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IZVORNI ZNANSTVENI RAD

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Analysis of Hospital-Based Dental Procedures Under General Anesthesia in Uncooperative Patients: a Retrospective Study

Analiza bolničkih stomatoloških zahvata u općoj anesteziji kod pacijenata koji ne surađuju: retrospektivna studija

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Abstract
General anesthesia is a well-documented therapeutic option for the provision of dental treatment, particularly in patients with special healthcare needs and uncooperative pediatric patients. **Objectives:** This retrospective study aimed to analyze the characteristics of dental general anesthesia (DGA) procedures for uncooperative patients of all ages in a tertiary healthcare facility, Clinical Hospital Dubrava, in Zagreb, Croatia. **Material and methods:** The hospital records for the patients treated for various dental reasons under GA were obtained at the Clinical Hospital Dubrava in Zagreb, Croatia. **Results:** Between 2014 and 2019, a total of 810 DGA procedures were performed including 697 patients. The median age was 18 years. Almost half of the patients referred to undergo DGA procedures were from the City of Zagreb and Zagreb County, 27.8% (N=225) and 21.0% (N=170), respectively. More than 90% of patients undergoing DGA procedures were referred with 1 to 3 medical conditions. 47.9% of patients had 1 to 3 dental conditions, of which caries was the most common condition (95.7%). The mean waiting time (±SD) was 113.06 (±62.62) days. 90 patients (14.8%) were referred for dental procedures under GA more than once, accounting for 203 procedures (25.1%). **Conclusions:** DGA remains a single dental treatment option for specific individuals. There is an institutional and, also, an organizational need to address the long waiting times and high repeated DGA rates.

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Introduction

Patients with special healthcare needs often require a different approach to dental treatment. These adjustments are intended to address and accommodate their physical, mental, emotional, sensory, cognitive, behavioral, or developmental disabilities (1). Successful outpatient treatment can be achieved solely through behavioral control methods in a particular portion of these patients. However, pharmacological premedication, conscious sedation, or general anesthesia may be required for performing dental care in individuals that could not be treated otherwise (2,3).

General anesthesia (GA) is a well-documented therapeutic option for the provision of dental treatment, not only for special healthcare patients but also for uncooperative pedi-

Uvod

Pacijenti s posebnim zdravstvenim potrebama često trebaju drukčiji pristup stomatološkom liječenju koji je usmjeren na rješavanje i prilagođavanje dentalnog zahvata prema njihovim tjelesnim mentalnim, emocionalnim, senzornim, kognitivnim, bihevioralnim ili razvojnim poteškoćama (1). Uspješno izvanbolničko liječenje određenog dijela pacijenata iz te skupine može se postići isključivo metodama kontrole ponašanja. No katkad može biti potrebna i farmakološka premedikacija, svjesna sedacija ili opća anestezija za provođenje dentalne skrbi kod pacijenata koji se ne mogu liječiti na drukčiji način (2, 3).

Opća anestezija (OA) provjerena je terapijska metoda u stomatološkom liječenju, ne samo za pacijente s poteškoćama u razvoju, nego i za nekooperativne pedijatrijske pacijen-

atric patients and for the provision of complex dental treatments in any age group (4,5). The greatest advantage of GA in the population of special healthcare needs patients is the possibility of providing comprehensive treatment in a single visit, thus reducing the number of appointments and visit-related stressful events (6). Additionally, studies conducted by parental surveys over the past decades suggest a positive trend in parents' perception toward pharmacological approaches to behavior management in the form of sedation or GA. This is likely due to better information on GA risks and knowledge of favorable dental procedure outcomes (7–10).

GA is the the last resort in patient care due to some organizational and technical requirements and the risk of complications. Furthermore, in terms of provided care, clinical procedures conducted in GA are also generally more radical, i.e., extraction of a questionable tooth/teeth opposing a less invasive procedure such as endodontic treatment (2). In fact, despite a continuous progress in preventive and restorative dentistry, tooth extraction remains on the rise in special healthcare needs of pediatric patients compared to healthy children of similar age (11–13). This difference is mainly observed in children with intellectual disabilities (11).

The definition of factors preventing successful outpatient care in this patient group is needed for better GA patient selection and treatment prioritization, thus indirectly reducing the risk of GA complications and healthcare system burden (14). Since the treatment under GA remains a single option for the provision of dental care for certain individuals, it is necessary to recognize, prioritize and timely provide a safe and effective treatment (15–17).

This retrospective study aims to analyze the characteristics of dental general anesthesia (DGA) procedures for managing patients primarily classified as "uncooperative" in a tertiary healthcare facility.

Material and methods

Study design and ethical considerations

This study was designed as a retrospective study analyzing data on DGA procedures from a single tertiary healthcare facility. The hospital records for the patients treated for various dental reasons under GA were obtained at the Clinical Hospital Dubrava in Zagreb, Croatia. Different procedures were conducted between January 2014 and December 2019. The Ethics Committee of the Clinical Hospital Dubrava (CHD) approved this research (Approval No. 2018/0905-07).

Study population

The study included hospital records on 810 DGA procedures for managing 697 patients. The primary criteria for the procedure inclusion in the analysis was that the dental treatment was performed exclusively under general endotracheal anesthesia for managing uncooperative patients. Thus, procedures in short-term inhalation and/or intravenous anesthesia, or GA procedures for managing cooperative patients (e.g.,

te te za one kojima su potrebni složeni stomatološki zahvati u bilo kojoj dobnoj skupini (4, 5). Najveća prednost postupka u općoj anesteziji u populaciji pacijenata s poteškoćama u razvoju jest mogućnost obavljanja cjelovitog tretmana u jednom posjetu te smanjenje broja dolazaka i stresnih situacija povezanih sa stomatološkim zahvatom (6). Dodatno, istraživanja provedena u roditeljskim anketama tijekom proteklih desetljeća upućuju na pozitivan trend u percepciji roditelja o korištenju farmakoloških metoda premedikacije kako bi se postigla kontrola ponašanja, najčešće u obliku sedacije ili opće anestezije. To je vjerojatno rezultat bolje informiranosti o rizicima opće anestezije i povoljnim ishodima takvih stomatoloških zahvata u navedenoj skupini pacijenata (7 – 10).

Opća anestezija svakako ostaje zadnja terapijska metoda za dentalne zahvate kako zbog organizacijsko-tehničkih zahtjeva tako i zbog rizika od komplikacija. Nadalje, kad je riječ o pruženoj skrbi, klinički postupci koji se provode u općoj anesteziji također su radikalniji, kao što je vađenje zuba s upitnom prognozom u odnosu prema manje invazivnom endodontskom tretmanu (2). Zapravo, unatoč stalnom napretku u preventivnoj i restaurativnoj stomatologiji, vađenje zuba i dalje je u porastu kod pedijatrijskih pacijenata s poteškoćama u razvoju u usporedbi sa zdravom djecom slične dobi (11 – 13). Ta se razlika uglavnom uočava kod djece s intelektualnim poteškoćama (11).

Definiranje čimbenika koji sprječavaju uspješnu izvanbolničku skrb u navedenoj skupini pacijenata nužno je za bolji probir pacijenata za postupak u općoj anesteziji i određivanje prioriteta u liječenju, čime se neizravno smanjuju dva rizika – komplikacija opće anestezije te opterećenje zdravstvenog sustava (14). Kako liječenje u općoj anesteziji ostaje jedina opcija za pružanje dentalne skrbi za određene pojedince, potrebno ih je prepoznati, odrediti prioritete i na vrijeme osigurati siguran i učinkovit tretman (15 – 17).

Cilj ove retrospektivne studije je analizirati karakteristike dentalnih zahvata u općoj anesteziji (DOA) provedenih u tercijarnoj zdravstvenoj ustanovi na pacijentima koji su primarno klasificirani kao „nekooperativni".

Materijal i metode

Dizajn istraživanja i etička razmatranja

Ovo istraživanje osmišljeno je kao retrospektivna studija u kojoj su analizirani podatci o zahvatima u općoj anesteziji iz jedne ustanove tercijarne zdravstvene skrbi. Bolnički kartoni pacijenata saniranih u općoj anesteziji zbog različitih dentalnih razloga dobiveni su u Kliničkoj bolnici Dubrava u Zagrebu, Hrvatska. Postupci su provedeni od siječnja 2014. do prosinca 2019. Istraživanje je odobrilo Etičko povjerenstvo Kliničke bolnice Dubrava (broj: 2018/0905-07).

Ispitivana skupina

Studija je uključivala bolničku evidenciju o 810 zahvata u općoj anesteziji za 697 pacijenata. Primarni kriterij za uključivanje u analizu bio je da je stomatološki tretman nekooperativnim pacijentima obavljen isključivo u općoj endotrahealnoj anesteziji. Zato su iz analize isključeni postupci u kratkotrajnoj inhalacijskoj i/ili intravenskoj anesteziji ili postupci u općoj anesteziji provedeni u slučaju kooperativnih

surgical treatment of large cysts and benign tumors), were excluded from the analysis.

Primary dentists referred the patients due to their lack of cooperation. The attending endodontics and oral surgery specialists provided final approvals for the type of treatment performed.

All clinical records were obtained from the central hospital information system (*Bolnički informacijski sustav*, BIS). The collected data included patient demographics (age, sex, county of residence), medical and dental clinical data (i.e., diagnoses), as well as the classification according to the American Society of Anesthesiologists (ASA) (18). All reported medical and dental conditions were taken directly from the central hospital information system and kept unaltered. Furthermore, elective surgery waiting time was calculated by the difference in dates between the first examination at the CHD and the date of the procedure. Patients with repeated procedures under GA were identified and recorded.

Statistical analysis

Categorical data are presented descriptively as absolute (N) and relative frequencies (%). For a given medical or dental condition, the proportions of children vs. adults were compared using the chi-square test. The proportions of children vs. adults were also compared within each referral county using the chi-square test. Since the data distribution for waiting time departed significantly from normality, as verified by Shapiro-Wilk's test, the data were compared within calendar years (2014.-2019.) using the Kruskal-Wallis test, followed by a Dunn post-hoc adjustment for multiple comparisons. The statistical analysis was performed using SPSS (version 25; IBM, Armonk, NY, USA). The overall level of significance for all comparisons was 0.05.

Results

Eight hundred and ten dental procedures under GA were conducted in a population of 697 patients over the course of six years (2014 – 2019) at the University Hospital Dubrava (Zagreb, Croatia). Three hundred forty-three procedures for females were performed (42.3%), while 467 procedures were performed for males (57.7%). The patient population comprised all age groups, ranging from 2 to 60 years, with a median age of 18.

Almost half of the procedures were performed for managing patients from the City of Zagreb and Zagreb County, 27.8% (N=225) and 21.0% (N=170), respectively. The number and percentage of all procedures performed for managing patients from all Croatian counties are shown in Table 1. Zagreb county and Krapina-Zagorje county led in the number of procedures per 100.000 citizens/county. The number of procedures per 100.000 citizens/county expressed for all counties can be observed in Figure 1.

A comparison between the number of procedures performed for managing children (<18 years old) and adults (≥18 years old), showed no significant differences in most counties. However, a significantly greater number of procedures was performed for managing adult patients from Krapina-Zagorje county and Osijek-Baranja county (Table

pacijenata (npr., kirurško liječenje velikih cista i benignih tumora).

Pacijente je uputio izabrani primarni stomatolog zbog nemogućnosti sanacije u ambulantnim uvjetima. Mjerodavni specijalisti endodoncije i oralne kirurgije u KBD-u dali su konačna odobrenja za vrstu provedenog zahvata.

Svi klinički zapisi dobiveni su iz središnjega bolničkoga informacijskog sustava (BIS). Prikupljeni podatci obuhvaćali su demografske podatke pacijenata (dob, spol, županiju gdje ima boravište), medicinske i stomatološke kliničke podatke (tj. dijagnoze) te klasifikaciju prema Američkome društvu anesteziologa (ASA) (18). Sva dokumentirana medicinska i stomatološka stanja nepromijenjeno su preuzeta iz središnjega bolničkog informacijskog sustava. Nadalje, vrijeme čekanja na elektivni kirurški zahvat izračunato je na temelju razlike u datumima između prvog pregleda u KBD-u i datuma zahvata. Identificirani su i zabilježeni pacijenti s ponovljenim dentalnim postupcima u općoj anesteziji.

Statistička analiza

Kategorijalni podatci prikazani su deskriptivno kao apsolutna (N) i relativna učestalost (%). Za određeno medicinsko ili stomatološko stanje udjeli djece u odnosu prema odraslima uspoređeni su s pomoću hi-kvadrat testa. Udjeli djece u odnosu prema odraslim uspoređeni su i unutar svake županije iz koje su upućeni korištenjem hi-kvadrat testa. Budući da je distribucija podataka za čekanje znatno odstupala od normale, što je potvrđeno Shapiro-Wilkovim testom, podatci su uspoređeni između kalendarskih godina (2014. – 2019.) s pomoću Kruskal-Wallisova testa, nakon čega je slijedila Dunnova post-hoc prilagodba za višestruke usporedbe. Statistička analiza provedena je korištenjem SPSS-a (verzija 25; IBM, Armonk, NY, SAD). Ukupna razina značajnosti za sve usporedbe bila je 0,05.

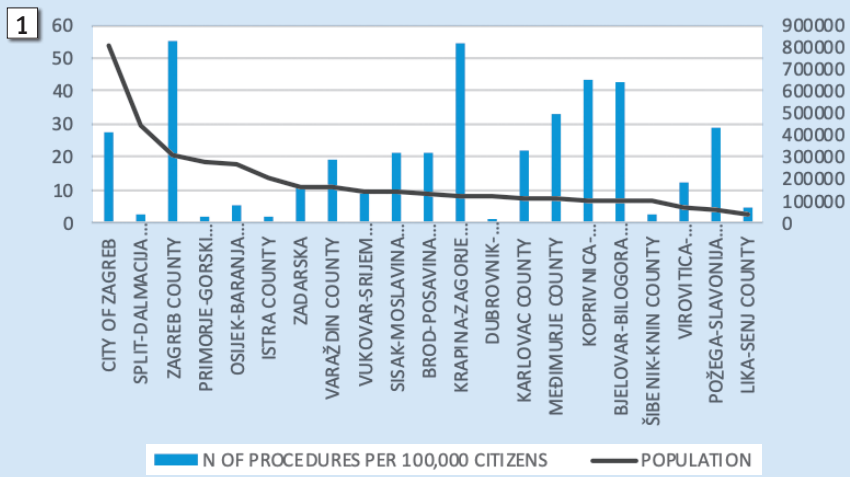
Rezultati

U populaciji od 697 pacijenata tijekom šest godina (2014. – 2019.) u Kliničkoj bolnici Dubrava (Zagreb, Hrvatska) obavljeno je 810 stomatoloških zahvata u općoj anesteziji. Od toga su 343 bile pacijentice (42,3 %), 467 pacijenti i (57,7 %). Bili su svih dobnih skupina, u rasponu od 2 do 60 godina, s prosječnom dobi od 18 godina.

Gotovo polovina zahvata obavljena je na pacijentima iz područja Grada Zagreba i Zagrebačke županije – 27,8 % (N = 225), odnosno 21,0 % (N = 170). Broj i postotak svih zahvata obavljenih na pacijentima iz svih hrvatskih županija nalazi se u tablici 1. Zagrebačka i Krapinsko-zagorska županija prednjače po broju zahvata na 100 000 stanovnika/županiji. Broj postupaka na 100 000 stanovnika/županiji izražen je za sve županije i može se vidjeti na slici 1.

Usporedba broja postupaka provedenih na djeci (< 18 godina) i odraslima (≥ 18 godina) nije pokazala značajne razlike u većini županija. No znatno veći broj zahvata obavljen je na odraslim pacijentima iz Krapinsko-zagorske županije i Osječko-baranjske županije (tablica 1.) – 63,2 %, odnosno 78,6 % (p = 0,001) te na djeci iz Koprivničko-križevačke županije – 73,9 % (p = 0,001).

Najčešće medicinske dijagnoze pacijenata upućenih na postupke u općoj anesteziji bile su mentalna retardacija, epi-



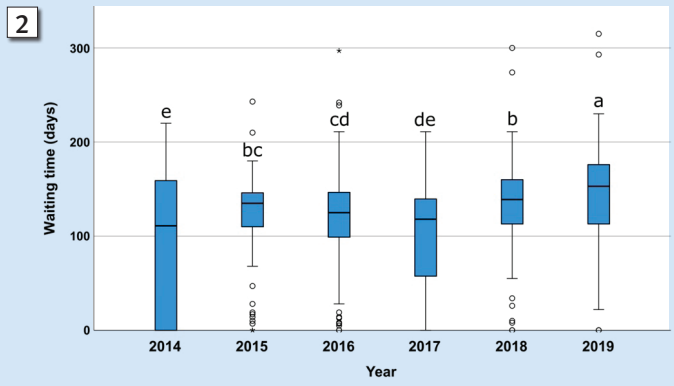


Figure 1 The number (N) of procedures per 100.000 citizens/county.
Slika 1. Broj (N) zahvata na 100 000 stanovnika/županiji
Figure 2 Waiting time length for the procedure per calendar year. Same letters represent statistically homogeneous groups. The boxplots show the median values (thick black lines), the boxes represent the 25% and 75% quartiles, and the whiskers represent 1.5 × interquartile range (IQR), or minima and maxima of the distribution if these values occurred below 1.5 × IQR. Outliers are presented by circles and extreme outliers are presented by asterisks.
Slika 2. Vrijeme čekanja na zahvat prema kalendarskoj godini; ista slova označuju statistički homogene skupine; okviri prikazuju medijane (debele crne crte), okviri predstavljaju 25 % i % kvartile, a gornje i donje horizontalne crte predstavljaju 1,5 × interkvartilni raspon (IQR) ili minimume i maksimume distribucije ako su se te vrijednosti pojavile ispod 1,5 × IQR; outlieri su predstavljeni kružićima, a ekstremni outlieri zvjezdicama

1), 63.2% and 78.6%, respectively (p=0.001) and children from Koprivnica-Križevci county, 73.9% (p=0.001).

The most common medical conditions of the patients referred for DGA procedures were mental retardation, epilepsy and autism, reported in 44.2% (N=358), 33.0% (N=267) and 19.1% (N=155) of the cases, respectively. Children undergoing DGA procedures were significantly more reported with diagnoses of dental phobia (88.2%, p<0.001), underdeveloped speech (77.8%, p=0.001), autism (69.0%, p<0.001) and chromosomal abnormalities other than Down syndrome (78.3%, p=0.010). All medical conditions and the number of affected children and adults are shown in Table 2. More than 90% of patients undergoing DGA procedures were referred with a single condition or up to three medical conditions. The remaining patients were referred to with up to six medical conditions (Table 3).

The most common dental conditions included caries in 775 cases (95.7%), retained roots (*radix relicta*) in 308 cases (38.0%) and chronic apical periodontitis in 210 (25.9%) cases (Table 4). Almost half of the patients undergoing DGA procedures had three dental conditions (47.9%, N=388) (Table 3).

Individuals undergoing more than 90% of the procedures were evaluated as ASA 2 or ASA 3 (Table 5). An age-stratification analysis showed that the greatest proportion of children undergoing dental procedures was classified as ASA 3 and adults as ASA 2, 56.5%, and 48.5%, respectively.

The analysis of annual procedure frequencies showed stable numbers from 2014-19, with 125 to 152 cases per year.

lepsija i autizam – prijavljeni su u 44,2 % slučajeva (N = 358) te u 33,0 % (N = 267), odnosno 19,1 % (N = 155) slučajeva. Djeca koja su bila podvrgnuta zahvatima u općoj anesteziji značajno su češće prijavljena s dijagnozama dentalne fobije (88,2 %, p < 0,001), nerazvijenog govora (77,8 %, p = 0,001), autizma (69,0 %, p < 0,001) i kromosomskih abnormalnosti, osim Downova sindroma (78,3 %, p = 0,010). Sva medicinska stanja i broj zahvaćene djece i odraslih prikazani su u tablici 2. Više od 90 % pacijenata podvrgnutih postupcima u općoj anesteziji upućeno je s jednom ili do tri medicinske dijagnoze. Ostali su imali čak do šest medicinskih dijagnoza (tablica 3.).

Najčešće dentalne bolesti bile su karijes u 775 slučajeva (95,7 %), retinirani korijeni (adix relicta) u 308 slučajeva (38,0%) i kronični apikalni parodontitis u 210 (25,9 %) slučajeva (tablica 4. Gotovo polovina pacijenata podvrgnutih zahvatima u općoj anesteziji imala je tri dentalne dijagnoze (47,9 %, N = 388) (tablica 3.).

Pojedinci koji su bili podvrgnuti više od 90 % postupaka ocijenjeni su kao ASA 2 ili ASA 3 (tablica 5.). Dobno-stratifikacijska analiza pokazala je da je najveći udio djece podvrgnute stomatološkim zahvatima klasificiran kao ASA 3, a odraslih kao ASA 2, – 56,5 %, odnosno 48,5 %.

Analiza godišnje učestalosti postupaka pokazala je stabilne brojke od 2014. do 2019., sa 125 do 152 slučaja na godinu.

Prosječno čekanje na zahvat (± SD) bilo je 113,06 (± 62,62) dana. Razlike u trajanju čekanja između godina mogu se vidjeti na slici 2.

Table 1 Procedure proportions by counties
Tablica 1. Omjeri postupaka po županijama

County • Županija	N (total • ukupno)	% (total • ukupno)	Children/adults • Djeca/odrasli	% of children • % djece	p *
City of Zagreb • Grad Zagreb	225	27.8	109/116	48.4	
Zagreb county • Zagrebačka županija	170	21.0	91/79	53.5	
Krapina-Zagorje county • Krapinsko-zagorska županija	68	8.4	25/43	36.8	**0.001**
Koprivnica-Križevci county •Koprivničko-križevačka županija	46	5.7	34/12	73.9	**0.001**
Bjelovar-Bilogora county • Bjelovarsko-bilogorska	45	5.6	25/20	55.6	
Međimurje county •Međimurska županija	36	4.4	16/20	44.4	
Varaždin county • Varaždinska županija	32	4.0	22/10	68.8	
Sisak-Moslavina county • Sisačko-moslavačka županija	31	3.8	9/22	29.0	
Brod-Posavina county • Brodsko-posavska županija	29	3.6	12/17	41.4	
Karlovac county • Karlovačka županija	25	3.1	15/10	60.0	
Požega-Slavonija county •Požeško-slavonska županija	19	2.3	9/10	47.4	
Zadarska • Zadarska županija	19	2.3	11/8	57.9	
Vukovar-Srijem county • Vukovarsko-srijemska županija	15	1.9	10/5	66.7	
Osijek-Baranja county • Osječko-baranjska županija	14	1.7	3/11	21.4	**0.001**
Split-Dalmacija county • Splitsko-dalmatinska županija	11	1.4	7/4	63.6	
Virovitica-Podravina county • Virovitičko-podravska županija	9	1.1	2/7	22.2	
Primorje-Gorski Kotar county • Primorsko-goranska županija	5	0.6	3/2	60.0	
Istra county • Istarska županija	4	0.5	2/2	50.0	
Šibenik-Knin county • Šibensko-kninska županija	3	0.4	1/2	33.3	
Dubrovnik-Neretva county • Dubrovačko-neretvanska županija	2	0.2	2/0	100.0	
Lika-Senj county • Ličko-senjska županija	2	0.2	0/2	0.0	
Total • Ukupno:	810	100.0	408/810	50.4	

Children - subjects aged <18; **N** – frequency; **%** - percentage; **p** – statistical significance; * bold – significant difference between children and adults • **Djeca** – ispitanici u dobi <,18; **N** – frekvencija; % – postotak; **p** – statistička značajnost; * podebljano – značajna razlika između djece i odraslih

Procedure mean waiting time (±SD) was 113.06 (±62.62) days. Differences in waiting times between years can be seen in Figure 2.

Ninety patients (14.8%) were referred for dental procedures under GA more than once. The majority, 75.6% (N=68), underwent two procedures, 23.3% (N=21) underwent three procedures, and one patient underwent four dental procedures under GA. The repeated DGA procedures accounted for 25.1% of all procedures (N=203).

Discussion

This paper elaborates the results of the first study in Croatia focusing exclusively on the characteristics of the procedures performed under general endotracheal anesthesia in a population of uncooperative patients in a specialist healthcare facility. The results suggest that DGA procedures are performed in a population leaning toward younger, adolescent age, most commonly with one to three

Više puta na dentalne zahvate u općoj anesteziji upućeno je 90 pacijenata (14,8%). Većina, njih 75,6 % (N = 68), podvrgnuto je zahvatima u općoj anesteziji dva puta, 23,3 % (N = 21) tri puta, a jedan pacijent četiri puta. Ponovljeni postupci u općoj anesteziji činili su 25,1 % svih postupaka (N = 203).

Rasprava

U ovom se radu obrađuju rezultati prvog istraživanja u Hrvatskoj koje se bavi isključivo razlozima dolaska na zahvate koji se u općoj endotrahealnoj anesteziji obavljaju u populaciji nekooperativnih pacijenata u specijalističkoj zdravstvenoj ustanovi. Rezultati upućuju na to da se takvi zahvati provode u populaciji koja naginje mlađoj, adolescentnoj dobi, najčešće s jednom do tri medicinske dijagnoze, pri čemu je karijes

Table 2 Medical conditions
Tablica 2. Medicinske dijagnoze

Medical condition • Medicinske dijagnoze	N (total • ukupno)	% (total • ukupno)	Children/adults • Djeca/odrasli	% of children • % djece	p *
Retardatio mentalis • Mentalna retardacija	358	44.2	127/231	35.5	**<0.001**
Epilepsy • Epilepsija	267	33.0	111/156	41.6	**0.001**
Autism • Autizam	155	19.1	107/48	69.0	**<0.001**
Tetraparesis sp • Tetrapareza sp.	139	17.2	50/89	36.0	**<0.001**
Cerebral paralysis •Cerebralna paraliza	130	16.0	66/64	50.8	
Retardatio psihomotorica • Psihomotorna retardacija	64	7.9	31/33	48.4	
Delayed psychomotor development • Zakašnjeli psihomotorni razvoj	47	5.6	32/15	68.1	**0.016**
Gastrointestinal diseases • Gastrointestinalne bolesti	47	5.8	19/28	40.4	
Cardiomyopathies • Kardiomiopatije	39	4.8	23/16	58.9	
Down syndrome • Downov sindrom	37	4.7	16/21	43.2	
Attention disturbances • Poremećaji pažnje	37	4.6	28/9	75.7	**0.002**
Undeveloped speech • Nerazvijen govor	36	4.4	28/8	77.8	**0.001**
Dental phobia • Dentalna fobija	34	4.2	30/4	88.2	**<0.001**
Obesity • Pretilost	31	3.8	6/25	19.4	**<0.001**
Blood disorders • Poremećaji krvi	25	3.1	6/19	24.0	**0.008**
Hormonal distrubances • Hormonalni poremećaji	25	3.1	11/14	44.0	
Psychiatric disturbances • Psihijatrijski poremećaji	24	3.0	6/18	25.0	**0.013**
Other chromosomopathies • Druge kromosomopatije	23	2.8	18/5	78.3	**0.010**
Sy West	21	2.6	10/11	47.6	
Asthma • Astma	21	2.6	14/7	66.7	
Chronic respiratory diseases • Kronične bolesti dišnog sustava	15	1.9	10/5	66.7	
Vision disturbances • Poremećaji vida	12	1.5	8/4	66.7	
Sy Dardy Walker	12	1.5	7/5	58.3	
Malignant diseases • Maligne bolesti	10	1.2	5/5	50.0	
Cleft lip/palate • Rascjep usne/nepca	5	0.6	3/2	60.0	
Sy di George	5	0.6	4/1	80.0	
Sy Struge Weber	2	0.2	1/1	50.0	
Glaucoma • Glaukom	2	0.2	1/1	50.0	

Children - subjects aged <18; **N** –frequency; **%** - percentage; **p** – significance level; * bold – significant difference between children and adults • **Djeca** – ispitanici u dobi < 18; **N** – frekvencija; % – postotak; **p** – statistička značajnost; * podebljano – značajna razlika između djece i odraslih

Table 3 Frequency and percentages of medical and dental conditions
Tablica 3. Učestalost i postotak medicinskih i dentalnih dijagnoza

# of conditions • # dijagnoza	Medical conditions – N (%) • Medicinska dijagnoza – N (%)	Dental conditions – N (%) • Dentalna dijagnoza – N (%)
1	309 (38.1)	1 (0.1)
2	278 (34.3)	298 (36.8)
3	156 (19.3)	388 (47.9)
4	46 (5.7)	119 (14.7)
5	20 (2.3)	4 (0.5)
6	1 (0.1)	0 (0.0)
Total • Ukupno	810 (100%)	810 (100%)

N – frequency • frekvencija; **%** - percentage • postotak

medical conditions, with caries being the most common dental condition.

Published studies evaluating DGAs mostly focused on children population, including healthy, uncooperative children and special healthcare pediatric patients (19–21). Another Croatia-based study in a different specialist institution reported on 100

najčešće uputna dijagnoza.

Objavljene studije u kojima su se ocjenjivali zahvati u općoj anesteziji uglavnom su bile usmjerene na dječju populaciju, uključujući zdravu djecu koja ne surađuju i pedijatrijske pacijente s posebnom zdravstvenom skrbi (19 – 21). U jednom drugom istraživanju u Hrvatskoj provedenom u drugoj

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Table 4 Dental conditions
Tablica 4. Dentalne dijagnoze

Dental condition • Dentalne dijagnoze	N (total • ukupno)	% (total • ukupno)	Children/adults • Djeca/odrasli	% of children • % djece	p *
Caries • Karijes	775	95.7	400/375	51.6	**0.001**
Radix relicta • Zaostali korijen	308	38.0	170/138	55.2	**0.031**
Chronic apical periodontitis • Kronični apikalni parodontitis	210	25.9	103/107	49.0	
Gingivitis and parodontitis •Gingivitis i parodontitis	61	7.5	16/45	26.2	**<0.001**
Impacted/retained tooth • Impaktirani/retinirani zub	18	2.2	8/10	44.4	
Abscess • Apsces	17	2.1	7/10	41.2	
Gingival enlargement • Hiperplazija gingive	16	2.0	7/9	43.8	
Radicular cyst • Radikularna cista	13	1.6	8/5	61.5	
Tooth fracture • Prijelom zuba	12	1.5	7/5	58.3	
Dental deposits • Dentalne naslage	8	1.0	1/7	12.5	
Diseases of the pulp and periapical tissues • Bolesti pulpe i periapeksnih tkiva	8	1.0	5/3	1.2	
Anomalies of tooth position •Anomalije položaja zuba	1	0.1	0/1	0.0	

Children - subjects aged <18; **N** –frequency; **%** - percentage; **p** – significance level; * bold – significant difference between children and adults • **Djeca** – ispitanici u dobi <18; **N** – frekvencija; % - postotak; **p** – statistička značajnost; * podebljano – značajna razlika između djece i odraslih

Table 5 ASA classification distribution
Tablica 5. Distribucija ASA klasifikacije

	Children – N(%) • Djeca – N (%)	Adults – N(%) • Odrasli – N (%)	All – N(%) • Svi – N (%)
ASA 1	8 (2.0)	47 (11.5)	55.0 (6.8)
ASA2	164 (40.8)	198 (48.5)	362 (44.7)
ASA 3	227 (56.5)	162 (39.7)	389 (48.0)
ASA 4	3 (0.7)	1 (0.2)	4 (0.5)
Total	402 (100)	408 (100)	810 (100)

Children - subjects aged <18; **N** – frequency; **%** - percentage • **Djeca** - subjekti u dobi <18; **N** – frekvencija; **%** - postotak

Table 6 Number of procedures per year
Tablica 6. Broj postupaka na godinu

Year • Godina	N	%
2014	125	15.4
2015	125	15.4
2016	144	17.8
2017	152	18.8
2018	138	17.0
2019	126	15.6
Total • Ukupno	810	100.0

N – frequency •frekvencija; % - percentage •postotak

patients with a median age of 11.3, of which, 80% were treated under GA due to lack of cooperation and the rest for other reasons. The population's median age in this study was 18 years and all individuals were considered "uncooperative".

The analysis of the number of referred procedures according to geographical origin, i.e. county of referral, highlighted that the greatest number of procedures (expressed per 100.000 citizens/county) were performed for managing patients from Zagreb County and Krapina Zagorje county. Both counties are neighboring and gravitating toward the City of Zagreb. An opposite trend could be observed for counties of greater geographical distance. It is, thus, plausible to conclude that the convenience of geographical distance may play a significant role in referrals for specialist treatment.

specijalističkoj ustanovi, autori su izvijestili o 100 pacijenata srednje dobi od 11,3 godine od kojih je 80 % liječeno u općoj anesteziji zbog nedostatka suradnje, a ostali iz drugih razloga. Srednja dob populacije u ovoj studiji bila je 18 godina i svi su pojedinci smatrani „nekooperativnima".

Analiza broja zahvata prema zemljopisnom podrijetlu, odnosno županiji iz koje su pacijenti upućeni, pokazuje da je najveći broj zahvata (izraženo na 100 000 stanovnika/županiji) obavljen na pacijentima iz Zagrebačke i Krapinsko-zagorske županije. Obje su susjedne i gravitiraju Gradu Zagrebu. Kad je riječ o udaljenijim županijama, može se primijetiti suprotan trend. Zato se može zaključiti da geografska udaljenost može biti važna u upućivanju na specijalističko liječenje.

Mental retardation, epilepsy and autism were among referred patients' most common medical conditions, 44.2%, 33.0%, and 19.1%, respectively. Developmental and mental disabilities are generally reported as leading causes for DGA referral in other studies across different countries and cultures, i.e., mental retardation (46.8%) in a South Korean study (22), autism in a Croatian (4) and a USA-based (23) study (29.0% and 38.0%, respectively), intellectual disability (57.9%) in another USA-based study (24), neurological/mental disabilities in a Saudi-Arabian study (25) and cerebral palsy in a Spanish study (26).

As expected, the sample sizes of these USA-based studies are larger than the sample sizes in this study. The healthcare system's capacity limits the provision of such treatment in Croatia (i.e., limited operatory facilities and operative time; growing yet unaddressed demand for educated specialists; interdisciplinary collaboration between medical and dental specialists).

The average waiting time from referral to the beginning of a procedure was 113 days. Goodwin et al. reported a similar length of waiting time of 137 days by analyzing data across six hospitals in the North West of England (27). In contrast, Badre et al. highlighted an average time of 7.6 months in a single university hospital in Morroco (28). Prolonged waiting time can result in persisting pain and sleep disturbances, thus further impacting school performance and leading to absence from school due to dental issues (27).

This study highlighted that a very high number of procedures (25.1%) were repeated DGA procedures for managing 14.8% of patients. Vertullo et al. reported 10.8% of repeated DGAs in a 10-year retrospective analysis (29). While this study did not assess types of procedures and dental status and their relation to DGAs, and repeat DGAs, a study by Harrison and Nutting found a positive correlation between the second DGA in patients that first underwent only single-tooth extraction and were concomitantly diagnosed with other carious teeth (30). The need for repeat DGA may therefore be consequential to inadequate treatment planning. More radical treatment solutions, such as multiple dental extractions, have been proposed to reduce repeated DGAs, particularly in children with deciduous dentition (31,32). Nevertheless, GA and repeated GA should be recognized for their potential risk. Repeated GA, in particular, has been suggested to modestly increase the risk of unfavorable neurodevelopmental outcomes in children (33).

This study focused solely on analyzing the characteristics of the DGA procedures. As such, the main limitation and concomitantly recommendation for future research is the analysis of the subjects, oral statuses and dental interventions provided. The authors, however, believe this paper fills the gap of still limited knowledge on this type of intervention in Croatia. Furthermore, from both clinical and research standpoints, highlighting the significant variability in medical and dental conditions, and modalities of diagnosis reporting found within the hospital's information system, is of merit. Many diagnoses did not follow the International Classification of Diseases and/or were of "descriptive" value, which may prevent a better understanding of the patient referral's background and justification.

Mentalna retardacija, epilepsija i autizam bili su među najčešćim medicinskim dijagnozama upućenih pacijenata – 44,2 %, 33,0 %, odnosno 19,1 %. Razvojne i mentalne poteškoće općenito se navode kao vodeća indikacija za upućivanje na zahvat u općoj anesteziji i u drugim studijama u različitim zemljama i kulturama. Prema podatcima u južnokorejskoj studiji, glavna indikacija za zahvat u općoj anesteziji je mentalna retardacija (46,8 %) (22), a u Hrvatskoj (4) i SAD-u to je autizam (23) (29,0 %, odnosno 38,0 %). Intelektualni nedostatak (57,9 %) naveden je u jednoj drugoj studiji u SAD-u (24), neurološke/mentalne poteškoće razlog su u saudijsko-arapskoj studiji (25), a cerebralna paraliza u španjolskoj studiji (26).

Kao što se i očekivalo, uzorak promatranih zahvata u navedenim studijama u SAD-u veći je usporedbi s našim istraživanjem. U našoj zemlji kapaciteti zdravstvenog sustava ograničuju broj postupaka u općoj anesteziji (tj. ograničeni kapaciteti i raspoloživost operacijskih dvorana, zatim sve veća ali neriješena potražnja za educiranim stručnjacima, interdisciplinarna suradnja između liječnika i stomatologa).

Prosječno čekanje od upućivanja do zahvata iznosilo je 113 dana. Analizirajući podatke u šest bolnica na sjeverozapadu Engleske, Goodwin i suradnici izvijestili su o sličnom čekanju od 137 dana (27). Nasuprot tomu, Badre i suradnici istaknuli su prosječno trajanje čekanja od 7,6 mjeseci u jednoj sveučilišnoj bolnici u Maroku (28). Produljeno čekanje može rezultirati perzistirajućom boli i poremećajima spavanja, pa tako dodatno utječe na kvalitetu života koja djeluje na školski uspjeh te na povećani broj izostanaka s nastave zbog dentalnih problema (27).

U ovoj je studiji istaknuto da je veoma velik broj postupaka u općoj anesteziji (25,1 %) bio ponovljen kod 14,8 % pacijenata. Vertullo i suradnici izvijestili su u 10-godišnjoj retrospektivnoj analizi o 10,8 % ponovljenih postupaka u općoj anesteziji (29). Iako se u toj studiji nije procjenjivala vrsta zahvata i dentalni status te njihov odnos s dentalnim zahvatima u općoj anesteziji i ponovljenim postupcima u općoj anesteziji, Harrison i Nutting pronašli su u svojoj studiji pozitivnu korelaciju između drugog zahvata u općoj anesteziji kod pacijenata kojima je u prvoj dentalnoj sanaciji u općoj anesteziji izvađen samo jedan zub, a istodobno su dijagnosticirane karijesne lezije na drugim zubima (30).

Potreba za ponavljanjem postupka opće anestezije može stoga biti posljedica neadekvatnog planiranja liječenja. Radikalnija rješenja, poput višestrukih vađenja zuba, predložena su da bi se smanjio broj ponovljenih postupka u općoj anesteziji, osobito kad je riječ o djeci s mliječnom denticijom (31, 32). Unatoč tomu, opća anestezija i ponovljena opća anestezija trebaju biti prepoznate zbog potencijalnog rizika. Sugerirano je da kod djece ponovljeni postupci u općoj anesteziji umjereno povećavaju rizik od nepovoljnih neurorazvojnih ishoda (33).

Conclusion

This study highlights a significant medical and dental variability of the patient population undergoing DGA procedures. All of the individuals, however, were classified as "uncooperative", which was the primary referral reasoning in the analyzed population. Tertiary healthcare, as the only setting for the provision of dental care for this particular patient population, is not sufficiently available and is not primarily related to resolving the problem of patient cooperation. Furthermore, a very high number of DGA repeated procedures (1 in 4) in the same individual is and should be of concern.

Better and more efficient dental healthcare for special needs and "uncooperative" patients undoubtedly requires better organizational means, additional education and clinical training on working with special healthcare needs patients at all educational levels. Dental professionals in primary healthcare system should address preventive and prophylactic procedures as well as methods of behavioral control in their respective clinical scope. Furthermore, the increase in the number of pediatric and preventive dentistry specialists, and their presence and availability across Croatia, is adamant. Their advanced training should further improve the dental health of all vulnerable patient populations, and within the context of this paper, it should particularly improve in managing patients with special healthcare needs and in rehabilitation of patients that have already undergone general anesthesia.

Conflict of interest statement

The authors declare no conflict of interest.

Ethics statement

The study was performed in accordance with the declaration of Helsinki and was approved by the Ethics Committee of the Clinical Hospital Dubrava / University of Zagreb, School of Dental Medicine.

Zaključak

U ovoj studiji istaknuta je značajna medicinska i stomatološka varijabilnost populacije pacijenata korisnika zahvata u općoj anesteziji. No sve su osobe klasificirane kao „nekooperativne", što je u analiziranoj populaciji bio primarni razlog za upućivanje. Tercijarna zdravstvena zaštita, kao jedina sredina za pružanje stomatološke zaštite toj populaciji pacijenata, nije dovoljno dostupna i primarno nije vezana za rješavanje problema suradnje pacijenata. Nadalje, vrlo velik broj ponovljenih postupaka u općoj anesteziji (1 od 4) kod iste osobe jest i trebao bi biti razlog za zabrinutost.

Bolja i učinkovitija dentalna zdravstvena zaštita pacijenata s poteškoćama u razvoju i „nekooperativnih" pacijenata nedvojbeno zahtijeva bolju organizaciju, dodatnu edukaciju i kliničko osposobljavanje za rad s pacijentima od posebne zdravstvene skrbi na svim obrazovnim razinama. Stomatološki stručnjaci u sustavu primarne zdravstvene zaštite u svojem osnovnom kliničkom radu trebali bi se baviti preventivnim i profilaktičnim postupcima te metodama kontrole ponašanja. Nadalje, prijeko je potrebno povećati broja specijalista dječje i preventivne dentalne medicine i njihovu dostupnost diljem Hrvatske. Njihovo usavršavanje omogućilo bi dodatno poboljšanje dentalnoga zdravlja svih ranjivih populacija pacijenata, a u kontekstu ovog rada, posebice pacijenata s poteškoćama u razvoju, te kontinuirano održavanje pacijenata poslije sanacije zuba u općoj anesteziji.

Izjava o sukobu interesa

Autori nisu bili u sukobu interesa.

Etička izjava

Studija je provedena u skladu s Helsinškom deklaracijom, a odobrilo ju je Etičko povjerenstvo Kliničke bolnice Dubrava/Stomatološkog fakulteta Sveučilišta u Zagrebu.

Sažetak

Ciljevi: Opća anestezija provjerena je terapijska metoda u stomatološkom liječenju, osobito ako je pacijent osoba s poteškoćama u razvoju ili nekooperativni pedijatrijski pacijent. **Materijal i metode:** Cilj ove retrospektivne studije je analizirati karakteristike stomatoloških postupaka u općoj anesteziji (DOA) koji se provode u slučaju nekooperativnih pacijenata svih dobnih skupina u tercijarnoj zdravstvenoj ustanovi, Kliničkoj bolnici Dubrava u Zagrebu. **Rezultati:** Od 2014. do 2019. godine primijenjeno je ukupno 810 zahvata u općoj anesteziji na ukupno 697 pacijenata. Prosječna dob bila je 18 godina. Gotovo polovina pacijenata bila je iz Grada Zagreba i Zagrebačke županije – 27,8 % (N =225), odnosno 21,0 % (N = 170). Više od 90 % pacijenata podvrgnutih tim zahvatima upućeno je s jednom do tri medicinske dijagnoze, njih 47,9 % imalo je jednu do tri dentalne dijagnoze, a najčešći je bio karijes (95,7 %). Prosječno čekanje na zahvat (±SD) iznosilo je 113,06 (± 62,62) dana. Više puta je na dentalne zahvate u općoj anesteziji upućeno 90 pacijenata (14,8 %), odnosno obavljena su 203 zahvata (25,1 %). **Zaključci:** Postupak u općoj anesteziji ostaje jedina opcija stomatološkog liječenja za određene pojedince. Postoji institucionalna i organizacijska potreba da se riješe problemi zbog dugog čekanja i visokih stopa ponovljenih postupaka u općoj anesteziji (DOA).

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