

FREQUENCY OF DIFFERENT INDICATIONS FOR ENDODONTIC TREATMENT AMONG PATIENTS FROM PANCEVO, SERBIA

UČESTALOST RAZLIČITIH INDIKACIJA ZA ENDODONTSKO LEČENJE ZUBA U DELU POPULACIJE STANOVNIKA GRADA PANČEVA

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Abstract

Introduction: Different types of irreversible pulp diseases are the most commonly stated reasons for conducting root canal treatment. Data obtained from epidemiological studies are of great importance for a better understanding of endodontic pathology and for evaluating the need for this kind of treatment.

Aim: The aim of this epidemiological study was to evaluate the structure of endodontic pathology among selected adult population of municipality of Pancevo, Serbia, indicated for endodontic treatment.

Material and methods: Investigations were conducted on a sample of patients who referred for dental examination and treatment, at the Department of Restorative Dentistry and Endodontics, Faculty of Dentistry in Pancevo, during 2018. The study included 229 male and female subjects, aged over 18, who had at least one tooth indicated for endodontic treatment. Subjects were clinically examined by a standardized procedure, using visual and tactile inspection, percussion and palpation tests, periodontal evaluation and pulp vitality tests. Panoramic and retroalveolar radiographs were also analyzed. Data were statistically analyzed using Chi-Square test.

Results: Endodontic treatment was indicated on 322 teeth from total number of 4911 (6.6%). Largest frequency of teeth indicated for treatment was recorded among subjects aged over 60 years (7.5%) and on frontal teeth (36.6%). The most commonly registered indications were asymptomatic irreversible pulpitis (32.3%) and symptomatic irreversible pulpitis (19.9%). Irreversible pulpitis was the most common indication for endodontic treatment between all age groups of subjects, between both genders and between all three teeth functional groups ($p < 0.001$).

Conclusion: Percentage of teeth indicated for endodontic treatment was higher than presented in other studies. Irreversible pulpitis was the most common indication for endodontic treatment. After conducting the study, it is clear that dental care and caries preventive programs should be strengthened and expanded, especially among people with less education and awareness regarding dental health.

Keywords:

indications for endodontic treatment,
irreversible pulpitis,
pulp necrosis

Sažetak

Uvod: Kao razlozi za sprovođenje endodontske terapije zuba najčešće se navode različiti tipovi ireverzibilnih oštećenja pulpodentinskog kompleksa. Podaci dobijeni iz epidemioloških studija od velikog su značaja za bolje razumevanje endodontske patologije i procenu potrebe za ovom vrstom terapije.

Cilj: Cilj ove studije bio je da se ispita struktura endodontske patologije u izabranom delu populacije stanovnika grada Pančeva, kod kojih je postojala indikacija za endodontsku terapiju zuba.

Materijal i metode: Istraživanje je sprovedeno tokom 2018. godine na odabranom uzorku pacijenata koji su se radi pregleda i sanacije zuba javili na Institut za stomatologiju Stomatološkog fakulteta u Pančevu. Uzorak je činilo 229 pacijenata oba pola, starosti iznad 18 godina, koji su imali najmanje jedan zub indikovao za endodontsku terapiju. Temeljni klinički pregled, uz primenu adekvatnih dijagnostičkih testova i analizu ortopantomografskih i retroalveolarnih snimaka, obavljen je za svakog ispitanika. Dobijeni podaci statistički su obrađeni primenom hi-kvadrat testa.

Rezultati: Od ukupno 4911 pregledanih, endodontska terapija bila je indikovana na 322 zuba (6,6%). Najveća učestalost zuba indikovanih za endodontsku terapiju zabeležena je u grupi pacijenata starijih od 60 godina (7,5%), kao i među frontalnim zubima (36,6%). Asimptomatski (32,3%) i simptomatski ireverzibilni pulpitis (19,9%) bili su najučestalije indikacije za endodontsku terapiju. Ireverzibilni pulpitis bili su najučestalija indikacija među pacijentima svih starosnih grupa, oba pola, kao i u među sve tri funkcionalne grupe zuba ($p < 0,001$).

Zaključak: Procenat zuba indikovanih za endodontsku terapiju u ovoj studiji bio je veći u odnosu na navedene procenat u drugim studijama. Ireverzibilni pulpitis predstavljali su najčešći razlog za izvođenje endodontske terapije. Rezultati ove studije ukazuju na potrebu za boljom stomatološkom negom, kao i sveobuhvatnijom edukacijom pacijenata i podizanjem nivoa svesti o važnosti očuvanja oralnog zdravlja.

Ključne reči:

indikacije za endodontsku terapiju, ireverzibilni pulpitis, nekroza pulpe

Introduction

The main goal of modern dental care should be tooth preservation, which means to ensure that a diseased tooth or root retains its functional role in the oral cavity. Important role in achieving this goal plays on time and high-quality endodontic treatment, which is an essential part of quality comprehensive dental care. Endodontic treatment is one of the most technically demanding procedures and a very specialized aspect in restorative dentistry requiring high level of technical skills (1).

Despite great efforts to develop preventive measures, conditions that require endodontic treatment are still among the most common reasons why patients visit their dentist. Those conditions are namely the sequels of dental caries, periodontal disease, trauma and inadequate restorative procedures. Irreversible pulpitis and pulp infection generally lead to pulp necrosis and development of apical periodontitis, frequently combined with apical bone or root resorption. Therefore, endodontic therapy must be planned in accordance to the accurate diagnosis of the present disease (2).

Despite certain number of studies, the data from literature regarding the epidemiology of conditions that require endodontic treatment are insufficient and sparse. Epidemiological findings on the frequency of different indications, as well as on distribution of teeth indicated for endodontic treatment may reflect attitudes toward this kind of treatment. Also, the results of such studies can

reveal the need and demand for root canal treatment in any given population. Figures on the proportion of endodontic therapy vary in different studies from 3% to 10% of all dental services. Due to a decrease of caries prevalence in recent years, it would be realistic to expect that there is a reduced need for endodontic treatment. However, results of Bjørndal and Reit's recent study revealed that between 1977 and 2003, the number of endodontic treatments increased by 20% (3). Variability in the literature also exists regarding the prevalence of teeth from different functional group indicated for endodontic treatment, and whether there is a difference between maxillary or mandibular teeth. Results of some studies revealed that relative frequency of endodontically treated teeth ranged from 51% to 68% in the maxilla, versus 32% to 49% in mandibula. The literature also reveals that the posterior teeth are more often indicated for endodontic treatment compared with anterior (53 - 72% vs. 28% - 47%) (4).

The aim of this study was to evaluate the structure of endodontic pathology among selected adult population of municipality of Pancevo, Serbia, indicated for endodontic treatment.

Material and methods

Investigation was conducted on a sample of patients who referred for dental examination and treatment, at the Department of Restorative Dentistry and Endodontics, Faculty of Dentistry in Pancevo, during 2018. The study

included 229 male and female subjects, aged over 18. The condition for participating in the study was to have at least one tooth indicated for endodontic treatment. The youngest participant was 19 years old, while the oldest one was 83. All subjects were divided into three age groups: the first group consisted of subjects aged 18 - 35 years, the second group of subjects 36 to 59 years, and the third group of subjects over 60 years old. A total number of 4911 teeth were examined. Before examination, the patients were fully informed about the study and each of them gave written consent to participate as a volunteer. All investigations in this study, i.e. the complete medical history and dental examination of patients, were conducted after approval by the "Ethics Committee for Research, Faculty of Dentistry in Pancevo" (179/1 - 2018, according to Resolution sections 3, 7, and 8 of the National Commission of Ethics in Research). The study procedures were conducted in complete accordance with the World Medical Association's Declaration of Helsinki.

For clinical examination, comfortable accommodation was provided in the dental chair, with adequate lighting. Subjects were clinically examined by a standardized procedure, using visual and tactile inspection, percussion and palpation tests, periodontal evaluation and available pulp vitality tests. Pulp vitality testing was conducted using thermal tests (cold test – spray with cold air, heat test – heated gutta-percha stick) and electric pulp testing (Electric pulp tester, Waldent). For radiographic examination were used panoramic and retroalveolar radiographs.

Number of present teeth, number of teeth indicated for endodontic treatment, teeth functional group, presence or absence of restoration and pulpal and periradicular diagnosis were recorded for each patient. Classification of endodontic diseases recommended by American Association of Endodontists from 2009 was used for diagnostic categories (5). Following conditions were considered as indications for endodontic treatment: Symptomatic and Asymptomatic irreversible pulpitis (a clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is incapable of healing); Pulp necrosis (a clinical diagnostic category indicating death of the dental pulp); Symptomatic apical periodontitis (inflammation, usually of the apical periodontium, producing clinical symptoms including a painful response to biting and percussion or palpation); and

Asymptomatic apical periodontitis (inflammation and destruction of apical periodontium that is of pulpal origin, appears as an apical radiolucent area, and does not produce clinical symptoms). Examiners also recorded teeth indicated for nonsurgical retreatment (previously treated teeth with inadequate root canal filling) and teeth indicated for endodontic treatment for prosthodontic reasons (teeth with vital pulp which were indicated for endodontic treatment as a part of prosthodontic rehabilitation). Complete clinical examination for this study, for almost equal number of subjects and using the same diagnostic procedure, was carried out by two examiners, previously trained and calibrated, all in order to get more precise data, and avoid potential differences in diagnostic criteria. After agreement concerning diagnostic procedure and criteria, inter-examiner agreement was calculated using Kappa statistics resulting from preliminary examination, following recommendations from WHO for reliability and validity of data. First 20 individuals were examined separately, two times, by each examiner, and after examination, examiners compared their records and conclusions. In case of a disagreement between the examiners, a mutual consensus was reached after a joint review. Cohen's Kappa value index was 0.87, which is considered excellent.

Descriptive statistics was obtained using SAS statistical package (SAS Institute, 2010) for all the characteristics. The categorical variables are presented as numbers and percentages. Chi-Square test was used for comparison between groups and different indications. P values of less than 0.05 were considered statistically significant.

Results

Study included 229 patients with at least one tooth indicated for endodontic treatment, 123 males and 106 females, mean age 47.5 (SD = 16.6). Endodontic treatment was indicated on 322 (6.6%) teeth from total number of 4911 examined. Largest frequency of teeth indicated for treatment was recorded among subjects aged over 60 years (7.5%), with statistically significant difference between three age groups ($p = 0.0351$). Slightly higher percentage of teeth indicated for endodontic treatment was recorded among male subjects, but without statistically significant difference between genders (**table 1**).

Frontal teeth (incisors and canines) were the

Table 1. Number of teeth indicated for endodontic treatment in relation to subjects age and gender

| | Subject | Present teeth | Teeth indicated for endodontic treatment | Chi - square | p |
|---------------|--------------|---------------|--|--------------|--------|
| Age* | I (18 - 35) | 69 | 1753 | 94 (5.4%) | 6.69 |
| | II (36 - 39) | 98 | 2090 | 147 (7.0%) | |
| | III (60 +) | 62 | 1068 | 81 (7.6%) | |
| Gender | Male | 123 | 2652 | 179 (6.7%) | 0.35 |
| | Female | 106 | 2259 | 143 (6.3%) | |
| Total | 229 | 4911 | 322 (6.6%) | | 0.5539 |

*Mean 47.5, Min 19, Max 83, SD 16.6

most common tooth group indicated for endodontic treatment (36.6%), followed by premolars (32%) and molars (31.4%). From the total number of 322 indicated for treatment, 61.8% were maxillary teeth. The differences between the tooth groups and jaws were significant ($p = 0.006$, $p < 0.001$) (figure 1, figure 2).

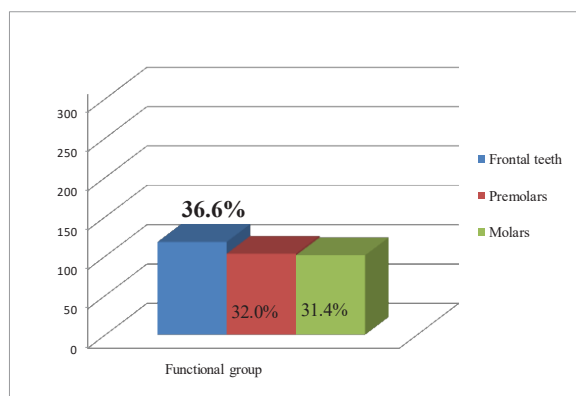


Figure 1. Distribution of teeth indicated for endodontic treatment in relation to functional group

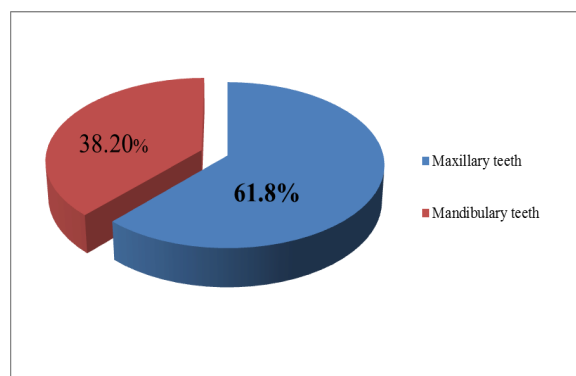


Figure 2. Distribution of teeth indicated for endodontic treatment in relation to jaw

The vast majority of teeth indicated for endodontic treatment were without any restoration (64.3%), followed by teeth with composite restorations (22.7%), while only 3.3% of them were restored with ceramic or metal-ceramic crowns. Significant difference was recorded between teeth indicated for endodontic treatment in relation to presence or absence of restoration ($p < 0.001$) (figure 3).

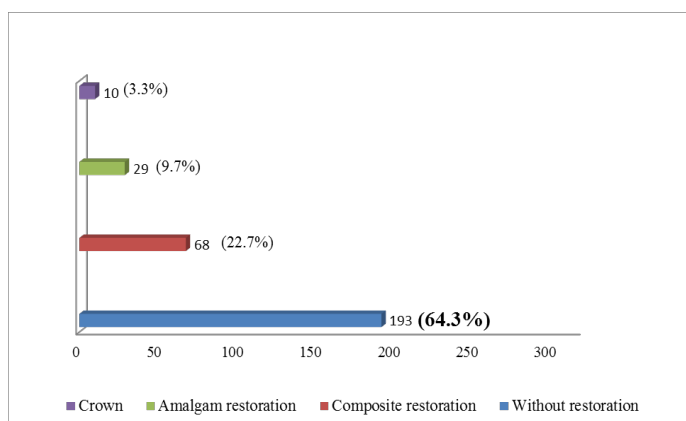


Figure 3. Distribution of teeth indicated for endodontic treatment in relation to type of restoration.

The most commonly registered indication for endodontic treatment was asymptomatic irreversible pulpitis (32.3%), followed by symptomatic irreversible pulpitis (19.9%) and pulp necrosis (16.2%) (figure 4).

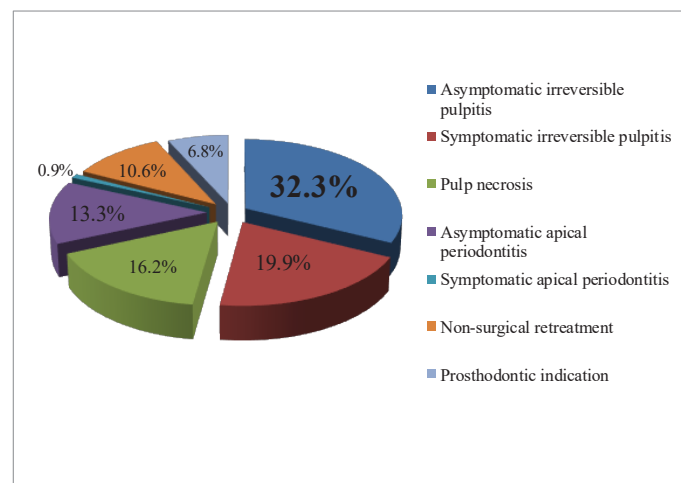


Figure 4. Frequency of different indications for endodontic treatment

Frequency of endodontic emergencies (symptomatic conditions which require urgent treatment) was 21%. The differences between frequency of different indications and symptomatic and asymptomatic conditions were significant ($p < 0.001$) (figure 5).

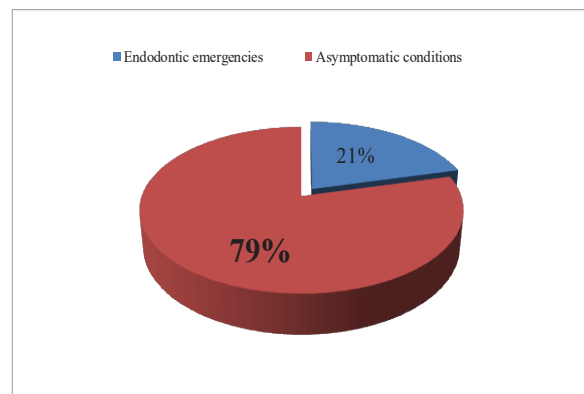


Figure 5. Frequency of endodontic emergencies versus asymptomatic conditions

Irreversible pulpitis was the most common indication for endodontic treatment between all age groups of subjects and between both genders ($p < 0.001$).

Frequency of pulp necrosis was the highest among patients under 35 years of age (23.4%), while apical periodontitis was the most frequently diagnosed among patients over 60 years of age (18.5%). Irreversible pulpitis was diagnosed among one half of male and female patients, followed by pulp necrosis (18.4%) at male and apical periodontitis (14.7%) at female patients (table 2).

The most common indication for endodontic treatment among all three tooth groups was also irreversible pulpitis ($p < 0.001$), with a frequency of 70.3% among molars, 52.4% among premolars and 36.4% among incisors and canines (table 3).

Table 2. Frequency of different indications for endodontic treatment in relation to subjects age and gender

| | | Irreversible Pulpitis | Pulp Necrosis | Apical Periodontitis | Nonsurgical retreatment | Prosthod. indication | Chi-square | p |
|--------|--------|-----------------------|---------------|----------------------|-------------------------|----------------------|------------|--------|
| Age | 18-35 | 53 (56.3%) | 22 (23.4%) | 11 (11.7%) | 4 (4.3%) | 4 (4.3%) | 111.62 | <0.001 |
| | 36-59 | 79 (53.7%) | 17 (11.6%) | 20 (13.6%) | 20 (13.6%) | 11 (7.5%) | 133.04 | <0.001 |
| | 60+ | 36 (44.4%) | 13 (16.1%) | 15 (18.5%) | 10 (12.4%) | 7 (8.6%) | 40.65 | <0.001 |
| Gender | Male | 88 (49.2%) | 33 (18.4%) | 25 (14.0%) | 20 (11.2%) | 13 (7.2%) | 126.3 | <0.001 |
| | Female | 80 (55.9%) | 19 (13.3%) | 21 (14.7%) | 14 (9.8%) | 9 (6.3%) | 148.1 | <0.001 |

Table 3. Frequency of different indications for endodontic treatment in relation to tooth functional group

| | Irreversible Pulpitis | Pulp Necrosis | Apical Periodontitis | Nonsurgical retreatment | Prosthod. indication | Chi-square | p |
|--------|-----------------------|---------------|----------------------|-------------------------|----------------------|------------|--------|
| Front. | 43 (36.4%) | 22 (18.6%) | 23 (19.5%) | 16 (13.6%) | 14 (11.9%) | 28.03 | <0.001 |
| Prem. | 54 (52.4%) | 19 (18.5%) | 13 (12.6%) | 10 (9.7%) | 7 (6.8%) | 89.39 | <0.001 |
| Mol. | 71 (70.3%) | 11 (10.9%) | 10 (9.9%) | 8 (7.9%) | 1 (1.0%) | 203.39 | <0.001 |

Discussion

The root canal system is free from infection, in its healthy and intact state. Bearing in mind this fact, it can be considered that on time caries therapy, as well as regular check-ups and implementation of preventive measures can lead to the reduced frequency of the diseases that require endodontic treatment. Once microorganisms find their way into the root canal system, the consequences may vary from a reversible pulpitis to the necrosis of the pulpal tissue and eventually formation of a periapical lesion. Pulpal necrosis on its own, when no microorganisms are involved, does not necessarily lead to apical periodontitis (6). Although different classification systems for pulpal and periapical diseases can be found in the literature, there seems to be evidence to support the consensus about the absence of correlation between clinical events, radiographic assessment and histopathological characteristics (7). Therefore, for the purpose of this study was used modification of classification recommended by American Association of Endodontists from 2009, which seems to be widely accepted. When it comes to radiographic examination, panoramic radiographs were used for overall dental status evaluation, and retroalveolar radiographs were analyzed for each tooth suspected for endodontic pathology, as a part of standard diagnostic procedure.

While there can be found certain number of studies which evaluate the frequency of endodontically treated teeth, there is not adequate study reporting the endodontic treatment need in the literature. The percentage of teeth indicated for endodontic treatment from the examined sample of this study is higher than in the Tasoker et al. and Weiger et al. studies, who reported 3% out of 19800 teeth and 2.3% out of 7897 examined teeth (8, 9). It should be mentioned that present study included only patients referred to the Department for Endodontics who had at least one tooth indicated for endodontic treatment. Because of that, the study sample does not necessarily reflect the need for endodontic treatment in a population, but can be used

to illustrate the structure and relative frequency of teeth and different indications for endodontic treatment.

Results of this study showed that need for endodontic treatment significantly increases with age. This finding is in agreement with other studies (3, 8, 10, 11) and can be related to increased exposure to caries, periodontal problems and restorative procedures leading to root canal treatment and age-related changes of dental pulp complex. In contrast, Umanah et al. found that the highest frequency of endodontic treatment was among patients between 20 and 29 years of age (12). While some authors found that males required endodontic treatment more often than females (8, 13, 14) and others revealed opposite results (1, 2, 12), in the present study no significant difference was recorded between genders, beside slightly higher percentage of teeth indicated for endodontic treatment among male subjects.

Frontal teeth (incisors and canines) were the most commonly tooth group indicated for endodontic treatment, followed by premolars and molars. This result can be considered as surprising, bearing in mind that most of the authors state that molars and premolars are the most frequent treated teeth (1, 2, 8, 10, 13). The reason for such a result could lie down in the assumption that the frontal teeth are more visible and aesthetic reasons are making the patient more motivated to visit their dentist. Umanah et al. found that maxillary incisors were the most frequently treated teeth (12), while Boykin et al. found no significant difference in frequency distribution between anterior and posterior teeth (4). In the present study, root canal treatment was more frequently indicated on maxillary teeth. This result is in agreement with the results of numerous studies (2, 8, 12, 15). Oglah et al. assumed that this could also be related to the aesthetic reason, as the upper teeth appear more prominent than the lower teeth during smile, making the patient more interested to preserve the upper teeth (1).

The majority of teeth indicated for endodontic treatment in this study were without any restoration. This result can be considered as expected having in mind that

untreated dental caries still represents the main causative factor for the development of irreversible pulp changes (10, 12, 14). Opposite result was obtained in Wigsten et al. study, who found that 83.5% of examined teeth had previously been restored at the time the root canal treatment was initiated (16).

In the present study, irreversible pulpitis was the most common indication for endodontic treatment, which correlates with the results of other studies (2, 12, 14, 17). This result can be explained by the fact that most of the patients of this study do not attend the dental service on a regular basis and had postponed the treatment of deep carious lesions over the years. The largest number of teeth indicated for endodontic treatment was affected by caries and without any restoration and it is well known that most common cause of pulpal injury are bacteria or their toxic byproducts, which may enter the pulp through a break in dentin from caries lesion. Caries lesion may also become a potential reason for root canal treatment even without the patient noticed any kind of symptoms. Similarly, an increase in the frequency of apical periodontitis can also be explained with age. It should be mentioned that there are studies in which pulp necrosis (16) and symptomatic apical periodontitis (18) were the most frequent reasons for performing root canal treatment. The literature suggests that pulpitis and acute apical periodontitis are the main reasons for seeking emergency treatment, ranging from 21% to 64% (4), and the results of this study concerning the frequency of endodontic emergencies are in that range

Conclusion

Within the restriction of the present study, it can be concluded that percentage of teeth indicated for endodontic treatment was higher than presented in other studies. Maxillary teeth showed higher percentage than mandibular and frontal teeth higher than posterior. Need for endodontic treatment increased with age. Irreversible pulpitis was the most common indication for endodontic treatment. After conducting the study, it is clear that dental care and caries preventive programs should be strengthened and expanded, especially among people with less education and awareness regarding dental health.

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