

# Application of rubber dam in restorative and endodontic procedures – the experience of the therapist and the patient

Jovana N. Stašić, Jugoslav Ilić, Tatjana Savić-Stanković

University of Belgrade, School of Dental Medicine, Department of Restorative Odontology and Endodontics, Belgrade, Serbia

## SUMMARY

**Introduction/Objective** Challenges in the application of the rubber dam, inexperience, and discomfort of the patient are reasons for its undesirability. That is why education and training of young dentists is important, as well as bringing this phase of work closer to patients in order to reduce discomfort.

The objective was to examine the attitudes about knowledge and skills of young dentists in our community and the impression of patients during the application of the rubber dam in the performance of restorative and endodontics procedures.

**Methods** The research was conducted on the basis of epidemiological questionnaires filled out by 30 dentists (specialist studies and internship at the Clinic for Dental Diseases) and 30 patients immediately after working with the rubber dam. The questionnaires had three categories: general information about the dentist's knowledge and experience, information on clinical work with the rubber dam, and patient impressions.

**Results** A total of 37% of dentists had the experience of using rubber dam during endodontic procedures, while 23% of dentists used them during restorative procedures. Lack of experience (2–4 years) did not significantly affect the ability to place rubber dam in simple clinical procedures ( $p = 0.321$ ) while it had a significant impact in more difficult situations ( $p = 0.027$ ). During clinical work, the indication for the placement of the rubber dam did not significantly influence the choice of the jaw on which the dental procedure will be performed ( $p = 0.659$ ). The average time for placing the rubber dam in both procedures was five minutes. After clinical work, 57% of patients felt no pain, and 93% would agree to reapply the rubber dam during future procedures.

**Conclusion** Young dentists have knowledge but insufficient experience when working with the rubber dam, which can be explained by their caution with the analysis of the clinical situation. Additional education and training during work with the rubber dam is necessary, in order to increase the independence of young dentists. Patients easily tolerate working with rubber dam and have a positive opinion.

**Keywords:** rubber dam; clinical experience; restorative procedures; endodontic procedures; attitude of patient

## INTRODUCTION

During restorative and endodontic procedures, the soft tissues of the lips, cheeks, and tongue, as well as the presence of saliva and gingival fluid, limit the working field and lead to the possibility of contamination. Ensuring a relatively dry working field is possible by using cotton rolls and aspiration by saliva ejector. However, to establish an absolutely dry working field, the use of the rubber dam is necessary.

In addition to limited working field during clinical work, using various irrigants and acids can easily lead to chemical damage to soft tissues, as well as to the possibility of aspiration and swallowing of small rotating instruments used during work.

To overcome all the mentioned difficulties, the rubber dam should be an essential part of restorative and endodontic procedures. The application of rubber dam provides several benefits. In addition to isolating the operating field from saliva, gingival fluid, and blood [1], the absolutely dry working field improves adhesive procedures

when applying restorative materials and contributes to the durability of adhesive restoration [2]. Furthermore, by preventing various irrigants, medications, and other chemical agents from coming into contact with the surrounding oral mucosa and damaging it, the use of a rubber dam ensures the patient's safety from swallowing/aspiration of small instruments [3, 4], as well as the protection of the dentist from infectious diseases and aerosol contamination during dental interventions [5, 6].

However, despite the well-known advantages of the rubber dam, dentists often do not decide to use it in their clinical work, based on the opinion that the implementation of this procedure is complicated and is more time consuming during clinical work. Also, additional reasons for not using rubber dam include the high cost of rubber dam sets and patients' non-acceptance [7].

In restorative dentistry, working with a rubber dam depends on the severity of the clinical situation and the possibility of placing the rubber dam. The European Association of Endodontists recommends using the rubber dam as mandatory during endodontic therapy and

vital pulp therapy [8, 9]. Data from the literature show that regardless of the development of modern dentistry and new materials, the use of rubber dam in different parts of Europe is not increasing. A study by Marshall and Page [10] in 1990 showed that of 1008 surveyed general dentists in the United Kingdom, only 1% applied rubber dam during restorative procedures and 11% during endodontic therapy. In New Zealand and the United States, the routine use of the rubber dam in endodontics was recorded by 57% and 59% of general dentists, respectively [11, 12]. Irish general dentists have reported a higher percentage of restorative and endodontic procedures without rubber dams [7]. Also, clinical experience has an influence on the incidence of rubber dam application. Çağa et al. [13] found in their work that dentists with more years of experience show a lower incidence of using the rubber dam when performing various dental procedures. In the same study, 110 dentists (27% of the respondents) stated that placing the rubber dam is complicated, and 143 (36%) patients do not accept working with rubber dam [13]. A study from New Zealand showed that, compared to more experienced dentists, significantly more dentists with less than 10 years of clinical experience use rubber dam. A greater trend of additional education in the application of the rubber dam was also noted, as well as a greater use of the rubber dam during endodontic procedures by dentists working in a team compared to independent ones in private practices [11]. A similar situation was observed in the study by Mala et al. [14], who examined the attitudes of final-year students on the use of rubber dam. Although the rubber dam was used in adult patients by 98% of students in their final year of study during endodontic procedures, 62% of them believed that rubber dam would decrease after graduation due to the difficulty of its placement and the lack of its acceptance by patients [14].

Therefore, the aim of this study was to examine the attitudes of young dentists in our community towards the knowledge and skills related to the rubber dam placement, as well as the patients' impressions during the application of the rubber dam during restorative and endodontic procedures.

## METHODS

The research was conducted at the Department of Restorative Odontology and Endodontics of the School of Dental Medicine, University of Belgrade, based on the filling out of epidemiological questionnaires. Thirty dentists, both specialization residents and on internships, and 30 patients completed questionnaires before and after placing the rubber dam during restorative and endodontic procedures. The dentists filled out two questionnaires, while the third questionnaire was filled out by the patients. Consent to fill out the questionnaire was completely voluntary.

The first questionnaire consisted of 11 questions related to general information about dentists and their previous knowledge about the rubber dam. In this questionnaire, the data was obtained from the dentist's previous experience working with rubber dam. For the purpose of data

analysis, young dentists were grouped based on years of experience into three groups: dentists having less than two years of clinical experience (on an internship or specialization residents), dentists with 2–4 years of experience (specialization residents), and those with more than five years of clinical experience. The questionnaire also contained a self-assessment of the degree of independence when placing rubber dam in simple and more difficult clinical situations. Clinical situations that were considered simple included the following: those where more than 50% of the crown was preserved, supragingival approximal cavities, the absence of interproximal contacts, normal interproximal contacts, and isolation of less than three teeth. More severe clinical situations included the following: destruction of more than 50% of the crown, subgingival proximal cavities, anxious patient and isolation of more than three teeth. Filling out of the first questionnaire was done immediately before the intervention.

The second questionnaire, also designed for dentists, consisted of questions related to the management of the rubber dam during restorative or endodontic procedures. This questionnaire was filled out after the clinical work. It consisted of 10 questions, and these were related to the indications for the placement of the rubber dam, the selection of clamps, and teeth that are isolated. Also, the time needed for rubber dam placement was noted, as well as the occurrence of difficulties during the procedure.

The third questionnaire was designed for patients, who gave answers after the intervention in which the rubber dam was applied. It consisted of nine questions, and the questions were formulated to obtain information about the presence of pain when placing and working with the rubber dam. The patient's overall impression and the willingness to use rubber dams again during future restorative and endodontic interventions were examined.

To carry out this research, a basic rubber dam set was used, comprising an elastic rubber sheet, a frame, metal clamps with and without the wings, a template for marking the perforations on the rubber, punch pliers (Ainsworth type), rubber dam forceps for holding and placing the clamp on the tooth and dental floss for fixing the rubber sheet circumferentially.

All data were statistically analyzed in IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA), via descriptive statistical methods, using the Mann–Whitney and  $\chi^2$  test.

## RESULTS

### a) Results based on the data obtained from the first questionnaire

#### 1. Age distribution of young dentists and clinical experience

The study includes dentists in specialist studies and internship with minimal clinical experience and experience of up to seven years. Of the total number of dentists who participated in the research, 17 were 25–29 years old,

**Table 1.** Distribution of dentists' age and clinical experience expressed in months**Tabela 1.** Distribucija starosti stomatologa i kliničkog iskustva iskazanog u mesecima

Age of the dentist	25	26	27	28	29	30	31	32	35	39
Number of dentists of the specified age	2	3	2	6	4	6	1	3	2	1
Clinical experience expressed in months	5.5	4	15	6.5	48	36	48	60	84	36

while one dentist was 39. By comparing years of age and clinical experience, the greatest clinical experience (84 months / seven years) was observed in dentists aged 35, while the least experience (4 months) was recorded in young dentists aged 26 (Table 1). By grouping the data according to the methodological plan, it was obtained that of the total number of dentists ( $n = 30$ ), 13 dentists had up to two years of clinical experience, 12 dentists 2–4 years, and five dentists 5–7 years of clinical experience.

## 2. Additional sources of learning about rubber dams in relation to clinical experience

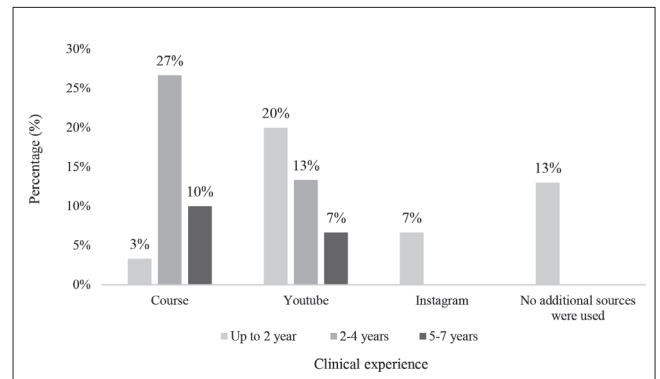
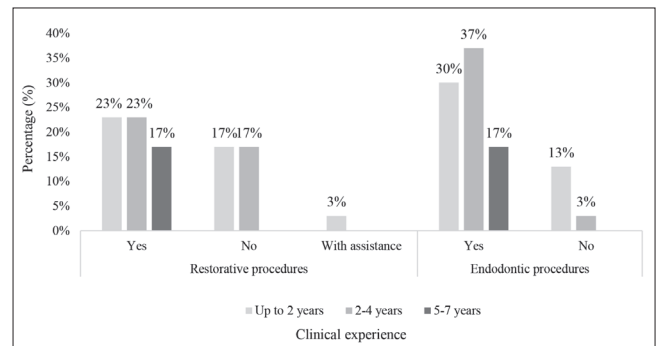
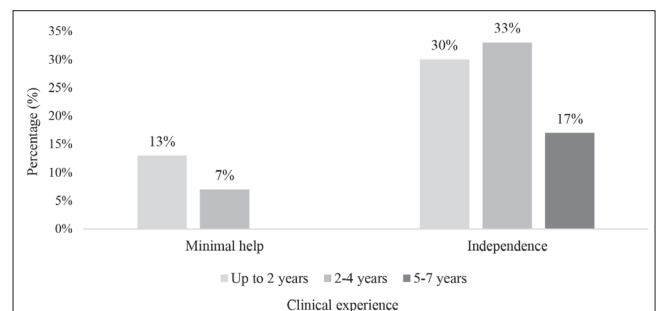
Dentists with 2–4 years of clinical experience attended courses (27%) and used internet sources – YouTube (13%) – as additional learning sources. A similar trend was observed among dentists with 5–7 years of experience (courses 10%; YouTube 7%). Among dentists with the least number of years of experience, a diverse application of additional learning sources was observed. It was also noted that 13% of dentists with the least years of experience did not use additional sources of learning. Years of clinical experience significantly influenced the need for additional learning resources ( $p = 0.028$ ) (Figure 1).

## 3. Previous application of the rubber dam during restorative and endodontic procedures by all dentists based on years of clinical experience

Based on previous knowledge and experience among dentists with up to two years of clinical experience and among dentists with 2–4 years of clinical experience, the independent use of rubber dam was reported in 23% of clinical situations during restorative procedures. Among dentists with the most years of clinical experience, independence in placing rubber dam during restorative procedures was recorded in 17% of the cases.

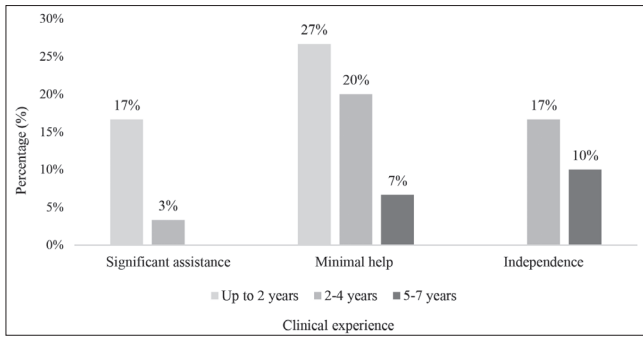
A somewhat higher frequency of working with a rubber dam during endodontic procedures was recorded among dentists with up to two years of clinical experience (30%), as well as among dentists with 2–4 years of clinical experience (37%). Dentists with the most clinical experience showed an equal representation of rubber dam during restorative and endodontic procedures.

In terms of clinical work without the use of the rubber dam, among dentists with the least years of clinical experience, it was observed that it was equally represented in both clinical procedures, while among dentists with clinical experience of 2–4 years, a higher percentage of not using the rubber dam was recorded when performing restoratives compared to endodontic procedures (Figure 2).

**Figure 1.** Additional sources of learning about rubber dam in relation to clinical experience**Slika 1.** Dodatni izvori učenja o koferdamu u odnosu na kliničko iskustvo**Figure 2.** Previous application of the rubber dam during the implementation of restorative and endodontic procedures by all dentists based on years of clinical experience**Slika 2.** Prethodna primena koferdama tokom sprovođenja restaurativnih i endodontskih procedura kod svih stomatologa na osnovu godina kliničkog iskustva**Figure 3.** The level of independence in applying the rubber dam in simple clinical situations in relation to clinical experience**Slika 3.** Nivo samostalnosti u primeni koferdama u jednostavnim kliničkim situacijama u odnosu na kliničko iskustvo

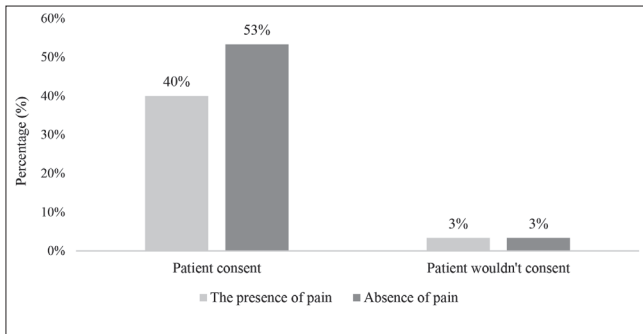
## 4. The level of independence in applying rubber dam in simple clinical situations in relation to clinical experience

Dentists with the least years of experience, as well as dentists with experience of up to four years, needed minimal help in 13% and 7% of the cases, respectively. Years of experience did not significantly affect the level of independence in placing the rubber dam in simple clinical situations ( $p = 0.321$ ) (Figure 3).



**Figure 4.** The level of independence in applying the rubber dam in more difficult clinical situations in relation to clinical experience

**Slika 4.** Nivo samostalnosti u primeni koferdama u težim kliničkim situacijama u odnosu na kliničko iskustvo



**Figure 5.** The patient consent to the re-placement of the rubber dam in relation to the presence of pain

**Slika 5.** Pristanak pacijenta na ponovno postavljanje koferdama u odnosu na prisustvo bola

**Table 2.** Distribution of the sex and age of patients  
**Tabela 2.** Distribucija pola i godina starosti pacijenta

Sex		Age (years)		
Female	Male	20–39	40–60	61–80
20	10	18	8	4

**5. The level of independence in applying rubber dam in more difficult clinical situations in relation to clinical experience**

In all three groups of dentists, minimal assistance was needed in placing the rubber dam in more difficult clinical situations, with the fact that the least independence was shown by the group of dentists with up to two years of work experience and the greatest by dentists with the most years of work experience. Complete independence in placing the rubber dam was recorded in 17% of cases among dentists with 2–4 years of work experience and dentists with the longest work experience (10%). In more difficult clinical situations, years of experience are significant characteristics at the level of independence ( $p = 0.027$ ) (Figure 4).

**a) Results based on the data obtained from the second questionnaire**

**1. Indications for placement of the rubber dam during clinical work in relation to experience**

During clinical work, young dentists with up to two years of clinical experience installed rubber dam in 33%

of cases during endodontic treatments and in 10% of restorative procedures. Dentists with 2–4 years of clinical experience, as well as dentists with the most experience, used rubber dam when performing endodontic procedures in 33% and 17% of situations. Clinical experience did not significantly influence the choice of indications for placing rubber dam ( $p = 0.128$ ).

**2. Choice of the jaw, isolated teeth, and teeth with a clamp placed on them**

Among all dentists, regardless of clinical experience, a higher prevalence of the rubber dam use was noted for the lower jaw in both clinical procedures. During restorative procedures, 7% of the dentists placed the rubber dam in the lower jaw, and 67% of endodontic treatments with the rubber dam were performed in the lower jaw. During clinical work, the indication for the placement of the rubber dam did not significantly influence the choice of the jaw on which the dental procedure will be performed ( $p = 0.659$ ). In most clinical situations, the lower lateral teeth are isolated with a rubber dam.

**3. Average time of placement of the rubber dam during restorative and endodontic procedures**

For restorative procedures, three (10%) dentists placed the rubber dam in five minutes, while one dentist needed 5–10 minutes. For placing rubber dam during endodontic procedures, 24 (80%) dentists recorded a time of five minutes. In both procedures, the average time for the rubber dam placement was five minutes ( $p = 0.137$ ).

**c) Results based on the data obtained from the third questionnaire**

**1. Distribution of sex and age of patients**

In the study, 20 female and 10 male patients participated. The patients were aged 20–80 years (Table 2).

**2. The presence of pain during the rubber dam placement and the patient's consent to re-placing the rubber dam in relation to the presence of pain**

During restorative and endodontic procedures, 43% of patients felt pain, while 57% had no painful sensations. After completing the clinical work, based on the subjective feeling of pain, 12 (40%) patients would agree to have the rubber dam re-placed, while one (3%) patient would not agree to the reinsertion of the rubber dam. The patient's consent to reapply the rubber dam in relation to pain was not statistically significantly related ( $p = 1.000$ ) (Figure 5).

**DISCUSSION**

Although the use of rubber dam dates to 1864, data from the literature indicate that rubber dam haven't yet been introduced as an integral part of the clinical procedure among dentists during restorative and endodontic procedures [15–18].

Licensing boards in the United States require the use of the rubber dam as a mandatory and integral part of clinical practice [19]. Also, the European Association of Endodontists' recommendation is the necessary use of the rubber dam during endodontic therapy and vital pulp therapy [8, 9].

In addition to these mandatory requirements, the practice of dentists has shown a certain level of aversion to rubber dam. Therefore, young dentists were included in this research in order to examine their attitudes based on the fact that they have little or no clinical experience. In addition to dentists, patients were also examined in terms of comfort while working with the rubber dam and the presence/absence of pain.

Although rubber dam application is a mandatory part of the curriculum in all dental schools, data from the study by Ryan and O'Connell [20] indicate that students graduate with the opinion that rubber dam application will have no benefit in their future clinical work except during endodontic treatment. As reasons for this, they cite difficulties and a long-time during placement, as well as the opinion that patients don't accept working with rubber dam [14].

Further educational activities are necessary to overcome the discrepancy between the knowledge acquired during studies and the low frequency of rubber dam use after graduation [21]. In their study, Mala et al. [14] concluded that due to the development of modern dentistry, there may be a different trend in the use of rubber dam after graduation among today's students compared to dentists who graduated decades ago.

The study of Milanovic et al. examined the attitudes, knowledge, and skills in working with rubber dam among students in their final year at the School of Dental Medicine, University of Belgrade. In this study 88% of 130 included students didn't feel confident enough to place a rubber dam on their own [22]. The findings of the study of Milanovic et al.'s can be linked to our results regarding independence in placing rubber dam in simple and more difficult clinical situations. In our study, the selection of simple and more difficult clinical situations was made based on clinical experience while working with rubber dam, as well as on the basis of the degree of difficulty of placing rubber dam. In simple clinical situations, young dentists with up to 2 years of experience and 2–4 years of clinical experience needed minimal help. In more difficult clinical situations, the need for minimal assistance was noted by all dentists regardless of years of experience. A higher rate of independence was observed in simple versus more difficult clinical situations.

In the second part of the research, dentists, after performing endodontic and restorative procedures, filled out a second questionnaire. The questions from the second questionnaire related to skills during work with rubber dam. The indications for the placement of rubber dam depended on clinical experience. The use of rubber dam was more prevalent during endodontic procedures in the lower jaw among all dentists. This can be explained by the fact that for endodontic interventions, it is usually necessary to isolate only one, treating tooth. Isolation of one tooth with a rubber dam is a simpler procedure and doesn't require much

time. For restorative procedures, such as the reconstruction of approximal cavities, it is necessary to isolate more teeth, both for the placement of the matrix and for providing more space for manipulation. Data from the literature give clear recommendations that during restorative procedures, it is necessary to isolate one tooth distally and two teeth mesially from the tooth being reconstructed [23], making placing rubber dam in these situations a more complex procedure. Dentists with up to 2 years of clinical experience placed a rubber dam in 33% of all restorative procedures. This can be explained by the increased motivation of young dentists with the least experience and desire to practice and implement techniques that are more complicated in order to acquire new knowledge.

The most frequently isolated teeth in both dental procedures were the lower lateral teeth, which can be explained by the difficult work in the lower jaw due to increased salivation and the presence of a massive tongue and surrounding soft tissues. In a study by Ryan and O'Connell [20], over 90% of students applied a rubber dam for the restoration of the lateral teeth, which is consistent with our study.

Data from the literature indicate that one of the reasons for not using the rubber dam is a time-consuming procedure [7, 24, 25]. In our study, the average time for placing the rubber dam in both restorative and endodontic procedures was five minutes. The data on the average time are in accordance with the data from the literature [26].

Although patients' first experience with the rubber dam procedure can be frightening, data from the literature show that they tolerate it well [13, 26, 27]. During restorative procedures without the use of local anesthesia, patients may experience pain and discomfort. The use of local anesthesia and careful work can reduce patient discomfort. Thus, out of 30 patients, 12 who felt pain would still repeat the dental procedure with the rubber dam. Adequate approach, explanation of the importance of placing the rubber dam, and the experience of the dentist greatly contribute to obtaining the patient's consent for the placement of the rubber dam in subsequent visits.

## CONCLUSION

Considering the limited sample size, we can conclude that young dentists have knowledge but insufficient experience when working with the rubber dam, which is related to the existence of less frequent use in more complex situations. Patients tolerate well the placement of the rubber dam and have a positive opinion about this procedure. Additional education and practical training in working with the rubber dam are necessary to increase the independence of young dentists when performing this phase of work.

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# Primena koferdama tokom izvođenja restaurativnih i endodontskih procedura – iskustva terapeuta i pacijenata

Jovana N. Stašić, Jugoslav Ilić, Tatjana Savić-Stanković

Univerzitet u Beogradu, Stomatološki fakultet, Klinika za bolesti zuba, Beograd, Srbija

## KRATAK SADRŽAJ

**Uvod/Cilj** Izazovi pri aplikaciji koferdama, neiskustvo u radu i nelagodnost pacijenata uzroci su nepoželjnosti njegove upotrebe. Zbog toga su edukacija i obuka stomatologa veoma važne, kao i približavanje ove faze rada pacijentima radi smanjivanja diskomforta. Cilj rada je ispitati stavove o znanju i veštinama mladih stomatologa u našoj sredini i utisak pacijenata tokom primene koferdama pri izvođenju restaurativnih i endodontskih procedura.

**Metode** Istraživanje je sprovedeno na osnovu popunjavanja epidemioloških upitnika od strane 30 stomatologa (specijalističke studije i pripravnički staž Klinike za bolesti zuba) i 30 pacijenata neposredno nakon rada sa koferdamom. Upitnici su podeljeni u tri kategorije: opšte informacije o znanju i iskustvu stomatologa, informacije tokom kliničkog rada sa koferdamom i utisak pacijenata.

**Rezultati** Iskustvo korišćenja koferdama tokom endodontskih procedura imalo je 37% stomatologa, dok je 23% stomatologa koristilo koferdam tokom restaurativnih procedura. Mali broj godina iskustva (2–4) nije značajno uticao na sposobnost postavljanja koferdama u jednostavnim kliničkim procedurama ( $p = 0,321$ ), dok su na sposobnost postavljanja koferdama u težim situacijama godine iskustva imale značajan uticaj ( $p = 0,027$ ). Tokom kliničkog rada, indikacija za postavljanje koferdama nije značajno uticala na odabir vilice na kojoj će biti sprovedena stomatološka procedura ( $p = 0,659$ ). Prosečno vreme za postavljanje koferdama kod obe procedure iznosilo je pet minuta. Nakon kliničkog rada, 57% pacijenata nije osetilo bol, a 93% bi pristalo na ponovno postavljanje koferdama tokom budućih procedura.

**Zaključak** Mladi stomatolozi imaju znanje ali nedovoljno iskustva tokom rada sa koferdamom, što se može objasniti oprežnošću u analizi kliničke situacije. Neophodne su dodatne edukacije i obuka tokom rada sa koferdamom kako bi se povećala njihova samostalnost. Pacijenti lako podnose rad sa koferdamom i imaju pozitivno mišljenje o njemu.

**Ključne reči:** koferdam; kliničko iskustvo; restaurativne procedure; endodontske procedure; stav pacijenta

## UVOD

Tokom izvođenja restaurativnih i endodontskih procedura, meka tkiva usana, obraza i jezika, kao i prisustvo pljuvačke i gingivalne tečnosti, ograničavaju radno polje i dovode do njegove kontaminacije. Obezbeđivanje relativno suvog polja rada moguće je primenom vaterolni i aspiracijom. Međutim, za uspostavljanje apsolutno suvog polja rada neophodna je upotreba koferdama.

Pored sužavanja radnog polja tokom kliničkog rada, izazov predstavlja i upotreba različitih iriganasa i kiselina koje lako mogu dovesti do hemijskih oštećenja mekih tkiva, kao i mogućnost aspiracije i gutanja sitnih rotirajućih instrumenata koji se koriste pri radu.

U cilju premošćavanja svih navedenih poteškoća, koferdam bi trebalo da predstavlja neizostavni deo sprovođenja restaurativnih i endodontskih procedura. Njegova primena obezbeđuje niz pogodnosti. Pored izolacije operativnog polja od pljuvačke, gingivalne tečnosti i krvi [1], apsolutno suvo polje rada unapređuje sprovođenje adhezivnih procedura tokom primene restaurativnih materijala i doprinosi dugotrajnosti adhezivnih ispuna [2]. Istovremeno, sprečavajući različite iriganse, medikamentate i druga hemijska sredstva da dođu u kontakt sa okolnom oralnom mukozom, primena koferdama obezbeđuje zaštitu pacijenta od gutanja i aspiracije sitnih instrumenata [3, 4], kao i zaštitu stomatologa od infektivnih bolesti i kontaminacije aerosolima tokom stomatoloških intervencija [5, 6].

Ipak, i pored dobro poznatih prednosti koferdama, stomatolozi se u svom kliničkom radu često ne odlučuju za njegovu upotrebu vodeći se mišljenjem da je sprovođenje ove procedure komplikovano i da iziskuje veći utrošak vremena tokom kliničkog rada. Takođe, kao dodatni razlozi za nekorišćenje koferdama navode se visoka cena koferdam seta i neprihvatnje

od strane pacijenata [7]. U restaurativnoj stomatologiji rad sa koferdamom zavisi od težine kliničke situacije, kao i od mogućnosti za njegovo postavljanje. Preporuka Evropskog udruženja endodontologa definiše upotrebu koferdama kao obaveznu tokom endodontske terapije i terapije vitalne pulpe [8, 9]. Podaci iz literature pokazuju da bez obzira na razvoj savremene stomatologije i novih materijala, upotreba koferdama u različitim delovima Evrope nije u porastu. Studija koju su sprovedli Marshall i saradnici [10] 1990. godine pokazala je da je od 1008 ispitivanih opštih stomatologa u zemljama Ujedinjenog Kraljevstva samo 1% primenjivao koferdam tokom restaurativnih procedura, a 11% pri endodontskoj terapiji. Na Novom Zelandu i u Sjedinjenim Američkim Državama rutinska primena koferdama u endodonciji zabeležena je kod 57% i 59% opštih stomatologa [11, 12]. Među irskim stomatolozima opšte prakse zabeleženo je sprovođenje restaurativnih i endodontskih procedura bez upotrebe koferdama u većem procentu [7]. Takođe, kliničko iskustvo ima uticaja na incidencu primene koferdama. Čađa i saradnici [13] u svom radu nalaze da stomatolozi sa većim brojem godina radnog staža ređe koriste koferdam pri sprovođenju različitih stomatoloških procedura. U istoj studiji, 110 stomatologa (27% ispitivanih) navelo je da je postavljanje koferdama komplikovano, a 143 (36%) da pacijenti ne prihvataju rad sa koferdamom [13]. U studiji sa Novog Zelanda pokazano je da, u odnosu na iskusnije stomatologe, znatno više stomatologa sa manje od deset godina kliničkog iskustva koristi koferdam. Zabeležen je i veći trend dodatnih edukacija u primeni koferdama, kao i veća primena koferdama tokom sprovođenja endodontskih procedura kod stomatologa koji rade u kolektivu u u poređenju sa onima koji rade samostalno u privatnim ordinacijama [11]. Slična situacija je uočena i u studiji koju su sprovedli Mala i saradnici [14], koji su ispitivali stavove studenata završne godine o primeni koferdama. Iako

je koferdam kod odraslih pacijenata koristilo 98% studenata završne godine studija tokom endodontskih procedura, njih 62% smatra da će se upotreba koferdama smanjiti nakon diplomiranja zbog teškoće postavljanja i neprihvatanja od strane pacijenata [14].

Stoga je cilj ove studije bio da se ispituju stavovi mladih stomatologa u našoj sredini o znanju i veštinama u vezi sa koferdamom, kao i utisci pacijenata tokom primene koferdama pri izvođenju restaurativnih i endodontskih procedura.

## METODE

Istraživanje je sprovedeno na Klinici za bolesti zuba Stomatološkog fakulteta Univerziteta u Beogradu na osnovu popunjavanja epidemioloških upitnika. Trideset stomatologa na specijalističkim studijama i pripravničkom stažu i 30 pacijenata popunili su upitnike pre i posle rada sa koferdamom tokom sprovođenja restaurativnih i endodontskih procedura. Stomatolozi su popunjavali dva upitnika, dok su treći upitnik popunjavali pacijenti.

Prvi upitnik se sastojao od 11 pitanja koja su se odnosila na opšte informacije o stomatolozima i njihovom prethodnom znanju o koferdamu. U ovom upitniku dobijeni su podaci o prethodnom iskustvu stomatologa u radu sa koferdamom. Radi statističke analize podataka, mladi stomatolozi su grupisani na osnovu godina iskustva u tri grupe: stomatolozi koji su na pripravničkom stažu i stomatolozi na specijalističkim studijama koji imaju do dve godine kliničkog iskustva, stomatolozi na specijalističkim studijama sa 2–4 godine iskustva i oni sa više od pet godina kliničkog iskustva. Upitnik je sadržao i ličnu procenu stepena samostalnosti pri postavljanju koferdama u jednostavnim i težim kliničkim situacijama. Pod jednostavnim kliničkim situacijama smatrane su: očuvanost više od ½ krunice, supragingivalni aproksimalni kaviteti, odsustvo interproksimalnih kontakata, normalni interproksimalni kontakti i izolacija manje od tri zuba. Pod težim kliničkim situacijama navedene su: destrukcija više od ½ krunice, subgingivalni aproksimalni kavitet, teskoba i izolacija više od tri zuba. Popunjavanje prvog upitnika vršeno je neposredno pre intervencije.

Drugi upitnik, koji je takođe bio namenjen stomatolozima, sadržao je pitanja koja su se odnosila na rad sa koferdamom tokom restaurativnih ili endodontskih procedura. Popunjavanje ovog upitnika vršeno je nakon sprovedenog kliničkog rada. Sastojao se od 10 pitanja, koja su bila vezana za indikacije za postavljanje koferdama, odabir kvačica i zuba koji su izolovani koferdamom. Takođe, notirano je i vreme za koje je postavljen koferdam, kao i postojanje poteškoća tokom rada.

Treći upitnik bio je namenjen pacijentima, koji su odgovore davali nakon završene intervencije u kojoj je primenjen koferdam. Upitnik je sadržao devet pitanja, a pitanja su formulisana u cilju dobijanja informacija o prisustvu bola pri postavljanju i radu sa koferdamom. Ispitivani su opšti utisak pacijenata i pristanak na ponovno postavljanje koferdama prilikom budućih restaurativnih i endodontskih intervencija.

Za sprovođenje ovog istraživanja korišćen je osnovni koferdam set, koji se sastojao od elastične gume, rama, metalnih kvačica sa krilcima i bez njih za fiksaciju gume za zub, šablona za obeležavanje otvora na gumi, klešta za pravljenje otvora, klešta

za držanje i postavljanje kvačice na zub i dentalnog konca za fiksiranje gume oko zuba.

Svi podaci su statistički analizirani u SPSS programu (SPSS v22.0, SPSS Inc, Chicago, IL, USA), deskriptivnim statističkim metodama upotrebom testova Men–Vitni i  $\chi^2$ .

## REZULTATI

### a) Rezultati na osnovu podataka dobijenih iz I upitnika

#### 1. Distribucija godina starosti mladih stomatologa i kliničkog iskustva

Studija obuhvata stomatologe koji su na specijalističkim studijama i pripravničkom stažu sa minimalnim kliničkim iskustvom i iskustvom do sedam godina. Od ukupnog broja stomatologa koji su učestvovali u istraživanju, njih 17 je bilo starosti 25–29 godina, dok je jedan stomatolog imao 39 godina. Poređenjem godina starosti i kliničkog iskustva uočeno je najveće kliničko iskustvo (84 meseca / sedam godina) kod stomatologa sa 35 godina starosti, dok je najmanje iskustvo (četiri meseca) zabeleženo kod mladih stomatologa starosti 26 godina (Tabela 1). Grupisanjem podataka prema metodološkom planu, dobijeno je da je od ukupnog broja stomatologa ( $n = 30$ ), 13 stomatologa imalo do dve godine kliničkog iskustva, 12 stomatologa između 2–4 godine, a pet stomatologa 5–7 godina kliničkog iskustva.

#### 2. Dodatni izvori učenja o koferdamu u odnosu na kliničko iskustvo

Stomatolozi sa 2–4 godine kliničkog iskustva pohađali su kurseve (27%) i koristili internet izvore – YouTube (13%) – kao dodatne izvore učenja. Sličan trend je zabeležen i kod stomatologa sa 5–7 godina iskustva (kursevi 10%, YouTube 7%). Kod stomatologa sa najmanjim brojem godina iskustva uočena je raznovrsna primena dodatnih izvora učenja. Zabeleženo je i da 13% stomatologa sa najmanje godina iskustva nije koristilo dodatne izvore učenja. Godine kliničkog iskustva značajno su uticale na potrebu za dodatnim izvorima učenja ( $p = 0,028$ ) (Slika 1).

#### 3. Prethodna primena koferdama tokom sprovođenja restaurativnih i endodontskih procedura kod svih stomatologa na osnovu godina kliničkog iskustva

Na osnovu prethodno stečenog znanja i iskustva, kod stomatologa sa kliničkim iskustvom do dve godine, kao i kod stomatologa sa 2–4 godine kliničkog iskustva, samostalna upotreba koferdama je prijavljena u 23% kliničkih situacija tokom sprovođenja restaurativnih procedura. Kod stomatologa sa najviše godina kliničkog iskustva zabeležena je samostalnost u postavljanju koferdama tokom sprovođenja restaurativnih procedura u 17% slučajeva.

Nešto veća učestalost rada sa koferdamom tokom sprovođenja endodontskih procedura zabeležena je kod stomatologa sa do dve godine kliničkog iskustva (30%), kao i kod stomatologa sa 2–4 godine kliničkog iskustva (37%). Stomatolozi sa najvećim kliničkim iskustvom pokazali su podjednaku upotrebu koferdama tokom sprovođenja kako restaurativnih tako i endodontskih procedura.



U pogledu kliničkog rada bez primene koferdama, kod stomatologa sa najmanjim brojem godina kliničkog iskustva uočeno je da je podjednako zastupljen kod obe kliničke procedure, dok je kod stomatologa sa kliničkim iskustvom 2–4 godine zabeležen veći procenat nekorišćenja koferdama prilikom izvođenja restaurativnih u odnosu na endodontske procedure (Slika 2).

#### 4. Nivo samostalnosti u primeni koferdama u jednostavnim kliničkim situacijama u odnosu na kliničko iskustvo

Kod stomatologa sa najmanjim brojem godina iskustva i stomatologa sa iskustvom do četiri godine bila je neophodna minimalna pomoć u 13% i 7% slučajeva, redom. Godine iskustva nisu značajno uticale na nivo samostalnosti u postavljanju koferdama u jednostavnim kliničkim situacijama ( $p = 0,321$ ) (Slika 3).

#### 5. Nivo samostalnosti u primeni koferdama u težim kliničkim situacijama u odnosu na kliničko iskustvo

Minimalna pomoć u postavljanju koferdama u težim kliničkim situacijama bila je potrebna kod sve tri grupe stomatologa, s tim što je najmanju samostalnost pokazala grupa stomatologa do dve godine radnog iskustva, a najveću stomatolozi sa najvećim brojem godina radnog iskustva. Potpuna samostalnost u postavljanju koferdama zabeležena je u 17% slučajeva kod stomatologa sa 2–4 godine radnog iskustva i kod stomatologa sa najdužim radnim iskustvom (10%). Pri težim kliničkim situacijama godine iskustva su značajno uticale na nivo samostalnosti ( $p = 0,027$ ) (Slika 4).

### b) Rezultati na osnovu podataka dobijenih iz II upitnika

#### 1. Indikacije za postavljanje koferdama tokom kliničkog rada u odnosu na iskustvo

Tokom kliničkog rada, mladi stomatolozi sa do dve godine kliničkog iskustva koristili su koferdam u 33% slučajeva tokom sprovođenja endodontskih tretmana i u 10% restaurativnih procedura. Stomatolozi sa 2–4 godine kliničkog iskustva i stomatolozi sa najvećim iskustvom koristili su koferdam pri sprovođenju endodontskih procedura u 33% i 17% situacija. Kliničko iskustvo nije značajno uticalo na izbor indikacija za postavljanje koferdama ( $p = 0,128$ ).

#### 2. Izbor vilice, zuba koji su izolovani i zuba na koje je postavljena kvačica

Kod svih stomatologa, bez obzira na kliničko iskustvo, primena je veća zastupljenost primene koferdama u donjoj vilici kod obe kliničke procedure. Tokom restaurativnih zahvata, 7% stomatologa je postavilo koferdam u donjoj vilici, dok je 67% endodontskih tretmana sa koferdamom sprovedeno u donjoj vilici. Tokom kliničkog rada, indikacija za postavljanje koferdama nije značajno uticala na odabir vilice na kojoj će biti sprovedena stomatološka procedura ( $p = 0,659$ ). U najvećem broju kliničkih situacija koferdamom su bili izolovani donji bočni zubi.

#### 3. Prosečno vreme postavljanja koferdama tokom restaurativnih i endodontskih procedura

Kod restaurativnih procedura tri (10%) stomatologa su postavila koferdam za pet minuta, dok je jednom stomatologu

bilo potrebno 5–10 minuta. Za postavljanje koferdama tokom sprovođenja endodontskih procedura kod 24 (80%) stomatologa zabeleženo je vreme od pet minuta. Kod obe procedure, prosečno vreme za postavljanje koferdama iznosilo je pet minuta ( $p = 0,137$ ).

### c) Rezultati na osnovu podataka dobijenih iz III upitnika

#### 1. Distribucija pola i godina starosti pacijenata

U istraživanju je učestvovalo 20 pacijenata ženskog i 10 pacijenata muškog pola. Pacijenti su bili starosti 20–80 godina (Tabela 2).

#### 2. Prisustvo bola tokom postavljanja koferdama i pristanak pacijenta na ponovno postavljanje koferdama u odnosu na prisustvo bola

Tokom sprovođenja restaurativnih i endodontskih procedura, 43% pacijenata je osetilo bol, dok 57% pacijenata nije imalo nikakve bolne senzacije. Nakon završenog kliničkog rada, na osnovu subjektivnog osećaja bola, 12 (40%) pacijenata bi pristalo da im se ponovo postavi koferdam, dok jedan (3%) pacijent ne bi pristao na ponovno postavljanje koferdama. Pristanak pacijenta na ponovno postavljanje koferdama u odnosu na prisustvo bola nije bilo statistički značajno povezano ( $p = 1,000$ ) (Slika 5).

## DISKUSIJA

Iako primena koferdama datira još iz davne 1864. godine, podaci iz literature ukazuju na to da među stomatolozima koferdam još uvek nije uveden kao sastavni deo kliničke procedure tokom sprovođenja restaurativnih i endodontskih zahvata [15–18].

Odbori za izdavanje licenci za rad u Sjedinjenim Američkim Državama zahtevaju upotrebu koferdama kao obavezni i sastavni deo kliničkog rada [19]. Takođe, preporuka Evropskog udruženja endodontologa je obavezna upotreba koferdama tokom endodontske terapije i terapije vitalne pulpe [8, 9].

I pored ovih obaveznih zahteva, praksa stomatologa je pokazala određenu stopu odbojnosti prema koferdamu. Stoga su u ovo istraživanje uključeni mladi stomatolozi kako bi se ispitali njihovi stavovi, polazeći od činjenice da nemaju ili imaju malo kliničkog iskustva. Pored stomatologa, ispitivani su i pacijenti u pogledu komfora tokom rada sa koferdamom i prisustva/odsustva bola.

Iako je na svim stomatološkim fakultetima primena koferdama obavezni deo nastavnog plana, podaci iz studije koju su sveli Ryan i O'Connel [20] ukazuju na to da studenti diplomiraju sa mišljenjem da primena koferdama neće imati nikakvu korist u njihovom budućem kliničkom radu, osim tokom endodontskog lečenja. Kao razloge za to navode teškoće i dugo vreme tokom postavljanja, ali i mišljenje da pacijenti ne prihvataju rad sa koferdamom [14].

Očigledno, neophodne su dalje edukativne aktivnosti kako bi se prevazišao nesklad između znanja stečenog tokom studiranja i niske učestalosti upotrebe koferdama nakon diplomiranja [21]. Mala i saradnici [14] u svojoj studiji su zaključili da usled razvoja savremene stomatologije može postojati drugačiji trend

upotrebe koferdama nakon diplomiranja današnjih studenata u poređenju sa stomatolozima koji su diplomirali pre nekoliko decenija.

Milanović i saradnici su u svojoj studiji ispitivali stavove, znanje i veštine u radu sa koferdamom kod studenata završne godine Stomatološkog fakulteta Univerziteta u Beogradu. U ovoj studiji od 130 studenata završne godine studija, 88% studenata se nije osećalo dovoljno sposobnim da samostalno postavi koferdam [22]. Nalazi studije Milanović i saradnika mogu se povezati sa našim rezultatima po pitanju samostalnosti u postavljanju koferdama u jednostavnim i težim kliničkim situacijama. U našoj studiji, odabir jednostavnih i težih kliničkih situacija izvršen je na osnovu kliničkog iskustva tokom rada sa koferdamom, kao i na osnovu stepena otežanosti postavljanja koferdama. Pri jednostavnim kliničkim situacijama, kod mladih stomatologa do dve godine i 2–4 godine kliničkog iskustva bila je neophodna minimalna pomoć. U težim kliničkim situacijama, potreba za minimalnom pomoći je zabeležena kod svih stomatologa bez obzira na godine iskustva. Veća stopa samostalnosti je uočena pri jednostavnim u odnosu na teže kliničke situacije.

U drugom delu istraživanja, stomatolozi su nakon sprovedenih endodontskih i restaurativnih procedura popunjavali drugi upitnik, u kome su se pitanja odnosila na veštine tokom rada sa koferdamom. Izbor indikacija za postavljanje koferdama zavisio je od kliničkog iskustva. Kod svih stomatologa, upotreba koferdama je bila češća tokom izvođenja endodontskih procedura i to u donjoj vilici. To se može objasniti činjenicom da je za endodontske intervencije najčešće neophodno izolovati samo jedan zub, onaj na kome se sprovodi endodontska terapija. Izolacija jednog zuba koferdamom je jednostavnija procedura i ne iziskuje mnogo vremena. Za restaurativne procedure, kao što je rekonstrukcija aproksimalnih kaviteta, neophodno je izolovati više zuba, kako zbog postavljanja matrice, tako i zbog obezbeđivanja više prostora za manipulaciju. Podaci iz literature daju jasne preporuke da se tokom restaurativnih zahvata izoluje jedan zub distalno i dva zuba mezijalno od zuba koji se rekonstruiše [23], što postavljanje koferdama u ovim situacijama čini kompleksnijim zahvatom. Stomatolozi sa do dve godine kliničkog iskustva su u 33% situacija postavili koferdam tokom izvođenja

restaurativnih procedura. To se može objasniti povećanom motivisanošću mladih stomatologa sa najmanje iskustva i željom da uvežbaju i implementiraju tehnike koje su komplikovanije kako bi stekli nova znanja.

Najčešće izolovani zubi kod obe stomatološke procedure bili su donji bočni zubi, što se može objasniti otežanim radom u donjoj vilici zbog povećane salivacije, prisustva masivnog jezika i okolnih mekih tkiva. U studiji koju su sprovedli Ryan i O'Connell [20], preko 90% studenata je primenilo koferdam za restauraciju bočnih zuba, što je u skladu sa našom studijom.

Podaci iz literature ukazuju da je jedan od razloga za nekorisćenje koferdama veliki utrošak vremena [7, 24, 25]. U našoj studiji, prosečno vreme za postavljanje koferdama i kod restaurativnih i kod endodontskih procedura iznosilo je pet minuta. Podaci o prosečnom vremenu su u skladu sa podacima iz literature [26].

Iako pacijentovo prvo iskustvo sa procedurom postavljanja koferdama može biti zastrašujuće, podaci iz literature pokazuju da je pacijenti dobro podnose [13, 26, 27]. Tokom sprovođenja restaurativnih procedura bez upotrebe lokalne anestezije moguća je pojava bola i nelagodnosti kod pacijenata. Upotreba lokalne anestezije i pažljiv rad mogu smanjiti nelagodnost kod pacijenata. Tako, od 30 pacijenata, njih 12 koji su osetili bol bi ipak ponovili rad sa koferdamom. Adekvatan pristup pacijentu, objašnjenje važnosti primene koferdama i iskustvo stomatologa umnogome doprinose dobijanju saglasnosti pacijenata za postavljanje koferdama pri narednim posetama.

## ZAKLJUČAK

Uzimajući u obzir ograničenu veličinu uzorka, možemo zaključiti da mladi stomatolozi imaju znanje, ali nedovoljno iskustva u radu sa koferdamom, što je u vezi sa ređom upotrebom u složenijim situacijama. Pacijenti dobro podnose rad sa koferdamom i imaju pozitivno mišljenje o ovoj proceduri. Dodatne edukacije i praktična obuka u radu sa koferdamom neophodne su kako bi se povećala samostalnost mladih stomatologa prilikom izvođenja ove faze rada.