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MODIFIKOVANA METODA DIREKTNOG POSTAVLJANJA BRAVICA ZA ZUBE – EFIKASNIJI PRISTUP ORTODONTSKE TERAPIJE: RETROSPEKTIVNA KLINIČKA STUDIJA

MODIFIED DIRECT ORTHODONTIC BONDING METOD - EFFECTIVENESS IN ORTHODONTIC THERAPY: A RETROSPECTIVE CLINICAL STUDY

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Sažetak

Uvod: *Cilj studije bio je da se utvrde procenat neželjenih debondiranja postavljenih bravica modifikovanom direktnom metodom bondiranja kod pacijenata oba pola, različitog životnog doba i malokluzija u toku 12 mesesci ortodontske terapije fiksnim aparatima.*
Materijali i metode: *Retrospektivnom kliničkom studijom obuhvaćen je period od novembra 2019. do decembra 2022. godine i obuhvaćeno je trideset pacijenata (prosečne starosti 17,07 ± 5,35 godina) 8 muških osoba,(prosečne starosti 18,77 ± 7,87 godina) i 22 ženske osobe, (prosečne starosti 16,45 ± 4,17 godina), koji su ispunjavali kriterijume studije. Postavljeno je ukupno 600 bravica 0.022" (Mini Sprint®, Forestadent, Germany) modifikovanom direktnom metodom pomoću adhezivnog materijala (Resiliance Light Bond™, Itasca, USA) od strane jednog operatera. Opservacija otpalih bravica praćena je 12 meseci od bondiranja.*
Rezultati: *Ukupan broj otpalih bravica bio je 10 (1,67%), a 8 pacijenata (26,7%) doživelo je neželjena debondiranja. Broj otpalih bravica u odnosu na godine i malokluzije nije dao statističke značajnosti. Postoji klinička razlika među polovima – 18,2% kod žena i 50% kod osoba muškog pola, a statistička značajnost u broju neželjenih debondiranja nije značajna (HR = 0,343; 95% CI: 0,084–1,394; p = 0,135).*
Zaključak: *Modifikovana direktna metoda bondiranja nije dala razlike na nivou godina, pola i vrste malokluzija, ali može biti jedna od metoda izbora prilikom direktnog bondiranja.*

Ključne reči: *direktno bondiranje, neželjeno debondiranje, metalne bravice, COVID-19*

Abstract

Background: *The aim of the study was to determine the percentage of bond failures of placed brackets with a modified direct method in patients of both genders, different ages and malocclusion types during 12 months of initial bonding.*
Material and Methods: *The retrospective clinical study covered the period from November 2019 to December 2022 and included thirty patients with an average age of 17.07±5.35 8 males,(average age 18.77±7.87), and 22 females, (average age 16.45±4.17) who met the criteria. A total of 600 brackets with a 0.022" slot size (Mini Sprint ®, Forestadent, Germany) were placed by a modified direct method using thin paste adhesive (Reliance Light Bond™, Itasca, USA) by one operator. The observation of bond failures lasted 12 months.*
Results: *The total number of bond failures was 10 (1.67%), where eight patients (26,7%) experienced unwanted debonding. The number of failed brackets in relation to age and malocclusion did not show statistical significance. There was a clinical difference between the genders, in 18.2% of women and in 50% of men. Statistical significance in number of failed brackets was not significant (HR=0.343; 95% CI: 0.084-1.394; p=0.135).*
Conclusion: *The modified direct bonding method did not show differences at the level of age, gender and type of malocclusion, but it can be one of the methods of choice during direct bonding.*

Key words: *direct bonding, bond failures, metal brackets, COVID-19*

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Uvod

Zahvaljujući adheziji između dva adherenta, uz korišćenje odgovarajućih adhezivnih materijala, direktno bondiranje pruža ortodontima na globalnom nivou brojne mogućnosti u rešavanju različitih nepravilnosti orofacijalne regije. Postizanje zadovoljavajuće veze između bravica i zuba primenom adhezivnih materijala predstavlja jedan od izazova u toku bondiranja ortodontskih bravica.

Konvencionalna metoda direktnog postavljanje ortodontskih bravica za zube, pored izuzetnih karakteristika, ima svoje nedostatke, koji se nekada teže uviđaju u toku svakodnevnog inicijalnog bondiranja. Neželjena debondiranja bravica ne samo da imaju svoju ekonomsku stranu, već iziskuju i dodatno vreme za ponovna bondiranja uz dodatni utrošak materijala. Takođe, mogu biti frustrirajuća, a nekada i obeshrabrujuća, naročito kada ih izvode ortodonati sa manjim iskustvom ili oni koji tek započinju svoj samostalni rad. Često rutinski svakodnevni rad može zaslepeti i najiskusnijeg terapeuta, koji će prevideti određene nedostatke u radu, koji mogu ostati neprimećeni, te kao takvi, uticati na povećan broj neželjenih debondiranja bravica.

Neželjena debondiranja u toku ortodontske terapije ne utiču samo na produženo vreme terapije, već i na ponovno postavljanje istih ili novih bravica. Tada je neophodno izdvojiti dodatno vreme, kako ortodonta, tako i pacijenta. Neželjena debondiranja dovode se u vezu sa neadekvatnom izolacijom radnog polja, pogrešnim manuelnim pristupom tokom bondiranja, slabijim vizuelnim pregledom, greškama u odabiru i vremenu kondicioniranja gleđi, ali i tehnici aplikacije adhezivnog materijala[1,2].

Na tržištu postoji veliki izbor materijala, ali i različitih protokola bondiranja bravica[3] za zube, nastalih sa željom da se redukuju određene faze ili vreme trajanja pojedinih faza. Na taj način redukovalo bi se vreme koje pacijenti provode na stolici, a sama metoda učinila efikasnijom i efektivnijom, što bi zasigurno dovelo i do veće produktivnosti.

Period pandemije virusa COVID-19 dokazao je da je izloženost virusima naročito prisutna u stomatološkim ordinacijama[4], gde je, zbog prirode posla stomatologa, mogućnost njihovog izlaganja infekcijama bila najzastupljenija. Najduža procedura ortodontskih intervencija je upravo direktno bondiranje, gde postoji najduži kontakt ortodonata sa pacijentima, a time i veća mogućnost zaražavanja.

Introduction

Achieving a satisfactory connection between brackets and teeth by applying adhesive materials is one of the challenges during the bonding of orthodontic brackets. The use of appropriate adhesive materials, direct bonding provides orthodontists with numerous opportunities on a global level in solving various irregularities of the orofacial region.

The conventional method of direct bonding, in addition to its exceptional characteristics, has its own disadvantages that are sometimes difficult to see during the daily initial bonding. Bond failure not only has its economic side, but also requires additional time for re-bonding with additional expenditure in material. It can also be frustrating, and sometimes discouraging, especially for orthodontists with less experience or those who are just starting their independent work. Often, routine daily work can blind even the most experienced therapist who will overlook certain defects in work that may go unnoticed and as such affect the increased number of unwanted debonding of brackets.

Then, it is necessary to set aside additional time, both orthodontists and patients. The occurrence of bond failures is associated with inadequate isolation of the working field, incorrect manual approach during bonding, poorer visual inspection, errors in the selection and time of enamel conditioning, but also the technique of adhesive material application[1,2].

There is a significant selection of materials on the market, as well as different protocols for bonding brackets[3] for teeth created with the desire to reduce certain stages or the duration of certain ones. In this way, the time patients spend in the chair would be reduced, and the method itself would be more efficient and effective, which would certainly lead to greater productivity.

The period of the pandemic (SARS COVID-19) proved that exposure to viruses was especially present in dental offices[4], where, due to the nature of dentists' work, the possibility of their exposure to infections was the most prevalent. The longest procedure of orthodontic interventions is direct bonding, where there is the longest contact between orthodontists and patients, and thus the greater possibility of infection.

By looking at the daily challenges and paying attention to details in the workflow, we can see potential errors, analyze them, make appropriate corrections and improvements, and make this method much simpler.

Sagledavanjem svakodnevnih izazova i obraćanjem pažnje na detalje u toku rada možemo uvideti eventualne greške, analizirati ih, izvršiti odgovarajuće korekcije i poboljšanja, te učiniti ovu metodu znatno jednostavnijom. Jednostavniji pristup metodi bondiranja može redukovati kontakt.

Dosadašnja poboljšanja i inovacije uglavnom su bile usmerene na materijale, koji se koriste u ortodontskoj terapiji fiksnim aparatima. Međutim, brojni noviteti ukazali su na neophodnost poboljšanja i u metodama, tehnikama ili procedurama, koje se koriste sa ciljem da se: redukuje vreme inicijalnog bondiranja[5]; poboljša preciznost postavljanja bravica na zube[6]; dobije adekvatno radno vreme adheziva[7]; omogući što optimalnija jačina veze između dva adherenta, koja bi trebalo da izdrži sve sile, kako oralne sredine, tako i primenjene ortodontske sile; redukuje neka od faza inicijalnog bondiranja; poboljša komfornost pacijenata; olakša i pojednostavi rad ortodonata[8].

Modifikovana direktna metoda predstavlja novi pristup aplikacionoj fazi, a razlikuje se od konvencionalne metode po načinu primene prajmera. Prilikom upotrebe prajmera u okviru modifikovane metode, prethodno kondicionirana i pripremljena površina zuba za bondiranje ostavlja se suva i vidljiva. Time se stiču uslovi za bolji vizuelni pregled i optimalniji manuelni pristup radnom polju. Ovakva modifikovana faza celokupnog procesa bondiranja dala je niz poboljšanja, kako za ortodonte, tako i za pacijente opisane u ovoj studiji.

Cilj studije bio je da se utvrde procenat neželjenih debondiranja bravica modifikovanom direktnom metodom bondiranja kod pacijenata oba pola, različitog životnog doba i malokluzija u toku 12 mesesci ortodontske terapije fiksnim aparatima.

Materijali i metode

Retrospektivna klinička studija urađena je na Klinici za dentalnu medicinu u Nišu, u Srbiji, i odobrena od strane Etičkog odbora Klinike za dentalnu medicinu (pod brojem 14/7-2019-4 EO), pri čemu su obuhvaćeni pacijenti koji su se javili radi ortodontske terapije fiksnim aparatima u periodu od novembra 2019. do decembra 2022. godine. Pacijenti koji su zadovoljili kriterijume opservirani su nakon 12 meseci od inicijalnog bondiranja bravica, bez obzira na duži period terapije. Zbog prirode studije, zaslepljenost operatera (prvog autora) i pacijenata nije bilo moguće koji su svoje učešće u studiji prihvatili usmeno, a svoj pristanak potvrdili pismenim putem. Maloletnim osobama potpis su dali njihovi roditelji/staratelji.

A simpler approach to the bonding method can reduce contact.

Improvements and innovations have mainly been focused on materials used in orthodontic therapy with fixed appliances so far. However, numerous novelties have indicated the necessity of improvements in the methods, techniques or procedures used with the aim of: reducing the initial bonding time[5], improved accuracy of placement of brackets on teeth[6], adequate working time of the adhesive[7], the most optimal strength of the connection between the two adherents, which should withstand all the forces of the oral environment as well as the applied orthodontic forces, reduction of some initial bonding stages, improved patient comfort, facilitating and simplifying the work of orthodontists[8].

The modified direct method represents a new approach to the application phase, which differs from the conventional method in the way the primer is applied. When using primers within the modified method, the previously conditioned and prepared tooth surface for bonding is left dry and visible. This creates the conditions for a better visual overview and optimal manual access to the working field. Such a modified phase of the entire bonding process provided a series of improvements, both for the orthodontists and for the patients described in this study.

The aim of the study was to determine the percentage of unwanted bracket debonding with a modified direct bonding method in patients of both genders, of different ages and malocclusions during 12 months of orthodontic therapy with fixed appliances.

Materials and Methods

The retrospective clinical study was performed at the Clinic of Dental Medicine in Niš, Serbia, and approved by the Ethics Committee of the Clinic of Dental Medicine (under number: 14/7-2019-4 EO) and included patients for orthodontic treatment therapy with fixed appliances in the period from November 2019 to December 2022. Patients who met the criteria were observed 12 months after the initial bonding of brackets, regardless of the longer period of therapy. Due to the nature of the study, blinding of the operator—first author and patients was not possible. Patients under 18 needed the parents'/guardian consent.

The inclusion factors for the selection of patients in the study were: patients who had no previous orthodontic therapy, patients who were indicated for orthodontic therapy with fixed orthodontic appliances with a full set of teeth, without composite fillings on of the teeth, without prosthetic restorations, patients without syndromes, able to understand and

U studiju su uključeni pacijenti iz sledećih grupa: pacijenti koji ranije nisu imali ortodontsku terapiju, pacijenti kojima je indikovana ortodontska terapija fiksnim ortodontskim aparatima sa punim zubnim nizom, bez kompozitnih ispuna na bukalnim površinama zuba, bez protetskih nadoknada, pacijenti bez sindroma, koji su u stanju da razumeju i budu sposobni za održavanje oralne higijene, bez obzira na pol, godine i vrstu malokluzije.

U studiju nisu uključeni: pacijenti sa protetskim nadoknadama, sa nepotpunim zubnim nizom, neadekvatnom oralnom higijenom, oni kod kojih je indikovana ekstrakciona terapija, pacijenti koji su pripremani za ortognatsku hirurgiju, kao i pacijenti čiji je IQ niži.

U studiju je uključeno ukupno 30 pacijenata, prosečne starosti 17,07 godina ± 5,35 godina, koji su zadovoljili kriterijume nakon date pismene saglasnosti. Među nijma bilo je 8 muških osoba, (prosečnih godina 18,77 ± 7,87), i 22 ženske osobe, (prosečnih godina 16,45 ± 4,17), a ukupno je postavljeno 600 bravica. Tube na molarima nisu bile uključene u studiju. Korišćene su metalne ortodontske bravice sa Roth bracket prescription 0.022 inch slot (Mini Sprint®, Forestadent, Germany). Profilaksa zuba svih pacijenata u studiji urađena je minimum nedelju dana od inicijalnog bondiranja bravica, i nije deo modifikovane metode direktnog bondiranja. Time se proveravala disciplinovanost i motivisanost pacijenata, koji su ispunili kriterijume studije.

Modifikovana metoda direktnog postavljanja ortodontskih bravica za zube uključivala je sledeće korake: sušenje zuba i izolaciju radnog polja korišćenjem vaterolni, samo u predelu vestibuluma na uglovima u donjoj vilici ispod očnjaka, uz korišćenje sisaljke, dok je pacijent uspostavljao kontakt incizalnim ivicama gornjih sekutića sa sisaljkom; kondicioniranje 37% ortofosfornom kiselinom u gelu (Etching Gel, 3M, Monrovia, CA, USA) u trajanju od 20 s na odgovarajuće bukalne površine zuba, neznatno veće od baza bravica; kiselina sa zuba je uklonjena hitrim pokretom prethodno navlaženog kraja vaterolne u vodi, a zatim su pusterom pod mlazom vode iz neposredne blizine isprani ostaci kiseline i nusprodukata, uz zamenu i istu lokalizaciju vaterolni u predelu očnjaka, uz sušenje zuba pod blagim pritiskom vazduha iz pustera udaljenim od zuba; prajmer (Transbond XT Primer, 3M, Monrovia, CA, USA) je aplikovan na bazu bravice pomoću mikročetkice (Disposable Micro Applicators, Med Comfort, Ampri GmbH, Germany), zatim je adheziv aplikovan preko prajmera, a na kraju je prajmer reaplikovan preko adheziva na

maintain oral hygiene regardless of gender, age and type of malocclusion.

The exclusion factors were: patients with prosthetic restorations, with an incomplete set of teeth, inadequate oral hygiene, in whom extraction therapy was indicated, as well as patients who were prepared for orthognathic surgery and patients with reduced IQ.

The total number of patients included in the study who met the criteria after written consent was 30, (mean age 17.07±5.35), of which 8 men, (mean age 18.77±7.87) and 22 women, (mean age 16.45±4.17) and a total of 600 brackets were placed. Tubes on molars were not included in the study. Metal orthodontic brackets with 0.022 inch slot Roth bracket prescription (Mini Sprint®, Forestadent, Germany) were used. Dental prophylaxis of all patients in the study was performed at least one week after the initial bonding of the brackets, and was not part of the modified method of direct bonding, that way checking the discipline and motivation of the patients who met the study criteria.

The modified method of direct placement of orthodontic brackets included the following steps:

Drying the teeth and isolating the working field using a cotton roll only in the area of the vestibule at the corners of the lower jaw under the canines with the use of a suction cup while the patient makes contact with the incisal edges of the upper incisors with the suction cup. Use of 37% orthophosphoric acid in liquid (Liquid Etchant, Reliance Orthodontic Products Inc., Itasca, USA) for 20 s on the appropriate surface of the buccal sides of the teeth slightly larger than the bases of the brackets. The acid was removed from the teeth by a quick movement of the water pre-moistened end of the cotton roll, the acid remains and side-products were cleaned under a stream of water using air/water irrigator from the immediate vicinity along with replacement and the same localization of the cotton rolls in the area of the canines, while the teeth were dried with lightly pressurized air using the air/water irrigator from a distance. Application of the primer (Light Bond™ Primer, Reliance Orthodontic Products Inc., Itasca, USA) to the base of the brackets with a microbrush (Disposable Micro Applicators, Med Comfort, Ampri GmbH, Germany), application of thin-paste adhesive (Reliance Light Bond™, Reliance Orthodontic Products Inc., Itasca, USA) over the primer on the bases of the brackets and re-application of the primer with a microbrush over the adhesive on the brackets

bazu bravice, dok se površina zuba održava suvom; bravice koje su pripremljene na ovaj način pozicionirane su i postavljene pod odgovarajućim pritiskom na prethodno pripremljenu površinu zuba; ukoliko je bilo neophodno, višak adhezivnog materijala oko bravica uklonjen je oštrom sondom, a svaka bravica polimerizovana pomoću Woodpecker Dental Curing Light (LED B. Curing Light, Guangxi, China) intenziteta 1200–1400 mW/cm^2, talasne dužine 420–480 nm; voltaže 3,7 V; 1500 mAh, u trajanju od 20 s.

Prvo su postavljene bravice na donjim zubnim nizovima, a zatim i na gornjim i to na sledeći način: nakon postavljenih tuba na sva četiri prva stalna molara, redosled postavljanja bravica bio je od drugog donjeg premolara do očnjaka desne strane i istim redosledom sa leve strane, a zatim su bravice postavljene u frontalnoj regiji donje vilice. Istim redosledom postavljene su bravice u gornjoj vilici. Nakon postavljene poslednje bravice, postavljani su, najpre, donji lukovi NiTi .014" (G & H Wire Co., Indiana, USA), a onda i na gornjim zubnim nizovima. Kasnije su postavljeni okrugli lukovi od nerđajućeg čelika (sledećim redosledom: .016", .018" G & H Wire Co., Indiana, USA), a zatim pravougaoni lukovi (sledećim redosledom: .018x.025" i .019x.025" G & H Wire Co., Indiana, USA).

Ukoliko je postojao kontakt bravica sa zubima antagonistima, postavljani su dezartikulatori (OptiBand Ultra, Light Cure Band Blue Cement, Glendora, CA 91740, USA) na prvim stalnim molarima u donjoj vilici.

Sve bravice postavljene su od strane prvog autora, (sa radnim iskustvom od 17 godina), dok su za zamenu ortodontskih lukova i ligiranje bravica bili zaduženi drugi (sa ortodontskim radnim iskustvom od 2 godine) i treći autor (sa ortodontskim radnim iskustvom od jedne godine). Na ovaj način, poboljšala se objektivnost u radu; dok drugi i treći autor nisu znali o kojoj se metodi postave bravica za zube radilo.

Nakon postavke bravica, pacijenti su dobili instrukcije o načinu održavanja oralne higijene i izbegavanju određene vrste hrane, kao što su tvrde namirnice, koje mogu oštetiti ortodontski aparat. Svi pacijenti praćeni su u periodu od 12 meseci.

Ispale bravice sa zuba tokom navedenog perioda pacijenti su bili dužni da prijave telefonskim pozivom ili dolaskom lekaru, kako bi se što pre izvršilo rebondiranje otpalih bravica ili se izvršila postava novih.

of the teeth, while the etched surface on the teeth remained dry and visible. The brackets prepared in this way were positioned and placed under appropriate pressure on the previously prepared surface of the tooth. If there was a need, excess adhesive material around the brackets was removed with a sharp scaler and polymerized with a Woodpecker Dental Curing Light (LED B. Curing Light, Guangxi, China) with light intensity of 1200−1400 mW/cm^2, optical wavelength 420−480 nm; voltage of 3.7 V; 1500 mAh, each bracket on the tooth for 20s.

Brackets were placed first on the lower teeth, and then on the upper ones, as follows: after the tubes were placed on all four first permanent molars, the order of placing the brackets was from the second lower premolar to the canine on the right side and in the same order on the left side, and then they were placed in the frontal region of the lower jaw. The brackets in the upper jaw were placed in the same order. After the last bracket was placed, the lower NiTi .014" arches (G & H Wire Co., Indiana, USA) were placed first, and then on the upper dental rows. Later, rounded stainless steel archwires (in the sequence .016", .018" G & H Wire Co., Indiana, USA) and then rectangular archwires (in the sequence .018x.025" and .019x.025" G & H Wire Co., Indiana, USA) were placed.

If there was contact of brackets with opposing teeth, disarticulators (OptiBand Ultra, Light Cure Band Blue Cement, Glendora, CA 91740, USA) were placed on the first permanent molars in the lower jaw.

All brackets were bonded by the first author (with 17 years of work experience), while the second author (with 2 years of orthodontic work experience) and the third author (with 1 year of orthodontic work experience) were in charge of replacing orthodontic arches and ligation of brackets. In this way, the objectivity of the work was improved, while the second and third authors did not know which method of placing the dental bracket was in question. In this way, an attempt was made to minimize subjectivity in the work methodology and to increase the bias to blinding while obtaining the most relevant results with maximum objectivity.

Immediately after the bonding procedures, the patients were instructed about the maintenance of their appliances, oral hygiene, and type of diet to be avoided, such as hard foods, in order not to damage the orthodontic accessories. All patients were followed up for a period of 12 months.

Sva rebondiranja bravica izvršena su na isti način kao i inicijalna bondiranja, ali sa prethodnim uklanjanjem viška adheziva sa zuba sa kojih su bravice otpale.

Statistička analiza

Broj debondiranih bravica opisan je kao proporcija bondiranih bravica u odnosu na ukupan broj postavljenih bravica. Razlike u broju debondiranih bravica u različitim kategorijama slučajeva testirane su Hi-kvadrat testom.

Vreme do debondiranja i vreme preživljavanja bravica opisano je aritmetičkom sredinom i standardnom devijacijom (mean and standard deviation), a razlike u prosečnom vremenu debondiranja i trajanja bravica testirane su t-testom i F-testom.

Analiza preživljavanja (Coxova regresija i Kaplan–Meyerova preživljavanje/opasnost funkcija) korišćena je za procenu uticaja različitih faktora (pol, starost, tip malokluzije, pozicija bravice) na vreme preživljavanja.

Za sve statističke analize u ovoj studiji (Studentov t-test i Hi-kvadrat test) određen je nivo značajnosti od 0,05. Analiza je vršena u programu IBM SPSS ver. 22, G*Power, verzija 3.1.9.4. Author Franz Faul, University of Kiel, Germany.

Rezultati

Demografski prikaz pacijenata u studiji prikazan je u Tabeli 1.

Između kategorija posmatranih varijabli nema statistički značajnih razlika, ni u broju debondiranih bravica, ni u prosečnom vremenu do debondiranja. Značajnost Fisherovog egzaktnog testa kreće se od 0,158 (pol) do 0,645 (starost). Hi-kvadrat statistika pokazuje značajnost od 0,242 za debondiranje prema tipu malokluzije. Statistička značajnost t-testa je 0,177 (pol) i 0,382 (starost), a značajnost F-statistike je 0,388. Ne postoji statistička značajnost neželjenih debondiranja bravica, kada je u pitanju pol (p = 0,08).

Rezultati pokazuju da nema statističke značajnosti, kada je u pitanju debondiranje bravica ponaosob, po zubu (Tabela 2).

Patients were required to report cases of failed brackets during the mentioned period by phone or to come in order to have the brackets rebonded or replaced as soon as possible. All bracket rebondings were performed in the same way as the initial bonding, but with the previous removal of excess adhesive from the teeth from which the brackets failed.

Statistical analysis

The number of debonded brackets is described as the proportion of bonded brackets in relation to the total number of installed brackets. Differences in the number of debonded brackets in different categories of cases were tested with the Chi square test.

The time to debonding and the standing test time of brackets were described by the arithmetic mean and standard deviation, and the differences in the average time of debonding and duration of brackets were tested with the t test and F test. The impact of various factors (such as gender, age, malocclusion type, position of a bracket) to survival time was assessed by Survival analysis (Cox regression and Kaplan Meyer survival/hazard function).

All statistical tests in this study (Independent samples of t-test, Chi-square test and odds ratio) were performed at the significance level of 0.05. The programme used was IBM SPSS ver. 22, G*Power, version 3.1.9.4. Author Franz Faul, University of Kiel, Germany.

Results

The demographic profile of the patients in this study is shown in Table 1.

There were no statistically significant differences between the categories of observed variables either in the number of debonded brackets or in the average time until debonding. Significance of Fisher's Exact Test statistics ranged from 0.158 (gender) to 0.645 (age). Chi square statistics for debonding by maloclusion type showed a significance of 0.242. The significance of t statistics was 0.177 (gender), 0.382 (age) and the significance of F statistics was 0.388. There was no statistical significance of unwanted brackets debonding in relation to gender (p = 0.08).

The results showed that there was no statistical significance regarding bracket debonding individually, per tooth (Table 2).

Tabela 1. Pacijenti sa debondiranim bravicama, vreme do debondiranja i vreme preživljavanja prema polu, starosti i tipu malokluzije
Table 1. Patients with bond failures, time to debonding, and survival time by gender, age and malocclusion type

Varijable Variable	Kategorija Category	N	Pacijenti sa debondiranim bravicama/Patients with debonded brackets	Prosečno vreme preživljavanja/Survival time mean	Vreme do debondiranja Time to debonding	
					Srednja vrednost Mean	Medijana Median
Pol Gender (female)	Ženski	22	4 (18.2%)	11.93 +/- 0.719	4.750 +/- 2.50	4
	Muški/Female Male	8	4 (50.0%)	11.77 +/- 1.255	5.833 +/- 2.483	5
Starost/ Age	<18	24	6 (25.0%)	11.875 +/- 0.98	4.50 +/- 1.604	4
	18+	6	2 (33.3%)	11.95 +/- 0.407	9.0 +/- 1.414	8
Tip malokluzije Malocclusion (ref type III)	I	14	2 (14.3%)	11.939 +/- 0.728	3.5 +/- 2.121	2
	II/1	6	3 (50.0%)	11.775 +/- 1.239	5.25 +/- 1.5	4
	II/2	4	2 (50.0%)	11.925 +/- 0.497	9.00 +/- 1.414	8
	III	6	1 (1.67%)	11.867 +/- 1.037	4.0	3
Total		30	8 (26.7%)	11.89 +/- 0.896	5.40 +/- 2.413	5

Tip malokluzije: I -, II/1 -, II/2 -, III -. Vreme mereno u mesecima
Malocclusion type: I -, II/1 -, II/2 -, III -. Time measured in months

Tabela 2. Debondirane bravice, prosečno vreme do debondiranja i prosečno vreme preživljavanja prema zubu
Table 2. Bond failures, mean time to debonding and mean survival time by tooth

Zub Tooth	N	Debondirane bravice Debonded brackets	Prosečno vreme do debondiranja Time to debond	Prosečno vreme preživljavanja Mean survival time	Std. devijacija Std. Deviation
LL1	30	0	-	12.000	-
LL2	30	0	-	12.000	-
LL3	30	1	10	11.933	0.3651
LL4	30	0	-	12.000	-
LL5	30	0	-	12.000	-
LR1	30	0	-	12.000	-
LR2	30	1	6	11.800	1.0954
LR3	30	0	-	12.000	-
LR4	30	1	4	11.733	1.4606
LR5	30	1	3	11.700	1.6432
UL1	30	0	-	12.000	-
UL2	30	1	5	11.767	1.2780
UL3	30	0	-	12.000	-

UL4	30	2	5.5	11.567	1.6955
UL5	30	0	-	12.000	-
UR1	30	0	-	12.000	-
UR2	30	1	2	11.667	1.8257
UR3	30	0	-	12.000	-
UR4	30	0	-	12.000	-
UR5	30	2	6.5	11.633	1.4499
Total	600	10	5.4	11.890	0.8959

LL – donji levi, LR – donji desni, UL – gornji levi, UR – gornji desni, N - broj pacijenata
1 - centralni sekutić, 2 - lateralni sekutić, 3 - očnjak, 4 - prvi premolar, 5 - drugi premolar
LL - lower left, LR - lower right, UL - upper left, UR - upper right, N - number of patients
1 - central incisor, 2 - lateral incisor, 3 - canine, 4 - first premolar, 5 - second premolar

Nije utvrđena statistička značajnost između broja debondiranih bravica, ni između vremena debondiranja, niti između vremena preživljavanja. Prosečno vreme debondiranih bravica od vremena inicijalnog postavljanja u totalu bilo je 5,40 ± 2,413 meseci (Tabela 3).

Procena uticaja pojedinih činilaca na trajanje bravica do debondiranja izvršena je pomoću *Survival* analize. Rezultati su prikazani u Tabeli 4.

No statistically significant difference was found either in the number of debonded brackets or in time to debond or in survival time. The average time of debonded brackets from the time of initial placement in total was 5.40 ± 2.413 months (Table 3).

The influence of individual factors on the duration of brackets until debonding was assessed using survival analysis. The results are shown in Table 4.

Tabela 3. Debondirane bravice, vreme do debondiranja i vreme preživljavanja prema luku, strani i regiji
Table 3. Debonded brackets, time to debonding, and survival time by arch, side and region

Varijable Variable	**Kategorija Category**	**N**	**Debondirane bravice Debonded**	**Srednje vreme do debondiranja Mean time to debond**	**Medijana vremena do debondiranja Median time to debond**	**Srednje vreme preživljavanja Mean survival time**
Luk Arch	Maksilarni Mandibularni Maxillary Mandibular	300 300	6 4	5.17 +/- 2.14 5.75 +/- 3.10	5 4	11.86 +/- 1.0 11.92 +/- 0.78
Strana Side	Desni Levi Right Left	300 300	6 4	4.67 +/- 2.16 6.50 +/- 2.65	4 5	11.85 +/- 1.07 11.93 +/- 0.68
Regija Region	Prednja Zadnja Anterior Posterior	240 360	3 7	4.33 +/- 2.08 5.86 +/- 2.54	5 5	11.90 +/- 0.87 11.88 +/- 0.91
Total		600	10	5.40 +/- 2.413	5	11.89 +/- 0.896

N – broj bravica
N – number of brackets

Tabela 4. Faktori koji utiču na preživljavanje bravica
Table 4. Factors influencing bracket survival

Varijable Variable	Hazard odnos Hazard ratio	95% CI	Sig	Median times ratio Median times ratio
Pol (ženski) **Gender (female)**	0.343	0.084 – 1.394	0.135	0.8
Starost (< ili > od 18) **Age (< or > than 18)**	1.14	0.211 – 6.199	0.876	0.25
Starost (mesec) **Age (month)**	1.001	0.990 – 1.012	0.874	-
Malokluzija (ref. tip III) **Malocclusion (ref type III)**		-	0.756	-
Malokluzija (I) **Malocclusion (I)**	0.592	0.076 – 4.611	0.617	0.67
Malokluzija (II) **Malocclusion (II)**	1.630	0.289 – 9.182	0.579	1.33
Malokluzija (III) **Malocclusion (III)**	1.083	0.086 – 13.681	0.951	2.67
Luk (maksilarni) **Arch (maxilliary)**	1.500	0.423 – 5.317	0.530	1.25
Strana (desna) **Side (right)**	1.502	0.424 – 5.322	0.529	0.8
Regija (prednja) **Segment (anterior)**	0.637	0.165 – 2.464	0.514	1

Pol, starost i regija

Na uzorku nađene izvesne razlike u riziku od debondiranja, nema dovoljno dokaza kako bismo tvrdili da postoji rizik od debondiranja bravica, u vezi sa polom (HR = 0,343; 95% CI: 0,084 – 1,394; p = 0,135), godinama pacijenata (HR = 1,14; 95% CI: 0,211 – 6,149; p = 0,876), kao i po pitanju regije (HR = 0,637; 95% CI: 0,165–2,464; p = 0, 514). Neželjena debondiranja u ovoj studiji nemaju statističku značajnost. U svim slučajevima 95% CI obuhvata 1, što znači da rizik od debondiranja jednaka u obema kategorijama prediktorskih varijabli.

Tip malokluzije

Rizik od debondiranja ne razlikuje se ni prema tipu malokluzije. Referentna kategorija po pitanju malokluzija bila je III klasa i, u odnosu na nju, malokluzija tipa I (HR = 0,592; 95% CI: 0,076 – 4,611; p = 0,617), za malokluziju tipa II/1 iznosila je (HR = 1,63; 95% CI: 0,289 – 9,182; p = 0,579), a za malokluzije tipa II/2 (HR = 1,083; 95% CI: 0,086 – 13,681; p = 0,951). Iako su pronađene neke razlike na ispitivanom uzorku, usled nedovoljne evidencije, ne možemo da tvrdimo da postoje statistički značajne razlike u debondiranju bravica između različitih tipova malokluzija usled variranja HR (HR = 0,592 – 1,083; 95% CI: 0,076 – 13,681; p = 0,617), kako bismo mogli da dokažemo da takve razlike postoje i u populaciji.

Patient age and Gender, Region

Although certain differences in the hazard ratio were found in the sample, there was insufficient evidence to state that there was a significant difference in hazard of bracket debonding between genders (HR = 0.343; 95% CI: 0.084-1.394; p = 0.135), patient age (HR = 1.14; 95% CI: 0.211-6.149; p = 0.876) as well as in terms of region (HR = 0.637; 95% CI: 0.165-2.464; p = 0.514). Indicating that bond failures in this study has no statistical significance. In all cases, the 95% CI included 1, which means that the hazard (or risk) of bond failures is equal in both categories of predictor variables.

Malocclusion type

The risk of debonding did not differ in relation to the type of malocclusion. The reference category for malocclusion was class III and in relation to it malocclusion type I (HR = 0.592; 95% CI: 0.076-4.611; p = 0.617), for malocclusion type II-1 (HR = 1.63; 95% CI: 0.289 -9.182; p = 0.579) while for type II-2 malocclusions it was (HR = 1.083; 95% CI: 0.086-13.681; p = 0.951), Although some differences were found in the examined sample, and due to insufficient records, we cannot claim that there are statistically significant differences in bracket debonding between different types of malocclusion due to varying HR (HR = 0.592-1.083; 95% CI: 0.076-13.681; p = 0.617) in order to be able to prove that such differences also exist in the population.

Diskusija

Studija predstavlja prospektivno istraživanje neželjenih debondiranih bravica u toku 12 meseci od inicijalnog bondiranja modifikovanom direktnom metodom. Sa ovakvom vrstom metode direktnog bondiranja nismo se susreli do sada i nije nam poznato da je u literaturi opisana. Usled ove činjenice, komparacija dobijenih rezultata urađena je u odnosu na dostupne podatke iz literature, koji se tiču konvencionalne metode direktnog bondiranja.

Incidenca debondiranih bravica u literaturi[9] kreće se u opsegu od 0,6% do 28,3%. Khan[10] u svojoj studiji prijavljuje stopu neuspeha od 6,4% (180 bravica je otpalo) debondiranih bravica na 150 pacijenata, pri čemu je 58,3% mlađih od 18 godina iskusilo neželjeno debondiranje; najčešće je dolazilo do otpadanja u bočnoj regiji (61%), naročito na donjim bočnim zubima (33,3%), i to na donjim drugim levim premolarima (12,2%), donjim drugim desnim premolarima (9,4%), dok je najmanji procenat otpalih bravica bio sa centralnih gornjih levih sekutića (1,1%). Kafle[11] je u svojoj studiji, kojom je obuhvaćeno 122 pacijenta i ukupno postavljenih 2440 bravica, došao do rezultata od 3,3% neželjenih debondiranja, tj. 32% pacijenata u studiji je iskusilo neželjeno debondiranje; pol, godine i vrsta malokluzije nisu dali razlike u broju neželjenih debondiranja, sa napomenom da su češća debondiranja na levom maksilarnom i desnom mandibularnom kvadrantu. Rezultati naše studije nisu u saglasnosti sa Khanovom studijom, uz napomenu da je naša studija obuhvatila manji broj pacijenata, ali jesu u saglasnosti sa Kafleovom studijom u vezi sa polom, godinama i vrstama malokluzija, kao i sa nižim vrednostima u broju pacijenata, koji su iskusili neželjena debondiranja i sa nižim procentom istih, ali i manjim brojem opserviranih pacijenata. Zajedničko je i to da su nešto češća debondiranja prisutna u gornjem desnom (drugi premolar) i gornjem levom kvadrantu (prvi premolar).

Oginski[12] prijavljuje stopu neželjenog debondiranja primenom metalnih bravica od 7,2% (od 195 metalnih bravica ukupno je otpalo 14), i to 83% u prvih 6 meseci, što se dovodi u vezu sa neprimenjenom profilaksom zuba pre inicijalnog bondiranja, sa rezultatom koji pokazuje da su debondiranja četiri puta češća kod dečaka nego kod devojčica. Pomenuti autor prijavljuje češća debondiranja na očnjacima (6,25%), zatim na centralnim sekutićima (5%), dok su najređa otpadanja bravica na drugim premolarima. Rezultati naše studije pokazali su manju stopu debondiranja

Discussion

The study presents a prospective investigation of bond failures within 12 months of initial bonding using a modified direct method. In the literature, we did not find a study with this type of direct orthodontic bonding. Due to this fact, the comparison of the obtained results was made in relation to the available data from the literature concerning the conventional method of direct bonding.

The incidence of debonded brackets ranges from 0.6% to 28.3% in the literature[9]. In his study, Khan[10] reports a failure rate of 6.4% (180 brackets failed) of debonded brackets in 150 patients, with 58.3% of those under 18 years of age experiencing unwanted debonding, while the most common debonding occurred in the lateral region (61%), especially on the lower lateral teeth (33.3%) the lower second left premolars (12.2%), and lower second right premolars (9.4%), while the lowest percentage of broken brackets was on the central upper left incisors (1.1%). Out of 122 patients and a total of 2440 brackets placed, Kafle[11] in his study reached the result of 3.3% of unwanted debonding, i.e. 32% of patients in the study experienced bond failures, while gender, age and type of malocclusion did not make a difference in the number of unwanted debonding, with the note that debonding is more common in the left maxillary and right mandibular quadrants. The results of our study are not in agreement with Khan's study, with a note that our study included a smaller number of patients, while they are in agreement with Kafle's study regarding gender, age and type of malocclusion and with lower values in the number of patients who experienced unwanted debonding and lower with the same percentage but in a smaller number of observed patients, and more frequent debonding present in the upper right (the second premolar) and upper left quadrant (the first premolar).

Oginski[12] reports a rate of bond failures using metal brackets of 7.2% (out of 195 metal brackets, a total of 14 failed), 83% of them failed in the first 6 months, which the mentioned author relates to the non-applied dental prophylaxis before initial bonding resulting in 4 times more common debonding in boys than in girls, and he reports more frequent bond failures on canines (6.25%), followed by central incisors (5%), while the rarest loss of brackets is on other premolars. The results of our study showed a lower rate of bond failures with a lower percentage of patients who experienced debonding, and it is in agreement when it comes to the ratio of broken brackets between the genders.

sa nižim procentom u broju pacijenata koji su iskusili debondiranje. Rezultati su takođe u saglasnosti kada je u pitanju odnos otpalih bravica među polovima.

Broj neželjenih debondiranja bravica ove studije u saglasnosti je sa rezultatima Roelofsa[13], koji prijavljuje stopu neuspeha od 1,8% neželjenih debondiranja na 153 pacijenta i 3336 postavljenih bravica, ali za period od 6 meseci, bez razlike po polu i godinama, naglašavajući da tehnički izazovi stomatološke stolice, svetla na radnoj jedinici ili pustera mogu biti od značaja u eventualnim komplikacijama u vidu neželjenih debondiranja. Vrednosti predstavljene u našoj studiji donekle su u saglasnosti i sa rezultatima koje je objavio Grunheld[14], koji je kod 45 pacijenata ukazao na najnižu stopu debondiranih bravica primenom konvencionalne metode od 0,9% u periodu od 12 meseci. Rezultati koje smo dobili u vezi sa polom u korelaciji su sa rezultatima Vasudevana[15], koji na 128 pacijenata (2135 bravica) prikazuje procenat otpalih bravica od 12,55% (268 otpalih bravica) za godinu dana. Od toga je 61% pacijenata iskusio debondiranje, a značajnije debondiranje pokazalo se u posteriornoj zoni (29,2%) u odnosu na anteriornu regiju (5,6%) da je broj debondiranja bio veći kod osoba muškog pola (20%) nego kod osoba ženskog pola (8%), a razlike nije bilo u broju otpalih bravica između mlađih i starijih pacijenata. Yavan[16] sa saradnicima na 350 pacijenata ukazuje na stopu od 15,42% otpalih bravica (54 pacijenta sa debondiranim bravicama), sa većom stopom kod žena nego kod muškaraca, ali bez razlike između starijih i mlađih pacijenata u periodu pandemije virusa COVID-19. I naša studija je prošla kroz period pandemije, a poredeći je sa prethodno navedenom studijom, možemo ukazati na manji broj pacijenata sa debondiranim bravicama, uz napomenu da je u našoj studiji učestvovao manji broj pacijenata i da je u procesu inicijalnog bondiranja učestvovao samo jedan ortodont, dok su u studiji koju je sproveo Yavan učestvovala četiri.

Treba izdvojiti nekoliko značajnih kliničkih karakteristika modifikovane metode. U situaciji koju pruža opisana metoda, ostavlja se suva površina prethodno kondicionirane površine zuba. Postavljanje bravica vrši se tako da se dobije adekvatna konstantna vizuelna izolacija radnog polja u kontinuitetu. Time se sprečava eventualna kontaminacija pljuvačkom, koja može ostati nezapažena i zamaskirana ukoliko se demineralizovana zona zuba prethodno premaže prajmerom, što je slučaj kod konvencionalne metode.

The number of bond failures in this study is in agreement with the results of Roelofs[13], who reports a failure rate of 1.8% of unwanted debonding in 153 patients and 3336 brackets placed, but for a period of 6 months, with no difference in gender and age, which emphasizes that the technical challenges of the dental chair, the light on the work unit or the cotton roll can be important in possible complications in the form of unwanted debonding. The values of our study are somewhat in agreement with the results of a study conducted in 45 patients by Grunheld[14], who indicated the lowest rate of 0.9% of debonded brackets using the conventional method in a period of 12 months, while the results we obtained related to gender were in correlation with the results of Vasudevan[15] obtained in 128 patients (2135 brackets) showing 12.55% (268 bond failures) of broken brackets in one year, of which 61% of patients experienced debonding, where more significant debonding was shown in the posterior zone (29.2%) compared to the anterior region (5.6%), and that the number of debonding was more frequent in males (20%) compared to females (8%), while there was no difference in the number of broken brackets between younger and elderly patients. In a study conducted in 350 patients, Yavan[16] et al. indicate a rate of 15.42% of broken brackets (54 patients with debonded brackets), with a higher rate in women than in men, but with no difference between older and younger patients in the period of the COVID-19 pandemic. As our study was also conducted in the period of the pandemic, comparing it with the previously mentioned study, we can point to a smaller number of patients with debonded brackets, noting that a smaller number of patients participated in our study and that only one orthodontist participated in the process of initial bonding, while four orthodontists participated in the study by Yavan.

Several significant clinical features of the modified method should be singled out. In the situation provided by the described method, the previously conditioned tooth surface is left dry. The placement of brackets is done in such a way as to obtain adequate constant visual isolation of the working field in continuity. This prevents potential contamination with saliva, which can remain unnoticed and masked if the demineralized area of the tooth is previously coated with a primer, which is the case with the conventional method.

It was Schwaneveldt and Foley[17] who were among the first to point out two critical moments during initial bonding, which can be crucial for premature debonding of brackets

Upravo su Schwaneveldt i Foley[17] među prvima ukazali na dva kritična momenta u toku inicijalnog bondiranja, koja mogu biti presudna za prevremeno debondiranje bravica kontaminacijom pljuvačke, koja se dešavaju: 1) nakon kondicioniranja; 2) posle aplikacije prajmera. Primenom ovakve metode, kontaminacija pljuvačkom i njeno eventualno maskiranje prajmerom u potpunosti su eliminisani. Ovu praktičnu konstataciju dopunili bismo i mogućnošću trećeg momenta – momenta kada su zubi osušeni i izolovani i, kao takvi, pripremljeni za aplikaciju kiseline. Ukoliko u ovom trenutku zubi ne bi bili osušeni na adekvatan način, moglo bi doći do razblažavanja kiseline nakon njenog aplikovanja na odgovarajuću površinu zuba. U tom slučaju, dva neželjena efekta bila bi moguća: prvi – da kiselina svoje agresivno dejstvo ne ispolji u predviđenom optimalnom vremenu, i drugi – da dođe do razlivanja kiseline na većoj površini zuba. U prvom slučaju, posledica bi bila formiranje neadekvatne mikrostrukture gleđi zuba, koja, kao takva, ne bi bila adekvatna za kasniju penetraciju prajmera. U drugom slučaju, došlo bi do formiranja nepotrebno prostranije površine demineralizovane zone, te i veće oblasti kondicionirane gleđi u odnosu na baze bravica pri njihovoj postavi. Na taj način, nakon bondiranja bravica ove oblasti demineralizovane gleđi predstavljale bi predilekciona mesta za atak mikroorganizama i bakterija prisutnih u oralnoj sredini. Zajednička posledica oba navedena faktora mogla bi prouzrokovati slabiju jačinu veze dva adherenta i dovesti do neželjenih debondiranja bravica u toku terapije, a u drugom slučaju i do pojave oboljenja tvrdih tkiva zuba.

Takođe, modifikovanom metodom direktnog bondiranja, aplikovanjem prajmera mikročetkicom preko adheziva na bazi bravica postiže se razmekšavanje konzistentnog adheziva. Na taj način utiče se na njegovo bolje raspoređivanje preko površine baze bravica. Nanošenje materijala znatno je preciznije, jer se već posle nekoliko aplikovanja može uvideti kolika je dovoljna količina adheziva po zubu. Postizanjem bolje fluidnosti materijala, koji su konzistentniji, može se uticati na kvalitetniju penetraciju unutar baza bravica, ali i na prethodno kondicioniranu površinu zuba, pri čemu se postiže intimniji kontakt između dva adherenta. Primena ovakvog metoda bondiranja sprečava klizanje bravica sa zuba do njihovog konačnog pozicioniranja, pritiska i postave. Kod konvencionalnog bondiranja neminovno dolazi do istiskivanja viška adheziva oko bravica.

due to saliva contamination: after conditioning and after applying the primer. Using this method, the possibility of contamination with saliva and its possible masking with primer is completely eliminated. They would supplement this practical statement with the possibility of the third moment, which is when the teeth are dried and isolated and as such prepared for the application of acid. If at this moment the teeth are not adequately dried, dilution of the acid could occur after its application to the appropriate surface of the tooth. In that case, two unwanted effects would be possible: first, that the aggressive effect of the acid does not manifest itself in the predicted optimal time, and second, that the acid spills over a larger surface of the tooth. In the first case, the consequence would be the formation of an inadequate microstructure of the tooth enamel, and as such, it would not be adequate for the subsequent penetration of the primer. In the second case, there would be the formation of an unnecessarily larger area of the demineralized zone, as well as a larger area of conditioned enamel compared to the bases of the brackets during their placement. In this way, after bonding the brackets, these areas of demineralized enamel would represent predilection sites for the attack of microorganisms and bacteria present in the oral environment. As a joint consequence of both mentioned factors, it could cause a weaker bond between the two adherents and lead to unwanted bond failures during therapy, while in another case, to the appearance of diseases of the hard tissues of the teeth.

Further, with a modified method of direct bonding, applying a primer over the adhesive based on the brackets with a microbrush achieves the softening of the consistent adhesive. In this way, it affects its better distribution over the surface of the base of the brackets. With conventional bonding, excess adhesive is inevitably squeezed out around the brackets. This occurs because a more consistent adhesive is applied to the base of the brackets over which the primer was previously applied, while the primer was applied over the conditioned, washed and dried surface of the tooth. The application of this bonding method prevents the brackets from sliding off the teeth until their final positioning, pressure and placement.

The short period of time between phases does not allow for the softening of the consistent material, which inevitably leads to the excess adhesive flash around the base of the brackets. The application of the material is much more precise, because after a few applications it can be seen how much adhesive is needed per tooth.

Višak adheziva oko baza bravica na zubima, ukoliko se ne ukloni pre polimerizacije, predstavlja pogodno tlo za razvoj kolonija mikroorganizama i biofilma. Na taj način su stvoreni uslovi za pojavu inflamacije i hipertrofiju gingive. Takva stanja nemaju samo negativan estetski efekat, nego utiču i na zdravstveno stanje oralne šupljine. Prilikom uklanjanja viška adheziva oko baza bravica, često dolazi do njenog preteranog i nepotrebnog pomeranja, što može oslabiti vezu između dva adherenta. U te svrhe, 3M Unitek (Monrovia, California, USA) proizveo APC™ Flash Free Adhesive Coated Appliance System sa industrijski precizno pripremljenom količinom adheziva na bazama bravica. Ovako pripremljene, zapakovane su u posebnim plastičnim mini-pakovanjima. Prilikom njihovog postavljanja nema istiskivanja viška adheziva oko bravica[18-21]. Međutim, kako je zastupljenost proizvođača i njihovih distributera različita u svetu, to je i dostupnost ovakvih materijala nejednaka. Iz tog razloga, improvizacija ili praktični, svakodnevni izazovi navode kliničare da u pojedinim situacijama rade u skladu sa dostupnim materijalima na način koji je u tom trenutku najadekvatniji.

Stiče se utisak da značajan broj ortodonata ostaje veran direktnoj metodi bondiranja. Kako rezultati dobijeni modifikovanom direktnom metodom nisu slabiji od rezultata saopštenih u literaturi u odnosu na konvencionalni pristup, a modifikovana metoda pokazuje niz drugih prednosti, smatramo da treba ozbiljno razmotriti promenu standarda.

Modifikovanu metodu nazvali smo PROTOKOL EX® (čita se „protokol ekser").

Ograničenja

Studija je imala nekoliko ograničenja. Prvo, izvršena je modifikovana metoda direktnog bondiranja, koja dosad nije zabeležena u literaturi, te je poređenje dobijenih rezultata urađeno u odnosu na konvencionalnu tehniku bondiranja. Manji broj pacijenata uvršten je u studiju iz nekoliko razloga: 1) primenjena je nova metoda, sa izvesnom dozom opreza; 2) nije lako u određenom periodu uvrstiti pacijente sa punim zubnim nizom, koji ispunjavaju sve kriterijume studije; 3) primena modifikovane metode odbila je nekoliko pacijenata, iako je do detalja objašnjena, što možemo pripisati strahu od novina i inovacija; 4) iznenadna pojava pandemije znatno je smanjila broj pacijenata u ordinacijama, što je neminovno dovelo i do manjeg broja onih koji bi mogli učestvovati u studiji.

By achieving better fluidity of materials that are more consistent, it can affect better penetration inside the brackets' bases, but also on the previously conditioned surface of the teeth, whereby a more intimate contact between the two adherents is achieved. Faster homogenization of the material allows better fluidity of the adhesive, which improves not only the manual work of the orthodontist, but also better penetration of the material. Excess adhesive flash around bracket bases on teeth, if unremoved before polymerization, is a suitable ground for the development of colonies of microorganisms and biofilms. In this way, conditions are created for inflammation and gingival hypertrophy. Such conditions have a negative, not only aesthetic effect, but also affect the health of the oral cavity. During the removal of excess adhesive around of the bracket bases, its excessive and unnecessary movement often occurs, which can weaken the bond between the two adherents. For these purposes, 3M Unitek (Monrovia, California, USA) produced APC™ Flash Free Adhesive Coated Appliance System with an industrially precisely prepared amount of adhesive on the base of the fasteners. Prepared in this way, they are packed in special plastic minipacks. When installing them, there is no squeezing out of excess adhesive around the brackets[18-21]. However, as the representation of manufacturers and their distributors is different in the world, the availability of such materials is also unequal. For this reason, improvisation or practical, everyday challenges lead clinicians to work in certain situations in accordance with the available materials in a way that is most adequate at that moment.

One gets the impression that a significant number of orthodontists remain faithful to the direct bonding method. As the results obtained by the modified direct method are not weaker than the results reported in the literature in relation to the conventional approach, and the modified method shows a number of other advantages, we believe that the change of the standard should be seriously considered.

We named the modified method: PROTOKOL EX® (pronounced: exer).

Limitations

The study had several limitations. First, a modified method of direct bonding was performed, which has not been recorded in the literature so far, and the results obtained were compared with the conventional bonding technique. A smaller number of patients were included in the study for several reasons: 1) the new method was applied and taken with a certain amount of caution; 2) it is not easy to

Zaključak

Primenom modifikovane metode direktnog bondiranja nije dalo statistički značajne razlike u broju i procentu neželjenih debondiranja u odnosu na malokluziju, pol i starost. Primenom ove metode nije bilo razlike ni u neželjenom otpadanju bravica sa zuba ni u odnosu na region kao ni na individualni zub.

include patients with a full set of teeth who meet all the criteria of the study in a certain period; 3) the application of the modified method was rejected by several patients even though it was explained in detail, which we can attribute to the fear of novelty and innovation; 4) the sudden onset of the pandemic significantly reduced the number of patients in dental practices, which inevitably led to a smaller number of those who could participate in the study.

Conclusion

Application of the modified method of direct bonding did not result in statistically significant differences in the number and percentage of bond failures in relation to malocclusion, gender and age. Applying this method, there was no difference in the bond failures of brackets from the teeth either in relation to the region nor to the individual tooth.

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