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## PERIOPERATIVNE KOMPLIKACIJE ORALNO-HIRURŠKIH ZAHVATA KOD KARDIOVASKULARNIH GERIJATRIJSKIH PACIJENATA

### PERIOPERATIVE COMPLICATIONS OF ORAL-SURGICAL PROCEDURES IN CARDIOVASCULAR GERIATRIC PATIENTS

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#### Sažetak

**Uvod:** Gerijatrijska populacija je dio populacije stanovništva s najbržim rastom koja čini 14% stanovništva Bosne i Hercegovine. Starosne promjene, politerapija, primarno kardiovaskularno oboljenje i komorbiditet su karakteristike gerijatrijskog kardiovaskularnog pacijenta u stomatološkoj praksi. Kako bi se minimizirali rizici vezani za oralno-hirurške intervencije kod takvih pacijenata, pažljiva preoperativna priprema bi trebala uvijek uključivati procjenu sistemskog oboljenja i propisane internističke terapije.

**Cilj:** Cilj ove studije je odrediti prevalencu kardiovaskularnih oboljenja i analizirati propisane lijekove i perioperativne komplikacije kod gerijatrijskih pacijenata s kardiovaskularnim oboljenjima koji se podvrgavaju oralno-hirurškim zahvatima na Katedri za oralnu hirurgiju Stomatološkog fakulteta Univerziteta u Sarajevu.

**Materijal i metode:** Ukupno 107 pacijenata je uključeno u studiju: 48 (45%) muškaraca i 59 (55%) žena, omjer 1:1,2 u korist žena, u rasponu godina od 65-81, sa srednjom vrijednosti  $\pm$  SD= 69 $\pm$ 4 godina.

**Rezultati:** 79% pacijenata sa sistemskim oboljenjima ima dijagnosticirano oboljenje kardiovaskularnog sistema. Jedina komplikacija vezana uz administraciju lokalne anestezije je sinkopa. Sinkopa je češća kod pacijenata sa kardiovaskularnim oboljenjima i većim brojem propisanih lijekova. Fraktura zuba je najčešća komplikacija tokom ekstrakcije (n=15; %=18) pri čemu se rizik od frakture povećava s dobi (p<0,05). Veća incidenca postekstrakcionih komplikacija je uočena kod pacijenata s većim brojem sistemskih oboljenja i propisanih lijekova (p<0,05). Veća incidenca postoperativnog krvarenja je zabilježena kod kardiovaskularnih pacijenata (p<0,05).

**Zaključak:** Fiziološke starosne promjene uz kompromitirajući medicinski status pacijenta karakteriziranih komorbiditetom i politerapijom, mogu komplikovati oralno-hirurški zahvat.

**KLjučne riječi:** kardiovaskularna oboljenja, gerijatrija, perioperativna njega, lokalna anestezija

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#### Abstract

**Introduction:** Geriatric population is the fastest growing segment of population and comprises 14% of the population of Bosnia and Herzegovina. Aging effects, polypharmacy, primary cardiovascular disease and comorbidity are the characteristics of cardiovascular geriatric patient in dental practice. Careful preoperative assessment should always include identifying of compromising medical conditions and prescribed medications in order to minimize the risk of complications related to oral-surgery procedures in geriatric patients.

**The aim:** The aim of this study was to determine the prevalence of cardiovascular diseases, prescribed medications and perioperative complications of oral surgical procedures in geriatric patients with cardiovascular diseases undergoing oral-surgical procedures at Department of Oral Surgery, University of Sarajevo.

**Material and methods:** The total of 107 patients were included: 48 (45%) males and 59 (55%) females, gender ratio 1:1,2 in favour of females, the age range was 65- 81 years, with mean age  $\pm$  SD= 69 $\pm$ 4 years.

**Results:** Seventy-nine percent of patients with systemic diseases had diagnosed cardiovascular disease (n=66). The only complication related to the administration of local anaesthetic is syncope. Syncope was more common in patients with cardiovascular diseases and multiple cardiovascular medications prescribed. Fracture of tooth was the most common complication during extraction (n=15; %=18) and the risk of tooth fracture increased with aging (p<0,05). Higher incidence of postextraction complications was seen in patients with multiple systemic diseases and multiple drugs prescribed (p<0,05). Higher incidence of postoperative haemorrhage was recorded in cardiovascular patients.

**Conclusion:** Physiological factors associated with aging combined with compromising medical status of cardiovascular geriatric patients characterized by comorbidity and polypharmacy can complicate oral-surgical procedures.

**Key words:** cardiovascular diseases, geriatrics, perioperative care, local anaesthetics

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## Uvod

Promjene u demografskoj strukturi koje uključuju povećanje broja i udjela starije populacije (osoba preko 65 godina) u opštoj populaciji su dovele do porasta broja gerijatrijskih pacijenata u stomatološkoj praksi. Gerijatrijska populacija čini 14% populacije Federacije Bosne i Hercegovine (FBiH), što njenu populaciju čini regresivnim biološkim tipom<sup>1</sup>. Povećanje udjela starije populacije u razvijenim zemljama je indikator visokog životnog standarda. Međutim, u FBiH su promjene u starosnoj strukturi stanovništva posljedica rata koji je trajao od 1992 do 1995 godine. Rat je ostavio duboke posljedice na zdravstveno stanje bosanskohercegovačke populacije usljed negativnih demografskih trendova (veliki broj žrtava, povećana prevalenca hroničnih oboljenja, migracije, loše životne navike, emigracija medicinskog osoblja)<sup>2</sup>.

Povećanje prevalencije hroničnih nezaraznih oboljenja je ključni javno-zdravstveni problem u FBiH. Prema podacima Zavoda za javno zdravstvo FBiH, zdravstveno stanje populacije FBiH karakterizira povećanje prevalencije arterijske hipertenzije, kardiovaskularnih oboljenja i diabetes melitusa. Gerijatrijska populacija je najbrže rastući dio populacije stanovništva s najbržim povećanjem morbiditeta u periodu 2008-2012. godine (slika 1). Ova populacija čini 21,9% ukupnog morbiditeta s arterijskom hipertenzijom kao najčešćim oboljenjem (slika 2)<sup>1</sup>.

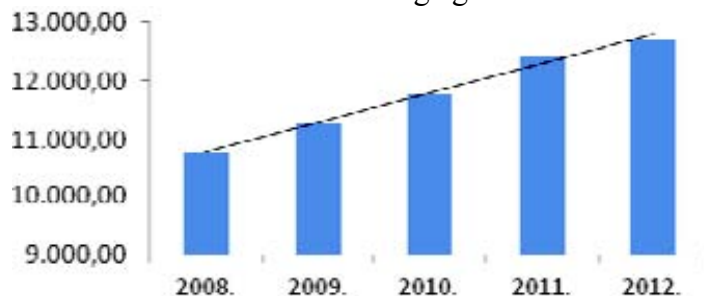
Fiziološke i patološke promjene povezane starosne promjene mogu dodatno komplicirati medicinsko stanje gerijatrijskog pacijenta. Starosne promjene kardiovaskularnog sistema

## Introduction

The changes of demographic structure including growth of number and proportion of elderly population have led to increased number of geriatric patients (patients aged 65+) within the dental health care system. Geriatric population comprises 14% of the population of Bosnia and Herzegovina that makes Bosnian population a regressive biological type<sup>1</sup>. The increase in the share of older population in the developed countries represents an indicator of higher living standard. However, in the Federation of Bosnia and Herzegovina, a change in age structure of the population is a result of war in Bosnia and Herzegovina which lasted from 1992 till 1995. War resulted in profound consequences on health status of the entire population due to negative demographical trends (large number of victims, increasing prevalence of chronic diseases, lots of migrations, spread of bad living habits, emigration of medical personnel)<sup>2</sup>.

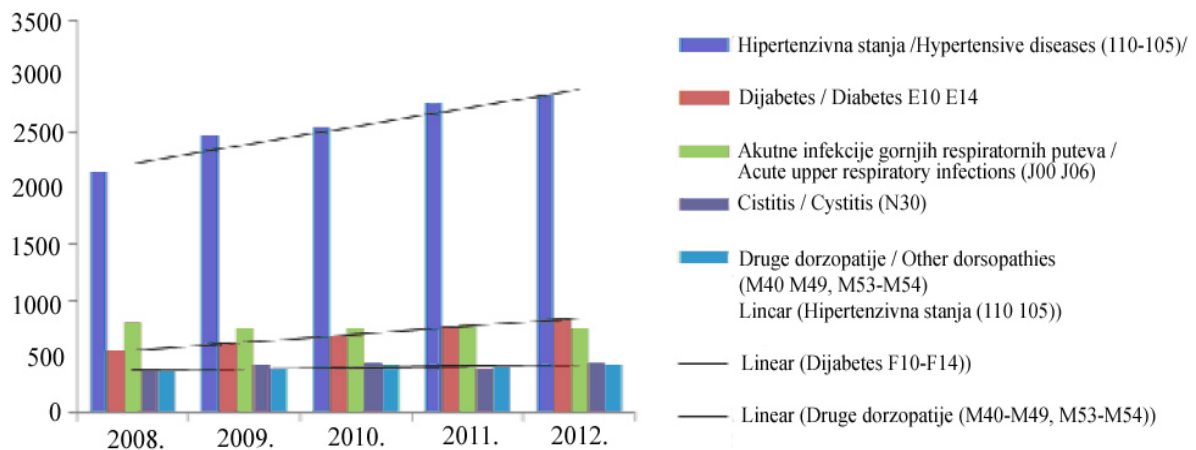
Increase in the number of chronic non-infectious diseases is a key public health problem in the Federation of Bosnia and Herzegovina. The recent data point to an increase in the prevalence of arterial hypertension, cardiovascular diseases and diabetes mellitus. According to Institute for Public Health of the Federation of Bosnia and Herzegovina, geriatric population is the fastest-growing segment of population and the rate of geriatric morbidity has the highest increase during the period 2008-2012 year (Figure 1) and comprises 21,9% in general morbidity with arterial hypertension as the most common disease (Figure 2)<sup>1</sup>.

Physiological and pathological changes related to aging are additionally complicated with compromising medical status of a patient. Aging affects the cardiovascular system both



Slika 1. Stopa morbiditeta gerijatrijske populacije (65+) u Bosni i Hercegovini tokom 2008-2012 godine (prikaz na 10.000 ljudi)

Figure 1. Rate of morbidity of geriatric population (65+) in Bosnia and Herzegovina, 2008-2012, rate/10.000 people



**Slika 2.** Morbiditet gerijatrijske populacije (65+) u Bosni i Hercegovini, 2008-2012, stopa/10.000 ljudi, prikazuje arterijsku hipertenziju kao najčešće oboljenje.

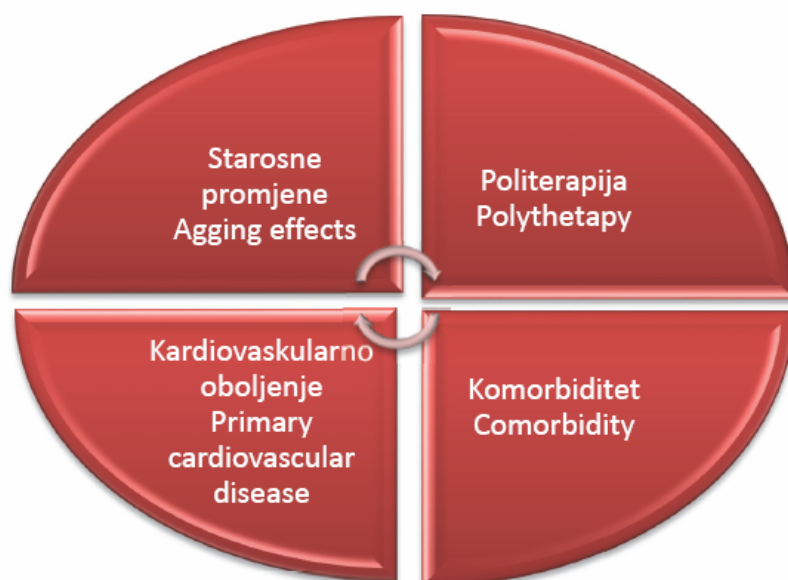
**Figure 2.** Morbidity of geriatric population (65+) in Bosnia and Herzegovina, 2008-2012, rate/10.000 people, shows that hypertension is the most common disease.

moгу biti strukturne i fiziološke. Strukturne promjene podrazumijevaju povećanu težinu srca, smanjen broj miokardnih ćelija s povećanjem preostalih ćelija, povećanu debljinu zida lijeve pretkomore i komore, povećanu rigidnost arterija, povećane količine elastina i kolagena, smanjenu rastezljivost zida aorte kao i snižen vaskularni tonus. Funkcionalno je kod pacijenata smanjen diastolni pritisak i diastolno punjenje, smanjena reakcija na beta-adrenergični stimulans, povećan sistolni i arterijalni pritisak, povećan diastolni pritisak lijeve komore i produženo trajanje faze kontrakcije i relaksacije srčanog mišića, kao i ventrikularne relaksacije<sup>3</sup>. Uprkos ovim promjenama, većina starijih pacijenata neće imati veće poteškoće osim ako nije prisutno oboljenje srčanog mišića ili srčanih zalistaka. Učestalost kardiovaskularnih oboljenja uključujući koronarno oboljenje, arterijsku hipertenziju, oboljenja zalistaka i poremećaja srčanog ritma se povećava s dobi pacijenta<sup>4</sup>. Karakteristike kardiovaskularnih gerijatrijskih pacijenata u stomatološkoj praksi (starosne promjene, politerapija, primarno kardiovaskularno oboljenje i komorbiditet) su prikazani na slici 3. Veći broj lijekova propisanih zbog komorbiditeta, osim željenih terapijskih efekata, može imati i neželjene posljedice poput većeg rizika od neželjenih dejstava,

structurally and physiologically. Structural changes include increased heart weight, decreased number of myocardial cells with enlargement of remaining cells, increased left ventricle wall thickness, increased arterial stiffness, increased elastin levels, increased collagen levels, increased left atrium size, decreased aortic distensibility and decreased vascular tone. Functionally, there is decreased diastolic pressure, decreased diastolic filling, decreased reaction to beta-adrenergic stimulus, increased systolic pressure, increased arterial pressure, increased wave velocity, increased left ventricular diastolic pressure, and elongation of muscle contraction phase, muscle relaxation phase, and ventricle relaxation<sup>3</sup>. Despite all of these changes, commonly older individuals function quite well unless a specific heart muscle or valvular disease is present. Cardiovascular diseases including coronary heart disease, arterial hypertension, heart valve disease and rhythm disorders become increasingly common with advancing age<sup>4</sup>. The characteristics of cardiovascular geriatric patient in dental practice (aging effects, polypharmacy, primary cardiovascular disease and comorbidity) are shown in Figure 3. Multiple drugs prescribed due to comorbidities besides desired therapeutic effects may lead to negative consequences

toksičnih reakcija ili promjene efikasnosti lijeka. Ovo su razlozi zašto su kardiovaskularni gerijatrijski pacijenti u oralno-hirurškoj praksi pacijenti visokog rizika, pogotovo u odsustvu odgovarajuće medicinske kontrole. Kako bi se sačuvalo zdravlje i sigurnost pacijenta prilikom izvođenja oralno-hirurške intervencije, potreban je kompetentan specijalista oralne hirurgije kako bi se pružila najbolja moguća njega i izbjegle potencijalne komplikacije. Kako bi se minimizirali rizici vezani za oralno-hirurške intervencije kod takvih pacijenata, pažljiva preoperativna priprema bi trebala uvijek uključivati procjenu sistemskog oboljenja i propisane internističke terapije.

such as higher risk of adverse effects, toxic reactions, changes in efficacy or reduced compliance of prescribed medications. These are reasons why cardio always include identifying of compromising vascular geriatric patients in oral-surgical practice are high risk cases, particularly in absence of adequate medical control. To ensure patients' health and safety, dental care for cardiovascular geriatric patients is complicated, requiring competent specialist who know how to provide the best possible care and avoid potential complications. Careful preoperative assessment should medical conditions and prescribed medications in order to minimize the risk of complications related to oral-surgery procedures in cardiovascular geriatric patients.



**Slika 3.** Karakteristike kardiovaskularnog gerijatrijskog pacijenta u stomatološkoj praksi.

**Figure 3.** Characteristics of cardiovascular geriatric patient in dental practice

### **Cilj**

Cilj ove studije je odrediti prevalencu kardiovaskularnih oboljenja, analizirati propisane lijekove i odrediti učestalost perioperativnih (intraoperativnih i postoperativnih, lokalnih i sistemskih) komplikacija oralno-hirurških zahvata kod gerijatrijskih kardiovaskularnih pacijenata Katedre za oralnu hirurgiju Stomatološkog fakulteta u Sarajevu.

### **Aim**

The aim of this study was to determine the prevalence of cardiovascular diseases, prescribed medications and perioperative (intraoperative and postoperative, local and systemic) complications of oral surgical procedures in geriatric patients with cardiovascular diseases undergoing oral-surgical procedures at Department of Oral Surgery, University of Sarajevo.

## Metode

Studija predstavlja prospektivnu studiju gerijatrijskih pacijenata (pacijenata starijih od 65 godina) koji se podvrgavaju oralno-hirurškim intervencijama na Katedri za oralnu hirurgiju Stomatološkog fakulteta u Sarajevu u periodu od januara do juna 2013.godine. Poslije anamnestičkodijagnostičke obrade pacijenta, koja uključuje medicinsku i stomatološku anamnezu, klinički i radiografski pregled te kompletnu krvnu sliku, postavljena je indikacija za operativni tretman. Svi operativni tretmani su provedeni u lokalnoj anesteziji 1,8ml Lidocain 2% Adrenalin 1:80000 u istoj operativnoj sali pod istim uslovima. Podaci su uneseni u operativni protokol, a potom u bazu podataka posebno kreiranu za ovu studiju koja je sadržavala sljedeće podatke o pacijentu: godine, spol, zdravstveno stanje, propisani lijekovi, redovitost uzimanja lijekova, kliničku dijagnozu, komplikacije prilikom administracije lokalne anestezije, intraoperativne i postoperativne komplikacije. Pacijenti su nakon informiranosti o zahvatu, operativnom toku i mogućim postoperativnim komplikacijama potpisali informirani pristanak za sudjelovanje u studiji. Studija je vođena u skladu s Helsinškom deklaracijom medicinskih istraživanja. Podaci su prikupljeni i analizirani statističkim softverom SPSS 20.0 (SPSS Inc, Chicago, IL, USA). T-test sa nivoom signifikantnosti od  $P < 0,05$  je korišten da se kompariraju varijable između grupa. Svi medicinski i lični podaci pacijenta su smatrani povjerljivim.

## Rezultati

Ukupno 107 pacijenata je uključeno u studiju: 48 (45%) muškaraca i 59 (55%) žena, odnosa 1:1,2 u korist žena. Prosječan broj godina  $\pm$  SD je  $69 \pm 4$  godina, u rasponu 65 do 81 godina. Ukupno 24 pacijenta se smatraju zdravim u trenutku pregleda ( $\% = 22$ ). 83 pacijenta (77%) imaju najmanje jednu hroničnu neinfektivnu bolest, pri čemu 67 pacijenata ( $n = 62\%$ ) ima više od jednog oboljenja (komorbiditet). 79% pacijenata sa sistemskim oboljenima ima dijagnosticiranu bolest kardiovaskularnog sistema ( $n = 66$ ). Učestalost kardiovaskularnih oboljenja je prikazana na slici 4.

## Methods

The current study is a prospective study of geriatric patients (aged  $>65$  years) undergoing oral surgical procedures in Department of Oral Surgery, Faculty of Dentistry at University of Sarajevo between January and June 2013. After diagnostics that includes complete medical and dental history, clinical and radiographical examination and blood laboratory tests, the surgical treatment is indicated. Diagnose of cardiovascular disease is based upon medical record of patient. Medically compromised patients underwent internistic preparation if needed and internistic agreement was necessary for oral-surgical treatment. All procedures were performed by the same surgeon in local anesthesia 1,8ml Lidocain 2% Adrenalin 1:80000 in the same operating room under the same conditions. The data were entered in operation protocols, and then in specially designed data base created for this study including the following information: patient's age, gender, medical condition, prescribed medications, regularity of taking medications, clinical diagnosis, complications related to the administration of local anesthesia, intraoperative complications and postoperative complications. Study participants include volunteering and consenting patients. Study was conducted in accordance with the Helsinki declaration of ethical principles for medical research. Data were processed and analyzed in statistical software SPSS 20.0 (SPSS Inc, Chicago, IL, USA). An unpaired t-test was used for the statistical analysis at significance level of  $P < 0,05$  to compare variables between groups. All data regarding patient identification and medical history were kept confidential.

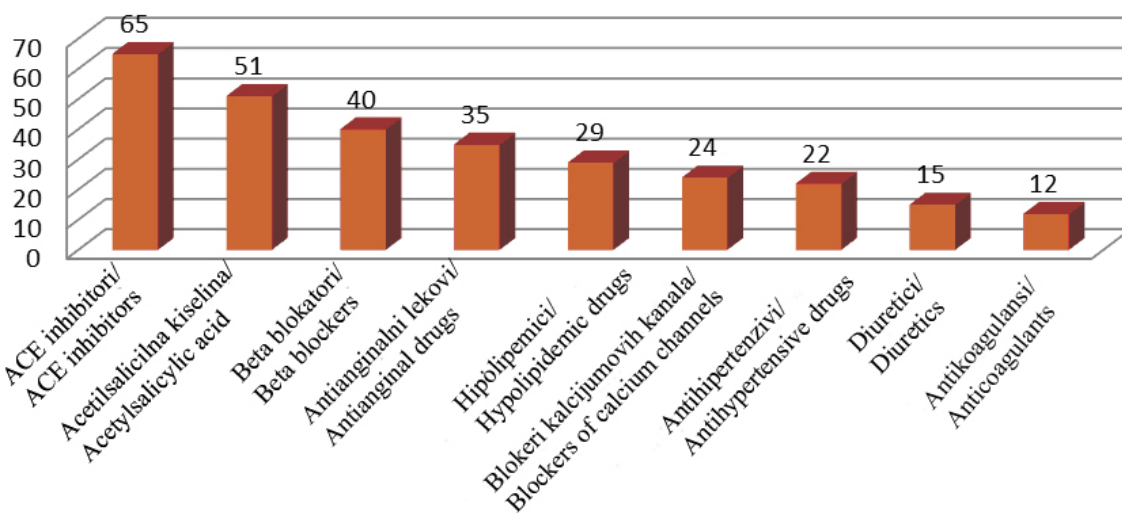
## Results

The total of 107 patients were included in this study: 48 (45%) males and 59 (55%) females, gender ratio 1:1,2 in favour of females. The age range was from 65 to 81 years, with mean age  $\pm$  SD =  $69 \pm 4$  years. A total of 24 patients ( $\% = 22$ ) was considered healthy. Eighty-three patients (77%) had at least one chronic non-infectious disease, and 67 patients ( $n = 62\%$ ) had more than one disease (comorbidity). Seventynine percent of patients with systemic diseases had diagnosed cardi-ovascular disease ( $n = 66$ ).



**Slika 4.** Učestalost kardiovaskularnih oboljenja kod gerijatrijskih pacijenata koji se podvrgavaju oralno-hirurškom zahvatu na Katedri za oralnu hirurgiju Stomatološkog fakulteta Univerziteta u Sarajevu (izraženo u procentima).

**Figure 4.** Frequency of cardiovascular diseases in geriatric patients who underwent oral-surgical procedures at Department of Oral Surgery, Faculty of Dentistry Sarajevo



**Slika 5.** Učestalost najčešće propisanih lijekova za kardiovaskularni sistem kod gerijatrijskih pacijenata koji se podvrgavaju oralno-hirurškom zahvatu na Katedri za oralnu hirurgiju Stomatološkog fakulteta Univerziteta u Sarajevu (izraženo u procentima).

**Figure 5.** Frequency of the most commonly prescribed medications to geriatric patients who underwent oral-surgical procedures at Department of Oral Surgery, Faculty of Dentistry Sarajevo

Ukupno 83 pacijenta (%=77) dnevno koristi najmanje jedan lijek, dok 65 (%=60) pacijenata koristi više lijekova (politerapija). 14 (%=13) pacijenata koristi više od 5 lijekova. Slika 5 prikazuje najučestalije propisane lijekove kod gerijatrijskih kardiovaskularnih pacijenata. Najčešći oralno-hirurški zahvat je ekstrakcija zuba (n=82; %=77), zatim predprotetska hirurgija (n=15; %=14) i ekscizija lezija oralne sluznice (n=10; %=9).

Frequency of cardiovascular diseases is shown in Figure 4. A total of 83 patients (%=77) use at least one medication on daily basis and 65 (%=60) patients had multiple medications prescribed (polypharmacy). Fourteen (%=13) patients use more than five medications daily. Majority of patients are taking pre-scribed medications regularly (n=105; %=98). Figure 5 shows the most common prescribed medications in geriatric cardiovascular patients.

Hirurška ekstrakcija zuba s podizanjem mukoperiostalnog reznja I kortikotomijom je urađena kod 23 (%=22) pacijenta. Najčešće dijagnoze su karijes zuba (n=24; %=22), parodontalna oboljenja (n=32; %=29), zaostali korijeni (n=26; %=24), atrofija alveolarnog grebena (n=5; %=4), benigne lezije oralne sluznice (n=10; %=9) i egzostoze (n=20; %=19).

Komplikacije prilikom administracije lokalne anestezije. Jedina komplikacija prilikom administracije lokalne anestezije je sinkopa. Sinkopa je češća kod pacijenata s kardiovaskularnim oboljenjima i većim brojem propisanih lijekova (12,5%) u odnosu na zdrave pacijente (0%) ( $p < 0,05$ ). Ne postoji statistički značajna povezanost incidence sinkope kod različitih vrsta propisanih lijekova ( $p > 0,05$ ).

Intraoperativne komplikacije. Fraktura zuba je najčešća komplikacija tokom ekstrakcije (n=15; %=18), a veća je incidenca frakture zuba zabilježena u posteriornom dijelu mandibule. Rizik od frakture se povećava sa starenjem ( $p < 0,05$ ). Postoperativne komplikacije. Veća incidenca postekstrakcionih komplikacija je češća kod pacijenata s više sistemskih oboljenja i propisanih lijekova ( $p < 0,05$ ). Prevalenca postekstrakcionih komplikacija se ne povećava sa starenjem ( $p > 0,05$ ). Najčešća postekstrakciona komplikacija je alveolitis s incidencom 8,4%. Pojava alveolitisa je najčešća u mandibuli u slučajevima hirurške ekstrakcije. Prevalenca alveolitisa ne pokazuje asocijaciju s dobi, spolom ili oboljenjem pacijenta ( $p > 0,05$ ). Veća incidenca postoperativnog krvarenja je zabilježena kod kardiovaskularnih pacijenata u odnosu na zdrave ispitanike: 18,75% prema 4,16% ( $p < 0,05$ ). Ostale postoperativne komplikacije (postoperativna infekcija, trizmus, postoperativna bol, oroantralna komunikacija) ne pokazuju povezanost s kardiovaskularnim oboljenjima ( $p > 0,05$ ).

## Diskusija

Arterijska hipertenzija je vodeće hronično nezarazno oboljenje pacijenata starijih od 65 godina, a kardiovaskularne su bolesti vodeći uzrok smrtnosti<sup>1</sup>. Pojava hipertenzije se kod gerijatrijskih pacijenata može povezati s brojnim strukturnim i funkcionalnim vaskularnim promjenama koje se razvijaju kao starosne promjene organizma<sup>5</sup>.

The most common oral surgical procedure was tooth extraction (n=82; %=77), followed by pre-prosthetic surgery (n=15; %=14) and excision of lesions of oral mucosa (n=10; %=9). Surgical extraction with reflection of soft-tissue flaps and bone removal was performed in 23 (%=22) patients. The most common diagnoses were dental caries (n=24; %=22), periodontal diseases (n=32; %=29), retained root tips (n=26; %=24), alveolar ridge atrophy (n=5; %=4), benign oral lesions (n=10; %=9) and exostoses (n=20; %=19).

Complications related to the administration of local anesthesia. The only complication related to the administration of local anesthetics is syncope. Syncope was more common in patients with cardiovascular diseases and multiple cardiovascular medications prescribed: 12,5% vs. 0% ( $p < 0,05$ ). There is no statistically significant association in incidence of syncope with different types of prescribed medications ( $p > 0,05$ ).

Intraoperative complications. Fracture of tooth was the most common complication during extraction (n=15; %=18), and the higher incidence of tooth fracture was recorded in the posterior region of the mandible. Risk of tooth fracture increased with aging ( $p < 0,05$ ). Postoperative complications. Higher incidence of postoperative complications was seen in patients with multiple systemic diseases and multiple drugs prescribed ( $p < 0,05$ ). Prevalence of postoperative complications is not increasing with aging ( $p > 0,05$ ). The most common postextraction complication was dry socket with the incidence of 8,4%. The occurrence of dry socket is the most common in the mandible in cases of surgical extraction. Prevalence of dry socket shows no association with age, gender and disease ( $p > 0,05$ ). Higher incidence of postoperative haemorrhage was recorded in cardiovascular patients compared with healthy subjects: 18,75% vs. 4,16% ( $p < 0,05$ ). Other postoperative complications (postoperative infection, trismus, postoperative pain, oroantral communication) shows no association with presence of cardiovascular diseases ( $p > 0,05$ ).

Čak i kod normotenzivnih pacijenata, određeni stepen ortostatske hipotenzije nije neobičan za gerijatrijske pacijente zbog usporevanja refleksnih mehanizama koji održavaju zadovoljavajući krvni protok iz srca prema mozgu. Antihipertenzivi mogu pogoršati ovo stanje, pogotovo ako pacijent nije pažljivo kontroliran ili terapija nije urađena prema principima farmakoterapije kod starijih pacijenata<sup>4</sup>. Ovo rezultira ošamućenošću ili vrtoglavicom, te se može povezati s višom incidencom sinkope tokom administracije lokalne anestezije kod kardiovaskularnih pacijenata u odnosu na zdrave ispitanike. Sinkopa je najčešće urgentno stanje u stomatološkoj praksi. Hass je uočio da se urgentna stanja najčešće dešavaju tokom administracije lokalne anestezije i za vrijeme ekstrakcije zuba, pri čemu najčešće urgentno stanje čini sinkopa (60%) a prati je hiperventilacija (7%)<sup>6</sup>.

Postoji klinička kontradikcija o kliničkoj primjeni lokalnih anestetika s adrenalinom kod pacijenata s kardiovaskularnim oboljenjima. Kako bi se obezbijedila sigurna i komforna stomatološka intervencija, Ezmek kod pacijenata s kardiovaskularnim oboljenjima preporučuje lokalne anestetike bez vazokonstriktora<sup>7</sup>.

Međutim, mnoge druge studije su dokazale da je lidokain s adrenalinom siguran anestetik koji izaziva vrlo malo ili nimalo hemodinamskih promjena kod pacijenata s kardiovaskularnim oboljenjima<sup>8,9</sup>. Studija Trninića i sar. Pokazuje da osim lokalne anestezije, ekstrakcija zuba također može uzrokovati hemodinamičke promjene (povećanje pulsa i krvnog pritiska) prilikom oralno-hirurške intervencije<sup>9</sup>. Iako alteriraju hemodinamičke parametre, lokalni anestetici ne uzrokuju kardijalne ishemijske promjene ili druge kardiovaskularne komplikacije. Nalazi Elada i Conrada također potvrđuju da administracija lokalne anestezije ne uzrokuje dodatni ishemijski rizik za pacijenta. Conrado naglašava da ekstrakcija zuba s upotrebom anestetika s razblaženjem adrenalina od 1:100000 ne implicira ishemijski rizik, dok god se lokalna anestezija aplicira s pravilnom tehnikom te pacijent redovito uzima terapiju propisanu od strane kardiologa<sup>10</sup>. Aspiracija s ciljem da se minimizira mogućnost intravaskularne

## Discussion

Arterial hypertension is leading chronic noninfectious diseases in patients aged 65+ and cardio-vascular diseases are the leading cause of death<sup>1</sup>. Hypertension in the elderly can be attributed to numerous structural and functional changes to the vasculature that develop with advancing age<sup>5</sup>. Even among normotensive patients, some degree of orthostatic hypotension is not unusual for geriatric patients due to slowing of a body's reflexes that maintain the blood flow from heart to the brain and other organs in efficient manner. Antihypertensive medications can worsen this condition, especially if patient is not carefully monitored or the medication regimen is not tailored according to principles of pharmacotherapy in older people<sup>4</sup>. This results with a light-headedness or dizziness, and can be related with the higher incidence of syncope during administration of local anesthesia in cardiovascular patients compared with healthy subjects. Syncope is the most frequently occurring medical emergency in dental office. Haas observed that medical emergencies were most likely occurring during and after local anesthesia, while performing tooth extraction and 60% of emergencies were syncope, followed by hyperventilation (7%)<sup>6</sup>.

There is clinical controversy about the use of local anesthetics with epinephrine in patients with cardiovascular diseases. Ezmek suggests using local anesthetic without vasoconstrictors in hypertensive patients to provide patients comfort and safety<sup>7</sup>. However, many other studies found lidocain with epinephrine safe with few, if any, hemodynamic consequences in patients with cardiovascular diseases<sup>8,9</sup>. Study of Trninić et al. suggests that hemodynamic changes (increased heart rate and blood pressure) are evoked both by administration of local anesthesia, as well as the tooth extraction<sup>9</sup>. Although hemodynamic parameters are changed, local anesthetics cause no cardiac ischemic alterations or any other cardiovascular complication derived from the treatment or the anesthesia has been observed. Findings of Elad and Conrado also concluded that



aplikacije je izuzetno bitna kod kardioloških pacijenata, budući da postoji signifikantna interakcija između adrenalina i neselektivnih beta-adrenergičkih blokatora. Iako je rijetka u stomatološkoj praksi, ova potencijalno opasna komplikacija može dovesti do izražene hipertenzije s konkomitantnom refleksnom bradikardijom. Čini se da je ozbiljnost ove interakcije ovisna o dozi<sup>11</sup>. Anksioznost i stres induciran hirurškim zahvatom može povećati puls i krvni pritisak kod kardiovaskularnih pacijenata, na taj način dodatno povećavajući efekte lokalne anestezije na kardiovaskularni sistem. Anksioznost i prethodna neugodna iskustva u stomatološkoj ordinaciji mogu utjecati na povećanje pulsa prilikom administracije lokalnog anestetika<sup>12</sup>. Sedacija i protokol za smanjenje stresa su sigurne i pouzdane metode koje primjenjene intraoperativno i postoperativno mogu potpuno reducirati komplikacije<sup>13</sup>. Iako su u literaturi opisane brojne komplikacije lokalne anestezije<sup>14</sup>, kod kardioloških pacijenata u našoj studiji jedina je komplikacija sinkopa, koja je bila češća kod pacijenata s više propisanih lijekova. Ovo je u skladu s rezultatima drugih autora koji potvrđuju da administracija lokalnih anestetika ima malo neželjenih efekata te komplikacije, ukoliko se i dogode, su prolaznog i blagog karaktera<sup>15</sup>.

Više propisanih lijekova kod starijih pacijenata dodatno povećava rizik od nastanka sinkope<sup>16,17</sup>, što je u skladu s rezultatima naše studije. Lijekovi za kardiovaskularni sistem (antihipertenzivi, vazodilatatori i diuretici) su povezani s ortostatskom i postprandijalnom hipotenzijom te predisponiraju starije pacijente za nastanak sinkope<sup>18,19</sup>.

Najčešća komplikacija tokom ekstrakcije zuba je fraktura, što je u skladu s nalazima drugih autora<sup>20,21</sup>. Starosne promjene u periodontalnom ligamentu kao i povećanje denziteta mandibule koja prati gubitak zuba je uzrok više prevalencije frakture zuba kod starijih pacijenata<sup>22,23</sup>. Incidenca alveolitisa u našoj studiji je 8,4%, što je u rasponu objavljenom od strane drugih autora. Uz ostale faktore, starost pacijenta je značajan determinant povećanja incidence komplikacija<sup>20</sup>.

Prema rezultatima naše studije, komorbiditet i politerapija povećavaju rizik od nastanka perioperativnih komplikacija kod kardiovaskularnih gerijatrijskih pacijenata.

administration of local anesthesia does not result in additional ischemic risks. Conrado emphasizes that dental extraction performed under anesthesia with 1:100.000 epinephrine does not imply additional ischemic risks, as long as it is performed with good anesthetic technique and maintenance of the pharmacological treatment prescribed by the cardiologist<sup>10</sup>. Aspiration in order to minimize inadvertent intravascular injection is particularly important in cardiovascular patients, since there is a possibility of a clinically significant interaction between epinephrine with nonselective beta-adrenergic blocking agents. Although apparently rare in the dental setting, this is a potentially serious complication that can lead to significant hypertension with a concomitant reflex bradycardia. The severity of the interaction seems dose-related<sup>11</sup>.

Anxiety and stress induced by surgery can also increase heart rate and blood pressure in cardiovascular patients, thus additionally increasing the effects of local anesthesia on cardiovascular system. Anxiety and traumatic dental history are associated with greater increase in heart rate during administration of local anesthesia<sup>12</sup>. The sedation techniques and antistress procedures are safe and can be applied intraoperatively or postoperatively, thus making complications almost non-existent<sup>13</sup>.

Although various regional and systemic complications from local anesthesia can arise<sup>14</sup>, in our study the only complication was syncope that occurred in cardiac patients with multiple drugs prescribed. This is in accordance with the results of other authors, suggesting that administration of local anaesthesia has a small risk of adverse events. Complications, if they occur, seem minor and transient in nature<sup>15</sup>. Multiple medications additionally increase the risk of syncope in elderly patients<sup>16,17</sup>, which is in accordance with the results of our study. Cardiovascular drugs (antihypertensive agents, vasodilators and diuretics) are associated with orthostatic and postprandial hypotension, and predispose older patients to the development of syncope<sup>18,19</sup>.

The most common complication related to tooth extraction is tooth fracture, which is in accordance with findings of other authors<sup>20,21</sup>. Age related changes in periodontal ligament and an increase in apparent density of ageing mandible following tooth loss is the cause of higher prevalence of tooth fracture at elderly patients<sup>22, 23</sup>.

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