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Raspon kretnji donje čeljusti i intenzitet boli kod pacijenata s anteriornim pomakom zglobne pločice bez redukcije

Mandibular Range of Movement and Pain Intensity in Patients with Anterior Disc Displacement without Reduction

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Sažetak

Svrha: Temporomandibularni poremećaj (TMP) najčešći su orofacijalni bolni poremećaj nedentalnog podrijetla. Istraživanje je provedeno kako bi se ispitao učinak istodobne primjene okluzijske udlage i fizikalne terapije. Pritom je postavljena hipoteza da je istodobna primjena okluzijske udlage i fizikalne terapije učinkovita metoda za liječenje anteriornog pomaka zglobne pločice bez redukcije. **Materijali i postupci:** U istraživanje je bilo uključeno 12 pacijenata (srednja dob = 30,5 god.) s anteriornim pomakom zglobne pločice bez redukcije (prema DKI/TMP-u, potvrđeno magnetskom rezonancijom) nasumično podijeljenih u dvije skupine: šest pacijenata dobilo je stabilizacijsku udlagu (SU), a šest je liječeno stabilizacijskom udlagom i fizikalnom terapijom (SU-FT). Ishodi liječenja uključivali su maksimalno otvaranje usta bez boli (MO), maksimalno asistirano otvaranje usta (MAO), devijaciju/defleksiju pri otvaranju i bol prema vizualno analognoj ljestvici (VAS). **Rezultati:** Na početku nije bilo razlika između skupina u jakosti boli prema vizualno analognoj ljestvici i rasponu kretnji donje čeljusti. Tijekom liječenja bol je prema vizualno analognoj ljestvici značajno smanjena u obje skupine (SU-FT $F = 28,964$, $p = 0,0001$, veličina učinka = 0,853; SU: $F = 8,794$, $p = 0,0011$, veličina učinka = 0,638). Raspon otvaranja usta značajno se povećao samo u skupini SU-FT (MO: $F = 20,971$, $p = 0,006$; MAO: $F = 24,014$, $p = 0,004$). Skupine su se značajno razlikovale s obzirom na devijaciju/defleksiju pri otvaranju ($p = 0,040$). Nakon terapije, devijacija tijekom otvaranja usta i dalje se pojavljivala samo kod jednog pacijenta u skupini SU-FT, prema njih pet u skupini SU. **Zaključak:** Unatoč ograničenjima ovog istraživanja pokazalo se da istodobna primjena stabilizacijske udlage i fizikalne terapije tijekom šestomjesečnog liječenja rezultira značajnijim povećanjem raspona otvaranja usta i značajnijim smanjenjem devijacija tijekom otvaranja od stabilizacijske udlage koja se upotrebljava bez fizikalne terapije. Obje terapijske opcije pokazale su se djelotvornima u smanjenju boli kod pacijenata s anteriornim pomakom zglobne pločice bez redukcije. Unatoč objektivno dijagnostičiranom poremećaju temporomandibularnog zgloba, fiziološka funkcija je obnovljena.

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Ključne riječi

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Uvod

Temporomandibularni poremećaji (TMP) najčešći su orofacijalni bolni poremećaji nedentalnog podrijetla. Tri su osnovne dijagnostičke podskupine TMP-a: (1) miofascijalna bol, (2) pomaci zglobne pločice (diska) te (3) artralgijska/degenerativne/upalne bolesti zgloba (1, 2). Pacijenti koji traže liječničku pomoć zbog ovih problema najčešće se žale na bol u žvačnim mišićima, preaurikularnoj regiji i/ili čeljusnom zglobu. Bol se često pojačava tijekom funkcije. Pacijenti također ističu ograničene pokrete donje čeljusti i zvukove u zglobu (3, 4).

Anteriorni pomak zglobne pločice temporomandibularnog zgloba (TMZ) bez redukcije, široko je rasprostranjeni poremećaj koji se klinički manifestira ograničenjima u kret-

Introduction

Temporomandibular disorders (TMD) are the most common source of orofacial pain of a non-dental origin. The subtypes of temporomandibular disorders (TMD) are myofascial pain, disc displacements, joint pain and degenerative and inflammatory joint disease (1, 2). Patients who seek professional help for these problems will commonly complain of pain located in the masticatory muscles, temporomandibular joint (TMJ) or both. Pain will usually increase during function. Patients also describe limited jaw movements and joint noise (3, 4).

Anterior disc displacement without reduction of the temporomandibular joint is a widespread disorder that clinical-

njama zgloba, pri čemu se mijenja morfologija diska, a ligamenti diska se izdužuju (5, 6). Etiopatogeneza pomaka zglobne pločice do danas nije razjašnjena. Poremećaj kondil-disk kompleksa može uzrokovati bilo koje stanje koje vodi prema produljenju ligamenata zglobne pločice ili promjeni u morfologiji njezina stražnjeg ruba. Trauma je najčešći uzročni čimbenik povezan s ovim poremećajem. To može biti makro-trauma – iznenadna sila koja djeluje na zglob i može izazvati njegove strukturne promjene, ili mikrotrauma – funkcijsko preopterećenje povezano s mišićnom hiperaktivnošću (bruk-sizmom). Ostali potencijalni čimbenici su povećana labavost (laksitet) zglobova, promjene u morfologiji i položaju kondila te degenerativne zglobne bolesti (osteoartritis), (7, 8).

Magnetska rezonancija (MR) omogućuje prikaz pozicija zglobne pločice TMZ-a, no isključivo taj nalaz nije dovoljan za postavljanje dijagnoze TMP-a (9). Liječnikova je profesionalna dužnost usporediti glavnu pacijentovu pritužbu s anamnezom i znakovima i simptomima tijekom fizikalnog pregleda te donijeti konačnu odluku.

U nedostatku jasnih etioloških mehanizama koji se nalaze u podlozi poremećaja, primarni cilj liječenja pomaka zglobne pločice bez redukcije jest ublažiti bol i ponovno uspostaviti funkciju donje čeljusti, bez obzira na narušene anatomske odnose između struktura TMZ-a. Pritom prednost ima konzervativno liječenje koje uključuje okluzijsku udlagu, lijekove, promjenu navika i fizikalnu terapiju (10). Među spomenutim metodama fizikalna terapija pokazala se djelotvornom kod većine pacijenata sa simptomima TMP-s, osobito u slučaju bolnih zglobova i ograničenih pokreta donje čeljusti (11 - 13).

Okluzijska udlaga česta je metoda u liječenju poremećaja disk-kondil kompleksa. Čini se da nošenje okluzijske udlage mijenja periferne senzoričke impulse iz receptora u žvačnim mišićima, parodontnom ligamentu i oralnoj sluznici te smanjuje intraartikularni pritisak u TMZ-u (14, 15).

Do danas su provedene mnogobrojne studije u kojima se ispitivao isključivo učinak okluzijske udlage ili učinak fizikalne terapije na liječenje poremećaja (16, 17). No rijetka su istraživanja u kojima se uspoređuju ove dvije vrste liječenja. U ovom radu istraživači su se vodili hipotezom da je istodobna primjena okluzijske udlage i fizikalne terapije učinkovita metoda u liječenju anteriornog pomaka zglobne pločice bez redukcije.

Materijali i postupci

Istraživanje je provedeno u Zavodu za mobilnu protetiku Stomatološkog fakulteta Sveučilišta u Zagrebu. Ispitanici su odabrani među pacijentima koji su se javili u Zavod zbog boli i disfunkcije temporomandibularne regije kao glavnih problema, a prije nisu bili liječeni. U studiju su bili uključeni pacijenti s anteriornim pomakom zglobne pločice bez redukcije (dijagnostička kategorija II prema protokolu DKI/TMP potvrđena nalazom magnetske rezonancije) i to njih 12 – trojica muškaraca i devet žena (srednja dob = 30,5 god.; sd = 13,97). Svi su bili obaviješteni o postupku istraživanja i potpisali su informirani pristanak. Istraživački protokol odobrilo je Etičko povjerenstvo Stomatološkog fakulteta

ly presents itself with restriction in jaw movements, in which the morphology of the disc is altered while the disc ligaments become elongated (5,6). So far it has not been possible to identify a clear, single cause of disc displacement.

Functional imbalance of the TMJ could be related to trauma. This can be macro trauma – any sudden force to the joint resulting in structural alteration, or micro trauma – functional overloading associated with parafunctional activity (bruxism). Other potential risk factors related to derangement of condyle–disc complex include: increased laxity of the joints, changes in morphology and position of the condyle, osteoarthritis etc. (7, 8).

With the help of MRI, the position of the TMJ disc can be determined (9). However, MRI is a tool which aids the diagnosis, but on no account is it able to make a diagnosis by itself. It is the clinician's professional duty to correlate the patient's main complaint with the history of the symptoms and the signs during physical examination and make a final decision.

In the absence of clear knowledge of the etiological mechanisms that are underlying this disorder, main goal in the treatment of temporomandibular joint disc displacement without reduction is to relieve pain and to restore mandibular function despite the disturbed anatomical relationship between TMJ structures. Conservative treatments, including occlusal splint, medication, self-care strategies and physical therapy, are considered the first choice for TMJ treatment (10). Physical therapy seems to be effective in improving range of movement and reducing pain in TMD patients (11, 13).

Occlusal splint has been frequently used for internal derangement treatment. It is believed that wearing an occlusal splint alters the peripheral sensory input from receptors in the masticatory muscles, periodontal tissues and oral mucosa and decreases the intra-articular pressure in the TMJ (14, 15).

So far, numerous studies investigating either occlusal splint therapy or only physical therapy have been conducted. Studies comparing those two types of treatment are rare (16, 17). This study tested the hypothesis that the simultaneous use of occlusal splint and physical therapy is an effective method of treatment of anterior disc displacement without reduction in a 6-month period.

Materials and methods

The study was conducted at the Department of Prosthodontics, School of Dental Medicine, University of Zagreb. The subjects were selected from patients referred to the Department of Prosthodontics for reported pain and dysfunction of the temporomandibular region as the primary problem and they had not previously undergone any treatment protocols. Patients with anterior disc displacement without reduction (diagnostic category II of the RDC/TMD and confirmed by magnetic resonance imaging) were included in the study. The inclusion and exclusion criteria are shown in Table 1. Twelve patients (3 men and 9 women; age range 18-62 years; mean (standard deviation) age 30.5 (13.97) met the

Pacijenti su odabrani prema sljedećim kriterijima: oba spola iznad 18 godina, pomak diska potvrđen nalazom magnetske rezonancije i spontana bol > 30 mm na vizualno analognoj ljestvici (VAS). Iz istraživanja su isključeni svi sa simptomima povezanim s bolestima nekoga drugog dijela stomatognatog sustava (npr. zuboboljom, neuralgijom), oni s artritisom ili kondilarnom traumom u anamnezi, s degenerativnim promjenama kondila, bolovima zbog sistemskih bolesti (npr. reumatoidnog artritisa), fibromijalgijom i psihijatrijskim poremećajima (tablica 1.).

inclusion and exclusion criteria. They were informed about the study procedure and an informed consent was obtained. The study protocol was approved by the Ethics Committee of the School of Dental Medicine.

Patients were selected according to the following inclusion criteria: 18 years and above, both genders, patients with disc displacement (confirmed by magnetic resonance imaging) and spontaneous pain greater than 30 millimetres on a visual analogue scale (VAS). Exclusion criteria were symptoms related to disease in other parts of the masticatory system (e.g. toothache, neuralgia), history of arthritis or condylar trauma, degenerative changes of condylar head, pain due to systemic disease, fibromyalgia and history of psychiatric disorders.

Tablica 1. Kriteriji za uključivanje i isključivanje iz istraživanja
Table 1 Inclusion and exclusion criteria of the study

Kriteriji za uključivanje • Inclusion criteria

A. Klinička dijagnoza anteriornog pomaka zglobne pločice • Clinical diagnosis of anterior disc displacement

1. Ograničeno otvaranje usta • Limitation of mouth opening
2. Bol u preaurikularnom području, osjetljivost temporalnog i okcipitalnog područja, glavobolja • Pre-auricular pain, temporal and occipital tenderness, headache
3. Trajanje simptoma najmanje 3 mjeseca • Persistence of symptoms at least for 3 months
4. Dislokacija zglobne pločice na jednom zglobu, normalan nalaz na drugom zglobu • Disc-displaced state on one side, normal state on the other side

B. Dijagnoza anteriornog pomaka diska bez redukcije potvrđena nalazom magnetske rezonancije • Magnetic resonance imaging (MRI) diagnosis of anterior disc displacement without reduction

Kriteriji isključivanja • Exclusion criteria

A. Sistemska bolest • Systemic disease

B. Artritis ili trauma kondila • Arthritis or history of condylar trauma

C. Degenerativne promjene kondila • Degenerative change of condylar head

D. Fibromijalgija i psihijatrijski poremećaji • Fibromyalgia and history of psychiatric disorders

Anamneza

Podatci o dobi, spolu i bračnom statusu ispitanika dobiveni su iz strukturiranog upitnika. Svi su također dali podatke povezane s trajanjem boli. Radi otkrivanja znakova i simptoma TMP-a bili su podvrgnuti rutinskom kliničkom pregledu temeljenom na hrvatskoj verziji protokola DKI/TMP (Os I), (18, 19).

Procjena kliničkih znakova

Bol

Za kvantificiranje boli korištena je vizualno analogna ljestvica (VAS), linija duljine 100 mm na čijim su se krajevima nalazili tekstualni podatci koji označavaju ekstremu bol. Lijevo kraj crte označavao je stanje bez boli, a desno najjaču bol koju osoba može zamisliti.

Maksimalno otvaranje usta bez boli i put otvaranja usta

Maksimalno otvaranje usta bez boli tj. maksimalno ugodno otvaranje (MO), definirano je kao maksimalna udaljenost koju ispitanik postigne otvarajući usta, a da ne osjeti bol ili nelagodu. Nakon što bi ispitanik otvorio usta do te širine, ispitivač bi izmjerio udaljenost između bridova maksimalnih i mandibularnih inciziva.

Maksimalno asistirano otvaranje

Maksimalno asistirano otvaranje (MAO) definirano je kao maksimalna udaljenost do koje ispitanici mogu otvoriti

History data

Data on the participants' age, gender and marital status were obtained by a brief structured questionnaire. Subjects also filled in data related to the duration of pain. The patients underwent a routine clinical examination to detect signs and symptoms of TMD. The examination was based upon the Croatian version of RDC/TMD (Axis I), (18,19).

Clinical sign evaluation

Pain

Spontaneous pain was evaluated by using a 100 mm-long VAS. The left endpoint of the scale indicated no pain at all, and the right endpoint indicated the worst pain imaginable.

Pain free opening and path of mouth opening

Pain-free opening e.g. maximum comfortable opening (MCO) was defined as the maximum distance the subject could open his/her mouth without experiencing any pain and discomfort. After the subject had opened this wide, the examiner measured the distance between the maxillary and mandibular incisal edges.

Maximum assisted opening

Maximum assisted opening (MAO) was defined as the maximum distance the subject could open the mouth, even if he/she felt pain or discomfort. After the subject had opened this wide, the examiner placed his fingers on the subject's maxillary and mandibular central incisors, and forced the

usta, bez obzira na to što otvaranje izaziva bol. Nakon što je ispitanik otvorio usta do te širine, liječnik je palcem i kažiprstom iste ruke pritiskao gornje i donje zube te se mjerio iznos tzv. pasivnog rastezanja.

Put otvaranja

Ispitivač bi uputio ispitanika da tri puta zaredom polako otvara usta i pritom promatrao odklon mandibule u frontalnoj ravnini od linije paralelne s mediosagitalnom ravninom. Procjenjivalo se postoji li tijekom otvaranja ispravljena ili neispravljena devijacija. Neispravljena devijacija (defleksija) obuhvaćala je devijaciju mandibule veću od dva milimetra udesno ili ulijevo tijekom maksimalnog neasistirano otvaranja.

Kalibracija ispitivača

Standardizacija ispitivača i kalibracija kliničkog pregleda provedena je na deset slučajno odabranih ispitanika. Rezultati su pokazali da je podudarnost u mjerenjima bila zadovoljavajuća ($p = 0,85 - 0,89$, t-test za zavisne uzorke).

Terapijske skupine

Ispitanici su nasumično podijeljeni u dvije skupine: šestero pacijenata dobilo je stabilizacijsku udlagu (SU), a šestero je liječeno istodobno stabilizacijskom udlagom i fizikalnom terapijom (SU-FT). Svi pacijenti uključeni u istraživanje sudjelovali su do njegova završetka.

Izrada stabilizacijske udlage

Maksimalna stabilizacijska udлага izrađena je na sadrenom odljevu montiranom u artikulatorku SAM-3 u položaju centrične relacije prema registratu centrične relacije (20). Udлага je izrađena od tvrdog akrilata (Resilit-S, Ercodent) i potpuno je prekrivala okluzijske plohe zuba. Debljina udlage na razini prvog molara iznosila je oko 1,5 mm. Sve udlage izradio je isti dentalni tehničar. Kontakt s udlagom ostvarivale su centrične kvržice svih mandibularnih stražnjih zuba, a prednji su bili tek u laganom dodiru s udlagom ili diskudirani. Tijekom laterotruzijske osiguranost je vođenje očnjakom. Pacijenti su dobili upute za korištenje udlage tijekom spavanja. Na kontrolnom pregledu nakon dva tjedna okluzijski dodiri ponovno su provjereni i prema potrebi ubrušeni.

Fizikalna terapija

Pacijenti u skupini SU-FT dobili su opće informacije o vlastitoj brizi o žvačnoj muskulaturi. Kliničar (M.G.) im je objasnio normalnu funkciju žvačnih mišića te istaknuo da trebaju izbjegavati pretjerane mandibularne pokrete. Rekao im je da obrate pozornost na aktivnost svojih žvačnih mišića i drže mišiće opuštenima. Fizikalna terapija obuhvaćala je tehnike mobiliziranja zglobova, pasivnu ekstenziju i translacijske kretnje prema lijevo, desno i naprijed. Taj je postupak bio udružen s masažom mišića podizača čeljusti (temporalisa i massetera). Pacijenti su vježbe obavljali kod kuće ispred zrcala, tri do četiri serije po dvije minute.

subject's mouth to open wider. The interincisal distance between the maxillary and mandibular incisal edges was measured.

Opening pattern

The examiner asked the patient to slowly open three times, observing from a position directly in front of the patient for movements of the mandible in the frontal plane that depart from a line parallel with a mid-sagittal plane. The presence of corrected or uncorrected deviation during mouth opening was evaluated. This was defined as deviation of the mandible of ≥ 2 mm to either the right or the left from the midline with maximum unassisted opening.

Training and calibration of the examiner

Standardization of the examiner and calibration of clinical examination was made on ten randomly selected subjects, different from the ones included in the investigation. There were no significant differences between the first and second measurement ($p=0.85-0.89$, paired t-test).

Treatments

The patients were randomly allocated into 2 groups: 6 received stabilization splint only (SS) and 6 received both physical therapy and stabilization splint (SS&PT). All patients who enrolled in the study also completed the study.

Stabilization splint fabrication

Maxillary stabilization occlusal splint was fabricated on stone cast mounted on SAM-3 articulator in centric relation according to centric relation registration (20). It was a hard acrylic (Resilit-S, Ercodent) stabilization type of splint with full coverage of the occlusal surfaces and a thickness of about 1.5 mm at the level of the first molar. The same dental technician made all splints. The splint was adjusted to create uniform point contact of the centric cusps against the splint on all posterior teeth. Anterior teeth were in light point contact or were in slight disclusion. The splint also had canine guidance. Patients were instructed to wear the splint only during sleep. Comfort, patient acceptance and function of the appliance were checked within 2 weeks and the same procedure was repeated at all follow-up appointments by the same clinician.

Physical Therapy Technique

Patients in the SS&PT group received general information about self-care of jaw musculature. The clinician (M.G.) explained the normal jaw muscle function, emphasizing that excessive mandibular movements should be avoided. The clinician instructed the patients to pay attention to their jaw muscle activity and to keep muscles relaxed. The techniques comprised mobilizing the joint, passive traction and translation movement; these movements were performed in all directions (front, left and right). This mobilizing procedure was followed by massage exercise of masseter and temporal muscles (21). The patients were instructed to perform all the exercises at home, two to three times a day in front of a mirror.

Prikupljanje podataka

Bol prema VAS-u (udaljenost u milimetrima od lijevo-ga kraja crte) procjenjivana je na prvom pregledu (T0) i na kontrolnim pregledima nakon mjesec dana (T1), tri mjeseca (T2) i šest mjeseci (T3) terapije. Mjere ishoda također su uključivale otvaranje bez boli (MO), maksimalno asistirano otvaranje (MAO) i defleksiju pri otvaranju.

Kliničar (I.A.), izvrstan u dijagnozi TMP-a, koji nije bio obaviješten o vrsti terapije, obavljao je kliničke preglede na početku, te sve nakon mjesec dana, tri mjeseca i šest mjeseci terapije.

Statistička analiza

U svim analizama korišten je statistički paket SPSS (verzija 17). Podatci na početku mjerenja i nakon šest mjeseci analizirani su chi-kvadrat testom (put otvaranja usta) i t-testom za zavisne uzorke (otvaranje bez boli i maksimalno asistirano otvaranje). Za procjenu razlika u intenzitetu boli prema VAS-u korištena je univarijantna analiza. Statistička analiza provedena je na razini značajnosti od α 0,5.

Rezultati

U istraživanje je bilo uključeno 12 ispitanika u dobi od 18 do 63 godine (srednja vrijednost 30,5 godina). Osnovne demografske karakteristike ispitanika, bol prema VAS-u, maksimalno otvaranje bez boli (MO) te maksimalno asistirano otvaranje (MAO), sažeti su u tablici 2. Prema vizualno analognoj ljestvici, srednje vrijednosti za najveću bol na početku mjerenja iznosile su 74 i 65,3 za skupinu SU-FT, odnosno za skupinu SU. Prosječno maksimalno otvaranje bez boli iznosilo je 32,43 mm u skupini SU-FT, a 31,33 mm u skupini SU. Prosječno maksimalno asistirano otvaranje iznosilo je 35,25 mm u skupini SU-FT, a 38,17 mm u skupini SU. Nije bilo razlika između skupina u jakosti boli prema vizualno analognoj ljestvici ($p > 0,05$) i rasponu kretanja donje čeljusti ($p > 0,05$). Na početku je kod svih ispitanika zabilježena defleksija pri otvaranju usta. Obilježja svakoga od njih te podatci o boli i o iznosu otvaranja usta na početku mjerenja i nakon šest mjeseci liječenja prikazani su u tablici 3.

Na slici 1. prikazana je promjena intenziteta boli u svakoj skupini. Bol prema VAS-u procjenjivana je na prvom pregledu (T0) i na kontrolnim pregledima nakon mjesec dana

Collection of data

An assessment of VAS (distance in millimetres from the lower anchor) was conducted at baseline before occlusal splint therapy (T0), and at follow-up appointments at 1 month (T1), 3 month (T2) and 6 month (T3) of the therapy. Treatment outcomes also included pain-free opening (MCO), maximum assisted opening (MAO) and path of mouth opening.

The clinician (I.A.), blind to a type of therapy and trained in TMD diagnosis, performed baseline assessment and all re-assessments at 1st, 3rd, and 6th month after treatment initiation.

Statistical analysis

The SPSS (version 17) statistical package was used in all analyses. The baseline and 6-month follow-up data were analysed by chi-square (path of mouth opening) and t-test (pain free opening and maximum assisted opening). Univariate analysis of variance for repeated measurements was used to test the assessment (baseline-T0, T1, T2 and T3) differences in VAS scores. Statistical significance was assessed at the 0.05 level.

Results

The mean age of 12 study participants was 30.5 (range 18 to 63) years. Table 2 summarizes participant baseline data (VAS scores, pain-free opening (MCO), maximum assisted opening (MAO)) in both treatment groups. According to the score on a 100-mm visual analogue scale, the mean values for the worst pain at baseline for SS&PT group and SS group were 74 and 65.3, respectively. The baseline mean pain free opening of SS&PT group and SS group were 32.43 mm and 31.33 mm, respectively. The baseline mean maximum assisted opening of SS&PT group and SS group were 35.25 mm and 38.17 mm, respectively. There were no statistical differences among the groups in terms of baseline pain ($p > 0.05$) and mouth opening ($p > 0.05$). Deviations in mouth opening were observed in all patients of both groups at the beginning of the treatment. The baseline scores for pre-treatment pain and range of mouth opening of each patient in the two groups are presented in Table 3.

The change patterns for pain in each group are shown in Figure 1. We checked the variable of pain at four points: baseline, 1 month, 3 months, and 6 months later. The lev-

Tablica 2. Demografski i početni podaci (n=12)

Table 2 Demographics and baseline data of participants (n=12)

	Skupina SU-FT • Group SS&PT (n=6)	Skupina SU • Group SS (n=6)	t (p)
Dob (godine) • Age (years)	31.5±12.85	29.5±16.19	0.237 (0.817)
Početna bol • Initial pain	74.0±8.39	65.3±18.23	1.058 (0.315)
Početni MO • Initial MCO	32.43±6.12	31.33±13.18	0.183 (0.859)
Početni MAO • Initial MAO	35.25±7.44	38.17±13.52	0.463 (0.653)

MO = maksimalno otvaranje usta bez boli • MCO = pain-free maximal mouth opening; MAO = maksimalno asistirano otvaranje usta • assisted maximal mouth opening

t=t-test, Vrijednosti su prikazane kao srednja vrijednost ± standardna devijacija • Values are presented as mean±standard deviation.

Skupina SU-FT: skupina liječena fizikalnom terapijom i stabilizacijskom udlagom • Group SS&PT: simultaneous application of physical therapy and occlusal splint

Skupina SU: skupina liječena samo stabilizacijskom udlagom • Group SS: occlusal splint use only

Tablica 3. Karakteristike, početni podaci i podaci nakon 6 mjeseci za svakog pacijenta u obje grupe
Table 3 Characteristics, baseline and six months scores of each patient in the two groups

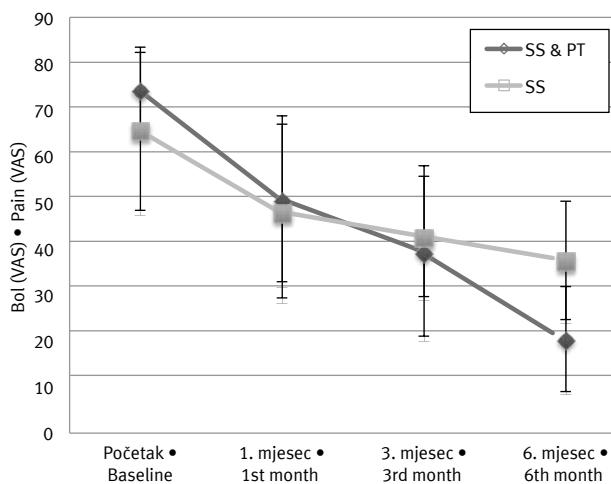
Pacijent br. • Patient no.	Dob • Age	Spol • Gender	Početna bol • Initial pain	Bol nakon završetka terapije • Final pain	Početni MO • Initial MCO	MO nakon završetka terapije • Final MCO	Početni MAO • Initial MAO	MAO nakon završetka terapije • Final MAO
Skupina SU-FT • Group SS&PT								
1	21	f	77	22	33	46	37	49
2	45	f	75	0	33	38.5	36	41.5
3	47	f	85	30	43	47	48	54
4	36	f	61	15	28	49	29	53
5	18	f	70	32	25	39	26	45
6	22	m	76	21	33	47	36	51
Skupina SU • Group SS								
6	62	f	70	45	23	34	31	38
7	27	m	40	18	54	40	56	55
9	24	f	49	44	41	51	54	56
10	24	f	72	30	23	37	30	43
11	18	f	90	54	24	35	27	36
12	22	m	71	31	23	39	31	41

Skupina SU-FT: skupina liječena fizikalnom terapijom i stabilizacijskom udlagom • Group SS&PT: simultaneous application of physical therapy and occlusal splint

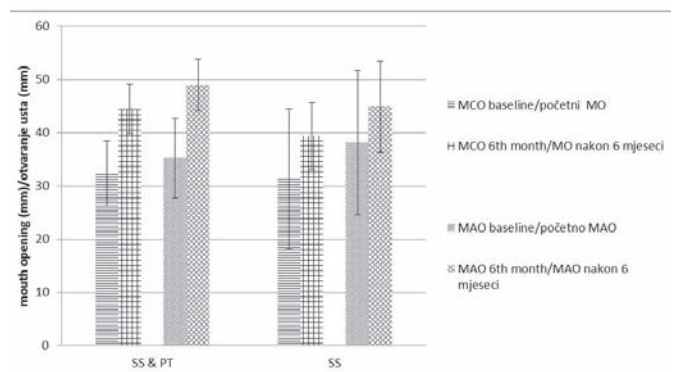
Skupina SU: skupina liječena samo stabilizacijskom udlagom • Group SS: occlusal splint use only

MO = maksimalno otvaranje usta bez boli • MCO= pain-free maximal mouth opening

MAO = maksimalno asistirano otvaranje usta • MAO= assisted maximal mouth opening



Slika 1. Usporedba VAS vrijednosti po grupama
Figure 1 Comparison of visual analogue scale (VAS) pain values in groups



Slika 2. Usporedba otvaranja usta na početku i kraju terapije (MCO = bezbolno maksimalno otvaranje usta, MAO = maksimalno asistirano otvaranje usta)
Figure 2 Comparison of mouth opening at baseline and at the end of the therapy in both groups (MCO= pain-free maximal mouth opening; MAO= assisted maximal mouth opening)

(T1), tri mjeseca (T2) i šest mjeseci (T3) terapije. Intenzitet boli značajno se smanjio u obje skupine (SU-FT skupina $F = 28,964$, $p = 0,0001$, veličina učinka = 0,853; SU skupina: $F = 8,794$, $p = 0,0011$, veličina učinka = 0,638).

Maksimalno otvaranje usta (MO) i maksimalno asistirano otvaranje usta (MAO) procjenjivalo se na prvom pregledu i na kontrolnom pregledu nakon šestomjesečne terapije. Usporedba iznosa otvaranja usta na početku i nakon završene šestomjesečne terapije nalazi se na slici 2, a podatci su analizirani t-testom za zavisne uzorke. Raspon otvaranja usta značajno se povećao samo u skupini SU-FT (MO: $F = 20,971$,

els of pain were found to decrease continuously across time; the difference was significant in group SS&PT ($F = 28.964$, $p = 0.0001$, effect size = 0.853) and group SS ($F = 8.794$, $p = 0.001$, effect size = 0.638).

We checked the variables of MCO and MAO at two points: baseline and 6 months later. Comparison of mouth opening at baseline and at the end of the therapy in both groups is shown in Figure 2. The pre-treatment and 6-month follow-up data were analysed by t-test for dependent samples. Pain free opening and maximum assisted opening improved significantly over time only in the SS&PT group

$p = 0,006$; MAO: $F = 24,014$, $p = 0,004$). Upotreba isključivo okluzijske udlage nije rezultirala statistički značajnim promjenama u rasponu otvaranja usta ($p > 0,05$).

Defleksija pri otvaranju usta procjenjivala se na početku mjerenja i na kontrolnom pregledu nakon šest mjeseci terapije, a podatci su uspoređivani chi-kvadrat testom. Skupine su se značajno razlikovale s obzirom na devijaciju/defleksiju pri otvaranju ($p = 0,040$). Nakon terapije, devijacija tijekom otvaranja usta bila je prisutna samo kod jednog pacijenta u skupini SU-FT, a u skupini SU devijacije su se i dalje pojavljivale kod njih petero.

Rasprava

Anteriorni pomak zglobne pločice bez redukcije bolan je poremećaj temporomandibularnog zgloba (22). Većina pacijenata zatraži liječničku pomoć kad bol interferira s njihovim svakodnevnim aktivnostima. Važan parametar u procjeni terapijskoga pristupa jest smanjenje ili potpuni prestanak boli. Većinu pacijenata s dijagnosticiranim poremećajem diska treba liječiti jednostavnom, konzervativnom terapijom koja uključuje savjetovanje o poremećaju, okluzijsku udlagu, lijekove i fizikalnu terapiju. Ovaj terapijski pristup pokazao se vrlo uspješnim, a kirurško liječenje ovih poremećaja više se ne preporučuje (23).

Epidemiološke studije pokazale su da poremećaji češće pogađaju žene reproduktivne dobi i da one češće traže liječenje od muškaraca (24 - 26). Ovo zapažanje potvrđeno je i u našoj studiji – uzorak se sastojao pretežito od pacijentica. Kao specifična skupina odabrani su ispitanici s anteriornim pomakom zglobne pločice bez redukcije. Istraživanje je provedeno kako bi se usporedio terapijski učinak istodobne primjene okluzijske udlage i fizikalne terapije i primjene isključivo okluzijske udlage.

Na početku nije bilo razlika između skupina u jakosti boli prema vizualno analognoj ljestvici i rasponu kretanja donje čeljusti. Tijekom liječenja bol prema vizualno analognoj ljestvici značajno je smanjena u obje skupine.

Okluzijska udлага najčešća je metoda u terapiji temporomandibularnih poremećaja. Lee i suradnici (27) pokazali su da okluzijska udлага značajno smanjuje bol TMZ-a kod pacijenata s anteriornim pomakom zglobne pločice bez redukcije. Major i Nebbe (28) izvijestili su da nošenje okluzijske udlage rezultira značajnim smanjenjem glavobolja i mišićne boli, ali da je ograničen njezin učinak na bol TMZ-a. Prema Lundhu i suradnicima (29), terapija okluzijskom udlagom nije rezultirala poboljšanjem kod pacijenata s dislokacijom diska bez redukcije. Rezultati naše studije pokazali su da ta udлага učinkovito smanjuje bol pacijentima s anteriornim pomakom zglobne pločice.

Naše istraživanje također je pokazalo da istodobna primjena stabilizacijske udlage i fizikalne terapije rezultira značajnijim povećanjem raspona otvaranja usta i značajnijim smanjenjem devijacija tijekom otvaranja od korištenja samo stabilizacijske udlage. U istraživanju Nicolakisa i suradnika (12), provedenom na 20 ispitanika, fizikalna terapija (vježbe) pokazala se korisnom u liječenju prednjeg pomaka diska bez

(MCO: $F=20.971$, $p=0.006$; MAO: $F=24.014$, $p=0.004$) (Figure 2). The use of an occlusal splint did not lead to statistically significant changes in the amount of mouth opening ($p>0.05$).

We also checked the variable “path of mouth opening” at two points: baseline and 6 months later. The pre-treatment and 6-month follow-up data were analysed by chi-square. The changes in path of mouth opening differ significantly between the groups ($p=0.040$). Only one patient in SS&PT group still presented deviations in mouth opening after completed therapy while in the SS group deviations were present in 5 patients after completed therapy.

Discussion

Anterior disc displacement without reduction has been reported to be a painful disorder (22). Most patients seek treatment when pain interferes with daily activities. Reduction or elimination of pain is an important parameter in evaluation of a therapeutic approach. The majority of patients with a diagnosed disc disorder can and should be treated with simple conservative means such as counselling, interocclusal device, medication and physical therapy. This approach has been proved to be very effective (23). A surgical approach to reposition the disc on the condyle is not recommended any longer.

Epidemiological studies revealed that female patients of reproductive age are mostly affected with TMD and seek more treatment than the males (24-26). This observation is confirmed in our study; the sample consisted of mainly female patients. Patients with anterior disc displacement without reduction were selected as the specific patient group. The study compared the treatment outcomes of the simultaneous use of occlusal splint and physical therapy (group SS&PT) and the use of occlusal splint alone (group SS).

At baseline of treatment there were no significant differences among the groups for VAS scores, as well as for the range of mandibular movement. As a result, both groups in this study showed reduction of pain.

Occlusal splint is often used for treatment of TMD. Lee et al. (27) showed that the adoption of occlusal splint in patients with anterior disc displacement without reduction significantly reduced TMJ pain. Major and Nebbe (28) reported that the application of occlusal splint resulted in significant reduction of headache and muscle pain, but its effect in the reduction of TMJ pain was limited. According to Lundh et al. (29), occlusal splint had no results in the treatment of disc dislocation without reduction. In light of the results of our study, occlusal splint is beneficial to TMD patients.

Considering the improvement in the range of mouth opening and reducing deviations during mouth opening, the splint combined with physical therapy was more effective than the occlusal splint used alone. In the study of Nicolakis et al., exercise therapy seems to be useful in the treatment of anterior disc displacement without reduction. Furthermore, the anaesthetic blockade and physical therapy, when used together, are effective in the reduction of pain and increasing

redukcije. Nakon tretmana četvero pacijenata više uopće nije imalo bolove. Nadalje, kod pacijenata kombiniranom terapijom (blokadama anestetika i fizikalnom terapijom) bol je značajno smanjena, a raspon otvaranja usta povećan (30).

U našem ispitivanju nedostaje neliječena ili placebo kontrolna skupina, zbog čega ne možemo odbaciti mogućnost da se kod nekih ispitanika bol spontano smanjila³¹. Unatoč ograničenjima ovog istraživanja, rezultati i dalje pokazuju značajno uspostavljanje fiziološke funkcije unatoč objektivnoj dijagnozi poremećene funkcionalne temporomandibularne anatomije. Naši zaključci upućuju na to da je za uspješno liječenje anteriornog pomaka zglobne pločice bez redukcije mnogo učinkovitija simultana upotreba stabilizacijske udlage i fizikalna terapija od upotrebe samo stabilizacijske udlage.

Zaključak

Unatoč ograničenjima ovog istraživanja pokazalo se da istodobna primjena stabilizacijske udlage i fizikalne terapije tijekom šestomjesečnog liječenja rezultira značajnijim povećanjem raspona otvaranja usta i značajnijim smanjenjem devijacija tijekom otvaranja od stabilizacijske udlage koja se koristi bez fizikalne terapije. Obje terapijske opcije pokazale su se djelotvornima u smanjenju boli pacijenata s anteriornim pomakom zglobne pločice bez redukcije. Unatoč objektivno dijagnosticiranom poremećaju temporomandibularnog zgloba, fiziološka funkcija je obnovljena.

Sukob interesa

Nije ga bilo.

of mouth opening when used in patients with disc displacement without reduction (12, 30).

Our trial lacked a non-treatment or placebo control group, hence we cannot discard the possibility that natural reduction of pain occurred in some participants (31). Taking the limitations of this study into account, the results still show a significant restoration of physiological function in spite of objectively diagnosed disruption of functional temporomandibular anatomy. Our findings indicate that, for successful management of anterior disc displacement without reduction, simultaneous application of occlusal splint and physical therapy may be more effective than use of occlusal splint only.

Conclusions

This limited study provided evidence that during treatment period lasting for 6 months, simultaneous use of stabilization splint and physical therapy was more efficient in reducing deviations and improving range of mouth opening than stabilization splint used alone. Both treatment options were efficient in reducing pain in patients with anterior disc displacement without reduction. Despite of objectively diagnosed disruption of temporomandibular joint anatomy, physiological function was regained.

Conflict of Interest

None declared.

Abstract

Objective: Temporomandibular disorders (TMD) are the most common source of orofacial pain of a non-dental origin. The study was performed to investigate the therapeutic effect of the conventional occlusal splint therapy and the physical therapy. The hypothesis tested was that the simultaneous use of occlusal splint and physical therapy is an effective method for treatment of anterior disc displacement without reduction. **Materials and Methods:** Twelve patients (mean age =30.5 y) with anterior disc displacement without reduction (according to RDC/TMD and confirmed by magnetic resonance imaging) were randomly allocated into 2 groups: 6 received stabilization splint (SS) and 6 received both physical therapy and stabilization splint (SS&PT). Treatment outcomes included pain-free opening (MCO), maximum assisted opening (MAO), path of mouth opening and pain as reported on visual analogue scale (VAS). **Results:** At baseline of treatment there were no significant differences among the groups for VAS scores, as well as for the range of mandibular movement. VAS scores improved significantly over time for the SS&PT group ($F=28.964$, $p=0.0001$, effect size =0.853) and SS group ($F=8.794$, $p=0.001$, effect size =0.638). The range of mouth opening improved significantly only in the SS&PT group (MCO: $F=20.971$, $p=0.006$; MAO: $F=24.014$, $p=0.004$) (Figure 2). Changes in path of mouth opening differ significantly between the groups ($p=0.040$). Only 1 patient in SS&PT group still presented deviations in mouth opening after completed therapy while in the SS group deviations were present in 5 patients after completed therapy. **Conclusion:** This limited study gave evidence that during the treatment period lasting for 6 months, the simultaneous use of stabilization splint and physical therapy was more efficient in reducing deviations and improving range of mouth opening than the stabilization splint used alone. Both treatment options were efficient in reducing pain in patients with anterior disc displacement without reduction. Despite of objectively diagnosed disruption of temporomandibular joint anatomy, physiological function was regained.

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Key words

Temporomandibular Joint; Dislocations; Pain; Occlusal Splints; Exercise Therapy; Physical Therapy Modalities

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