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Treatment Protocol in Failed Endodontics

Jesús M. González-González

Doctor in Medicine and Surgery, University of Alicante. Specialist in stomatology, University of Murcia. Private practice in Salamanca, Spain

Abstract: ***Introduction: the causes of endodontic failure are many. It is proposed a treatment protocol in failed endodontics. Material and methods: in a private clinic in the city of Salamanca, 544 endodontics were performed from March 2015 to February 2018. The proportion of failures and the type of treatment was studied. Results: 3.12% endodonticsgave problems, but the dentist had considered correct 2.57% and only 0.55% with the possibility of failing. The patients came to the dental clinic after an average of 6.3 months. Medication was done in 100% of the cases, nonsurgical retreatment in 35.29%, periapical surgery in 5.88% and extractions in 17.64%. Discussion: Failed endodontics and areas of periapical radiolucency can occur even in teeth with apparently well-instrumented canals. A periapical radiolucency is not always a failure of endodontics. Conclusions: it is proposed: Step 1: medication: antibiotic + anti-inflammatory. Step 2: nonsurgical retreatment, with:* Disposal of material and disinfection (different days, several months).* Over-instrumentation with files can be done to try to periapical lesion react to the healing.* When there is no infection in 3 consecutive months will be filled with gutta-percha and finished. Step 3: periapical surgery. Step 4: extraction.***

Keywords: endodontics, retreatment, surgery, periapical, lesion

1. Introduction

Endodontics is a treatment technique that is used when a tooth has damaged the pulp and the success rates are variable (table 1). Retreatment has been defined as the procedure that aims to eliminate root canal filling materials from the tooth, in order to clean, remodel and seal the canal again[1,2].

When an endodontics fails, it is thought that it is due to the persistence of infection in the root canal system, by inadequate cleaning and preparation [3,4], which results in a periapical lesion after treatment [5]. However, numerous works collect many other causes (table 2).

A failure should be suspected by[1]:

- Pain to the percussion of the tooth or spontaneous pain.
- Presence of thermal sensitivity.
- Presence of fistula.
- Presence of inflammation of tissues surrounding the tooth.
- Radiolucent image that was not on the preoperative radiograph.
- Radiolucent image increased when it is compared with preoperativeradiograph.

There are authors who point out the presence of periapical lesions in 2.9% of the population, as well as in 24.5% of endodontics teeth [6].

The inflammatory periapical lesion is due to a response of tissues surrounding the dental apex against infectious stimuli that come from the necrotic pulp. This would result in an acute injury, subacute injury with a fistula that drains periodically, or even be asymptomatic [7]. There are inflammatory cells (lymphocytes, macrophages, plasma cells, neutrophils) and mediators of inflammatory immune response (IgG, and less IgA, M, E and D) [7,8].

Among the germs involved in the process are obligately anaerobic and facultative anaerobic bacteria [5,7,9]. More than 40 types of microorganisms present in the root canals having described, most notably Staphylococcus and Streptococcus [10]. In general, they are described as the most common species of the root canal, those of the genera Fusobacterium, Prevotella, Phorphyromonas, Eubacterium, Peptostreptococcus, Actinomyces and Propionibacterium. However previous authors [11] find the most frequent species Bacteroides forsythus (39.3%), Haemophilus aphrophilus (25%), Corynebacterium matruchotii (21.4%), Porphyromonas gingivalis (17.9%) and Treponema denticola (17.9%). On the other hand, it is indicated that Actinomyces israelii and P. propionicum have been found repeatedly in periapical tissues of cases that did not respond to conventional endodontic treatment [12]. In endodontic failure was also found Enterococcus faecalis in 30% and this has been attributed to a contamination of the root canal during treatment, due to an inadequate aseptic technique together with a resistance of this bacteria to antibiotic treatments [5]. In other cases, germs of the type of A. radicans and Candida albicans have been detected within the root canal, which could initially be there or enter during the treatment phase due to poor asepsis [12].

It is known that a decrease of leukocytes can affect the development of periapical lesions [8].It is also known that the "transforming growth factor beta$_1$" (TGF-β_1) is in periapical lesions, but not in lesions with scar tissue. The amount of TGF-β_1 in the tissue is related to the size of the lesion [13].

In any way, the differential diagnosis of periapical lesions with another pathology must be made (table 3). There are many difficulties in providing solutions to endodontic failures. For that, the objective of this work is to make a protocol that can improve the prognosis of this type of treatments.

2. Material and Methods

In a private practice in the city of Salamanca, 544 endodontics were performed during the period from March 2015 to February 2018. It was considered "correct endodontics" those teeth that did not give any symptoms and

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"failed endodontics" those in which the patient received new treatments for the same. In the failed endodontics was studied:

- Appreciations of the dentist when he did the endodontics.
- Time since the endodontics was done until the failure was verified.
- Treatment with medication.
- Retreatment with new endodontics.
- Treatment with periapical surgery.
- Treatment with extraction.

Finally a treatment protocol is proposed for cases of failed endodontics.

3. Results

They are in table 4. In 544 endodontics, 3.12% gave problems. Within this 3.12% the dentist had considered correct 2.57% and only 0.55% with the possibility of failure. When there are failure of the endodontics, the patients come to the dental clinic after an average of 6.3 months. The first treatment was antibiotic and anti-inflammatory in 100% of the cases. Nonsurgical retreatment was done in 35.29% and periapical surgery in 5.88%. Extractions were performed in 17.64% by the patients' own decision, except for one case that had a vertical fracture.

4. Discussion

Many times the persistence of a radiolucent area is used as a criterion of failure, but it is not always the case. Previous authors advise not to treat if the radiolucent area is small in size and the tooth is asymptomatic, but it is advisable to make periodic controls if further intervention is necessary [14]. It is described that periapical radiolucency can be mistaken with endodontic failure and can actually be a scar tissue formation [12,15]. On other occasions, a reabsorption of periapical bone gives an image of radiolucency that is misdiagnosed as apical periodontitis [15]. For these reasons we think that the first treatment should be the medication: antibiotics + anti-inflammatories. Regarding the antibiotic, several authors recommend the use of amoxicillin + clavulanic acid because it is the most effective in relation to the type of germs that are usually associated [10]. This is supported because 30-40% of cases are resolved with a conservative treatment [7]. Cases of periradicular healing have also been described, when is filled the canal with calcium hydroxide [16], especially in cases of apicoformation [17].

Occasionally the periapical lesion has a membrane rich in bacteria that prevents the action of the antibiotics given orally and / or parenterally [9]. In that case it must be done retreatment. It is also done when the initial treatment seems inadequate, previous endodontics have failed or the root canal has been contaminated by prolonged exposure to the oral environment [1]. We agree with other authors that nonsurgical retreatment is preferable when there are a failure of endodontics and periapical surgery should be to exceptional cases [3,18-22] or lesions larger than 20 mm [7].

A retreatment is more complex than normal endodontics, as there may be different materials (posts, cements, silver tips, gutta-percha, broken instruments, screws), blockages (steps), perforations, tears[4,20]. For that reason the success rate is lower (table 1). These difficulties give an idea that even doing the cleaning of canals with high quality standards,a failure and appearance of areas of periapical radiolucency can happen [12,15].

There are authors who advise to solve the periapical lesions through the over-instrumentation of the root canal, which would give transient acute inflammation with destruction of epithelial cells by neutrophils, hemorrhage and necrosis [23]. We believe that this could be useful during retreatments, as well as the use offulguration with high frequency alternating currents during this treatment, as some authors indicate [24].

Periapical surgery is advised when other more conservative measures have failed [14,18,22,25] and especially when the tooth is condemned to extraction, by inaccessible canals, calcifications, posts impossible to remove, root perforations, broken instruments, open apices with failed apicoformation [3,19]. A conventional technique with rotating instruments or an ultrasonic technique may be used [26], but periapical surgery alone is not enough to replace the conventional treatment of infected root canal [22]. Among the disadvantages of periapical surgery is the possibility of removal a healed periapical scar [15].

5. Conclusions

Taking into account the above, we propose a treatment protocol for cases of failed endodontics:
Step 1: medication: antibiotic + anti-inflammatory.

Step 2: if step 1 fails, nonsurgical retreatment will be done, with:

- Disposal of material and disinfection, on different days and for several months until there is no infection.
- Over-instrumentation with files can be done to try to periapical lesion react to the healing.
- When there is no infection in 3 consecutive months will be filled with gutta-percha and finished.

Step 3: If step 2 fails, periapical surgery will be done.

Step 4: If step 3 fails, the tooth will be extracted.

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Author Profile

González-González, Jesús M. Ballicher of Medicine, University of Salamanca (1985). Doctor of Medicine and Surgery, University of Alicante (1992). Specialist in Stomatology, University of Murcia (1992). Medical practitioner of State Health Service, 1987-1990. Dentist of State Health Service, 1991-2. Private practice in Stomatology 1991-present. 4 Masters. 10 published books. 57 published manuscripts. 21 reports in congresses. 6 patents. 3 honour mention

Table 1: Success rates for different treatments, according to authors.

• Endodontics: 48-98% [21], 89.66% [23], or 80-100% [20], 85-90% [7,12].
• Nonsurgical retreatment: 40-70% [20].
• Periapical surgery: 50-90% [18], 44-95% [21].

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Table 2: Causes of endodontic failure [1,3-5,9,12,14,21,27].

- endodontics without correct isolation
- not preserve the sterility chain
- not irrigate in quantity and adequate quality
- poorly sealed canals
- poor cleaning
- untreated canals
- anatomical variations not perceived
- inadequate coronal sealing
- the instruments do not have access
- inaccessible canals: calcifications
- root perforations
- blockages
- open apex with failed apicoformation
- External resorbations that communicate with pulp
- Intracanal residual infection
- infection resistant to intracanal medication
- extraradicular infection
- foreign body reaction
- over-filling of the root canal that drags bacteria to the apical zone
- microfiltration through coronary access wall
- accessory canals
- Periodontal problem that moves bacteria from periodontium
- partial fractures
- Post placement error
- broken instruments
- Incorrect placement of the root-end filling material

Table 3: Differential diagnosis of periapical granuloma [7].

Benign lesions:	Malignant lesions:
* aneurysmal bone cyst * traumatic bone cyst * middle palatal cyst * eosinophilic granuloma * odontogenic myxoma * central fibroma * neurofibroma * periodontal injury * cementoma * fibrous dysplasia * keratocyst * giant cell granuloma * ameloblastoma * hemangioma * osteoblastoma * infections such as actinomycosis	* metastasis of lung carcinoma * metastasis of lung adenocarcinoma * cystic adenoid carcinoma * metastasis of renal adenocarcinoma * rhabdomyosarcoma * multiple myeloma * antral carcinoma

Table 4: Results of the study of failed endodontics out of a total of 544. RE: retreatment. PS: periapical surgery. EX: extraction. AC: amoxicillin + clavulanic acid. SM:spiramycin + metronidazole. IB: ibuprofen. PA: paracetamol

Teeth with Failed endondontics	Appreciation of the dentist	Time elapsed	Medication	RE	PS	EX
17	Short filling in mesiobuccal canal	10 months	AC + IB	X		
25	Correct	1 month	SM + IB			
36	Rest of file in mesial. Apex open	5 months	AC + IB			
17	Correct	8 months	AC + IB			
37	Correct	2 months	AC + IB			X
15	Correct	15 days	SM + IB			
13	Correct. Post	3 days	AC + IB			
37	Correct	4 months	AC + IB			
46	Correct	2 months	SM + IB			X
21	Correct	4 months	AC + IB	X		
11	Correct. Previous apical lesion	1 month	AC			
14	Correct	22 months	AC	X		
25	Correct	3 months	AC + IB	X	X	X
36	Over filling of the mesial canal	4 months	AC + IB			
47	Correct	6 months	SM + PA	X		
36	Correct. Post	25 months	AC + IB			
25	Correct	5 months	AC + IB	X		

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