



# Guideline

endodontic diagnosis and treatment *2022/3*

Summary



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This document contains the summary of the "Guideline for Endodontic Diagnosis and Treatment" as prepared by the Dutch Society for Endodontology (NVvE). This revised Guideline was presented by the NVvE in November 2023. [The full Guideline can be downloaded from the NVvE website.](#)

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# Diagnosing the condition of the pulp

Guideline for endodontic diagnosis and treatment 2022-2023 - Chapter 3 - pages 27 to 41

## RECOMMENDATION

To determine the sensibility and, indirectly, the vitality of the pulp, the study group suggests the use of the cold test and electrical test.

## RATIONAL

Of none of the tests to determine the sensibility and, indirectly, vitality of the pulp, the diagnostic value has been scientifically demonstrated with a reasonable to high degree of certainty. Of the tests based on measuring a response to sensory stimuli, the cold test and electrical test seem to be the most sensitive/specific. Moreover, they are non-invasive, inexpensive tests.

Tests based on the measurement of blood circulation to determine the vitality of the pulp have not yet been investigated in a sufficiently robust manner to be applied routinely, and are also relatively expensive. Therefore, the study group assumes that pulse oximetry and laser Doppler flowmetry, in part because of the costs associated with them, are not or rarely used by general practitioners for the time being.

At this time, one cannot rely purely on the results of sensibility tests for an accurate diagnosis of the condition of the pulp.

The working group believes that in combination with the medical and clinical history, intra-oral examination and additional X-ray diagnosis, one can ultimately arrive at a working diagnosis.



## Imaging diagnostics

Guideline for endodontic diagnosis and treatment 2022-2023 - Chapter 4 - pages 42 to 68

**RECOMMENDATION** A periapical X-ray image is preferred for radiologically assessing the condition of periapical tissue. If necessary, multiple images can be taken at different angles to avoid overlap and get a better view of different structures without a 3D image.

CBCT should not be routinely used as an imaging technique for identifying periapical pathology. The ALARA principle is applied here.

High-resolution CBCT with limited volume should be considered when

- 1) no clear diagnosis of periapical abnormalities can be made from the clinical symptoms and periapical radiographs because of:
  - a. conflicting clinical symptoms, or
  - b. due to poorly localized symptoms associated with an on-treated or a previously endodontically treated tooth.
- 2) In case of serious suspicion of the presence of an additional channel
- 3) In serious suspicion of the presence of a vertical root fracture.

Application of CBCT should be done only by a dentist or endodontist who has been trained in it. Otherwise, referral to a dentist or endodontist trained in it is necessary.

When using CBCT to image multiple teeth in one image, radiological abnormalities of other teeth should also be checked for. The entire image should be assessed, and thus all the different tissues and structures.

**RATIONALE** Despite that the cost of CBCT versus that of a periapical X-ray image is higher, CBCT gives a higher radiation exposure than a periapical X-ray image, the working group has given great weight to the evidence on presence of an extra canal and a vertical root fracture as well as the relevant opinions of European Society of Endodontology position statement on CBCT.



# Treatment of pulpitis

Guideline for endodontic diagnosis and treatment 2022-2023 - Chapter 5 - pages 69 to 100

**RECOMMENDATION** Consider the use of MTA\* when partial or total pulpotomy is chosen.

\* See glossary (<https://nvve.com/wp-content/uploads/2018/03/Glossary-Endodontology.pdf>).

**RATIONALE** The working group placed considerable weight on the more favorable clinical effect of MTA compared with calcium hydroxide, the multiple uses of MTA and little weight on the fact that MTA is more expensive than calcium hydroxide.

**RECOMMENDATION** When irreversible pulpitis is suspected, pulpectomy is the standard treatment. However, pulpectomy may be considered, with the advantages and disadvantages of pulpectomy for irreversible pulpitis discussed with the patient and weighed in concert.

**RATIONALE** The Working Group gave considerable weight to the fact that despite new studies published since 2016, there are still insufficient studies available comparing the long-term effects (minimum follow-up duration of 48-60 months) of pulpotomy with those of pulpectomy. On this basis, pulpectomy is considered the standard treatment for the time being.

**RECOMMENDATION** In patients with permanent dentition, try to avoid pulpal exposure.

Selective removal of carious tissue is preferable to "stepwise excavation.

**RATIONALE** The working group placed great weight on avoiding pulpal exposure. In addition, incomplete removal of carious tissue does not reduce clinical success, provided the enamel-dentin boundary is clean. Selective removal of central carious tissue can be done in one sitting, as opposed to "stepwise excavation.

**RECOMMENDATION** For patients with permanent dentition and deep caries in whom pulpal exposure occurs, MTA and Biodentine are the agents of first choice as direct capping materials.

**RATIONALE** The working group placed considerable weight on the fact that MTA is likely to be less likely to cause treatment failure than calcium hydroxide and is the most researched of the 'hydraulic calcium silicate-



based cements' (HCSCs), and has given little weight to the higher cost of MTA and Biodentine.

**RECOMMENDATION** The working group does not recommend any of the overdenture materials for indirect pulpal overdenture.

**RATIONALE** The working group placed great weight on the fact that it is by no means certain whether or not overdenture material is necessary at all in indirect pulpal overdenture.

**RECOMMENDATION** Consider treating (irreversible) pulpitis in one sitting. This may be deviated from when warranted by the presence of pain (emergency), the difficulty of treatment and/or the patient's wishes.

**RATIONALE** The study group gave great weight to the fact that treating in one session is more pleasant for the patient (convenience; time savings) than treating in two sessions, costs less and the risk of leakage is reduced (since there is no temporary restoration as when a second session takes place) . The study group gave little weight to the possible more frequent occurrence of post-operative pain within one week.

**RECOMMENDATION** For pain relief, do not consider occlusal reduction.

**RATIONALE** The working group placed great weight on the view that sacrificing natural tissue by occlusal reduction for highly uncertain pain reduction is undesirable.



# Regenerative endodontic treatment

Guideline for endodontic diagnosis and treatment 2022-2023 - Chapter 6 - pages 101 to 117

## RECOMMENDATION

1. Consider preservation of an immature tooth with pulpal necrosis by regenerative therapy or apexification. The cause of pulpal necrosis (trauma, dens evaginatus or caries) does not play a role in choosing between the two options.
2. If regenerative therapy is chosen, consider
  - not apply EDTA irrigation, but only sodium hypochlorite,
  - avoid use of antibiotics as an intracanal medication (in favor of calcium hydroxide)
  - perform regeneration (induction of bleeding, formation of a blood clot) in a second session.
3. Consider using a non-discoloring material and inform patient and/or parents or guardians of the possibility of discoloration of the element.
4. Regenerative therapy is contraindicated in case of:
  - replantation of teeth because revitalization can occur naturally,

- Insufficient ability to isolate the dentition,
- dentition with extensive loss of coronal tissue requiring repair with a post buildup that occupies the space required for blood clot formation.

5. The study group did not formulate a recommendation regarding regenerative therapy in the case of mature teeth. In the working group's opinion, insufficient research has been conducted to base a recommendation on this.

**RATIONALE** A clinically relevant difference in success or survival between regenerative therapy and apexification has not been demonstrated. The cause of pulpal necrosis (trauma, dens evaginatus or caries) is not an indication for one or the other treatment, the study group believes. There is evidence from the discussed literature to avoid EDTA as an irrigant and make do with sodium hypochlorite. There are also indications from the discussed literature that it is better to perform the entire regeneration procedure in two sessions rather than one. Regarding the avoidance of antibiotics as an intracanal medication, the



working group that because of the risk of antibiotic resistance, it is desirable to apply them as little as possible. According to Kharchi et al. (2020), their review shows that the combination of sodium hypochlorite with calcium hydroxide may provide a sufficiently disinfected environment. They acknowledge that although the evidence is weak, they note: '(...) it can be argued that when evidence is questionable but calcium hydroxide does not have the disadvantages of TAP [in addition to risk for antibiotic resistance a gerin- gere control of discoloration], it is practical to use calcium hydroxide as a non-antibiotic intravenous medication'. Although the literature reviewed provides

evidence that calcium hydroxide compared with antibiotics increases the risk of root canal calcification, but calcification is not to be considered failure of regenerative therapy nor an obvious risk factor for root canal treatment, according to the working group.

The study group assumes that the costs for both options will be reimbursed and thus not a reason to prefer one or the other. The recommendations on contraindications were taken from European Society of Endodontists position statement (Galler et al., 2016).





# Treatment of necrotic pulp

Guideline for endodontic diagnosis and treatment 2022-2023 - Chapter 7 - pages 118 to 160

**RECOMMENDATION** It is recommended to use hand irrigation with sodium hypochlorite during chemo-mechanical cleaning, preferably after each instrument.

**RATIONALE** The combination sodium hypochlorite + EDTA (and again sodium hypochlorite) is a simple procedure, has good dissolution capacity of organic tissue and is associated with low cost.

**RECOMMENDATION** Do not consider adding laser techniques to chemo-mechanical cleaning.

**RATIONALE** Adding laser techniques to chemo-mechanical cleaning has no additional effect on periapical repair but requires additional costs.

**RECOMMENDATION** Consider a reciprocating or rotary system

**RATIONALE** Both systems differ little or not at all in terms of bacterial reduction and effect on postoperative pain. Reciproke systems require a little less operating time, providing a little more comfort to the patient, and give a little less

cost to the patient. Given the potentially minor or even absent differences, practitioners' familiarity and experience with these systems will play an important role.

**RECOMMENDATION** At the end of chemo-mechanical cleaning, ultrasonic activated irrigation may be considered.

**RATIONALE** Ultrasonic activated cleaning seems to lead to slightly less short-term pain and slightly more healing/reduction of periodontitis apicalis. As for cost, it is variable and need not be an impediment to applying ultrasonic activated cleaning.

**RECOMMENDATION** Removal of the resulting smear layer with EDTA may also be considered.

**RATIONALE** According to the working group, removal of the smear layer provides more cleaning and disinfection of the root canal walls and better adaptation of filling materials to the cavity wall.



**RECOMMENDATION** Consider using epoxy resin-based sealers

**RATIONALE** Although "bioceramic" sealers seem to show slightly more radiographic healing in the short term than epoxy resin-based sealers, nevertheless, more studies are needed to be more certain about their long-term effect before a recommendation can be made, also considering the additional cost of "bioceramic" sealers.

**RECOMMENDATION** Consider performing root canal treatment of a necrotic pulp in one sitting. This may be deviated from when warranted by the presence of pain (emergency), the difficulty of the treatment and/or the patient's wishes.

**RATIONALE** The outcomes of treating in one or more sessions do not seem to differ much, if at all. Most patients prefer treatment in one session.

**RECOMMENDATION** In root canal treatment of a necrotic pulp, consider not using calcium hydroxide as an intra-canal medication.

**RATIONALE** The endotoxin reducing effect of calcium hydroxide as an intra-canal medication seems to be of little importance for the final treatment outcomes. There are significant drawbacks to its use: it is difficult to remove, and residual residue left behind can cause reduced adhesion of the canal filling or composite filling used.

**RECOMMENDATION** During initial root canal treatment of a necrotic pulp or re-treatment with periodontitis apicalis, consider achieving apical clearance to prevent apical blockage.

**RATIONALE** Achieving apical clearance (with a #08 or #10 K file) reduces postoperative pain and may indirectly have a beneficial effect on healing/reduction of apical periodontitis.

**RECOMMENDATION** Antibiotics for the purpose of analgesia should not be administered.

**RATIONALE** Use of an antibiotic as an ineffective form of pain relief should be avoided. Use of an antibiotic as an ineffective form of pain relief should be avoided. This also helps reduce antimicrobial resistance.



## Orthograde re-treatment

Guideline endodontic diagnosis and treatment 2022-2023 - Chapter 8 - pages 161 to 175

No studies were found, insofar as they met the inclusion criteria, that examined the effect of the number of treatment sessions, instrumentation, disinfection protocol or root canal filling material in a comparative observational or experimental study. All included studies aimed to detect prognostic factors for treatment outcome.

**RECOMMENDATION** Inform the patient in whom orthograde re-treatment is being considered, preferably also in writing, of the magnitude of the risk of inadequate healing of periodontitis apicalis.

**RATIONALE** The guideline working group attaches great importance to a well-informed patient.



# Acute complaints and pain management

Guideline endodontic diagnosis and treatment 2022-2023 - Chapter 9 - page 176 t/ 204

The following recommendations apply to patients in whom the complaint-causing tooth has not previously been treated endodontically by a general practitioner or dental endodontist

**RECOMMENDATION** Use of antibiotics in acute complaints related to irreversible pulpitis or symptomatic apical periodontitis and acute apical abscess is not recommended in the context of pain management.

**RATIONALE** The guideline working group gave considerable weight to the finding that an antibiotic is unlikely to be effective as an analgesic and may lead to resistance and over-sensitivity.

**RECOMMENDATION** As part of pain management, consider not using an intracanal medication.

**RATIONALE** Although the use of chlorhexidine and calcium hydroxide as intracanal medications has a beneficial effect on postoperative pain, the study group does not recommend it because of its various disadvantages. For example, calcium hydroxide is difficult to remove, weakens the

dentin in the prolonged presence of an intracanal drug, there is reduced adhesion of the filling material and an unfavorable shift in biofilm may occur.

**RECOMMENDATION** The working group does not recommend cooling irrigants.

**RATIONALE** The Working Group believes that additional measures to provide cooling irrigants are disproportionate to the small effect they might be expected to have on postoperative pain.

**RECOMMENDATION** Use of premedication is not recommended.

**RATIONALE** Premedication seems to be effective only when using relatively 'heavy' analgesics, such as corticosteroids. 'Lighter' agents such as paracetamol and NSAIDs have at least the same effect when given postoperatively.



**RECOMMENDATION** *The working group does not provide a recommendation Regarding mepivacaine.*

**RATIONALE** The working group noted the promising results of mepivacaine (i.c.w. adrenaline) but notes that this drug is not available in the Netherlands. The use of articaine and bupivacaine can be continued.

**RECOMMENDATION** In case of fluctuating swelling, an abscess incision is indicated.

Patients with severe swelling who also have fever and/or swallowing symptoms should be referred to an MKA surgeon immediately for treatment.

**RATIONALE** The proposed incision will quickly reduce pain and swelling and may allow further endodontic treatment to take place at a later stage.

**RECOMMENDATION** As analgesia, in acute symptoms associated with irreversible pulpitis or symptomatic apical periodontitis, paracetamol (with or without an NSAID) may be given.

When this medication provides insufficient pain relief,

the WHO pain ladder can be consulted (see Appendix 2 in Chapter 9 of this guideline).

Use of the combination paracetamol and codeine is not recommended.

**RATIONALE** Paracetamol can be used safely. In severe postoperative pain, there is a reasonable degree of certainty that paracetamol is ineffective and the combination of paracetamol and NSAIDs or NSAIDs alone will provide adequate analgesia. Use of NSAIDs may be contraindicated in patients. The efficacy of the paracetamol-codeine combination has not been demonstrated in clinical studies. The advice regarding paracetamol/NSAIDs and the WHO pain ladder is taken from the NHG standard "Pain."

**RECOMMENDATION** If a previously endodontically treated element is involved

All of the above recommendations and treatment strategies also apply to these. However, the treatment of these elements is more challenging because the old canal treatment will have to be removed first. In such cases, it is worth considering referring the patient to a dental endodontist. If the treatment is not going to be performed immediately, pain relief can also be prescribed in this case.



**RATIONALE** The guideline working group sees no reasons (pathophysiological or practical) why the recommendations formulated in connection with acute complaints in an element not previously endodontically treated should not be applicable for an element that has been previously endodontically treated.



# Permanent and temporary restoration of elements

Guideline for endodontic diagnosis and treatment 2022-2023 - Chapter 10 - pages 205 to 239

**RECOMMENDATION** Inform the patient in whom root canal treatment is being considered that proper coronal closure will affect the outcome of treatment.

**RATIONALE** The guideline working group places great weight on a well-informed patient.

**RECOMMENDATION** In a patient in whom root canal treatment is planned and in whom less than two upright walls are present, consider using a fiberglass post.

**RATIONALE** The working group believes that a fiberglass post can provide additional retention for coronal restoration when insufficient tooth material remains.

**RECOMMENDATION** In a patient in whom root canal treatment is planned and in whom less than half of the coronal tooth tissue is present, consider fabricating a nodule-covering restoration.

**RATIONALE** The guideline working group emphasizes the importance of avoiding fracture of an element/node.

**RECOMMENDATION** For endodontically treated molars with severe tissue loss, consider placing an endocrown or a build-up and conventional crown.

For endodontically treated premolars with severe tissue loss, consider placing not an endocrown but a post buildup with conventional crown.

**RATIONALE** The survival time of an endocrown for molars appears similar to that of a conventional crown, The survival time of an endocrown for premolars appears significantly shorter than that of a conventional crown.

**RECOMMENDATION** For a temporary restoration associated with multiple consecutive appointments, consider using Teflon instead of a cotton ball as an "endodontic spacer," if use of a "spacer" is deemed necessary.

**RATIONALE** The working group attaches importance to the prevention of bacterial growth, thereby reducing the risk of endodontic failure.



# Avoiding and treating complications

Guideline for endodontic diagnosis and treatment 2022-2023 - Chapter 12 - pages 245 to 267

**RECOMMENDATION** Inform the patient of a complication that has occurred.

**RATIONALE** The guideline working group attaches great importance to informing the patient after the occurrence of a complication.

**RECOMMENDATION**

Consider the following factors when deciding whether or not to remove or have removed the aborted instrument:

- position of the aborted fragment;
- cleaning degree of the root canal;
- available resources;
- risk of complications and
- Presence of periapical lesion.

In the following conditions, consider leaving the aborted instrument in situ:

- No periapical radiolucency is visible on the solo recording at the root where the instrument fracture occurred, AND

- The root canal apical to the aborted instrument is sufficiently clean by thorough irrigation prior to instrument fracture, AND
- The fragment is not accessible (located in the apical part of the root canal or beyond the bend).

In all other conditions, removal of the aborted instrument should be considered. This should include the risk of complications; if the aborted instrument is not in the coronal part of the root canal, removal of the fragment will involve tissue loss to make the fragment accessible.

If the practitioner considers himself not competent in removing broken instruments and/or does not have the necessary tools, he should refer the patient to a dental endodontist.

**RATIONALE** The guideline working group attaches great importance to preventing harm resulting from repairing complications.





**RECOMMENDATION** Non-surgical repair of a root perforation using MTA material is preferred. The defect to be repaired should be cleaned.

When the perforation is above bone level, composite or glass ionomer cement is the material of choice.

**RATIONALE** The guideline working group attaches great importance to repairing complications and the correct choice of equipment.

**RECOMMENDATION**

Accident prevention with sodium hypochlorite:

- Identify risk factors such as perforations and resorptions, and
- prevent jamming of the irrigation needle in the root canal.

Treatment in the same session in which accident occurred:

For mild damage (mild pain, swelling <30%, local hematoma, no ulcerations or necrosis), the general practitioner or dental endodontist should:

- explanation to the patient;
- prescribe analgesics, preferably an NSAID to control swelling;
- cool by application of cold compresses or a cold pack to control swelling and

- perform an intra-oral radiograph or OPT to determine the cause of jacking and to aid in further management.

With moderate or severe damage (moderate or severe pain, swelling >30%, diffuse hematoma, intraoral ulcerations, necrosis, airway obstruction or neurovascular damage), the patient should be referred to the MKA surgeon.

Follow-up treatment in the first week after the accident  
For mild damage (mild pain, swelling <30%, local hematoma, no ulcerations or necrosis), the general practitioner or dental endodontist should:

- recommend using warm compresses to stimulate blood flow and
- perform regular monitoring to detect a deterioration in the patient's condition in a timely manner.

Longer-term follow-up treatment

With mild damage (mild pain, swelling <30%, local hematoma, no ulcerations or necrosis) or

After referral back by the MKA surgeon, the general practitioner or dental endodontist should complete the root canal treatment.

Also when completing root canal treatment, use sodium hypochlorite as a root canal irrigant. In



some cases, physiological saline may be chosen in consultation with patient as a root canal irrigant, even though it may adversely affect treatment outcome.

**RATIONALE** The guideline working group attaches great importance to the avoidance of sodium hypochlorite injury, distinguishing between mild on the one hand and moderate or severe on the other, and verifying the correct estimation of the injury level.

**Good practice statements**

As a good practice point\*, the guideline working group emphasizes the importance of always preceding root canal treatment with a diagnosis and inventory of risk factors (such as by determining a DETI score; see Appendix 2 of Chapter 7 in this guideline).

As a good practice point\*, the guideline working group emphasizes the importance of using cofferdam because of the following benefits:

- protection: by using a cofferdam, the chance of aspiration is very small;
- Endodontic treatment with a cofferdam prevents contamination of the work area;
- better visibility of the work area and
- treatment can be carried out more efficiently.

As a good practice point\*, the working group emphasizes the importance of using an augmentation tool because of the following benefits:

- better view of the work area;
- tool for diagnostics and
- better work attitude.

As a good practice point\*, the working group recommends the following:

- Inform the patient prior to treatment about the prognosis of endodontic treatment and the possible effect of preoperative status on it.
- Keep in mind that the following factors can have a negative effect on the healing of periodontitis apicalis:
  - filling of the root canal more than 2 mm away from the radiographic apex ending;
  - gross overfilling;
  - voids.

\* A good practice point is considered important for good dental practice for which, however, significant evidence may be lacking.