



Clinical Practice Guideline

“Emergency Management of an Acute Apical Abscess in Adults”

Full Report

October 25, 2003

This Clinical Practice Guideline report is designed to be an up-to-date source of the best available evidence on a relevant clinical topic, developed through a systematic review, evidence synthesis and input from the community of dental practitioners. The guideline is intended to facilitate evidence-based practice.

1. PREAMBLE: ABOUT THE CLINICAL PRACTICE GUIDELINE REPORTS

The Canadian Collaboration on Clinical Practice Guidelines (CPGs) in Dentistry is the national, autonomous organization responsible for the development and maintenance of CPGs for Canadian dental practitioners. The purpose of the CCCD is to improve oral health through the application of the best available evidence to clinical decisions. The core activity of the CCCD is the development of practice guidelines, by multi-disciplinary Clinical Advisory Groups, using the methodology of the Practice Guidelines Development Cycle (1). The resulting practice guideline reports are a convenient and up-to-date source of the best available evidence on a clinical topic. They are developed through systematic reviews, evidence synthesis and input from a broad community of practitioners. They are intended to enable evidence-based practice.

For more information about the CCCD, or practice guidelines, please visit the web site <http://www.cccd.ca/>.

2. CHOICE OF TOPIC AND RATIONALE

Topics, or clinical questions, are prioritized and selected by the CCCD Council, in consultation with stakeholder groups, using the following criteria in the decision-making process (2)

- Prevalence of the clinical condition
- Burden of illness
- Amount of unexplained variation in practice patterns in managing the condition
- Relevance to local practice patterns
- Likelihood to influence change in clinical practice
- Availability of high quality evidence to support practice
- Cost of managing the condition

2.1. CHOICE OF ACUTE APICAL ABSCESS (AAA)

An acute apical abscess (AAA), also known as acute periapical abscess, acute dentoalveolar abscess or acute periradicular abscess, is a highly symptomatic inflammatory response of the periapical connective tissues (3). It originates when the pulpal tissues initiate an inflammatory response to trauma or caries, eventually leading to pulpal necrosis.

There are usually clear clinical and radiographic signs in a patient with AAA, although there is a continuum. Pain often occurs rapidly, the severity ranging from slight tenderness to intense, throbbing pain. The source of the pain is easy to determine, as the affected tooth becomes increasingly tender to percussion and chewing. The tooth may be in hyper-occlusion, again interfering with normal function. In some cases, the tooth may be mobile. In the late stages of abscess formation, the patient can usually tolerate the discomfort if the tooth is not touched. Resorption of the overlying cortical bone and localization of the suppurative mass beneath the alveolar mucosa produces a palpable, fluctuant swelling.

Frequently, a localized sense of fullness accompanies the pain. Radiographically, the appearance of the periodontal ligament space ranges from within normal limits, to slightly thickened, (4) to a large periapical radiolucency.

As AAA is due to pulpal necrosis and localized infection, the recommended treatment is to remove the necrotic tissue. This is generally accomplished by allowing drainage of the infection via trephination through the tooth and extripation of the necrotic pulp (i.e. pulpectomy), incision of the soft tissue swelling (as short term relief), or extraction of the offending tooth (4). Other therapies have been used on their own or in conjunction with a pulpectomy to relieve the patient's symptoms. These include the use of systemic or local medicaments, such as corticosteroids, analgesics, and antibiotics. If untreated, AAA may progress to a more wide spread infection and even cellulitis. There is a risk of dissemination of organisms from a periapical abscess to the bloodstream, resulting in systemic complications. The signs of systemic involvement are pyrexia, lymphadenopathy and malaise (5). This risk is reduced in periapical infections that can drain freely.

If adequate drainage cannot be established through pulpectomy, incision and drainage or extraction, antibiotics are commonly prescribed to prevent systemic complications. Although incidence of the latter is unreported, it would seem logical to use them as an adjunct in patients who are immunocompromised (6). Although the pain from AAA is the result of an infectious process, this infection is usually localized; thus, the use of antibiotics as a sole or concomitant therapy for most patients is questionable. Despite this, up to 75% patients with painful abscesses, and no systemic symptoms may be treated with antibiotic therapy (7-9).

The prevalence of AAA has been reported to range from 5% to 46% (10, 11). The condition can have significant social impact (12), in terms of days of work missed and diminished quality of life. In terms of cost, emergency dental treatment comprises from 2-6% of the costs of all dental therapy, an amount similar to all periodontal treatment costs (13, 14). In view of the prevalence of this condition in everyday practice and the evidence of practice variation, a systematic review is warranted. The objective of this review is to determine the effectiveness of the various interventions used in the management of acute apical abscess in the permanent dentition.

3. GUIDELINE DEVELOPMENT METHODOLOGY

The CCCD has developed a process for the development of clinical practice guidelines (15). This involves several stages (16):

- The clinical question is established.
- A systematic review on the topic in question is completed (or appraised if one currently exists).
- Based on the findings of the systematic review, an evidence-based report (Practice-guideline-in-progress), explicitly documenting the strategy and results of the systematic review is generated. This is an interpretative summary of the evidence that is then reviewed by the Clinical Advisory Group (CAG). Evidence-based recommendations are developed by consensus within that group.
- A final draft of this report is sent to a representative sample of practicing Canadian dentists, for whom the guideline may be relevant, for feedback. These individuals complete the practitioner feedback form, the information from which is used to modify the clinical recommendations as necessary. The modified Practice-guideline-in-progress (now a draft of the final CPG) is sent to the CCCD Council for review.

- The final guideline is approved by the CCCD Council and published. The CAG has a formal standardized process to ensure the currency of each guideline report. This consists of periodic review and evaluation of the scientific literature, and, where appropriate, integration of this literature with the original guideline information.

4. THE CLINICAL QUESTION

The Clinical Advisory Group for this guideline was composed of three general dentists from across the country, two endodontists and the co-chairs of the CAG. The clinical question to be addressed was developed using a process of consensus and is outlined below.

Target Population: patients presenting with acute apical abscess resulting from a non-vital pulp in the permanent dentition. This condition is characterized by pulp necrosis, with pain on biting pressure and/or swelling, soft tissue edema and/or redness. There may be mobility of the affected tooth, and it may be in hyper-occlusion.

Interventions:

- pharmacotherapeutics including systemic (antibiotics, corticosteroids, NSAIDS /analgesics) and local (irrigants, intracanal medicaments) therapy.
- pulpectomy, open or closed
- bony trephination
- extraction.
- monitoring (no treatment)

Comparison/control: any comparison group including placebo and watchful waiting;

Outcome Measures: the effect on patient outcomes in terms of symptom relief as measured by patients or clinicians;

Types of Studies: all controlled clinical trials that met the above eligibility criteria.

5. SYSTEMATIC REVIEW

5.1. METHODS

5.1.1. Study Identification

A systematic review (17) was performed by members of the Methodology Resource Group (MRG): Drs. Susan Sutherland and Debora Matthews (co-chairs), and Dr. Bettina Basrani (Head, Division of Endodontics, Dalhousie University). In order to identify relevant clinical trials, the MedLine database and the Controlled Trials Register of the Cochrane Library were searched from their origins to March 2002. A further search was done of the Specialized Register of Clinical Trials of the Cochrane Oral Health Group. The search strategy is outlined in Appendix 1.

5.1.2. Study Selection

The criteria identified by the CAG were used to determine eligibility of studies for inclusion in the review. All controlled clinical trials that met the eligibility criteria were included. Two reviewers, where available, examined titles and abstracts. All papers deemed relevant or possibly relevant by either reviewer were obtained. Reference lists of all retrieved articles, review papers and relevant book chapters were scanned and pertinent citations were obtained. Following the study selection process described below, endodontic experts and

published authors were contacted. They were asked to provide further references that the search may have missed. To assess the proportion and possible impact of non-English language citations, no citations were excluded from the list of relevant papers based on language. However, only the full text of English and French language papers was obtained. Throughout the project, an ongoing literature search on the topic was carried out using the Automated Medfetch Query using the same search strategy as for MedLine. Unpublished studies were not sought.

5.1.3. Assessment of Methodological Quality

Three reviewers independently assessed the methodological quality of all selected studies, using a checklist. This checklist addressed whether or not the population, intervention(s), outcomes and study design were described clearly. In addition, the validated assessment tool developed by Jadad et al. (18) was used to assign a score to the quality of randomized controlled trials. The maximum possible score on the scale was five. The measurement criteria are described in Table 1.

5.1.4. Data Extraction

Pertinent information was abstracted from each study. This included study design, sample size, population (including the study setting), patient characteristics and eligibility criteria, interventions and comparisons used (including dose, schedule and route of drugs or specifics of the technique and allowed co-interventions), outcome measures and results.

For papers with missing or unclear data published within the last 5 years, authors were contacted and asked to provide detailed information.

There was considerable variation between studies in the patient evaluation schedules, making it impossible to extract data for the same time frame for each study. The approach taken was to choose the most comparable time frames, taking into consideration the pharmacokinetics of the particular drug.

5.1.5. Data Analysis

Within each category of intervention, trials that were not too clinically different, or heterogeneous, were pooled and statistically evaluated using meta-analytic techniques (RevMan 4.1 for Windows, Cochrane Collaboration, Oxford, U.K.).

5.1.6. Meta-analysis

The outcomes of interest were relief of pain and swelling, and reduction of systemic symptoms from AAA after emergency treatment, as assessed by patients and/ or clinicians. These were summarized for all studies for which they were available. For outcomes reported as binary data, individual odds ratios (OR) of response to treatment (test versus control) and associated 95% confidence intervals were calculated for each trial. For outcomes reported as continuous data, individual weighted mean differences (WMD) were calculated for each study. When calculating the combined mean effect of treatment from several studies, this method gives greater weight to studies with larger sample sizes. Where different researchers used different numerical scales, data were transformed to a common percentage scale, using the method described by Eisenberg et al (19). A pooled interval estimate of the population OR or WMD was calculated. A test for heterogeneity was done, using the chi-square test. Significance for this test was set liberally at $p \leq 0.1$, since, in practice, the test often lacks the power to detect inter-study differences of the treatment effect (20). The DerSimonian and

Laird Random Effects Model of pooling (21) was used, based on the assumption of the presence of inter-study variability, to provide a more conservative estimate of the true effect.

5.1.6.2. Subgroup Analysis:

Several sources of heterogeneity were anticipated. To explore the relationship between treatment effect and study features, several *a priori* hypotheses regarding heterogeneity were developed and subgroup analyses planned. A separate analysis was proposed for each intervention, if there were sufficient studies (>1) for pooling within each category. A sensitivity analysis was planned to evaluate the influence of methodological quality (score ≥ 3 versus score <3).

5.2. RESULTS

5.2.1. Study Identification and Selection

Seventy-two English studies were identified by the search. Eighteen non-English, non-French language reports were identified but not reviewed due to lack of resources for translation. There were no eligible studies in French. Thirteen papers were identified through searching of bibliographies. Thirty-five of the 85 papers met the broad screening criteria and were retrieved and reviewed. Upon scrutiny by the two reviewers, twenty-five further studies were eliminated because they did not meet the inclusion criteria.

For the remaining ten papers, two authors were contacted for clarification or verification of the population, intervention or outcome. Neither responded, resulting in the exclusion of two additional papers. References for the 27 excluded studies are listed in Appendix 2.

5.2.2. Trial Characteristics

Eight papers, all controlled clinical trials, met all eligibility criteria (6, 22-28). A total 531 patients were included in these studies. There were two distinct groups of studies: those that compared two antibiotics (N = 460) and those that compared an antibiotic to placebo or no antibiotic treatment (N = 71). The salient features of all trials are shown in Table 2.

5.2.3. Methodological Quality

The median quality score was 3 with a range of 1-5 (table 3). Of the eight trials, all stated that they were randomized, but only three described the method of randomization. Four of the eight papers did mention or describe withdrawals or dropouts and none stated a planned intention to treat analysis. The only study showing a significant difference between the treatment and control groups (24) was an open label comparative study. As this was a drug trial, there was no reason that a double-blinded placebo controlled trial should not have been done. None of the studies reported a power-based sample size calculation.

5.2.4. Meta-analysis

5.2.4.2. Studies comparing two antibiotics

Six trials provided relevant binary data on the outcome of absence of pain and swelling (proportions of patients in the treatment and control groups experiencing absence of pain and/or swelling following administration of the intervention/comparison). The results for these six studies are shown in table 4 and figure 1. Four of these studies measured absence of pain alone (n=437 patients): Odds ratio (OR) [95% CI] = 1.21 [0.59, 2.51]. Three measured absence of infection (swelling +/- systemic symptoms) alone (413 patients): OR [95% CI] =

0.73 [0.32, 1.69]. For both of these outcomes, none of the study results were statistically significant.

Four studies (6, 22, 24, 26) measured a combined absence of pain and swelling/infection at the end of the follow-up period (n= 460 patients). In three of the studies, (6, 22, 26) there was an equivalent treatment effect in treatment and control groups (n=197). The remaining study, an open label comparison of azithromycin and Co amoxiclav, showed a statistically significant result favouring azithromycin (24): (OR) [95% CI] = 0.58 [0.35, 0.96]. Four studies measured absence of pain alone (6, 23-25) (n=437 patients): OR [95% CI] = 1.21 [0.59, 2.51].

5.2.4.3. Studies comparing antibiotics to placebo or no treatment

The two studies in this group provided continuous data for post-operative pain ratings at day 3 (figure 2). Both groups examined patients with local involvement only. Neither study showed benefit related to administration of antibiotics, with a combined WMD [95% CI] = 5.78 [-12.89, 24.44].

6. CLINICAL ADVISORY GROUP CONSENSUS PROCESS

An evidence-based report, as presented above (sections 1 – 5), was circulated to members of the CAG. The following DRAFT recommendations were drawn up and will be modified and approved through a process of consensus to develop the practice-guideline-in-progress.

6.1. DRAFT CLINICAL RECOMMENDATIONS

The following draft recommendations were developed based on evidence from the systematic review and consensus from the clinical advisory group.

For the emergency management (i.e. pain and swelling relief) of an acute apical abscess in an adult patient:

- Non-surgical endodontic treatment (root canal therapy) should be initiated on the affected tooth as soon as possible. It is recognized that there may be patient or clinician factors that preclude immediate initiation of this. In these cases, appropriate analgesia (NSAIDs) should be recommended. (Grade C recommendation¹)
- In the event of systemic complications (fever, lymphadenopathy, cellulitis) antibiotics should be prescribed in addition to drainage of the tooth. There is no evidence to recommend one antibiotic over another in the management of AAA with systemic complications (Grade A).
- To control post-operative pain following initial endodontic therapy, use of non-steroidal anti-inflammatory drugs, especially when given immediately pre-operatively, is recommended. (Grade C)
- For some patients and in certain situations extraction of the affected tooth is a reasonable alternative. (Grade C)

¹ See Appendix 4 for levels of evidence and grades of recommendations.

6.1.1. Qualifying Statements

Not all patients can be managed in a general dental office. If accessibility to an endodontist is not a concern, the clinician may choose to refer patients (as defined above) when:

- a) The clinician is unable to confidently diagnose the condition,
- b) The clinician is unable to locate or negotiate the root canal(s),
- c) A complication occurs.

7. EXTERNAL REVIEW OF THE PRACTICE GUIDELINE REPORT

External review of the guideline-in-progress, by Canadian practitioners and clinicians and chairs of Endodontic programs in Canadian faculties, was obtained through a mailed survey. Data from this survey has been used to draft the final practice guideline. The results of this survey are included Appendix 3 of the final CPG.

7.1. METHODS

Practitioner feedback was obtained through a mailed survey of volunteer dentists and endodontic program chairs in Canada. The survey consisted of items evaluating the methods, results and interpretive summary used to form the draft recommendations and whether the draft recommendations should be approved as a practice guideline. Written comments were invited.

7.2. RESULTS

In an effort to ensure confidentiality of the responses, we did not put any identification on the surveys themselves. This made it difficult to follow up with non-respondents. Nonetheless, 69% of the surveys were returned. All respondents indicated that the practice-guideline-in-progress report was relevant to their clinical practice and they completed the survey (Appendix 3). Ninety-five percent agreed or strongly agreed with the methods and 94% with the data synthesis. Ten percent felt the recommendations would not be acceptable to patients; 5% felt the recommendations “would not be supported by their colleagues”. One respondent felt the guidelines were too rigid to apply to individual patients and application of the guideline would not result in better use of resources. Ninety percent endorsed the evidence-based report as a practice guideline and 85% were likely or very likely to use this guideline in their practice.

The main points were:

- Despite the evidence, when nonsurgical endodontics could not be initiated (i.e. time constraints, long waiting lists for the endodontist or an inability to anesthetize the area), some clinicians felt antibiotics would help make the patient comfortable.
- There was overall concern, and some surprise, that the evidence for the use of nonsurgical endodontics to manage acute apical abscesses is lacking.
- The choice of whether to use narcotics or NSAIDs should be left to the practitioner.
- Upon presentation of a patient with an acute abscess, the practitioner should reflect on the desirability and feasibility of successful endodontic therapy and coronal restoration. Consideration should be given to the prognosis of the tooth, the strategic value of the tooth, patient preference and economic considerations. Additional thought should be

given to the severity of the infection and the risk of life threatening exacerbation. After such consideration it is often established that tooth extraction is the treatment of choice, and as such extraction should be the first and most important intervention as opposed to an “alternate and / or acceptable intervention”. Initiation of endodontic therapy and extraction should be given equal weight.

- Where appropriate, soft tissue incision and drainage should be carried out as a matter of high priority in conjunction with commencement of endodontic therapy or extraction. This intervention should be given greater weight than antibiotics treatment unless systemic symptoms or cellulitis are present.

7.3. MODIFICATIONS/ACTIONS

Based on written comments and survey answers, together with input from Council, modifications were made to the report.

- Extraction and incision and drainage were included as reasonable alternatives for initial drainage of the abscess.
- A recommendation on post-operative pain management was added, based on data from another systematic review (29).
- Although no evidence was found, feedback recommended that in situations of hyperocclusion, it may be helpful to relieve occlusion on the offending tooth.

8. RECOMMENDATIONS FOR CLINICAL PRACTICE

Based on the evidence from the systematic review, and within the limitations of this evidence, feedback from practitioners, the consensus of the CAG and the CCCD Council, the following recommendations were drafted:

For the emergency management (i.e. pain and swelling relief) of an acute apical abscess in an adult patient:

- Drainage of the abscess should be initiated on the affected tooth as soon as possible. This may include non-surgical endodontic treatment (root canal therapy), incision and drainage or extraction. (Grade C recommendation²)
- Upon presentation of a patient with an acute abscess, the practitioner should reflect on the desirability and feasibility of successful endodontic therapy and coronal restoration, versus incision and drainage or extraction. Consideration should be given to the prognosis of the tooth, the strategic value of the tooth, patient preference and economic considerations. Additional thought should be given to the severity of the infection and the risk of life threatening exacerbation. (Grade C recommendation)
- Systemic antibiotics provide no additional benefit over drainage of the abscess in the case of localized infections. (Grade A)
- In the event of systemic complications (fever, lymphadenopathy, cellulitis), or a patient who is immunocompromised, antibiotics may be prescribed in addition to drainage of the tooth. There is no evidence to recommend one antibiotic over another in the management of AAA with systemic complications (Grade A).

² See Appendix 4 for levels of evidence and grades of recommendations.

- It is recognized that there may be patient or clinician factors that preclude immediate initiation of drainage. In these cases, appropriate analgesia (NSAIDs) should be recommended until the infection can be adequately drained. (Grade C)
- In situations of hyperocclusion, it may be helpful, in the short term, to relieve occlusion on the offending tooth. (Grade C)
- To control post-operative pain following initial endodontic therapy, use of non-steroidal anti-inflammatory drugs, especially when given immediately pre-operatively, is recommended. This recommendation is based on data from a previous systematic review. (Grade B)

8.1.1. Qualifying Statements

Not all patients can be managed in a general dental office. If accessibility to an endodontist is not a concern, the clinician may choose to refer patients (as defined above) when:

- d) The clinician is unable to confidently diagnose the condition,
- e) The clinician is unable to locate or negotiate the root canal(s),
- f) A complication occurs.

This practice guideline reflects the integration of the draft recommendations in the External Review process and has been approved by the MRG and the CAG of the CCCD.

9. RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the findings of the systematic review and the guideline development process, future endodontic research should be designed to study:

- the effect of non-surgical endodontic therapy alone versus that combined with antibiotic therapy,
- endodontic therapy versus incision and drainage as an emergency treatment, and
- the most appropriate and effective drugs, routes, dosages and timing of analgesics and anti-inflammatory drugs.

In addition, trials should:

- provide consistent definitions for endodontic disease entities
- clearly state the inclusive and appropriate eligibility criteria for various types of trials
- use consistent and clinically relevant outcome measures with patients (not teeth) as the unit of analysis
- use rigorous RCT designs and reporting of trials consistent with the CONSORT statement
- use binary or dichotomous outcomes (for example, proportion of patients who achieve 50% pain relief or total pain relief by a certain time point). This would allow the calculation of the numbers-needed-to-treat. The number-needed-to-treat (NNT) can be applied to treatment efficacy, adverse events and other clinical endpoints, is easily understood by clinicians and has immediate relevance for clinical decision-making.

10. FINAL APPROVAL OF GUIDELINE

Upon receipt of the report from the stakeholders' review, the chair of the CAG will prepare a report including the final CPG for approval by the CCCD Council.

11. GUIDELINE DISSEMINATION

The approved guideline will be edited and formatted for publication in the Journal of the Canadian Dental Association <http://www.cda-adc.ca/jcda/>, as well as on the CCCD website <http://www.cccd.ca/>. The website will include the full version of the guideline, including the methods and results of the external review process, as well as a brief summary for dentists and a patient version for consumers.

12. CURRENCY OF THE GUIDELINE

This guideline will be updated and new evidence evaluated every 5 years, at a minimum. If indicated by the presence of new strong evidence prior to this, the CPG will re-enter the guideline cycle. The CPG Chair will initiate this process.

A report will be generated when the guideline is updated, following a scheduled review procedure. The document will be similar to the original Clinical Practice Guideline report, but if new information has emerged, it will be incorporated, with original and new information clearly labeled "ORIGINAL" and "UPDATE" respectively. It contains a narrative history, including publication status, of the original guideline and the methods and results of both the original guideline and all updating activities.

13. DECLARATION OF CONFLICT OF INTEREST

Drs. Sutherland and Matthews are members of the CCCD Council. They are not involved with the final approval of the guideline. No other member of the Clinical Advisory group have any conflict of interests to declare.

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TABLE 1. QUALITY ASSESSMENT SCALE (ADAPTED FROM JADAD ET AL, 1996)

FOR EACH QUESTION, PICK ONLY THE <u>BEST</u> ANSWER AND CIRCLE THE POINTS FOR THAT QUESTION.	ANSWER	POINTS
1. Was the study described as randomized (this includes the use of words such as randomly, random, and randomization)?	No Yes Yes , and the method to generate the sequence of randomization was <u>described and it was appropriate</u> (table of random numbers, computer generated, etc.) Yes , and the method to generate sequence of randomization was <u>described and it was inappropriate</u> (patients were allocated alternately, or according to date of birth, hospital number etc.)	0 1 2 0
2. Was the study described as double blind?	No Yes Yes , and the method of double blinding was <u>described and appropriate</u> (identical placebo, active placebo, dummy, sham)	0 1 2

<p>OR IF DOUBLE BLINDING NOT APPROPRIATE TO THE NATURE OF THE STUDY:</p> <p>Was the study described as blinded?</p>	<p>No Yes Yes, and the person evaluating the outcome was blinded to the TREATMENT ALLOCATION OF THE PATIENT</p>	<p>0 1 2</p>
<p>3. Was there a description of withdrawals and dropouts?</p>	<p>No Yes</p>	<p>0 1</p>
<p>TOTAL POSSIBLE SCORE</p>		<p>5</p>

TABLE 2. FEATURES OF INCLUDED TRIALS

Study	N	Setting	Baseline patient characteristics	Intervention	Comparison	Concomitant treatment allowed	Additional therapy	Length of follow-up
Adriaenssen	292	Private practice	Acute abscess	Azithromycin 500 mg daily for 3 days	Co amoxiclav ³ , 625 mg; 3x/d for 5-10 days	Not stated	None	4 days
Gilmore	55	University dental clinic	Acute abscess with systemic involvement	Clindamycin 150 mg; 4x times per day for 7 d	Pen V 250 mg; 4x per day for 7 days	Not stated	I&D ⁴ , extraction or pulpectomy	7 days
Hood	37	Not stated	Acute abscess + systemic involvement	Metronidazole 200 mg; eight hourly for 3 days	Pen G 600 mg i.m., followed by Pen V 250 mg; four times daily. for 5 days	Not stated	I&D	3-5 days
Ingham	25	Dental hospital	Acute abscess	Pen G 600 mg + procaine penicillin 600 mg i.m.	Metronidazole 200 mg eight hourly for 3 days	Not stated	Surgery if indicated	3 days
Lewis 1986	60	Hospital dental clinic	Acute abscess	Amoxycillin 3.0 gr. post-op and 3.0 g 8 hrs later	Pen V 250 mg; six hourly for 5 days	Not stated	I&D, extraction or pulpectomy	2 days

³ Amoxycillin + clavulanic acid

⁴ I & D = incision and drainage

Study	N	Setting	Baseline patient characteristics	Intervention	Comparison	Concomitant treatment allowed	Additional therapy	Length of follow-up
Lewis 1993	78	Hospital dental clinic	Acute abscess	Amoxicillin 250 mg + clavulanic acid 125 mg; 8 hourly for 5 days	Pen V 250 mg; six hourly; for 5 days.	Not stated	I&D, extraction or pulpectomy	5 days
Fouad	30	University dental clinic	Localized acute apical abscess	Pen VK 1 gr post-op and 500 mg qid for 7 days	Placebo or no treatment	Ibuprofen	Pulpectomy; I&D if indicated	3 days
Henry	41	University dental clinic	Symptomatic necrotic tooth with spontaneous pain ^{3,4}	Pen VK 500 mg q6h for 7 days	Placebo	Ibuprofen; acetaminophen with 30 mg codeine	Pulpectomy	7 days

³ 54% of patients had self-rated swelling (mild = mild puffiness of the face, not bothersome; moderate = bothersome facial distortion; severe = very bothersome, serious facial distortion)

⁴ All involved teeth demonstrated radiographic periapical radiolucency

Table 2. Quality scores (based on Jadad et al. 1996)

Study	Randomized			Double Blinded		Description of Patient Withdrawals ⁵	Total score (/5)
	Yes, but Method Not Described (1)	Yes and Method Appropriate (2)	Yes, but Method Not Appropriate (0)	Yes, but Method Not Described (1)	Yes and Method Described (2)		
Adriaenssen ⁶	X					X	2
Gilmore		X			X	X	5
Hood		X					2
Ingham	X						1
Lewis '86		X		X			2
Lewis '93	X			X		X	3
Fouad	X			X		X	3
Henry	X				X		3

⁵ None of the studies did an intention-to-treat analysis

⁶ Randomized, open label, comparative study

Table 4. Odds ratios for various outcomes

Outcome¹	No. of studies	Reference	No. of patients	Test for heterogeneity	Odds Ratio	95% CI
Absence of infection AND pain	5	Adriaenssen ² Hood ² Lewis '86 ² Lewis '93	460	NA	0.58	0.35, 96
Absence of infection	3	Adriaenssen Gilmore ² Lewis '86	413	Chi-square = 0.23 df=1 p=0.63 ³	0.73	0.32, 1.69 ³
Absence of pain	4	Adriaenssen Gilmore ² Ingham Lewis '86	437	Chi-square = 2.40 df = 2 p = 0.3 ³	1.21	0.59, 2.51 ³

¹Follow-up period varied

²Odds ratios not estimable: equivalent treatment effect in treatment and control groups

³Not statistically significant

Figure 1. Forrest plot for outcomes "absence of pain and swelling"

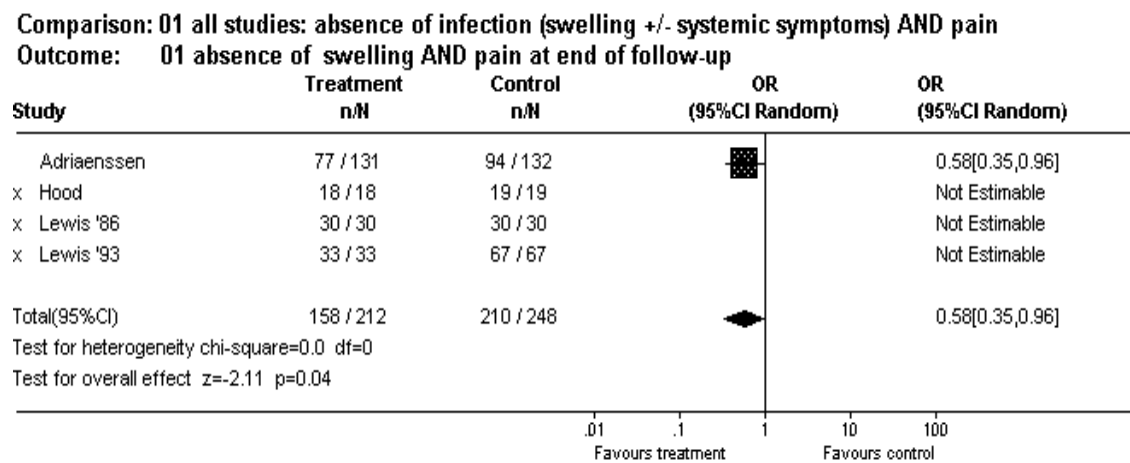
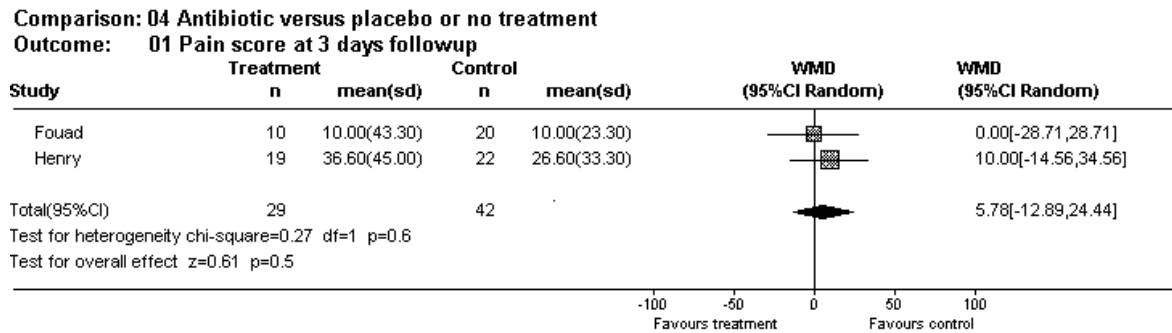


Figure 2. Forrest plot for outcome mean pain



‘Understanding meta-analysis graphs’ (Figures 1-2)

For each individual study, the box represents the study result or point estimate (weighted mean difference (WMD) for continuous data, odds ratio (OR) for dichotomous data), which is the best estimate of the true value for the population from which the sample of patients was taken. The horizontal bars on either side of the point estimate are the 95% confidence intervals, representing the uncertainty due to chance associated with the estimate: the true result may lie anywhere within that interval. Wide confidence intervals indicate a large amount of uncertainty about the estimate. Narrow confidence intervals lead us to have more confidence that the estimate is close to the true result — there is greater precision associated with the result. The vertical line of the graph is the line of equivalence, where there is no difference between the effects of the treatment versus the effect of the control. A point estimate that lies on the ‘favours treatment’ side of the vertical line indicates the intervention may be beneficial; one which lies on the ‘favours control’ side indicates that the control or placebo may actually be more beneficial than the treatment being studied. However, if the confidence interval for the estimate crosses the vertical line of the graph, one of the possible values for the true estimate is zero. In this case, the result is deemed to be non-statistically significant. The diamond at the lower end of the graph represents the combined results of all studies and the associated 95% confidence interval.

APPENDIX 1: SEARCH STRATEGY

- Search was done using Medline on OVID -- Database: Medline <1966 to Present>
- Each search included the Disorder, one of the interventions, and the limits.

1. The disorder:

- Periapical abscess/ OR ((apical or apex or periradicular or peri-radicular or dentoalveolar) and abscess:).mp. OR (apical periodontitis and suppurative).mp. OR (((dental or tooth) and abscess:) not periodontal).mp.

2. Interventions

- exp ⁷Antibiotics/
- exp Analgesics/
- exp Anti-inflammatory agents, steroidal/
- exp Endodontics/ OR (endodontic\$ or pulpectomy or pulpotomy or root canal therap\$).mp.
- exp Drainage/ OR drain\$.mp.
- exp Cresols/ OR exp Anti-infective agents/ OR Eugenol/ OR Calcium hydroxide/ OR Methenamine/ OR Silver/ OR Titanium/ OR Ketorolac tromethamine/ OR exp Chlorophenols/ OR Tolmetin/ OR Sodium hypochlorite/ OR Zinc oxide-eugenol cement
- Trephining/ OR trephin\$.mp. OR Decompression, surgical/ OR Punctures
- Occlusal adjustment/ OR (adjust\$ adj5 (bite or occlus\$ or tooth)).mp.
- Tooth extraction/
- (no\$1 adj treat\$).mp. OR untreated.mp. OR "watchful waiting".mp.

3. Limits

- human
- (clinical trial or clinical trial, phase i or clinical trial, phase ii or clinical trial, phase iii or clinical trial, phase iv or consensus development conference or consensus development conference, nih or controlled clinical trial or meta analysis or multicenter study or practice guideline or randomized controlled trial or review, academic)
- english language
- Double-blind method/ OR random allocation/ OR exp clinical trials/ OR placeb\$.mp. OR (double\$ adj blind\$).mp. OR (meta-anal\$ or metaanal\$).mp. OR ((quantitativ\$ or qualitativ\$ or systematic\$

⁷ MEDLINE abbreviation: exp = explode (a method to use a subject heading as an umbrella term to capture more specific headings on the same subject), mp. = keyword

or methodologic\$) and review\$).mp.OR ((quantitativ\$ or qualitativ\$ or systematic\$ or methodologic\$) and overview\$).mp.

APPENDIX 2. REFERENCES FOR EXCLUDED STUDIES

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Appendix 3: Practitioner feedback report

NA: Not applicable, SA: Strongly agree, SD: Strongly disagree.

CPG. Clinical Practice Guideline

PGIP. Practice Guideline in Progress

Question	Frequency (%) n=20					
	NA	SA	Agree	Neutral	Disagree	SD
1. The rationale for developing this CPG, as stated in the “Choice of Topic” section of the report, is clear.		60%	40%			
2. There is a need for a CPG on this topic.		30%	65%	5%		
3. The literature search is relevant and complete (i.e., no key trials were missed, nor any included that should not have been) in this PGIP report.	5%	30%	45%	20%		
4. I agree with the methodology used to summarize the evidence included in this PGIP report.		25%	70%	5%		
5. The results of the trials described in the PGIP report are interpreted according to my understanding of the data.		26%	68%	5%		
6. The recommendations in this report are clear.		45%	58%		5%	
7. I agree with the recommendations as stated.		26%	63%	5%	5%	
8. The recommendations are suitable for the patients for whom they are intended		35%	60%		5%	
9. The recommendations are too rigid to apply to individual patients.		0%	5%	5%	85%	0.05
10. When applied, the recommendations will produce more benefits for patients than harms.		40%	55%		5%	
11. The PGIP report presents options that will be acceptable to patients.		25%	65%		10%	
12. To apply the recommendations will require reorganization of services/ care in my practice setting.	5%		10%		55%	0.3
13. To apply the recommendations will be technically challenging.			5%		50%	0.45
14. The recommendations are too expensive to apply.					35%	0.65

	NA	SA	Agree	Neutral	Disagree	SD
15. The recommendations are likely to be supported by a majority of my colleagues.		25%	45%	25%	5%	
16. If I follow the recommendations, the expected effects on patient outcomes will be obvious.		20%	70%	10%		
17. The recommendations reflect a more effective approach for improving patient outcomes than is current usual practice. (If recommendations are the same as current practice, please tick NA).	55%	10%	25%	10%		
18. When applied, the recommendations will result in better use of resources than current usual practice. (If recommendations result in the same outcomes as current practice, please tick NA).	40%	10%	35%	10%	5%	
19. This PGIP report should be approved as a practice guideline.		45%	45%	5%	5%	

If this PGIP report were to become a practice guideline, how likely would you be to make use of it in your own practice?

Very Likely	Likely	Neutral	Unlikely	Very Unlikely
65%	20%	10%	5%	

Appendix 4. Grading of Evidence (30, 31)

Statements of evidence

- Ia* Evidence obtained from meta-analysis of randomized controlled trials.
- Ib* Evidence obtained from at least one randomized controlled trial.
- IIa* Evidence obtained from at least one well-designed controlled study without randomization. (RCTs considered *IIa* if method of randomization not clear)
- IIb* Evidence obtained from at least one other type of well-designed quasi-experimental study.
- III* Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies.
- IV* Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities.

Grades of Recommendations

- A Requires at least one randomized controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation. (*Evidence levels Ia, Ib*)
- B Requires the availability of well conducted clinical studies but no randomized clinical trials on the topic of recommendation. (*Evidence levels IIa, IIb, III*), OR, small randomized trials with uncertain results (and moderate to high risk of error)
- C Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates an absence of directly applicable clinical studies of good quality. (*Evidence level IV*)

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