

ZZQ

AGENCY FOR QUALITY

IN DENTISTRY

a unit of the Institute of

German Dentists

GUIDELINE

Apical surgery

Short version February 2009

WHAT ARE GUIDELINES?

Guidelines are systematically developed aids to decision-making concerning the medical or dental procedures appropriate for preventive measures and specific health problems. They constitute a consensus among a number of experts from various disciplines and/or working groups arrived at by a defined process that has been made as transparent as possible. Rather than rigidly prescribed directives, they are guides, or “corridors for action and decision”, for the safeguarding and improvement of healthcare, as well as instruments of quality assurance and quality management. They are intended to minimize the risks of treatment and to provide the motivation for a scientifically based medical approach, while at the same time taking account of patient needs and attitudes. Guidelines are drawn up in accordance with the latest state of medical knowledge without regard to the current extent of benefits offered by individual insurance systems.

Another function of guidelines is to evaluate the current status of knowledge in relation to specific health problems and medical action. They also serve for resolving conflicting views and for weighing the advantages of a given procedure against the risk of harm. In addition, a guideline should specify its aims, the significance of the health problem in question and the relevant target group.

The systematic gathering and collation of the available literature for the compilation of a guideline takes due account of the current levels of published (scientifically validated) evidence.

Finally, guidelines serve to answer the following questions: What is necessary and reasonable? What is superfluous? What is obsolete?

CLASSIFICATION OF EVIDENCE LEVELS (FROM AWMF 2001, MODIFIED)

CRITERION	TYPE OF EVIDENCE
I	Evidence based on meta-analyses of randomized controlled studies Evidence based on one randomized controlled study
II	Evidence based on at least one well-designed controlled study without randomization Evidence based on at least one well-designed quasi-experimental study
III	Evidence based on well-designed non-experimental descriptive studies (e.g. cross-sectional studies)
IV	Evidence based on reports or opinions of groups of experts, consensus conferences and/or clinical experience of recognized authorities or on case studies

A classification by recommendation levels is arrived at on the basis of the above criteria by a consensual process involving all parties concerned; in this process, account must be taken of such considerations as patient preferences, clinical relevance and feasibility of application in the routine medical situation. The recommendation levels are:

A Strong recommendation **B** Recommendation **O** Recommendation open / specific-case appraisal of relative benefits

Apical surgery

1. INTRODUCTION

1.1 Reasons for attribution of priority

The compilation of a guideline on apical surgery (AS) has become a matter of urgency for the following reasons:

- Prevalence of the clinical problem and frequency of the operation
- Discrepancy between published success rates and actual endodontic status as documented in epidemiological studies. No epidemiological data currently exists on actual post-AS status
- Clinically relevant complications of apical surgery
- Clinically relevant complications of chronic apical periodontitis
- Uncertainty concerning the indications for adjuvant surgery of apical periodontitis

1.2 Users of the Guideline

Dentists in general, dentists specializing in endodontology and periodontology

Dentists working in the field of oral surgery

Medical practitioners – in particular, those specializing in oral and maxillofacial surgery

1.3 Situations not covered by the Guideline

The following are beyond the scope of this Guideline:

- Differential indications for apical surgery vs. prophylactic tooth extraction for higher-level medical reasons, e.g. in patients receiving radiotherapy, chemotherapy or immunosuppressive treatment
- Situations where biopsy and histological diagnosis are indicated if the patient's history or clinical or radiological examination suggests the existence of periradicular osteolysis of non-dental origin

2. DEFINITIONS

Apical surgery denotes surgical shortening of the root apex after access through the bone has been gained by osteotomy with or without simultaneous root filling, whether or not accompanied by retrograde sealing. The aim of the overall procedure is to seal the root canal against the entry of bacteria at the resected surface. Apical surgery is not a substitute for exact root canal treatment.

The therapy is directed principally towards healing existing periapical pathology (apical periodontitis or a cyst) and hence preservation of tooth function.

3. AIMS OF THE GUIDELINE

The Guideline is intended mainly to set out the indications for and risk factors involved in apical surgery and the currently recognized methods of performing the procedure. Another aim of the Guideline is to help the professional groups mentioned above and their patients to decide on the appropriate therapy (whether purely conservative or endodontic/surgical) for periapical lesions.

Hence the overriding aim of the Guideline is to improve the quality of care for the relevant group of patients by minimizing possible complications due to:

- a. failed primary orthograde endodontic treatment or retreatment, or
- b. avoidable surgical/endodontic treatment.

4. SYMPTOMS

Some typical clinical and radiological symptoms of apical periodontitis are as follows:

- Lack of response to a thermal or electrophysiological sensitivity test
- Pain and sensation of pressure, whether local or radiating to other facial regions
- Fistulation, whether intraoral or extraoral
- Acute exacerbation with local or regional abscess formation
- Horizontal and vertical sensitivity to percussion
- Periodontal space widening/periradicular radiolucency

5. EXAMINATIONS

5.1 Examinations required for decision on treatment

- Inspection and probing for clinical assessment of continued tooth viability
- Percussion test and palpation of periapical region
- Sensitivity test on affected tooth and neighbouring teeth

- Complete radiological examination of tooth including periapical radiolucency and imaging of relevant surrounding anatomical structures, possibly including comparison with earlier images to assess progress of condition

5.2 Additional examinations helpful in specific cases

- Determination of specific periodontal parameters
- Sensitivity test (lingual and inferior alveolar nerves)
- Biopsy in the case of pathological changes
- Eccentric radiography
- Radiography in a second plane or where appropriate computer tomography or DVT for differential diagnosis of large-scale pathological changes extending beyond the periapical region
- Exploratory drilling of tooth
- Chemical laboratory tests (e.g. of clotting parameters) in the event of comorbidities

6. THERAPEUTIC OPTIONS FOR PERIAPICAL LESIONS

6.1 Conservative endodontic therapy

- Orthograde root canal treatment
- Retreatment of an existing root filling

6.2 Surgery

- Apical surgery with additional sealing of the endodontic system (root canal filling). The endodontic system may have been sealed before surgery, or orthograde or retrograde sealing or a combination of the two may be carried out during surgery.

In exceptional cases:

- Hemisection or root amputation
- Intentional tooth reimplantation
- Cortical trephination

6.3 Supplementary measures

- Bacteria-tight tooth crown restoration capable of withstanding static and dynamic chewing forces
- Accompanying antibiotic therapy in patients at increased local or general risk

6.4 Alternative forms of therapy

- Extraction
- Extraction and prosthetic treatment
- Antibiotic treatment as minimum therapy for inoperable patients

7. RISK FACTORS

Apical surgery may present an increased risk and/or be less likely to succeed in the following cases in particular:

- Acute current signs of infection or fistulation
- Root anomalies
- Projection of inferior alveolar nerve to root apex or its immediate vicinity
- Close proximity to neighbouring teeth
- Persistent apical periodontitis after prior apical surgery
- Advanced marginal periodontal pathologies, especially in the event of apicomarginal or tunnelling defects
- Broken endodontic instruments
- Root perforation during root canal treatment
- Poor-quality root filling not amenable to retreatment
- Severe comorbidities in the patient
- Major bone defect, e.g. due to a cyst
- Internal resorption
- Root canal obliteration
- Wound healing risk factors due to general or local disturbances of bone regeneration (radiotherapy, chemotherapy, medication such as bisphosphonates, metabolic disorders, immunosuppression)

8. COMPLICATIONS

Besides general perioperative manifestations such as bleeding, swelling and pain, the following typical complications of apical surgery are possible:

- Persistent infection with clinical and/or radiological symptoms
- Post-operative infections
- Continuity between marginal and apical periodontitis
- Root fracture
- Damage to sensitive branches of the trigeminal nerve
- Damage to neighbouring teeth
- Luxation of root apex into maxillary sinus, nasal cavity, floor of the mouth or a nerve canal
- Osteonecrosis
- Partially retained root

9. RECOMMENDATIONS

9.1 Recommendations concerning indications for treatment

The methodological quality of the existing studies on differential indications for AS is low. In particular, with regard to the decision to undertake endodontic treatment alone or AS, only isolated prospective randomized comparative studies are available. However, the treatment methodologies used in these studies do not consistently conform to present-day standards. The following recommendations as to the indications for AS can be deduced from the available data:

9.1.1 Indications for AS:

- Persistent apical periodontitis with clinical symptoms or increasing radiologically visible osteolysis after complete or incomplete root canal filling or retreatment, if this cannot be eliminated or improved or if elimination or improvement would involve disproportionate risk (e.g. if complicated prostheses or root pins are present). Regression or resorption observed radiologically may in this case take a number of years. **A**
- Following overfilling of the root canal where material has been extruded through the apex and where clinical symptoms are present or if neighbouring structures (e.g. maxillary sinus or mandibular canal) are affected. **A**
- Where conservative root canal treatment is not feasible or if complete root canal filling is precluded by abnormal root morphology. **A**
- Teeth with an obliterated root canal preventing instrumental access, in the case of clinical and/or radiological symptoms. **A**

9.1.2 Possible indications for AS

- For apical periodontitis as an alternative to conservative endodontic treatment, especially with a periapical index of >3 or an apical lesion measuring not less than 4-5 mm. **B**
(Notwithstanding this consensus recommendation, the representatives of the endodontology societies advise that conservative endodontic treatment alone be attempted even in the case of a periapical index of >3.)
- For persistent apical periodontitis as an alternative to conservative endodontic retreatment. **B**
(For retreatments too, notwithstanding this consensus recommendation the representatives of the endodontology societies advise that conservative endodontic treatment alone be attempted first.)
- Where a root canal instrument has broken close to the apex and orthograde removal is not possible. **B**
- A false or complex canal system at the apical foramen that is not amenable to orthograde sealing. **B**

- Fractures in the apical third of the root, especially if the apical fragment or the fracture itself is infected or if the coronal fragment can be treated only by retrograde filling. **B**
- Persistent pain symptoms even after clinically and radiologically perfect root canal filling, in order to eliminate a possible cause of the pain. However, endodontic retreatment should always be preferred in this situation. **Q**
- If root apices are exposed or injured during surgery (e.g. cyst removal or biopsy). **B**
- Persistent apical periodontitis in teeth that have already undergone surgery. **B**
In the case of persistent apical periodontitis without clinical symptoms but where regression or resorption of the lesion has not been observed radiologically, it should be noted that this may take several years.

9.2 Recommendations on the conduct of surgical measures

9.2.1 Outpatient/inpatient treatment; general anaesthesia

Outpatient treatment with local anaesthesia is as a rule feasible. The use of other methods of pain prevention (such as analgesic sedation or general anaesthesia) depends on the overall extent of the surgical procedure, on the patient's cooperation, on known risk factors (see Section 7) and – taking account of both these and general medical criteria – on patient preference. Inpatient treatment may be indicated in the case of serious general pathology or unusual surgical situations. **B**

9.2.2 Technique and materials

The specific techniques of apical surgery and the materials used are subject to constant further development. Generally applicable recommendations cannot be given in the present state of our knowledge. **Q**

9.2.3 Adjuvant therapy

The scientific evidence in favour of perioperative systemic antibiotic or antiphlogistic treatment is currently inconclusive. A generally applicable recommendation cannot therefore be given. **Q**

9.2.4 Specific surgical situations and diagnostic constellations

For specific situations (comorbidities such as heart valve replacement), reference should be made to the relevant guidelines or links (see also Section 11 of this Guideline).

10. REFERENCES

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11. RELEVANT SCIENTIFIC OPTIONS (in German only):

<http://www.dgzmk.de> under Wiss. Leitlinien / Leitlinien / aktuelle Leitlinien

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12. WHERE TO FIND FURTHER INFORMATION

The complete Guideline on apical surgery (in German), based on systematic evaluation of the relevant medical literature and four expert conferences, together with a list of references, can be found on the website of the Agency for Quality in Dentistry:

www.zzq-koeln.de under **Schwerpunkte/Leitlinien**

13. UPDATE RECOMMENDATIONS

This Guideline will be updated in 2012.

14. AUTHORS

The Guideline was drawn up on behalf of the German Society of Dental, Oral and Craniomandibular Sciences (DGZMK) and the Agency for Quality in Dentistry (zzq).

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The following professional societies and associations took part in the consensual process:

Deutsche Gesellschaft für Zahn-, Mund- und Kieferheilkunde [German Society of Dental, Oral and Craniomandibular Sciences] (DGZMK)
 Deutsche Gesellschaft für Zahnerhaltung [German Society for Conservative Dentistry] (DGZ)
 Deutsche Gesellschaft für Zahnärztliche Prothetik und Werkstoffkunde [German Society for Dental Prosthetics and Materials Science] (DGZPW)
 Arbeitsgemeinschaft für Kieferchirurgie in der DGZMK [DGZMK Working Group on Maxillomandibular Surgery]
 Arbeitsgemeinschaft Endodontologie & Traumatologie der DGZ [DGZ Working Group on Endodontology and Traumatology]
 Arbeitskreis Oralpathologie und Oralmedizin [Working Party on Oral Pathology and Oral Medicine]
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