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The chicken or the egg? Periodontal-endodontic lesions*



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Because of the shared root and anatomically predetermined connection paths between the periodontium and the endodontium, a bacterial infection originating in one of these tissues may transfer to the other. The long-term prognosis after treatment of perio-endo lesions is determined by correct primary diagnosis and careful endodontic treatment, followed by periodontal treatment if necessary.

■ Introduction

The classification of periodontal disorders by the American Academy of Periodontology, 1999¹, contains 'periodontitis in connection with endodontal lesions' (commonly referred to as perio-endo lesions) as one of the total of eight disorder groups. This is understood to mean pathological disorders that can be determined, clinically or through the use of radiographs, to be common to both the periodontium and the endodontium of a tooth.

■ Clinical images

Perio-endo lesions are often initially not clinically visible or are accompanied by non-specific discomfort, such as sensitivity when biting. Sometimes this may lead to fistula formation (Fig 1a) or an abscess.

The diagnosis of perio-endo lesions often results from coincidental findings, e.g. due to conspicuous radiograph results and in particular due to significantly increased exploratory depths at one particular aspect of a tooth (Fig 1b).

■ Microbiological aspects

Periodontal and endodontal bacterial disorders are anaerobic mixed infections. In general and also in particular cases, it has been possible, time and again, to find extensive bacterial colonisation of periodontal pockets and infected root canals²⁻⁴.

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Fig 1 Clinical images of a perio-endo lesion.



Fig 1a Tooth 46: marginal vestibular fistula.

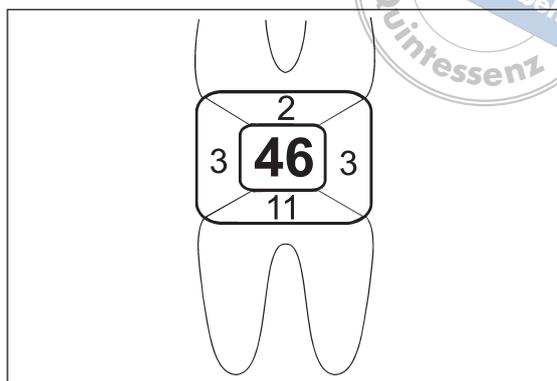


Fig 1b Tooth 46: localised, significantly increased exploratory depth.

■ Connecting paths between the periodontium and the endodontium

The periodontium and endodontium develop with a shared root, which results in numerous communication channels, which may lead to the spread of pathological disorders⁵.

The most well known connection is in the area of the apical foramen. Using the apical foramen, an infection of the endodontium is able to produce lesions in the desmodont. It is also able to form a fistula pathway that provokes drainage via the marginal periodontium. Conversely, advanced periodontitis, which has reached the apex and the vascular-neural connection, can provoke an infection of the endodontium (retrograde pulpitis).

Additional connecting paths exist via the side canals in the lateral root area⁶ and in the molars via so-called pulp-periodontal canals, which flow into the furcation area⁷.

Communication channels also exist via exposed dentine canals. These may be in the enamel-cement border area, which houses approximately 10% of the teeth in a cement-free intermediate zone. However, connections between the periodontium and the endodontium may also exist via open dentine canals when instruments have been used on the root surface.

Alongside these anatomically predetermined paths, the formation of non-physiological connections, e.g. by means of root perforations or vertical root fractures⁸, is also possible.

■ Classifications

Both the classic arrangement according to Simon et al⁹ and the classification according to Mutschelknauss¹⁰ and Guldener¹¹ essentially differentiate between three groups:

- Primary endodontal lesions with secondary periodontal involvement (Fig 2)
- Primary periodontal lesions with secondary endodontal involvement (Fig 3)
- 'Truly' combined lesions, i.e. the periodontium and the endodontium are diseased independently from each other (Fig 4).

■ Clinical and radiographic results (Table 1)

Differential diagnosis is particularly important with regard to the prognosis of teeth with perio-endo lesions. Characteristic results and, in particular, combinations of results make classification easier. Whereas the sensitivity inspection of teeth that are primarily periodontally diseased is generally positive, the result for teeth that are primarily endodontally diseased is generally negative or unclear. It should therefore be considered that a partial infection or necrosis may already exist, in particular in the case of multi-rooted teeth and also where the pulp has a positive reaction.

Unlike teeth with periodontal-related lesions, teeth with endodontic-related lesions mainly feature extensive restorations. In contrast to teeth with endodontal lesions, periodontal lesions are often vis-

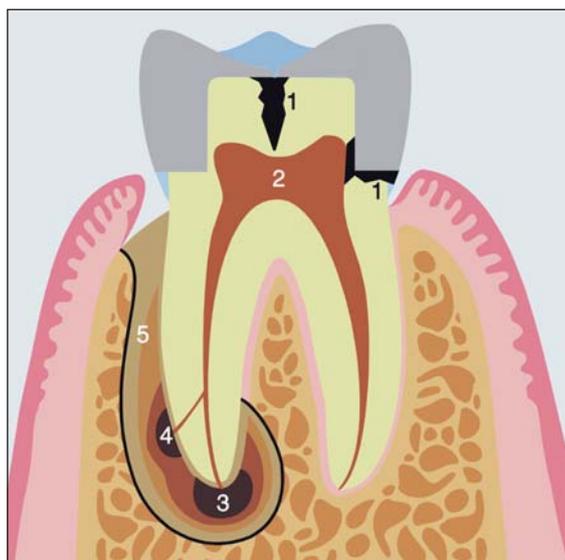
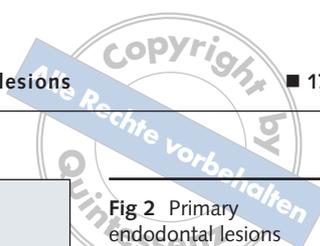


Fig 2a Apical foramen and side canal as the connecting path. 1 = primary caries, secondary caries or grinding trauma; 2 = devitalised pulp; 3 = endodontal cause of apical bone loss; 4 = endodontal cause of lateral bone loss; 5 = increasing osteolysis.

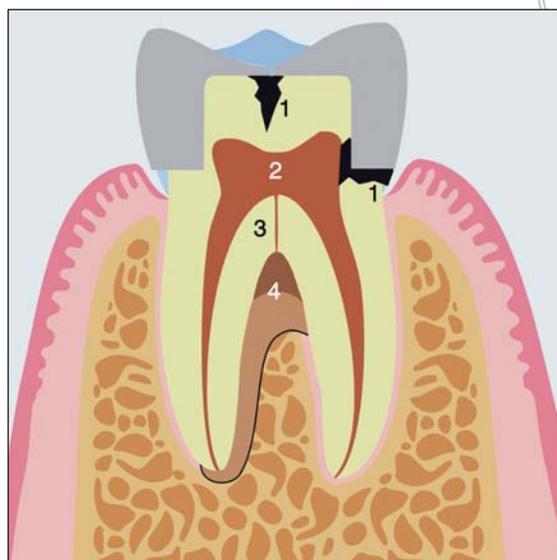


Fig 2b Pulp periodontal canal as the connecting path. 1 = primary caries, secondary caries or grinding trauma; 2 = devitalised pulp; 3 = pulp periodontal canal; 4 = endodontal cause of bone loss in the furcation.

Fig 2 Primary endodontal lesions (according to Hauelsen et al¹²).

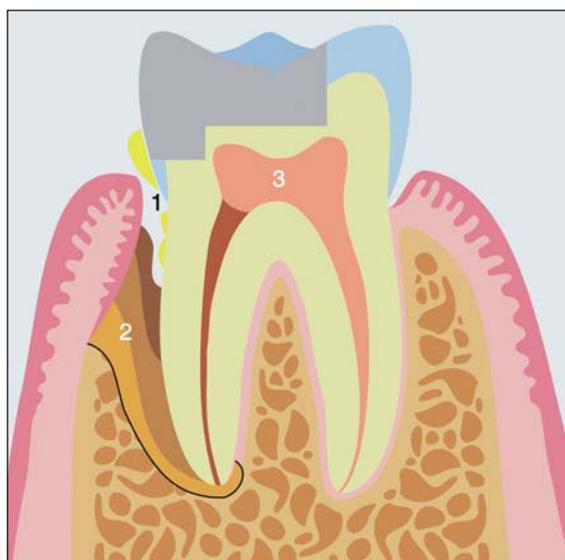


Fig 3 Primary periodontal lesion – apical foramen as the connecting path. 1 = supragingival and subgingival plaque; 2 = periodontal cause of bone loss; 3 = condition of pulp is vital, partly vital, devitalised (according to Hauelsen et al¹²).

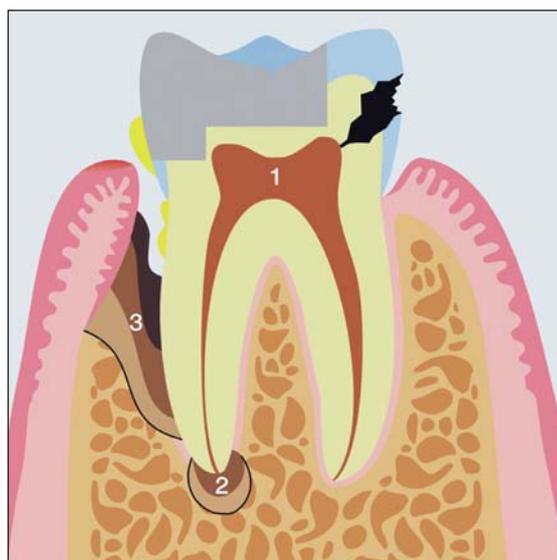


Fig 4 'Truly' combined lesions, i.e. the periodontium and the endodontium are diseased independently from each other. 1 = devitalised pulp (primary caries, secondary caries or grinding trauma); 2 = endodontal cause of apical bone loss; 3 = periodontal cause of coronal bone loss (according to Hauelsen et al¹²).

Result	Endodontal lesion	Periodontal lesion
Vitality	Negative, unclear	Mainly positive
Restoration	Extensive	Slight
Plaque/calculus	Absent	Present
Exploratory depth	Localised 'disappearance of the probe' in a deep, narrow defect	Generally increases
Radiograph result affected	Narrow defect, U-shaped, extensive apex	Additional defect, V-shaped, apex seldom affected

Table 1 Clinical and radiographic results for perio-endo lesions.

Fig 5 Therapy concept: systematic treatment of perio-endo lesions (according to Haueisen et al¹²).

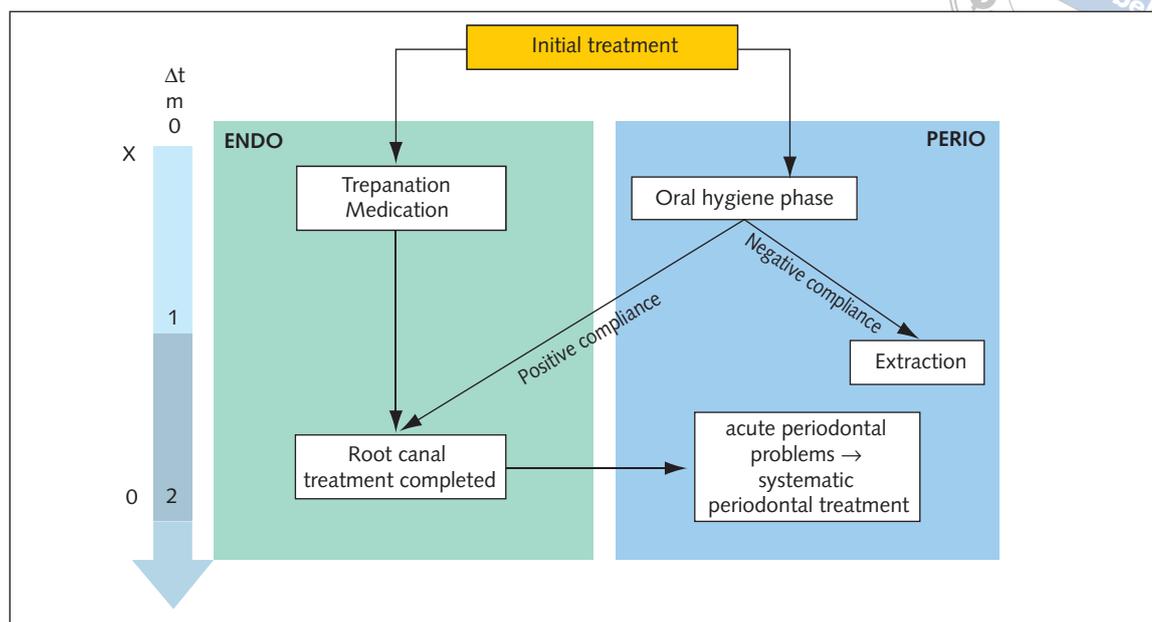


Fig 5a Initial treatment phase: root canal treatment.

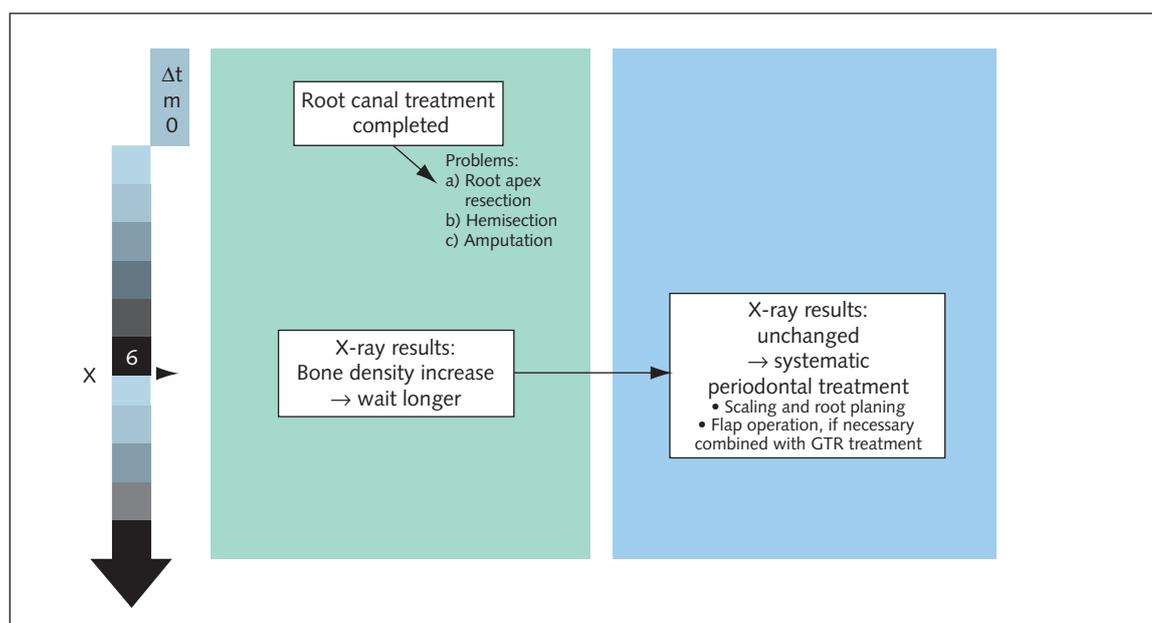


Fig 5b Second treatment phase: recall 1, if necessary periodontal treatment.

ible in combination with local factors (plaque/calculus). Whereas periodontal-related lesions generally involve increased exploratory depths, endodontal-related lesions mainly exhibit striking individual periodontal results: during probing, at one particular aspect of the tooth, the probe 'disappears' into a deep, narrow, fistula-like defect.

With endodontal lesions only one single defect is visible; this displays the apex as an extensive U-shape and appears very narrow at the corona. With periodontal lesions, generalised bone loss can often be determined using an X-ray; the particular defect is

displayed as a V-shape and appears wide open at the corona; the apical area is seldom affected.

■ Therapeutic concept

A therapeutic concept developed some years ago at the Frankfurt Dental Clinic regarding a systematic treatment for perio-endo lesions (Fig 5)¹² stipulates a predetermined sequence within a fixed time frame.

Firstly, if necessary, pain is eliminated. If possible, the use of instruments is primarily excluded from the area

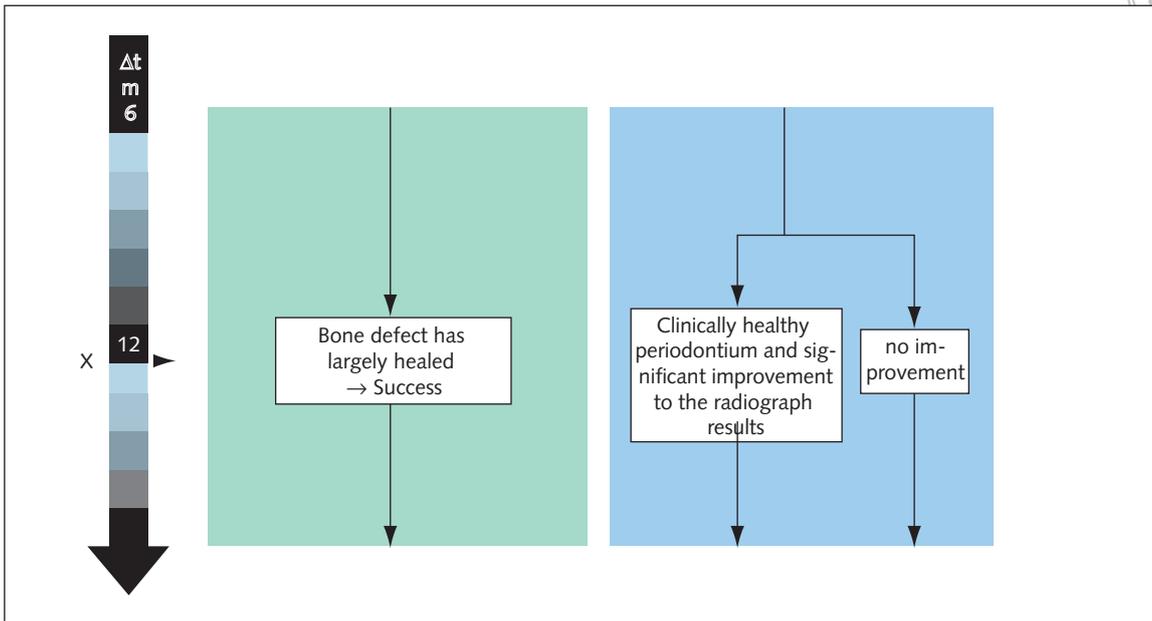
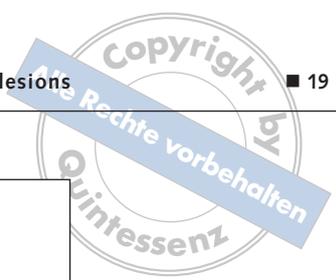


Fig 5c Recall 2: success rating.

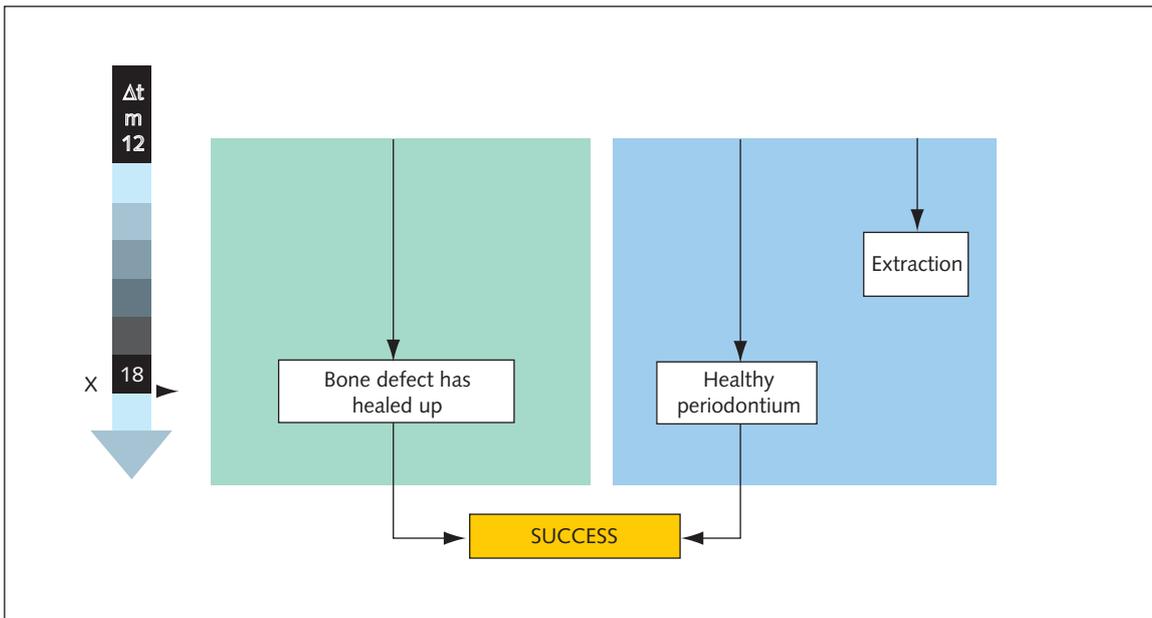


Fig 5d Recall 3: final success rating.

of the periodontal defect, so as not to endanger the periodontal structures that are capable of regeneration.

The *initial treatment phase* (Fig 5a) spans 2 months. In this period, the root canal treatment is carried out and at the same time the patient strives for improved oral hygiene; in doing this it is possible to assess whether the patient is prepared to cooperate.

If the patient is not compliant, it may be necessary to opt for the extraction of the affected tooth. If problems arise during root canal treatment, endosurgical measures (root apex resection, hemisection, root amputation) may be indicated. Periodontal treatment

is only carried out during the initial treatment phase in cases of acute periodontal problems.

The *first follow-up inspection* is carried out 6 months after completion of the root canal treatment (Fig 5b).

With hindsight, it is possible to ascertain the primary cause of the perio-endo lesion: a significant improvement in the clinical results (reduction of the exploratory depth) combined with an increase in bone density, which is visible by radiography, indicates a former primary endodontic lesion, whereas no improvement in the results is indicative of a primary

Fig 6 Course of treatment for primary endodontic lesion.



Fig 6a Radiograph results before treatment (with gutta-percha point inserted into the periodontal lesion).



Fig 6b Radiograph results 13 months after root canal treatment.

periodontal or combined lesion, which now requires periodontal and possibly also regenerative treatment.

The *second follow-up inspection* is carried out after a further 6 months, i.e. 12 months after the root canal treatment (Fig 5c). A primary endodontic lesion should now have largely healed up and a primary periodontal lesion should show significant signs of improvement. If this is not the case, extraction of the tooth should be considered, as it is unlikely that the tooth can be permanently retained.

The final clinical and radiograph inspections and *evaluation of the treatment results* is carried out six months later, i.e. 18 months after the root canal treatment (Fig 5d).

The course of treatment for a primary endodontic lesion is depicted by the radiograph results before and 13 months after root canal treatment (Fig 6).

■ Long-term results

Fifty-nine teeth with perio-endo lesions have been treated on the basis of this concept. Follow-up examinations were conducted 5 to 10 years after treatment. These involved interviews with patients as well as clinical and radiograph inspections. It transpired that it was possible for 61% of the teeth ($n = 36$) to be initially retained for at least 5 years.

In the entire monitoring period up to the present, 35 extractions have been necessary, mainly due to periodontal problems as well as endodontic complications and vertical root fractures.

Teeth with a primary endodontic lesion had a significantly better prognosis than teeth with primary periodontal or combined lesions (Fig 7).

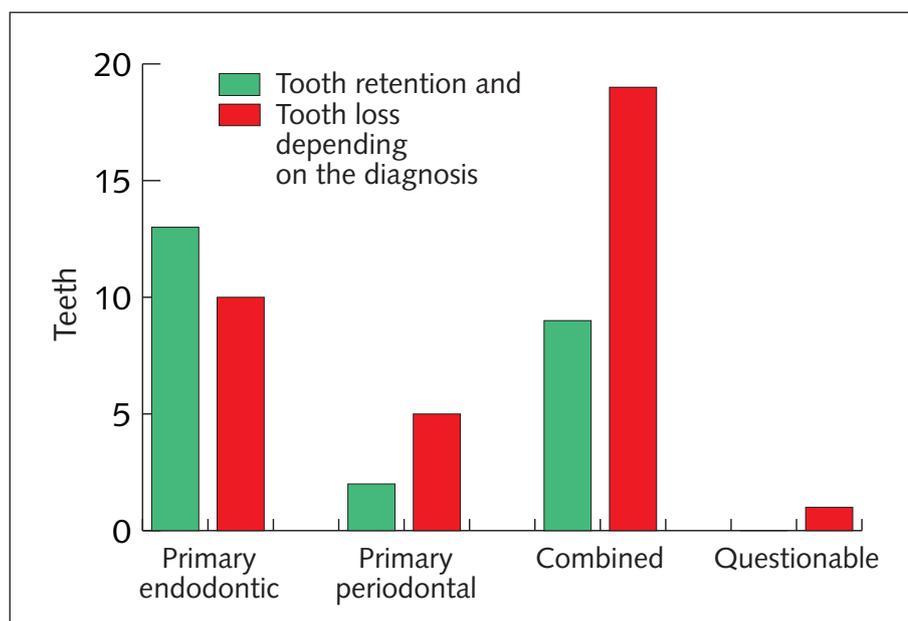
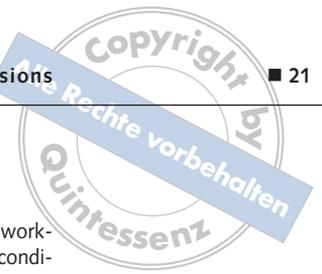


Fig 7 Tooth retention and loss depending on the diagnosis for 59 teeth with perio-endo lesions 5 to 10 years after treatment.



■ Conclusions

- Numerous connections between the periodontium and endodontium enable the spread of pathological disorders within these structures.
- A series of diagnostic references leads to the suspected diagnosis of a 'perio-endo lesion'. Premature periodontal treatment should be avoided so as not to endanger structures that are capable of regeneration.
- Root canal treatment is the first priority in the treatment of perio-endo lesions; delayed periodontal treatment is also conducted solely for periodontal-related lesions.
- For primary endodontic-related lesions, a good regeneration potential can be assumed as well as a good long-term prognosis.

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