

DENTISTS' PERSPECTIVES ON THE CHOICE OF TREATMENT OF TEETH WITH APICAL PERIODONTITIS

ANDREEA IULIANA KUI¹, ANCA JIGLĂU LABUNET²,
CODRUȚA POPESCU³, DANIELA POPA¹, LIANA LASCU¹

¹Dental Prosthetics Department, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Dental Materials Department, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

³History of Medicine Department, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

Abstract

Background and aim. Therapeutic decision in dentistry is a complex cognitive process for the practitioners because it involves taking into consideration several factors, including patients' preferences. The hypothesis of this study was that apicoectomy might be indicated more often than necessary and in order to confirm or invalidate it a survey was designed. We also aimed to explore whether the preferences were associated or not with dentist-related or practice-related characteristics.

Methods. The survey included questions about treatment options in case of four scenarios, each one concerning an anterior and a posterior tooth with apical periodontitis, with or without previous endodontic treatment and also general questions, such as medical specialties, age and years of experience. The distribution of the questionnaires was done by email and direct distribution in the dental offices, in Cluj County, Romania.

Results. After descriptive statistical analysis was performed, preferences rates were subjected to Chi-square test (including McNemar test for significance). Statistically significant differences were considered when $p \leq 0.05$.

Conclusions. The results indicate that dentists prefer nonsurgical endodontic treatment in case of a tooth with apical periodontitis. Apicoectomy was the second option treatment preferred by general dentists, oral and maxillo-facial surgeons, prosthodontists and endodontists.

Keywords: root canal therapy, apicoectomy, retrograde filling, survey

Background and aim

The therapeutic decision in dental medicine is a complex cognitive process that implies taking several factors into consideration. This way, the therapeutic decision becomes a process based more on experience and personal values than on the objective analysis of benefits, risks and costs [1].

The new specialties in dental medicine in Romania that have been established since 2009 required good practice guidelines for the doctors. The guidelines were put

together in accordance with the specific competence of each specialty. In making the therapeutic decision, a specialist should consider these guidelines [2].

Establishing a treatment plan for a tooth that is affected by chronic apical periodontitis is a complex process. Apical periodontitis is an inflammatory response to a microbial challenge, involving the destruction of periapical tissues [3].

The dentist must take into account a number of factors, such as the clinical and radiological aspect of the lesion, treatment possibilities in the dental office and the patient's preference. It is highly probable that an endodontist or an oral surgeon will take into account the recommendations of

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Address for correspondence: andreeakui@gmail.com

the guidelines specific for each specialization. S/he will also take into account personal experience and recommendations mentioned in the literature. An important aspect of the therapeutic decision for an apical periodontitis is the radiological aspect that allows a subjective interpretation by the dentist. When considering all of these aspects, the dentist must recommend a certain treatment plan for a tooth affected by apical periodontitis [4,5].

According to the guidelines available in Romania, an apicoectomy is indicated when a non-surgical root canal therapy has failed or when the anatomical situation does not allow performing a correct endodontic treatment [2]. Even so, the therapeutic decision will depend on both the dentist's and patient's opinion.

The working hypothesis of this study was that apicoectomy might be indicated in more cases than needed by dentists in Cluj, Romania. This is why *the aim of this study* was to survey dentists' preferences for management of a tooth, affected by apical periodontitis, considering the choices to be - endodontic treatment or re-treatment (root canal therapy), apicoectomy or extraction with/without prosthetic reconstruction of the edentulous space. We also aimed to explore whether the preferences were associated or not with dentist-related or practice-related characteristics such as gender, age, specialty, experience, location of practice or type of clinical services performed in the dental office.

Methods

The survey design was approved by the Ethics Committee, of the Iuliu Hatieganu University of Medicine and Pharmacy of Cluj-Napoca (332/02.06.2015).

A questionnaire addressed to dentists was conceived. First, the questionnaire was pilot tested among five specialists in dentistry from the Faculty of Dentistry, Cluj-Napoca, in order to verify the clarity of the questions, to validate the questions and the response options and to estimate the time needed for completion. After making the necessary modifications, the final questionnaire included 9 questions, distributed in two sections, according to its objectives.

The first section referred to the ranking of treatment preference (5-point scale: 5 – recommended treatment of choice, 1 – least desirable treatment), from among 4 options (endodontic retreatment, apicoectomy, tooth extraction with prosthetic/implant supported reconstructions or tooth extraction without any reconstruction) for 4 scenarios of teeth with apical periodontitis (a frontal and a lateral tooth with periapical lesions presenting or not a pre-existing endodontic treatment) (Table I).

The second section included general questions, such as the doctor's specialty, gender, age and years of experience or the environment where he or she works.

The distribution of the questionnaires was done by email and direct distribution in the dental offices, in Cluj County, Romania.

Table I. Treatment preference scenarios.

I. A 50 year old man, with no systemic pathology, seeks treatment for a permanent tooth associated with a periapical lesion. The tooth has a large restoration with extensive recurrent caries and there is NO evidence of a previous root canal treatment. On X-ray, the root anatomy seems to be normal, the periapical lesion has a diameter of ~4 mm but no mobility. The tooth can be considered restorable, and it is bordered by healthy teeth, mesially and distally. With treatment, the overall prognosis can be considered favorable. Assuming that all of the following treatment options are feasible, please rank each choice according to your recommendation. Please note that there are separate possible answers for an anterior tooth and a posterior tooth.		
<i>Please rank from 1 (the least recommended) to 5 (most recommended)</i>		
<i>Treatment type</i>	ANTERIOR tooth	POSTERIOR tooth
Endodontic treatment with /without prosthetic restoration		
Apicoectomy		
Extraction with tooth replacement (implant or prosthetic)		
Extraction without tooth replacement		
II. A 50 year old man, with no systemic pathology, seeks treatment for a permanent tooth associated with a periapical lesion. The tooth has a large restoration and there is a previous root canal treatment. The root canal treatment can be considered correct (adequate length and density). On X-ray, the root anatomy seems to be normal, the periapical lesion has a diameter of ~4 mm but no mobility. The tooth can be considered restorable, and it is bordered by healthy teeth, mesially and distally. With treatment, the overall prognosis can be considered favorable. Assuming that all of the following treatment options are feasible, please rank each choice according to your recommendation. Please note that there are separate possible answers for an anterior tooth and a posterior tooth.		
<i>Please rank from 1 (the least recommended) to 5 (most recommended)</i>		
<i>Treatment type</i>	ANTERIOR tooth	POSTERIOR tooth
Endodontic treatment with /without prosthetic restoration		
Apicoectomy		
Extraction with tooth replacement (implant or prosthetic)		
Extraction without tooth replacement		

Data Analysis

Answers obtained from direct distribution were extracted and entered into the Statistical Package for Social Sciences software 22.0 (SPSS, Chicago, IL). The data obtained from the web-survey were downloaded from the Google Forms web site as a Microsoft Excel (Microsoft Corp., Redmond, WA) file. After recording the variables, the answers were exported to SPSS and merged to the direct distribution database.

In a primary stage, a descriptive analysis was performed. In order to determine statistical differences between two or several groups, the Chi-Square test was performed. It also includes the McNemar test for the significance of modifications. Statistically significant differences were those with $p \leq 0.05$.

Results

The answers obtained from 54 participants (16 males and 38 females) were validated and statistically analyzed. The demographic characteristics of survey participants are summarized in Table II.

Regarding the procedures provided in the dental office: 85.2 % reported practicing endodontic treatments, 37% reported in performing apicoectomy, 96.3% reported performing fixed partial dental prosthesis and 81.5%

reported performing removable prosthodontics (table II). Pearson Chi-Square test revealed that there were strong associations between the respondent's specialty and procedures performed in private practice – for apicoectomy - $\chi^2=18.946$, $df=5$, $p=0.002$, for implant insertion - $\chi^2=15.631$ $df=5$, $p=0.008$, for FPDP (fixed partial dental prosthesis) - $\chi^2=21.288$, $df=5$, $p=0.001$, and for RPDP (removable partial dental prosthesis) - $\chi^2=13.947$, $df=5$, $p=0.016$.

The participants' preferences on the treatment options, depending on the scenario, were evaluated. The results showed a general pattern of choosing an endodontic treatment, rather than apicoectomy for scenarios 1 and 2, and an endodontic re-treatment, rather than apicoectomy for scenarios 3 and 4.

For the first scenario (an anterior tooth requiring initial endodontic treatment), 81.48 % of the respondents considered initial endodontic treatment (ET) as a first choice of treatment – meaning 65% of general practitioners respondents, 91.6% of prosthodontists, 84.61% of oral surgeons and all the periodontitis and orthodontists respondents. For the same scenario, only 25.9% of the respondents considered apicoectomy as a second best treatment option (Table III).

For a posterior tooth requiring initial ET, 79.6% of

Table II. Description of the respondents (dentists) participating in the survey.

Variables	Specialty						Total
	General dentists	Oral surgery	Prosthodontics	Endodontics	Periodontics	Orthodontics	
Number of participants (N) and %	20	13	12	3	4	2	54
	37.0	24.1	22.2	5.6	7.4	3.7	100
<i>Age, y</i>							
25-34	10	9	10	2	2	0	33
35-44	9	3	1	1	2	1	17
45-54	1	1	1	0	0	0	3
55-64	0	0	0	0	0	1	1
<i>Experience, y</i>							
<10	16	11	10	3	3	1	44
11-20	3	2	2	0	1	0	8
>20	1	0	0	0	0	1	2
<i>Procedures (%)</i>							
1.Endodontic treatments	90	76.9	75	100	100	100	85.2
2.Endodontic re-treatments	75	53.8	66.6	66.7	100	50	68.5
3.Apicoectomy	30	76.9	0	66.7	50	0	37
4.Implant insertion	15	53.8	0	33.3	75	50	27.8
5.FPDP	100	100	100	66.7	100	50	96.3
6.RPDP	90	61.5	100	33.3	100	50	81.5

Table III. Frequency rate of the first two preferences for each scenario, related to the respondent's specialty (ET – endodontic treatment).

Scenario	Most desirable treatment options	Specialty						Total (%)
		General dentists (%)	Oral surgery (%)	Prosthodontics (%)	Endodontics (%)	Periodontics (%)	Orthodontics (%)	
Anterior tooth requiring initial ET	Initial ET	65	84.61	91.6	100	100	100	81.48
	Apicoectomy	45	23	8.3	33.3	0	0	25.9
Posterior tooth requiring initial ET	Initial ET	70	69.2	91.6	100	100	100	79.6
	Apicoectomy	40	30.7	0	33.3	0	0	24
Anterior tooth requiring repeated ET	Repeated ET	50	53.8	75	100	100	100	64.81
	Apicoectomy	45	38.4	25	33.3	0	0	33.3
Posterior tooth requiring repeated ET	Repeated ET	50	61.5	75	66.7	100	100	64.81
	Apicoectomy	40	30.7	25	66.7	0	0	31.5

the respondents considered initial endodontic treatment as a first treatment option, and only 24% of them considered apicoectomy as a second treatment option. For scenarios 3 and 4, an anterior and a posterior tooth requiring repeated ET, 64.81% of the respondents considered that repeated endodontic treatment should be the first treatment option (Table III).

Pearson Chi-Square test revealed a strong association between the respondent's specialty and apicoectomy for a posterior tooth requiring an endodontic treatment (ET) ($\chi^2=31.903$, $df=20$, $p=0.044$), but also between the respondent's specialty and extraction without tooth replacement for a posterior tooth requiring repeated endodontic treatment (ET) ($\chi^2=26.190$, $df=10$, $p=0.03$).

Also, Pearson Chi-Square test revealed a strong association between the respondent's experience (in years) and extraction with tooth replacement for both anterior and posterior teeth, requiring an endodontic treatment ($\chi^2=14.013$, $df=6$, $p=0.029$; $\chi^2=28.520$, $df=8$, $p=0.000$) and between respondent's experience and extraction with tooth replacement for a posterior tooth requiring a repeated endodontic treatment ($\chi^2=29.813$, $df=8$, $p=0.000$).

Depending on the procedures performed in dental offices, Pearson Chi-Square test revealed several strong associations, depending on the scenario: between the procedures and apicoectomy for both anterior and posterior teeth requiring an endodontic treatment ($\chi^2=93.120$, $df=60$, $p=0.004$; $\chi^2=84.848$, $df=60$, $p=0.019$); between procedures and extraction without tooth replacement for a posterior tooth requiring an endodontic treatment ($\chi^2=70.418$, $df=30$, $p=0.000$); between procedures and endodontic treatment for an anterior tooth requiring an endodontic treatment ($\chi^2=90.011$, $df=6$, $p=0.007$); between procedures and extraction without tooth replacement for an anterior tooth requiring a repeated endodontic treatment ($\chi^2=94.016$,

$df=45$, $p=0.000$).

No significant associations were evidenced between other variables (gender, age, location of private practice) and preferences regarding the treatment option for each scenario.

Discussion

Conservative endodontic treatment or non-surgical root canal treatment has a success rate between 53% and 98%, while retreatment cases have lower reported success rates [6,7,8]. The failure of an endodontic treatment is often attributed to either inadequate cleaning and disinfection of the root canal space during the first root canal therapy, or recontamination, due to coronal leakage [9].

Apicoectomy is a surgical procedure that requires incision, root resection, root-end cavity preparation associated with a retrograde/root-end filling and closure [10].

Apicoectomy is one of the most used surgical treatments in endodontics, because it can prevent tooth extraction, by eliminating the pathological tissues around the apical third of the root [11]. Also, there are several types of dental materials that can be used as a root-end filling, in order to seal the apical surface, each having its advantages and disadvantages [10].

According to American Association of Endodontics, endodontic surgery (apicoectomy) is recommended when traditional endodontic therapy fails to obtain favorable outcomes: complicated canal anatomy, persistent periradicular pathological issues following endodontic treatment or when a periradicular lesion enlarges after endodontic treatment [12]. But apical surgery may also fail, even when it was correctly indicated, due to over-preparation of the canal for a post and post placement, which can cause root fracture after or during apicoectomy [13].

This study's main goal was to investigate the

dentists' "overall" and "general" treatment preferences regarding teeth affected by primary and post-treatment apical periodontitis, as a potential indicator of their judgment process in planning a treatment. We considered that in order to reveal general rather than specific preferences of dentists, no other additional information, like radiographs or other data, should be provided as background information. Also, a further investigation of this type of study would be necessary to determine if dentists actually select various treatments possibilities differently, depending on different visual and informational aids (like pre- and post- endodontic treatment radiographs, clinical photographs, written description, etc.). For our study, the information provided for each scenario included a generic description with a radiographic image and description. The scenarios were conceived after researching the literature on surveys related to this topic [1,5,14,15].

Four scenarios were conceived, two for a frontal tooth and a lateral tooth without existing endodontic treatment and two scenarios for a frontal and lateral tooth with a previous endodontic treatment.

For each scenario, the respondent was asked to grade, with a value from 1 to 5 (1 being the least recommended and 5 the most recommended) each treatment possibility. Treatment possibilities were: for the first two scenarios – non surgical endodontic treatment, apicoectomy, extraction with tooth replacement or implant reconstruction and extraction without tooth replacement. For the other two scenarios – non-surgical endodontic treatment, apical resection, extraction with tooth replacement or implant supported reconstruction and extraction without tooth replacement. Questions included in this survey were inspired by the study performed in 2012 by Azarpazhooh, who investigated therapeutic options made by dentists for a tooth affected by apical periodontitis, between endodontic treatment or dental extraction with implant supported crown [5].

For the four scenarios, doctors' preference was favorable to the non-surgical endodontic treatment; the least preferred option being the dental extraction without prosthetic reconstruction. Apicoectomy was the second option treatment preferred by general dentists, oral and maxillo-facial surgeons, prosthodontists and endodontists (Table III), in different rates, depending on the scenario. The results are in accordance with other surveys, investigating the treatment choice for a periradicular lesion [16].

For scenarios 1 and 3 (an anterior tooth requiring either an endodontic treatment or an endodontic re-treatment), there was no statistically significant association between the preferences of a treatment plan and the respondent's specialty. Non-surgical endodontic treatment was chosen as "most recommended" for both scenarios, no matter the respondent's specialty (Table III).

For scenario 2, regarding a posterior tooth requiring an endodontic treatment, there was a significant association between respondent's specialty and choosing apicoectomy

as less recommended. Also, for scenario 4, regarding a posterior tooth requiring an endodontic re-treatment, we found a significant association between the respondent's specialty and choosing extraction without prosthetic reconstruction as the least recommended treatment plan. In this case, most prosthodontists thought this type of treatment was "less" or "the least" recommended.

Statistical analysis showed an association between the respondent's experience (in years) and choosing extraction with tooth replacement as less recommended for scenarios 1,2, and 4 (anterior and posterior teeth, requiring an endodontic treatment and posterior tooth requiring a repeated endodontic).

There was a significant association between the procedures performed by the respondents (endodontic treatments and re-treatments, along with fixed and removable prosthetic dentures) in private practice and choosing an endodontic re-treatment as first treatment choice for an anterior tooth with a previous endodontic treatment. Moreover, statistical analysis evidenced a significant association between the respondents who perform same procedures as mentioned before and choosing (as the least recommended treatment option) extraction without tooth replacement for an anterior tooth requiring repeated endodontic treatment.

No significant associations were detected between other variables (like gender, age, location of private practice) and preferences regarding the treatment option for each scenario.

There was a significant association between the procedures performed by the respondents (endodontic treatments and re-treatments, along with fixed and removable prosthetic dentures) in private practice and choosing an endodontic re-treatment as first treatment choice for an anterior tooth with a previous endodontic treatment.

It is a well known fact that dentists, when analyzing a case, take into account their capacity to accomplish a certain treatment, their capacity to take on different risks, but also their experience [16]. Through statistical analysis of the answers obtained, we wanted to also analyze the association between the same variables that describe the respondent's practical activity and the treatment options for the four scenarios.

Although in the beginning of this study we anticipated an association between surgical maneuvers performed in the office and the preference for apical resection in the case of apical periodontitis, it seems that in this situation, the study hypothesis (stating that oral surgeons and maxillo-facial surgeons will choose a surgical treatment in the case of an apical periodontitis as a first option for a tooth that requires an endodontic re-treatment) was rejected. Dentists that favored endodontic surgery as a treatment choice did not perform this type of treatment in their offices, but probably have collaborations with specialists in oral or maxillo-facial

surgery in performing these treatments. We also observed a statistically significant association between doctors that perform maneuvers such as endodontic treatments and retreatment, fixed and removable prosthetic dentures and considering as “least recommended” the extraction of an anterior tooth that had pre-existing endodontic treatment or the extraction of a posterior tooth with or without pre-existing endodontic treatment. In this case, the therapeutic option is in concordance with the maneuvers performed in the dental office – conservative endodontic and prosthetic treatments.

Conclusion

Considering the limitations of our study, this survey suggested that for teeth affected by apical periodontitis, dentists in Cluj County, Romania, preferred non-surgical endodontic treatment as a first choice in treatment. Apicoectomy was the second option treatment preferred by general dentists, oral and maxillo-facial surgeons, prosthodontists and endodontists.

For the second scenario (posterior tooth requiring an endodontic treatment) there was a significant association between respondent’s specialty and choosing apicoectomy as less recommended. There was a significant association between the procedures performed by the respondents (endodontic treatments and re-treatments, along with fixed and removable prosthetic dentures) in private practice and choosing an endodontic re-treatment as first treatment choice for an anterior tooth with a previous endodontic treatment.

We can also conclude that, although variability in treatment preferences can influence the process of decision-making, the dentists’ perceptions of both alternatives could potentially be shaped by interdisciplinary communication and education.

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