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Research Article

Effect of e-learning and Covid 19 on the Quality of Practical Endodontic Treatment by final year students

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Abstract

Aim: The aim of the present study is to evaluate the effect of distance e- learning and Covid-19 on the quality of the endodontic treatment performed by students in their final year.

Material and Methods: The object of the study is the practical endodontic work of 139 Bulgarian students as follows: 74 girls and 65 boys. Statistically, this class of students was in a distance e-learning mode with the longest duration of time compared to the other classes in faculty dental medicine due to the imposed restrictions and closing universities, measures introduced in the country on the occasion of the Covid-19 pandemic worldwide.

Results: The total number of endodontic cases performed by the final year students was 272, of which 193 were cases of endodontic treatment of single-rooted teeth. The identified perforations were 16 in number or 5.9% of all registered clinical cases, 11 of which were registered in upper and lower molars. The most common type of perforations found were on the floor of the pulp chamber.

Conclusion: The results of the present work show that the prolonged distance e- learning, the Covid-19 pandemic and the reduction of practical work hours for the graduating students of 2022 have worsened the quality of their endodontic treatments, increasing the frequency of recorded iatrogenic perforations, with less- performed available treatments compared with the data reported from previous, similar studies.

Keywords: e-learning and Covid 19, iatrogenic perforations, direct and strip perforations in the furcation

1. Introduction

The first data on persons ill with Covid-19 were recorded in Wuhan China in December 2019. Disease caused by the respiratory virus SARS-CoV-2 [1]. A serious respiratory disease, transmitted via respiratory droplets and physical contact [2]. This way of spreading the virus is also the reason for its rapid and widespread worldwide. And in March 2020, the World Health Organization defined the disease as a global pandemic[3-5].

The first officially registered case of a person with Covid-19 in Bulgaria was announced on 08.03.2020. At the beginning of the disease's global spread, there were many unknowns regarding both its course and clinical protocols and best treatment practices. All this, together with the rapid spread of the virus in the world and the numerous recorded deaths, necessitated the announcement of a lockdown by the government in Bulgaria on March 13th, 2020 for a period of 1 month, which was subsequently extended several times in order to limit the spread of the disease in the country [6]. A complete economic and social lockdown was introduced in Bulgaria, including a ban on face-to-face studies at universities.

The class of 2022 final year students of doctors of dental medicine was the class that was in a distance e-learning mode with the longest duration of time compared to the other classes, without hours for practical work due to the imposed restrictions and closure of the universities, measures introduced in the country. At the time of the introduction of these bans namelythe summer semester of the academic year 2019/20, the students were in the 4th year of their studies, i.e. at the beginning of their practical work in conservative dentistry with patients. Their distance e-learning continued

during the winter turn of the academic year 20/21 with a complete lack of hours for practical work in the discipline.

In the literature we found no data on the effect of e-learning and Covid-19 on the quality of endodontic treatment performed by students who were in a mode of long-distance learning accompanied by severe limitations and reduction of practical hours.

Most of the data and conclusion in the dental literature are questionnaire studies with very mixed results and conclusions [7-11].

Practical activity is an outstanding and important part of the overall dental education and its absence would likely affect the quality of the education students receive. Regardless of the different forms of e-learning used at Sofia Medical University, they cannot replace the real conditions of clinical dental practice.

The aim of the present study is to evaluate the effect of distance e- learning and Covid-19 on the quality of the endodontic treatment performed by students in their final year of study during the academic year 21/22 (the class of 2022) in terms of the frequency of admitted iatrogenic perforations during their pre-graduation internship.

The first null hypothesis is that e-learning has a negative effect on the quality of the endodontic treatment performed, due to the lack of established practical skills and experience. The second hypothesis is that distance e -learning has an extremely positive effect on the quality of endodontic treatment, due to the possibility of accumulating basic knowledge.

2. Material and Methods

The object of this study is to evaluate the quality of the endodontic treatment performed (in relation to the iatrogenic perforations) by students in the last year of their study during the 21/22 academic year (the class of 2022). The object of the study is the practical endodontic work of 139 Bulgarian students as follows: 74 girls and 65 boys.

The pre-graduation state internship lasts 135 working days. It starts on September 27, 2021. and ends on March 25, 2022. The practical hours in conservative dentistry are 5 academic hours per week.

In this period, the mandatory minimum amount of practical work performed for conservative disease treatment for each student includes treatment of 1 endodontic clinical case and treatment of two caries. All patients treated by students had signed an informed consent.

The criteria for root canal treatment qualitywere established in accordance with the European guidelines and previous studies on the outcome of endodontic treatment performed by dental students [12].

The criteria for the diagnosis of iatrogenic perforations are: the occurrence of sudden bleeding and pain during endodontic treatment. Apical perforation: identified when the apical termination of the filled canal was different from the original canal terminus, or when the filling material was extruding through the apical foramen [13] .

For perforations diagnosed only by radiography, the following criteria are accepted: a clearly visible endodontic instrument in the perforation, a post penetrating the adjacent tissues. Apical iatrogenic perforations were found only clinically, with the absence of apical stop and free passage outside the anatomical apex of an endodontic instrument equal to or greater than №35 as a criterion, provided that the initial size of the physiological narrowing corresponded to a smaller tool.

The x-rays from patients' records were investigated separately by two experienced examiners with a double-magnifying glass. The two researchers were calibrated before and after the evaluation.

All patients had signed informed consentt forms. The Ethics Commission for Research at the Medical University of Sofia (KENIUMUS) approved the study. Results for descriptive statistics were expressed as means and standard deviations (SD), frequencies and percentages. The data are presented tabularly and graphically.

The statistical method "Comparison of relative shares" was used. The results were processed statistically.Compare percentages between groups. There is no significant difference, p=0.05

3. Results:

The results are presented in the table 1 and figure 1. The total number of endodontic cases performed during the pre-graduation internship is 272, of which 193 are cases of endodontic treatment of single-rooted teeth. The identified perforations were 16 in number or 5.9% of all registered clinical cases, 11 of which were registered in upper and lower molars. The most common type of perforations found were on the floor of the pulp chamber.

Table1. Frequency of perforations during endodontic treatment

Perforation	Frequency	%
0 /no/	256	94,1
1 /yes/	16	5,9
Total	272	100

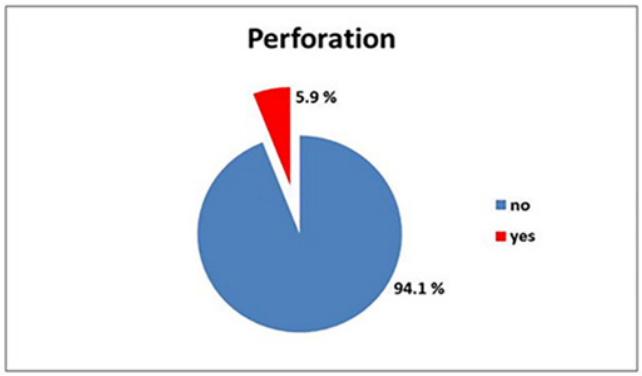

Figure 1: Frequency of iatrogenic perforations

The main reason for the admittes iatrogenic perforations is the lack of in-depth knowledge of the anatomy of the endodontium in the different groups of teeth, which leads, on the one hand, to improper preparation of the endodontic cavity, not in accordance with the clinical cases, 11 of which were registered in upper and lower molars. The most common type of perforations found were on the floor of the pulp chamber. crown inclination, and, on the other hand, to failure to detect the localization of the orifices. Treatments are usually for the elderly, and the age-related changes that have occurred are an additional challenge for students.

4. Discussion: The practical clinical work in conservative dentistry of the Bulgarian students from the Faculty of Dental Medicine Sofia starts from the 4th year. Before the Covid-19 pandemic, the total number of practical hours for conservative dentistry students was 315, of which 165 hours for the 4th year and 150 hours for the 5th year.

During the Covid-19 pandemic, the class of 2022 were in distance e- learning mode for the entire summer term of the academic year 2019/20 and the entire winter term of the academic year 20/21 and were deprived of 188 hours of practical work with patients, in connection with the announced lockdown.

In January 2021, after the introduction of the first messenger RNA genetic vaccines and vaccination started in Bulgaria, hybrid training was introduced in the summer semester of the 21/22 academic year. Hybrid training is a combination of distance e-learning and practical exercises. 1/2 of each student group does a full week of distance e- learning, and the other half has hands-on training with patients; and next week there will be an exchange of the subgroups and their type of training.

Calculating the total number of hours oc practical work for the entire course of study of the class of 2022, subject of this study, a total of 127 hours was found. The limitation of the present form of training necessitated a change and reduction in the required minimum standard for prepared endodontic clinical cases, and this had an impact on the acquisition of practical experience and manual skills of the Bulgarian students. In previous studies, Dimitrova et al [14]. Investigating the frequency of iatrogenic perforations made by students, during the pre-diploma internship, reported respectively for the academic year 2015 of 3.9% perforations and in 285 completed endodontic clinical cases and respectively 4.1% for 2016 academic year with 493 treated teeth. These are data on the quality of endodontic treatment by students, during a full course of practical training outside of pandemic and Covid-19 conditions. In research, in years outside the conditions of Covid- 19 Dimitrova et al. report a total of 20 perforations made by students for the academic year 2016, the majority of which affect the group of molars[15].

As can be seen from the current result, there is a visible trend of deterioration in the quality of the endodontic treatment performed, with a significant increase in the frequency of iatrogenic perforations made by the students from the class of 2022, at less endodontic treatments. Students in a long-term distance e-learning mode and a significantly smaller number of clinical cases of endodontic treatments - 272 endodontic treatments and 5.9% of iatrogenic perforations were established, compared to e.g. academic year 2015, 285 endodontic clinical cases, 3.9% were the registered perforations. Therefore, based on the obtained results, the second hypothesis made about the positive effect of distance e-learning on conservative dentistry is rejected.

We did not find similar real-world comparative data on the quality of endodontic treatments performed by students trained during the Covid pandemic and in the distance e-learning mode. Most of the reported data in the literature is based on a survey conducted among students or teachers. But the results of these studies are based on subjective opinions and sometimes may not accurately reflect the changed conditions due to e-learning and Covid-19.

Data on the negative effect of distance learning prevail. For example, Al-Attar reports that more than 85% of surveyed students define the closing of universities as a negative effect on the quality of education [16]. Similar data were also found by other authors (Oana0Oana-Cella Andrei et al [7]. found that only 8.3% of surveyed students rated e-learning as effective, with most dental students having a negative attitude because of the loss of clinical activity.

And Loch et al [17]. conclude that the Covid-19 pandemic has significantly affected dental practice and education. Similar data were found on the quality of education in India by Shrivastava KJ, Nahar [18].

And Ayca Sanalioglu Gungor et al [19]. summarize opinions according to which distance (online) education used in dental schools in Turkey is not positive, as dental training requires intensive clinical practice, and this has been interrupted during the pandemic.

Relatively few published data in the literature support the positive effect of distance e –learning in dental students

[20,11].

Iatrogenic perforation is a serious complication during endodontic treatment and may result in tooth loss. Despite the availability of many different modern calcium silicate cements, the success of the restoration depends not only on the physicochemical properties of the calcium silicate cements, but also on many other factors. The healing process is complex in nature [21].

5. Conclusion:
The results of the present work show that the prolonged distance e-learning, the Covid -19 pandemic and the reduction of practical work hours for the graduating students of 2022 have worsened the qualityof their endodontic treatments, increasing the frequency of recorded iatrogenic perforations, with less- performed available treatments compared with the data reported from previous, similar studies.

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Declaration of Interest

The authors report no conflict of interest

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