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„Nas ne muči odliv mozgov,
naš je problem ostanak idiota.“

Ivo Andrić

Prozaična svakodnevnica oslikana lažima i „zlatno doba“ gde svako ide svojim bespućem je već dugo paradigma naše stvarnosti. Filozofija besmisla i moralna inverzija kreiraju „falsifikovani“ društveni ambijent i monoumno tumačenje svega postojećeg. U poplavi laži, straha, paranoje i progona, radost je „izopštena“ iz okvira normalnosti, a „brlog i kaljuga“ su ponuđeni kao jedini i najubedljiviji program za budućnost.

vako šizofrenu situaciju dodatno „oplemenjuju“ besprizorna „retorika ulice“, primitivna patetika i „otrovne informacije“ koje žestinom bujice sa svih medija kreiraju kulturu nasilja i maligno šminkaju postojeće pseudovrednosti. U takvoj medijskoj imitaciji stvarnosti, primitivna agresija laži „slobodan pad lifta kome je pukla sajla“ tumači se kao let i time degradira i unižava svaku normalnost. Ambijent besmisla i društvena hipokrizija zaodnuta neistinom i bahatom retorikom, a opijeni „političkom narkozom“ neukih i onih sa kupljenim diplomama, demotivišu znanje i odgovornost i uspešno vode u budućnost beznađa.

Društvo „poremećenih vrednosti“ najbolje objašnjava citat našeg nobelovca sa početka ovog komentara, jer je to slika aktuelnog trenutka i sva istina vrednosnog i intelektualnog narativa, gde je destruktivni talenat „elite koja upravlja našim životima“ sinonim ideologije propadanja i „kulture nasilja“.

Da li je moguć izlaz iz kolektivnog bezizlaza? Odgovor je lak i jednostavan, ali rešenje ovog problema kompleksno i bremenito, upravo zbog teškoća u „dekontaminaciji“ maligno kontaminiranog društva. Iskorak iz „kolektivne besvesti“ i „reanimacija“ svega potonulog može se realizovati samo odgovornim i čestitim stavom hrabrih, slobodnih i obrazovanih, i vraćanjem vrednosnih postulata suprotnih narativu i „nedelima“ aktuelne „elite“.

Moralni stav, znanje, odgovornost, kreativnost i nadasve borba za istinu moraju biti osnovni kriterijumi za spas sopstvenog života i jedini izlaz iz kandži bezizlaza koje kao kišobran nadkriljuju naše bitisanje.

Osećaj sopstvenog morala i iskrena želja da se besmislenost privede normalnosti, uz energiju koja mora da nadvlada galimatijas primitivnosti, jedini su put za bolje sutra i jedino skretanje sa auto-puta za beznađe i pohod u nestajanje.

Poljuljane vrednosne i moralne društvene norme mogu se potvrditi jedino iskrenim činjenjem obrazovanih, učenih i odgovornih, čija energija i neodustajanje mogu iskoreniti prostotu i laž i sprečiti svekoliki sunovrat jednog društva.

Ovaj komentar ću takođe završiti citatom velikana pisane reči, našeg Iva Andrića: „Kada bi ljudi znali koliko malo pameti upravlja svetom, umrli bi od straha“ jer najbolje oslikava vreme u kojem živimo, ali i upozorava na relativnu trajnost svake društvene promene.

Prof. dr Slavoljub Živković

The influence of orofacial functions on sagittal growth and development of occlusion

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SUMMARY

Introduction Orthodontics experience has shown that dental compensation of some skeletal irregularities is under the positive influence of external factors. During sagittal development of cranial base and dental arches, they can be placed in relationship of I, II or III skeletal and dentoalveolar class. Malocclusion may be caused by a skeletal irregularity. Despite that, normal occlusion can be achieved by dentoalveolar compensation.

The aim of this study was to investigate the influence of orofacial functions on maxillary and mandibular growth, as well as occlusion development in sagittal plane.

Material and method This study consisted of 60 male and female adolescents (average age 15.9). Types of respiration and deglutition were clinically determined. Molar relation and length of dental arch were evaluated from study models. On the lateral cephalograms the following parameters were measured: angles SNA, SNB, ANB, I/SpP and i/MP.

Results showed that 78.8% of patients with regular orofacial functions and 11.1% of patients with irregular functions had developed molar class I. Patients with skeletal Class I and Class III and irregular orofacial functions, had protrusion of upper incisors in 88.9% (I) and 80% (III) and high length of maxillary dental arches in 58.8% (I) and 70% (III).

Conclusion There is relationship between orofacial functions and dental compensation of sagittal skeletal irregularities.

Keywords: orofacial functions; oral respiration; infantile swallowing; dental compensation

INTRODUCTION

Individual development of occlusion and craniofacial system is based on interaction between genotype and external factors. Orthodontic experience has shown that dental compensation of some skeletal irregularities can be under the positive influence of external factors, but also irregular orofacial functions and negative influence of external factors can aggravate current anomaly.

During life, orofacial functions constantly repeat. Soft tissues and muscle contractions participate in forming dental occlusion. They are one of the most important factors in determining the type of occlusion [1–6]. Orthodontic treatment is dependent on genotype of particular person and influence of external factors. Therefore, motivation and oral hygiene, bad habits and orofacial functions are important in achieving better treatment results [7, 8, 9].

During sagittal development of cranial base and dental arches, they can be placed in relationship of I, II or III skeletal and dentoalveolar class. Skeletal and dental findings don't have to be the same. Normal occlusion can be achieved by dentoalveolar compensation and skeletal irregularity can be overcome [10–13].

The aim of this study was to investigate the influence of orofacial functions on maxillary and

mandibular growth, and development of occlusion in sagittal plane.

MATERIAL AND METHOD

This study included 60 male and female adolescents (average age 15.9). All patients are clinically evaluated for breathing and swallowing functions. Respiratory function was examined by unnoticed observation of the patient, demanding of patient to inhale with the mouth closed and placing dental mirror under the nostrils. Swallowing function was examined by digital holding of the lower lip, extraoral palpation of hyoid region and asking patient to swallow. By inspection, it was determined if mimics exist and accessory respiratory muscles contraction. All patients were divided into the two groups: Group P- patients with regular orofacial functions and Group N- patients with irregular respiratory or/and swallowing function. Molar relation was evaluated from study models by position of the upper canine and the upper first permanent molar. Length of maxillary and mandibular dental arches was evaluated from study models as well. Cephalometric parameters were SNA, SNB, ANB, I/SpP and i/MP. Patients of Group P and Group N were divided into the six groups by skeletal class: P (I), P (II), P (III) and N (I), N (II), N (III).

RESULTS

Results showed that 36 patients (60%) had irregular respiratory and swallowing functions and 24 patients (40%) had regular orofacial functions. Results are indicated in the Graph 1.

Group P: Parameter ANB results: 5 patients- class I, 16 patients- class II and 3 patients- skeletal class III. Molar relation: 17 patients- class I, 6 patients- class ½II and 1 patient- dental class III. Graph 2 indicates relation between skeletal and dental classes in Group P.

Group N: Parameter ANB results: 18 patients- class I, 8 patients- class II and 10 patients- skeletal class III. Molar relation: 4 patients- class I, 11 patients- class ½II, 2 patients- class II and 6 patient- dental class III. Graph 3 indicates relation between skeletal and dental classes in Group N.

Group P (I): SNA and SNB- maxillary and mandibular normognathism (66.7%), maxillary and mandibular retrognathism (33.3%). I/SpP and i/MP- normal position of upper incisors (100%), normal position of lower incisors (66.7%). Increased length of maxillary dental arch.

Group N (I): SNA and SNB- maxillary and mandibular normognathism (55.6%), maxillary and mandibular retrognathism (44.5%). I/SpP- upper incisors protrusion (88.9%). i/MP- normal position of lower incisors (66.7%). Increased length of maxillary dental arch (58.8%).

Group P (III): SNA and SNB- maxillary and mandibular normognathism (44.5%), maxillary prognathism and mandibular normognathism (29.4%), maxillary and mandibular retrognathism (23.5%). I/SpP and i/MP: retrusion of upper incisors and normal position of lower incisors (35.3%), normal position of upper and protrusion of lower incisors (35.3%), normal position of upper and lower incisors (29.4%). Group N (II): SNA and SNB- maxillary normognathism and mandibular retrognathism (50%), maxillary and mandibular retrognathism (25%), maxillary prognathism and mandibular normognathism (25%). I/SpP and i/MP- no significant statistical values.

Group P (III): SNA and SNB- maxillary normognathism and mandibular prognathism (100%). I/SpP and i/MP- normal position of upper and retrusion of lower incisors (100%). Increased length of maxillary dental arch (100%). Group N (III): SNA and SNB- maxillary normognathism and mandibular prognathism (50%), maxillary retrognathism and mandibular normognathism (50%). I/SpP and i/MP- protrusion of upper incisors (80%) and normal position of lower incisors (60%). Increased maxillary dental arch (70%).

DISCUSSION

An optimal physiological occlusion for individuals is based on their specific genotype, with influence from various factors in their external environment. The

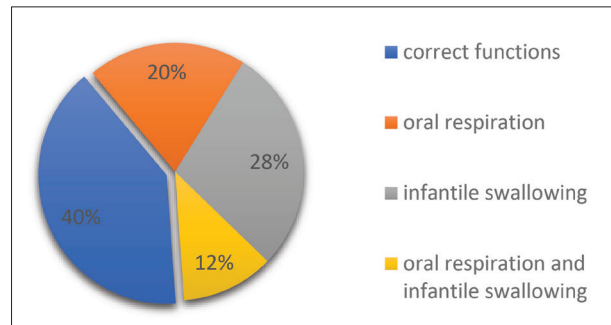


Figure 1.
Slika 1.

primary external factors are correct performance of orofacial functions, like nasal breathing, competent lips and mature somatic swallowing pattern. Clinical research of orofacial functions confirmed that there is a difference in position of tongue and lips between nasal and oral respiration, as well as between somatic and infantile swallowing. Different tongue and lips positions result in different pressure [2, 4], which influence the shaping of teeth.

Occlusion growth and development depend on the growth of cranial base and jaw, as well as on teeth eruption and teeth positioning. The growth of skeletal structure is mainly genetically conditioned [10-13]. Observation of the skeletal development parameters of upper and lower jaw between patient groups with regular and irregular orofacial functions did not result in significant statistical differences of these parameters. It can be concluded that the way of performing the orofacial functions does not have impact on neither the upper and lower jaw development in sagittal plane nor on the angle between them. The research on similar topic [3] showed that patients with oral respiration have tendency to develop the skeletal Class II.

There was no established causal evidence between the ANB angle values and instances of dental compensation. Similar results were shown by investigation of dental compensation instances within different skeletal malocclusions [15]. The authors established existence of a wide range of skeletal variations present in patients with normal occlusions.

The results of our research point to the existence of links between the way the orofacial functions of breathing and swallowing are performed, and the incidence of dental compensation for skeletal anomalies. Patients who correctly perform these functions have developed normal occlusion in 78.8% of cases (as per the Class I Angle classification), whilst only 11.1% of patients from the incorrect orofacial functions group managed to achieve normal occlusion. Dentoalveolar compensation happens due to inclination of teeth. This way skeletal irregularity can be bridged, with the correct functioning of lips, tongue and cheeks contributing to the optimum physiologic occlusion. The role of dental compensation in establishing normal occlusion was confirmed within multiple research studies. Observation of the patients

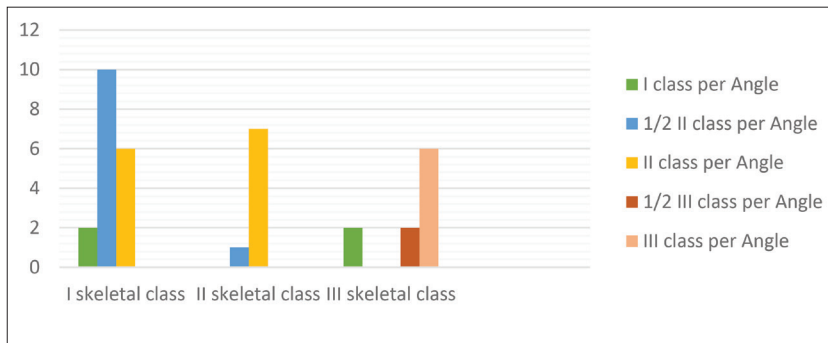


Figure 2.
Slika 2.

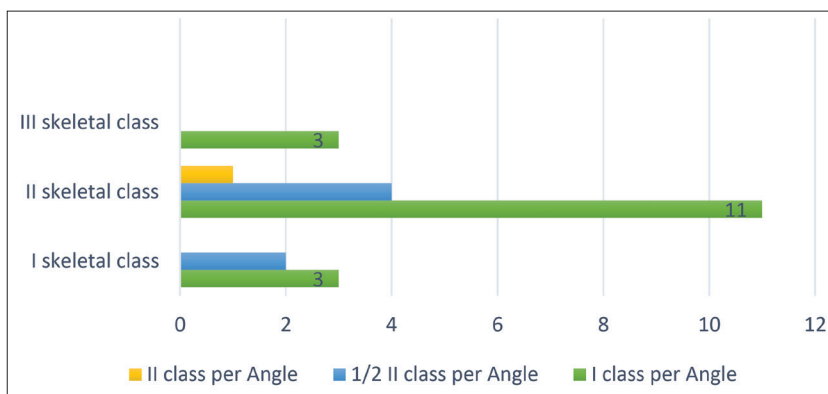


Figure 3.
Slika 3.

from skeletal Classes I and III, with oral respiration and infantile swallowing confirmed the tendency towards transition to the Angle Class II. This proved to be aligned with the results from other authors [3].

Our research showed that with patients in the Class I and III, who incorrectly performed orofacial functions of breathing and swallowing, there was a presence of upper incisor protrusion in 88.9% (Class I) and 80% (Class III) cases, as well as the increased length of the upper teeth in 58.8% (I) and 70% (III) cases. The results pointing to upper incisor protrusion in case of irregular orofacial functions are in accordance with another research [1, 17]. The data also confirmed the theory established in 1953 by Rix, who observed that patients with infantile swallowing show protrusion of upper, and retrusion of lower teeth. Our investigation confirmed that besides the incorrect swallowing, this problem is also seen in patients with nasal respiration, or in patients with nasal respiration combined with infantile swallowing. It can be explained by separated lip position that is characteristic in patients with irregular breathing functions [2]. The Class II participants in our study did not show statistically significant presence of upper incisor protrusion, which is different from results of some other authors. In order to examine the discrepancy of these results, it would be worth observing separately the participants in II/1 and II/2 class in the future research. It would also be useful to investigate the influence of orofacial functions on the

facial growth and development, and vertical skeletal relationship.

This research confirmed that correct performance of orofacial functions has positive influence on achieving the Class I occlusion in patients with sagittal skeletal abnormalities. It is for this reason that the adolescent orthodontic therapy, besides dental camouflage, should also include educating and motivating patients towards correct breathing and swallowing functions, as well as removing other bad habits in this area. Achieving the optimum balance between orofacial (lip, tongue and cheek) muscles will help maintain the results of therapy. If, however, bad habits resulting in incorrect orofacial functions are not corrected, the soft tissues will continue to have an adverse impact on shaping the teeth, which could worsen the results of the treatment.

CONCLUSION

The results of this research point to the existence of links between the way the orofacial functions of breathing and swallowing are performed, and the incidence of dental compensation for skeletal anomalies. Correct performance of orofacial functions has positive influence on achieving the Class I occlusion in patients with sagittal skeletal abnormalities. Patients in the Class I and III, who incorrectly performed orofacial functions of breathing and swallowing, have upper incisor protrusion. Orofacial functions did not have impact on upper or lower jaw development in sagittal plane.

REFERENCES

1. Greven M. Prevalence of Malocclusion Patterns in Mouth Breathing Children Compared to Nasal Breathing Children—A Systematic Review. *Int J Clin Oral Maxillofac Surg.* 2021;7(2):17. [DOI: 10.11648/j.ijcoms.20210702.12]
2. D'onforio L. Oral dysfunction as a cause of malocclusion. *Orthodon Craniofac Res.* 2019; 22:43–8. [DOI: 10.1111/ocr.12277] [PMID: 31074141]
3. Anggraini CM, Budiardjo SB, Setyanto DB, Indarti IS. Malocclusion in Mouth-Breathing Children Caused by Nasal Obstruction. *Adv Health Sci Res.* 2018;4:62–3. [DOI: 10.2991/idsm-17.2018.8]
4. Festa P, Mansi N, Varricchio AM, Savoia F, Cali C, Marraudinoet C, et al. Association between upper airway obstruction and malocclusion in mouth-breathing children. *Acta Otorhinolaryngol Ital.* 2021;41(5):436. [DOI: 10.14639/0392-100X-N1225]
5. Acharya SS, Mali L, Sinha A, Nanda SB. Effect of Naso-respiratory Obstruction with Mouth Breathing on Dentofacial and Craniofacial Development. *Orthodont J Nepal.* 2018;8(1):22–7. [DOI: 10.3126/ojn.v8i1.21343]

6. Zou J, Meng M, Law C, Rao Y, Zhou X. Common dental diseases in children and malocclusion. *Int J Oral Sci.* 2018;10(1):1–7. [DOI: 10.1038/s41368-018-0012-3] [PMID: 29540669]
7. Lyu L, Zhao Z, Tang Q, Zhao J, Huang H. Skeletal class II malocclusion caused by mouth breathing in a pediatric patient undergoing treatment by interceptive guidance of occlusion. *J Int Med Res.* 2021;49(6):03000605211021037. [DOI: 10.1177/03000605211021037] [PMID: 34098781]
8. Prado DGA, Berretin-Felix G, Migliorucci RR, Bueno MDRS, Rosa RR, Polizel M, et al. Effects of orofacial myofunctional therapy on masticatory function in individuals submitted to orthognathic surgery: a randomized trial. *J Appl Oral Sci* 2018;26:e20170164. [DOI: 10.1590/1678-7757-2017-0164] [PMID: 29412368]
9. Nagda SC, Dixit UB. Current Evidence on the Effect of Pre-orthodontic Trainer in the Early Treatment of Malocclusion. *IOSR J Dent Med Sci.* 2019;18.4:23–6. [DOI: 10.9790/0853-1804172228]
10. Mossey PA. The heritability of malocclusion: part 2. The influence of genetics in malocclusion. *Br J Orthod.* 1999;26(3):195–203. [DOI: 10.1093/ortho.26.3.195] [PMID: 10532158]
11. Uslu O, Akcam MO, Evirgen S, Cebeci I. Prevalence of dental anomalies in various malocclusions. *Am J Orthod Dentofacial Orthop.* 2009;135(3):328–35. [DOI: 10.1016/j.ajodo.2007.03.030] [PMID: 19268831]
12. Moreno Uribe LM, Miller SF. Genetics of the dentofacial variation in human malocclusion. *Orthod Craniofac Res.* 2015;18:91–9. [DOI: 10.1111/ocr.12083] [PMID: 25865537]
13. Basdra EK, Kiokpasoglou MN, Komposch G. Congenital tooth anomalies and malocclusions: a genetic link? *Eur J Orthod.* 2001;23(2):145–52. [DOI: 10.1093/ejo/23.2.145] [PMID: 11398552]
14. Lambrechts H, De Baets E, Fieuws S, Willems G. Lip and tongue pressure in orthodontic patients. *Eur J Orthod.* 2010;32(4):466–71. [DOI: 10.1093/ejo/cjp137] [PMID: 20089572]
15. Kim JY, Lee SJ, Kim TW, Nahm DS, Chang JI. Classification of the skeletal variation in normal occlusion. *Angle Orthod.* 2005;75(3):311–9. [DOI: 10.1043/0003-3219(2005)75[311:COTSVI]2.0.CO;2] [PMID: 15898366]
16. Landouzy JM, Delattre AS, Fenart R, Delattre B, Claire J, Biecq M. The tongue: deglutition, orofacial functions and craniofacial growth. *Int Orthod.* 2009;7(3):227–56. [DOI: 10.1016/s1761-7227(09)73500-4] [PMID: 20303913]
17. Begnoni G, Cadenas de Llano-Pérula M, Dellavia C, Willems G. Cephalometric traits in children and adolescents with and without atypical swallowing: A retrospective study. *Eur J Paediatr Dent.* 2020;21(1):46–52. [DOI: 10.23804/ejpd.2020.21.01.09] [PMID: 32183528]

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Uticaj orofacijalnih funkcija na sagitalni rast i razvoj okluzije

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KRATAK SADRŽAJ

Uvod U ortodontskoj praksi uočeno je da spoljašnji faktori mogu dovesti do kompenzacije određenih genetski uslovljenih nepravilnosti. Razvrtkom viličnih baza i zubnih lukova u sagitali, oni se mogu postaviti u odnos I, II ili III skeletne, odnosno dentoalveolarne klase. Nalaz ne mora biti skeletno i dentalno u istoj klasi. Mehanizmom dentoalveolarne kompenzacije moguće je da se oformi normalna okluzija u I klasi po Englu. Na taj način se premošćava skeletni nesklad.

Cilj rada je ispitati uticaj funkcija disanja i gutanja na razvoj viličnih baza, zubnih nizova i razvoj okluzije u sagitalnoj ravni.

Materijal i metod Istraživanjem je obuhvaćeno 60 adolescenata oba pola, prosečne starosti 15,9 godina. Kliničkim ispitivanjem orofacijalnih funkcija utvrđeni su tipovi disanja i gutanja kod svih ispitanika. Na studijskim modelima je određivana klasa okluzije po Englu i visina luka u gornjoj i donjoj vilici. Na profilnim telerendgenskim snimcima analizirani su uglovi SNA, SNB, ANB, I/SpP i i/MP.

Rezultati Pravilnu okluziju u I klasi po Englu razvilo je 78,8% ispitanika sa pravilnim funkcijama disanja i gutanja, dok je u grupi sa nepravilnim funkcijama to postiglo samo 11,1% ispitanika. Pacijenti sa I i III skeletnom klasom i nepravilnim funkcijama disanja i gutanja pokazuju protruziju gornjih sekutića u 88,9% (I) / 80% (III) slučajeva i povećanu dužinu gornjeg zubnog niza u 58,8% (I) / 70% (III) slučajeva.

Zaključak Ovo istraživanje ukazuje na to da postoji povezanost između načina izvođenja orofacijalnih funkcija disanja i gutanja i učestalosti pojave dentalne kompenzacije skeletnih nepravilnosti.

Ključne reči: orofacijalne funkcije; oralna respiracija; infantilno gutanje; dentoalveolarna kompenzacija

UVOD

Individualni razvojni proces okluzije i kraniofacijalnog sistema uopšte odvija se bliskom interakcijom između genotipa osobe i činilaca spoljašnje sredine. U ortodontskoj praksi uočeno je da spoljašnji faktori mogu dovesti do kompenzacije određenih genetski uslovljenih nepravilnosti, ali takođe i da nepravilno vršenje orofacijalnih funkcija, kao i negativan uticaj drugih spoljašnjih faktora, često pogoršavaju već postojeće anomalije.

Orofacijalne funkcije se neprestano ponavljaju u toku dana i tokom čitavog života, a na oblikovanje dentalne okluzije utiču meka tkiva i kontrakcije mišića koji učestvuju u ovim radnjama. S obzirom na ove činjenice, orofacijalne funkcije predstavljaju jedan od bitnih etioloških faktora u nastanku malokluzija, čemu svedoče mnogi radovi [1–6]. Rezultat ortodontske terapije, i pored stručnosti terapeuta, uslovljen je genotipom osobe i načinom delovanja pomenutih spoljašnjih faktora. S obzirom na to da se na genotip osobe ne može uticati, treba se okrenuti ka motivaciji i obuci pacijenta o pravilnom održavanju oralne higijene, uklanjanju loših navika i načinu izvođenja orofacijalnih funkcija, radi postizanja boljih terapijskih rezultata [7, 8, 9].

Razvrtkom viličnih baza i zubnih lukova u sagitalnom pravcu, oni se mogu postaviti u odnos I, II ili III skeletne, odnosno dentoalveolarne klase. Nalaz ne mora biti skeletno i dentalno u istoj klasi. Mehanizmom fiziološke adaptacije i dentoalveolarne kompenzacije moguće je da se oformi normalna okluzija u I klasi po Englu. Na taj način, premošćava se skeletni nesklad, koji je velikim delom genski uslovljen [10–13].

Cilj istraživanja je bio da se ispita uticaj funkcija disanja i gutanja na razvoj viličnih baza, zubnih nizova i dentalne okluzije u sagitalnoj ravni.

MATERIJAL I METOD

Istraživanjem je obuhvaćeno 60 pacijenata oba pola, u adolescentskom periodu života (prosečne starosti 15,9 godina), koji

su se javili radi ortodontskog lečenja na Kliniku za ortopediju vilica Stomatološkog fakulteta u Pančevu.

Kliničkim ispitivanjem orofacijalnih funkcija utvrđeni su tipovi disanja i gutanja kod svih ispitanika. Funkcija disanja je ispitivana neopaženim dužim posmatranjem pacijenta, zahtevanjem od pacijenta da duboko udahne vazduh sa zatvorenim ustima i postavljanjem stomatološkog ogledala ispod nozdrva. Funkcija gutanja je ispitivana bidigitalnim držanjem donje usne i zahtevanjem od pacijenta da proguta, uz istovremenu ekstraoralnu palpaciju poda usta, da bi se potvrdilo da li je akt gutanja izvršen. Takođe, inspekcijom se utvrđivalo da li postoji kontrakcija mimičnih i pomoćnih respiratornih mišića, koja se ne javlja kod pacijenata koji zrelo gutaju. Zatim su pacijenti podeljeni na: grupu P, koju čine pacijenti sa pravilnim funkcijama, i grupu N, koju čine oni pacijenti koji imaju nepravilne funkcije disanja i/ili gutanja.

Na studijskim modelima je utvrđena klasa okluzije po Englu, na osnovu međusobnog odnosa očnjaka i gornjeg prvog stalnog molara sa njihovim antagonistima. Zatim je merena visina luka u gornjoj i donjoj vilici.

Na profilnim telerendgenskim snimcima analizirani su sledeći parametri: uglovi SNA, SNB, ANB, I/SpP i i/MP. Ispitanici grupe P i grupe N su podeljeni prema skeletnoj klasi na: P(I), P(II) i P(III) i N(I), N(II) i N(III).

REZULTATI

Rezultati kliničkih ispitivanja orofacijalnih funkcija: 36 pacijenata (60%) nepravilno vrši funkcije disanja i gutanja, 24 pacijenta (40%) imaju nazalnu respiraciju i zrelo gutanje. Rezultati su prikazani u Grafikonu br. 1.

Rezultati merenja ugla ANB u grupi P: pet pacijenata sa I, 16 pacijenata sa II i tri pacijenta sa III skeletnom klasom. Dentalna klasa okluzije u grupi P: 17 pacijenata ima I klasu, šest pacijenata ½II, a jedan pacijent III klasu okluzije po Englu. Odnos i zastupljenost skeletnih i dentalnih klasa u grupi P prikazan je u Grafikonu br. 2.

Rezultati merenja ugla ANB u grupi N: 18 pacijenata sa I, osam pacijenata sa II i 10 pacijenata sa III skeletnom klasom. Dentalna klasa okluzije: četiri pacijenta ima I klasu, 11 pacijenata ima ½II, dva pacijenta 1/2III, a šest pacijenata III klasu okluzije po Englu. Odnos i zastupljenost skeletnih i dentalnih klasa u grupi N prikazan je u Grafikonu br. 3.

Grupa P(I): SNA i SNB – normognatizam gornje i donje vilice (66,7%), retrognatizam gornje i donje vilice (33,3%). I/SpP i i/MP – normalan položaj gornjih sekutića (100%), normalan položaj donjih sekutića (66,7%). Visina luka – povećana u gornjoj vilici (100%). Grupa N(I): SNA i SNB – normognatizam gornje i donje vilice (55,6%), retrognatizam gornje i donje vilice (44,5%). I/SpP – protruzija gornjih sekutića (88,9%). i/MP – normalan položaj donjih sekutića (66,7%). Visina luka – povećana u gornjoj vilici (58,8%).

Grupa P(II): SNA i SNB – normognatizam gornje i retrognatizam donje vilice (44,5%), prognatizam gornje i normognatizam donje vilice (29,4%), retrognatizam gornje i donje vilice (23,5%). I/SpP i i/MP – retruzija gornjih i normalan položaj donjih sekutića (35,3%), normalan položaj gornjih i protruzija donjih sekutića (35,3%), normalan položaj gornjih i donjih sekutića (29,4%). Grupa N(II): SNA i SNB – normognatizam gornje i retrognatizam donje vilice (50%), prognatizam gornje i retrognatizam donje vilice (25%), prognatizam gornje i normognatizam donje vilice (25%). I/SpP i i/MP – nisu dobijene statistički značajne vrednosti.

Grupa P(III): SNA i SNB – normognatizam gornje i prognatizam donje vilice (100%). I/SpP i i/MP – normalan položaj gornjih i retruzija donjih sekutića (100%). Visina luka – povećana dužina gornjeg zubnog niza (100%). Grupa N(III): SNA i SNB – normognatizam gornje i prognatizam donje vilice (50%), retrognatizam gornje i normognatizam donje vilice (50%). I/SpP i i/MP – protruzija gornjih sekutića (80%) i normalan položaj donjih sekutića (60%). Visina luka – povećana dužina gornjeg zubnog niza (70%).

DISKUSIJA

Individualno optimalna, fiziološka okluzija, raste i razvija se na genotipu određene osobe uz uticaj činilaca spoljne sredine. U ove uticaje se prevashodno ubraja pravilno vršenje orofacijalnih funkcija, kao što su disanje kroz nos, kompetentne usne i zrelo somatsko gutanje. Kliničkim ispitivanjem orofacijalnih funkcija pacijenata utvrđeno je da se položaj jezika i usana razlikuje kod nazalne i oralne respiracije, kao i kod somatskog i infantilnog gutanja. Njihov položaj proizvodi različitu silu pritiska [2, 14] i tako utiče na oblikovanje zubnog niza.

Rast i razvoj okluzije uslovljen je rastom kranijalne baze i vilica, kao i erupcijom zuba i njihovim pozicioniranjem u zubnim nizovima. Rast skeletnih struktura je u velikom broju slučajeva genetski uslovljen [10–13]. Posmatrajući skeletni razvoj gornje i donje vilice i poredeći rezultate grupe sa pravilnim, i rezultate grupe sa nepravilnim funkcijama, nije uočena statistički značajna razlika u vrednosti ovih parametara. Prema tome, na osnovu našeg istraživanja, čini se da način izvođenja orofacijalnih funkcija ne utiče na razvoj gornje i donje vilice u sagitalnoj ravni, kao ni na stepen ugla između njih, dok ispitivanje koje se bavilo sličnom temom [3] pokazuje da pacijenti sa oralnom respiracijom imaju tendenciju razvoja II skeletne klase.

Nisu uočene uzročno-posledične veze između vrednosti ugla ANB i pojave dentalne kompenzacije. Slične rezultate pokazalo je istraživanje zastupljenosti dentalne kompenzacije kod različitih skeletnih malokluzija [15]. Autori su utvrdili da postoji širok raspon varijacija skeletnih odnosa kod pacijenata sa normalnom okluzijom.

Rezultati ovog istraživanja ukazuju da postoji povezanost između načina izvođenja orofacijalnih funkcija disanja i gutanja i učestalosti pojave dentalne kompenzacije skeletnih nepravilnosti. Pacijenti koji pravilno izvode ove funkcije uspeali su da razviju pravilnu okluziju u I klasi po Englu u 78,8% slučajeva, dok je u grupi sa nepravilnim funkcijama to postiglo samo 11,1% ispitanika. Dentoalveolarna kompenzacija se odigrava zahvaljujući inklinaciji zuba. Na taj način skeletni nesklad se premošćava, a pravilnim funkcionisanjem usana, jezika i obraza formira se individualno optimalna fiziološka okluzija. Ulogu dentalne kompenzacije u uspostavljanju normalne okluzije potvrdilo je mnogo istraživanja. Među pacijentima I i III skeletne klase, sa oralnom respiracijom i infantilnim gutanjem, uočena je tendencija ka stvaranju II klase po Englu, što se poklapa sa rezultatima drugih autora [3].

U našem istraživanju rezultati su pokazali da kod pacijenata sa I i III skeletnom klasom koji nepravilno izvode funkcije disanja i gutanja postoji prisustvo protruzije gornjih sekutića u 88,9% (I) / 80% (III) slučajeva i povećana dužina gornjeg zubnog niza u 58,8 (I) / 70% (III) slučajeva. Rezultati koji ukazuju na protruziju gornjih sekutića kod nepravilnih orofacijalnih funkcija poklapaju se sa rezultatima drugih istraživanja [1, 17]. Ovi podaci potvrđuju i teoriju koju je uspostavio Riks još 1953. godine, koji je smatrao da pacijenti sa infantilnim gutanjem imaju protruziju gornjih i retruziju donjih zuba. U našem istraživanju utvrđeno je da, pored nepravilnog načina gutanja, do ovog poremećaja dolazi i kod pacijenata koji imaju nazalnu respiraciju, ili udruženu nazalnu respiraciju sa infantilnim gutanjem. Objašnjenje ove nepravilnosti može se naći u razdvojenom položaju usana, koji je karakterističan za pacijente sa nepravilnim funkcijama disanja [2]. Naši ispitanici sa II skeletnom klasom, za razliku od nalaza drugih autora, nisu pokazali statistički značajno prisustvo protruzije gornjih sekutića. U cilju objašnjenja ovih nepodudarnosti rezultata, u budućim istraživanjima bilo bi valjano odvojeno posmatrati ispitanike II/1 od II/2 klase. Takođe bi bilo bi korisno u sledećim istraživanjima ove problematike ispitati uticaj orofacijalnih funkcija na tip rasta lica i vertikalne skeletne odnose.

Ovim istraživanjem utvrđeno je da pravilno vršenje orofacijalnih funkcija pozitivno utiče na formiranje I klase okluzije kod pacijenata sa sagitalnim skeletnim nepravilnostima. Iz ovog razloga ortodontsku terapiju adolescenata, pored dentalne kamuflaže skeletnih nepravilnosti, treba bazirati na motivaciji i obuci pacijenta o pravilnom izvođenju funkcija disanja i gutanja, kao i uklanjanju drugih loših navika. Na taj način, uravnoteženo dejstvo mišića usana, jezika i obraza održavaće postignute rezultate terapije. Ukoliko se nepravilna navika ne ispravi, meka tkiva nastaviće da deluju nepovoljno na oblikovanje zubnog niza, što može pogoršati rezultate terapije.

ZAKLJUČAK

Rezultati ovog istraživanja ukazuju na to da postoji povezanost između načina izvođenja orofacijalnih funkcija disanja

i gutanja i učestalosti pojave dentalne kompenzacije skeletnih nepravilnosti. Procenjujući uticaj orofacijalnih funkcija disanja i gutanja na razvoj viličnih baza, zubnih nizova i okluzije u sagitalnom pravcu, možemo izvesti zaključke: pravilne funkcije disanja i gutanja kod pacijenata sa II i III skeletnom klasom

utiču na formiranje I klase dentoalveolarne okluzije; infantilno gutanje i nazalna respiracija uzrokuju vestibularnu inklinaciju gornjih sekutića kod pacijenata sa I i III skeletnom klasom; način izvođenja navedenih funkcija ne utiče na razvoj gornje i donje vilične baze.

Challenges in oral health-related quality of life assessment

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SUMMARY

Oral health is an important part of general health, and the overall quality of life directly depends on preserving the function of the orofacial system. The use of exclusively clinical parameters does not adequately present functional and psychosocial aspects of oral health and individual's needs. Therefore, the concept of oral health-related quality of life (OHRQOL) is introduced to assess the impact of oral diseases on overall well-being. Numerous questionnaires and scales adapted to the needs of different population groups are used for this purpose. The OHRQOL measurement facilitates the screening of hidden oral health problems in population and directs the design of public health programs following the population's health needs. Although the use of OHRQOL assessment tools has improved significantly in the recent years, it is still underrepresented in clinical practice. There is a need to increase the use of the OHRQOL assessment questionnaire in clinical practice in order to improve communication between dentists and patients, facilitate the evaluation of final therapeutic outcomes and improve the quality of dental health care.

Keywords: oral health; quality of life; oral health-related quality of life; questionnaire

INTRODUCTION

Traditional methods of measuring oral health, based mainly on clinical indicators do not consider oral health's functional and psychosocial aspects. Therefore, the concept of oral health-related quality of life (OHRQOL) is introduced to assess the impact of oral diseases on overall well-being. The use of OHRQOL instruments has significantly improved patients' health care and public health practices. However, in clinical practice, the use and analysis of these questionnaires are underrepresented, which is why efforts are being made to identify and overcome existing problems.

HEALTH-RELATED QUALITY OF LIFE

The term Quality of Life (QOL) was first used by the British economist Arthur Cecil Pigou in the 1920s. Later, from the general quality of life concept, the QOL that is affected by health, health-related quality of life (HRQOL) is singled out.

According to the World Health Organization (WHO) definition, and based on the International Classification of Functioning, Disability and Health, the quality of life is self-assessment and understanding of one's position in life, concerning specific goals, expectations, standards and requirements. In contrast, health-related quality of life represents expectations, standards, priorities and goals regarding one's health [1].

Almost simultaneously, the US Food and Drug Administration (FDA) organised an independent working group that defined health-related quality of life as a

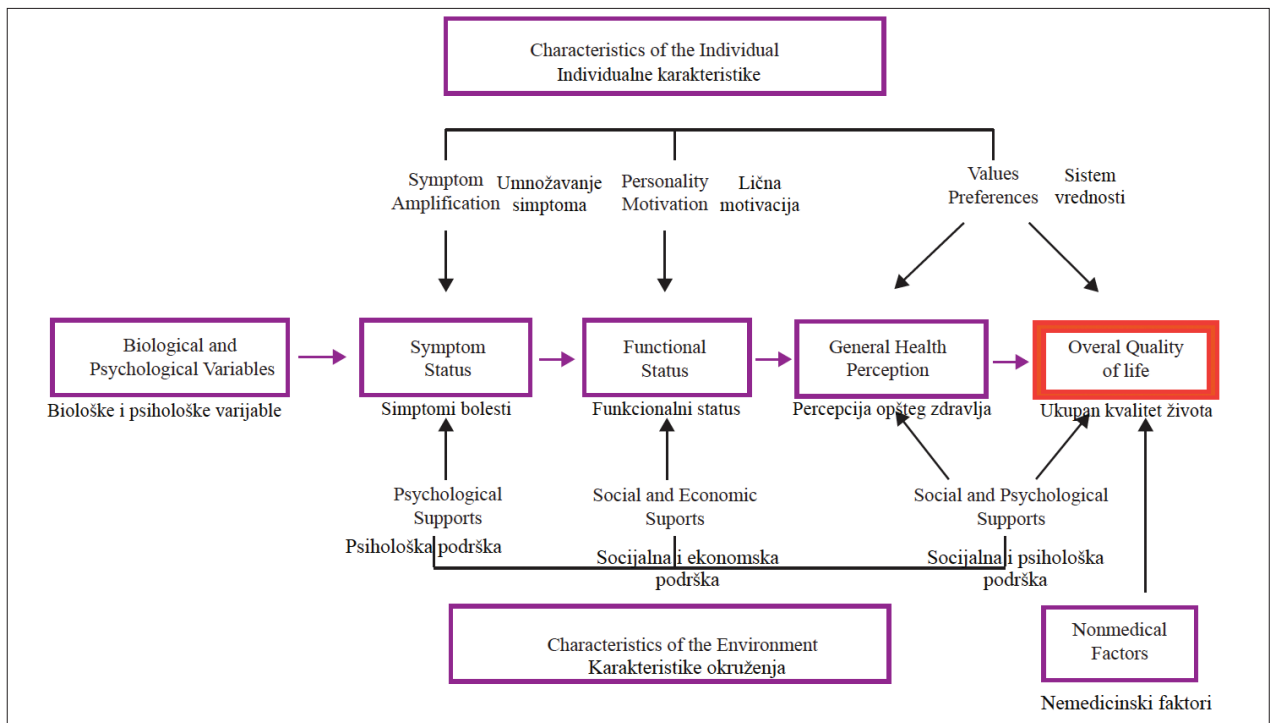
personal evaluation of health status and applied treatment to everyday life, including minimal physical, psychological and social functioning [2].

A significant contribution to today's understanding of the concept of health-related quality of life was made by Locker, who emphasised the importance of moving from a biomedical approach, with a disease as a centre of problems, to biopsychosocial, with a patient in the centre of the health system [3]. According to Locker, quality of life is a broader concept than health, although it includes all measurements related to health. Relying on the model of Wilson and Cleary (Scheme 1), he found that quality of life was determined by personality characteristics and non-medical parameters [4].

ORAL HEALTH-RELATED QUALITY OF LIFE

As oral health is an inseparable part of general health, the overall quality of life directly depends on preserving the function of the orofacial system. Traditional methods of measuring oral health and the necessity of treatment based mainly on clinical indicators do not necessarily consider oral health functional and psychosocial aspects. They also do not have to coincide with people's perceptions and concerns about their oral health. Individuals can rate their oral health as excellent only because they do not feel pain in the oral cavity despite missing a few teeth. At the same time, another person may consider their oral health poor because only one tooth is missing [5].

The impact of oral diseases can be described through the application of quantitative and qualitative indicators. The incidence, prevalence and duration of oral health



Scheme 1. Linkages between clinical variables and quality of life (Wilson and Cleary, 1995)
Shema 1. Povezanost između kliničkih varijabli i kvaliteta života (Wilson i Kliri, 1995)

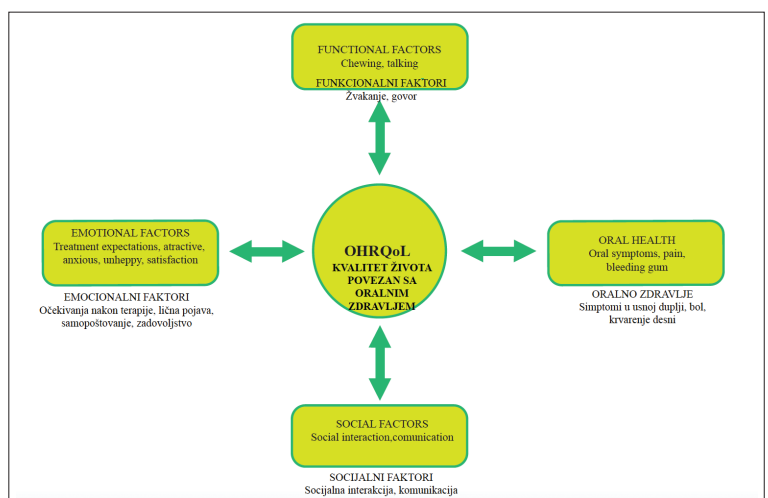
disorders show its quantitative impact, while the qualitative impact can best be described by the concept of Oral health-related quality of life (OHRQOL) [6]. According to the Centers for Disease Control and Prevention, OHRQOL's subjective assessment "reflects people's comfort while eating, sleeping, and participating in social activities; self-esteem and satisfaction with oral health" [7].

Like HRQOL, OHRQOL is a multidimensional complex of interconnected domains:

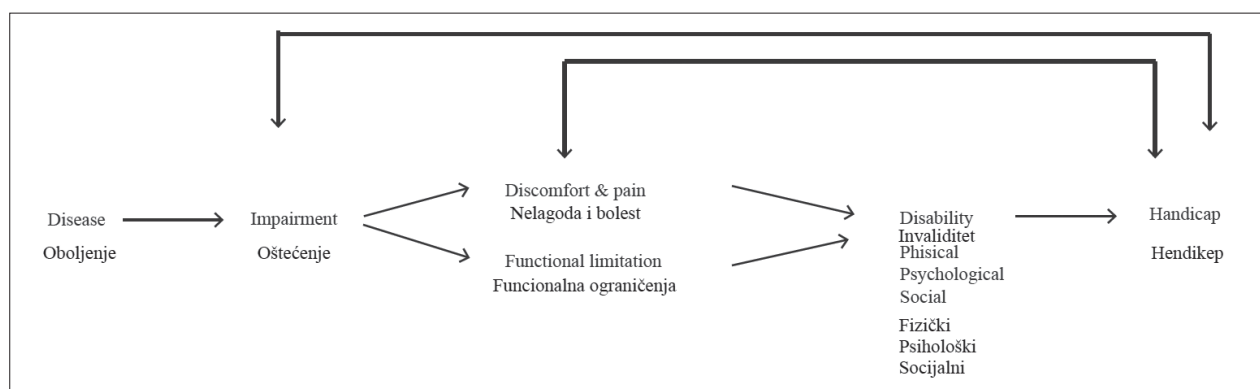
- Absence of potentially lethal diseases and pathological changes,
- Absence of functional impairments, diseases or their symptoms,
- Appropriate function concerning chewing, swallowing and the absence of discomfort and pain in the region of the oral cavity,
- Emotional functioning related to smiling and laughing,
- Social functioning in connection with the performance of daily activities in society,
- Experience of good oral health,
- Satisfaction with the state of oral health,
- Absence of social or cultural disadvantage due to poor oral status [8].

Oral health-related quality of life can also be viewed as a personal assessment of the impact of functional, psychological, social, and pain-related factors on patient well being (Scheme 2) [9]. All four groups of factors can be measured by different scales in clinical practice or research and should be included in quality of life assessment.

Recently, a group of authors proposed four dimensions of oral health: oral function, orofacial pain, orofacial appearance, and psychosocial impact, which form the basis of a patient's experience with oral health [10, 11]. OHRQOL is the most commonly used form of treatment outcome assessment by the patient - Patient-Reported Outcome (PRO) [6, 12]. Questionnaires developed based on the oral health model, or so-called Dental Patient-Reported Outcome Measure (dPROM), can help quantify patient's suffering. The data obtained from the patient's outcome report form the basis for evidence-based dentistry in all branches of dentistry [13].

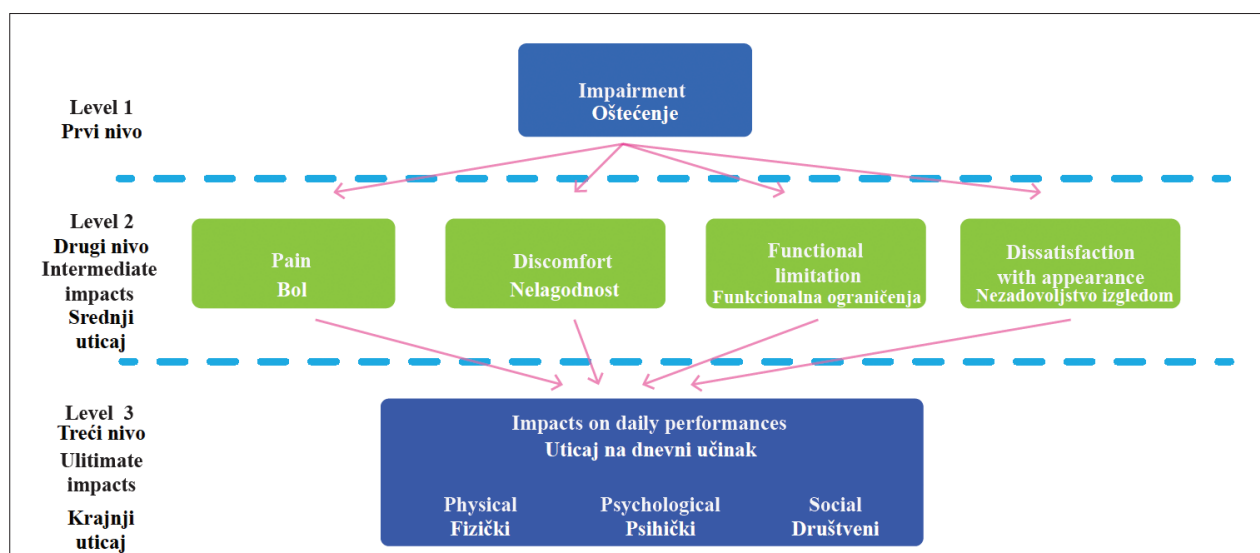


Scheme 2. The relationship between quality of life factors and oral health (Inglehart et al., 2002)
Shema 2. Prikaz povezanosti faktora kvaliteta života sa oralnim zdravljem (Inglehart i sar., 2002)



Scheme 3. Conceptual model for measuring oral health (Locker, 1988)

Shema 3. Konceptualni model za merenje oralnog zdravlja (Loker, 1988)



Scheme 4. Theoretical framework of consequences of oral impacts (Locker, 1988)

Shema 4. Teorijski okvir posledica negativnog uticaja oralnih oboljenja (Loker, 1988)

The Center for Disease Control and Prevention (CDC) recognises the importance of measuring the oral health-related quality of life to improve public health. With the fourth generation of the program “Healthy People 2030”, CDC recognises oral health as an area of special interest [14].

MEASURING THE ORAL HEALTH-RELATED QUALITY OF LIFE

The use of exclusively clinical parameters in oral health assessment has met numerous criticisms because it does not include functional and psychosocial aspects of oral health and does not adequately present the individual's health status, function, and needs. The foundations of the scientific examination of the psychosocial aspect of oral health were laid by Cohen and Jago in the 1970s [15]. Locker, who established the theoretical framework for measuring OHRQOL (Scheme 3), made a significant contribution to the development of standardised oral health questionnaires. According to Locker's model the disease can lead to anatomical loss or damage to tissue structure, which further causes functional limitations (e.g. loss of organ or organ function), pain and discomfort [16]. Wors-

ening, then, can lead to physical, mental or social disability, with the possible final outcome being total disability.

Based on Locker's modification of the WHO International Classification of Impairment, Disability and Handicap amended for dentistry, different levels of consequent manifestations have been established (Scheme 4) [16]. The first level refers to oral status, including damage to oral tissues, mainly measured by clinical indicators. The second level, termed “medium effects,” includes the earliest possible negative effects caused by oral health status: pain, discomfort, functional limitation, and dissatisfaction with appearance. The third level, or “ultimate impact”, presents the impact on the ability to perform daily activities consisting of physical, psychological and social performance and is equivalent to the disability and handicap in the previous Locker's model.

The number of instruments (questionnaires/scales) for assessing the quality of life associated with oral health increases daily. Ten questionnaires that measure the oral health-related quality of life were presented at the First International Congress of Oral Health Measurement in 1997 (Table 1) [3].

Today, numerous identified and clinically verified questionnaires can measure the degree of impact of oral

Table 1. Standardized questionnaires used to assess quality of life related to oral health (First International Congress on Oral Health Measurement, 1997).**Tabela 1.** Standardizovani upitnici korišćeni za merenje kvaliteta života povezanog sa oralnim zdravljem (Prvi međunarodni kongres merenja oralnog zdravlja, 1997).

Instrument Upitnik	Dimensions measured Dimenzije koje se mere	No. of question Broj pitanja	Response format Predloženi odgovori
Sociodental Scale Sociodentalna skala	Chewing, talking, smiling, laughing, pain appearances Žvakanje, govor, smejanje, bol, izgled	14	Yes/No Da/Ne
RAND Dental Health Index Indeks dentalnog zdravlja RAND	Pain, worry, conversation Bol, zabrinutost, konverzacija	3	4 categories; "not at all" to "a great deal" Četiri kategorije: od „uopšte ne“ do „znatno“
General Oral Health Assessment Index Indeks procene opšteg oralnog zdravlja	Chewing, eating, social contacts, appearance, pain, worry, self-consciousness Žvakanje, socijalni kontakt, izgled, bol, zabrinutost, samosvest	12	6 categories; "always/never" Šest kategorija: od „uvek“ do „nikad“
Dental Impact Profile Profil dentalnog uticaja	Appearance, eating, speech, confidence, happiness, social life, relationships Izgled, ishrana, govor, poverenje, sreća, socijalni život, odnosi	25	3 categories; good effect, bad effect, no effect Tri kategorije: dobar efekat, loš efekat, bez efekta
Oral Impact Profile Profil oralnog uticaja	Function, pain, physical disability, social disability, handicap funkcionisanje, bol, fizička nesposobnost, socijalna nesposobnost, hendikep	49	5 categories; "very often/never" Pet kategorija: od „veoma često“ do „nikad“
Subjective Oral Health Status Indicator Subjektivni indikator oralnog zdravstvenog stanja	Chewing, speaking, symptoms, eating, communication, social relations Žvakanje, govor, simptomi, ishrana, komunikacija, socijalni odnos	42	Various depending on question format Različiti u zavisnosti od formata pitanja
Dental Impact on Daily Living Uticaj zuba na svakodnevni život	Comfort, appearance, pain, daily activities, eating Ugodnost, izgled, bol, svakodnevne aktivnosti, ishrana	36	Various depending on question format Različiti u zavisnosti od formata pitanja
Oral Health-Related Quality of life Kvalitet života vezan za oralno zdravlje	Daily activities, social activities, conversation Svakodnevne aktivnosti, socijalne aktivnosti, konverzacija	3	6 categories; "all of time" to "none of the time" Šest kategorija: od „sve vreme“ do „nikad“
Oral Impacts on Daily Performances Uticaj oralnog stanja na dnevne aktivnosti	Performance in eating, speaking, oral hygiene, sleeping, appearance emotion Ishrana, govor, oralna higijena, spavanje, izgled, emocije	9	Various depending on question format Različiti, zavisno od tipa pitanja
Oral Health Quality of Life Inventory Uticaj oralnog zdravlja na kvalitet života	Oral health, nutrition, self-related oral health, overall quality of life Oralno zdravlje, ishrana, vlastita procena oralnog zdravlja, sveukupan kvalitet života	56	Part A: 4 categories "not at all" to "a great deal" Part B: 4 categories "unhappy/happy" A: četiri kategorije: od „uopšte mi nije važno“ do „jako mi je važno“ B: četiri kategorije: od „nesrećan“ do „srećan“

diseases and health disorders on the quality of life of different population groups. The structure of all questionnaires includes a number of questions based on which information is obtained directly from the patient.

Conducting a survey requires some experience because it is sometimes difficult to obtain appropriate information, especially when it comes to children, the elderly or people with speech disorders. Within the defined scale, each answer to the question is expressed by a certain number of points. The offered answers are most often represented by the Likert scale (five-point from "excellent" to "unsatisfactory"), the visual-numerical scale (VAS - visual-analogue scale), or less often only the offered answers Yes / No. In questionnaires with VAS, the respondent has to answer on a scale from 0 to 10 or from 0 to 100, which can sometimes be a problem due to turning an abstract attitude about one's quality of life into a metric scale. In this regard, all patients should be patiently and uniformly trained. Additional assistance in

completing the questionnaire may consist of instructions given to the patient. When assessing the quality of life through interviews, the minimum suggestive influence of the examiner should be taken into account. In some questionnaires, one of the difficulties is the large number of questions, which is why efforts are made to develop shorter versions to facilitate their application in everyday clinical practice.

Not all questionnaires are equally valid and reliable. It is often necessary to conduct research using several instruments, testing psychometric characteristics and then comparing them. Translation and cultural adaptation of the questionnaire is necessary, thus providing a proper use in multinational quality of life studies. The language barrier further complicates this procedure, so it is necessary to carefully translate the questionnaire and adapt it to the population's given language and cultural characteristics. Until now, a small number of questionnaires have been validated in Serbian language [3, 17, 18].

Although the term quality of life is increasingly used in dental practice, OHRQOL assessment instruments are still underrepresented. The most common reasons for that are:

- Lack of short versions of existing questionnaires,
- Multidimensionality of the questionnaire that requires complex analysis,
- Lack of time and resources,
- Subjective health assessment and selective reporting of health problems by the patient,
- The burden on patients and health care staff by completing a questionnaire [19].

Gathering data on quality of life can help make health care decisions at multiple levels. First of all, they can help shape public policies and decisions related to the health-care system made by the government and the Ministry of Health. They can also guide the research program of pharmaceutical companies in finding adequate therapy. QOL studies should inform clinicians about the impact of specific treatments on the final outcome, which includes a personal perception of health. All this information can be shared with patients and used to aid joint decision-making on therapy selection. Providing specific information on the possible outcome in terms of quality of life allows:

- Better communication between doctor and patient,
- Screening of hidden oral health problems,
- Identification of problems that may have a significant impact on the patient's QOL,
- Referral of physicians to a priority problem arising during treatment that affects QOL [20].

CONCLUSION

The OHRQOL measurement enables the assessment of the harmful effects of oral diseases on overall well-being and facilitates the screening of hidden oral health problems. It also directs the design of public health programs following the population's health needs and improves the overall public dental health. In clinical practice, it contributes to better communication between the dentist and the patient, facilitates the evaluation of the final therapeutic outcome, thus increasing the patient's satisfaction with the provided dental care.

REFERENCES

1. World Health Organization. International Classification of Impairments, Disabilities and Handicaps. Geneva, Switzerland: World Health Organization; 1980.
2. Guidance for industry. Patient-reported outcome measures: use in medical product development to support labeling claims. Draft guidance, 2006.
3. Slade GD, ed. Measuring Oral Health and Quality of Life. Chapel Hill: University of North Carolina-Dental Ecology; 1997.
4. Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. *JAMA*. 1995;273(1):59–65. [PMID: 7996652]
5. Petričević N, Čelebić A, Baučić Božić M, Renner-Sitar K. Oralno zdravlje i kvaliteta života: temelj suvremenog pristupa. *MEDIX*. 2008;75/76:197–201.
6. Sekulic S, John MT, Häggman-Henrikson B, Theis-Mahon N. Dental patients' functional, pain-related, aesthetic, and psychosocial impact of oral conditions on quality of life-Project overview, data collection, quality assessment, and publication bias. *J Oral Rehabil*. 2021;48(3):246–55. [DOI: 10.1111/joor.13045] [PMID: 32628288]
7. Centers for Disease Control and Prevention. Oral Health. Oral health in America: a report of the Surgeon General. U.S. Department of Health and Human Services; 2000.
8. Gift HC, Atchison KA. Oral health, health, and health-related quality of life. *Med Care*. 1995;33(11):NS57–77. [DOI: 10.1097/00005650-199511001-00008] [PMID: 7475433]
9. Inglehart MR, Bagramian RA, eds. Oral Health-Related Quality of Life. Illinois: Quintessence Publishing Co; 2002.
10. John MT, Reissmann DR, Celebic A, Baba K, Kende D, Larsson P, et al. Integration of oral health-related quality of life instruments. *J Dent*. 2016;53:38–43. [DOI: 10.1016/j.jdent.2016.06.006] [PMID: 27353210]
11. Mittal H, John MT, Sekulić S, Theis-Mahon N, Renner-Sitar K. Patient-Reported Outcome Measures for Adult Dental Patients: A Systematic Review. *J Evid Based Dent Pr*. 2019;19(1):53–70. [DOI: 10.1016/j.jebdp.2018.10.005] [PMID: 30926102]
12. Doward LC, McKenna SP. Defining patient-reported outcomes. *Value Health*. 2004;7:54–8. [DOI: 10.1111/j.1524-4733.2004.7s102.x] [PMID: 15367236]
13. Reissmann DR. Dental Patient-Reported Outcome Measures Are Essential for Evidence-Based Prosthetic Dentistry. *J Evid Based Dent Pract*. 2019;19(1):1–6. [DOI: 10.1016/j.jebdp.2019.01.003] [PMID: 30926098]
14. Centers for Disease Control and Prevention. National Center for Health Statistics. Healthy people; 2030.
15. Cohen LK, Jago JD. Toward the formulation of sociodental indicators. *Int J Health Serv*. 1976;6(4):681–98. [PMID: 971976] [DOI: 10.2190/LE7A-UGBW-J3NR-Q992]
16. Locker D. Measuring oral health: a conceptual framework. *Community Dent Health*. 1988;5(1):3–18. [PMID: 3285972]
17. Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. *Community Dent Health*. 1994;11(1):3–11. [PMID: 8193981]
18. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. *J Dent Educ*. 1990;54(11):680–7. [PMID: 2229624]
19. Singer S, Langendijk J, Yarom N. Assessing and improving quality of life in patients with head and neck cancer. *Am Soc Clin Oncol Educ Book*. 2013. [DOI: 10.1200/EdBook_AM.2013.33.e230] [PMID: 23714510]
20. Murphy BA, Ridner S, Wells N, Dietrich M. Quality of life research in head and neck cancer: a review of the current state of the science. *Crit Rev Oncol Hematol*. 2007;62(3):251–67. [DOI: 10.1016/j.critrevonc.2006.07.005] [PMID: 17408963]

Izazovi u proceni kvaliteta života povezanog sa oralnim zdravljem

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KRATAK SADRŽAJ

Oralno zdravlje je važan deo opšteg zdravlja, te ukupni kvalitet života direktno zavisi od očuvanosti funkcije orofacijalnog sistema. Korišćenje isključivo kliničkih parametara ne prezentuje adekvatno funkcionalne i psihosocijalne aspekte oralnog zdravlja i potrebe individue. Zbog toga se za procenu uticaja oralnih oboljenja na celokupno blagostanje uvodi koncept Kvaliteta života povezan sa oralnim zdravljem (*Oral health related quality of life – OHRQOL*). U ovu svrhu koriste se brojni upitnici i skale prilagođeni potrebama različitih populacionih grupa. Merenje *OHRQOL* olakšava skrining skrivenih oralnih oboljenja u populaciji i usmerava dizajniranje javnozdravstvenih programa u skladu sa zdravstvenim potrebama stanovništva. Iako je poslednjih godina korišćenje instrumenata za procenu *OHRQOL* značajno unapređeno, u kliničkoj praksi je i dalje nedovoljno zastupljeno. Potrebno je povećati upotrebu upitnika za procenu *OHRQOL* u kliničkoj praksi kako bi se unapredila komunikaciji između stomatologa i pacijenata, olakšala evaluacija konačnih terapijskih ishoda i poboljšao kvalitet stomatološke zdravstvene zaštite.

Cljučne reči: oralno zdravlje; kvalitet života; kvalitet života povezan sa oralnim zdravljem; upitnici

UVOD

Tradicionalne metode merenja oralnog zdravlja zasnovane uglavnom na kliničkim pokazateljima ne uzimaju u obzir funkcionalne i psihosocijalne aspekte oralnog zdravlja. Stoga se za procenu uticaja oralnih oboljenja na celokupno blagostanje u upotrebu uvodi koncept Kvaliteta života povezan sa oralnim zdravljem (*Oral health related quality of life – OHRQOL*). Upotrebom *OHRQOL* instrumenata značajno je unapređena zdravstvena zaštita pacijenata i javnozdravstvena praksa. Ipak, u kliničkoj praksi je upotreba i analiza ovih upitnika nedovoljno zastupljena, zbog čega se ulažu naporu u prepoznavanju i prevazilaženju postojećih problema.

KVALITET ŽIVOTA POVEZAN SA ZDRAVLJEM

Pojam kvalitet života (*Quality of life – QOL*) prvi put je upotrebio britanski ekonomista Arthur Sesil Pigu dvadesetih godina XX veka. Kasnije se iz koncepta opšteg kvaliteta života izdvaja onaj aspekt kvaliteta života na koji utiče zdravlje, odnosno kvalitet života povezan sa zdravljem (*Health-related quality of life – HRQOL*). Prema definiciji Svetske zdravstvene organizacije (SZO), a na osnovu Internacionalne klasifikacije funkcionalnosti, invalidnosti i zdravlja (*International Classification of Functioning, Disability and Health*), „kvalitet života predstavlja samoprocenu i shvatanje svoje pozicije u životu, u odnosu na određene ciljeve, očekivanja, standarde i zahteve, dok kvalitet života povezan sa zdravljem predstavlja očekivanja, standarde, prioritete i ciljeve u vezi sa sopstvenim zdravljem“ [1]. Američka agencija za hranu i lekove (*Food and drug administration – FDA*) gotovo je istovremeno organizovala nezavisnu radnu grupu koja je kvalitet života povezan sa zdravljem definisala „kao ličnu evaluaciju zdravstvenog stanja i primenjenog tretmana na svakodnevni život obuhvatajuću minimalno fizičko, psihološko i socijalno funkcionisanje“ [2].

Značajan doprinos današnjem shvatanju koncepta kvaliteta života povezanog sa zdravljem dao je Loker, koji ističe važnost prelaska sa biomedicinskog pristupa bolesti kao središta problema na biopsihosocijalni, sa pacijentom u središtu zdravstvenog sistema [3]. Prema Lokeru, kvalitet života je širi pojam od zdravlja iako uključuje i sva merenja koja se odnose na zdravlje.

Oslanjajući se na model Vilsona i Klirija (Shema 1), utvrdio je da je kvalitet života određen karakteristikama ličnosti i nemedicinskim parametrima [4].

KVALITET ŽIVOTA POVEZAN SA ORALNIM ZDRAVLJEM

Kako je oralno zdravlje neodvojivi deo opšteg zdravlja, tako i ukupni kvalitet života direktno zavisi od očuvanosti funkcije orofacijalnog sistema. Tradicionalne metode merenja oralnog zdravlja i potrebe lečenja zasnovane uglavnom na kliničkim pokazateljima ne uzimaju nužno u obzir funkcionalne i psihosocijalne aspekte oralnog zdravlja i ne moraju se poklapati sa percepcijom i zabrinutošću ljudi za sopstveno oralno zdravlje. Pojedinaac može oceniti svoje oralno zdravlje kao odlično samo zato što ne oseća bol u usnoj duplji iako mu nedostaje nekoliko zuba, dok druga osoba može smatrati lošim svoje oralno zdravlje jer nedostaje samo jedan zub [5].

Uticaj oralnih oboljenja se može opisati kroz primenu kvantitativnih i kvalitativnih pokazatelja. Incidencija, prevalencija i trajanje poremećaja oralnog zdravlja pokazuju njegov kvantitativni uticaj, dok se kvalitativni uticaj najbolje može opisati konceptom Kvalitet života povezan sa oralnim zdravljem (*Oral health related quality of life – OHRQOL*) [6]. Prema Centru za kontrolu i prevenciju bolesti, *OHRQOL* „odražava komfor ljudi tokom jela, dok spavaju i učestvuju u društvenim aktivnostima; samopoštovanje i zadovoljstvo u pogledu oralnog zdravlja“ [7].

Kao i *HRQOL*, *OHRQOL* je multidimenzionalni kompleks međusobno povezanih domena:

- odsustvo potencijalno letalnih oboljenja i patoloških promena,
- odsustvo funkcionalnih oštećenja, bolesti ili njihovih simptoma,
- odgovarajuća funkcija u vezi sa žvakanjem, gutanjem i odsustvom nelagodnosti i bola u regiji usne duplje,
- emocionalno funkcionisanje u vezi sa osmehom i smejanjem,
- socijalno funkcionisanje u vezi sa izvođenjem svakodnevnih aktivnosti u društvu,
- doživljaj dobrog oralnog zdravlja,

- zadovoljstvo stanjem oralnog zdravlja,
- odsustvo socijalnog ili kulturnog nedostatka zbog lošeg oralnog statusa [8].

Kvalitet života povezan sa oralnim zdravljem može se posmatrati i kao lična ocena uticaja funkcionalnih, psihičkih, socijalnih faktora i faktora vezanih za iskustvo bola i neugode na pacijentovo blagostanje (Shema 2) [9]. Sve četiri grupe faktora trebaju biti uključene u proceni kvaliteta života i mogu se meriti različitim skalama u kliničkoj praksi ili istraživanjima.

Nedavno je grupa utora predložila četiri dimenzije oralnog zdravlja: oralnu funkciju, orofacijalni bol, orofacijalni izgled i psihosocijalni uticaj, koje predstavljaju osnovu pacijentovog iskustva sa oralnim zdravljem [10, 11]. OHRQOL predstavlja najčešće korišćeni oblik procene ishoda lečenja od strane pacijenta – pacijentov izveštaj o ishodu (*Patient-Reported Outcome, PRO*) [6, 12]. Upitnici razvijeni na osnovu modela oralnog zdravlja, tzv. pacijentov izveštaj o ishodu u stomatologiji (*Dental Patient-Reported Outcome Measure – dPROM*) može pomoći kvantifikaciji pacijentove patnje. Podaci dobijeni na osnovu pacijentovog izveštaja o ishodu predstavljaju osnovu za stomatologiju zasnovanu na dokazima u svim granama stomatologije [13].

Važnost merenja kvaliteta života povezanog sa oralnim zdravljem radi unapređenja javnog zdravlja prepoznata je i od strane Centra za kontrolu bolesti i prevenciju, koji već četvrtom generacijom programa „Zdravi ljudi 2030“ (*Healthy People 2030*) prepoznaje oralno zdravlje kao područje od posebnog interesa [14].

MERENJE KVALITETA ŽIVOTA POVEZANOG SA ORALNIM ZDRAVLJEM

Korišćenje isključivo kliničkih parametara u proceni oralnog zdravlja naišlo je na brojne kritike jer ne uključuje funkcionalne i psihosocijalne aspekte oralnog zdravlja i ne prezentuje adekvatno zdravstveni status, funkciju i potrebe individue. Osnove naučnog ispitivanja psihosocijalnog aspekta oralnog zdravlja postavili su Koen i Jago 70-ih godina XX veka [15]. Za razvoj standardizovanih upitnika za oralno zdravlje značajan doprinos dao je Loker, koji je utemeljio teorijske okvire za merenje OHRQOL (Shema 3). Prema Lokerovom modelu, bolest može dovesti do anatomskog gubitaka ili oštećenja strukture tkiva, što dalje uzrokuje funkcionalna ograničenja (npr. gubitak funkcije organa ili sistema organa), pojavu bola i neugodnosti [16]. Pogoršanje, zatim, može dovesti do fizičke, psihičke ili socijalne onesposobljenosti, pri čemu je mogući konačni ishod potpuna nesposobnost (hendikep).

Prema Lokerovoj modifikaciji SZO Međunarode klasifikacije oštećenja, invaliditeta i hendikepa namenjenoj stomatologiji, ustanovljeni su različiti nivoi posledičnih manifestacija (Shema 4) [16]. Prvi nivo se odnosi na oralni status, uključujući oštećenja oralnih tkiva, koja se uglavnom mere kliničkim pokazateljima. Drugi nivo, označen kao „srednji uticaji“, uključuje najranije moguće negativne uticaje izazvane oralnim zdravstvenim statusom: bol, nelagodnost, funkcionalno ograničenje i nezadovoljstvo izgledom. Treći nivo ili „krajnji uticaj“ predstavlja uticaj na sposobnost obavljanja svakodnevnih aktivnosti koje se sastoje od fizičke, psihološke i socijalne performanse i

predstavlja ekvivalent invaliditetu i hendikepu iz prethodnog Lokerovog modela.

Broj instrumenata (upitnika/skala) za procenu kvaliteta života povezanog sa oralnim zdravljem se svakodnevno uvećava. Na Prvom međunarodnom kongresu za merenje oralnog zdravlja 1997. godine predstavljeno je 10 upitnika za merenje kvaliteta života povezanog sa oralnim zdravljem (Tabela 1) [3].

Danas postoje brojni identifikovani i klinički verifikovani upitnici pomoću kojih je moguće meriti stepen uticaja oralnih oboljenja i poremećaja zdravlja na kvalitet života različitih populacionih grupa. Struktura svih upitnika podrazumeva određeni broj pitanja na osnovu kojih se dobijaju informacije direktno od pacijenta. Sprovođenje ankete zahteva izvesno iskustvo, jer je nekada teško dobiti odgovarajuću informaciju, posebno kada se radi o deci, osobama starije životne dobi ili osobama sa smetnjama u govoru. U okviru definisane skale, svaki odgovor na postavljeno pitanje je izražen određenim brojem bodova. Ponudeni odgovori su najčešće predstavljeni Likertovom skalom (petostepena od „odlično“ do „nezadovoljavajuće“), vizuelno-numeričkom skalom (*visual-analog scale – VAS*) ili ređe samo ponudjenim odgovorima Da/Ne. Kod vizuelno-numeričke skale ispitanik mora dati odgovor na skali od 0 do 10 ili od 0 do 100, što nekada može predstavljati problem jer se apstraktni stav o vlastitom kvalitetu života pretvara u metričku skalu. S tim u vezi, treba strpljivo i uniformno obučiti sve pacijente. Dodatna pomoć u popunjavanju upitnika se može sastojati od instrukcija koje se daju pacijentu. Kada se procena kvaliteta života meri pomoću intervjua, treba voditi računa o minimalnom sugestivnom uticaju ispitivača na ispitanika. Kod pojedinih upitnika jednu od poteškoća predstavlja i veliki broj pitanja; zbog toga se ulažu naporu u izradi kraćih verzija kako bi se olakšala njihova primena u svakodnevnoj kliničkoj praksi.

Nisu svi upitnici podjednako validni i pouzdani. Često je potrebno sprovesti istraživanje pomoću nekoliko instrumenata, testirajući psihometrijske karakteristike, a zatim vršiti njihovo međusobno poređenje. Prevod i kulturološka adaptacija upitnika su neophodni i omogućavaju pravilnu upotrebu u multinacionalnim studijama o kvalitetu života. Jezička barijera dodatno komplikuje ovaj postupak, zbog čega je neophodno pažljivo prevesti upitnik tako da bude prilagođen datom jeziku i kulturološkim osobinama populacije. Do sada je na srpski jezik validiran manji broj upitnika [3, 17, 18].

Iako se pojam kvaliteta života sve češće koristi u stomatološkoj praksi, korišćenje instrumenata za procenu OHRQOL je i dalje nedovoljno zastupljeno. Kao najčešći razlozi navode se:

- nedostatak kratkih verzija postojećih upitnika,
- višedimenzionalnost upitnika koja zahteva složenu analizu,
- nedostatak vremena i sredstava,
- subjektivna procena zdravlja i selektivno izveštavanje o zdravstvenim problemima od strane pacijenta,
- opterećenost pacijenata i zdravstvenog osoblja popunjavanjem upitnika [19].

Podaci o kvalitetu života mogu pomoći u donošenju odluka o zdravstvenoj zaštiti na više nivoa. Pre svega, mogu pomoći u oblikovanju javnih politika i odluka vezanih za zdravstveni sistem, donetih od strane vlade i ministarstva zdravlja. Takođe, mogu usmeravati istraživački program farmaceutskih kompanija u pronalaženju adekvatne terapije. Studije o QOL treba da informišu kliničare o uticaju specifičnih tretmana na konačan

ishod koji podrazumeva i ličnu percepciju zdravlja. Ove informacije se mogu podeliti sa pacijentima i koristiti kao pomoć u zajedničkom donošenju odluke o izboru terapije. Obezbeđivanje konkretnih informacija o mogućem ishodu sa aspekta kvaliteta života omogućava:

- bolju komunikaciju između lekara i pacijenta,
- skrining skrivenih problema u vezi sa oralnim zdravljem,
- identifikaciju problema koji mogu imati značajan uticaj na QOL pacijenta,
- usmeravanje lekara na prioritetni problem nastao tokom lečenja, koji utiče na QOL [20].

ZAKLJUČAK

Merenje OHRQOL omogućava procenu štetnih uticaja oralnih oboljenja na celokupno blagostanje i olakšava skrining skrivenih problema u vezi sa oralnim zdravljem. Takođe, usmerava dizajniranje javnozdravstvenih programa u skladu sa zdravstvenim potrebama stanovništva i unapređuje celokupno stomatološko javno zdravlje. U kliničkoj praksi doprinosi boljoj komunikaciji između stomatologa i pacijenta, olakšava evaluaciju konačnog terapijskog ishoda, čime se povećava zadovoljstvo pacijenata pruženom stomatološkom zdravstvenom zaštitom.

Reciprocal movements of endodontic files – simpler and more certain therapeutic procedure

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SUMMARY

Numerous technological solutions in recent years have significantly improved the cleaning and shaping of canals and made canal instrumentation simpler, more efficient and safer. Significantly faster and less stressful canal instrumentation for the therapist is enabled by the specific design of the file working part and a special thermal modification of NiTi alloy with a change in the movement dynamics of the file in the canal.

Research has shown that the problem of cyclic fatigue and torsional stress of the file during canal preparation can be solved by changing usual continuous rotation of the file. Dental technology has introduced the technique of reciprocal movements as an alternative to full file rotation. This change in file rotation direction during instrumentation, based on the technique of balanced forces, significantly reduces contact surface with the canal wall, eliminates the effect of screwing, extends the life of the file and further increases safety of instrumentation of different canal systems. An important advantage of changing the usual dynamics of file movements is that the concept of reciprocal movements is based on the use of only one file, which in addition to shortening treatment time also makes this intervention safer and with significantly lower percentage of defects and fractures of NiTi files.

The aim of this paper was to present the concept of canal instrumentation with NiTi files with reciprocal movements as well as development, properties and possibility of application of these files in different clinical situations.

Keywords: reciprocal movements; NiTi files; canal preparation

INTRODUCTION

Endodontic instrumentation has significantly improved at the beginning of this century, and cleaning and shaping the canal has become simpler, more efficient and safer. In addition, frustrations of many dentists due to possible fractures of NiTi files during canal instrumentation has been quite alleviated [1, 2]. Various technological solutions in recent years related to thermal modification and transformation of NiTi alloy [3, 4], specific design of the working part of the file (cross section; number, appearance and arrangement of the blade; conicity) [4, 5] or change of file movement dynamics (reciprocal, eccentric, transaxial) have made this therapeutic procedure significantly faster and less stressful [5]. Current concepts of designing the working part of NiTi files are primarily aimed at increasing their blade efficiency and reducing surface contact with the canal walls, which significantly reduces the possibility of deformations and fractures [5, 6, 7].

Research has shown that the two most common reasons for the occurrence of NiTi files fracture are: cyclic fatigue (alternating exposure of the file to tensile forces on the outside and compression forces on the inside) and torsional stress of the file (screwing in the canal curvature) [5, 6]. The strategy of changing usual movement dynamics of the NiTi file during canal instrumentation [2, 7–10] was

an important step in solving this problem. Dental technology presented the technique of reciprocal movements of NiTi files in the canal [1, 5, 9, 10, 11] as an alternative to continuous rotation. This alternating change in the direction of NiTi files rotation during canal instrumentation is based on the technique of balanced forces and significantly reduces the contact surface with the canal wall and thus eliminates the cumulative effect of bending forces in the canal curvature [5, 7]. The file achieves full rotation with reciprocal movement in three alternating movements, which significantly reduces cyclic fatigue and torsional stress, eliminates the effect of screwing (which occurs with full rotation) and significantly extends the life of the file [7, 12, 13]. Clinical evaluation of 1,696 used NiTi files with reciprocal movements indicated extremely low incidence of fractures (0.47%) and deformations (0.35%), although reuse of these systems is relatively common in clinical practice [5].

The popularity of systems with reciprocal movements in endodontic dental treatment is primarily based on excellent *in vitro* and *in vivo* results related to mechanical properties, good shaping and absence of file deformations after preparation of different canal systems [3, 4, 5, 9]. It was confirmed that reciprocal file movement, which first involves rotation counter clockwise (cutting direction) and then much shorter rotation clockwise (relaxation),

reduces contact with the canal walls, eliminates the need for pressure, increases cutting capacity and further increases safety during operation [1, 2, 9, 14].

The first experimental study on the effects of reciprocal movements in canal preparation was presented by Yared in 2008, using PROTAPER F2 file (otherwise intended for full rotation) with different rotation angles and low pressure [15]. Initially, it was considered that conventional files intended for full rotation could also be used in the technique with reciprocal movements, while today working parts of NiTi files are designed exclusively for reciprocal movements [5, 11, 15].

The aim of this paper was to present the concept of canal preparation with NiTi files with reciprocal movements as well as development, properties and possibility of application of these files in different clinical situations.

DEVELOPMENT OF NITI FILES WITH RECIPROCAL MOVEMENTS

Combined efforts of endodontists and dental technology in the last two decades have, among other things, been aimed to designing NiTi files that will provide efficient dentin cutting, increase the effect of irrigation and medication, and provide the best canal geometry for complete canal system obturation [4, 5]. Another, no less important requirement, was to increase the resistance of the file and prevent the occurrence of possible deformations and fractures during the biomechanical preparation of the canal [4, 5, 16, 17].

Reciprocal movements are recommended for clinical practice due to significantly reduced cyclic fatigue and torsional stress, and this strategic decision proved to be correct as it resulted in significantly lower percentage of fractures of NiTi files [11, 18]. An important advantage of changing the usual dynamics of file movements is that this concept of canal instrumentation is based on the use of only one file (SINGLE FILE), which, in addition to shortening instrumentation time (3-4 times) and saving time for patients and endodontists, makes this intervention safer and more predictable [5, 11, 16, 19, 20].

Instruments with reciprocal movements that replaced the concept of full rotation introduced in the late 1980s belong to the fourth generation of NiTi files and appeared on the market in 2011 [5, 6, 16, 19, 21]. Most of these files are active when rotating counter clockwise (rotation angles 120-270°; clockwise 60-90°) (UNICONE, WAVE ONE, WAVE ONE GOLD, RECIPROC, RECIPROC BLUE, PRO DESIGN R, X1 BLUE FILE), but there are also systems that remove paracanal dentin (cut) when moving clockwise (GENIUS, PRO DESIGN S) [2, 5, 16, 18, 19]. While the file rotates in the canal counter clockwise, the paracanal dentin is cut and slightly moved towards the apex. This is followed by a movement with a shorter rotation (clockwise) that ensures that the file is released from excessive torsional stress and thus prevents its entrapment and possible fracture in the canal [2, 21-24].

In addition to greater flexibility and resistance to cyclic fatigue and torsional stress, a significant benefit of these

files is the fact that most canal systems with moderate bending (about 80%) can be instrumented with only one file and without prior patency with hand instruments of smaller diameter [2, 11, 21, 24, 25, 26].

Research confirms that extended lifespan of NiTi files with reciprocal movements is mainly due to specific design solutions of the working part and physical properties of NiTi alloy [4], ie. special thermal treatments of alloy to optimize its microstructure [3, 4, 27, 28]. These files are mainly made of specific NiTi alloy and M-wire that in the martensitic phase becomes softer and more flexible and provides the file with extreme efficiency and greater resistance to cyclic fatigue [28-31].

MECHANICAL CHARACTERISTICS OF RECIPROCAL FILES

Numerous factors (therapist's skill and expertise, canal anatomy, design and material from which the file was made, movement dynamics and file reuse) have been found to affect NiTi file fractures, while deformations and fractures of files with reciprocal movements are less common than file with full rotation [1, 5, 6, 10, 31, 32].

The introduction of new, especially heat-treated NiTi alloys (M-wire, CM-wire, MAX-wire) improved mechanical properties of files with reciprocal movements, ie. special technological procedures after making files (electropolishing, ion implantation) significantly increased flexibility and resistance to cyclic fatigue [5, 7, 9, 27, 33, 34]. The specific design of the working part of the NiTi file ensures reduced file engagement during dentin cutting (less contact with the walls during movement in the canal) and thus less torsional load (the torque is directly proportional to the surface of the engaged file), which significantly increase its resistance [2, 5, 10, 19, 29]. Alternating file movement and shorter rotational path (compared to full rotation) are less likely to lead to screwing in the canal, while the use of single files significantly reduces time and stress during biomechanical instrumentation, which also affects increased resistance to cyclic fatigue and prolongs file life [1, 2, 5, 35]. Some researchers associate extended file duration with reciprocal movements with increased file flexibility [1, 36, 37], ie. greater resistance to cyclic fatigue during instrumentation [1, 2, 5, 30, 35, 37]. It has been confirmed that deformation or fracture of the file most often occurs with increasing speed, ie increasing the cutting angle [38, 39]. It has also been found that NiTi files designed for full rotation have higher resistance to cyclic fatigue when used in reciprocal movement dynamics [13, 34, 40].

DENTIN CUTTING EFFICIENCY

NiTi files with reciprocal movements cannot completely clean the canal system, but these files effectively remove dentin from almost all surfaces of canal walls due to primarily specific design of the working part, its surface treatment, but also the dynamics of movement in the canal

[1, 5, 11, 12, 13, 20, 41, 42]. Although only one file is usually used for canal instrumentation and canal treatment takes less time (the irrigation effect is weaker), satisfactory blade efficiency [1, 11, 42] and efficient removal of debris and smear layer from canal walls have been confirmed [1, 20, 43, 44]. A SEM study to check the efficiency of canal wall cleaning using two NiTi systems with reciprocal movements (UNICONE, RECIPROC BLUE) found that these files do not completely remove the smear layer, but provide efficient cleaning of the apical region of the canal [44]. The efficacy of files with reciprocal movements in removing smear layer was confirmed in the apical segment of the canal [5, 12, 41, 45-48] and blade efficiency can be reduced only due to their prolonged (multiple) clinical use [1, 38].

During canal instrumentation, these files follow the path of least resistance, provide better centering and in most canals can be used without first creating patency with hand instruments, which is mandatory and necessary for files with full rotation [2, 25]. Reciprocal movements provide less risk of transportation [2, 13, 49] and extrusion of canal contents into periapical tissue [1, 13, 49, 50, 51]. However, there are also studies that indicate somewhat higher extrusion of contents from the canal compared to files with full rotation [47, 52]. In the preparation of highly curved canals, NiTi files with reciprocal movements are as effective as those with full rotation because they do not change the curvature and do not lead to canal transportation [53, 54, 55].

Shaping of "S" canals using PROTAPER files (with full rotation and reciprocal turns) and WAVE ONE files showed that the best results can be achieved using PROTAPER files with reciprocal movements [1, 13, 56]. Single NiTi files with reciprocal movements confirmed similar possibilities in canal shaping and preservation of the original morphology as the self-adjusting file (SAF) with transaxial (vibrating) movements [13, 57, 58, 59].

Comparing the efficiency of files with full rotation and reciprocal movements in cleaning and shaping the canal, it was noticed that no system completely provided clean canal walls, as some parts of the canal system remained intact [13, 60, 61]. In the retreatment procedure (demanding and long procedure), full rotation NiTi file system and reciprocal movement system indicated effective removal of inadequate filling, but no system was able to completely clean and prepare the canal [62, 63, 64] and eliminate extrusion of obturation material into the periapical tissues [64]. An important benefit of the concept of instrumentation with one file with reciprocal movements is significantly shorter canal instrumentation time [2, 5, 16, 19], regardless of whether the total shaping time included instrumentation, cleaning, file change and irrigation [58, 61] or only duration of mechanical shaping without additional procedures [17, 65].

CLINICAL EFFECTS OF FILES WITH RECIPROCAL MOVEMENTS

Data on the clinical application of single files with reciprocal movements are relatively numerous, and available

findings confirm satisfactory efficacy in canal preparation. Apart from shorter time for biomechanical treatment [16, 19, 58, 61], efficient elimination of bacteria [66] and reduction of postoperative pain [67, 68], these files are a good choice for the retreatment of inadequately endodontically treated canals [63, 64].

Two systems with reciprocal and 2 systems with full rotation were used in a study (48 single-rooted teeth with infected canals) and it was concluded that both systems (reciprocal: RECIPROC, WAVE ONE; full rotation: PROTAPER, M TWO) provide similar efficiency, but none completely eliminates all bacteria from the dental canal system [69]. A clinical study where the preparation and obturation of dental canals with apical periodontitis was performed using NiTi files with reciprocal movements showed similar effects as manual instrumentation, but canal processing was faster, simpler and less stressful for the patient [70]. A clinical study evaluating the effect of reducing bacteria in the canal after the application of NiTi files with different dynamics of movement confirmed a slightly better biomechanical effect of files with reciprocal movements in oval canals with apical periodontitis [66].

Comparison of the effectiveness of 3 different systems in canal preparation (WAVE ONE, ONE SHAPE, SAF) and postoperative pain after canal instrumentation indicated similar effects of tested files and the occurrence of minimal pain after treatment in one visit [68]. Similar finding and significant pain reduction was observed after instrumentation of the canal with single files with reciprocal movements and a set with several files with full rotation with significantly shorter time and faster intervention using files with reciprocal movements [67].

In the recent years, it has been confirmed that the system with reciprocal movements is also safe, simple and very acceptable concept of preparation for those who use it for the first time, as well as for students in postgraduate education [71]. Another study also confirmed that files with reciprocal movements (WAVE ONE, RECIPROC), used in education by undergraduate students, were easy to use and that very few defects and fractures were observed during the instrumentation of 826 teeth (2056 canals) [72].

CONCLUSION

The concept of canal instrumentation with NiTi files with reciprocal movements increases the file's resistance to cyclic fatigue and torsional loading, which significantly reduces the risk of their fracture and prolongs durability.

Reciprocal movements provide efficient mechanical removal of dentin from all parts of the canal walls, good shaping and centering of the canal while preserving the original anatomy, but they cannot completely remove all debris and smear layer.

Instrumentation of canals with single files with reciprocal movements can be realized in most canals without prior patency with hand instruments that significantly shorten the preparation time and provide safe and less stressful canal treatment.

Although very simple and practical, the concept of reciprocal file movements still does not meet all the requirements of optimal canal instrumentation, therefore new strategies are needed in search of more efficient and complete biomechanical instrumentation.

REFERENCES

- Plotino G, Ahmed HM, Grande NM, Cohen S, Bukiet F. Current Assessment of Reciprocation in Endodontic Preparation: A Comprehensive Review--Part II: Properties and Effectiveness. *J Endod.* 2015;41(12):1939–50. [DOI: 10.1016/j.joen.2015.08.018] [PMID: 26480824]
- Van der Vyver PJ, Jonker C. Reciprocating instruments in endodontics: a review of the literature. *SADJ.* 2014;69(9):404–9. [PMID: 26571923]
- Hamdy TM, Galal M, Ismail AG, Abdelraouf RM. Evaluation of Flexibility, Microstructure and Elemental Analysis of Some Contemporary Nickel-Titanium Rotary Instruments. *Open Access Maced J of Med Sci.* 2019;7(21):3647–54. [DOI: 10.3889/oamjms.2019.811] [PMID: 32010393]
- Haapasalo M, Shen Y. Evolution of Nickel-titanium instruments: from past to future. *Endod Topics.* 2013;29(1):3–17. [DOI: 10.1111/etp.12049]
- Gavini G, Santos MD, Caldeira CL, Machado MEL, Freire LG, Iglecias EF, et al. Nickel-titanium instruments in endodontics: a concise review of the state of the art. *Braz Oral Res.* 2018;32(suppl 1):e67. [DOI: 10.1590/1807-3107bor-2018.vol32.0067] [PMID: 30365608]
- Gutmann JL, Gao Y. Alteration in the inherent metallic and surface properties of nickel-titanium root canal instruments to enhance performance, durability and safety: a focused review. *Int Endod J.* 2012;45(2):113–28. [DOI: 10.1111/j.1365-2591.2011.01957.x] [PMID: 21902705]
- Gambarini G, Grande NM, Plotino G, Somma F, Garala M, De Luca M, et al. Fatigue resistance of engine-driven rotary nickel-titanium instruments produced by new manufacturing methods. *J Endod.* 2008;34(8):1003–5. [DOI: 10.1016/j.joen.2008.05.00] [PMID: 18634935]
- Karataş E, Arslan H, Büker M, Seçkin F, Çapar ID. Effect of movement kinematics on the cyclic fatigue resistance of nickel-titanium instruments. *Int Endod J.* 2016; 49(4):361–4. [DOI: 10.1111/iej.12453] [PMID: 25816834]
- Alcalde MP, Tanomaru-Filho M, Bramante CM, Duarte MAH, Guerreiro-Tanomaru JM, Camilo-Pinto J, et al. Cyclic and Torsional Fatigue Resistance of Reciprocating Single Files Manufactured by Different Nickel-titanium Alloys. *J Endod.* 2017;43(7):1186–91. [DOI: 10.1016/j.joen.2017.03.008] [PMID: 28527852]
- Živković S, Popović Bajić M, Jovanović-Medojević M, Nešković J. How to prevent fracture of NiTi files. *Serb Dent J.* 2021;68(2):86–92. [DOI: 10.2298/SGS2102086Z]
- Poggio C, Dagna A, Chiesa M, Scribante A, Beltrami R, Colombo M. Effects of NiTi rotary and reciprocating instruments on debris and smear layer scores: an SEM evaluation. *J Appl Biomater Funct Mater.* 2014;12(3):256–62. [DOI: 10.5301/jabfm.5000161] [PMID: 24425380]
- de Carvalho FM, Gonçalves LC, Marques AA, Alves V, Bueno CE, De Martin AS. Cleaning Effectiveness of a Reciprocating Single-file and a Conventional Rotary Instrumentation System. *Open Dent J.* 2016;10:704–13. [DOI: 10.2174/1874210601610010704] [PMID: 28217185]
- Salloum S, Torbey C, Bassam S, Claudia DIB. Reciprocal and continuous rotation is two sides of the same coin. *J Dent Health Oral Disord Ther.* 2018;9(3):210–3. [DOI: 10.15406/jdhodt.2018.09.00380]
- Kiefner P, Ban M, De-Deus G. Is the reciprocating movement per se able to improve the cyclic fatigue resistance of instruments? *Int Endod J.* 2014;47(5):430–6. [DOI: 10.1111/iej.12166] [PMID: 24033466]
- Yared G. Canal preparation using only one Ni-Ti rotary instrument: preliminary observations. *Int Endod J.* 2008;41(4):339–44. [DOI: 10.1111/j.1365-2591.2007.01351.x] [PMID: 18081803]
- Sharma P, Goel M, Verma S, Sachadeva GS, Sharma N, Kumar V. Entering A New Era in Endodontics with Revolutionary Single File Systems: A Comprehensive Review. *EC Dent Sci.* 2016;5(3):1100–22.
- You SY, Bae KS, Baek SH, Kum KY, Shon WJ, Lee W. Lifespan of one NiTi rotary file with reciprocation motion in curved root canals. *J Endod.* 2010;36(12):1991–4.
- Varela-Patiño P, Ibañez-Párraga A, Rivas-Mundiña B, Cantatore G, Otero XL, Martín-Biedma B. Alternating versus continuous rotation: a comparative study of the effect on instrument life. *J Endod.* 2010;36(1):157–9. [DOI: 10.1016/j.joen.2009.09.023] [PMID: 20003957]
- Živković S, Popović Bajić M, Jovanović Medojević M, Nešković J. Single file endodontic treatment – a perspective endodontic concept. *Vojnosanit Pregl.* 2022;79(1):86–93. [DOI: 10.2298/VSP210524078Z]
- De-Deus G, Marins J, Silva EJ, Souza E, Belladonna FG, Reis C, et al. Accumulated hard tissue debris produced during reciprocating and rotary nickel-titanium canal preparation. *J Endod.* 2015;41(5):676–81. [DOI: 10.1016/j.joen.2014.11.028] [PMID: 25670245]
- Neelakantan P, Reddy P, Gutmann JL. Cyclic fatigue of two different single files with varying kinematics in a simulated double-curved canal. *J Investig Clin Dent.* 2016;7(3):272–7. [DOI: 10.1111/jicd.12159] [PMID: 25940837]
- Kaval ME, Capar IC, Ertas H. Evaluation of cyclic fatigue and torsional resistance of novel nickel-titanium rotary files with various alloys properties. *J Endod.* 2016;42(12):1840–3. [DOI: 10.1016/j.joen.2016.07.015] [PMID: 27776878]
- Kuzekanani M. Nickel-Titanium Rotary Instruments: Development of the Single-File Systems. *J Int Soc Prev Community Dent.* 2018;8(5):386–90. [DOI: 10.4103/jispcd.JISPCD_225_18] [PMID: 30430063]
- Lee WL, Hwang YJ, You SY, Kim HC. Effect of reciprocation usage of nickel-titanium rotary files on the cyclic fatigue resistance. *Aust Endod J.* 2013;39(3):146–50. [DOI: 10.1111/j.1747-4477.2012.00352.x] [PMID: 24279662]
- Saber SE, Schäfer E. Incidence of dentinal defects after preparation of severely curved root canals using the Reciproc single-file system with and without prior creation of a glide path. *Int Endod J.* 2016;49(11):1057–64. [DOI: 10.1111/iej.12555] [PMID: 26426069]
- De-Deus G, Arruda TE, Souza EM, Neves A, Magalhães K, Thuanne E, et al. The ability of the Reciproc R25 instrument to reach the full root canal working length without a glide path. *Int Endod J.* 2013;46(10):993–8. [DOI: 10.1111/iej.12091] [PMID: 23560929]
- Srivastava S, Alghadouni MA, Alotheem HS. Current Strategies in Metallurgical Advances of Rotary NiTi Instruments: A Review. *J Dent Health Oral Disord Ther.* 2018;9(1):72–7. [DOI: 10.15406/jdhodt.2018.09.00333]
- Chen X, Ophus C, Song C, Ciston J, Das S, Song Y, et al. Origins of the transformability of Nickel-Titanium shape memory alloys. *Phys Rev Materials.* 2020;4. [DOI: 10.1103/physrevmaterials.4.103611]
- Palekar A, Vajpayee A, Biradar B. Recent advances in metallurgy and design of rotary endodontic instruments: a review. *Int J Dent Mater.* 2020;2(2):52–9. [DOI: 10.37983/IJDM.2020.2204]
- Gambarini G, Galli M, Nardo D, Seracchiani M, Donfrancesco O, Testarelli L. Differences in cyclic fatigue lifespan between two different heat treated NiTi endodontic rotary instruments: WaveOne Gold vs EdgeOne Fire. *J Clin Exp Dent.* 2019;11(7):609–13. [DOI: 10.4317/jced.55839] [PMID: 31516658]
- Alfouzan K, Jamleh A. Fracture of nickel titanium rotary instrument during root canal treatment and re-treatment: a 5-year retrospective study. *Int Endod J.* 2018;51(2):157–63. [DOI: 10.1111/iej.12826] [PMID: 28796346]
- Boutsoukiou C, Lambrianidis T. Factors affecting intracanal instrument fracture. In: Lambrianidis T. (eds). *Management of Fractured Endodontic Instruments.* Cham: Springer; 2018. p. 31–60. [DOI: 10.1007/978-3-319-60651-4_2]

33. Zupanc J, Vadhat-Pajouh N, Schafer E. New thermomechanically treated NiTi alloys – a review. *Int Endod J.* 2018;51(10):1088–103. [DOI: 10.1111/iej.12924] [PMID: 29574784]
34. De-Deus G, Silva EJ, Vieira VT, Belladonna FG, Elias CN, Plotino G, et al. Blue Thermomechanical Treatment Optimizes Fatigue Resistance and Flexibility of the Reciproc Files. *J Endod* 2017;43(3):462–6. [DOI: 10.1016/j.joen.2016.10.039] [PMID: 28131415]
35. Pedullà E, Plotino G, Grande NM, Scibilia M, Pappalardo A, Malagnino VA, et al. Influence of rotational speed on the cyclic fatigue of Mtwo instruments. *Int Endod J.* 2014;47(6):514–9. [DOI: 10.1111/iej.12178] [PMID: 23992374]
36. Lopes HP, Viera MV, Elias CN, Siqueira JF Jr, Mangelli M, Lopes WS, et al. Fatigue life of Wave One and Pro Taper instruments operated in reciprocating or continuous rotation movements and subjected to dynamic and static test. *Endo (long engl).* 2013;7:217–22.
37. Wan J, Rasimick BJ, Musikant BL, Deutsch AS. A comparison of cyclic fatigue resistance in reciprocating and rotary nickel-titanium instruments. *Aust Endod J.* 2011;37(3):122–7. [DOI: 10.1111/j.1747-4477.2010.00222.x] [PMID: 22117719]
38. Gambarini G, Rubini AG, Al Sudani D, Gergi R, Culla A, De Angelis F, et al. Influence of different angles of reciprocation on the cyclic fatigue of nickel-titanium endodontic instruments. *J Endod.* 2012;38(10):1408–11. [DOI: 10.1016/j.joen.2012.05.019] [PMID: 22980189]
39. Castelló-Escrivà R, Alegre-Domingo T, Faus-Matoses V, Román-Richon S, Faus-Llácer VJ. In vitro comparison of cyclic fatigue resistance of ProTaper, WaveOne, and Twisted Files. *J Endod.* 2012;38(11):1521–4. [DOI: 10.1016/j.joen.2012.07.010] [PMID: 23063228]
40. Pérez-Higueras JJ, Arias A, de la Macorra JC, Peters OA. Differences in cyclic fatigue resistance between ProTaper Next and ProTaper Universal instruments at different levels. *J Endod.* 2014;40(9):1477–81. [DOI: 10.1016/j.joen.2014.02.025] [PMID: 25146037]
41. Plotino G, Giansiracusa Rubini A, Grande NM, Testarelli L, Gambarini G. Cutting efficiency of Reciproc and waveOne reciprocating instruments. *J Endod.* 2014;40(8):1228–30. [DOI: 10.1016/j.joen.2014.01.041] [PMID: 25069938]
42. Elashiry MM, Saber SE, Elashry SH. Comparison of Shaping Ability of Different Single-File Systems Using Microcomputed Tomography. *Eur J Dent.* 2020;14(1):70–6. [DOI: 10.1055/s-0040-1701393] [PMID: 32005040]
43. Nešković J, Ninković N, Opačić-Galić V, Jovanović-Medojević M, Popović-Bajić M, Maksimović M, et al. The influence of the final irrigation protocol on the efficiency of root canal cleaning. *Srp Arh Celok Lek.* 2020;148(1–2):10–6. [DOI: 10.2298/SARH190513132N]
44. Živković S, Nešković J, Popović-Bajić M, Medojević-Jovanović M. The efficiency of canal cleaning with reciprocating movements instruments-SEM study. *Srp Arh Celok Lek.* 2020;148(3–4):148–52. [DOI: 10.2298/SARH190412002Z]
45. Robberecht L, Dehurtevent M, Lemaitre G, Béhal H, Hornez JC, Claisse-Crinquette A. Influence of Root Canal Curvature on Wall Cleanliness in the Apical Third during Canal Preparation. *Eur Endod J.* 2017;2(1):1–6. [DOI: 10.5152/eej.2017.16035] [PMID: 33403324]
46. Uslu G, Özyürek T, Yılmaz K, Gündoğar M, Plotino G. Apically Extruded Debris during Root Canal Instrumentation with Reciproc Blue, HyFlex EDM, and XP-endo Shaper Nickel-titanium Files. *J Endod.* 2018;44(5):856–9. [DOI: 10.1016/j.joen.2018.01.018] [PMID: 29550013]
47. Bürklein S, Schäfer E. Apically extruded debris with reciprocating single-file and full-sequence rotary instrumentation systems. *J Endod.* 2012;38(6):850–2. [DOI: 10.1016/j.joen.2012.02.017] [PMID: 22595125]
48. Živković S, Nešković J, Jovanović Medojević M, Popović Bajić M, Ostojić D. Efficiency of root canal cleaning using a single instrument with reciprocating motion systems and full rotation systems: sem study. *Serb Dent J.* 2018;65(4):171–8. [DOI: 10.2478/sdj-2018-0016]
49. Zan R, Tunç T, Hubbezoğlu İ, Sümer Z. Apical extrusion of intracanal biofilm using ProTaper Gold, WaveOne Gold, Twisted File Adaptive, OneShape New Generation and K3XF. *Eur Endod J.* 2016;1(1):1–6. [DOI: 10.5152/eej.2016.16017] [PMID: 32566898]
50. De-Deus G, Neves A, Silva EJ, Mendonça TA, Lourenço C, Calixto C, et al. Apically extruded dentin debris by reciprocating single-file and multi-file rotary system. *Clin Oral Investig.* 2015;19(2):357–61. [DOI: 10.1007/s00784-014-1267-5] [PMID: 24950606]
51. Tinoco JM, De-Deus G, Tinoco EMB, Saavedra F, Fidel RAS, Sassone LM. Apical extrusion of bacteria when using reciprocating single-file and rotary multifele instrumentation systems. *Int Endod J.* 2014;47(6):560–6. [DOI: 10.1111/iej.12187] [PMID: 24111671]
52. Ozsu D, Karatas E, Arslan H, Topcu MC. Quantitative evaluation of apically extruded debris during root canal instrumentation with ProTaper Universal, ProTaper Next, WaveOne, and self-adjusting file systems. *Eur J Dent.* 2014;8(4):504–8. [DOI: 10.4103/1305-7456.143633] [PMID: 25512732]
53. D'Amario M, De Angelis F, Mancino M, Frascaria M, Capogreco M, D'Arcangelo C. Canal shaping of different single-file systems in curved root canals. *J Dent Sci.* 2017;12(4):328–32. [DOI: 10.1016/j.jds.2017.03.001] [PMID: 30895071]
54. Nevares G, de Albuquerque DS, Freire LG, Romeiro K, Fogel HM, Dos Santos M, et al. Efficacy of ProTaper NEXT Compared with Reciproc in Removing Obturation Material from Severely Curved Root Canals: A Micro-Computed Tomography Study. *J Endod.* 2016;42(5):803–8. [DOI: 10.1016/j.joen.2016.02.010] [PMID: 27117757]
55. Delai D, Jardine AP, Mestieri LB, Boijink D, Fontanella VRC, Grecca FS, et al. Efficacy of a thermally treated single file compared with rotary systems in endodontic retreatment of curved canals: a micro-CT study. *Clin Oral Investig.* 2019;23(4):1837–44. [DOI: 10.1007/s00784-018-2624-6] [PMID: 30215147]
56. Giuliani V, Di Nasso L, Pace R, Pagavino G. Shaping ability of waveone primary reciprocating files and ProTaper system used in continuous and reciprocating motion. *J Endod.* 2014;40(9):1468–71. [DOI: 10.1016/j.joen.2014.02.024] [PMID: 25146035]
57. Yoo YS, Cho YB. A comparison of the shaping ability of reciprocating NiTi instruments in simulated curved canals. *Restor Dent Endod.* 2012;37(4):220–7. [DOI: 10.5395/rde.2012.37.4.220] [PMID: 23430033]
58. Bürklein S, Bente S, Schäfer E. Shaping ability of different single-file systems in severely curved root canals of extracted teeth. *Int Endod J.* 2013;46(6):590–7. [DOI: 10.1111/iej.12037] [PMID: 23240965]
59. Siqueira JF Jr, Alves FR, Versiani MA, Rôças IN, Almeida BM, Neves MA, et al. Correlative bacteriologic and micro-computed tomographic analysis of mandibular molar mesial canals prepared by self-adjusting file, reciproc, and twisted file systems. *J Endod.* 2013;39(8):1044–50. [DOI: 10.1016/j.joen.2013.04.034] [PMID: 23880274]
60. Busquim S, Cunha RS, Freire L, Gavini G, Machado ME, Santos M. A micro-computed tomography evaluation of long-oval canal preparation using reciprocating or rotary systems. *Int Endod J.* 2015;48(10):1001–6. [DOI: 10.1111/iej.12398] [PMID: 25314154]
61. Saber SE, Nagy MM, Schäfer E. Comparative evaluation of the shaping ability of WaveOne, Reciproc and OneShape single-file systems in severely curved root canals of extracted teeth. *Int Endod J.* 2015;48(1):109–14. [DOI: 10.1111/iej.12289] [PMID: 24673737]
62. Zuolo AS, Mello JE Jr, Cunha RS, Zuolo ML, Bueno CE. Efficacy of reciprocating and rotary techniques for removing filling material during root canal retreatment. *Int Endod J.* 2013;46(10):947–53. [DOI: 10.1111/iej.12085] [PMID: 23506150]
63. Silva EJ, Orłowsky NB, Herrera DR, Machado R, Krebs RL, Coutinho-Filho Tde S. Effectiveness of rotary and reciprocating movements in root canal filling material removal. *Braz Oral Res.* 2015;29:1–6. [DOI: 10.1590/1807-3107bor-2015.vol29.0008] [PMID: 25466331]
64. Rios Mde A, Villela AM, Cunha RS, Velasco RC, De Martin AS, Kato AS, et al. Efficacy of 2 reciprocating systems compared with a rotary retreatment system for gutta-percha removal. *J Endod.* 2014;40(4):543–6. [DOI: 10.1016/j.joen.2013.11.013] [PMID: 24666908]
65. Hwang YH, Bae KS, Baek SH, Kum KY, Lee W, Shon WJ, et al. Shaping ability of the conventional nickel-titanium and reciprocating nickel-titanium file systems: a comparative study using micro-computed tomography. *J Endod.* 2014;40(8):1186–9. [DOI: 10.1016/j.joen.2013.12.032] [PMID: 25069930]

66. Amaral RR, Guimarães Oliveira AG, Braga T, Reher P, de Macêdo Farias L, Magalhães PP, et al. Quantitative Assessment of the Efficacy of Two Different Single-file Systems in Reducing the Bacterial load in Oval-Shaped Canals: A Clinical Study. *J Endod.* 2020;46(9):1228–34. [DOI: 10.1016/j.joen.2020.06.007] [PMID: 32653532]
67. Bartols A, Laux G, Walther W. Multiple-file vs. single-file endodontics in dental practice: a study in routine care. *PeerJ.* 2016;4:e2765. [DOI: 10.7717/peerj.2765] [PMID: 27957398]
68. Jain N. & Pawar A. & Gupta A. Incidence and severity of postoperative pain after canal instrumentation with reciprocating system, continuous rotary single file system, versus SAF system. *Endodontic practice.* 2016;10(3):153–60.
69. Martinho FC, Gomes AP, Fernandes AM, Ferreira NS, Endo MS, Freitas LF, et al. Clinical comparison of the effectiveness of single-file reciprocating systems and rotary systems for removal of endotoxins and cultivable bacteria from primarily infected root canals. *J Endod.* 2014;40(5):625–9. [DOI: 10.1016/j.joen.2013.12.006] [PMID: 24767554]
70. de Figueiredo FED, Lima LF, Oliveira LS, Ribeiro MA, Correa MB, Brito Júnior M, et al. Effectiveness of a reciprocating single file, single cone endodontic treatment approach: a randomized controlled pragmatic clinical trial. *Clin Oral Investig.* 2020;24(7):2247–57. [DOI: 10.1007/s00784-019-03077-7] [PMID: 31650315]
71. Mahmoodi B, Azaripour A, Sagheb K, Sagheb K, Willershausen B, Weusmann J. Undergraduate Students' Acceptance of a Reciprocating One-File System for Endodontic Treatment. *Eur J Dent.* 2020;14(3):393–6. [DOI: 10.1055/s-0040-1710142] [PMID: 32438431]
72. Caballero-Flores H, Nabeshima CK, Binotto E, Machado MEL. Fracture incidence of instruments from a single-file reciprocating system by students in an endodontic graduate programme: a cross-sectional retrospective study. *Int Endod J.* 2019;52(1):13–8. [DOI: 10.1111/iej.12982] [PMID: 29985528]

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Recipročni pokreti endodontskih instrumenata – jednostavnija i izvesnija terapijska procedura

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KRATAK SADRŽAJ

Brojna tehnološka rešenja poslednjih godina značajno su unapredila čišćenje i oblikovanje kanala i preparaciju kanala učinila jednostavnijom, efikasnijom i sigurnijom. Specifičnim dizajnom radnog dela instrumenta i posebnom termičkom modifikacijom NiTi legure uz promenu dinamike kretanja turpije u kanalu omogućena je znatno brža i za terapeuta manje stresna obrada kanala.

Istraživanja su ukazala da se problemi cikličnog zamora i torzionog naprezanja instrumenta tokom preparacije kanala mogu rešiti promenom uobičajene kontinuirane rotacije turpije. Kao alternativu punoj rotaciji turpije, dentalna tehnologija je predstavila tehniku recipročnih pokreta. Ova naizmenična promena smera rotacije turpije tokom obrade bazira se na tehnici balansiranih sila, značajno smanjuje površinu kontakta sa zidom kanala, isključuje efekat ušrafljivanja, produžava vek instrumentu i dodatno povećava sigurnost instrumentacije različitih kanalskih sistema. Važna prednost promene uobičajene dinamike kretanja turpija je i u tome što koncept recipročnih pokreta bazira na upotrebi samo jednog instrumenta koji osim što skraćuje vreme obrade, ovu intervenciju čini sigurnijom i sa znatno manjim procentom defekata i preloma NiTi instrumenata.

Cilj ovog rada je da predstavi koncept preparacije kanala NiTi instrumentima sa recipročnim pokretima i prikaže razvoj, osobine i mogućnost primene ovih turpija u različitim kliničkim situacijama.

Ključne reči: recipročni pokreti; NiTi instrumenti; preparacija kanala

UVOD

Početak ovog veka endodontska instrumentacija je značajno unapređena, a čišćenje i oblikovanje kanala postalo je jednostavnije, efikasnije i sigurnije. Zahvaljujući toj činjenici, frustracije brojnih stomatologa zbog mogućih fraktura NiTi turpija tokom preparacije prilično su ublažene [1, 2]. Različita tehnološka rešenja poslednjih godina, vezana za termičku modifikaciju i transformaciju NiTi legure [3, 4], specifičan dizajn radnog dela instrumenta (poprečni presek; broj, izgled i raspored sečiva; koničnost) [4, 5] odnosno promenu dinamike kretanja instrumenta u kanalu (recipročni, ekscentrični, transaksijalni) učinila su ovaj terapijski postupak znatno bržim i manje stresnim [5]. Aktuelni koncepti dizajniranja radnog dela NiTi instrumenata usmereni su pre svega ka povećanju njihove sečivne efikasnosti i smanjenju površinskog kontakta sa zidovima kanala, čime se značajno smanjuje i mogućnost pojave deformacija i fraktura [5, 6, 7]. Istraživanja su pokazala da su dva najčešća razloga za pojavu loma NiTi turpija ciklični zamor (naizmenično izlaganje instrumenta silama zatezanja na spoljašnjoj i silama kompresije na unutrašnjoj strani) i torziono naprezanje instrumenta (ušrafljivanje u predelu krivine kanala) [5, 6].

Važan iskorak u rešavanju ovog problema bila je strategija promene uobičajene dinamike kretanja NiTi instrumenta tokom obrade kanala [2, 7, 8, 9, 10]. Kao alternativu kontinuiranoj rotaciji dentalna tehnologija je predstavila tehniku recipročnih pokreta NiTi turpija u kanalu [1, 5, 9, 10, 11]. Ova naizmenična promena smera rotacije NiTi turpije tokom obrade bazira se na tehnici balansiranih sila, značajno smanjuje površinu kontakta sa zidom kanala i time eliminiše kumulativni efekat savijajućih sila u predelu krivine [5, 7]. Recipročnim pokretom turpija punu rotaciju ostvari u tri naizmenična pokreta, čime se značajno smanjuje ciklični zamor i torzioni stres, isključuje se efekat ušrafljivanja (koji se javlja kod pune rotacije) i značajno produžava vek instrumentu [7, 12, 13]. Klinička procena 1696 korišćenih NiTi turpija sa recipročnim pokretima je ukazala

na izuzetno nisku učestalost preloma (0,47%) i deformacija (0,35%) iako je ponovna upotreba ovih sistema relativno česta u kliničkoj praksi [5].

Popularnost sistema sa recipročnim pokretima u endodontskom lečenju zuba bazira se pre svega na odličnim *in vitro* i *in vivo* rezultatima vezanim za mehanička svojstva, dobro oblikovanje i odsustvo deformacija na turpijama nakon preparacije različitih kanalskih sistema [3, 4, 5, 9]. Potvrđeno je da recipročni pokret turpije, koji podrazumeva najpre rotaciju u smeru suprotnom kazaljki sata (sekući smer) i potom mnogo kraću rotaciju u smeru kazaljke (opuštanje), utiče na smanjenje kontakta sa zidovima kanala, eliminiše potrebu za pritiskom, povećava kapacitet sečenja i dodatno povećava sigurnost tokom rada [1, 2, 9, 14].

Prvu eksperimentalnu studiju o efektima recipročnih pokreta u preparaciji kanala predstavio je Yared 2008. godine koristeći instrument PRO TAPER F2 (inače namenjen za punu rotaciju) sa različitim uglovima rotacije i malim pritiskom [15]. U početku se smatralo da se konvencionalne turpije namenjene za punu rotaciju mogu koristiti i u tehnici sa recipročnim pokretima, dok su danas radni delovi NiTi instrumenata dizajnirani isključivo za recipročne pokrete [5, 11, 15].

Cilj ovog rada je da predstavi koncept preparacije kanala NiTi instrumentima sa recipročnim pokretima i prikaže razvoj, osobine i mogućnost primene ovih turpija u različitim kliničkim situacijama.

RAZVOJ NITI INSTRUMENTATA SA RECIPROČNIM POKRETIMA

Dinamični naponi endodontista i dentalne tehnologije u poslednje dve decenije su između ostalog usmereni ka dizajniranju NiTi instrumenata, koji će obezbediti efikasno sečenje dentina, povećati efekat irigansa i medikamenata, odnosno obezbediti najbolju geometriju kanala za kompletnu opturaciju kanalskog

sistema [4, 5]. Drugi, ne manje važan zahtev je povećanje otpornosti turpije i sprečavanje pojava mogućih deformacija i fraktura tokom biomehantičke pripreme kanala [4, 5, 16, 17].

Upravo zbog značajno smanjenog cikličnog zamora i torzionog stresa, recipročni pokreti su preporučeni za kliničku praksu, a ova strateška odluka se pokazala ispravnom jer je uslovlila znatno manji procenat preloma NiTi instrumenata [11, 18]. Važna prednost promene uobičajene dinamike kretanja turpija je i u tome što ovaj koncept preparacije bazira na upotrebi samo jednog instrumenta (SINGLE FILE), koji, osim što skraćuje vreme instrumentacije (3-4 puta) i time štedi vreme pacijentu i endodontisti, ovu intervenciju čini znatno sigurnijom i predvidljivijom [5, 11, 16, 19, 20].

Instrumenti sa recipročnim pokretima koji su zamenili koncept pune rotacije uveden krajem osamdesetih godina prošlog veka pripadaju četvrtoj generaciji NiTi instrumenata i na tržištu su se pojavili 2011. godine [5, 6, 16, 19, 21]. Većina ovih turpija je aktivna prilikom rotacije u smeru suprotnom kazaljki sata (uglovi rotacije 120°–270°; smer kazaljke sata 60°–90°) (UNICONE, WAVE ONE, WAVE ONE GOLD, RECIPROC, RECIPROC BLUE, PRO DESIGN R, X1 BLUE FILE), ali postoje i sistemi koji uklanjaju parakanalni dentin (seku) prilikom pokreta u smeru kazaljke sata (GENIUS, PRO DESIGN S) [2, 5, 16, 18, 19]. Dok se turpija rotira u kanalu u smeru suprotnom kazaljki sata dolazi do sečenja parakanalnog dentina i njenog laganog pomeranja prema apeksu. Posle ovog sledi pokret sa kraćom rotacijom (u smeru kazaljke sata) koji osigurava da se instrument oslobodi prekomernog torzionog naprezanja i time spreči njegovo ukleštenje i mogući lom u kanalu [2, 21–24].

Uz veću fleksibilnost i veću otpornost na ciklični zamor i torzioni stres, značajna prednost ovih turpija je i činjenica da se većina kanalskih sistema sa umerenom povijenošću (oko 80%) može obraditi samo jednim instrumentom i bez prethodne prohodnosti ručnim instrumentima manjeg promera [2, 11, 21, 24, 25, 26].

Istraživanja potvrđuju da je produženi vek trajanja NiTi instrumenata sa recipročnim pokretima uglavnom posledica specifičnih dizajnerskih rešenja radnog dela i fizičkih svojstava NiTi legure [4], odnosno posebnih termičkih tretmana legure radi optimizacije njene mikrostrukture [3, 4, 27, 28]. Ove turpije su uglavnom izrađene od specifične NiTi legure i M-žice koja u martenzitnoj fazi postaje mekša i fleksibilnija i obezbeđuje instrumentu izrazitu efikasnost i veću otpornost na ciklični zamor [28, 29, 30, 31].

MEHANIČKE KARAKTERISTIKE RECIPROČNIH TURPIJA

Utvrđeno je da na pojavu preloma NiTi instrumenata utiču brojni faktori (veština i stručnost terapeuta, anatomija kanala, dizajn i materijal od koga je instrument izrađen, dinamika kretanja i ponovna upotreba turpije) i da su deformacije i frakture turpija sa recipročnim pokretima ređe nego kod turpija sa punom rotacijom [1, 5, 6, 10, 31, 32].

Na poboljšanje mehaničkih osobina turpija sa recipročnim pokretima uticalo je uvođenje novih, posebno termički tretiranih NiTi legura (M-wire, CM-wire, MAX-wire), odnosno posebnih tehnoloških postupaka posle izrade instrumenata (elektropoliranje, jonska implantacija), koji su značajno uticali na povećanu fleksibilnost i otpornost na ciklični zamor [5, 7, 9,

27, 33, 34]. Specifični dizajn radnog dela NiTi turpija obezbeđuje smanjenu angažovanost instrumenta tokom sečenja dentina (manji kontakt sa zidovima tokom kretanja u kanalu) a time i manje torziono opterećenje (tork je direktno proporcionalan površini angažovanog instrumenta), čime mu se izrazito povećava otpornost [2, 5, 10, 19, 29]. Naizmenični pokret turpije i kraća rotaciona putanja (u odnosu na punu rotaciju) ređe dovodi do ušrafljivanja u kanalu, dok primena pojedinačnih instrumenata izrazito skraćuje vreme i stres tokom biomehantičke obrade, što takođe utiče na povećavanu otpornost na ciklični zamor i produžava vek turpije [1, 2, 5, 35]. Pojedini istraživači produženo vreme trajanja turpije sa recipročnim pokretima povezuju sa povećanom fleksibilnošću instrumenta [1, 36, 37], odnosno većom otpornošću na ciklični zamor tokom instrumentacije [1, 2, 5, 30, 35, 37]. Potvrđeno je da do deformacije ili preloma instrumenta najčešće dolazi sa povećanjem brzine, odnosno povećanjem ugla sečenja [38, 39]. Utvrđeno je takođe da NiTi instrumenti dizajnirani za punu rotaciju imaju veću otpornost na ciklični zamor kada se koriste u dinamici recipročnih pokreta [13, 34, 40].

EFIKASNOST SEČENJA DENTINA

NiTi instrumenti sa recipročnim pokretima ne mogu potpuno očistiti kanalski sistem, ali ove turpije efikasno uklanjaju dentin sa skoro svih površina zidova kanala zahvaljujući pre svega specifičnom dizajnu radnog dela, njegovom površinskom tretmanu, ali i dinamici kretanja u kanalu [1, 5, 11, 12, 13, 20, 41, 42]. Iako se za instrumentaciju kanala najčešće koristi samo jedna turpija i obrada kanala kraće traje (slabiji je efekat irigacije), potvrđena je zadovoljavajuća sečivna efikasnost [1, 11, 42] i efikasno uklanjanje debrisa i razmaznog sloja sa zidova kanala [1, 20, 43, 44]. U SEM studiji provere efikasnosti čišćenja zidova kanala primenom dva NiTi sistema sa recipročnim pokretima (UNICONE, RECIPROC BLUE) uočeno je da ove turpije ne uklanjaju potpuno razmazni sloj, ali obezbeđuju efikasno čišćenje apikalne regije kanala [44]. Efikasnost turpija sa recipročnim pokretima u uklanjanju razmaznog sloja potvrđena je i u apeksnom segmentu kanala [5, 12, 41, 45–48], a sečivna efikasnost može biti smanjena samo usled njihove produžene (višestruke) kliničke upotrebe [1, 38].

Ove turpije tokom preparacije kanala prate put najmanjeg otpora, obezbeđuju bolje centriranje i kod većine kanala se mogu koristiti bez prethodnog kreiranja prohodnosti ručnim instrumentima, koje je obavezno i neophodno kod turpija sa punom rotacijom [2, 25]. Recipročni pokreti obezbeđuju manji rizik od transportacije [2, 13, 49] i ekstruzije kanalnog sadržaja u periapeksno tkivo [1, 13, 49, 50, 51]. Međutim, postoje i istraživanja koja ukazuju na nešto veću ekstruziju sadržaja iz kanala u poređenju sa turpijama sa punom rotacijom [47, 52]. U preparaciji izrazito povijenih kanala NiTi instrumenti sa recipročnim pokretima su podjednako efikasni kao i oni sa punom rotacijom jer ne menjaju krivinu i ne dovode do transportacije kanala [53, 54, 55].

Oblikovanje „S“ kanala primenom turpija PRO TAPER (sa punom rotacijom i recipročnim pokretima) i turpija WAVE ONE ukazalo je na najbolje rezultate primenom PRO TAPER instrumenta sa recipročnim pokretima [1, 13, 56]. Pojedinačne NiTi turpije sa recipročnim pokretima su potvrdile slične mogućnosti

u oblikovanju kanala i čuvanju originalne morfologije kao i samopodešavajuća turpija (SAF) sa transaksijalnim (vibrirajućim) pokretima [13, 57, 58, 59].

Poređenjem efikasnosti turpija sa punom rotacijom i recipročnim pokretima u čišćenju i oblikovanju kanala uočeno je da nijedan sistem nije u potpunosti obezbedio čiste zidove kanala, jer su pojedini delovi kanalskog sistema ostali netaknuti [13, 60, 61].

U postupku retreatmana (zahtevan i dug postupak) sistem NiTi instrumenata sa punom rotacijom i sistem sa recipročnim pokretima su ukazali na efikasno uklanjanje neadekvatnog punjenja, ali nijedan sistem nije bio u stanju da potpuno očistiti i pripremi kanal [62, 63, 64] i eliminiše ekstruziju opturacionog materijala u periapiksna tkiva [64].

Važna prednost koncepta preparacije jednim instrumentom sa recipročnim pokretima je značajno kraće vreme preparacije kanala [2, 5, 16, 19], bez obzira na to da li ukupno vreme oblikovanja uključuje pripremu, čišćenje, promenu turpija i irigaciju [58, 61] ili samo trajanje mehaničkog oblikovanja bez dodatnih postupaka [17, 65].

KLINIČKI EFEKTI TURPIJA SA RECIPROČNIM POKRETIMA

Podaci o kliničkoj primeni pojedinačnih turpija sa recipročnim pokretima su relativno brojni, a dostupni nalazi potvrđuju zadovoljavajuću efikasnost u preparaciji kanala. Osim kraćeg vremena za biomehaničku obradu [16, 19, 58, 61], efikasne eliminacije bakterija [66] i redukcije postoperativnog bola [67, 68], ove turpije su dobar izbor i za retreatman neadekvatno endodontski lečenih kanala [63, 64].

U jednoj studiji (48 jednokorenih zuba sa inficiranim kanalima) korišćena su dva sistema sa recipročnim i dva sistema sa punom rotacijom i zaključeno je da oba sistema (recipročni: RECIPROC, WAVE ONE; puna rotacija: PRO TAPER, M TWO) obezbeđuju sličnu efikasnost, ali nijedan ne eliminiše potpuno sve bakterije iz kanalskog sistema zuba [69]. U kliničkoj studiji gde je preparacija i opturacija kanala zuba sa apikalnim parodontitisom realizovana primenom NiTi turpija sa recipročnim pokretima pokazala je slične efekte kao i instrumentacija ručnim, ali je obrada kanala bila brža, jednostavnija i manje stresna za pacijenta [70]. Klinička studija koja je procenjivala efekat redukcije bakterija u kanalu posle primene NiTi instrumenata

sa različitom dinamikom kretanja potvrdila je nešto bolji biomehanički efekat turpija sa recipročnim pokretima u ovalnim kanalima sa apikalnim parodontitisom [66].

Poređenje efikasnosti tri različita sistema u preparaciji kanala (WAVE ONE, ONE SHAPE, SAF) i pojave postoperativnog bola nakon instrumentacije kanala ukazalo je na slične efekte testiranih turpija i pojavu minimalnog bola nakon tretmana u jednoj poseti [68].

Sličan nalaz i značajna redukcija bola uočeni su i posle instrumentacije kanala pojedinačnim turpijama sa recipročnim pokretima i seta sa više turpija sa punom rotacijom uz značajno kraće vreme i bržu intervenciju primenom instrumenata sa recipročnim pokretima [67].

Poslednjih godina je potvrđeno da je sistem sa recipročnim pokretima siguran, jednostavan i vrlo prihvatljiv koncept preparacije i za one koji ga koriste prvi put, kao i za studente na posle diplomskoj edukaciji [71]. Druga studija je takođe potvrdila da su instrumenti sa recipročnim pokretima (WAVE ONE, RECIPROC), koje su u edukaciji koristili studenti na osnovnim studijama, bili jednostavni za primenu i da je tokom instrumentacije 826 zuba (2056 kanala) uočeno vrlo malo grešaka i fraktura [72].

ZAKLJUČAK

Koncept instrumentacije kanala NiTi turpijama sa recipročnim pokretima povećava otpornost turpije na ciklični zamor i torziona opterećenje, čime se značajno smanjuje rizik za pojavu frakture i produžava trajnost NiTi turpije.

Recipročni pokreti obezbeđuju efikasno mehaničko uklanjanje dentina sa svih delova zidova kanala, dobro oblikovanje i centriranje kanala uz očuvanje originalne anatomije, ali ne mogu u potpunosti ukloniti sav debris i razmazni sloj.

Instrumentacija kanala pojedinačnim turpijama sa recipročnim pokretima se u najvećem broju kanala može realizovati bez prethodne prohodnosti ručnim instrumentima, čime se značajno skraćuje vreme preparacije i obezbeđuje sigurna i manje stresna obrada kanala.

Iako vrlo jednostavan i praktičan, koncept recipročnih pokreta turpije još uvek ne ispunjava sve zahteve optimalne pripreme kanala, pa su neophodne nove strategije u potrazi za efikasnijom i kompletnijom biomehaničkom obradom.

Multidisciplinary approach in the rehabilitation of partial edentulousness – adjunctive orthodontic and subsequent prosthodontic treatment

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SUMMARY

Introduction Malocclusions in partially edentulous patients represent a special rehabilitation challenge in dentistry. In patients who, in addition to orthodontic problem, also have a certain number of missing teeth, it is necessary to approach in a multidisciplinary manner. This approach implies a synergy of conservative, orthodontic and prosthetic treatment.

The aim of this paper was to present a patient with partial edentulism including upper left canine palatally located that was successfully rehabilitated with orthodontic and subsequent fixed prosthodontic treatment.

Case report The clinical examination of the 24-year-old patient was followed by additional orthodontic analysis that included analysis of study models, X-rays, and photographs. The patient was found to have ectopic teeth 13 and 23, reverse overbite of the tooth 12, and tooth 26 was extracted in childhood. Due to the prevalence of carious lesions and tooth destruction, the attending dentist planned extraction of teeth 16, 14, 24, 25. It was decided to conduct adjunctive orthodontic treatment in order to achieve tooth levelling and move teeth to the positions planned in the previous analysis. After completion of orthodontic treatment, fixed prosthodontic work was done to achieve complete functional and aesthetic rehabilitation.

Keywords: partial edentulousness; adjunctive orthodontics; ectopia; zirconia

INTRODUCTION

According to the criteria of the World Health Organization, edentulous patients are categorized as people with physical disabilities due to difficulties in achieving proper chewing and speech [1]. Research and reports by the World Health Organization indicate that the edentulism in the population of Bosnia and Herzegovina over the age of 65 is as high as 78% [2]. Often, missing teeth are accompanied by a certain degree of malocclusion. There are various methods of classification of partial edentulousness, of which Kennedy's is the most common. According to this classification, Class I represents bilateral edentulous areas, Class II unilateral edentulous areas, Class III unilateral edentulous area with natural teeth remaining both anterior and posterior to it, and Class IV represents the edentulous space in the front area [3]. Although there is a large amount of research on the frequency of Kennedy's classification and choice of treatment, unfortunately, such data are not available for the population of Bosnia and Herzegovina. The therapeutic approach of partial edentulousness in relation to the degree of severity and patient's age may include mobile prosthodontic replacement, fixed prosthodontic replacements and implant- prosthodontic rehabilitation. A special challenge in the care of partially

edentulous patients is when, in addition to the primary problem, there is present malocclusion of remaining teeth including tooth ectopy. The palatal position of the ectopic canine is twice as common as the buccal position [4].

Adjunctive orthodontic treatment of adult patients is used as a pre-treatment in dental rehabilitation when the aim is to correct the position and arrangement of existing teeth and use them to replace those that are missing. Such treatment requires a more comprehensive treatment plan. Due to adjunctive orthodontic therapy in adult patients, it is possible to move teeth in order to facilitate subsequent dental treatments. Adjunctive orthodontic treatment is coordinated with other procedures included in the treatment plan, periodontal and restorative. Typically, only a part of the teeth is included in the fixed orthodontic appliance, and the treatment itself lasts several months to a year, sometimes a little longer. With such orthodontic treatment, the aim is to achieve reposition of teeth that have moved to edentulous space due to premature tooth loss (extraction) and thus to get optimal to ideal conditions for prosthodontic rehabilitation. With this treatment, the teeth are levelled for the best possible aesthetical restoration; fractured teeth are moved in order to make satisfactory crowns. The planning of adjunctive therapy is based on a list of problems and represents a complex process where the teamwork of



Figure 1. Initial orthopantomogram
Slika 1. Početni ortopantomogram



Figure 2. Intraoral photo showing teeth position and condition after extraction of upper right first premolar and first molar, and upper left first and second premolar
Slika 2. Intraoralna fotografija koja opisuje položaj zuba i stanje nakon ekstrakcije gornjeg desnog prvog premolara i prvog molara, te gornjeg levog prvog i drugog premolara

several therapists is required. In the dental team, the key professional is the restorative dentist, while the orthodontist is the one who allows better implementation of the restoration plan. The decision on how to treat a partially edentulous patient is made after creating the full treatment plan, i.e., clinical examination, analysis of X-rays and photographs. Prior to commencing orthodontic treatment, it is necessary to perform rehabilitation of existing dental (caries, pulp/periodontal infections, residual roots) and periodontal diseases.

The aim of this paper was to present a patient with partial edentulism including upper left canine palatally located that was successfully rehabilitated with orthodontic and subsequent fixed prosthodontic treatment.

CASE REPORT

Clinical examination of a 24-year-old patient revealed a number of dental problems, caries of large number of



Figure 3. Occlusal view of the upper arch and palatal position of the upper left canine
Slika 3. Okluzalni prikaz gornjeg luka i palatinalnog položaja gornjeg levog očnjaka



Figure 4. Review of the progress of orthodontic therapy: the first row photo describes the condition immediately after the positioning of the brackets, the second row photo shows the therapy progress after ten months and the third row shows the condition at the end of the therapy just before removing the brackets.

Slika 4. Prikaz napredovanja ortodontske terapije: u prvom redu fotografija opisuje stanje neposredno nakon postavljanja bravica, u drugom redu je prikazan progres terapije nakon deset meseci i u trećem redu je prikazano stanje na završetku terapije neposredno pred skidanje bravica.

teeth, irregular ectopic position of tooth 23 located palatally, as well as tooth 13 located vestibularly, reverse overbite of the tooth 12, tooth 26 extracted long time ago, and asymmetries caused by teeth loss. After the examination, an orthopantomogram was performed for a more detailed analysis of the case (Figure 1). Additionally, periapical



Figure 5. Intraoral view of anterior and lateral segments after orthodontic-prosthetic rehabilitation

Slika 5. Intraoralni prikaz frontalnog i bočnih segmenata nakon ortodontsko protetske rehabilitacije



Figure 6. Occlusal view of the upper arch after the treatment completion

Slika 6. Okluzalni prikaz gornjeg luka nakon završene terapije

imaging was performed to assess observed periapical lesions. After a team analysis of X-rays and in agreement with the patient, the orthodontist decided to extract teeth 16, 14, 24 and 25. Active carious lesions rehabilitation of the remaining teeth was performed prior to initiating orthodontic treatment while prosthodontic treatment was done after.

Orthodontic analysis was obtained on the basis of clinical examination, analysis of study models, X-rays and photographs [5] (Figures 2 and 3). The goal of the adjunctive orthodontic treatment was to level the teeth of the upper front, i.e., to level the incisors and bring the upper right lateral incisor into the normal overbite, then bring both upper canines in correct positions. The conventional metal brackets were used - discovery, Dentaaurum, Roth 22 prescription 0.022 inch. The brackets were applied after cleaning and polishing the teeth, and enamel etching with 37.5% orthophosphoric acid [6]. The adhesive material used to fix the brackets was Heliosit Orthodontic Ivoclar Vivadent. Brackets on each tooth were placed in precise

position as in the case of comprehensive orthodontic therapy. It is important to emphasize that sometimes during adjunctive orthodontic therapy it is desirable to place the bracket on the supporting teeth in a position that will not change the teeth location [7]. In the first stage of treatment that lasted three months a series of elastic archwires - NiTi (0.012, 0.014, 0.016, 0.016×0.016 inches) were used, achieving the levelling of the brackets in all three spatial planes, i.e., corrected inclinations, rotations of all teeth and reverse overbite. After the elastic NiTi arch wires, a steel archwire was placed, 0.016×0.016, followed by 0.017×0.025. The teeth of the intercanine sector, except the tooth 23, were tied in the block and represented a support unit for traction of the teeth 15 with the aim of closing the extraction space created by extraction of the tooth 14. An elastic chain was used for that purpose. Traction of the tooth 23 from the palate was performed by extrusion with vestibular elastic thread, then with elastic chain. When the conditions were met, an accessory NiTi archwire of 0.012 inches in diameter was placed in the upper left canine bracket. Ten months after the beginning of treatment, all teeth were positioned correctly (Figure 4). The entire treatment lasted thirteen months. After achieving the planned results with the adjunctive orthodontic treatment, the patient's fixed orthodontic appliance was removed. For the retention of the achieved condition, a fixed retainer was placed on the palatal side of the front teeth. The retainer covered all teeth of the intercanine sector except the tooth 23, since this tooth needed to become an abutment tooth for prosthodontic rehabilitation. The prosthodontic phase involved the construction of two fixed prosthetic devices (bridges), a bridge containing two abutment teeth and one pontic tooth was planned on the right side, while bridge on the left side contained two abutment teeth and two pontic teeth. The bridges were made of zirconia. The procedure of bridge development involved the preparation of the abutment teeth, taking impressions, then preparation and placement of temporary crowns made of polymethylmethacrylate (PMMA). The next step was to test the zirconia construction, which was done by the process of shofu ceramics layering. After the final step, the bridges were fixed with composite cement (Figures 5 and 6).

DISCUSSION

The case report presents the successful rehabilitation of a patient with partial edentulousness and orthodontic anomaly (ectopic teeth 13 and 23). There are many challenges that dentists face in the treatment of patients with this diagnosis: hard and soft tissue health, patient motivation, and optimal oral hygiene. The oral health of the patient in this case was extremely poor due to the presence of extensive carious lesions on a number of teeth and poor soft tissue condition. With the beginning of the therapy, the patient changed her previous habits of oral hygiene and adopted and implemented all the recommendations in order to preserve oral health.

In conditions that are characterized by teeth misalignment and the lack of a certain number of teeth, it is

necessary to have multidisciplinary approach to develop a treatment plan [8]. The goal of the orthodontic prosthetic rehabilitation plan is to achieve an individual optimum both from the aesthetical aspect as well as functional aspect. In this case, the lesser challenge posed by orthodontic treatment was the levelling of teeth, placement of teeth 13 and closure of the extraction space created by tooth extraction 14. On the other hand, traction of the tooth 23 from the palatal position posed bigger orthodontic challenge. Numerous sources pointed to the fact that palatal ectopic position of canine was much more common compared to buccal [9]. Isik Aslan and Ucuncu [10] concluded that maxillary canines play a very important role in the formation of facial aesthetics and smiles, and provide support to other teeth with their protective role in function. Therefore, it was extremely important to preserve ectopic canines and bring them into the dentition.

Ectopic tooth 23 was positioned in the dentition in order to reduce the edentulous space and use it as an abutment tooth for bridge. In order to move the ectopic tooth, it was necessary to provide space during orthodontic treatment by the extraction of the destroyed tooth 24, one of the four teeth planned for extraction. In cases with ectopic teeth, it is crucial to make a correct diagnosis that allows the correct positioning of the tooth in the bone. This means centering the tooth in the alveolar bone in the area where the gingiva was the most massive.

When planning orthodontic treatment that includes moving one or more teeth, it is necessary to provide an anchorage that resists reactive forces. Teeth do not represent an absolute anchorage because their reactive displacement always occurs. Lee KJ and Park YC [11] explained that when force is applied to a tooth or to a segment of an active unit from a placed mini-implant in the alveolar bone, the reactive unit does not manifest itself on the mini-implant, so there is no fear of “losing an anchorage”. So the ideal solution for this patient was to place a mini implant for tooth traction 23. Although the benefits of using a mini implant were explained to the patient, she still declined the proposed treatment plan. For this reason, mesial movement of tooth 27 for 1.5 mm occurred.

After the orthodontic treatment, teeth were prepared for bridges and the material of choice was zirconia ceramics. Zirconia ceramics is one of the newer materials used in prosthodontics. They meet all three criteria that a material should have-biocompatibility, aesthetics and functionality. The advantage of zirconia ceramics is reflected in a fact that it does not cause allergic reactions, has low affinity to retain plaque and bacteria, which reduces the possibility of gingival inflammation. Zirconia ceramics is characterized by strength and resistance to breakage. Teeth made of this material possess the characteristics of natural teeth. According to the research, the sustainability of bridges made of zirconia ranges between 95.4 and 98% after ten years [12]. CAD-CAM technology enables high precision production of zirconia crowns in a very short period of time. In this case, prosthetic rehabilitation was completed through three visits.

The disadvantage of this type of treatment is the reduction of four teeth in a patient who has already suffered the

loss of a certain number of teeth. A better option in this case would be prosthetic rehabilitation of partial edentulousness by crowns on implants.

CONCLUSION

The therapeutic procedure for patients who have malocclusion with partial edentulism is complex. The success of the rehabilitation treatment of such patients depends on a multidisciplinary treatment plan. Although the treatment plan included the extraction of four teeth, primarily due to their low biological value, the final result indicated that this treatment plan was optimal. A 24 years old patient with poor oral health and ectopic teeth 13 and 23, thirteen months after adjunctive orthodontic and subsequent prosthodontics treatment was provided with satisfactory and stable results from aesthetical and functional point of view.

REFERENCES

1. Lee DJ, Saponaro PC. Management of Edentulous Patients. *Dent Clin North Am.* 2019;63(2):249–61. [DOI: 10.1016/j.cden.2018.11.006] [PMID: 30825989]
2. Polzer I, Schimmel M, Muller F, Biffar R. Edentulism as part of the general health problems of elderly adults. *Int Dent J.* 2010;60(3):143–55. [DOI: 10.1922/IDJ_2184Polzer13] [PMID: 20684439]
3. Ozkurt-Kayahan Z, Ozcakil Tomruk C, Kazazoglu E. Partial edentulism and treatment options. *Yeditepe Dental Journal.* 2017;13(1):31–6. [DOI: 10.5505/yeditepe.2017.62207]
4. Sachan A, Chaturvedi T. Orthodontic management of buccally erupted ectopic canine with two case reports. *Contemp Clin Dent.* 2012;3(1):123–8. [DOI: 10.4103/0976-237X.94563] [PMID: 22557914]
5. Nakaš E, Tiro A, Džemidžić V, Redžepagić-Vražalica L, Ajanović M. *Osnovi ortodontske dijagnostike.* 1st ed. Sarajevo: Stomatološki fakultet sa klinikama; 2014.
6. Demirović D. *Osnovi fiksne tehnike u ortodonticiji.* 1st ed. Demirović D, editor. Sarajevo: Stomatološki fakultet-Sarajevo, Arka Press- Sarajevo; 2005.
7. Proffit WR, Sarver DM, Fields Jr. HW. *Ortodoncija* Šljaj M, editor. Jastrebarsko: Naklada Slap; 2010.
8. Rubinstein S, Levin BP, Michalczyk ER, Razdolsky Y, Fujiki T. The Importance of Interdisciplinary Treatment in an Esthetically Challenging Case. *Compend Contin Educ Dent.* 2021;42(1):e5–e9. [PMID: 33481620]
9. Husain J, Burden D, McSherry P. Management of the Palatally Ectopic Maxillary Canine. *National clinical guidelines for management of the palatally ectopic maxillary canine.* 2012;213(4):171–6. [DOI: 10.1038/sj.bdj.2012.726] [PMID: 22918345]
10. Isik Aslan B, Ucuncu N. Clinical Consideration and Management of Impacted Maxillary Canine Teeth. *IntechOpen.* 2015. [DOI: 10.5772/59324]
11. Lee K, Park Y. The biomechanics of miniscrews. In: *Burstone C, Choy K. The Biomechanical Foundation of Clinical Orthodontics.* Quintessence Publishing Co; 2015.
12. Groß K, Wolfart S. Interfaces between orthodontics and prosthodontics: interdisciplinary possibilities and “innovations”. *DZZ International.* 2020;2(5). [DOI: 10.3238/dzz-int.2020.0160-0167]

Multidisciplinarni pristup u rehabilitaciji parcijalne bezubosti – pomoćni ortodontski tretman i protetska nadoknada

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KRATAK SADRŽAJ

Uvod Malokluzije kod parcijalno bezubih pacijenata predstavljaju poseban rehabilitacijski izazov u stomatologiji. Kod pacijenata koji pored ortodontskog problema imaju i određen broj zuba koji nedostaju potrebno je pristupiti multidisciplinarno. Taj pristup podrazumeva sinergiju konzervativnog, ortodontskog i protetskog tretmana.

Cilj rada je predstavljanje pacijenta sa parcijalnom bezubošću, palatinalno smeštenim gornjim levim očajnikom, koji su uspešno rešeni ortodontskim tretmanom i izradom fiksnih protetskih radova.

Prikaz slučaja Nakon kliničkog pregleda pacijentkinje starosti 24 godine, usledila je dodatna ortodontska analiza koja je obuhvata analizu studijskih modela, rendgenskih snimaka i fotografija. Utvrđeno je da pacijentkinja ima ektopične zube 13 i 23, obrnut preklap zuba 12, te u detinjstvu izvađen zub 26. S obzirom na raširenost karioznih lezija i destrukciju zuba, ordinirajući stomatolog planirao je ekstrakciju zuba 16, 14, 24, 25. Odlučeno je da se provede pomoćna ortodontska terapija s ciljem postizanja nivelacije zuba te pomeranje zuba na pozicije koje su prethodnom analizom isplanirane, te da se nakon ortodontskog tretmana pristupi izradi protetskih fiksnih radova kako bi se postigla potpuna rehabilitacija pacijenta kako sa funkcionalnog tako i sa estetskog aspekta.

Ključne reči: parcijalna bezubost; pomoćna ortodoncija; ektopija; cirkonijumska keramika

UVOD

Prema kriterijumima Svetske zdravstvene organizacije, bezubi pacijenti spadaju u osobe sa telesnim oštećenjima, upravo zbog otežane mogućnosti pravilnog žvakanja i govora [1]. Istraživanja i izveštaji Svetske zdravstvene organizacije ukazuju na podatak da bezubost stanovnika Bosne i Hercegovine starijih od 65 godina iznosi visokih 78% [2]. Neretko, pacijente sa bezubošću prati i određeni stepen malokluzije. Postoje različite metode klasifikacije parcijalne bezubosti, od kojih je Kenedijeva najzastupljenija. Prema toj klasifikaciji, klasa I predstavlja obostrani bočni nedostatak zuba, klasa II unilateralni bočni nedostatak zuba, klasa III unilateralni prekinuti zubni niz bočno, klasa IV bezubi prostor u predelu fronta [3]. Iako postoji veliki broj istraživanja o učestalosti Kenedijeve klasifikacije i izbora tretmana, nažalost, takvih podataka nema za stanovništvo Bosne i Hercegovine. Terapijski pristup parcijalne bezubosti u odnosu na stepen izraženosti, godine pacijenta, može obuhvatati mobilno protetsko nadomeštanje, fiksne protetske nadomestke te implanto-protetsku rehabilitaciju.

Poseban izazov u zbrinjavanju parcijalno bezubih pacijenata je kada, uz primarni problem, postoji i stanje malokluzije u smislu nepravilnog položaja preostalih zuba, posebno ukoliko postoji i slučaj ektopije zuba. Palatinalni položaj ektopičnog očajnika je duplo više zastupljen u odnosu na bukalni položaj [4].

Pomoćni ortodontski tretman odraslih pacijenata se koristi kao predtretman u dentalnoj rehabilitaciji kada se želi ispraviti položaj i raspored postojećih zuba i iskoristiti ih za nadomeštanje onih koji nedostaju, što zahteva opsežniji terapijski plan. Zahvaljujući pomoćnoj ortodontskoj terapiji kod odraslih pacijenata moguće je pomerati zube u cilju olakšavanja drugih stomatoloških tretmana kojima se kontrolišu dentalna oboljenja. Pomoćna ortodontska terapija se usklađuje sa drugim zahvatima koji su obuhvaćeni planom terapije, parodontološkim i restaurativnim. Najčešće je u fiksnu ortodontsku napravu uključen samo deo zuba i sam tretman traje nekoliko meseci do godinu dana, nekada nešto duže. Pomoćnom ortodontskom terapijom postiže se repozicija zuba koji su migrirali u bezubi prostor koji

je nastao usled preranog gubitka zuba, odnosno nakon ekstrakcije, te se na taj način dobijaju optimalni do idealni uslovi za izradu protetskog rada. Zatim, ovom terapijom se nivelišu zubi za što bolju estetsku restauraciju, izvlače frakturirani zubi kako bi se izradila zadovoljavajuća krunica i slično. Planiranje pomoćne terapije se bazira na osnovu liste problema kod pacijenta i predstavlja složen proces gde je potrebno timsko delovanje više terapeuta. U timu stomatologa glavna karika je restaurativni stomatolog, dok je ortodont taj koji omogućava samo bolje izvođenje plana restauracije. Odluku kako tretirati parcijalno bezubog pacijenta se donosi nakon formiranja liste problema, odnosno nakon kliničkog pregleda, analize rendgenskih snimaka i fotografija. Pre početka ortodontskog tretmana potrebno je sanirati postojeća oboljenja zuba (karijes, periapikalni procesi, zaostali korenovi) i oboljenja parodonticija.

Cilj ovog rada je da se prikaže način na koji je rešen problem nepravilno postavljenih zuba fiksnim ortodontskim tretmanom, te kako je rešena retencija i nadomešten gubitak zuba fiksnim protetskim radovima.

PRIKAZ SLUČAJA

Kliničkim pregledom pacijentkinje starosti 24 godine uočen je niz problema, karijes velikog broja zuba, ektopičan položaj zuba 23, koji je smešten palatinalno, kao i zuba 13, koji je smešten vestibularno, obrnuti preklap zuba 12, davno ekstrahirani zub 26, te asimetrije nastale gubitkom zuba. Nakon pregleda urađen je ortopantomogram za detaljniju analizu slučaja (Slika 1). Dodatno su urađeni retroalveolarni snimci radi analize uočenih periapikalnih lezija. Nakon timske analize rendgenskih snimaka i u dogovoru sa pacijentkinjom, ordinirajući stomatolog odlučio je da se ekstrahuju zubi 16, 14, 24 i 25. Na preostalim zubima potrebno je da se saniraju aktivne kariozne lezije, te urade pomoćni ortodontski tretman i protetska nadoknada.

Nakon završenog konzervativnog zbrinjavanja pacijentkinje usledila je ortodontska terapija. Rezultati ortodontske analize

su dobiveni na osnovu kliničkog pregleda, analizom studijskih modela, rendgenskih snimaka i fotografija [5] (slike 2 i 3).

Cilj pomoćnog ortodontskog tretmana je bio iznivelisati zube gornjeg fronta, odnosno iznivelisati sekutiće i gornji desni lateralni sekutić dovesti u normalan preklap, zatim postaviti oba gornja očnjaka na pravilne pozicije u zubnom nizu.

U tretmanu su korištene konvencionalne metalne bravice – Discovery, Dentaurum, Roth preskripcije širine 0,022 inča.

Postavci bravica prethodi čišćenje i poliranje zuba, zatim jetkanje cakline 37,5% ortofosfornom kiselinom [6]. Adhezivni materijal korišten za fiksaciju bravica je Heliosit Orthodontic – ivoclar vivadent. Kod ove pacijentkinje, gde se sprovodila pomoćna ortodontska terapija, odlučeno je da se postave bravice na svakom zubu u preciznoj poziciji, kao kod sveobuhvatne ortodontske terapije. Ovo je potrebno posebno naglasiti zbog činjenice da je ponekad kod pomoćne ortodontske terapije, na zubima koji predstavljaju uporište, poželjno postaviti bravicu u poziciju kojom se neće menjati njihov položaj [7]. U prvom stadijumu lečenja, koji je trajao tri meseca, korišćena je serija elastičnih lukova – NiTi (0,012, 0,014, 0,016, 0,016 × 0,016 inča), čime je postignuta nivelacija bravica u sve tri prostorne ravni, odnosno korigovani su nagibi, rotacije svih zuba i obrnut preklap. Nakon elastičnih NiTi lukova postavljen je čelični luk 0,016 × 0,016, zatim 0,017 × 0,025, zubi interkaninog sektora, izuzev zuba 23, bili su vezani u blok i predstavljali su uporišnu jedinicu za privlačenje zuba 15 s ciljem zatvaranja ekstrakcionog prostora nastalog vađenjem zuba 14. U tu svrhu korišćen je elastični lanac. Trakcija zuba 23 iz palatuma se vršila elastičnim koncem, zatim elastičnim lancem. Kada su se stekli uslovi, u bravicu gornjeg levog očnjaka je stavljen akcesorni NiTi luk promera 0,012 inča. Deset meseci od početka terapije svi zubi su bili uključeni u isti luk i spremni za privođenje ortodontske terapije kraju (Slika 4).

Celokupni tretman je trajao trinaest meseci. Nakon postignutih planiranih rezultata pomoćnim ortodontskim tretmanom pacijentkinji je uklonjen fiksni ortodontski aparat. Za retenciju postignutog stanja postavljen je fiksni retiner sa palatinalne strane frontalnih zuba. Retinerom su obuhvaćeni svi zubi interkaninog sektora osim zuba 23, jer je on predviđen kao nosač protetskog rada. Protetska faza je podrazumevala izradu dva fiksna protetska rada (mosta), sa desne strane je planiran most koji sadrži dva člana i jedan međučlan, a sa leve strane most od dva člana i dva međučlana. Mostovi su izrađeni od cirkonijumske keramike. Procedura izrade mostova je uključivala preparaciju zuba nosača, uzimanje otisaka, zatim izradu privremenih krunica od polimetilmetakrilata (PMMA). Sledeći korak je bio proba konstrukcije od cirkona, koja je rađena slojevanjem shofu keramikom. Nakon završnog sloja mostovi su fiksirani kompozitnim cementom (slike 5 i 6).

DISKUSIJA

Prikazom slučaja predstavljena je uspešna rehabilitacija pacijentkinje sa parcijalnom bezubošću i ortodontskom nepravilnošću (ektopija zuba 13 i 23). Brojni su izazovi sa kojima se stomatolozi susreću u terapiji pacijenata sa navedenom dijagnozom: zdravlje tvrdih i mekih tkiva, motivacija pacijenta, optimalna oralna higijena. Oralno zdravlje pacijentkinje u prikazanom slučaju je bilo izuzetno loše zbog prisustva obimnih karioznih lezija na većem broju zuba te lošeg stanja mekih tkiva. Sa početkom

terapije pacijentkinja je promenila dotadašnje navike oralne higijene i usvojila i provodila sve preporuke u cilju očuvanja oralnog zdravlja.

Kod stanja koja karakterišu nepravilno položeni zubi i nedostatak određenog broja zuba za izradu plana terapije potrebno je pristupiti multidisciplinarno [8]. Zadatak ortodontsko-protetskog plana rehabilitacije je bio postizanje individualnog optimuma, kako sa aspekta estetike tako i sa aspekta funkcije. U ovom slučaju, manji izazov je predstavljala nivelacija zuba, smeštaj zuba 13 te zatvaranje ekstrakcionog prostora nastalog vađenjem zuba 14. S druge strane, smeštanje zuba 23 iz palatinalnog položaja predstavljalo je veći ortodontski izazov. Brojni izvori literature ukazuju na činjenicu da je palatinalna ektopija očnjaka mnogo više zastupljena u odnosu na bukalnu [9]. Isik Aslan i Ucuncu [10] smatraju da maksilarni očnjaci imaju veoma važnu ulogu u formiranju estetike lica i osmeha, te pružaju podršku ostalim zubima svojom zaštitnom ulogom pri funkciji. Stoga je od izuzetne važnosti bilo očuvati ektopične očnjake i dovesti ih u zubni niz. Ektopični zub 23 smešten je u zubni niz kako bi se smanjio bezubi prostor i iskoristio kao nosač protetskog rada. Kako bi se smestio ektopičan zub prilikom ortodontskog tretmana, bilo je neophodno obezbediti prostor ekstrakcijom destruiranog zuba 24, jednog od četiri zuba terapijom planirana za ekstrakciju. U slučajevima kada postoji ektopija zuba od ključne važnosti je pravilno postaviti dijagnozu kojom se omogućava pravilno pozicioniranje zuba u kosti. Ovo podrazumeva centriranje zuba u alveolarnom nastavku i to u području gde je gingiva najmasivnija. Prilikom planiranja ortodontske terapije kod pomeranja jednog ili više zuba potrebno je obezbediti uporište koje se opire reaktivnim silama. Zubi ne predstavljaju apsolutno uporište jer uvek dolazi do njihovog reaktivnog pomeranja. Lee KJ i Park YC [11] smatraju da kada se sila primeni na zub ili na segment aktivne jedinice iz postavljenog mini-implantata u alveolarnoj kosti, reaktivna jedinica se ne ispoljava na mini-implantat, stoga strah od „gubitka uporišta“ ne postoji. Tako da je kod ove pacijentkinje bilo idealno rešenje postaviti mini-implantat za trakciju zuba 23. Iako su pacijentkinji objašnjene prednosti primene mini-implantata, ona je ipak odbila taj plan terapije. Iz tog razloga je došlo do mezijalizacije zuba 27 u vrednosti od 1,5 mm.

Nakon ortodontskog tretmana pristupilo se izradi protetskih radova, materijal izbora je bio cirkonijumska keramika. Cirkonijumska keramika se ubraja u novije materijale za izradu protetskih nadomestaka u stomatologiji. Ispunjava sva tri kriterijuma koja jedan materijal treba da ima: biokompatibilnost, estetika i funkcionalnost. Prednost cirkonijumske keramike je da ne uzrokuje alergijske reakcije, plak i bakterije se teže zadržavaju, što smanjuje mogućnost gingivalne upale. Cirkonijumsku keramiku odlikuje čvrstoća odnosno otpornost na lom. Zubi rađeni od ovog materijala izgledaju kao prirodni zubi. Prema istraživanjima, održivost mostova napravljenih od cirkona se kreće između 95,4 i 98% nakon deset godina [12]. CAD-CAM tehnologija omogućava veliku preciznost izrade cirkonijumskih keramičkih radova u veoma kratkom periodu. U ovom prikazanom slučaju protetska rehabilitacija je završena kroz tri posete.

Nedostatak ovog vida protetskog zbrinjavanja je bio brušenje četiri zuba kod pacijentkinje koja je već pretrpela gubitak određenog broja zuba. Bolja opcija u ovom slučaju bi bila protetska rehabilitacija parcijalne bezubosti izradom protetskih radova na implantatima.

ZAKLJUČAK

Terapijska procedura pacijenata koji imaju malokluziju uz parcijalnu bezubost je kompleksna. Uspešnost rehabilitacijskog tretmana takvih pacijenata zavisi od multidisciplinarnog plana terapije. Iako je planom terapije, na već postojeći nedostatak zuba, bilo predviđeno vađenje dodatna četiri zuba, prevashodno

zbog njihove male biološke vrednosti, konačan rezultat ukazuje na to da je ovaj plan tretmana bio optimalan. Pacijentkinji od 24 godine sa lošim oralnim zdravljem i ektopijom zuba 13 i 23, 13 meseci nakon pomoćne ortodontske terapije, te nakon protetske izrade mostova, omogućeni su zadovoljavajući i stabilni rezultati sa estetskog i funkcionalnog aspekta.

Autotransplantation of wisdom tooth in the alveolus of extracted first mandibular molar

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SUMMARY

Dental autotransplantation is a surgical procedure where tooth or dental germ is transferred from one position to another, within the same person. This way an edentulous area after extraction can be successfully restored without the need of other more invasive approaches. This procedure is recommended in young individuals who have lost permanent molars due to caries complications and have an impacted third molar as a potential donor tooth.

The aim of this report is to present a successful transplantation of wisdom tooth into the alveolus of the first mandibular molar in a case of a young individual.

Keywords: autotransplantation; wisdom tooth; mandibular molar.

INTRODUCTION

Autotransplantations in the region of the mouth are surgical procedures that have become everyday praxis. Autologous mucosa, connective tissue, bone grafts are often used as a part of different therapy solutions. However, tooth as a graft material, is very rarely considered. Dental autotransplantation is defined as the movement of one tooth or dental germ from one position to another, within the same person [1]. Based on time when the donor tooth will be inserted in the receptor alveolus, the transplantation can be immediate or delayed [2].

The most common indication for autotransplantation is the loss of first mandibular molar in young individuals, who also have an impacted lower third molar as a potential donor [3]. Fixed dentures are not recommended in young individuals as they require extensive enamel removal of intact teeth. Implant placement is a better solution but also expensive and it isn't recommended until growth and development of jaws is completed [4]. Other conditions, in which transplantation can be considered, include tooth agenesis, traumatic tooth loss, root resorption, cervical root fractures, localized juvenile periodontitis as well as other pathologies [5, 6].

The objective of this report was to present dental autotransplantation in a young adult person as successful solution in reconstructing an edentulous area after molar extraction and avoiding other more invasive and expensive therapy means.

CASE REPORT

A 20 years old female patient was referred to the Department of Oral Surgery, School of Dental Medicine, University of Belgrade for extraction of the lower right

first molar. Dentist noticed an artificial perforation in the furcation area that could not be repaired and referred the patient for extraction (Figure 1). An orthopantogram also showed impacted wisdom tooth in the same quadrant with mesioangular position and two thirds of the root developed (Figure 2).



Figure 1. Radiographic finding of the tooth indicated for extraction
Slika 1. Radiološki prikaz zuba indikovanog za ekstrakciju

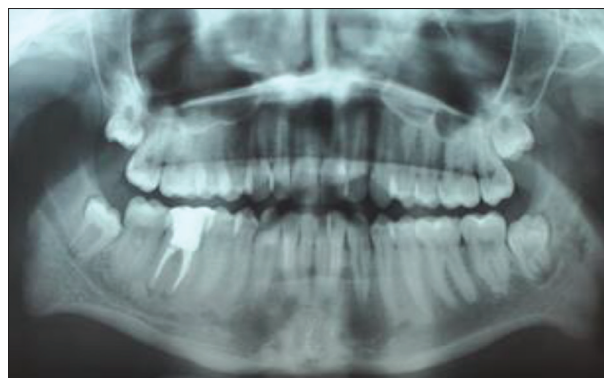


Figure 2. Radiographic finding of the impacted lower right wisdom tooth
Slika 2. Radiološki prikaz impaktiranog donjeg desnog umnjaka

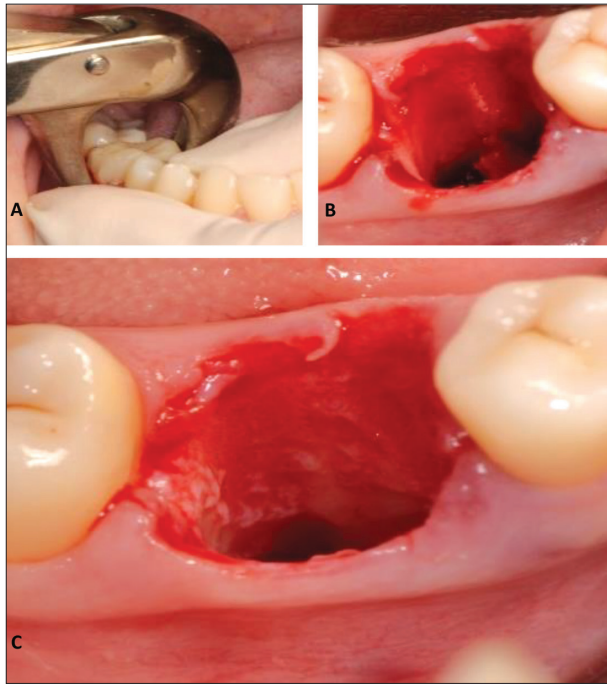


Figure 3. Tooth extraction (A); presence of interradicular septum (B); interradicular septum removed (C)
Slika 3. Ekstrakcija zuba (A); prisutan interradikularni septum (B); uklonjen interradikularni septum (C)

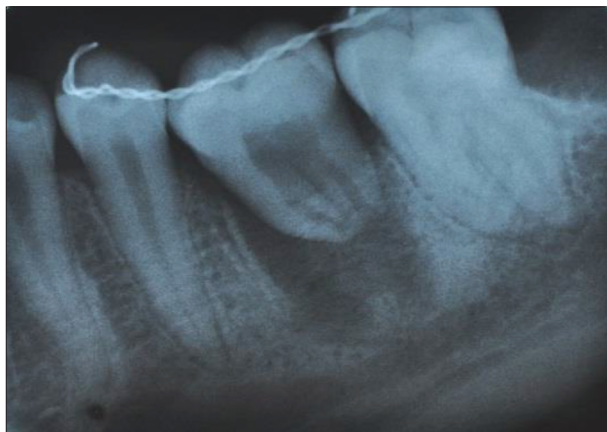


Figure 4. Radiographic finding of the transplanted and splinted lower right wisdom tooth
Slika 4. Radiološki prikaz transplantiranog i splintiranog donjeg desnog umnjaka

In the view of patient's age, favorable position and morphology of lower right wisdom tooth, transplantation of wisdom tooth into the alveolus of first molar was suggested to the patient. After getting informed consent, it was decided to perform two stage autologous transplantation. In the first stage, first molar was extracted and interradicular septum was removed (Figure 3). Periapical lesions were curettaged but further curettage of alveolus walls wasn't performed in order to preserve blood clot and prevent alveolar osteitis. Three weeks after extraction, receptor alveolus was further prepared for donor implantation by cutting out a part of connective tissue from the receptor alveolus and making a receptor bed. Wisdom tooth extraction was performed with minimal trauma to the tooth and periodontal fibers. Donor tooth was placed in slight infraocclusion in order to allow reinsertion of periodontal

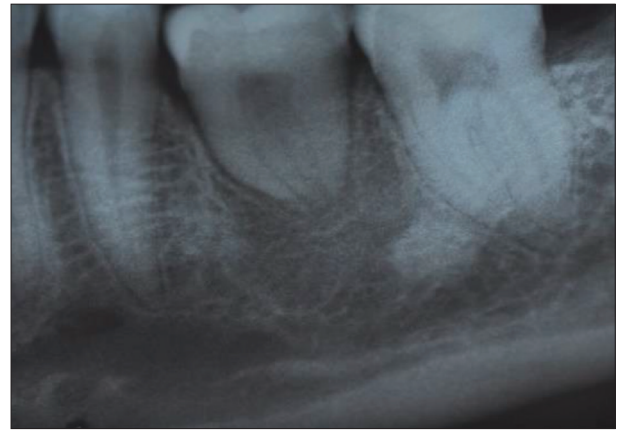


Figure 5. Retroalveolar radiogram after one year
Slika 5. Kontrolni retroalveolarni radiogram nakon godinu dana



Figure 6. Clinical finding of the transplanted wisdom tooth after one year
Slika 6. Klinički nalaz transplantiranog umnjaka nakon godinu dana

fibers and formation of the apical third of the root. With formation of the apical third, transplanted tooth is expected to gradually reach adequate occlusal relation with the teeth in the upper jaw [3, 7].

After placing donor tooth in the receptor alveolus, it was established that the transplanted tooth did not have adequate stability and it was decided to splint the tooth (Figure 4). The splint is normally removed two weeks after as in this period periodontal fibers reinsert themselves onto the alveolus walls [7]. Patient was prescribed an oral antibiotic for the next five days. Sutures were removed after seven days and splint after fourteen days. Follow-ups were scheduled weekly in the first month, then after three months, six months and one year later and they included monitoring soft tissue status, pulp sensibility and tooth stability. One year later, retroalveolar radiogram showed fully formed apical third of the root, presence of periodontal space and no signs of root resorption (Figure 5). Clinically, transplanted tooth was intact and there were no signs of tooth mobility (Figure 6).

DISCUSSION

Tooth autotransplantation is often perceived as an unpredictable alternative, even though survival rate after six years is in range from 75.3% do 91% [8]. Perhaps the reason why autotransplantation is considered as an

unreliable option, is the unpredictability of ankylosis and root resorption that are the most frequent complications of autotransplantation [9].

Success of autologous tooth transplantation depends of appropriate patient selection, suitable donor tooth and suitable recipient site [3]. Patients need to be in good health, able to follow post-operative instructions and be available for follow-up visits [3]. Our patient was a young person who showed great will and motivation in order to get the best possible result. In our case, donor tooth had favorable characteristics which were described in literature. Donor tooth had two-thirds of root formed and that gave him better chances of success in comparison with completely developed tooth [7]. The most predictable results are obtained with teeth having between one-half to two-thirds of root formed [3, 10]. Teeth, with incomplete root development, have apical foramina with diameter wider than 1 mm which allows successful revascularization of the donor tooth in the receptor alveolus without the need of later endodontic treatment [10]. In our presented case, there was no need for endodontic treatment. Root morphology as well as the position of the donor tooth in our case, were favorable enough to do the transplantation without damaging surrounding hard and soft tissues. Teeth with complex root morphology and position in the alveolar ridge, which require tooth sectioning and significant manipulation of surrounding tissue, are contraindicated for this surgery [3].

One more factor that is recognized as crucial in performing successful autotransplantation is the time that donor tooth spends out of the alveolus. This time ranges from three to sixteen minutes. Risk of inflammatory root resorption increases with time [11]. In our case, donor tooth was immediately transferred in previously prepared receptor alveolus. Recipient site, in the present case, had sufficient alveolar bone support in all dimensions with sufficient amount of attached keratinized tissue to allow stabilization of the transplanted tooth [3, 11].

It was decided to perform the transplantation of the donor tooth three weeks after the extraction of the mandibular first molar. The two stage technique has shown to be more successful than immediate transplantation technique, because it enables the formation of connective tissue in the period of two to three weeks which later favors adaptation of the donor tooth into the receptor bed. As a result of improved vascularization in the receptor bed, the chances of successful treatment are greater [12]. A successful transplantation is achieved when transplanted tooth presents no inflammatory changes, signs of root resorption and demonstrates sufficient root development, confirmed by clinical and radiographic evaluation [6, 12]. Regular check-ups are very important in the first year after transplantation because the highest percentage of complications happen in this period. Inflammatory resorption may become evident after three or four weeks, while tooth ankylosis may not become evident until three or four months after transplantation. The incidence of

both types of resorption can be decreased with atraumatic extraction of the donor tooth and immediate transfer to the recipient site to minimize the risk of injury to the periodontal ligament [6, 13].

Based on literature evidences and experience from our case, we can conclude that autotransplantation gives positive long term results when previously named indications and criteria are carefully analyzed and followed. Autotransplantation is good solution in young individuals who lost their first or second mandibular molars and at the same time have impacted third molars as potential donors.

REFERENCES

1. Andreasen JO, Paulsen HU, Yu Z, Ahlquist R, Bayer T, Schwartz O. A long-term study of 370 autotransplanted premolars. Part I. Surgical procedures and standardized techniques for monitoring healing. *Eur J Orthod.* 1990;12(1):3–13. [DOI: 10.1093/ejo/12.1.3] [PMID: 2318261]
2. Andreasen JO. Atlas of replantation and transplantation of teeth. London: Elsevier Health Sciences; 1992.
3. Clokie CML, Yau D, Chano L. Autogenous tooth transplantation: An alternative to dental implant placement? *J Can Dent Assoc.* 2001;67(2):92–6. [PMID: 11253297]
4. Nagori SA, Bhutia O, Roychoudhury A, Pandey RM. Immediate autotransplantation of third molars: an experience of 57 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2014;118(4):400–7. [DOI: 10.1016/j.oooo.2014.05.011] [PMID: 25183229]
5. Leffingwell CM. Autogenous tooth transplantation: a therapeutic alternative. *Dent Surv.* 1980;56(2):22–3, 26. [PMID: 6933116]
6. Mendes RA, Rocha G. Mandibular third molar autotransplantation: Literature review with clinical cases. *J Can Dent Assoc.* 2004;70(11):761–6. [PMID: 15588551]
7. Akiyama Y, Fukuda H, Hashimoto K. A clinical and radiographic study of 25 autotransplanted third molars. *J Oral Rehabil.* 1998;25(8):640–4. [DOI: 10.1046/j.1365-2842.1998.00215.x] [PMID: 9781869]
8. Machado LA, do Nascimento RR, Ferreira DM, Mattos CT, Vilella OV. Long-term prognosis of tooth autotransplantation: a systematic review and meta-analysis. *Int J Oral Maxillofac Surg.* 2016;45(5):610–7. [DOI: 10.1016/j.ijom.2015.11.010] [PMID: 26696138]
9. Herrera-Gimbernat D, Recio-Lora C, Torres-Lagares D, Romero-Ruiz MM, Gutiérrez-Pérez JL. Current state of dental autotransplantation. *Med Oral Patol Oral Cir Bucal.* 2011;16(7):e948–52. [DOI: 10.4317/medoral.17267] [PMID: 21743404]
10. Thomas S, Turner SR, Sandy JR. Autotransplantation of teeth: is there a role? *Br J Orthod.* 1998;25(4):275–82. [DOI: 10.1093/ortho/25.4.275] [PMID: 9884778]
11. Ustad F, Ali FM, Kota Z, Mustafa A, Khan MI. Autotransplantation of teeth: A review. *Am J Med Dent Sci.* 2013;1:25–30.
12. Nethander G, Andersson JE, Hirsch JM. Autogenous free tooth transplantation in man by a 2-stage operation technique. A longitudinal intra-individual radiographic assessment. *Int J Oral Maxillofac Surg.* 1988;17(5):330–6. [DOI: 10.1016/s0901-5027(88)80014-6] [PMID: 3143782]
13. Cohen AS, Shen TC, Pogrel MA. Transplanting teeth successfully: autografts and allografts that work. *J Am Dent Assoc.* 1995;126(4):481–5; quiz 500. [DOI: 10.14219/jada.archive.1995.0211] [PMID: 7722109]

Autotransplantacija impaktiranog umnjaka u alveolu izvađenog prvog molara

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KRATAK SADRŽAJ

Autotransplantacija zuba je hirurška intervencija prebacivanja zuba ili zubnog zametka u alveolu ekstrahovanog zuba iste osobe. Na ovaj način, bezubo polje može biti uspešno rekonstruisano, bez potrebe za drugim skupljim i invazivnijim rešenjima. Ovaj hirurški zahvat se preporučuje kod mladih osoba koje su izgubile stalni molar zbog karijesa, a istovremeno imaju impaktirani umnjak.

U ovom radu je prikazana uspešna transplantacija umnjaka u alveolu ekstrahovanog prvog mandibularnog molara kod odrasle mlade pacijentkinje.

Ključne reči: autotransplantacija; umnjak; mandibularni molar

UVOD

U regiji usne duplje sprovode se različite vrste autotransplantacija. U svakodnevnoj praksi su vrlo aktuelne transplantacije sluzokožnog, vezivnog i koštanog tkiva u sklopu različitih terapijskih procedura. Međutim, zub, kao vrsta autotransplantata, retko se razmatra kao opcija. Autotransplantaciju zuba definišemo kao prebacivanje zuba ili zubnog zametka sa jedne lokacije na drugu unutar usne duplje [1]. U odnosu na vreme transplantacije zuba, autologna transplantacija može biti imedijatna ili odložena [2].

Autotransplantacija zuba je najčešće indikovana kod mladih osoba kod kojih je neminovna ekstrakcija donjih prvih stalnih molara, a ujedno je prisutan impaktirani umnjak kao potencijalni zub donor [3]. Kod mladih osoba ne preporučuje se izrada fiksne nadoknade ukoliko su susedni zubi intaktni i sa voluminoznom pulpnom komorom. Ugradnja implantata na mestu izvađenog zuba je bolje ali skuplje rešenje, a kontraindikovano je dok se ne završi rast i razvoj vilica [4]. Druge indikacije bi bile anodoncija stalnog zuba, gubitak zuba usled traume, frakture korena, resorpcija korena, lokalizovani periodontitis i generalno zubi sa lošom prognozom [5, 6].

Cilj ovog rada je prikaz uspešne autologne transplantacije zuba kod mlade osobe u cilju ponovnog uspostavljanja kontinuiteta zubnog niza i izbegavanja kasnije primene drugih invazivnijih i skupljih terapijskih modaliteta.

PRIKAZ SLUČAJA

Dvadesetogodišnja pacijentkinja dolazi po uputu svog stomatologa na Kliniku za oralnu hirurgiju Stomatološkog fakulteta u Beogradu radi ekstrakcije donjeg desnog prvog molara zbog arteficialne i nereparabilne perforacije u regiji furkacije. Na ortopantomogramu je uočeno prisustvo neizniklog umnjaka u donjoj vilici sa iste strane sa nezavršenim rastom i razvojem korenova i angulacijom ka drugom molaru (Slika 2).

S obzirom na godine pacijentkinje, povoljnu poziciju i povoljne morfološke karakteristike donjeg desnog umnjaka, pacijentkinji je predložena transplantacija umnjaka u ekstrakcionu alveolu prvog molara. Nakon dobijene saglasnosti pacijentkinje, intervencija je sprovedena u dva akta. U prvom aktu je izvršena ekstrakcija prvog molara i uklanjanje interradikularnog septuma (Slika 3). Odmah nakon ekstrakcije izvršena je i kiretaža

periapikalnih lezija, pri čemu zidovi alveole nisu kiretirani, kako bi se neometano formirao krvni ugrušak i izbegao nastanak alveolitisa. Nakon tri nedelje, u drugom aktu, isečen je deo mladog vezivnog tkiva, koje je popunjavalo ekstrakcionu alveolu, kako bi se formiralo ležište koje odgovara zubu donoru.

Vađenje impaktiranog umnjaka je izvršeno pažljivo uz minimalnu traumu, kako bi se izbegla povreda tvrdih zubnih tkiva i očuvala periodontalna vlakna. Zub donor je zatim prebačen u prethodno pripremljenu ekstrakcionu alveolu. Transplantirani zub je plasiran u blagoj infraokluziji, kako bi se s jedne strane omogućilo nesmetano zaceljenje periodontalnih vlakana, a sa druge strane adekvatno formiranje apikalne trećine korena zuba i samim tim postepeno dovođenje zuba u adekvatan okluzalni odnos sa antagonistima [3, 7].

Nakon transplantacije umnjaka u ekstrakcionu alveolu donjeg prvog molara, ustanovljeno je da transplantirani zub nema adekvatnu stabilnost i da je neophodno splintiranje za susedne zube (Slika 4). Pacijentkinji je ordinirana antibiotska terapija u trajanju od pet dana. Konci su uklonjeni nakon sedam dana, a splint nakon četrnaest dana jer se smatra da su se periodontalna vlakna u ovom periodu reinsertirala za zid zubne čašice [7]. Kontrolni pregledi su se sprovodili jednom nedeljno narednih mesec dana, a zatim nakon tri i šest meseci, a podrazumevali su praćenje stanja mekih tkiva, proveru vitaliteta i stabilnosti zuba. Nakon godinu dana načinjen je kontrolni retroalveolarni snimak, na kome je uočen završen rast i razvoj apikalne trećine korena transplantiranog zuba, formiran periodontalni prostor kao i odsustvo znakova resorpcije korena zuba (Slika 5). Kliničkim pregledom su uočena zdrava meka tkiva i intaktna krunica transplantiranog umnjaka bez znakova labavljenja zuba (Slika 6).

DISKUSIJA

Autotransplantacija zuba se vrlo često smatra nesigurnom alternativom od strane oralnih hirurga, iako se stepen preživljavanja transplantiranih zuba nakon šest i više godina kreće u rasponu 75,3% do 91% [8]. Razlog manje zastupljenosti ove intervencije verovatno leži u činjenici da su najčešće komplikacije, ankiloza i resorpcija korena, nepredvidive [9].

Uspeh autotransplantacije zuba zavisi od više faktora, a to su pacijent, zub koji se transplantira i mesto implantacije [3]. Za

uspeh ove intervencije neophodno je da pacijent bude dobrog opšteg zdravstvenog stanja, sposoban da prati instrukcije date od strane terapeuta i dostupan za redovne kontrolne preglede [3]. U našem slučaju radilo se o mladoj osobi, motivisanoj za ovaj način nadoknade zuba. U opisanom slučaju zub koji je bio indikovani za transplantaciju još uvek nije imao završen rast i razvoj korena, što je preduslov za bolji ishod transplantacije, u odnosu na zub sa završenim rastom [7]. Idealnim donatorom se smatra zub koji ima formiranu jednu polovinu do dve trećine ukupne dužine korena [3, 10]. Kod zuba koji još uvek nisu završili rast i razvoj apikalni foramen je širi od 1 mm, što im omogućava nesmetanu revaskularizaciju bez kasnije potrebe za endodontskim tretmanom [10]. U predstavljenom slučaju koren zuba donora nije još uvek imao razvijenu apikalnu trećinu i nije bio potreban postoperativni endodontski tretman. Morfologija korena impaktiranog umnjaka kao i njegova pozicija su predstavljale povoljnu situaciju sa aspekta hirurške ekstrakcije uz minimalnu traumu samog zuba i okolnog čvrstog i mekog tkiva. Zubi sa komplikovanom korenskom morfologijom i položajem, koji zahtevaju separaciju i obimnu manipulaciju okolnim tkivom, po literaturnim podacima su kontraindikovani za transplantaciju [3].

Još jedan faktor koji je ključan za uspešnu transplantaciju je vreme koje je zub donor proveo van alveole. Potrebno je u što kraćem periodu postaviti zub donor u alveolu, kako bi se sprečilo isušivanje periodontalnih vlakana i njihovo posledično oštećenje. Vreme koje zub donor može da provede van alveole a da pritom ne dođe do oštećenja periodontalnih vlakana se kreće od tri do šesnaest minuta. Sa povećanjem vremena koje zub donor proveo van alveole povećava se mogućnost nastanka inflamatorne resorpcije korena zuba [11]. U našem slučaju zub

donor je odmah po ekstrakciji prebačen u već pripremljeno ležište receptorske alveole.

Na mestu implantacije u opisanom slučaju bila je prisutna adekvatna koštana podrška i dovoljna količina keratinizovanog tkiva za povoljno pozicioniranje zuba donora, što je navedeno kao bitan faktor uspešnosti autotransplantacije [3, 11].

U prikazanom slučaju odlučeno je da transplantacija impaktiranog umnjaka bude sprovedena dvofazno, odnosno tri nedelje nakon ekstrakcije prvog molara. U alveoli ekstrahovanog zuba u periodu od dve do tri nedelje dolazi do formiranja mladog vezivnog tkiva, bogatog mladim krvnim sudovima, čime se poboljšava vaskularizacija cele regije, a samim tim i uspešnost tretmana [12]. Autotransplantacija se smatra uspešnom kada transplantirani zub, na osnovu kliničkih i radioloških parametara, ne pokazuje inflamatorne promene na pulpi, znakove resorpcije korena zuba i ankiloze, a razvoj korena zuba je završen [6, 12]. Kontrole u prvih godinu dana su veoma bitne, jer najveći broj komplikacija nastaje u ovom periodu. Inflamatorna resorpcija se obično javlja u prve tri do četiri nedelje od transplantacije, dok se ankiloza javlja tri do četiri meseca nakon transplantacije. Prevencija obe vrste komplikacija jeste ekstrakcija uz minimalnu traumu po periodontalna vlakna i kratko vreme trajanja intervencije [6, 13].

Na osnovu podataka iz literature i prikazanog slučaja možemo zaključiti da je autotransplantacija zuba uspešan zahvat, koji daje dobre rezultate kada se postavi prava indikacija, a intervencija sprovede uz poštovanje svih neophodnih kriterijuma. Ova hirurška intervencija indikovana je pre svega kod mladih osoba kod kojih je neizbežno vađenje prvog ili drugog molara u donjoj vilici, a koji istovremeno imaju prisutne impaktirane umnjake kao potencijalne donore zube.

Da li ste pažljivo čitali radove?

1. Prva studija o recipročnim pokretima turpije u reparaciji kanala je predstavljena:
 - a) 2005. god.
 - b) 2008. god.
 - c) 2011. god.
2. Vilične baze i zubni lukovi se u sagitali mogu postaviti u odnos:
 - a) jedne skeletne mase
 - b) dve skeletne mase
 - c) tri skeletne mase
3. Bezubost u Bosni i Hercegovini kod osoba starijih od 65 godina iznosi:
 - a) 68%
 - b) 78%
 - c) 88%
4. Teorijske okvire za merenje kvaliteta života povezanog sa oralnim zdravljem dao je:
 - a) Locker
 - b) Cohen
 - c) Jogo
5. Turpija u konceptu recipročnih pokreta se opušta:
 - a) u smeru kazaljke sata
 - b) u smeru suprotnom kazaljki sata
 - c) u oba smera
6. Da li spoljašnji faktori mogu dovesti do kompenzacije određenih genetski uslovljenih nepravilnosti?
 - a) Da
 - b) Ne
 - c) Nikada
7. Između tipova disanja i gutanja i pojave dentalnih kompenzacija skeletnih nepravilnosti:
 - a) postoji povezanost
 - b) ne postoji povezanost
 - c) postoji samo kod I skeletne klase
8. Turpija u konceptu recipročnih pokreta seče:
 - a) u smeru kazaljke sata
 - b) u smeru suprotnom kazaljki sata
 - c) u oba smera
9. Sa nepravilnim funkcijama disanja i gutanja pravilnu okluziju I klase po Englu (Angle) razvilo je:
 - a) 21,1% adolescenata
 - b) 16,8% adolescenata
 - c) 11,1% adolescenata
10. Skeletni i dentalni odnos vilica i zuba mora uvek biti u istoj meri?
 - a) Da
 - b) Ne
 - c) Izuzetno retko
11. Problem malokluzija kod parcijalno bezubih pacijenata se rešava:
 - a) multidisciplinarno
 - b) samo ortodontskim pristupom
 - c) samo protetskim pristupom
12. Koncept recipročne preparacije bazira se na upotrebi:
 - a) više instrumenata
 - b) samo dva instrumenta
 - c) samo jednog instrumenta
13. Učestalost deformacija kod turpija sa recipročnim pokretima iznosi:
 - a) 2,35%
 - b) 1,35%
 - c) 0,35%
14. Na sagitalni rast i razvoj okluzije proveren je uticaj:
 - a) disanja
 - b) gutanja
 - c) disanja i gutanja
15. Pravilna okluziju u I klasi po Englu (Angle) razvilo je:
 - a) 78,8% ispitanika sa pravilnim funkcijama disanja i gutanja
 - b) 68,8% ispitanika sa pravilnim funkcijama disanja i gutanja
 - c) 58,8% ispitanika sa pravilnim funkcijama disanja i gutanja

16. Koncept kvaliteta života povezan sa oralnim zdravljem uključuje procenu uticaja oralnih oboljenja na celokupno blagostanje?
a) Da
b) Ne
c) Skoro nikad
17. Četiri dimenzije oralnog zdravlja su:
a) oralna funkcija i bol
b) oralna funkcija, bol i or izgled
c) oralna funkcija, bol o izgled i psihološki uticaj
18. Pacijent sa parcijalnom bezubošću je imao još i:
a) palatinalno smešten gornji levi očnjak
b) palatinalno smešten gornji desni očnjak
c) palatinalno smešten gornji lateralni sekutić
19. Najzastupljenija klasifikacija bezubosti je:
a) po Englu
b) po Kenediju
c) po Mileru
20. Koncept recipročnih pokreta instrumenata:
a) skraćuje vreme obrade kanala
b) produžava vreme obrade kanala
c) otežava obradu kanala
21. Uticaj disanja i gutanja na sagitalni razvoj okluzije ispitan je kod:
a) 60 adolescenata oba pola
b) 60 adolescenata ženskog pola
c) 60 adolescenata muškog pola
22. Adolescenti sa I i II skeletnom klasom i nepravilnim funkcijama disanja i gutanja pokazuju protruziju gornjih sekutića u prvoj klasi u:
a) 88,9% slučajeva
b) 78,9% slučajeva
c) 68,9% slučajeva
23. U proceni koncepta kvaliteta života povezanog sa oralnim zdravljem koriste se:
a) brojni upitnici
b) brojne skale
c) brojni upitnici i skale
24. Prema Lokerovoj modifikaciji S20 međunarodne klasifikacije oštećenja, invaliditeta i hendikepa u stomatologiji prvi nivo se odnosi na:
a) oralni status
b) bol i nezadovoljstvo izgledom
c) sposobnost obavljanja svakodnevnih aktivnosti
25. Multidisciplinarni pristup u rešavanju parcijalne bezubosti je realizovan kod:
a) pacijenata uzrasta 18 godina
b) pacijenata uzrasta 24 godine
c) pacijenata uzrasta 30 godina
26. Primenom kontinuirane rotacije NiTi instrumenta mogu se smanjiti ciklični zamor i torzioni stress?
a) Da
b) Ne
c) Samo kod ručnih instrumenata
27. Koncept recipročnih pokreta dovodi do:
a) manjeg procenta defekata i preloma instrumenata
b) većeg procenta defekata i preloma instrumenata
c) ne utiče na prelome i defekte instrumenata
28. Prosečna starost ispitivanih adolescenata u studiji o uticaju disanja i gutanja na razvoj okluzije iznosila je:
a) 12,9 god.
b) 15,9 god.
c) 16,9 god.
29. Adolescenti sa II i III skeletnom klasom i nepravilnim funkcijama gutanja i disanja pokazuju protruziju gornjih sekutića u III klasi u:
a) 70% slučajeva
b) 80% slučajeva
c) 90% slučajeva
30. Procena oralnog zdravlja koja se bazira na kliničkim pokazateljima:
a) ne uzima u obzir funkcionalne i socijalne aspekte
b) uzima samo funkcionalne aspekte
c) uzima samo socijalne aspekte
31. Prema Lokerovoj modifikaciji SZO međunarodne klasifikacije oštećenja, invaliditeta i hendikepa u stomatologiji, drugi nivo se odnosi na:
a) oralni status
b) bol i nezadovoljstvo izgledom
c) sposobnost obavljanja svakodnevnih aktivnosti
32. Kod pacijentkinje sa multidisciplinarnim pristupom uočen je obrnut preklap:
a) zuba 11
b) zuba 12
c) zuba 13
33. Alternativa punoj rotaciji NiTi instrumenata su:
a) recipročni pokreti
b) kontinuirana rotacija
c) kružni pokreti
34. Dinamika kretanja NiTi instrumenata u kanalu uključuje:
a) samo recipročne
b) samo ekscentrične
c) recipročne, ekscentrične i transaksijalne pokrete
35. Kod svih testiranih adolescenata u ortodonskoj studiji utvrđeni su:
a) tipovi disanja
b) tipovi gutanja
c) tipovi disanja i gutanja

36. Povećana dužina gornjeg zubnog niza kod I klase je uočena u:
- 58,8% slučajeva
 - 68,8% slučajeva
 - 78,8% slučajeva
37. Koncept kvaliteta o prvi put je upotrebljen:
- dvadesetih godina XX veka
 - tridesetih godina XX veka
 - pedesetih godina XX veka
38. Prema Lokerovoj modifikaciji SZO međunarodne klasifikacije oštećenja, invaliditeta i hendikepa u stomatologiji treći nivo se odnosi na:
- oralni status
 - bol i nezadovoljstvo izgledom
 - sposobnost obavljanja svakodnevnih aktivnosti
39. Kod pacijentkinje sa obrnutim preklapom zuba 12 u detinjstvu je izvađen:
- zub 15
 - zub 11
 - zub 26
40. Recipročni pokreti se baziraju na mehanici:
- balansiranih sila
 - dvostrukog konusa
 - step-back
41. Smanjenje površinskog kontakta instrumenta sa zubima kanala:
- smanjuje mogućnost pojave deformacija i fraktura
 - povećava mogućnost pojave deformacija i fraktura
 - povećava samo kod pravih kanala
42. Povećana dužina gornjeg zubnog luka kod III klase je uočena u:
- 50% slučajeva
 - 60 slučajeva
 - 70% slučajeva
43. Oralno zdravlje je neodvojivi deo opšteg zdravlja?
- Da
 - Ne
 - Samo u slučaju teških oralnih oboljenja
44. Na prvom međunarodnom kongresu za procenu oralnog zdravlja (1977) predstavljeno je:
- 10 upitnika
 - 15 upitnika
 - 20 upitnika
45. Kod pacijentkinje sa multidisciplinarnim pristupom prvo je realizovan:
- ortodonski tretman
 - protetska rehabilitacija
 - istovremeno i ortodonski i protetski tretman
46. Kod recipročnih pokreta instrumenata umirivanje je:
- vrlo često
 - isključeno
 - često kod pravih kanala
47. Kod recipročnih pokreta turpija punu rotaciju ostvari:
- u dva naizmenična pokreta
 - u tri naizmenična pokreta
 - u četiri naizmenična pokreta
48. Kod pacijentkinje sa multidisciplinarnim pristupom planirana je ekstrakcija:
- jednog zuba
 - dva zuba
 - četiri zuba
49. Recipročni pokreti instrumenata:
- povećavaju sigurnost instrumentacije
 - smanjuju sigurnost instrumentacije
 - skraćuju vek instrumenta
50. Učestalost preloma kod turpija sa recipročnim pokretima iznosi:
- 0,47%
 - 1,47%
 - 2,47%

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