



Endodontic flare-ups: incidence, etiology, prevention, diagnosis, and treatment

Lieutenant Commander Howard Van Ness, DC, USN and Captain Carol Diener Weber, DC, USN

Introduction

Flare-ups are a complication of endodontic treatment, defined as an acute exacerbation of pulpal or periradicular pathosis after the initiation or continuation of root canal treatment.¹

According to Walton and Fouad, signs and symptoms of flare-ups include an increase in pain with or without swelling that occurs within a few hours to days after endodontic treatment. The pain is of such severity that the patient contacts the dentist.² The purpose of this update is to describe the incidence, etiology, prevention, and treatment of endodontic flare-ups.

Incidence of endodontic flare-ups

Studies have shown that flare-ups occur in only a small percentage of cases, with values varying between 1.58% to 15.7%.^{3,4} Recently, a meta-analysis determined the incidence to be an average of 8.4%.⁵ Although the occurrence of flare-ups is low, its effects often have a severe impact on the patient, dentist, and the dental office staff. When the dentist understands the etiology of flare-ups, a) preventative measures can be taken to avoid them, b) a proper diagnosis can be made when they do occur and c) the appropriate treatment can be promptly provided.

Etiology of endodontic flare-ups

There are many suggested causes for flare-ups. They can be divided into host factors and treatment factors.

Host factors

- Preoperative pain or swelling^{2,3}
- Necrotic pulp^{2,6}
- Periapical lesion^{3,6,7}
- Bacteria⁸
- Gender: female > male^{2,9}
- Molar teeth⁹
- Mandibular teeth¹⁰
- Anxiety¹¹
- Percussion sensitivity¹²

Treatment factors

- Overinstrumentation¹³
- Extrusion of debris, bacterial products, irrigants or medicaments¹⁴
- Extrusion of obturation materials¹⁵
- Hyper-occlusion¹²
- Inadequate debridement or missed canal

The causes of flare-ups are typically multifactorial.

Prevention of endodontic flare-ups

A primary goal of endodontic therapy is the removal of bacteria and the infected pulp. Complete debridement of inflamed or infected tissue, bacteria and bacterial by-products is essential for preventing flare-ups. It is imperative that all chemo-mechanical debridement and obturation of the root canal be done within the confines of the canal. Additional steps for

preventing flare-ups include the use of an interappointment medication, occlusal reduction, antibiotics, and analgesics.

Intracanal medicament

The most commonly used intraappointment medicament is calcium hydroxide. It has been shown to hydrolyze bacterial materials associated with inflammation.¹⁶ In necrotic cases, using a 7-day intracanal dressing of calcium hydroxide demonstrated a significantly reduced incidence of postobturation pain and swelling when compared to those cases treated in a single visit or those in two visits without any intracanal dressing.¹⁷ In order to eliminate bacteria which may have survived chemomechanical instrumentation, calcium hydroxide should remain in the canal system for at least 7 days.¹⁸

Occlusal reduction

Patients who present with a profile of preoperative pain, percussion sensitivity, vital pulp and/or absence of periapical radiolucency are more likely to benefit from occlusal reduction.¹² Judicious occlusal reduction of the tooth's functional cusps, as opposed to indiscriminate "flat-planing" of the natural crown, will help prevent postoperative pain in these patients while preserving natural tooth structure for the restoration.

Antibiotics

Historically, antibiotics have been administered in the hope that they will decrease pain. However, evidence in the literature does not support this practice. One study showed that patients with localized apical pain or swelling generally recover quickly with local treatment and do not benefit from supplemental penicillin administration.¹⁹ Other studies have shown that penicillin does not reduce pain, percussion sensitivity, swelling, or the number of analgesics needed postoperatively.^{20,21}

Analgesics

The use of NSAIDs has been shown to be effective in the prevention of endodontic flare-ups. Incidence of flare-ups may be reduced by administering pretreatment and posttreatment analgesics such as ibuprofen.²²

Diagnosis of endodontic flare-ups

When an endodontic patient returns to the clinic in pain, the initial phase of treatment must include a thorough examination and diagnosis. Always listen to the patient's chief complaint, and recognize that increased intensity of pain, assessed using a Visual Analog Scale, is indicative of a flare-up. Conduct a thorough review of the medical and dental history. A comprehensive clinical examination should then be performed to locate the source of discomfort and to evaluate the presence of swelling or other signs of infection. Carefully assess if the previous diagnosis was correct and if the previous treatment was adequate. Rule out whether or not the cause is of odontogenic origin and if there is another tooth involved. Additional radiographs may be necessary.

Treatment protocols

Definitive treatment should begin once the diagnosis has been made. If debridement of the root canal was incomplete, or uncer-

tain, it is imperative to reenter the tooth in order to completely remove the contents of the canal. Examples of incomplete debridement may include a missed canal, inadequate access, or shortness of working length. Many effective preventive methods can also be utilized. Occlusion should be evaluated and reduction may be indicated if the patient fits the aforementioned profile.¹² Occlusal reduction may also be indicated to decrease pain in patients who have developed percussion sensitivity postoperatively. Even if occlusal reduction was previously completed, in cases of acute periapical abscess, the tooth may have regained occlusal contact.

A clinical study revealed that a combined regimen of 600 mg ibuprofen with 1000 mg acetaminophen was more effective than ibuprofen alone for management of postoperative endodontic pain.²³ A prescription alternating every three hours between 400-600 mg ibuprofen and 325- 650 mg acetaminophen is effective.²⁴ Keep in mind that the maximum adult daily dosage of acetaminophen is 4000 mg, while ibuprofen is 3200 mg.

In the presence of swelling, an incision and drainage procedure may be done to allow evacuation of purulence, bacteria and toxins. It also allows the release of periradicular tissue pressure, resulting in significant pain relief.

Summary

Although endodontic flare-ups are uncommon, the impact on the patient and the busy dental practice is significant. Understanding the contributing factors will allow the dentist to decide if the emergency is best managed pharmacologically or with further dental treatment. Identifying patients and situations prone to result in flare-ups can help the practitioner plan for possible follow-ups and eliminate the disruptive unscheduled visit. A clinical reassessment of the flare-up patient should consider the possibility of a previous misdiagnosis. Utilizing proper preventative measures and choosing the correct treatment plan for flare-ups will improve patient comfort, restore patient confidence in their provider and help the dentist build a successful practice.

References

1. American Association of Endodontists. Glossary of endodontic terms, 7th ed. Chicago: American Association of Endodontists; 2003.
2. Walton R, Fouad A. Endodontic interappointment flare-ups: a prospective study of incidence and related factors. *J Endod.* 1992 Apr;18(4):172-7.
3. Imura N, Zuolo ML. Factors associated with endodontic flare-ups: a prospective study. *Int Endod J.* 1996 Nov;29(6):382-6.
4. Harrison JW, Baumgartner JC, Svec TA. Incidence of pain associated with clinical factors during and after root canal therapy. Part 1. Interappointment pain. *J Endod.* 1983 Sep;9(9):384-7.
5. Tsesis I, Faivishevsky V, Fuss Z, Zukerman O. Flare-ups after endodontic treatment: a meta-analysis of literature. *J Endod.* 2008 Oct;34(10):1177-81.
6. Mor C, Rotstein I, Friedman S. Incidence of interappointment emergency associated with endodontic therapy. *J Endod.* 1992 Oct;18(10):509-11.
7. Iqbal M, Kurtz E, Kohli M. Incidence and factors related to flare-ups in a graduate endodontic programme. *Int Endod J.* 2009 Feb;42(2):99-104.
8. Chavez de Paz Villanueva LE. Fusobacterium nucleatum in endodontic flare-ups. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2002 Feb;93(2):179-83.
9. Ng YL, Glennon JP, Setchell DJ, Gulabivala K. Prevalence of and factors affecting post-obturation pain in patients undergoing root canal treatment. *Int Endod J.* 2004 Jun;37(6):381-91.
10. Alacam T, Tinaz AC. Interappointment emergencies in teeth with necrotic pulps. *J Endod.* 2002 May;28(5):375-7.
11. Watkins CA, Logan HL, Kirchner HL. Anticipated and experienced pain associated with endodontic therapy. *J Am Dent Assoc.* 2002 Jan;133(1):45-54.
12. Rosenberg PA, Babick PJ, Schertzer L, Leung A. The effect of occlusal reduction on pain after endodontic instrumentation. *J Endod.* 1998 Jul;24(7):492-6.
13. Georgopoulou M, Anastassiadis P, Sykaras S. Pain after chemomechanical preparation. *Int Endod J.* 1986 Nov;19(6):309-14.
14. Seltzer S, Naidorf IJ. Flare-ups in endodontics: I. Etiological factors. 1985. *J Endod.* 2004 Jul;30(7):476-81.
15. Harrison JW, Baumgartner JC, Svec TA. Incidence of pain associated with clinical factors during and after root canal therapy. Part 2. Postobturation pain. *J Endod.* 1983 Oct;9(10):434-8.
16. Safavi KE, Nichols FC. Alteration of biological properties of bacterial lipopolysaccharide by calcium hydroxide treatment. *J Endod.* 1994 Mar;20(3):127-9.
17. Ghoddusi J, Javidi M, Zarrabi MH, Bagheri H. Flare-ups incidence and severity after using calcium hydroxide as intracanal dressing. *N Y State Dent J.* 2006 Jun-Jul;72(4):24-8.
18. Sjogren U, Figdor D, Spangberg L, Sundqvist G. The antimicrobial effect of calcium hydroxide as a short-term intracanal dressing. *Int Endod J.* 1991 May;24(3):119-25.
19. Fouad AF, Rivera EM, Walton RE. Penicillin as a supplement in resolving the localized acute apical abscess. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1996 May;81(5):590-5.
20. Nagle D, Reader A, Beck M, Weaver J. Effect of systemic penicillin on pain in untreated irreversible pulpitis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2000 Nov;90(5):636-40.
21. Henry M, Reader A, Beck M. Effect of penicillin on postoperative endodontic pain and swelling in symptomatic necrotic teeth. *J Endod.* 2001 Feb;27(2):117-23.
22. Holstein A, Hargreaves K, Niederman R. Evaluation of NSAIDS for treating post-endodontic pain: a systematic review. *Endodontic Topics.* 2002;3:3.
23. Menhinick KA, Gutmann JL, Regan JD, Taylor SE, Buschang PH. The efficacy of pain control following nonsurgical root canal treatment using ibuprofen or a combination of ibuprofen and acetaminophen in a randomized, double-blind, placebo-controlled study. *Int Endod J.* 2004 Aug;37(8):531-41.
24. Hargreaves KM, Keiser K, Byrne BE, eds. *Pathways of the pulp.* 9th ed. St. Louis: Mosby, Inc. 2006:668-90.

Lieutenant Commander Van Ness is an endodontic resident at the Naval Postgraduate Dental School. Captain Weber is a staff member of the Endodontics Residency Program at the Naval Postgraduate Dental School, Bethesda, MD.

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the U.S. Government.