarks, profound anesthesia, inci-

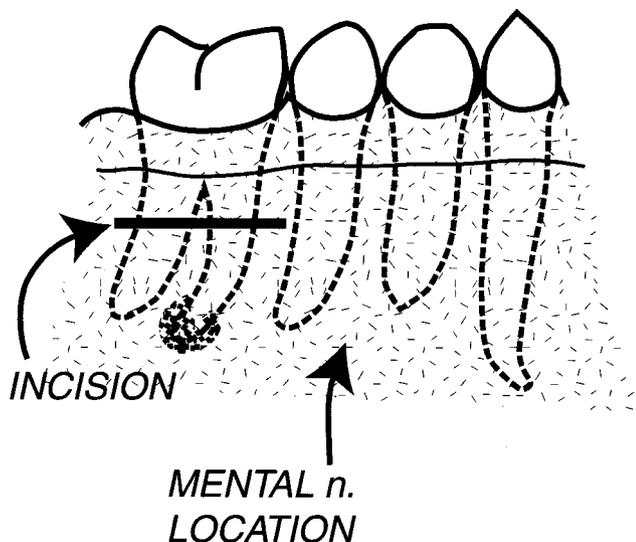


FIG 1. Location of incision in mandibular posterior area.

sion, retraction of tissue, trephination, apical curettage, and wound closure.

Knowledge of the anatomy of the area where you plan to make an incision is essential. A prime concern in endodontics is the inferior alveolar nerve/artery and the mental nerve. Additional areas of concern include the maxillary sinus, frenums, muscle insertions, and of course, roots of teeth. Phillips et al. (10, 11) and Chogel et al. (12) have demonstrated that the most common location of the mental nerve/foramen is deep and slightly mesial to the apex of the mandibular second bicuspid and that digital palpation corresponds to radiographic location of the mental nerve 88% of the time. Incision placement or flap design must take into account the location of the nerve to avoid serious consequences. If working on the lower first molar or either lower bicuspid, it is advisable to actually locate and visualize the mental nerve. This simple act helps the clinician know where not to be! The maxillary sinus can be avoided by tracing the root apically as described below. Profound local anesthesia can be very difficult to achieve in areas of severe infection. Several techniques can help the clinician with anesthesia; utilizing a block injection is preferred because it gets the anesthetic farther away from the area of lower pH, thus allowing the anesthetic to work normally. Articaine Hydrochloride (Hoechst AG, Frankfurt, Germany) provides an additional edge when working in areas of infection. The thiophene ring in Articaine Hydrochloride provides a high degree of lipid solubility (13), thus enabling the solution to cross the nerve membrane quicker. A clinician should not hesitate to use infiltration (buccal and lingual or palatal), subperiosteal injections, or even intraosseous injections to achieve profound anesthesia.

Once the local anatomical features have been identified and anesthesia achieved, the next step is the incision. A horizontal incision should be made roughly in the middle to apical $\frac{1}{3}$ of the root (Fig. 1). Longer incisions allow better retraction of the tissues and thus better visibility in some locations, for example, the lower molar/bicuspid area (Fig. 2). Sometimes, a vertical releasing incision at one end of the horizontal cut can be helpful to improve access. A #4 or larger, round, surgical, high-speed bur is used to make a window in the cortical plate and to locate the root. Proceed apically carefully removing bone over the root with the bur until the apex is reached (Fig. 3).

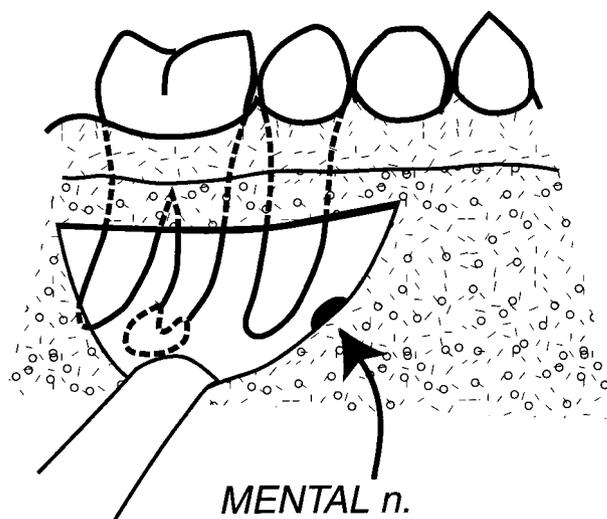


FIG 2. Retraction and mental nerve identification.

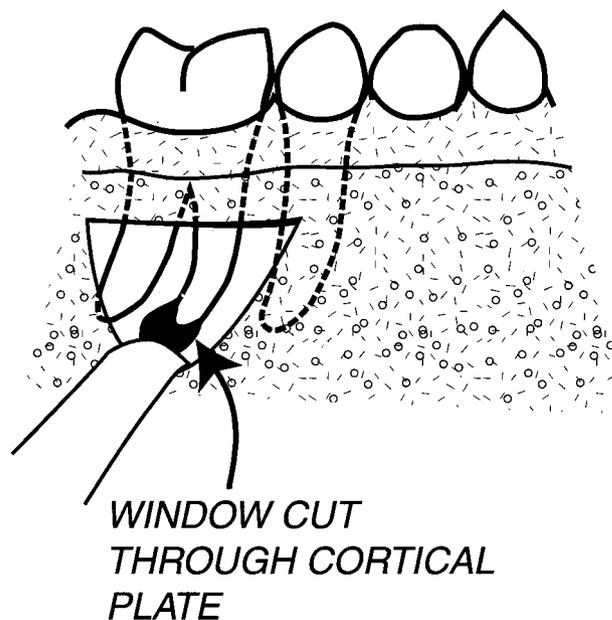


FIG 3. Access to area of abscess.

Enlarge the bone window and curette any tissue from around the apex. It has been suggested that simply penetrating the cortical plate anywhere from the crestal bone to the apical region will provide sufficient drainage. In our experience the key to successful drainage is trephinating into the abscessed area. This is almost always at the apex. Thus, our recommendation is that the trephination should occur at the apex of the tooth. Apical curettage removes all the pus, pathological tissue, or inflamed bone.

Once drainage has been achieved, the surgical site can be irrigated and closed. We advocate using an H-shaped piece of rubber dam as a drain sutured into the incision with the drain extending into the apical area. Our technique for suturing the drain into place is to place the needle through the center of the H, then into the free edge of the flap and out the attached edge (Fig. 4). Knot the suture and tuck $\frac{1}{2}$ of the H into the tissue (Fig. 5). Resorbable sutures should be placed to close the lateral extent of

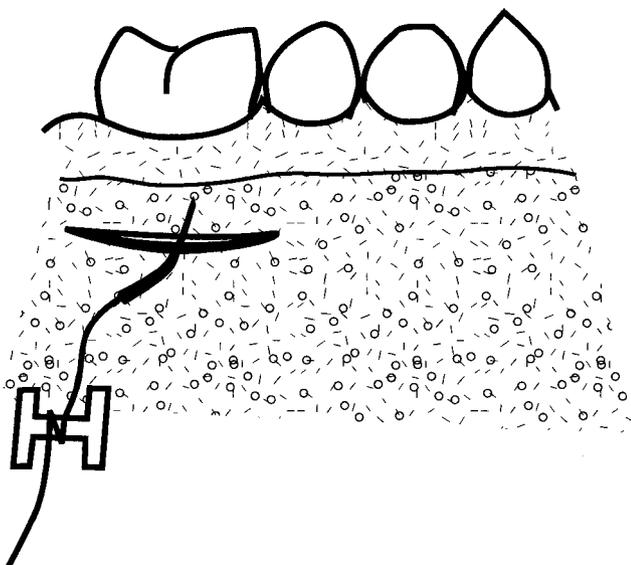


FIG 4. Drain prepared for placement.

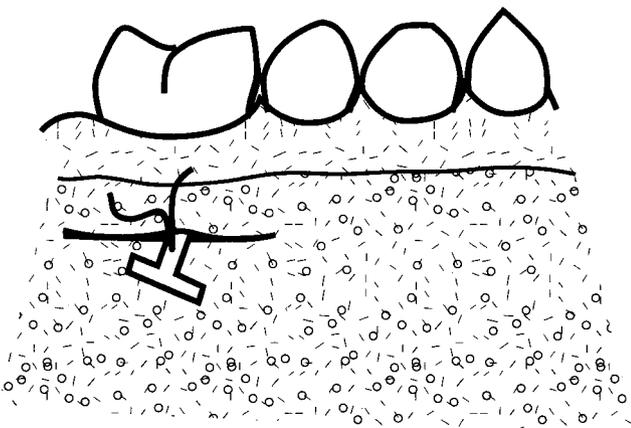


FIG 5. Suturing completed.

a longer incision. The drain and associated suture should be removed within 24 to 48 h, leaving the resorbable sutures to aid wound healing with minimal scarring.

DISCUSSION

Systemic factors must be taken into account when deciding whether to prescribe antibiotics or not. Generally, a healthy, non-immunocompromised patient does not require antibiotic coverage after this incision and trephination procedure, unless one or more of the four cardinal signs of infection are present: fever, malaise, lymphadenopathy, or cellulitis. Antibiotics help the body limit the

spread of infection. Providing surgical drainage achieves the same result (14, 15). There is controversy over the use of a drain; our feeling is that if thorough debridement of the abscess is obtained, then a drain is not needed. If this is not possible or in the case of a cellulitis or space infection or if treatment involves an immunocompromised patient, then a drain should be utilized. Many factors determine a patient's pain reaction threshold: age, culture, previous experiences, etc. In our practice we have found that many patients experience such dramatic relief from the trephination procedure that they do not require analgesics. This will vary with each individual, but in our experience if analgesics are required, mostly the amount is minimal.

It has been stated to us that this is a barbaric, crude, and painful procedure; however, we feel that the contrary is true. To leave a patient in severe, uncontrollable pain is barbaric and totally unjustified by today's standards of care (8). One reason patients are referred to endodontists is because they are experiencing very severe pain. We believe it is endodontists' duty to relieve the pain as expediently as possible. In our practice we have found surgical trephination a very useful technique to achieve this objective.

Drs. Henry and Fraser maintain private clinical practices in Vancouver, B.C., they are on staff at the University of British Columbia Faculty of Dentistry, run a joint clinical study club, and lecture nationally and internationally.

References

1. Madison S. Management of endodontic emergencies. *Curr Opin Dent* 1991;1:744-9.
2. Stedman's Medical Dictionary. 23rd ed. Baltimore: Williams & Wilkins, pg. 1475.
3. Sargenti J. Apical aeration made easy by a new instrument. *Br Endod Soc* 1972;49-50.
4. Henry M, Reader AI, Beck M. Effect of penicillin on postoperative pain and swelling in symptomatic necrotic teeth. *J Endodon* 2001;27:117-23.
5. Pickenpaugh L, Reader AI, Beck M, Meyers WJ, Peterson LJ. Effect of prophylactic amoxicillin on endodontic flare-up in asymptomatic, necrotic teeth. *J Endodon* 2001;27:53-6.
6. Gutmann JL, Harrison JW. *Surgical endodontics*. Chapter 12. Boston: Blackwell Scientific Publications, 1991.
7. Torabinejad M, Walton RE. Managing endodontic emergencies. *J Am Dent Assoc* 1991;122:99, 101, 103.
8. Ingle JI, Beveridge EE. *Endodontics*. 2nd ed. Philadelphia: Lea & Febiger, 1976:502-510.
9. Bender IB, Seltzer S. Roentgenographic and direct observation of experimental lesions in bone. *J Am Dent Assoc* 1961;62:152-60.
10. Phillips JL, Weller RN, Kullid JC. The mental foramen: part I. Size, orientation, and positional relationship to the mental foramen. *J Endodon* 1990;16:221-3.
11. Phillips JL, Weller RN, Kullid JC. The mental foramen: part II. Radiographic position in relation to the mandibular second premolar. *J Endodon* 1992;18:271-4.
12. Chogel SM, Mickel AK, Nguyen TN. Working length determination: should we obdurate to the radiographic apex [Abstract]. *J Endodon* 2001;27:240.
13. Isen DA. Articaine: pharmacology and clinical use of a recently approved local anesthetic. *Dent Today* 2000;19:72-5.
14. Haas DA, Epstein JB, Eggert FM. Antimicrobial resistance: dentistry's role. *Can Dent Assoc* 1998;64:496-502.
15. Pallasch TJ. How to use antibiotics effectively. *J Calif Dent Assoc* 1993;21:46-50.