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Dear Colleagues,

It is with great pleasure that I welcome you to the first issue of our peer-reviewed academic journal named, “**Journal of Dental Sciences and Education**”. As editor-in-chief, I am honored to introduce this exciting new journal dedicated to advancing the field of dentistry. In this first issue, a review of new developments in the field of dentistry, original researches, and an interesting case report are included. One of our most important goals is to mediate appropriately the sharing of knowledge and experience among dental professionals, researchers and academics. In this issue, we share with you six articles covering various topics in dentistry.

Our first article of the journal “*Complaints and expectations of patients who admitted to dental faculty hospital*” is an original article including a total of 100 patients, and the authors presented to determine the purpose of hospital admission and their expectations from the hospital of patients. The second article “*Effect of mouthwash on color change and solubility of composite resins*” is an invitro study evaluating the effects of currently available mouthwashes on color changes and solubilities of composite resins by comparing them. Our third article “*Experiences of dentistry interns during the COVID-19 pandemic*” is another an original article. The fourth article titled “*Rubber dam application in clinical practice: a study on patient perspective*”, which includes 250 patients in total, is a study presented to determine the opinions of patients who underwent dental procedures about rubber dam application. The fifth article “*Premixed calcium silicate-based cements: a literature review*” is a review of calcium silicate-based cements, materials that have proven successful in dentistry due to their odontogenic/osteogenic properties. Finally, the sixth article titled “*Management of a complex dentoalveolar trauma: a case report*,” the authors presented an interesting case of dentoalveolar trauma evaluated clinically and radiographically.

As we embark on this new journey together, I would like to thank the authors, reviewers, editorial team and publisher for their hard work and dedication in bringing this first issue to fruition. We look forward to providing you with the latest insights and developments in dentistry, and we welcome your feedback and suggestions.

Sincerely,

Elif Pınar Bakır, PhD,
Editor-in-Chief

Volume: 1 Issue: 1 Year: 2023

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Complaints and expectations of patients who admitted to dental faculty hospital

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ABSTRACT

Aims: This study aimed to determine the purpose of hospital admission and their expectations from the hospital of patients who were first-time admitted to the Faculty of Dentistry Hospital. Thus, it was aimed to determine the awareness of patients about dental health and raise awareness among healthcare professionals.

Methods: This cross-sectional study, which was conducted among 100 patients who were first-time admitted to Cukurova University Faculty of Dentistry Hospital, was carried out with a data collection form. The data collection form consisted of 3 section, including demographic information, reasons for hospital admission, and questions about expectations from the hospital. Categorical data were summarized as percentages and numbers. The Chi-square test statistic was used to determine the patient characteristics that influenced the expectation questions. P value <0.05 was considered statistical significance.

Results: The mean age of the patients, consisting of 52 women and 48 men, was 34.87 years. The vast majority of patients (89%) had social insured and more than half were students (39%) or housewives (19%). It was found that patients often admitted to hospital for dental caries, severe toothache and tooth extraction. The questions with the most agreement in the expectation questions was the ease of access to the hospital and the cleanliness of all units, with a response rate of 37%. Female patients had higher expectations of hygiene and safety from the hospital compared to male patients (29% vs. 2.2%). Patients who were transferred due to trauma mostly marked the option that nurses should be able to assist the patient in case of an emergency (transferred: 23.8%, non-transferred: 2.7%).

Conclusion: Although the majority of patients who were admitted to the Faculty of Dentistry hospital came when a toothache started and admission as tooth extraction, the presence of patients who were came for general check-ups is promising.

Keywords: Dental hospital, patient, complaint

* This study was presented as an oral presentation at the International Aegean Health Areas Symposium (2021).

INTRODUCTION

Healthcare services are an important indicator of a country's socioeconomic development level.¹ The main goal of healthcare services is to provide the health services it needed to the community at the quality and time desired by the patient and at the lowest possible cost. The healthcare sector is among the most problematic institutions when it comes to meeting patients' expectations.²

In recent years, more studies have been conducted to determine the quality of healthcare services.³ High quality in the healthcare sector is defined as meeting the expectations and needs of service recipients. Therefore, it is important to take patients' views into account when evaluating the service provided and ensuring continuity of service. The World Health Organization's (WHO) "World Health Report 2000, Health Systems: Improving Performance" report includes meeting patient expectations as one of the three main goals of healthcare systems.⁴

Current researches is increasingly focused on the impact of psychosocial factors on clinical treatment outcomes. It has been found that expectancy, which is an important

psychological factor, generally affect the patient's evaluation of treatment quality or satisfaction with the treatment outcome.⁵ What patients think may influence what happens during clinical treatment. When the discrepancy between expectations and reality increases, it can affect the course of dental treatment. Unmet expectations can lead to dissatisfaction, while a positive attitude can increase the success of the treatment.⁶

Improving the quality of healthcare services can be achieved by reducing the number of patients admitted to hospitals.⁷ In this context, factors such as raising society's awareness, preventing diseases through appropriate measures, and strengthening preventive medical activity are gaining importance. In the field of dentistry, patients should adopt important habits for dental health, such as brushing and flossing their teeth, avoiding caries-causing foods and beverages, and visiting the dental check-up every six months.⁸

This study aimed to determine the purpose of hospital admission and their expectations from the hospital of patients who were first-time admitted to the Faculty of





Dentistry Hospital. In addition, determining patients' level of knowledge about dental health and raising awareness for healthcare professionals are secondary purposes.

METHODS

A total of 100 patients aged 16-65 years who were first-time admitted to Çukurova University (CU) Faculty of Dentistry Hospital and able to make their own decisions were included in this cross-sectional study.

The data collection form was made for each participant by face-to-face interview technique. Ethical approval for the study was obtained from Çukurova University Faculty of Medicine Medical Ethics Committee (Date: 09.03.2019, Decision No: 106). Informed consent was obtained from all participants.

The data collection form was composed of three sections:

The first section included patients' demographic information, including gender, age, health insurance, education level, occupation, presence of a healthcare professional in the family, whether they were students or employees of the university, and whether they were referred from another institution.

The second part included the reasons for hospitalisation, such as general control, dental cleaning, gum diseases, caries, tooth sensitivity, severe toothache, tooth extraction, trauma, dental prosthesis, orthodontic treatment, aesthetic expectations (smile aesthetics) and intraoral wound or disease.

The third section included questions related to patients' expectations from the hospital, healthcare services, non-healthcare personnel, healthcare professionals, and physicians (Table 1). The patients were asked to mark the two options they considered most important for each question.

Statistical Analysis

The IBM SPSS Statistics version 20.0 package program (IBM Corp. Armonk, NY, USA) was used for statistical analysis of the data. Categorical measurements were presented as numbers and percentages. Chi-square test were used to determine the patient characteristics that influenced the patients' primary expectations (the first two preferences) for the questions about the hospital and its staff. P value of < 0.05 was considered statistically significant.

RESULTS

A total of 100 patients participated in the study, of which 52 were female and 48 were male. The youngest patient in the study was 16 years old, while the oldest was 65 years old. The mean age of the patients was 34.87 years. The social security and education status of the patients is summarized in Figure 1, while their professions are summarized in Figure 2.

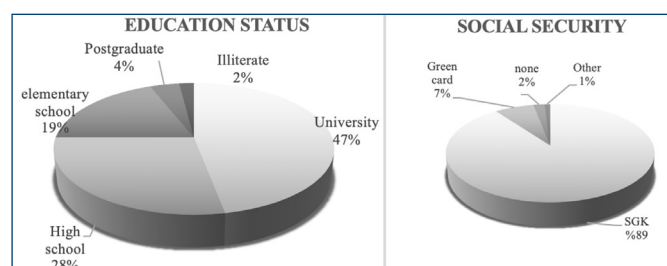


Figure 1. Social security and educational status of patients participating in the study.

Table 1. The questions in the third part of the data collection form on patients' expectations of the hospital, health service, non-health staff, healthcare professionals and physicians.

What are your expectations from our hospital?
Access to the hospital should be easy (near bus stops and the hospital)
All areas of the hospital (e.g., the treatment clinic, waiting rooms, and restrooms) should be clean
The waiting area in the hospital should be spacious and have enough seating.
Areas such as canteen, infant care room, prayer room should be available in the hospital.
The hospital must be equipped for emergencies (fire, earthquake, etc.)
What are your expectations of our hospital's health services?
Patients should receive an appointment as soon as possible.
The patient should arrive on time on the day of the appointment and enough time should be allowed.
The most advanced treatment for the patient should be done with the highest quality materials.
Because of the complications that can occur (after the treatment e.g., the filling out, hitting the prosthesis, the face swelling), the patient should be treated without waiting again.
Satisfaction, suggestions and complaints about the hospital or the staff should be possible without any problems.
What are your expectations from our hospital non-health staff?
Secretarial, information, security and cleaning staff should be respectful, smiling and courteous.
All hospital staff should answer patients' questions in their area of responsibility.
Procedures such as registration, registration, making appointments should be handled expeditiously by staff.
Staff should be at the duty station during working hours and should be concerned only with their work.
If necessary, disabled, sick and elderly patients should be accompanied
What are your expectations from our hospital healthcare professionals?
All health care workers (nurses and aids) should be polite, smiling, and helpful.
Nurses should be able to assist patients in emergencies.
Treatment times should be shortened by having an adequate number of nurses and aids.
They must have a general knowledge of the specialty to be able to answer the patient's questions
Patient privacy should be maintained during examination and treatment.
What do you expect from our hospital interns and specialists?
Physicians must be caring, smiling, hardworking and professionally equipped
Physicians should listen to patients' complaints and consider their expectations.
Physician should spare time and examine the patient in detail.
Physician should educate the patient about the disease and its treatment and obtain consent for treatment.
Depending on the patient's condition, the specialist physician should take care of the patient instead of the intern.

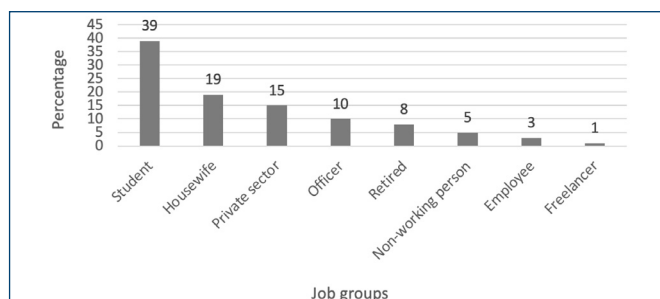


Figure 1. Occupations of the patients participating in the study.

In response to the question, "Do you have a healthcare worker in your family?", 20% of patients answered "Yes". To the question "Are you a student or employee of the CU?", 23% answered "Yes", and to the question "Did you come to our hospital with a referral?", 22% answered "Yes". The most frequently marked responses and their numbers to the question "What is the reason for your hospital admission?" are shown in Table 2.

**Table 2. Complaints and numbers of patients admitted to dental faculty hospital.**

Patient complaint	n	Patient complaint	n
Severe toothache	20	Tooth extraction	20
Tooth decay	19	General control	14
dental prosthesis	10	Trauma	7
Gum diseases	7	Implant	6
Orthodontic treatment	5	Tooth sensitivity	3
Cyst	2	Aesthetic expectation	2
Teeth cleaning	2	Intraoral wound, disease, etc.	1

In response to the question “What are your expectations from hospital?”, the combination of “The hospital should be easily accessible (with bus stops near to the hospital), and all units of the hospital (treatment clinic, waiting rooms, and toilets) should be clean” was marked by 37% of patients.

A statistically significant difference was found between female and male in their expectations from the hospital. Female’s expectations were mostly related to hygiene and safety (female: 29.4%, male: 2.2%), while men’s expectations were related to easy access to the hospital and a spacious waiting room with sufficient seating (male: 22.2%, female: 7.8%).

In response to the question “What are your expectations from the healthcare services of our hospital?”, the combination of “Patients should be given appointments as soon as possible, and patients should be treated without delay in case of complications after treatment (such as fillings falling out, prostheses hitting, and facial swelling)” was marked by 28% of the patients.

In response to the question “What are your expectations from our non-healthcare personnel?”, the combination of “Secretaries, receptionists, security, and cleaning staff should be respectful, cheerful, and polite” and “Procedures such as applications, registrations, and appointments should be performed quickly by staff” was marked by 22% of patients.

In response to the question “What are your expectations from our healthcare professionals?”, the combination of “All healthcare workers (nurses and assistants) should be kind, cheerful, and helpful”, and “Sufficient numbers of nurses and assistants should be provided to shorten treatment times” was marked by 26% of patients. For this question, a statistically significant difference was found between patients who came to the hospital with a referral and those who did not. Patients who came to the hospital with a referral were more often marked the answer “Nurses should be able to help patients in case of an emergency” (referred: 23.8%, non-referred: 2.7%). It was also found that the reasons for admission of referred patients were mostly trauma-related.

In response to the question “What are your expectations from our intern doctors and specialist doctors?”, the combination of “Doctors should listen to patients’ complaints and take their expectations into account, and doctors should inform patients about their illness disease and treatment and obtain their approval for treatment” was marked by 14% of the patients.

DISCUSSION

When people perceive a deterioration in their health, they exhibit various behaviors. In general, the patient’s understanding of health is shaped by their beliefs, fears, anxieties, and expectations, which encompass their experiences. It is the responsibility of health professionals to address patients’ fears. Healthcare professionals can make

some mistakes in their daily practices when it comes to what needs to be done for the patient. Among the most important ones are interrupting patients, not listening to their views, and not taking into account their expectations.⁹ There are some studies in the literature that focus on patients’ expectations and preferences.^{10,11} However, very little research has been done on this topic in our country. In a study conducted in Elazığ, where the perceived service quality of four hospitals in the city center was measured and compared using the Servqual scale, it was found that the hospitals did not meet patients’ expectations.¹²

Healthcare services provided by health care facilities are inherently prone to errors, and not every patient leaves fully satisfied. While some of these situations may be unavoidable in hospitals, others are due to rights violations. Inadequacies in the healthcare system are the primary cause of these violations, while others are the fault of patients and healthcare professionals. Factors such as modern equipment, dentist and assistant approach, quality of treatment, pain control, waiting time, dentist accessibility, and time allotted for treatment are all factors that affect patient satisfaction. Healthcare facilities should incorporate patient satisfaction into their quality management policies. Although measuring and evaluating patient satisfaction can be challenging, it is critical to the development of the healthcare sector.

A study conducted at Giresun State Hospital on patient satisfaction with oral and dental healthcare services reported that patient satisfaction with the services received did not differ by age, gender, place of residence, education level, occupation, and social security status.¹⁵ The higher the income and education level, the higher the satisfaction expectation. The most important reason for preferring the polyclinic was that they had been there before and were satisfied with the services. The most important reason for satisfaction was the good relationship between patient and doctor, while low price was another reason for low-income patients.

Some studies have compared patient satisfaction between State and Private hospitals in Turkey.¹⁶ A previous study concluded that participants were generally more satisfied with Private hospitals than with State hospitals, but that Private hospitals also had some shortcomings.

In a study assessing Oral and Dental Health-Related Quality of Life and Oral Health Impact Profile in Turkey, patients’ gender, marital status, age, education level, and reasons for admission to the hospital were examined, and these factors were found to have significant effects. It was found that female had lower scores than male on these scales. The illiterate group had lower oral health-related quality of life. Individuals who were admitted to hospital for gum problems, tooth decay, and prosthesis treatment had the lowest mean scores.¹⁷

When the results of this study were examined, it was found that the majority of patients who were admitted to hospital came for toothache and admitted for tooth extraction. This indicated that patients are not adequately awareness about oral hygiene. Since the vast majority of patients in the study were young (mean age: 34.87 years), the proportion of patients who were admitted for prosthetic treatment was lower than expected.

A previous study examined the difference between service quality expectations and experiences of patients who were admitted to Dental Training Hospital was examined using a modified version of the Parasuraman Servqual model. It was found that 11.6% of respondents had problems related to service, and the most important reason given was reliability,



especially for women. While the service expectations of participants without academic qualifications were lower, those of professional individuals were more realistic.¹⁸ Another study on measuring patients' expectations of dental services showed that the patient's expectation for the clinical environment received the highest score, followed by dental human factors. Convenience of transportation from the patient's home to the clinic was found to be an important factor in the use of dental services.¹⁹

This study is consistent with the literature. Consensus was reached on the questions regarding expectations, with ease of transportation and cleanliness of the hospital being the most important. In addition, it was found that female placed more importance on cleanliness and reliability, while male placed more importance on transportation and comfort.

A previous study conducted at a dental school hospital in the United Kingdom examined what patients expected from emergency dental services. Although their first desire was to get rid of the pain, they also wanted reassurance that the problem was not serious and information about the cause of their pain. Effective and sensitive communication between dentists and patients may be even more important during emergency consultations than in other clinical situations. In addition, it was emphasized that the dentist's skills of listening, explaining, and reassuring are more important for this patient population.²⁰

In this study, the number of patients presenting with trauma, which is an urgent condition, was higher than the expected rate (7 per 100 individuals). This may indicate that patients presenting with trauma were more likely to be referred to the university than to local oral and dental health centres. It was found that these patients were statistically more likely to mark the option "Nurses should be able to assist help patients in emergency" in their expectations from healthcare professionals. Consistent with the literature, this may be due to these patients' desire to feel safe.

In healthcare, the "Green" concept has emerged and it is gaining popularity.²¹ The use of green practices in healthcare facilities, such as effective use of energy, water, and resources, prevention of waste, effective waste management, and quality interior and environmental management, is important not only in terms of cost benefits but also to improve public health. A previous study²² aimed to provide literature information on the implementation of the green hospital concept in the world and in Turkey, to examine the expectations of employees, patients, and their relatives regarding green hospital features in a public hospital in Istanbul, and to investigate whether these expectations differ according to demographic characteristics. The result showed that hospital users had a high level of awareness and expectations regarding green hospital features. According to the results, it was determined that both hospital staff and service users considered not only the physical structure where treatment is provided, but also how they use natural resources and energy to be important. This study can be improved by integrating green concepts in healthcare into the expectation questions.

CONCLUSION

The high incidence of severe toothache, dental caries, and tooth extraction as the reasons for hospital admission indicated that patients do not give enough importance to oral and dental health. Efforts should be made to increase patients' awareness. However, the presence of patients who come for

general check-ups is also promising. Patients' expectations, as observed in this study, should create awareness among hospital management and staff. This study can be improved by increasing the number of patients attending the oral and dental health hospital and assessing their satisfaction after treatment.

ETHICAL DECLARATIONS

Ethics Committee Approval: Ethical approval for the study was obtained from Çukurova University Faculty of Medicine Medical Ethics Committee (Date: 09.03.2019, Decision No: 106).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Effect of mouthwash on color change and solubility of composite resins

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ABSTRACT

Aims: This study aimed to evaluate the effects of currently available mouthwashes on color changes and solubilities of composite resins by comparing them.

Methods: Three different types of composite resins, namely nanofill, nanohybrid, and microhybrid resins (Filtek Ultimate, Estelite Sigma Quick, and Filtek Z250, respectively), were used in this study. A total of 120 samples, with 40 for each composite material, were prepared. The composite resins were placed in plastic molds of 10 mm × 2 mm with round disc shapes and polymerized with an LED light device. After finishing and polishing them with a polishing disc, the prepared samples were stored in distilled water. Initial color measurements were performed using the VITA Easyshade V device (VITA, Germany) for color stability evaluations. For solubility measurements, the dry weights of the samples were measured and their diameters and thicknesses were recorded with a caliper. Samples from each group were then immersed in three different mouthwashes (Kloroben, Listerine Advanced White, and Colgate Plax) twice a day for 2 minutes for 14 days. After 14 days, color and weight measurements were repeated for all samples. Kruskal-Wallis and Mann-Whitney U tests were used in the statistical analysis of the data.

Results: Significant color changes were detected in all samples as a result of color measurements ($p < 0.05$). Significant differences were observed for all solution groups in terms of color change, but the lowest amount of color change was observed with the Colgate Plax solution. Comparisons of composite groups revealed that Filtek Ultimate was the composite with the lowest amount of color change. Positive solubility values were recorded for all samples as a result of solubility measurements. Although no significant difference was observed among composite groups in terms of solubility, higher solubility levels were detected with the Kloroben, Listerine Advanced White, and Colgate Plax solutions compared to the control group.

Conclusion: In this study, in all evaluated composite groups, acceptable levels of color change and solubility were detected, with values varying depending on the composite material after immersion in the mouthwashes.

Keywords: Composite resin, mouthwash, color change, solubility

INTRODUCTION

Composite resins are now among the most commonly used dental restoration materials due to their advanced aesthetic, mechanical, and physical properties. They have become widely used, especially with the advancements in adhesive technology. Despite the progress in composite resins, however, color stability remains an important issue. Color change is one of the most common reasons for the replacement of restorations (1).

After composite resin restorations are applied to teeth, they are in constant interaction with the oral environment (2). They are exposed to the chemical components of saliva, water, food, and oral hygiene products in the mouth. Polymer-based composite resins are negatively affected by the fluid environment in the mouth. They can absorb water and solvents and release certain components, including filler particles. This phenomenon, known as water sorption and solubility, can have negative effects on the resin matrix structure (3).

Mouthwashes can be used with or without a dentist's recommendation for different purposes including the

treatment of periodontal infections such as gingivitis and periodontitis, prevention of dental caries or bad breath, plaque control, daily oral hygiene routines, and whitening effects (4). These mouthwashes, containing water, antimicrobial compounds, salts, organic acids, preservatives, coloring agents, and sometimes alcohol, can have harmful effects on oral soft tissues, teeth, and restorative materials (5,1).

The aim of this study is to examine the effects of mouthwashes with different contents that are widely used today on the color change and solubility of three different types of composite materials.

METHODS

Ethics committee decision is not required as it does not contain human and animal material. All procedures were carried out in accordance with the ethical rules and the principles.





In this study, three different types of A2 shade composite materials were used, including nanofill (3M ESPE Filtek Ultimate Universal Restorative, 3M, St. Paul, MN, USA), microhybrid (3M ESPE Filtek Z250 Universal Restorative, 3M, St. Paul, MN, USA), and nanohybrid (Tokuyama EsteliteSigma Quick, Tokuyama Dental Corp., Tokyo, Japan) composites. Forty samples were prepared from each of these composites, resulting in a total of 120 samples. Plastic molds with a diameter of 8 mm and thickness of 2 mm containing circular voids were used to prepare the samples. Cement-glass was placed under the molds, followed by transparent tape. The composite materials were condensed into the molds using a dental spatula to eliminate any air voids and transparent tape was placed over them, followed by cement-glass. Excess materials were removed by gently pressing the composites down and obtaining a smooth surface. Polymerization was then carried out using an LED light device according to the manufacturer's recommendations for each composite type. Glass of 1 mm in thickness was used for standardization of the distance between the composite and the light device during polymerization and the head of the light device was held perpendicular to the glass. The prepared samples were polished using Sof-Lex discs and then stored in distilled water at 37°C in an incubator for 24 hours.

A chlorhexidine and benzydamine hydrochloride-based antiseptic mouthwash (Kloroben, Drogosan, Ankara, Turkey), whitening mouthwash (Listerine Advanced White, Johnson & Johnson, Istanbul, Turkey), and alcohol-free mouth care solution (Colgate Plax, Colgate-Palmolive, Istanbul, Turkey) were used as experimental solutions, while distilled water was used for the control group.

Each sample disc was numbered and four subgroups were created for each composite resin group to be immersed in the chosen solutions (n=10). The designated solutions were added to closed bottles with volumes of 20 mL. The samples were immersed in these bottles according to mouthwash groups twice a day for 2 minutes at 12-hour intervals for 14 days. After each immersion, the samples were rinsed and held in distilled water until the next immersion. The samples in the control group were kept in distilled water throughout the experimental period.

Initial color measurements of the samples were carried out in the Dicle University Faculty of Dentistry's Prosthetic Dentistry Laboratory using a spectrophotometer (VITA Easyshade V, VITA Zahnfabrik, Bad Sackingen, Germany). This procedure was performed against a white background in a dark room. Color measurements were repeated three times for each

composite sample. L*, a*, and b* values in the CIELAB color system were recorded for all samples individually.

The initial weights of the samples were recorded as M₁ in micrograms. The diameters and thicknesses of the samples were measured with a caliper (Jensen JP-1, Germany) and average values were calculated. The average diameter of each sample was calculated in mm² and the average thickness in mm³ using the equation $V = \pi r^2 h$. For initial solubility measurements, the samples were kept in a desiccator (EN025, NUVE, Ankara, Turkey) containing silica gel at 37°C for 22 hours. Subsequently, they were kept in a Mikrotest MST-55 oven (Mikrotest, Ankara, Turkey) at 24°C for 2 hours. After measuring the dry weights of the samples on a balance with sensitivity of 0.0001 mg (Precisa XB 220A, Switzerland), it was determined whether there was a weight change of more than 0.2 mg, and the same procedures were repeated after 24 hours. The initial weight of each of the samples, the weight loss of which was found to be less than 0.1 mg (with fixed weight), was thus recorded as M₁ in micrograms.

After 14 days, the samples were washed and dried and the color was measured again under the same conditions. These second values were recorded and the color change value was calculated for each sample using the following formula:

$$\Delta E = [(L_1^* - L_2^*)^2 + (a_1^* - a_2^*)^2 + (b_1^* - b_2^*)^2]^{1/2}$$

For the repetition of solubility measurements, samples were kept in a desiccator for 24 hours, as at the beginning of the experiment, in order to regain their constant weight. When the constant weight was obtained, the new values were recorded as M₃. In this process, the following formula was applied:

$$WSL (\mu g/mm^3) = \frac{M_1 (\mu g) - M_3 (\mu g)}{V (mm^3)}$$

WSL: Water solubility V: Sample volume

Statistical analysis

The analysis of the data obtained in this study was carried out with Licensed IBM SPSS Statistics Version 21 package program. The unit numbers of the variables were taken into account, and whether they were normally distributed or not was tested with the Shapiro Wilk's test. When analyzing the differences between the groups, the Kruskal Wallis H Test was used when there was no normal distribution. In case of significant difference in the comparison of more than two groups, Post-Hoc tests (Mann Whitney U test with Bonferroni correction) were used to determine which groups had a significant difference. While evaluating the data, 0.05 was used as the significance value. It has been reported that there is a significant difference if p<0.05 is found, and there is no significant difference if p>0.05 is found.

Table 1. Composite materials used in the study

Composite materials	Resin matrix	Inorganic Particle	Filler Particle Ratio	Manufacturer Company and Lot No.
Filtek™ Ultimate	Bis-GMA,UDMA TEGDMA,PEGDMA, Bis-EMA	Silica, Zirconium	63% by volume, 78.5% by mass	3M ESPE,ABD 3920A2B
Filtek™ Z250	Bis-GMA,UDMA TEGDMA,Bis-EMA	Silica, Zirconium	60% by volume, 82% by mass	3MESPE,ABD 6020A2
Estelite Sigma Quick	Bis-GMA, TEGDMA	Silica, Zirconium	71% by volume, 82% by mass	Tokuyama Dental Corp. Japan E7802

Table 2. Mouthwash solutions used in the study

Name Of Mouthwash	Mouthwash Content	Manufacturer
Distilled water (Control Group)	Deionized water	Deionized Water, Brtr Chemical
Chlorobene	0.12% chlorhexidine gluconate 0.15% benzydamine hydrochloride	Drogosan Pharmaceuticals Industry Trade Inc.
Listerin Advanced White	Aqua, tetrapotassium, pyrophosphate, pentasodium, triphosphate, alcohol, sorbitol, thymol, menthol, sodium saccharin, sodium fluoride	Johnson and Johnson Sanitary Materials Industry. Trade Ltd.
Colgate Plax	Aqua, glycerin, propylene glycol, cetylpyridinium chloride, sorbitol, sodium, saccharin, sodium fluoride, menthol, aroma	Colgate-Palmolive Cleaning Product. Industry Trade Inc.



RESULTS

Findings of ΔE values

In terms of average ΔE values after mouthwashes and soaking in distilled water, the ΔE value of the Filtek Ultimate group was lower compared to the Filtek Z250 and Estelite Sigma Quick groups (Table 3).

Table 3. Comparison of ΔE values between composite groups

	Composite groups						Kruskal Wallis H Test		
	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
ΔE value								25.458	0.001
FU	40	4.45	4.32	2.49	8.49	1.24	39.66		
FZ250	40	6.21	6.34	3.19	8.35	1.36	78.63		
ESQ	40	5.6	5.22	2.54	9.97	1.84	63.21		
Total	120	5.42	5.25	2.49	9.97	1.66			

When mouthwashes and distilled water were evaluated, the ΔE value of Colgate Plax solution was significantly lower than Chloroben and Listerine Advanced White solutions. There was no significant difference between the other solutions (Table 4).

In the 3M Filtek Ultimate composite group, the ΔE value of the Distilled Water solution was significantly lower than that of Chloroben and Listerin Advanced White solutions. In the 3M Filtek Z250 composite group, the ΔE value of the Colgate Plax solution was significantly lower than that of the Chlorobene solution. In the Tokuyama Estelite Sigma Quick composite group, the ΔE value of Colgate Plax solution was significantly lower than that of Listerin Advanced White and Distilled Water solutions.

There was no significant difference in values between the composite groups in Colgate Plax and Listerine Advanced White solutions ($p > 0.05$) (Table 6).

In the chlorobene solution, the value of the Filtek Z250 composite group was higher. Although there was no

significant difference between Estelite Sigma Quick and Filtek Ultimate composite groups, the value of the Filtek Ultimate group was lower.

In distilled water solution, the ΔE value of 3M Filtek Ultimate composite group was lower than that of 3M Filtek Z250 and Tokuyama Estelite Sigma Quick composite groups (Table 6).

Resolution Findings

There was no statistically significant difference between the composite groups in terms of solubility values ($p > 0.05$).

There was a significant difference between the solutions in terms of solubility values ($p < 0.05$). The solubility values of Chloroben, Colgate Plax and Listerine Advanced White solutions were higher than the distilled water solution. There was no statistically significant difference between the other solutions (Table 8).

In the 3M Filtek Ultimate composite group, solubility values differed significantly between solutions ($p < 0.05$). In the 3M Filtek Ultimate composite group, the solubility value of the Distilled Water solution was lower than that of Colgate Plax and Listerin Advanced White solutions (Table 9).

In the 3M Filtek Z250 composite group, solubility values differed significantly between solutions ($p < 0.05$). In the 3M Filtek Z250 composite group, the solubility value of the Distilled Water solution was lower than the Chloroben, Colgate Plax, and Listerine Advanced White solutions (Table 9).

In the Tokuyama Estelite Sigma Quick composite group, solubility values differed significantly between solutions ($p < 0.05$). In the Tokuyama Estelite Sigma Quick composite group, the solubility value of the Distilled Water solution was lower than that of Chlorobene, Colgate Plax, and Listerine Advanced White solutions (Table 9).

Table 4. Analysis results regarding the differences in solutions in terms of ΔE values

	Solutions						Kruskal Wallis H Test		
	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
ΔE value								15.643	0.001
K	30	5.7	5.31	3.45	8.35	1.45	67.35		
LAW	30	6.06	6.1	3.06	8.49	1.57	74.28		
CPlax	30	4.48	4.14	2.54	7.65	1.29	40.67		
Distilled water	30	5.45	4.89	2.49	9.97	1.92	59.7		
Total	120	5.42	5.25	2.49	9.97	1.66			

Table 5. Analysis of the difference in solutions in terms of ΔE values in composite groups

	ΔE values						Kruskal Wallis H Test		
	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
FU								12.373	0.006
K	10	4.68	4.53	3.56	5.87	0.78	24.7		
LAW	10	5.26	4.95	3.06	8.49	1.83	25.8		
C Plax	10	4.39	4.52	3.08	5.47	0.79	22		
Distilled Water	10	3.46	3.67	2.49	3.81	0.46	9.5		
Total	40	4.45	4.32	2.49	8.49	1.24			
FZ250								10.884	0.012
K	10	7.23	7.52	5.28	8.35	1.08	29.05		
LAW	10	6.51	6.34	5.79	8.03	0.67	22.5		
C Plax	10	5.12	5.28	3.19	7.65	1.56	12.4		
Distilled Water	10	5.99	6.08	4.63	7.57	1.16	18.05		
Total	40	6.21	6.34	3.19	8.35	1.36			
ESQ								16.883	0.001
K	10	5.18	5.13	3.45	6.9	0.98	18.6		
LAW	10	6.4	6.49	3.55	8.42	1.75	25.95		
C Plax	10	3.94	3.85	2.54	7.05	1.22	8.95		
Distilled Water	10	6.9	7.14	4.2	9.97	1.81	28.5		
Total	40	5.6	5.22	2.54	9.97	1.84			

Table 6. Analysis results regarding the difference in composite groups in terms of ΔE values in solutions

	ΔE value						Kruskal Wallis H Test		
	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
K								16.034	0.001
FU	10	4.68	4.53	3.56	5.87	0.78	9.4		
FZ250	10	7.23	7.52	5.28	8.35	1.08	24.4		
ESQ	10	5.18	5.13	3.45	6.9	0.98	12.7		
Total	30	5.7	5.31	3.45	8.35	1.45			
LAW								4.16	0.125
FU	10	5.26	4.95	3.06	8.49	1.83	10.9		
FZ250	10	6.51	6.34	5.79	8.03	0.67	18.3		
ESQ	10	6.4	6.49	3.55	8.42	1.75	17.3		
Total	30	6.06	6.1	3.06	8.49	1.57			
C Plax								4.964	0.084
FU	10	4.39	4.52	3.08	5.47	0.79	15.85		
FZ250	10	5.12	5.28	3.19	7.65	1.56	19.7		
ESQ	10	3.94	3.85	2.54	7.05	1.22	10.95		
Total	30	4.48	4.14	2.54	7.65	1.29			
Distilled Water								19.865	0.001
FU	10	3.46	3.67	2.49	3.81	0.46	5.5		
FZ250	10	5.99	6.08	4.63	7.57	1.16	19.1		
ESQ	10	6.9	7.14	4.2	9.97	1.81	21.9		
Total	30	5.45	4.89	2.49	9.97	1.92			

Table 7. Analysis results regarding the differences in composite groups in terms of solubility values

	Composite groups						Kruskal Wallis H Test		
	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
Solubility values								5,312	0,07
FU	40	3.55	2.98	0	9.96	2.62	53.94		
F Z250	40	4.85	4.98	0	9.96	2.83	70.65		
ESQ	40	3.56	3.98	0	7.96	2.31	56.91		
Total	120	3.99	3.98	0	9.96	2.65			

Table 8. Analysis results regarding the differences in solutions in terms of solubility values

	Solutions						Kruskal Wallis H Test		
	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
Solubility values									
K	30	4.21	4.48	0	9.96	2.23	64.75	51.424	0.001
LAW	30	5.71	5.97	0	9.96	2.69	82.12		
C Plax	30	4.78	4.98	0.96	8.96	2.12	72.38		
Distilled water	30	1.25	0.99	0	2.98	0.74	22.75		
Total	120	3.99	3.98	0	9.96	2.65			

Table 9. Analysis results regarding the difference in solutions in terms of solubility values in composite groups

	Solubility values						Kruskal Wallis H Test		
	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
FU									
K	10	3.28	2.98	0	7.96	2.49	19.6	14.694	0.002
LAW	10	4.78	4.98	0	9.96	2.92	25.7		
C Plax	10	4.97	4.98	0.96	7.96	2.11	27.3		
Distilled Water	10	1.17	0.96	0	1.99	0.64	9.4		
Total	40	3.55	2.98	0	9.96	2.62			
FZ250									
K	10	4.98	4.48	2.98	9.96	2.2	21.4	23.798	0.001
LAW	10	7.47	7.96	3.98	9.96	1.95	31.1		
C Plax	10	5.37	5.48	0.99	8.96	2.36	23.2		
Distilled Water	10	1.58	1.99	0	2.98	0.85	6.3		
Total	40	4.85	4.98	0	9.96	2.83			
ESQ									
K	10	4.38	4.98	0.99	5.97	1.83	24.65	17.133	0.001
LAV	10	4.88	5.97	0	7.96	2.41	27.05		
C Plax	10	3.98	3.98	0.99	6.97	1.82	22.6		
Distilled Water	10	0.99	0.99	0	1.99	0.66	7.7		
Total	40	3.56	3.98	0	7.96	2.31			

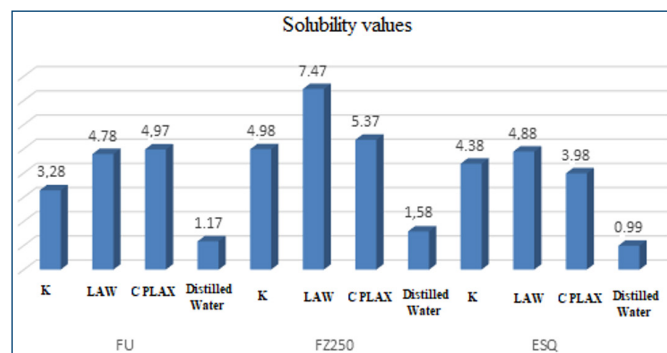


Figure 1. Differences in solubility values in composite groups and solutions

The solubility values in the Listerine Advanced White solution differed significantly between the composite groups ($p < 0.05$). In the Listerin Advanced White solution, the solubility value of the 3M Filtek Ultimate and Tokuyama Estelite Sigma Quick composite groups was lower than the 3M Filtek Z250 composite group.

DISCUSSION

Color stability and solubility of composite materials upon exposure to various chemicals are important factors affecting the clinical life of aesthetic restorations (6,7). Recent studies have reported that visible color changes in restorations are among the most important reasons for the replacement of composite restorations in the anterior region (7). Water absorption and water solubility of composite restorations cause changes in their biological structures, aesthetic losses, and deterioration of marginal and surface properties. As a result, the clinical success of the restorations may decrease. For these reasons, the effects on color change and solubility of three different mouthwashes for three different composite types with different contents were evaluated in our study.

Nanofill, nanohybrid, and microhybrid composite resins are commonly used in different clinical settings due to their differences in chemical structure and filler content. Kloroben, Listerine Advanced White, and Colgate Plax mouthwashes were used as test solutions in the present study, chosen from among the mouthwashes currently widely used in Turkey considering differences in their chemical contents, whether they contain alcohol, and differences in pH values. Distilled water was selected for the control group to mimic a moist environment such as that created by saliva, oral fluids, and water that composite restorations are exposed to in the oral cavity.

In the literature, the result of the studies examining the effect of mouthwashes on the color change or surface properties of different restorative materials differ in terms of the immersion times of samples in solutions. These times vary among studies from not being immersed for 1 minute a day for 60 days to keeping samples in solutions continuously for 28 days. However, in daily life, mouthwashes are generally used twice a day for 1-2 minutes. In addition, teeth and restorations are constantly in contact with saliva. Due to its cleansing properties, saliva reduces the discoloration that may occur on teeth and restorations. Therefore, in our study, samples were kept in mouthwash solutions twice a day for 2 minutes each for 14 days to mimic daily use. As pH changes can affect diffusion and consequently solubility and color change, fresh solutions were used every 12 hours to prevent variations in pH levels in our study (8).

In our study, to prevent the results from being affected by polymerization times, all samples were polymerized according to the manufacturer's instructions. At the same time, to standardize the light distance during polymerization, a glass slide was placed between the light device and the samples. The samples were prepared with diameters of 10 mm to ensure that the light device's tip diameter of 11 mm was not exceeded. The thickness of the samples was determined as 2 mm due to the maximum polymerization depth of the composite resins being 2 mm.

In a study conducted by Barbosa et al., the effects of different finishing and polishing systems on the surface roughness of composite resin materials with different structures were compared and it was emphasized that the most ideal surfaces could be obtained using the Sof-Lex disc system (9). In our study, after polymerization, the samples were polished with aluminum oxide-containing discs (Sof-Lex XT, 3M, St. Paul, MN, USA).

In our study, we used the VITA Easyshade V spectrophotometer (VITA Zahnfabrik, Bad Sackingen, Germany), which can measure colors at wavelengths between 400 and 700 nm, allows for standard repetitions and gives reliable results, and can show the equivalent of the color on the VITA scale as well as $L^*a^*b^*$ values. Considering previous studies on materials used in dentistry, although the most widely used CIELAB system is generally considered sufficient to detect color changes, it has also been reported that the CIEDE 2000 system is much more sensitive in detecting color differences (8,186). For this reason, values with ΔE greater than 3.1 were considered to be significant in terms of color change, based on the CIEDE 2000 system, for color change calculations in our study.

Significant color changes were observed in all composite groups kept in distilled water and the mouthwashes that we used in our study. It was determined that Colgate Plax, an alcohol-free mouthwash, caused significantly less color change for the Filtek Z250 and Estelite Sigma Quick composite materials than the Kloroben or Listerine Advanced White mouthwashes. The fact that Colgate Plax produced lower amounts of color change in the Estelite Sigma Quick group compared to distilled water is an important finding of our study. It was previously reported that cetylpyridinium chloride, an ingredient of Colgate Plax, creates roughening and coloring effects on the surfaces of restorative materials (10). In previous studies, Listerine Advanced White was shown to have bleaching effects on colored composite resins (11), and in our study, it exerted coloring effects in all composite groups. It is thought that such effects may be caused by the organic acids and alcohol that it contains. The color change caused by the chlorhexidine in Kloroben mouthwash is one of its well-known side effects.

In various studies, it was reported that the color effects of mouthwashes increase with decreasing pH values and increasing alcohol contents. The fact that Colgate Plax (pH 5.9) has a higher pH value than Kloroben (pH 5.5) and created smaller amounts of color change supports those previous findings. Colgate Plax has a lower pH value compared to Listerine Advanced White (pH 6.15), but it is thought to cause lower amounts of color change due to the fact that it does not contain alcohol.

As another finding of our study, significantly lower amounts of color change were observed for the Filtek Ultimate samples immersed in Kloroben mouthwash compared to



the Filtek Z250 samples, and for Filtek Ultimate samples immersed in distilled water compared to both the Filtek Z250 and Estelite Sigma Quick groups. Although there was no statistically significant difference in color change between the composites in Listerine Advanced White and Colgate Plax mouthwashes, Filtek Ultimate was determined as the composite material with the least color change. This finding is most likely due to the fact that the samples made of Filtek Ultimate, as a nanofill composite, had smaller particle sizes compared to the Filtek Z250 composite, a microhybrid type. On the other hand, in contrast to Estelite Sigma Quick, which has a nanohybrid structure, Filtek Ultimate contains both UDMA and Bis-EMA, which have lower average particle sizes and higher resistance to color change than Bis-GMA and TEGDMA (12). It was previously reported in the literature that the color stability of resin composites increases with decreasing inorganic particle sizes (13,14). As a result of the study conducted by Ertaş et al., microhybrid composite resins were found to be more colored than nanohybrid composite resins due to the size of the filler particles (15).

The solubility of resin composites is explained by the release of unreacted monomers, inorganic particles, oligomers, and ions that move away from the structure. Composite solubility is also related to the water absorption of the composite because the solvent must penetrate the polymer so that leachable components can be released from the material (16). The ratio of filler particles and the contact of filler particles with the resin also have important effects on solubility. Composite resins with low filler content create more spaces and passageways for water molecules moving into the polymer matrix, increasing the free volume and the water absorption required for proper fluid absorption. Depending on the water absorption mechanism, solubility may increase when residual monomers or small polymer rings break off from the resin (17).

Monomers such as TEGDMA, Bis-GMA, and UDMA in the composite resins we used in this study contain polar hydrophilic units with areas that support water absorption (TEGDMA: ethylene dioxide; Bis-GMA: hydroxyls; UDMA: urethane) (18). Bis-GMA and TEGDMA are more hydrophilic than UDMA, and UDMA has lower solubility due to the presence of urethane groups. Khokhar et al. observed that composite resins containing UDMA had lower rates of water absorption (19). In our study, Estelite Sigma Quick, which does not contain UDMA, unlike the other composites, had lower resolution than Filtek Z250. However, its resolution was similar to that of Filtek Ultimate.

It is known that the combination of nanoparticles to form nanoclusters in nanofill composites reduces the gaps between filler particles, which causes more filler loading in the resin and reduces water absorption and solubility compared to microhybrid composites (20). In our study, the detection of significantly higher solubility in the microhybrid 3M Filtek Z250 composites kept in Listerine Advanced White solution compared to other composite groups containing nanofillers is in line with that information.

When the solutions we used in our study were examined, significantly higher solubility was found in all mouthwash groups compared to the control group. This is thought to be related to the various substances contained in mouthwashes. Excluding the control group, the pH of all solutions was less than 7, and Listerine Advanced White also contains alcohol. Solutions with low pH values produce methacrylic acid,

causing enzymatic degradation over time (21). In addition, the acid can reduce the pH in the organic matrix, hydrolyze ester groups from dimethacrylate monomers to form carboxylic acid and alcohol molecules, and trigger monomer separation. The results of a study by Abu-Bakr et al. showed that the acidic nature of their solutions played a role in the degradation of composite resins (22). Alcohol is an effective dimethacrylate solvent. It can affect solubility by softening the polymer matrix of composite resins and increasing the amount of unreacted monomers and oligomers (23). Although there were no statistically significant differences between our solution groups in terms of solubility, Listerine Advanced White was determined to be the solution causing the highest solubility. This is thought to be due to the alcohol content of Listerine Advanced White. Sarett et al. reported that the alcohol contents of mouthwashes adversely affected the water absorption and solubility of composite resins (24). Pereira et al. similarly found that mouthwashes containing alcohol caused more solubility for composite resins than those without alcohol (25).

Our study showed that the effects of mouthwashes on the color change and solubility of composite resins varied depending on the material. Color stability and solubility varied depending on the structure of the organic matrix of the composite, the size and amount of filler particles, and the chemical structure and contents of the mouthwashes.

CONCLUSION

Different levels of clinically unacceptable color change were observed in all composite groups evaluated in this study after immersion in mouthwashes. The color stability of the composite resins was found to be directly related to the structure of the resin matrix and the filler particle size. Filtek Ultimate, with a nanofill particle structure, was determined as the composite material with the lowest amount of color change. It was also observed that color stability changed according to the chemical contents and pH values of the mouthwashes. The Colgate Plax mouthwash was determined to cause the lowest amount of color change. When evaluated in terms of solubility, levels of dissolution were found to be related to the filler particle size of the composite resin. While solubility changes were determined for all composite samples in all mouthwash groups, the microhybrid Filtek Z250 composite was found to be the composite material experiencing the highest solubility. In terms of the solutions, the highest amount of solubility was observed with the Listerine Advanced White mouthwash. Within the limitations of this study, considering that significant color changes may occur in the composite materials of existing restorations as a result of regular exposure to mouthwashes and that dissolution may affect the clinical life of restorations, it can be suggested that the contents of mouthwashes should be taken into account when dentists recommend mouthwashes to their patients.

ETHICAL DECLARATIONS

Ethics Committee Approval: Ethics committee decision is not required as it does not contain human and animal material.

Informed Consent: Due to the nature of the study, informed consent is not required.



Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Experiences of dentistry interns during the COVID-19 pandemic

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ABSTRACT

Aims: This study was undertaken to explore the effects of the pandemic period for students in the 4th and 5th years of a dentistry program who were completing internships through the Dicle University Faculty of Dentistry in terms of their health, education, and socioeconomic status.

Methods: For this study, a total of 200 voluntary participants completing internships in the 4th or 5th year of enrollment in the Dicle University Faculty of Dentistry were asked to fill out a questionnaire that was created with the aim of understanding the effects of the COVID-19 pandemic on interns in terms of education, health, transportation, and socioeconomic status. In the statistical analysis of the survey data, a frequency distribution table was created for general characteristics and the chi-square test was applied to compare the obtained answers. Confidence intervals were evaluated at 95% and the significance value was accepted as 5%.

Results: The overwhelming majority of the participants reported that the pandemic affected their general health, and almost all of them reported that they were worried about the future and that the COVID-19 pandemic had reduced the quality of their education and their academic motivation. More than half of the participants stated that they were adversely affected by online education and that they had difficulties in terms of transportation while continuing their internships during the pandemic. It was also determined that a relative or acquaintance of nearly all of the participants had been diagnosed with COVID-19, and nearly half of the participants lost a relative or acquaintance due to COVID-19.

Conclusion: This study has revealed that dentistry students were negatively impacted by the COVID-19 pandemic to a larger extent than expected, with serious consequences for their mental health, hopes for the future, and general enjoyment of life. We conclude that it is important to provide regular psychological support, academic assistance, and motivational programs for dentistry students, as well as support for all healthcare professionals in general, in order to prevent the problems that arose from the pandemic from becoming permanent.

Keywords: COVID-19, pandemic, dentistry student, online education

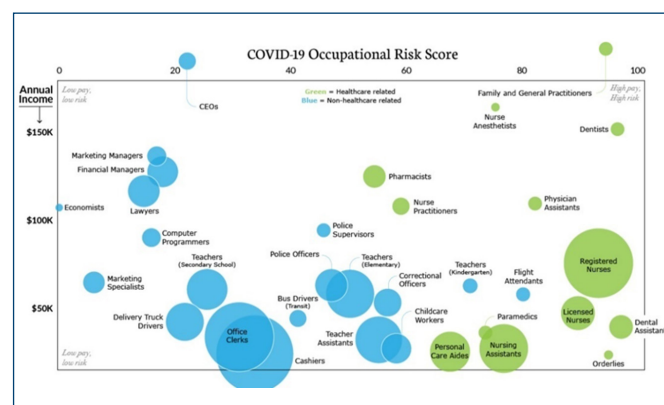
INTRODUCTION

Past epidemics such as SARS and Ebola caused serious health problems resulting in many deaths. However, they also provided valuable experience and knowledge to be applied during the COVID-19 pandemic together with the development of many vaccines in a short period of time.¹⁻⁴

Although progress has been made in the field of medicine since the beginning of the COVID-19 pandemic, social and economic recovery has not shown the same momentum, and the conditions of the pandemic made it difficult for people to maintain their economic well-being or access education and health services.⁴

It is thought that dentists have been particularly negatively impacted by the COVID-19 pandemic, as they work in constant exposure to respiratory aerosols as the main source of the spread of COVID-19, and they are also in direct contact with the oral flora of their patients for long periods of time.⁵ It can reasonably be assumed that dentistry students

who are still continuing their educations have been similarly adversely affected by the pandemic (Picture 1).⁹



Picture 1: COVID-19 occupational risk score (9)



For this reason, personal precautions such as the use of N95 masks, face shields or protective glasses, gloves, hair bonnets, and other protective clothing have been of utmost importance since the beginning of the pandemic, especially for dentists and dentistry students.⁵⁻⁸ This has meant that a new chain of procedures needed to be developed, especially for students and interns. This has complicated the working conditions in the field of dentistry, and the limitations imposed on the use of air conditioners during the pandemic and the admission of patients into small rooms with HEPA filters may aggravate preexisting medical conditions.⁸

The COVID-19 pandemic quickly became a worldwide crisis on a general scale, and it has also caused various challenges for education, including unique problems for dentistry faculties.¹⁰ In Turkey, students are referred to as “trainee dentists” in the 4th and 5th years of their university education within the scope of the standard 5-year dental education program, and they receive clinical training that requires one-on-one contact with patients. The word “intern” entered Turkish from French to describe individuals engaged in an apprenticeship or trial phase, and this word is also used to describe students in the 4th and 5th years of dentistry education.

Due to the fact that these trainee dentistry students are in contact with patients and participate in rotation programs, clinical internship procedures make students potential vectors in the spread of COVID-19.¹⁰

For these and other similar reasons, practical education in the field of dentistry was suspended at the beginning of the pandemic with the aim of avoiding the risk of transmission. Accordingly, the pandemic posed significant educational challenges for trainee dentistry students.¹¹

In order to reduce the spread of the virus, it was recommended that all educational institutions, including dental faculties, be temporarily closed around the world, including Turkey.^{11,12} All educational institutions in Turkey were temporarily closed as of March 25, 2020, in line with those recommendations.¹³ That temporary complete closure was followed by a period of online education, defined as a computer-assisted learning model that may include only online learning or a mix of online and offline education.¹⁴ Although it offers advantages such as instant feedback from students and reduced costs, it is frequently stated by educators that online learning is not an effective substitute for face-to-face education.¹⁴

In the present study, the difficulties experienced by students in the 4th and 5th years of a dentistry program who were completing internships through the Dicle University Faculty of Dentistry during the pandemic, their perspectives on the education they received, and the changes in their emotions and thoughts are evaluated. The null hypothesis of the research was that the COVID-19 pandemic did not cause changes in the lives of interns from a dentistry program.

METHODS

Participants were informed about the purpose of the study and their consent was obtained by paying attention to the principle of voluntariness. In addition, it was ensured that the information about the participants was kept confidential. The study was approved by the Dicle University Faculty of Dentistry Ethics Committee (Date: 2021; Decision No: 2021/34). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

For this study, a total of 200 voluntary participants completing internships in the 4th or 5th year of enrollment in the Dicle University Faculty of Dentistry were asked to fill out a questionnaire that was created with the aim of understanding the effects of the COVID-19 pandemic on interns in terms of education, health, transportation, and socioeconomic status.

The questionnaire also contained questions intended to collect descriptive information about the participants and multiple-choice questions regarding the impact of COVID-19 in their lives.

Statistical Analysis

Frequency distribution table was created for general features. Chi-square test was applied to compare the answers given to the general features, which are categorical variables, and the questions with categorical data. The confidence interval was 95% and the significance value was evaluated as 5%.

RESULTS

The participants in the study were 46.5% female, 53.5% male, 47.5% 4th grade and 52.5% 5th grade students. 19.5% of them have a health problem, 12% of them constantly use drugs, and 90% of them think that the pandemic process affects their general health.

90% of them had a relative/acquaintance diagnosed with COVID-19 disease, 47.5% of them lost a relative/acquaintance due to COVID-19 disease, and 18% of them contracted COVID-19 disease. It was observed that 1.5% spent the process in the hospital (inpatient).

When asked “What is your most important source of information about the COVID-19 pandemic”, 6.5% of the participants answered family environment/relative/friend, 2% school/university, 37% social media, 42% internet (following the pages of the Ministry of Health, etc.), 8.5% television/radio, 2% seminar/congress, and 2% no answer. There was a statistically significant relationship between gender and participants’ responses to “What is your most important source of information about the COVID-19 pandemic” ($p < 0.05$). While female interns mainly obtain information via the internet (following the pages of the Ministry of Health, etc.); male interns mostly prefer social media.

When asked “How would you evaluate your psychology during the pandemic period?”, 12.5% of the participants answered “I enjoy many things as much as I used to”, 25.5% “I can’t enjoy many things like I used to”, and 34% “Nothing gives me complete pleasure anymore” and 28% “I’m bored of everything”. 95% of participants reported worrying about the future, 6.5% of them received psychological support, and 8.5% reported taking antipsychotic/antidepressant medication. In addition, 98.5% of participants reported that COVID -19 affected their quality of educational life, while 95.5% reported that the COVID -19 pandemic decreased their academic motivation.

When asked “What is the reason that most diminishes your academic motivation?”, 46.5% of participants answered “Anxiety about the future”, 27.5% “Changing the way of education (Face to Face/Online)”, 12% “Fear of catching COVID-19”, 7% “Inability to meet the need for socialization”, 3% “Inability to meet physical activity needs”. The rate of participants who reported that my academic motivation was not affected during the COVID-19 period was 4%.



Table 1. Distribution of participants' levels of being affected by the outbreak from COVID -19

		n	%
Gender	Female	93	46.5
	Male	107	53.5
Class	4 th grade	95	47.5
	5 th grade	105	52.5
Do you have any health problems? (Cardiovascular, Diabetes, Respiratory Problems, Psychological Disorders etc.)	Yes	39	19.5
	No	161	80.5
Do you have a regular medication?	Yes	24	12.0
	No	176	88.0
Do you think the pandemic process is affected your overall health?	Yes	180	90.0
	No	20	10.0
Have you ever had a relative/acquaintance diagnosed with COVID-19 disease?	Yes	180	90.0
	No	20	10.0
Have you lost a relative/acquaintance due to COVID-19 disease?	Yes	95	47.5
	No	105	52.5
Have you caught the COVID-19 disease?	Yes	36	18.0
	No	164	82.0
If you have been infected with COVID-19 disease, where did you spend the treatment process?	At Home (Standing)	32	16.0
	In the Hospital (Inpatient)	3	1.5
	I did not have COVID-19.	165	82.5
	Family/ Relative/ Friend	13	6.5
	School/ University	4	2.0
	Social media	74	37.0
What is your most important source of information about the COVID-19 pandemic?	Internet (following the pages of the Ministry of Health, etc.)	84	42.0
	Television/ Radio	17	8.5
	Seminar/ Congress	4	2.0
	None	4	2.0
	I enjoy many things as much as I used to.	25	12.5
	I can't enjoy many things like I used to.	51	25.5
How would you evaluate your psychology during the pandemic period?	Nothing gives me complete pleasure anymore.	68	34.0
	I'm bored of everything.	56	28.0
Did you receive psychological support during this period?	Yes	13	6.5
	No	187	93.5
Did you take antipsychotics/antidepressants etc. medication during this time?	Yes	17	8.5
	No	183	91.5
Are you worried about the future?	Yes	190	95.0
	No	10	5.0
Do you think COVID-19 has affected the quality of your educational life?	Yes	197	98.5
	No	3	1.5
Do you think the COVID-19 pandemic has reduced your academic motivation?	Yes	191	95.5
	No	9	4.5
If so, what is the reason that most diminishes your academic motivation?	Inability to meet the need for socialization	14	7.0
	Anxiety about the future	93	46.5
	Inability to meet physical activity needs	6	3.0
	Fear of catching COVID-19	24	12.0
	Changing the way of education (Face to Face/Online)	55	27.5
	My academic motivation was not affected during this period.	8	4.0
How has online education affected your life?	Overall, it had negative effects.	120	60.0
	Overall it had positive effects.	45	22.5
	It had no effect.	35	17.5
Does continuing your internships during the pandemic process create difficulties in terms of transportation?	Yes	131	65.5
	No	69	34.5
Are you worried about taking care of active patients during the pandemic period?	Yes	130	65.0
	No	70	35.0
Do you feel safe in terms of COVID-19 while caring for active patients?	Yes	41	20.5
	No	159	79.5
Has the COVID-19 pandemic caused financial difficulties to meet your internship training needs? (Aerator, micromotor, consumables, etc.)	Yes	183	91.5
	No	17	8.5
Has the COVID-19 pandemic process affect your perspective towards the dentistry profession?	It affected positively.	15	7.5
	It affected adversely.	115	57.5
	It did not affect.	70	35.0
Total		200	100.0



When students' perspectives on the dentistry profession were examined during the COVID-19 pandemic, it was found that 7.5% were positively affected, 57.5% were negatively affected, and 35% were not. When asked about the effects of online education on their lives, 60% of participants answered "Overall, it had negative effects", 22.5% "Overall it had positive effects", and 17.5% "It had no effect".

65.5% of participants had difficulties in transportation while continuing their internship during the pandemic process, 65% were worried about taking care of active patients during the pandemic period, 20.5% felt safe in terms of COVID-19 while caring for active patients. In addition, 91.5% of participants reported financial difficulties to meet their internship training needs during the COVID-19 epidemic.

There was no statistically significant relationship between the status of taking medication, the effects of COVID-19 on the quality of their education life, thinking that it reduces their academic motivation, creating economic difficulties to meet their needs for internship education, affecting their perspectives towards the dentistry profession, and their perspective on online education ($p > 0.05$).

There was statistically significant relationship between class of the participants and the difficulties in transportation during the pandemic process, worry about caring for active patients, and feeling safe in terms of COVID-19 while looking at a patient, but these findings were not related to gender.

There is significant relationship between the participants' state of having any health problems and worry about looking after active patients during the pandemic period ($p < 0.05$). It was determined that there was no significant relationship between the presence of a health problem and catching the COVID-19 disease ($p > 0.05$).

In COVID-19 period, no significant relationship was found between the loss of a relative/acquaintance due to COVID-19 and psychological evaluations, such as receiving psychological support and use of drugs (antipsychotics/antidepressants etc) ($p > 0.05$). A statistically significant relationship was determined between losing a close/acquaintance due to COVID-19 and anxiety about the future ($p < 0.05$).

There was significant relationship between the participants' cases of contracting the COVID-19 disease and their evaluation of psychology during the pandemic period and their anxiety about the future ($p < 0.05$). There was no significant relationship between taking medication, being uneasy about looking at active patients during the pandemic period, and thinking that it reduces their academic motivation ($p > 0.05$).

DISCUSSION

COVID-19, as one of the most significant pandemics to affect the entire world, has also caused changes in the feelings and thoughts of individuals. This pandemic has had significant effects such as stress, fear, and anxiety among people working in the fields of health and education and it has affected their psychology in the workplace.⁵

Dentists constitute one of the occupational groups most affected by this pandemic, and students enrolled in faculties of dentistry are located at the intersection of the field of health and the field of education due to the clinical and theoretical training that they receive. As COVID-19 can be transmitted through saliva and aerosols, it directly affects dentistry students who are beginning to gain experience in working in direct contact with patients.⁵

In this study, which was conducted with students in the 4th and 5th years of the dentistry education program of the Dicle University Faculty of Dentistry and were thus completing internships based on practical training, the difficulties experienced by the students during the pandemic, their perspectives on the education they received, and the changes in their emotions and thoughts during that period were evaluated. Due to the continuation of both distance education and the pandemic at the time of the research, the questionnaire was administered online. As the study only included students completing internships in the Dicle University Faculty of Dentistry, participation was limited to 200 people.

The questions were designed with the aim of revealing the level of exposure of the participants to COVID-19. Among the interns who participated in our study, 90% reported that the pandemic had affected their general health, and only 16% stated that they still enjoyed many things as much as they had before the pandemic. These respective high and low percentages suggest that the pandemic has had a seriously negative impact on students.

In our study, it was found that intern dentistry students in the 4th year of the program were less nervous about actively caring for patients during the pandemic compared to students in the 5th year of the program, and they also felt more safe in terms of COVID-19 while actively working with patients. Participants were specifically asked if they were worried about taking care of active patients during the pandemic period. While 80% of the students in the 5th year of the program replied positively to this question, only about half of the students in the 4th year said "yes." When specifically asked if they felt safe in terms of COVID-19 while actively caring for patients, 95% of the students in the 5th year of the program said "no," while 64% of the students in the 4th year said "no." We postulated that these findings are due to the fact that students in the 5th year had gained more knowledge and experience and could predict possible risks better than those in the 4th year of the program.

It was found that 82.1% of the students who stated that they were anxious about actively caring for patients during the pandemic had preexisting health problems. Thus, among our participants, individuals with health problems were more anxious than others about the transmission of COVID-19.

According to the data obtained in this study, there was no relationship between participants having any previous health problems and contracting COVID-19. Based on this finding, it can be said that the participants' preexisting health problems were generally not diseases considered as predisposing risk factors for COVID-19.

Considering that COVID-19 is spread via transmission routes that include aerosols, saliva, and sneezing, it is clear that dentists are among the high-risk professional groups. Dentists who are in direct contact with patients during a pandemic may experience psychological problems such as fears of infecting their families, friends, and other patients, as well as stress and anxiety about contracting the virus.^{15,16} Wang et al.¹⁷ reported that healthcare professionals experienced more stress during epidemic periods. In a similar study, Lu et al.¹⁸ from the end of sentence reported that healthcare professionals exposed to high aerosol concentrations experience have more psychological problems such as anxiety than those working in an aerosol-free environment.



Dentists face risks of harm to both their physical health and mental health while working during a pandemic. While dentists have participated in previous studies of the effects of the COVID-19 pandemic among different professional groups, there have not been sufficient studies on the experiences of interns or dentistry students working in similar environments during the pandemic.

Among our participants who contracted COVID-19, 72.2% stated that they could no longer enjoy anything as much as they used to and that they were bored, 5.6% received psychological support, and 5.6% reported using antipsychotics, antidepressants, or other similar drugs. On the other hand, 75% of our participants who contracted the virus were worried about actively caring for patients, 94.4% felt that their academic motivation had decreased, and 86.1% were worried about the future. Thus, our study has revealed that the general health, psychology, educational life, and future thoughts of students who contracted COVID-19 were adversely affected.

It was seen that the quality of education of 98.5% of all students participating in our study was negatively affected during the pandemic and the academic motivation of 95.5% of all participants decreased. It is particularly unfortunate that the intern students in the 4th year of the program, who were receiving practical training with patients for the first time, stated that the quality of their education was affected. It was observed that the transition to online education had a negative impact on the lives of students.

The reason for decreased academic motivation was said to be the transition of education from the classic face-to-face system to online education by 27.5% of the participants, which suggests that students do not benefit efficiently from this system. When previous studies in the literature are examined, claims that online education cannot replace face-to-face education are dominant.^{19,20}

A study conducted by Tunç et al.²¹ assessed dentists' knowledge level of COVID-19 infection and found that physicians were most obtained information of the epidemic through Ministry of Health follow-up and that social media/Internet was the second most frequently cited source. We also asked our participants: "What is your most important source of information about the COVID-19 pandemic?" Students stated that they obtained information from the webpages of the Ministry of Health, followed by social media. Students obtaining information from the school/university were fewest in number. We attribute this finding to the closure of educational institutions such as universities during the course of the pandemic. However, a similar study among dental students in Nigeria showed that most information about COVID-19 was obtained through social media.²² Kara et al.²³ examined the impact of the COVID-19 epidemic on dental student education and reported that the most common source of information was social media. In light of this literature, we attribute it the fact that young people's use social media for information purposes and more actively.

When students were asked if continuing their internships created difficulties in terms of transportation during the pandemic, 65.5% of the participants responded positively. It was seen that students in the 5th year answered "yes" more to this question than those in the

4th year. The curriculum for the 5th year of the dentistry program includes a longer internship and the frequency of coming to school is thus different; this may have been why students in the 5th year had more difficulties than those in the 4th year. Since Dicle University receives many students from the surrounding districts, a significant part of the students' time is devoted to commuting. The fact that 65.5% of the students reported transportation difficulties also suggests that pandemic-related factors such as restrictions on public transportation during the pandemic, travel restrictions between provinces, and scientific explanations about the spread of the virus in public transit environments made transportation more difficult and worrying for the students.

The overwhelming majority of the students (91.5%) stated that the COVID-19 pandemic created economic difficulties as they worked to complete their internships. In the course of the pandemic in Turkey, restrictions were imposed on both domestic travel and foreign entries and exits. The difficulties experienced by the students in this dimension included the increasing costs of imported hand tools required for dentistry work and the difficulty of accessing such tools due to the closure of dental and medical facilities. At the same time, we can also attribute these difficulties to the fact that some of the students' families experienced economic difficulties triggered by the loss of jobs.

The data we obtained in our study show that the Covid-19 pandemic process negatively affects students not only in terms of mental and physical health, but also in terms of economy and transportation.

Students were also asked the following question: "Has the COVID-19 pandemic affected your perspective on the dentistry profession?" While 57.5% of the students stated that their perspectives had been negatively affected, 35% stated that they were not. We found that 61.6% of the students who were negatively affected answered that they did not feel safe in terms of COVID-19 while caring at active patients. We attribute this situation to the fact that students' perspectives of the profession have changed due to their fear of getting sick.

It was observed that students who lost a relative or acquaintance to COVID-19 had more intense anxiety about the future ($p < 0.05$). Students who contracted COVID-19 themselves also experienced more intense anxiety about the future. In light of all of these findings, the null hypothesis of the study was rejected and it was concluded that the COVID-19 pandemic negatively affected dentistry interns more than we initially expected.

CONCLUSION

This study has revealed that dentistry students were negatively impacted by the COVID-19 pandemic to a larger extent than expected, with serious consequences for their mental health, hopes for the future, and general enjoyment of life. We conclude that it is important to provide regular psychological support, academic assistance, and motivational programs for dentistry students, as well as support for all healthcare professionals in general, in order to prevent the problems that arose from the pandemic from becoming permanent.



ETHICAL DECLARATIONS

Ethics Committee Approval: The study was approved by the Dicle University Faculty of Dentistry Ethics Committee (Date: 2021; Decision No: 2021/34).

Informed Consent: Participants were informed about the purpose of the study and their consent was obtained by paying attention to the principle of voluntariness. In addition, it was ensured that the information about the participants was kept confidential.

Referee Evaluation Process: Externally peer-reviewed.

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Rubber dam application in clinical practice: a study on patient perspective

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ABSTRACT

Aims: The present study aimed to elicit the views of patients, applying to our faculty for dental treatment, on rubber dam application.

Methods: We recruited 250 patients, who applied to Dicle University, Faculty of Dentistry, Department of Restorative Dentistry for dental treatment, in this study upon their informed consent. Following routine clinical and radiological examinations, the patients undergoing dental procedures with rubber dams were asked to fill out a questionnaire about their views on the application. Accordingly, while the patients' characteristics and responses to the questionnaire are shown descriptively, we sought the relationships between the categorical variables using a chi-square test. All statistical analyses were performed on the IBM SPSS 25.0 program.

Results: The findings revealed that rubber dams were applied to 85.6% of the patients for the first time. In this sense, the majority of the patients (86.8%) found the treatment with rubber dams more comfortable than their previous treatments. It was discovered that the patients were uncomfortable the most when being unable to communicate with the physician during the treatment. About half of the patients (52.8%) found the most comforting aspect of rubber dam application to be the absence of water accumulation in the mouths. Besides, we found a significant association between gender and the most disturbing aspect of rubber dam application. Accordingly, while 42.6% of the female patients reported having difficulty swallowing or breathing, 40% of the male patients reported being uncomfortable when being unable to rinse their mouth and communicate with the physician during the treatment. Finally, almost all patients (93.2%) stated that they would prefer rubber dam application on their next visit.

Conclusion: Despite the advantages of rubber dam application, clinicians hold a belief that patients may be disturbed by the application for various reasons. Yet, our findings showed vice versa; most patients were not disturbed by the application, and even they would prefer it on their future visit. Thus, addressing rubber dam applications in undergraduate and postgraduate education would help improve patient comfort and the quality of dental procedures.

Keywords: Rubber dam, isolation, patient satisfaction

INTRODUCTION

Thanks to the advantages it offers for infection control, patient protection, and treatment effectiveness, rubber dams are accepted as a standard in dental procedures, particularly in root canal treatment (RCT) (1-4). The most prominent advantage of using a rubber dam may be that it ensures safety during the operation by reducing the risk of transmission of infectious agents between the operator/dental assistant and the patient. Moreover, it assumes a critical role in preventing malpractice during endodontic procedures as it hinders accidental swallowing of instruments, solvents, and irrigation solutions during root canal treatment (5) and protects soft tissues, including gingiva, buccal mucosa, and tongue (9). A rubber dam provides a clean, dry operation area by excluding tissues other than the tooth focused and greater visibility to the operator during treatment (5).

Despite its advantages, rubber dam application is not a popular method for area isolation among many practitioners and specialist dentists. Difficulty in its placement, insufficient training in clinical years, and expensive equipment and materials can be counted among the reasons why rubber dams are not widely adopted. When misapplied, they may disturb the patient, which, in turn, may hinder their use among dentists (6).

Most dental schools worldwide teach rubber dam application in the preclinical years and expect student qualification till the final year. Rubber dams are now utilized more in practice by newly graduated dentists than in the past. (7) To improve the quality of dental procedures, relevant skills can be acquired or improved through continuous professional education (8). The present study aimed to reveal patients' views on their experience with rubber dam application in restorative procedures in the Faculty of Dentistry at Dicle University.





METHODS

The study was approved by the Dicle University Faculty of Dentistry Ethics Committee (Date: 2021, Decision No: 2021/34). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Following their routine clinical and radiological examinations, we sought descriptive characteristics of and informed consent from 250 patients who applied to Dicle University, Faculty of Dentistry, Department of Restorative Dentistry for dental restoration. After their treatments with rubber dam application, they were asked to fill out a questionnaire about the quality of the rubber dam application during the procedure.

While the patients' characteristics and responses to the questionnaire are shown descriptively, we sought the relationships between the categorical variables using a chi-square test. The confidence interval was set to 95%, and a p -value < 0.05 was accepted as statistically significant. All statistical analyses were performed on the IBM SPSS 25.0 program.

RESULTS

Table 1. Patients' demographic characteristics		
	N	%
Sex		
Female	115	46.0
Male	135	54.0
Age		
18-25 years	83	33.2
26-30 years	56	22.4
31-35 years	39	15.6
36-40 years	38	15.2
41 years and older	34	13.6
Total	250	100

There were a total of 250 patients in the study, 115 (46%) females and 135 (54%) males. About one-third of them (33.2%) were aged 18-25 years, 22.4% were aged 26-30 years, 15.6% were aged 31-35 years, 15.2% were aged 36-40 years, and 13.6% were aged 41 years and older.

The majority of the patients (85.6%) were not applied a rubber dam in their previous visits for treatment. Similarly, most of the patients (86.8%) reported feeling more comfortable with the rubber dam application, while 6.4% and 6.8% experienced the same comfort and uncomfortable, respectively, compared to their previous treatments. Moreover, we found the most disturbing aspect of the application to be difficulty in swallowing or breathing (26.8%), being unable to rinse mouth during the treatment (30.4%), and being unable to communicate with the dentist during the treatment (37.6%) (Table 2). On the other hand, the aspects of the application that the patients felt the most comfortable with were as follows: no water accumulation in the mouth (52.8%), no risk of materials spilling in the mouth (26.8%), no risk of swallowing or inhalation of the materials used (16.4%), and better protection from infection (4%). In addition, almost all patients (92.3%) stated that they would prefer rubber dam application on their next visit for treatment.

When it comes to the relationship between patients' views on the rubber dam application and sex, we found a significant difference between the male and female patients only in the aspect of the application that bothered them the most ($p < 0.05$). Accordingly, while 42.6% of the female patients felt uncomfortable with the application due to difficulty swallowing or breathing, 40% of the male patients complained about being unable to rinse their mouths and communicate with the dentist during the treatment (Table 3).

We also compared the patients' views on the rubber dam application by age. The findings demonstrated that the patients significantly differed in the aspect of the application with which they felt most comfortable the most by age ($p < 0.05$). In this regard, 70.6% of patients aged 41 years and older reported that they were more comfortable with no water accumulation in their mouths (Table 3).

Table 2. Patients' views on the rubber dam application			
		N	%
Was any rubber dam applied in your previous treatments?	Yes	36	14.4
	No	214	85.6
Have you been informed about why a rubber dam would be applied?	Yes	250	100.0
To what extent has the rubber dam application been comfortable compared to your previous treatments?	More comfortable	217	86.8
	In the same comfort	16	6.4
	More uncomfortable	17	6.8
What has bothered you the most during the rubber dam application?	Difficulty swallowing or breathing	67	26.8
	Being unable to rinse the mouth during the treatment	76	30.4
	Being unable to communicate with the dentist during the treatment	94	37.6
	Other	13	5.2
What aspect of the rubber dam application have you felt the most comfortable with?	No water accumulation in the mouth	132	52.8
	No risk of materials spilling into the mouth	67	26.8
	No risk of swallowing or inhalation of the materials used	41	16.4
	Better protection from infection	10	4.0
Would you prefer rubber dam application in your following treatments?	Yes	233	93.2
	Uncertain	12	4.8
	No	5	2.0
Total		250	100

**Table 3. Patients' views on the rubber dam application by sex**

	Sex		χ^2	P
	Female	Male		
To what extent has the rubber dam application been comfortable compared to your previous treatments?			2.768	0.251
More comfortable	96 83.5%	121 89.6%		
In the same comfort	8 7.0%	8 5.9%		
More uncomfortable	11 9.6%	6 4.4%		
What has bothered you the most during the rubber dam application?			30.420	0.000*
Difficulty swallowing or breathing	49 42.6%	18 13.3%		
Being unable to rinse the mouth during the treatment	22 19.1%	54 40.0%		
Being unable to communicate with the dentist during the treatment	40 34.8%	54 40.0%		
Other	4 3.5%	9 6.7%		
What aspect of the rubber dam application have you felt the most comfortable with?			5.939	0.115
No water accumulation in the mouth	55 47.8%	77 57.0%		
No risk of materials spilling into the mouth	33 28.7%	34 25.2%		
No risk of swallowing or inhalation of the materials used	19 16.5%	22 16.3%		
Better protection from infection	8 7.0%	2 1.5%		
Would you prefer rubber dam application in your following treatments?			0.486	0.784
Yes	107 93.0%	126 93.3%		
Uncertain	5 4.3%	7 5.2%		
No	3 2.6%	2 1.5%		

*p < 0.05

DISCUSSION

Anything that obscures the operating field is likely to adversely affect the efficiency and success of the operator. In this sense, the proper use of a rubber dam may help easily perform any procedure with improved quality of treatment outcome. Compared to other insulation methods, rubber dam application is considered the best moisture control method (9). Despite all its procedures and difficulties, a rubber dam should be applied for proper tooth isolation during root canal treatments, as highlighted in the quality guidelines by the European Society of Endodontics (10).

One reason why a rubber dam is not favored may probably be the time it takes to be placed in the operation area. We calculated the time of rubber dam application in the patients to be about two minutes. In their study, Orafi et al. (11) reported the average time required to place a rubber dam to be 4.28 minutes for general practitioners. It should be noted that the time may be influenced by factors such as the occupancy of the working environment (hospital, private clinic), dentists' workload, experience in manual dexterity and rubber dam application, and patient-related anxiety, panic, and excitement.

A dentist should be able to recognize when a patient is under extreme stress or anxiety. In doing so, clinicians should be able to avoid or reduce anxiety-provoking procedures and minimize their impacts on their patients (12). Sana et al. emphasized that the more experienced the operator, the less time they would spend on rubber dam application. Moreover, they also stated that the acceptance of rubber dam application would increase when the need for the application is clearly conveyed to patients (8). Therefore, it is deemed important for clinicians to demonstrate satisfying competence for correct, quick use of a rubber dam both during their undergraduate education and in clinical practice.

Table 4. Patients' views on the rubber dam application by sex by age

	Age					χ^2	P
	18-25 years	26-30 years	31-35 years	36-40 years	41 years and older		
Was any rubber dam applied in your previous treatments?						3.692	0.449
Yes	15 18.1%	10 17.9%	5 12.8%	3 7.9%	3 8.8%		
No	68 81.9%	46 82.1%	34 87.2%	35 92.1%	31 91.2%		
To what extent has the rubber dam application been comfortable compared to your previous treatments?						13.290	0.102
More comfortable	71 85.5%	52 92.9%	35 89.7%	32 84.2%	27 79.4%		
In the same comfort	8 9.6%	3 5.4%	2 5.1%	0 0.0%	3 8.8%		
More uncomfortable	4 4.8%	1 1.8%	2 5.1%	6 15.8%	4 11.8%		
What has bothered you the most during the rubber dam application?						11.123	0.518
Difficulty swallowing or breathing	26 31.3%	18 32.1%	9 23.1%	7 18.4%	7 20.6%		
Being unable to rinse the mouth during the treatment	23 27.7%	19 33.9%	15 38.5%	11 28.9%	8 23.5%		
Being unable to communicate with the dentist during the treatment	29 34.9%	15 26.8%	14 35.9%	18 47.4%	18 52.9%		
Other	5 6.0%	4 7.1%	1 2.6%	2 5.3%	1 2.9%		
What aspect of the rubber dam application have you felt the most comfortable with?						25.063	0.015*
No water accumulation in the mouth	46 55.4%	25 44.6%	16 41.0%	21 55.3%	24 70.6%		
No risk of materials spilling into the mouth	25 30.1%	17 30.4%	7 17.9%	9 23.7%	9 26.5%		
No risk of swallowing or inhalation of the materials used	10 12.0%	13 23.2%	13 33.3%	5 13.2%	0 0.0%		
Better protection from infection	2 2.4%	1 1.8%	3 7.7%	3 7.9%	1 2.9%		

*p < 0.05



On the other hand, overlapping with our results, Kapitan et al. (13) emphasized that patients with a higher level of comfort during rubber dam application would also prefer it in their future dental treatments. In previous research in Riyadh and Croatia, 75.8% and 69.1% of the patients, respectively, stated that they would prefer a rubber cover for their future dental procedures if a more experienced operator could perform it (14, 15). Maslamani et al. also reported that 61% of their patients would prefer rubber dam applications for future dentist visits, which may be significantly related to patient acceptance and comfort during the application (16).

CONCLUSION

Overall, besides our findings, further research is needed to understand better the psychological impacts of dental treatments on patients and the acceptability of dental treatment practices in optimizing patient comfort and treatment quality. It should be noted that despite a substantial emphasis on the importance of rubber dam application in relevant curricula and clinical studies, high costs and lack of time restricts the use of a rubber dam in dental operations.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was approved by the Dicle University Faculty of Dentistry Ethics Committee (Date: 2021, Decision no: 2021/34).

Informed Consent: Participants were informed about the purpose of the study and their consent was obtained by paying attention to the principle of voluntariness. In addition, it was ensured that the information about the participants was kept confidential.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Premixed calcium silicate-based cements: a literature review

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ABSTRACT

In dental treatment procedures such as exposure of the pulp, root perforation, apexification or revascularization due to traumatic injuries, it is very important to ensure the tissue repair process. In this way, the formation of a mineralized barrier can be induced. The most commonly used material for this purpose is MTA. However, its disadvantages are the long curing time, difficult manipulation and the need to apply moist absorbent cotton after the process. Pre-mixed calcium silicate cements (CSC), which allow easy application, have become very popular in recent years. This review aimed to compare and present the literature on pre-mixed CSC.

Keywords: Calcium silicate based cement, premixed cement, bioceramics

INTRODUCTION

Calcium silicate-based cements (CSC) are materials that have proven their success in dentistry due to their odontogenic/osteogenic properties.¹ They are chemically stable and biocompatible materials that can maintain pulp vitality due to these properties. These materials can be classified as follows (**Table 1**);³

Table 1. Classification of calcium silicate-based cements

Bioinert - which do not interact with biological systems, e.g. alumina and zirconia
Bioactive - which exhibits interactions with adjacent tissues, e.g., bioactive glass and glass ceramics
Biodegradable - which ultimately replace or are incorporated into tissue, e.g. calcium silicates

CSCs contain di-calcium and/or tri-calcium and/or tetra-calcium silicate phases in their basic mechanisms of action during the hydration process. Pre-mixed CSCs have superior mechanical and biological properties due to the content of calcium silicate, zirconium oxide, tantalum oxide, calcium phosphate and fillers. These bioceramics are hydrophilic and require moisture from the surrounding tissue. They are classified according to their consistency with similar ingredients:⁴

1. Syringe form
2. Paste form
3. Fast-setting paste form

Some advantages of pre-mixed CSCs over other bioceramics can be listed as follows:⁵

1. Since it is a ready-to-use product, the factor of user error that may occur during mixing is eliminated.
2. It is homogeneous.
3. It is used as needed and wastage of material is avoided.

4. The possibility of cross-contamination is reduced.
5. It is easy to manipulate.

Due to these advantages, pre-mixed CSCs can be used for pulp capping, perforation repair, pulpotomy, retrograde filling and root canal filling.⁶ Many different pre-mixed calcium silicate cements are available on the dental market (**Table 2**).

Table 2. Pre-mixed calcium silicate-based cements and their contents

Pre-mixed CSC	Manufacturer	Content
EndoSequence BC RRM	Brasseler USA, Savannah, GA.	Tricalcium and dicalcium silicate, calcium sulfate, tantalite, zirconia and proprietary organic liquid
NeoPutty	NuSmile, Houston, TX, USA.	Tricalcium and dicalcium silicate and aluminate, tantalite, proprietary organic liquid and stabilizers
Bio-C Repair	Angelus, Londrina, PR, Brazil.	Calcium silicate, calcium aluminate, calcium oxide, zirconium oxide, iron oxide, silicon dioxide
TotalFill BC RRM	FKG, La Chaux-de-Fonds, Switzerland.	Tricalcium Silicate, Dicalcium Silicate, Zirconium Oxide, Tantalum Pentoxide, Calcium Sulfate.
iRoot BP	Innovative Bioceramics, Vancouver, Canada.	Calcium silicate, calcium phosphate, calcium sulfate, zirconium oxide, tantalum pentoxide

Endosequence Root Repair Material

Endosequence root repair material is available in premixed and ready-to-use injectable or compactable paste form⁷ (**Figure 1**). While monocalcium phosphate in its content is involved in the formation of hydroxyapatite, tantalum oxide and zirconium oxide are responsible for radiopacity. It is reported that the fluid in the dentinal tubules affects the





physiology of the hardening of the material, and the setting time is stated to be 2-4 hours.⁸ Its advantages include high pH and lack of shrinkage during washing and setting.⁹



Figure 1. EndoSequence BC RRM

It has been shown that the setting time of EndoSequence BC RRM increases and its microhardness decreases as the ambient humidity increases. It has been reported that the setting time in a 100% humid environment at 37°C is up to 168 hours.¹⁰ Although the manufacturer claims a compressive strength of 70-90 MPa, a study found that the strength of the material is 40-50 MPa, and this value is similar to that of MTA.¹¹ The nanoparticles contained in EndoSequence BC RRM facilitate the penetration of the material into the dentinal tubules. In addition, the material is predicted to be mechanically bonded to the dentin thanks to the moisture in the dentin tubules, reducing its shrinkage potential and maintaining its stability.¹²

An in vitro study reported that EndoSequence BC RRM, used as a retrograde filling material, showed similar properties to MTA in terms of marginal adaptation and sealing.¹³ It was shown that EndoSequence BC RRM, prepared with physiological saline solution, formed hydroxyapatite-like precipitates, and the calcium ion ratio and pH value released in association with hard tissue formation were similar to MTA.⁸ Similarly, it was reported that the push-out bond strength of the material was similar to that of MTA.¹⁴

Cytotoxicity studies on gingival fibroblasts, mouse fibroblasts, human dermal fibroblast, periodontal ligaments, and osteoblast cells reported that EndoSequence BC RRM showed similar biocompatibility compared to MTA.¹⁰

It is suggested that the antibacterial effect of EndoSequence BC RRM on *Enterococcus faecalis* is similar to that of MTA, and this effect is due to the high pH of the material during curing.¹⁵

NeoPutty

NeoPutty (NuSmile, Houston, TX, USA) is a bioceramic material with an extremely fine structure and a pre-mixed anhydrous organic liquid. The product is packaged ready for use and does not require mixing¹⁶ (Figure 2). The pulp begins to harden with moisture from the dentinal tubules or apically.^{17,18} The setting time of this material after exposure to atmospheric humidity is unknown.¹⁷ However, according to the manufacturer, the setting time is approximately 4 hours at 37°C and the working time is over 1 hour at room temperature.¹⁹ NeoPutty has been shown to be more biocompatible and longer shelf life than EndoSequence BC

RRM.¹⁸ It has also been reported that NeoPutty is less affected by atmospheric humidity than EndoSequence BC RRM.¹⁷ According to the manufacturer, NeoPutty is more radiopaque than NeoMTA 2 (8.4 mm aluminium equivalent).¹⁹ A previous study showed that the NeoPutty's shear strength was not superior to the NeoMTA-2.¹⁸ Another study reported that NeoPutty had lower bond strength to dentin walls than Biodentine. The reason for this has been shown to be that the high viscosity of pre-mixed bioceramic is too high to penetrate deeply into the dentinal tubules.¹⁶



Figure 2. NeoPutty

A study evaluating cytotoxicity showed that NeoPutty EndoSequence BC is more biocompatible than RRM.¹⁶ NeoPutty was found to be mildly cytotoxic to human dental pulp stem cells and human periodontal ligament fibroblasts when mixed with bioinert material such as polytetrafluoroethylene (Teflon).¹⁷

Bio-C Repair

Bio-C Repair (Angelus, Londrina, PR, Brazil) is ready-to-use a new silicate-based material (Figure 3). Its application is similar to MTA.²⁰ It has an excellent consistency that allows much better ease of use compared to MTA.²¹ The manufacturer states that it has a maximum setting time of 2 hours, a pH of about 12, radiopacity greater than 7.0 mm Al, ease of application, and does not cause coloration.²² An in vitro study reported that Bio-C Repair to have similar cytotoxicity, biocompatibility and biomineralization to MTA Repair High-Plasticity and MTA-Angelus.²⁰ Stem cells in the periodontal ligament also showed similar pH values with Bio-C Repair and Bio-C Sealer, but Bio-C Repair showed greater cell viability and cell adhesion. Bio-C Repair also showed excellent cytocompatibility with ProRoot MTA and Biodentine on human dental pulp.²³



Figure 3. Bio-C Repair



TotalFill BC RRM

There are three different forms of bioceramic materials as paste, putty and sealer (Figure 4). Calcium phosphate, which increases the formation of hydroxyapatite, is available in TotalFill BC RRM as a monobasic adjunct agent.²⁴ TotalFill BC RRM, a pre-mixed bioceramic-based material, is a new material recently introduced to compensate for the poor handling properties of MTA and Biodentine.²⁵ The setting time of TotalFill BC RRM is at least 2 hours in normal situations.^{26,27} A previous study reported that TotalFill BC RRM has high radiopacity, rapidly alkalizes the environment in the first hour during the sitting of the material, and has an average pH of approximately 10.3 on day.²⁸ This alkaline environment promotes apatite formation and deposition.²⁶ Another previous study reported that TotalFill BC RRM showed less microleakage in root canal walls compared to Biodentine and MTA.²⁵ A study testing surface microhardness in an acidic environment found that TotalFill BC RRM had lower surface microhardness compared to ProRoot MTA and Biodentine.²⁸ According to the manufacturer, it begins to set when exposed to ambient humidity without mixing. The working time is more than 30 minutes.²⁷



Figure 4. Paste, putty and sealer form TotalFill BC RRM

iRoot BP

The setting time after exposure to moisture is 2 hours.²⁹ A previous study showed that apoptotic iRoot BP and MTA have a similar proportion of apoptotic cells.³⁰ Another study reported that iRoot BP showed greater cellular viability than MTA.³¹ iRoot BP Plus shows antimicrobial effect against *Streptococcus mutans*, *Staphylococcus aureus* and *Enterococcus faecalis*.³²



Figure 5. iRoot BP

CONCLUSION

Pre-mixed CSCs appear to have comparable properties to Biodentine and MTA. Considering the ease of use of these materials, manipulation can be increased by shortening working times in pedodontic, endodontic and restorative procedures. In addition, efficiency increases with the reduction of seating time.

ETHICAL DECLARATIONS

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Management of a complex dentoalveolar trauma: a case report

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ABSTRACT

This paper describes the case of a 33-year-old male patient with a severe lateral and canine luxation of the maxillary incisors who fell down the stairs. Treatment involved suture of the soft tissues lacerations, and repositioning and splinting of the injured teeth, followed by endodontic treatment, periodontal surgery and prosthetic restorations. After a 1-year follow-up, clinical and radiographic evaluation revealed that the incisors presented satisfactory esthetic and functional demands.

Keywords: Dental trauma, endodontics, prosthodontics

INTRODUCTION

Traumatic injuries in adults are a common problem that usually results from accidents, contact sports, falls, and violence (1,3). Report rate of dental trauma is low, despite this, rate of the affected population is %5. Dental trauma injuries are the most common problems after dental caries especially among children and young adolescents (6,8)

The most common dentoalveolar traumatic injuries occur in the upper incisor area and most common types of injuries affecting periodontal tissues are luxations, whose prevalence varies from 15 to 61% (1,7). Luxation diagnosis depends on clinical and radiographic findings; laterally luxated teeth often have their crowns displaced palatally, which usually results in comminution or fracture of the labial alveolar bone and considerable injury to the periodontal ligaments (1). Although luxation can be clinically diagnosed, a radiographic examination must be done to ensure that it is the only injury (1,2). Because traumatic injuries are difficult to treat, the correct diagnosis must also be associated with prompt treatment and a long follow-up period so that the treatment is successful (1,10). This paper describes the treatment of a severe traumatic injury involving the extraoral soft tissues extending from the upper lip to the nose, as well as intraoral structures, namely the upper lip mucosa, the maxillary lateral incisors and canine and the surrounding periodontal tissues in a 33-year-old man followed up for a period of 1 year.

CASE REPORT

A 33-year-old Caucasian male patient was brought by his friend to the Emergency Unit of the Bayındır Hospital, about 10 h after fell down the stairs, that resulted in dental

trauma. He had already been seen by the medical staff of the emergency unit of a local hospital, where suture of the extraoral tissues was done and no neurological damage or medical complications were detected. Past medical history was reviewed and a signed, written informed consent form was obtained from him for treatment and further publication of the case. The patient was in excellent health with no remarkable past medical history.

Clinical examination showed nasal and maxillary lip bruises, as well as laceration of the maxillary labial mucosa and buccal gingiva with the fracture of the maxillary right permanent lateral incisor and canine. Due to Andreasen Classification, lateral incisor has a complicated fracture involving enamel, dentine and exposing pulp and canine has a fracture involving enamel, dentine, cementum and exposing the pulp. (5) Panoramic and periapical radiographic examination (**Figure 1-2**) and CBCT images (**Figure 3**) did not show root fracture or any other injuries involving other teeth.



Figure 1. Panoramic X-Ray at the beginning.



Figure 2. Periapical X-Ray for diagnosis at the beginning

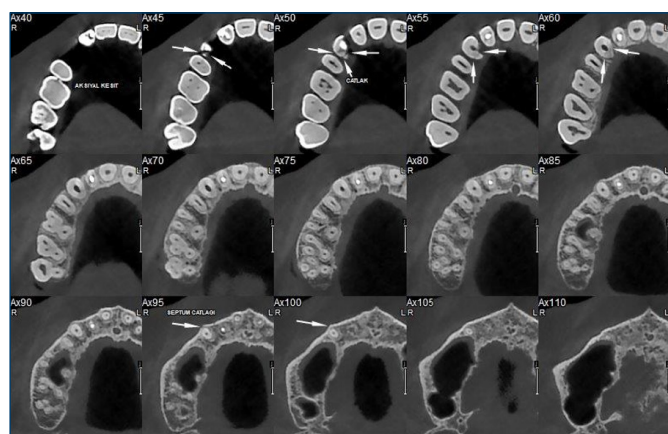


Figure 3. Axial CBCT images at the beginning

After 7 days, both incisors' root canals shaped using Protaper Next X5 files (Dentsply Sirona, USA) and dressed with a calcium hydroxide-based dressing (AH-temp, Dentsply Sirona, USA). 10 days later endodontic treatments of both teeth were completed using AH Jet paste (Dentsply Sirona, USA) as sealer and Protaper Next X5 gutta perchas (Dentsply Sirona, USA) (Figure 4). G-Premio Bond (GC Europe) and EverX Flow (GC Europe) was used as coronal filling material.



Figure 4. Periapical X-ray just after the endodontic treatment

After endodontic treatments completed, individual zirconium crowns were made in three sessions with the trying session (Figure 5)



Figure 5. Crown restorations just after treatment

The patient was recalled regularly. At 1 year follow-up, clinical and radiographic examination showed healthy tissues and teeth, and both incisors presented satisfactory functional and esthetic demands (Figure 6-8).



Figure 6. Panoramic X-Ray one-year follow up



Figure 7. Periapical X-Ray one-year follow up



Figure 8. Crown restorations one-year follow-up



DISCUSSION

The 33-year-old man of this case report had a complex traumatism involving dentoalveolar structures and soft tissues, caused by a fall down the stairs accident. In fact, male traumatic injuries to permanent dentition appear to be more severe and are among the variety of conditions that can cause trauma. Indeed, accidents involving cycling or other sports activities account for 30% of the injuries to the facial region (3).

The direction of trauma and health of the periodontal tissues affect the severity of the damage. When the trauma directly comes to the tooth the result is crown fracture, soft tissue injury and malalignment (9).

There are four different classifications of dental trauma; Andreasen, World Health Organisation, Garcia-Godoy and Ellis classifications. This case was evaluated due to Andreasen classification and treatment planning was made due to the latest International Association of Dental Traumatology (IADT) guidelines. This guideline advises a follow-up schedule and some complications due to the trauma itself (4). In this case there is only 1 year follow-up (5).

It is impossible to prevent accidents completely that might result in dental injuries (3), but their associated complications can be avoided by ready and adequate treatment and follow-up. In the present case, the correct diagnosis and treatment were crucial to the successful management and preservation of the traumatized teeth. Finally, it should be highlighted the importance of a multidisciplinary treatment of traumatic injuries, such as in the present case, in which endodontic, restorative and periodontal procedures were combined to recover the esthetics and function of the traumatized area.

CONCLUSION

Right ventricular remodeling is common during progress of COPD as well as obstructive and amphysematous changes in the pulmonary system. Imaging should be part of the routine examination in patients with COPD to detect thrombus/mass that may affect mortality, as well as assessment for elevated pulmonary pressure.

ETHICAL DECLARATIONS

Informed Consent: All patients signed the free and informed consent form.

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