Utjecaj socijalno-ekonomskog statusa, pušenja i zdravstvenog statusa pacijenata na neuspjeh implantološke terapije

Patients’ Socio-Economic Status, Tobacco and Medical History Associated with Implant Failure

Introduction

Dental implants have become a preferred treatment option over the last several decades because of the reduced psychological trauma and the high functional and esthetic treatment outcome when compared to conventional restorative treatments (1,2). The reported success rates of dental implants range from 96.7% to 97.5% for single implants and 92.5% to 93.6% for fixed partial restorations over a period of 6 to 7 years (3). Although the use of osseointegrated dental implants have become a predictable treatment option, complications leading to implant loss may still occur during loading and maintenance (4). Factors that affect implant survival are diverse and have been associated with patient’s risk factors such as smoking, periodontal disease, periodontal pathogenic bacteria, bone density, systemic diseases and bone atrophy as well as implant micro- and macrostructure and surgical techniques (5,6).
Neuspjesi implantoprotetičke terapije mogu se podijeliti na rane i kasne, prema razdobljiju kada su se dogodili (4). Rani neuspjesi obično se otkrivanju u prvih tri do šest mjeseci, a obilježava ih slaba oseointegracija. Kasni neuspjesi mogu nastati nakon što se implantat oseointegrisao, a obilježava ih neadekvatno očuvanje koštane potpore. Odbacivanje implantata karakterizira radiolucenciju oko cijelog opsega implantata s nedostatkom kontakta između implantata i kosti te pomičnost, a implantatima kojima prijeti neuspjes sporo i kontinuirano gube marginalnu kost bez kliničke mobilnosti (4). Odbacivanje implantata velik je problem za pacijente, kirurge i osiguravajuća društva te su potrebna daljnja istraživanja kako bi se identificirali mogući rizični čimbenici.

Odbacivanje implantata i perimplantitis pojavljuju se kod 5% svih ugrađenih implantata (7). Za pacijentu s odbačenim implantatom nadomještaj je ovim katkad je jedina dostupna opcija za izradu fiksnog ili mobilnog nadomještaja. No, ishod s implantatima ugrađenima na položaje odbačenih još nije jasan (8, 9). U sustavnom pregledu literature, preživljavanje i uspješnost ugrađenih implantata u takvim slučajevima bili su između 71% i 100% (10). Oznajmo se u ovim prilikama etologijom i identificirati potencijalne rizične čimbenike za gubitak implantata i minimizirati tu površinu.

Razumijevanje potencijalnih rizičnih čimbenika za odbacivanje implantata prije početka liječenja može pospješiti dugoročno preživljavanje implantata, zdravlje periimplantarnog tkiva i preživljavanje proteze retnirane implantatima. Naime, važno je prepoznati rizik od gubitka i u skladu s tim prilagoditi plan liječenja. Istraživanje je pokazalo da su socio-loški i okoliški parametri ključni za zdravstvene rezultate (11). Traženje zdravstvene zaštite također je usko povezano sa statusom zdravstvenog osiguranja, što posljedično utječe na ishod liječenja (12, 13). U dentalnoj medicini dokazano je da se osobe s nižim socijalno-ekonomskim statusom imaju povećan rizik od oralnih bolesti od onih s višim (14). Nizak socijalno-ekonomski status i nedostatak zdravstvenog osiguranja povezani su s povećanim potrebama za stomatološkim zahvataima zbog premalo znanja o oralnom zdravlju, nedovoljnog pristupa stomatološkoj skrbi ili loših oralno-higijenskih naprava (14, 15). Stoviše, u dentalnoj implantologiji manjkava stomatološka skrbi ili loša oralna higijena nakon implantoprotesičke terapije mogu utjecati na dugotrajnost rezultata liječenja. Socijalno-ekonomski status pacijenata i zdravstveno osiguranje nisu u literaturi istraženi kao potencijalni čimbenici rizika od gubitka implantata. Zato je cilj ove retrospektivne studije bio ispitati svaku potencijalnu vezu između socijalno-ekonomskog statusa, povijesti bolesti, pušenja i zdravstvenog osiguranja pacijenata kod kojih se dogodilo odbacivanje implantata i onih sa uspješnom implantoprotesičkom terapijom.

**Materijali i metode**

**Uzorak**

Podaci za ovu retrospektivnu studiju prikupljeni su iz elektroničkih zapisa terapija provedenih između 2010. i 2016. na Stomatološkom fakultetu Sveučilišta u Minnesoti. Odobrio ju je fakultetski Institucionalni odbor za reviziju. Medicinska dokumentacija pacijenata kojima su ugrađeni i uklonjeni implantati na Stomatološkom fakultetu dobiveni implant operations can be divided into early and late based on the time of the failure (4). Early implant failure is usually detected within the first 3-6 months and is characterized by poor osseointegration. Late failure may occur after the implant is osseointegrated and is characterized by inadequate preservation of the bone support. Failed implants are characterized by radiolucency around the entire circumference of the implant with lack of implant-to-bone contact and mobility, while failing implants demonstrate slow and continuous marginal bone loss with absence of clinical mobility (4). Implant failure is a significant concern for patients, implant surgeons and insurance companies and further investigation is required to identify potential factors of implant failure.

The frequency of implant failure and peri-implantitis has been reported in 5% of all placed implants (7). In patients with failed implants, replacement with a new implant is sometimes the only available treatment option for fixed or removable rehabilitation. However, the outcome of implants placed in previously failed implant sites is still unclear (8,9).

In a systematic review of the literature, the survival and success rates of implant placement in previously failed implant sites ranged between 71% and 100% (10). It is of paramount importance to determine the etiology and identify potential factors of implant failure and minimize its occurrence.

Understanding potential risk factors of implant failure prior to the initiation of the treatment may foster long-term implant survival, peri-implant tissue health and implant supported prosthesis survival. It is critical to recognize the risk of implant loss and therefore treatment plan accordingly. Research has revealed that social and environmental parameters play a critical role in general health and health outcomes (11). Seeking health care is also closely related to health insurance status which subsequently affects the treatment outcome (12,13).

In dentistry, it has been demonstrated that individuals with a lower socio-economic status exhibit an increased risk for oral diseases rather than in those with a higher socio-economic status (14). Low socio-economic status and lack of dental insurance are associated with increased dental treatment needs due to lack of oral health knowledge, poor access to dental care or poor oral hygiene habits (14,15). Moreover, in implant dentistry, infrequent dental care or poor oral hygiene following an implant treatment may affect the long-term treatment outcome. Patient's socio-economic status and dental insurance have not been examined in the literature as potential risk factors of implant failure. Therefore, the aim of this retrospective case-control study was to examine any potential association between socio-economic status, medical history, tobacco status and dental insurance of patients that experienced implant failure and those who had a successful implant treatment.

**Material and methods**

**Subject population**

Data for this retrospective case-control study were obtained from the electronic records at the University of Minnesota School of Dentistry for treatment provided between 2010 and 2016 to patients attending the dental clinics. The study was approved by the Institutional Review Board of the University of Minnesota School of Dentistry for medical re-

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su iz fakultetske elektroničke baze i podudarali su se prema dobi i spolu kako bi se smanjio rizik od pristranosti odabi-ra. Pacijenti su morali imati najmanje 18 godina s navede-nim potpunim demografskim podacima i statusom zdrav-stvenog osiguranja te potpuno ispunjenim anamnestičkim upitnikom. U tablicu su uneseni broj kartona pacijenata, dob tijekom postupka, spol, ima li ili nema zdravstveno osigura-nje, povijest bolesti, pušenje, poštanski broj i ishod liječenja.

Prikupljanje podataka
Sistemska medicinska stanja koja su obuhvaćena uključi-vala su povišeni krvni tlak, srčani udar, visoki kolesterol, ast-mu, skečnu bolest, poremećaje rada štitnjače, poremećaje rada bubrega, artritis, umjetne zglobove, osteoporozu, depresiju, anksioznost, rak i liječenje raka. Medicinska povijest bole-sti, spol, pušenje i zdravstveno osiguranje uključeni su kao binarni parametri. Dob tijekom postupka uvrštena je u analizu kao kontinuirani parametar, a pacijenti su podijeljeni u četiri skupine u skupini s uspješnom implantoprotetič-kom terapijom i u skupini s odbacivanjem implantata prema percentilima dobi: < 54 godine (od 25. do 50. percentila), od 61 do 67 godina (od 50. do 75. percentila) ili ≥ 68 godina (od 75. percentila naviše). Položaj implantata kategoriziran je prema luku (maksila/mandibula) i regiji (prednja/stražnja).

Poštanski brojevi pacijenata korištene su u istraživanju za procjenu socijalno-ekonomskog statusa na temelju ankete Americane zajednice od 2010. do 2014., te petogodišnje procje-nee Ureda za popis stanovništva SAD-a. Prema toj anketi pro-
terni od 68.707 dolara, između 68.708 i 85.598 dolara, između
mno (od 25. do 50. percentila), niskog do umjerenog (od 25. do 50. percentila), umjerenog do visokog (od 50. do 75. percentila) ili visokog socijalno-ekonomskog sta-
ts juta (75. percentila i više), ako je prosječan godišnji prihod kućanstva prema poštanskom broju grada u kojem je živio bio man-

Vrsta terapije
Vrsta terapije identificirana je na temelju kodova ADA-
c: D 6010 (kirurška ugradnja endosealnog implantata) i D 6100 (uklanjanje implantata – neuspjeh). Sve uključene
plantate kirurški su ugradili ili uklonili specijalisti u De-
dental school. All patients that had implant removal (n=186) were included in the analysis, while patients with a successful implant treatment (n=186) were divided into four sub-study groups in the implant success and the implant failure study groups based on the percentiles of age with <54 years (under the 25th percentile), 54-60 years (25th to 50th percentile), 61-67 years (50th to 75th percentile) or ≥68 years of age (75th percentile and above). Implant location was categorized into arch (maxilla/mandible) and region (anterior/posterior).

Patient ZIP codes were utilized in the study to assess economic status based on the 2010-2014 American Community Survey 5-year estimates of the U.S. Census Bureau. This survey reported that the mean annual household income was estimated to be $90,488.46. Each included patient was classified based on percentiles of income with a low (under the 25th percentile), low to moderate (25th to 50th percentile), moderate to high (50th to 75th percentile) or high socio-economic status (75th percentile and above) if the mean annual household income of the ZIP code where he/she lived was below $68,707, between $68,708 and $85,598, between $85,599 and $103,788 or above $103,789, respectively.

Data collection
The examined systemic medical conditions consisted of self-reported high blood pressure, heart attack, high cholesterol, asthma, diabetes, thyroid disorder, kidney disorder, arthritis, artificial joint, osteoporosis, depression, anxiety, cancer and cancer treatment. Medical history, gender, tobacco use and dental insurance were included as binary parameters. Age at the time of the procedure was included in the analysis as a continuous parameter, while patients were also divided into four sub-study groups in the implant success and the implant failure study groups based on the percentiles of age with <54 years (under the 25th percentile), 54-60 years (25th to 50th percentile), 61-67 years (50th to 75th percentile) or ≥68 years of age (75th percentile and above). Implant location was categorized into arch (maxilla/mandible) and region (anterior/posterior).

Type of treatment
The type of treatment provided was identified based on the ADA codes: D6010 (surgical placement, endosteal implant) and D6100 (implant removal-failure). All included implants were surgically placed or removed by faculty or residents in the Division of Periodontology, Oral and Maxillofacial surgery, Prosthodontics and Endodontics at the University of Minnesota School of Dentistry. All patients that had implant removal (n=186) were included in the analysis, while patients with a successful implant treatment (n=186) were randomly selected to serve as control.

Statistical analysis
An inherent problem in retrospective case-control studies is the selection of a comparable control group. The aim is to select individuals with similar distribution of exposure status. The control group in the present study was randomly selected from the same population and was matched for age and gender due to the selection of a comparable control group. The aim is to se-

Statistička analiza
Uobičajeni problem retrospektivnih studija slučaja s kon-

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Potencijalni rizik od pristranosti. Prikupljeni podatci uneseni su u računalnu bazu podataka i analizirani statističkim programom. Korištena je deskriptivna statistika, uključujući frekvencije, srednje vrijednosti i standardne devijacije. Obavljena je hidukvadrat test za procjenu značajnosti položaja implanta (luk, regija), učestalosti medicinskih stanja, statusa zdravstvenog osiguranja i socijokonomskog statusa s obzirom na zavisnu varijablu (uklanjanje implanta). Omjeri vjerojatnosti i odgovarajuće p-vrijednosti za uzorak analizirani su logističkom regresijskom analizom. Svi testovi značajnosti procijenjeni su na razini p<0.05, s pomoću statističkog softvera (SPSS v.21.0, IBM, Armonk, NY, SAD).

Rezultati

U ispitnu skupinu uključeno je ukupno 186 zapisa o uklanjanju implanta pronađenih u elektroničkoj bazi podataka Stomatološkog fakulteta Sveučilišta u Minnesoti. Oni s uspješnim ugradnjama implanta koje su obavili specijalisti ili na-stavnici toga fakulteta na početku su pregledani da bi se provjerala prihvatljivost na temelju uključnih i isključivih kriterija, a 186 zapisa koji su se prema dobi i spolu podudarali s ispitnom skupinom slučajno su odabrani i uvršteni u kontrolnu skupinu. Zato su u konačnu analizu uključena ukupno 372 zapisa o dentalnim implantatima kako bi se ustanovilo jesu li status zdravstvenog osiguranja, socijokonomski status, pušenje i medicinski uvjeti povezani s gubitkom implanta. Prosječna dob pacijenata bila je 61.26±11.02 s 23.7% populacije koja je bila < 54 godina, 22.8% u obidi od 54 do 60 godina, 26.6% u obidi između 61 i 67 godina i 26.9% ≥ 68 godina. Populacija je činilo je 52.4% muškaraca i 47.6% žena.

Results

A total of 186 dental records of implant removal were identified in the electronic database of the University of Minnesota School of Dentistry and included in the test group. Records of successful implants placed by residents or faculty members of the University of Minnesota School of Dentistry were initially screened for eligibility based on the inclusion and exclusion criteria of the study and 186 age and gender matched records were randomly selected and included in the control group. Therefore, a total of 372 records of dental implants were included in the final analysis to determine whether dental insurance, socio-economic status, tobacco use and medical conditions are associated with implant failure. The mean age of the included 372 patients was 61.26±11.02 with 23.7% of the population being <54 years of age, 22.8% 54-60 years, 26.6% between 61 and 67 years and 26.9% ≥68 years. The included population consisted of 52.4% males and 47.6% females.

Table 1

Tablica 1. Status zdravstvenog osiguranja, socijokonomski status i pušenje ukupne populacije i usporedba između pacijenata s uspješnom i neuspješnom implantoprotektičkom terapijom

| Parametar • Characteristics | Ukupno • Total (n=372) | Odbacivanje implantata • Implant failure (n=186) | Uspješna implantoprotektička terapija • Successful implant treatment (n=186) | p-vrijednost* • p-value* |
|-----------------------------|------------------------|---------------------------------|---------------------------------|------------------------|
| Socijokonomski status • Socio-economic status |                        |                                 |                                 |                        |
| Nizak • Low (%)             | 100 (26.9)             | 48 (86.0)                       | 52 (52.0)                       | 0.021                  |
| Nizak do umjeren • Low to moderate (%) | 88 (23.7)             | 54 (61.4)                       | 34 (38.6)                       |                        |
| Umjeren do visok • Moderate to high (%) | 91 (24.4)             | 48 (52.7)                       | 43 (47.3)                       |                        |
| Visok • High (%)            | 93 (25.0)              | 36 (38.7)                       | 57 (61.3)                       |                        |
| Zdravstveno osiguranje • Dental insurance |                        |                                 |                                 |                        |
| Da • Yes (%)                | 182 (48.9)             | 96 (52.7)                       | 86 (47.3)                       | 0.300                  |
| Ne • No (%)                 | 190 (51.1)             | 90 (47.4)                       | 100 (52.6)                      |                        |
| Pušenje • Tobacco use |                        |                                 |                                 |                        |
| Da • Yes (%)                | 36 (9.7)               | 27 (75.0)                       | 9 (25.0)                        | 0.002                  |
| Ne • No (%)                 | 336 (90.3)             | 159 (47.3)                      | 177 (52.7)                      |                        |
| Područje implantacije • Implant region |                        |                                 |                                 |                        |
| Prednje • Anterior (%)      | 81 (21.8)              | 47 (58.0)                       | 34 (42.0)                       | 0.102                  |
| Stražnje • Posterior (%)    | 291 (78.2)             | 139 (47.8)                      | 152 (52.2)                      |                        |
| Luk • Implant arch |                        |                                 |                                 |                        |
| Maksila • Maxilla (%)       | 222 (59.7)             | 107 (48.2)                      | 115 (51.8)                      | 0.398                  |
| Mandibula • Mandible (%)    | 150 (40.3)             | 79 (52.7)                       | 71 (47.3)                       |                        |

* Statistički značajna razlika među skupinama s p-vrijednošću ≤ 0.05. Za stomatološko osiguranje, socioekonomski status, korištenje duhana, mjesto implantacije (regija i zubni luk), korišten je hidukvadrat test. Podebljane vrijednosti predstavljaju statistički značajne razlike. • Statistical significant difference between study groups with p-value≤0.05. For dental insurance, socio-economic status, tobacco use, implant location (region and arch), chi-square test was used. Bold values represent statistically significant differences.
U tablici 1. prikazani su status zdravstvenog osiguranja, socijalno-ekonomski status i navika pušenja ukupne populacije te usporedba pacijenata s gubitkom implantata i s uspješno oseointegriranim implantatima. Socijalno-ekonomsko stanje za 26,9 % ocijenjeno je kao nisko, za 23,7 % kao nisko do umjeren, za 24,5 % kao umjeren do visoko i za 25,0 % kao visoko. Socijalno-ekonomsko status dosegnuo je razinu statističke značajnosti (hi-kvadrat test, \( p = 0,021 \)), što pokazuje da osobe s visokim socijalno-ekonomskim statusom (≥$103,789) u usporedbi s onima s niskim, imaju veću prevalenciju sistemskih stanja. U tablici 2. prikazani su status zdravstvenog osiguranja, socijalno-ekonomski status i navika pušenja ukupne populacije te usporedba pacijenata s gubitkom implantata i s uspješno oseointegriranim implantatima. Socijalno-ekonomski status dosegnuo je razinu statističke značajnosti (hi-kvadrat test, \( p = 0,021 \)), što pokazuje da osobe s visokim socijalno-ekonomskim statusom (≥$103,789) u usporedbi s onima s niskim, imaju veću prevalenciju sistemskih stanja.

**Insurance status, socio-economic status and tobacco use of the total population and comparison between patients with implant failure and successful implants** are shown in Table 1. In regards to the socio-economic status, 26.9% were classified as low, 23.7% as low to moderate, 24.5% as moderate to high and 25.0% as high socio-economic status. The socio-economic status reached the significance level (chi-square test, \( p = 0.021 \)) demonstrating that individuals with high a socio-economic status (≥$103,789) when compared to those with a low socio-economic status are more likely to have a

**Table 2.** Prevalence of systemic conditions in the total population and between patients that had an implant removal and a successful implant treatment.

| Stanje • Characteristics | Ukupno • Total (n=372) | Odbacivanje implantata • Implant failure (n=186) | Uspješna implantoprotetička terapija • Successful implant treatment (n=186) | \(p\)-vrijednost* • p-value* |
|--------------------------|------------------------|---------------------------------------------|--------------------------------------------------|-----------------------------|
| Visoki krvni tlak • High blood pressure  
Da • Yes (%)  
Ne • No (%) | 110 (29.6)  
262 (70.4) | 56 (30.9)  
130 (49.6) | 54 (49.1)  
132 (50.4) | 0.820 |
| Srčani udar • Heart attack  
Da • Yes (%)  
Ne • No (%) | 14 (3.8)  
358 (96.2) | 3 (21.4)  
183 (51.1) | 11 (78.6)  
175 (48.9) | 0.029 |
| Visoka razina kolesterolja • High cholesterol  
Da • Yes (%)  
Ne • No (%) | 91 (24.7)  
280 (75.3) | 43 (46.7)  
143 (51.1) | 49 (53.3)  
137 (48.9) | 0.471 |
| Astma • Asthma  
Da • Yes (%)  
Ne • No (%) | 19 (5.1)  
353 (94.9) | 11 (57.9)  
175 (49.6) | 8 (42.1)  
178 (50.4) | 0.480 |
| Djabetes • Diabetes  
Da • Yes (%)  
Ne • No (%) | 40 (10.8)  
332 (89.2) | 18 (45.0)  
168 (50.6) | 22 (55.0)  
164 (49.4) | 0.503 |
| Poremećaj rada štitnjače • Thyroid disorder  
Da • Yes (%)  
Ne • No (%) | 36 (9.7)  
336 (90.3) | 23 (63.9)  
163 (48.5) | 13 (36.1)  
73 (51.5) | 0.079 |
| Bolest bubrega • Kidney disease  
Da • Yes (%)  
Ne • No (%) | 4 (1.1)  
368 (98.9) | 2 (50.0)  
184 (50) | 2 (50.0)  
184 (50) | 1.000 |
| Artritis • Arthritis  
Da • Yes (%)  
Ne • No (%) | 94 (25.3)  
278 (74.7) | 51 (54.3)  
135 (48.6) | 43 (45.7)  
143 (51.4) | 0.340 |
| Umjetni zglobovi • Artificial joint  
Da • Yes (%)  
Ne • No (%) | 41 (11.0)  
331 (89.0) | 26 (63.4)  
160 (48.3) | 15 (36.6)  
171 (51.7) | 0.069 |
| Osteoporoza • Osteoporosis  
Da • Yes (%)  
Ne • No (%) | 22 (5.9)  
350 (94.1) | 15 (68.2)  
171 (48.9) | 7 (31.8)  
179 (51.1) | 0.079 |
| Depresija • Depression  
Da • Yes (%)  
Ne • No (%) | 52 (14.0)  
320 (86.0) | 30 (57.7)  
156 (48.8) | 22 (42.3)  
164 (51.2) | 0.232 |
| Anksioznost • Anxiety  
Da • Yes (%)  
Ne • No (%) | 46 (12.4)  
326 (87.6) | 24 (52.2)  
162 (49.7) | 22 (47.8)  
164 (50.3) | 0.753 |
| Rak • Cancer  
Da • Yes (%)  
Ne • No (%) | 42 (11.3)  
330 (88.7) | 19 (45.2)  
167 (50.6) | 23 (54.8)  
163 (49.4) | 0.512 |
| Liječenje raka • Cancer treatment  
Da • Yes (%)  
Ne • No (%) | 25 (6.7)  
347 (93.3) | 8 (32.0)  
178 (51.3) | 17 (68.0)  
169 (48.7) | 0.062 |

* Statistički značajna razlika među skupinama je \( p\)-vrijednost ≤ 0.05, podebljane vrijednosti pokazuju statistički značajnu razliku na temelju hi-kvadrat testa • Statistical significance between study groups with p-value≤0.05. Bold value represents statistically significant differences obtained from chi-square test.
Pacijenti i odbacivanje implantata

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cu vjerojatnost za uspješno liječenje implantatom i manji rizik od potrebe za uklanjanjem implantata. Pojedinci s niskim socijalno-ekonomskim statusom imali su omjer vjerojatnosti 0,469 (logistička regresijska analiza, 95% CI: 0,237 - 0,929, p = 0,030) kad je riječ o uspješnoj implantoprotečkoj terapiji.

U vezi sa statusom zdravstvenog osiguranja istaknimo da je 48,9% stanovništva bilo osigurano, a 51,1% nije. Taj status nije statistički značajno utjecao na ishod liječenja (hi-kvadrat test, p = 0,300) i u obje skupine (s osiguranjem ili bez osiguranja) rezultat liječenja bio je sličan. Pušenje je prijavilo 9,7% pacijenata, a većina je navela (90,3%) da ne konzumira duh. Kod većine uključenih konzumenata duhana (75%) dogodilo se odbacivanje implantata i to je statistički značajno različito (hi-kvadrat test, p = 0,002) u usporedbi s pojedincima koji nisu pušili (47,3%). Pušači su s 3,710 (95% CI: 1,319 - 10,440) imali statistički značajno veći omjer vjerojatnosti od gubitka implantata za određenu regiju (hi-square test, p = 0,102) i za luk (kvadratni kvadrat, p = 0,398).

U tablici 2. prikazana je prevalencija sistemskih stanja u ukupnoj populaciji i između pacijenata s uspješno i neuspješno implantoprotečkom terapijom. Visok krvni tlak (29,6%), visok kolesterol (24,7%), artritis (25,3%) i depresija (14,0%) bile su najčešće navedene opće bolesti. Srčani udar (hi-kvadrat test, p = 0,029) pokazao je statistički značajnu povezanost s ishodom liječenja. Konkretno, osobe s preboljšanim srćanim udarom imale su veću vjerojatnost za uspješno liječenje implantatom (78,9%) kao kompariranog s onima s niskim socijalno-ekonomskim statusom (78.2%) bilo je u stražnjoj regiji i 59.7% u maksili, ali njihovali položaj nije značajno utjecao na rizik od gubitka implantata. Prevalence of systemic conditions in the total population and between patients that had an implant failure and a successful implant treatment is shown in Table 2. High blood pressure (29.6%), high cholesterol (24.7%), arthritis (25,3%) and depression (14,0%) were the most commonly self-reported medical diseases. Heart attack (hi-square test, p=0.029) showed statistically significant association with the treatment outcome. In particular, individuals with heart attack were more likely to have a successful implant treatment (78.9%) as compared to individuals with no history of heart attack (48.9%) (chi-square test, p=0.029). None of the other examined systemic disease parameters evaluated were found to be significantly associated with the treatment outcome.

Rasprava

Identifikacija čimbenika koji utječu na ishod liječenja može dati vrijedne informacije da bi se razlikovali pacijenti s rizikom od odbacivanja implantata od onih s uspješnim odgovorom na liječenje. Prepoznavanje varijabli kod pacijenata koje mogu utjecati na ishod liječenja potiče na bolje proširenje (16). U ovom istraživanju nastojali smo ustanoviti socio-economic parameters, insurance status, medical conditions and history of tobacco use that would have the potential to demonstrate treatment effect modification. We identified socio-economic parameters, insurance status, medical conditions and history of tobacco use that would have the potential to enhance clinical reasoning (16). In this study, we aimed to identify socio-economic parameters, insurance status, medical conditions and history of tobacco use that would have the potential to demonstrate treatment effect modification. We found that individuals with high socio-economic status, tobacco non-users and patients with a history of heart attack were significantly more likely to have a successful implant than those with a low socio-economic status, tobacco users and with no history of heart attack.

In the decision-making process, clinicians may be influenced by characteristics of patients such as age, gender, education level, personality and socio-economic status (17). Socio-economic status was a statistically significant predictor of implant failure and removal. In the present study, individu-
zid od odbacivanja implantata. Važno je napomenuti da su takvi pojedinci lošijega zdravstvenog stanja zbog teža dostupnih resursa i ograničenog pristupa zdravstvenoj zaštiti (18). Nemogućnost redovitog obavljanja profilaktičkog čišćenja ili parodontoloških pregleda može biti problem. U literaturi je zabilježena povezanost između socijalno-ekonomskog statusa i četkanja zuba ≥ 3 puta dnevno, pri čemu su osobe s većim dohotkom i višim stupnjem obavljanja imale vjerojatnosti od 1,264 do 2,686 (19). Neadekvatne navike oralne higijene također mogu opravdati naše rezultate. U ovom istraživanju, informacije o stupnju obavljanja pacijenata nisu bile dostupne zbog retrospektivnog oblika istraživanja.

Stomatološki fakultet Sveučilišta u Minnesoti ne traži informacije o stupnju obavljanja tijekom prijima pacijenata. Učinak socijalno-ekonomskog statusa u ovom istraživanju procijenjen je poštanskim brojem adrese pacijenata, kao pomoć pri određivanju individualnog socijalno-ekonomskog statusa, što je u prošlosti potvrđeno drugim epidemiološkim istraživanjima (21, 22). U ovom istraživanju pacijenti sa zdravstvenim osiguranjem imali su slične ishode liječenja u usporedbi s neosiguranima. Činjenica da pacijent ima zdravstveno osiguranje nije utjecala na preživljava implantata kao što se na početku pretpostavljalo. To otkriće može se pripisati niskom trošku profilaktičkih postupaka i godišnjim preživljavanjima implantata (19). U ovom istraživanju liječenje implantaca se postavilo kao prihvatljivo. U četiri pacijenta (97,9 %) (24).

U ovom istraživanju nisu ustanovljene razlike u stopama preživljavanja prema položaju implantata, što je u skladu s retrospektivnim istraživanjem Eckerta i suradnika koje je pokazalo da položaj implantata nema nikakva utjecaja na preživljava implantata, učestalost lomljenja implantata, popuštanje vijaka ili pucanje vijaka (23). Za dentalne implantate u maksili zabilježena je i trostruko veća stopa neuspjeha negoli za one u mandibuli (4). Drugi autori ističu da su najniže stope uspjeha u stražnjem dijelu gornje čeljusti (91,4 %), zatim u prednjem dijelu gornje čeljusti (97 %), u stražnjem dijelu donje čeljusti (96,3 %) te u prednjem dijelu donje čeljusti (97,9 %) (24).

Osnovne sistemske bolesti mogu utjecati na preživljavanje implantata i rizik od periimplantitis (25). Autori su propoštali da su pojedinci s određenim sistemskim bolestima/stanjima i pušači skloniji odbacivanju implantata u usporedbi sa zdravom kontrolom. Sistemske bolesti povezane s komplikacijama u implantoproteričkoj terapiji uključuju kardiovascularne bolesti, poremećaje rada štitnjače, dijabetes, hepatitis, HIV, Crohnova bolest, osteoporozu i pušenje (25,26). Ne stupanj ozbiljnosti određene sistemske bolesti može biti važniji od njezine prirode. U ovom istraživanju dijabetes nije bio povezan s odbacivanjem implantata, što bi se moglo objasniti kontroliranim razinama glikemije. Pojedinci s prebolišnim srčanim udarom imali su statistički značajno veću vjerojatnost za uspješno liječenje implantatima u usporedbi s onima bez srčanog udara u povijesti bolesti. To se može pri-
Pacijenti i odbacivanje implantata

Chatzopoulos i sur.

182

www.ascro.hr

Pacijenti i odbacivanje implantata

Chatzopoulos i sur.

182

www.ascro.hr

liječnici opće prakse preporučili da redovito posjećuju stomatologa prije bolesti. Pacijentima su možda njihovi kardiolozi i pisati općim promjenama životnih navika pacijenata koji su bolesti i pušenja na rizik od odbacivanja implantata. Strogo planiranje terapije mogu rezultirati uspješnim dijagnozom implantoprotetičke terapije s funkcionalnim i estetskim nadomjesima. Identifikacija parametara koji mogu potaknuti odbacivanje implantata iznimno je važna i za kliničare i za pacijente.

Zaključci

Uzimajući u obzir ograničenja ove retrospektivne studije slučaja, pojedinci s visokim društveno-ekonomskim statusem, poviješću pušenja u virovjatnost postaja implantat. U odabiru pacijenata za uspješno liječenje implantatima od onih s niskim društveno-ekonomskim statusom i bez srčanog udara u povijesti bolesti. Rezultati ovog istraživanja daju doktorima dentalne medicine vrijedne informacije o odabiru pacijenata za uspješno liječenje implantatima, ali nema dokaza da je povijest bolesti povezana s ishodom implantata i njegovo preživljavanje (33, 34). Uklanjanje implantata zahtijeva od pacijenta dodatne troškove i postupke te frustrira terapeute. Zato odgovarajući odabir pacijenata i pravilno planiranje terapije mogu rezultirati uspješnim duhoročnim ishodom implantoprotetičkih terapija s funkcionalnim i estetskim nadomjesima. Identifikacija parametara koji mogu potaknuti odbacivanje implantata iznimno je važna i za kliničare i za pacijente.

Sukob interesa

Autori navode da nisu bili u sukobu interesa.

not related to implant failure which may possibly be associated with controlled glycemic levels. Individuals with a history of heart attack were statistically significantly more likely to have a successful implant treatment compared to those without heart attack. This may be attributed to the general lifestyle shifts of patients who underwent heart attack which includes adoption of healthier social habits than prior to the heart attack. Patients may have been recommended by their cardiologists and general medical practitioners to receive dental treatment regularly in order to eliminate any potential risk of general infection. Similar complications and failures of dental implants between medically compromised patients and healthy individuals were reported in a systematic review of the literature revealing the need for larger studies (27). In the current study, tobacco users were 3.710 times more likely to have an implant failure when compared to non-smokers. Smoking is considered one of the major risk factors that impacts the long-term survival of dental implants (25). The association between smoking habits and implant survival has been attributed mainly to its effect on osteogenesis and angiogenesis as well as to behavioral parameters such as smokers' less optimal oral health, infrequent dental visits and less favorable oral hygiene habits (28-31).

Implant failures in dentistry can be attributed to a variety of conditions or situations. These include loss of osseointegration, poor treatment planning and/or poor surgical experience that lead to positional failure, soft tissue defects and biomechanical failures that include a variety of incidences that range from screw loosening to implant or implant component fracture (32). Due to the retrospective design of the study, data on patients' oral hygiene habits and plaque control were not available for the analysis. This is a limitation of the study due to the detrimental effect of poor oral hygiene on peri-implant tissue health and implant survival (33,34). The aftermath of implant removal leads to further cost and additional procedures for the patient as well as a clinician's frustration. Therefore, appropriate patient selection and proper treatment planning may result in successful long-term dental implants with functional and esthetic implant supported restorations. The identification of parameters that may lead to implant failure is of paramount importance for both clinicians and patients.

Conclusions

Within the limitation of this retrospective case-control study, individuals with high socio-economic status, no history of tobacco use and history of heart attack were more likely to have a successful implant treatment than those with a low socio-economic status, tobacco users and without a history of heart attack. The results of the present study provide valuable information for dental professionals about patient selection for successful implant treatment, but there is lack of evidence to suggest that medical history is associated with implant treatment outcome. Further prospective large scale studies should assess the effect of insurance status, socio-economic status, medical history and tobacco use on the risk of implant failure.

Conflict of interest

The authors declare no conflicts of interests.
Abstract

Objective: To examine the potential association between patients’ characteristics that experienced implant failure and those who had successful implant treatment. Materials and methods: This retrospective case-control study is based on 186 dental records of implant failure and 186 age and gender matched successful treatments for a total of 372 patients. Age at the time of the procedure, gender, medical history, tobacco use, dental insurance status, ZIP code and type of treatment provided (implant failure-successful implant treatment) were recorded. Results: The population consisted of 47.6% females, 48.9% individuals with dental insurance and 9.7% self-reported tobacco users. A statistically significant association (p<0.05) was found between implant failure and successful implant treatment in regards to tobacco use, socio-economic status and medical history. Insurance status and implant location (arch) did not affect significantly (p>0.05) the outcome of implant therapy. Conclusions: Within the limitation of this retrospective case-control study, individuals with high socio-economic status, no history of tobacco use and history of heart attack were more likely to have a successful implant treatment than those with a low socio-economic status, tobacco users and without history of heart attack.

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