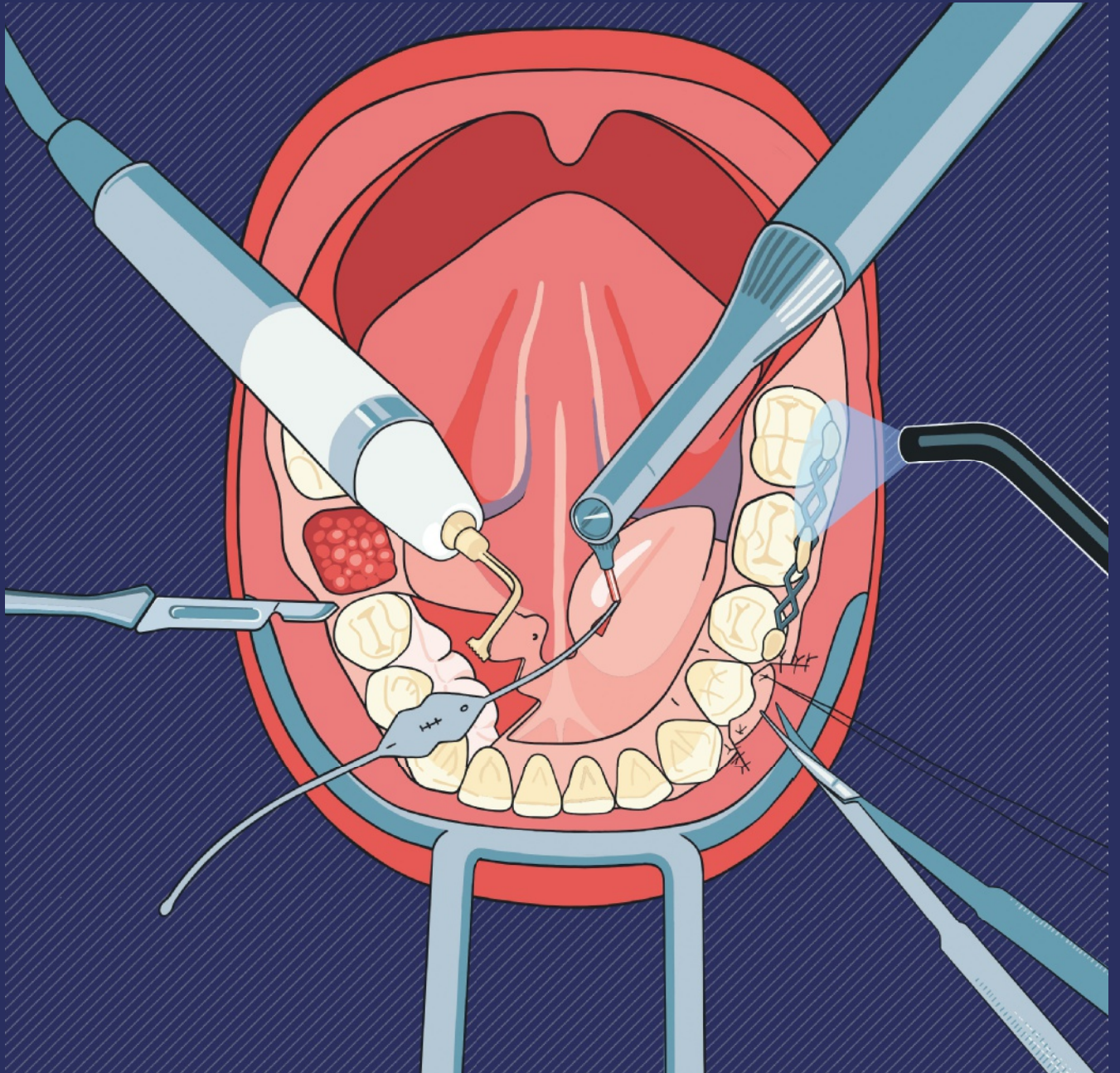


Andreas Filippi | Fabio Saccardin | Sebastian Kühl (eds)

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# ADVANCED ORAL SURGERY



Andreas Filippi | Fabio Saccardin | Sebastian Kühl (eds)



# ADVANCED ORAL SURGERY

With contributions by:

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Jürgen Wallner, Wolfgang Zemann

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## Preface



Our book *Basic Oral Surgery* was published in late 2022. It became clear even during the creation of that first volume that if that book was about “basic” oral surgery, there would need to be a successor. And so we set about creating this book, *Advanced Oral Surgery*, the content and scope of which is based on advanced training programs and the range of clinical advanced training in oral surgery provided by university departments. The book is aimed at our advanced oral surgery colleagues who frequently perform oral surgery procedures in their practices and want to update or develop their skills as well as current and prospective specialists in oral and maxillofacial surgery.

Like the first volume, *Advanced Oral Surgery* is not designed as a textbook but as an atlas. Particularly in the clinical chapters, the theoretical content is outlined in short passages of text that all follow a similar structure: indications, contraindications, step-by-step clinical procedures, and postoperative course, together with just a few relevant literature references. These chapters come to life in the series of photographs in the book and the videos linked via QR codes, which can be viewed very easily and almost instantaneously on any up-to-date smartphone or tablet. This significantly expands the scope and value of the book beyond mere static images. We hope that as a result our book



The editors in the operating room at the dental clinic in Basel before surgery (from left to right): Fabio Saccardin, Andreas Filippi, and Sebastian Kühl.

## Preface

will give practitioners more confidence before, during, and after oral surgery interventions. Some redundancies in the content as well as a few contradictory statements by the team of authors drawn from three nations are intentional on the part of the editors.

Our special thanks again go to everyone who has been involved in the creation of this second volume: our co-authors Stephan Acham, Daniel Baumhoer, Michael M. Bornstein, Thomas Connert, Dorothea Dagassan-Berndt, Henrik Dommisch, Tobias Fretwurst, Mathieu Gass, Norbert Jakse, Ronald E. Jung, Georgios Kanavakis, Adrian Kasaj, Khaled Mukaddam, Katja Nelson, Puria Parvini, Michael Payer, Martina Schriber, Michael Schwaiger, Frank Schwarz, Bernd Stadlinger, Frank Strietzel, Silvio Valdec, Carlalberta Verna, Jürgen Wallner, and Wolfgang Zemann.

Our thanks also go to Sabrina Peterer for the cover image, which continues the style of the iconic covers of books by Andreas Filippi; Anita Hattenbach from Quintessence Publishing, Andreas Filippi's favorite editor for her ever-reliable, incredibly pleasant, and highly professional editing (and that is compared with all the other publishers with whom Andreas Filippi has previously worked); and to all the staff involved at Quintessence Publishing in Berlin.

Finally, thank you to all our colleagues at our really fantastic Department of Oral Surgery at UZB in Basel for your support, your motivation, and your dedication. It is tremendously enjoyable to work with all of you every day.

Andreas Filippi, Fabio Saccardin,  
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# Apicoectomy



Sebastian Kühl, Andreas Filippi

### Indications

An apicoectomy is indicated if an apical event in the form of apical periodontitis or a radicular cyst cannot be explored and hence treated via coronal root canal access (Fig 10-1). This is generally the case when, for example, a tooth root is fitted with a pin that cannot be removed for endodontic retreatment (orthograde access) (Fig 10-1). An apicoectomy may also be indicated, however, if success is not achieved despite endodontic retreatment (Fig 10-2) or there is a recurrence after the apicoectomy has been carried out (Fig 10-3). In this situation, the cause might lie in the apical delta, which the clinician is trying to eliminate by performing the apicoectomy<sup>4</sup>, or in recurrences which might have originated from an insufficient orthograde or retrograde filling or an inadequate restoration (see Fig 10-3). In the case of multirooted teeth, it is justifiable to resect the affected root alone. A study showed that only 8.1% of nontreated roots displayed radiographic signs of apical periodontitis after 5 years<sup>2</sup>.

### Contraindications

Absolute contraindications mainly arise from the general medical history when patients cannot undergo surgery due to their general state of health (e.g. undergoing chemotherapy or diagnosed with terminal-stage cancer). Provisional triple anticoagulation that will be switched to bi- or monotherapy in the foreseeable future is an example of a temporary contraindication. Local infections may also be regarded as a temporary contraindication because an adequate depth of anesthesia during the surgical procedure might not be achievable. An apicoectomy is contraindicated if the tooth root exhibits a longitudinal fracture in the case of advanced marginal periodontitis or a complex

periodontal-endodontic lesion. In this situation, the tooth must be extracted.

### Specific risks

The specific risks arise from the nature of the procedure and the patient's specific anatomy. In this regard, it is important to preserve vital neighboring structures such as the mental nerve in the mandibular premolar region or the inferior alveolar nerve in the molar region. Making a mistake regarding which root requires treatment due to a lack of orientation is another risk, which must be absolutely avoided. In the maxillary posterior region, there is a risk of perforation of the maxillary sinus and consequently displacement of the resected root apex into the sinus (Fig 10-4). Most inflammatory processes are associated with increased blood flow. Hence, slightly increased local bleeding is not uncommon, especially at the start of an apicoectomy, but this bleeding can usually be stopped effectively. Furthermore, as with any surgical procedure, the general risks in the form of pain, swelling, wound infections, and bleeding have to be accepted.

### Step-by-step clinical procedure

In the maxilla, it is advisable to inject local anesthetic into the vestibule mesial and distal to the root apex being resected<sup>1</sup>. Intraoperative bleeding can be reduced with the use of a vasoconstrictor (adrenaline/epinephrine 1:100,000), which optimizes the overall view and the working of materials used for retrograde sealing of the neo-apex. In addition, palatal infiltration anesthesia should be carried out because the infection will frequently have extended so far palatally that painless removal of granulation tissue by curettage or enucleation of the cyst





**Fig 10-1** Apical periodontitis in the form of an apical radiolucency. Orthograde access to the apex is not possible due to a post and core.



**Fig 10-2** Despite endodontic retreatment of the maxillary right central and lateral incisors, the apical radiolucency is unchanged after 6 months.



**Fig 10-3** Despite a root canal filling and a previously performed apicoectomy, the apical radiolucency has not diminished and there are clinical symptoms (pain and fistula).



**Fig 10-4** As a result of the anatomical proximity to the maxillary sinus, there is a risk in the maxillary posterior region of displacing the resected root apex into the maxillary sinus.

in this area is not possible without palatal local anesthesia.

In the mandible, a distinction must be made between the anterior and posterior regions. In the mandibular anterior region, it is usually enough to inject local anesthetic into the vestibule mesial and distal to the apex being resected, and additionally carry out lingual infiltration anesthesia<sup>1</sup>. In the mandibular posterior region, especially the molar region, a nerve block of the inferior alveolar nerve is additionally indicated in order to achieve adequate freedom from pain. Despite the nerve block, mesial and distal infiltration into the vestibule is also required in order to adequately anesthetize the mucosa and create bloodless conditions at the surgical site. Once again, it is advisable to use a local anesthetic with a vasoconstrictor (adrenaline/epinephrine 1:100,000).

The incision is made after local anesthesia has taken place. The incision path and access are dictated by the localization of the apex being resected. In principle, the incision should be intrasulcular in the region of the root being

resected, and a vertical releasing incision should be placed at the line angle of the neighboring tooth (Figs 10-5 and 10-6). For esthetic reasons, this vertical releasing incision should be made as distally as possible in the anterior region, whereas in the posterior region it should be made to the mesial neighboring tooth for reasons of visibility (Fig 10-7). After a mucoperiosteal flap has been raised, the root apex is located and exposed with round burs (Figs 10-8 and 10-9, Video 10-1).

This is followed by a resection of the root of about 3 mm using diamond or tungsten carbide burs (Fig 10-10). A bevel toward the vestibular aspect should be avoided or reduced to a minimum (< 20 degrees)<sup>8</sup>. Any apical soft tissue (cyst or granulation tissue) should be curetted at the latest after the resection of the root tip. The part of the root now visible is stained with methylene blue (Fig 10-11) in order to exclude a longitudinal fracture. In principle, magnifying aids (ideally an operating microscope or endoscope, see Section 2) should be used for every apicoectomy because they have a great influence on treatment outcome<sup>5,6</sup>.

## 10 Apicoectomy



**Fig 10-5** An intrasulcular incision is made in the anterior region and a vertical releasing incision is made in the distal third of the neighboring tooth for esthetic reasons.



**Fig 10-6** After raising the mucoperiosteal flap.




**Fig 10-7** In the posterior region, the releasing incision is made to the mesial neighboring tooth because it aids visibility and the esthetic demands are lower.



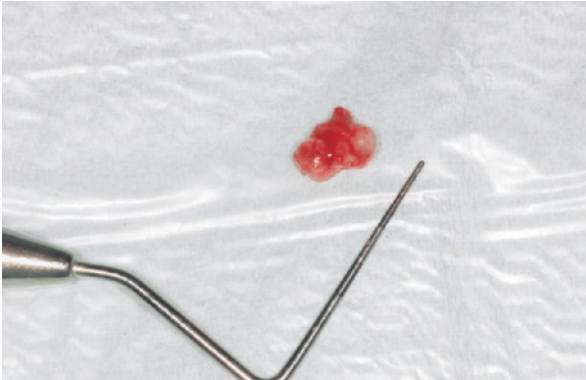
**Fig 10-8** The root apex is exposed with a rose bur.



**Fig 10-9** Exposed root apices.



**Video 10-1** Apicoectomy with retrograde filling.



**Fig 10-10** The root tip is resected at least 3 mm from the apex (the same patient as in Fig 10-7).



**Fig 10-11** A loose retrograde filling is revealed as the cause of recurrence. The lack of tightness is very clearly highlighted by the methylene blue.



**Fig 10-12** Retrograde cavity preparation by piezoelectric surgery.



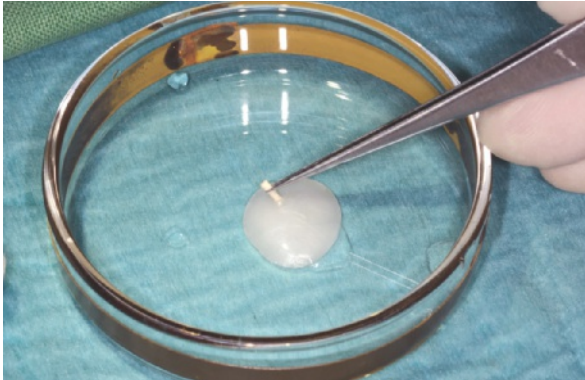
**Fig 10-13** Diamond-coated piezoelectric surgery insert for retrograde preparation of the cavity.

With the aid of special diamond-coated piezoelectric surgery inserts (see Section 4), retrograde preparation of a cavity along the root canal can be carried out (Figs 10-12 and 10-13). For guidance, it is helpful to orient the tip of the piezoelectric surgery insert in the direction of the incisal edge or occlusal surface of the tooth. The retrograde cavity should then be 3-mm deep, if possible. Where there are orthograde-positioned posts extending into the apical third of the root, the cavity is prepared as far as the post.

The smear layer, an abrasion film of hydroxyapatite-collagen detritus that arises with any kind of preparation, is removed with chelate-forming substances such as pH-neutral 25% ethylenediaminetetraacetic acid (EDTA; PrefGel®, Straumann). For this purpose, sterile absorbent points are cut into 4- to 5-mm-long pieces, which are then coated to carry the EDTA and inserted into the retrograde cavity (Figs 10-14 to 10-16). This is allowed to take effect for 1 minute, and then the gel is rinsed off with sterile isotonic saline.



## 10 Apicoectomy



**Fig 10-14** Coating the cut-to-size sterile absorbent point with ethylenediaminetetraacetic acid (EDTA; PrefGel®).



**Fig 10-15** The prepared sterile absorbent points used to apply the EDTA can be tailored to any shape.



**Fig 10-16** The sterile absorbent points are inserted into the retrograde cavity to apply the EDTA.



**Fig 10-17** A paper point is used to dry the retrograde cavity.

The same short absorbent points are used to dry the retrograde cavity before and after conditioning (Fig 10-17).

What are known as hydraulic silicate cements (HSCs) are employed nowadays as retrograde filling material. This group of products is biocompatible and offers excellent tightness and setting properties in the humid environment. However, they are difficult to handle because they must be neither too fluid nor too solid when mixed. Special syringe systems (e.g. the MAP System, PD Dental) have proved useful for

application into the retrograde cavity (Figs 10-18 and 10-19). During the surgical procedure, all the working steps should be checked with a magnifying aid (ideally an operating microscope or endoscope, see Section 2) (Figs 10-20 to 10-26).

Before wound closure, the resection cavity is cleaned and thoroughly flushed with sterile isotonic saline (Fig 10-27). Wound closure in the area of the releasing incision involves the use of interrupted sutures (Figs 10-28 and 10-29). Suture material with a 4-0 or 5-0 diameter should be used here, if possible. The papillae are



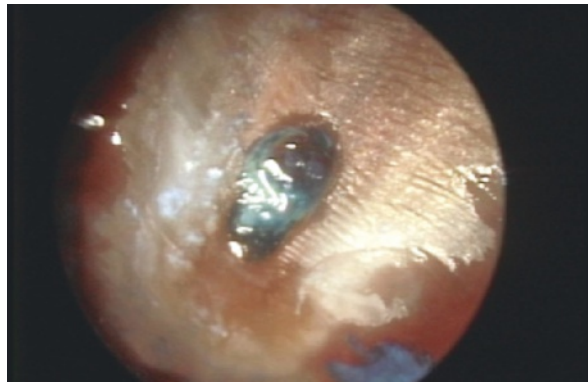
**Fig 10-18** Introducing the hydraulic silicate cement (HSC) in a retrograde fashion with a special syringe system.



**Fig 10-19** Applying the HSC using a special syringe system.



**Fig 10-20** Inadequate root canal filling visible with an endoscope.

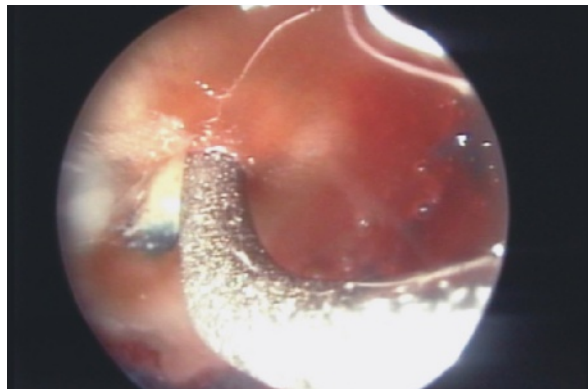


**Fig 10-21** After staining with methylene blue, the insufficiency of the root canal filling is visible with an endoscope.

fixed using vertical mattress sutures and a 3-0 diameter suture material. For tunneling defects with bicortical bone destruction, it is advisable to treat the defect by means of resorbable membranes for guided tissue regeneration<sup>7</sup>.

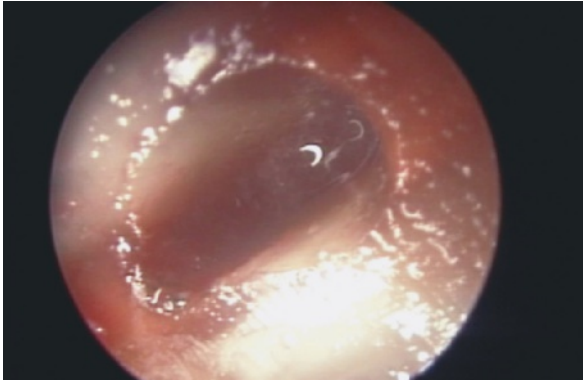
## Postoperative controls and course

A single-tooth radiograph should be performed to document the procedure immediately after



**Fig 10-22** Endoscopic image of the retrograde preparation by piezosurgery.

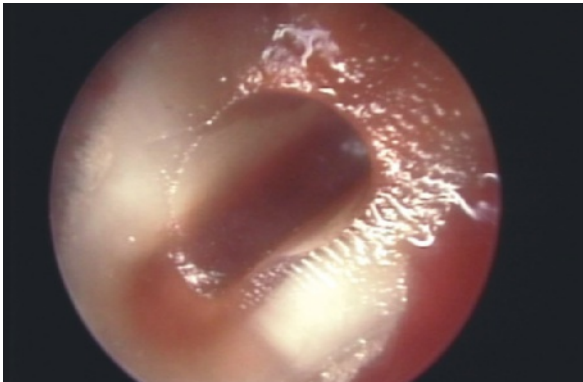
## 10 Apicoectomy



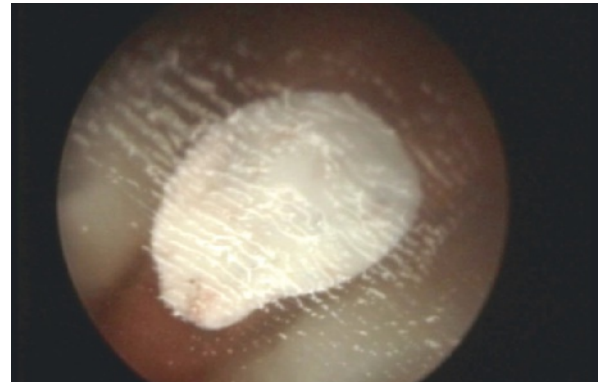
**Fig 10-23** Endoscopic image of the mechanically cleared neo-apex shortly before it is decontaminated.



**Fig 10-24** Endoscopic image of the absorbent points coated with EDTA for decontamination.



**Fig 10-25** Endoscopic image after the neo-apex has been dried.



**Fig 10-26** Endoscopic image after filling with HSC.



**Fig 10-27** Situation after wound cleansing and irrigation with sterile isotonic saline prior to wound closure.



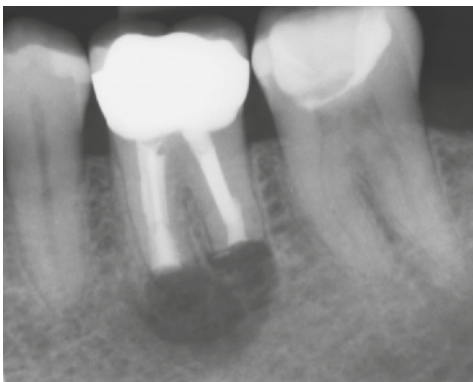
**Fig 10-28** Interrupted sutures used to close the releasing incision, and vertical mattress sutures used for the papillae.



**Fig 10-29** Situation after wound closure.

surgery or a few days later and should be used as a reference to check the course of progress and to assess the outcome (Figs 10-30 and 10-31). Recalls for surgical procedures usually take place on the second day postoperatively (Figs 10-32 and 10-33). During the check-up, the wound can be disinfected with 1% hydrogen peroxide or with povidone iodine solution. It is important to encourage patients to maintain their habitual hygiene measures after the procedure and to clean the wound area with a relatively soft

toothbrush. The sutures are generally removed after a week (Figs 10-34 and 10-35). A clinical and radiographic check-up takes place 1 year after the apicoectomy (Figs 10-36 to 10-39). If the tooth is fitted with a provisional restoration, a clinical and radiographic check-up is recommended after 6 months. Freedom from clinical symptoms once the intervention-related complaints have subsided as well as radiographic consolidation define the success criteria for apicoectomies (Figs 10-40 and 10-41).



**Figs 10-30 and 10-31** Single-tooth radiographs immediately after surgery.

## 10 Apicoectomy



**Fig 10-32** Recall 2 days after apicoectomy.



**Fig 10-33** Slight plaque accumulation 2 days post-operatively.



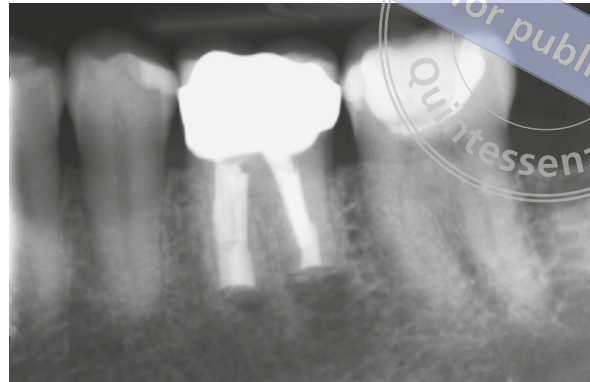
**Fig 10-34** Recall after 1 week, at the time of suture removal.



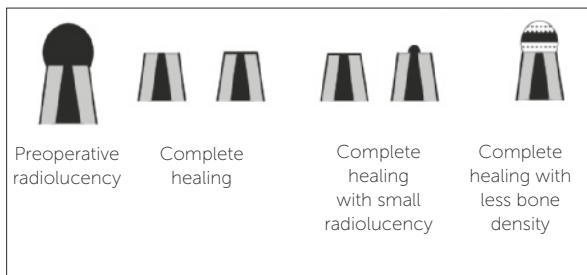
**Fig 10-35** Situation 1 week after apicoectomy.



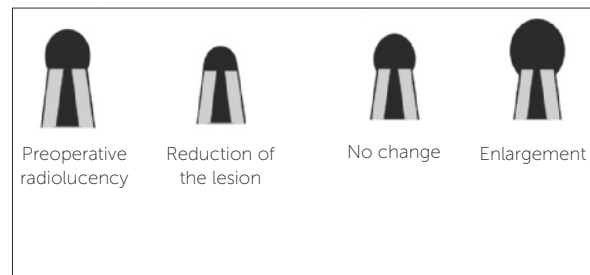
**Figs 10-36 and 10-37** Clinical views 1 year after apicoectomy.



**Figs 10-38 and 10-39** Control radiographs 1 year after apicoectomy.



**Fig 10-40** Possible radiographic findings assessed as treatment success 1 year after apicoectomy (adapted from Molven et al<sup>3</sup>).



**Fig 10-41** Possible radiographic findings assessed as treatment failure 1 year after apicoectomy (adapted from Molven et al<sup>3</sup>).

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