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Prevalencija patoloških nalaza na panoramskim radiogramima: Kalcificirani aterom karotidne arterije

Prevalence of Pathologic Findings in Panoramic Radiographs: Calcified Carotid Artery Atheroma

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Sažetak
Svrha rada: Autori su željeli procijeniti prevalenciju slika koje mogu upućivati na kalcificirane aterome karotidne arterije (ISCCAA) na panoramskim radiogramima stomatoloških pacijenata. **Materijali i metode:** Uzorak se sastojao od 8338 panoramskih radiograma pacijentica (n = 5 049) i pacijenata (n = 3 289) u dobi od 4 do 94 godine. Panoramski radiogrami analizirani su zbog ISCCAA-e. Dobiveni podatci statistički su povezani sa spolom i dobi. **Rezultati:** ISCCAA je pronađena na 579 radiograma (6,9 %). Nije bilo statistički značajne razlike između muškoga i ženskoga spola (p > 0,05). ISCCAA je bila prevalentnija kod pacijenata u srednjoj dobi, dakle od 50 godina (p < 0,05). **Zaključak:** Prema dobivenim nalazima može se zaključiti koliko je, u sklopu kliničke dentalne prakse, važna rana dijagnoza potencijalnih slučajeva ISCCAA-e s pomoću panoramskih radiograma.

Uvod

Ateroskleroza je upalna kronična bolest koju obilježava zadebljanje, sužavanje i/ili gubitak elastičnosti stijenke arterija (1, 2). Njezino multietiološko podrijetlo uključuje biokemijski fenomen koji uzrokuje patološku kalcifikaciju arterija (3). Te kalcifikacije zovu se ateromi i potječu od lokalne proliferacije fibroblasta te odlaganja kalcija, a najčešće se nalaze na mjestima gdje se račvaju karotidne arterije (4) i gdje je brzina protoka krvi smanjena pa se povećava izlaganje aterogenim česticama sklonima kalcifikaciji (5).

Klinička važnost ateroma očituje se u njihovu otkidanju od arterijskih stijenki i o uključivanju u krvotok te u potpunom začepljivanju arterije na užim dijelovima, što može rezultirati cerebrovaskularnim inzultom (2, 6 – 8). Gotovo 20 posto ishemijskih cerebrovaskularnih inzulta uzrokovano je otkidanjem ateroma iz karotidne arterije (9).

Doktori dentalne medicine imaju iznimno važnu zadaću u sprječavanju cerebrovaskularnih inzulta jer mogu, zahvaljujući panoramskim radiogramima, rano uočiti i dijagnosticirati kalcificirani arterijski aterom (ISCCAA). Ti radiogrami uo-

Introduction

Atherosclerosis is an inflammatory chronic disease characterized by the thickening, narrowing and/or loss of elasticity of artery walls (1,2). The multi-etiological origin of atherosclerosis involves a biochemical phenomenon that creates pathological arterial calcifications (3). These calcifications, now called atheromas, originate from the local proliferation of fibroblasts and deposition of calcium. Atheromas are particularly common in the bifurcation of the carotid artery (4), in which the blood flow velocity is reduced increasing the exposure to atherogenic particles that are prone to calcification (5). The clinical importance of atheromas mainly consists in their potential disruption from artery walls following the blood flow, completely obstructing the artery in more narrowed regions, and consequently leading to cerebrovascular accidents (2,6-8). Nearly 20% of the ischemic cerebrovascular accidents are caused by disrupted atheromas in the carotid artery (9).

Dentists play an important role by preventing cerebrovascular accidents through the early diagnosis of images sug-

bičajeno se koriste u dentalnoj medicini (9) i poznati su kao korisno sredstvo za upozoravanje na aterome u karotidnoj arteriji (10). Radiografski se ISCCAA-e prikazuju kao čvoraste radioopakne strukture u blizini područja cervikalnih kralježaka C3 i C4 i u kutu mandibule (7). Diferencijalna dijagnoza za slične radiografske nalaze sastoji se od kalcificiranih limfnih čvorova, sijalolita, flebolita, tonzilolita i hrskavičnog čvorića tirohiodnog ligamenta (*triticeous cartilage*) (3, 7, 11, 12). Unatoč doprinosu rane dijagnoze ateroma u karotidnoj arteriji, ISCCAA na panoramskim radiogramima mora se potvrditi specifičnim testovima, a to su Dopplerov ultrazvučni pregled (13) i kompjutorizirana tomografija (5). Ovom istraživanju svrha je bila pronaći prevalenciju ISCCAA-e na panoramskim radiogramima i njezinu povezanost sa spolom i dobi te pritom istaknuti važnost rane dijagnoze i svijest o atipičnim nalazima u rutinskoj dentalnoj medicini.

Materijali i metode

Ovo istraživanje provedeno je na temelju odobrenja Povjerenstva za etiku – broj protokola je 980 997.

Uzorak se sastojao od 8338 digitalnih panoramskih radiograma snimljenih između 2013. i 2014. godine, a od toga je pacijenticama pripadalo 60,6 posto snimki (n = 5 049), a pacijentima 39,4 posto (n = 3 289). Svi su bili pod dentalnom terapijom i u dobi između 4 i 94 godine (srednja dob – 34 godine). Kriterij za uključivanje bila je dob između 4 i 94 godine. Isključni kriteriji sastojali su se od nedostatka demografskih podataka, poput dobi i spola, te loše kvalitete radiograma. Panoramski radiogrami snimani su za potrebe dentalne terapije na uređaju *Orthopantomograph® OP200 D* (Instrumentarium Dental®, Tuusula, Finska).

Analiza panoramskih radiograma obuhvaćala je pregledavanje mekog vratnog tkiva uz kralješke C3 i C4 i traženje radioopaktnih struktura sličnih ISCCA-i (slika 1.). Dobiveni podatci prikazani su u tablicama te je izračunata povezanost sa spolom na temelju hi-kvadrat testa i dobi s pomoću Mann-Whitneyeva U testa. Statistička analiza provedena je progra-

gestive of calcified artery atheromas (ISCCAA) in panoramic radiographs. These radiographs are commonly used in dentistry and known as a useful tool to indicate the presence of atheromas in the carotid artery (9,10). Radiographically, ISCCAA are recorded as nodular radiopaque structures adjacent to the region of cervical vertebrae C3 and C4 and to the angle of the mandible (7). Differential diagnoses for similar radiographic findings consist of calcified lymph nodes, sialoliths, phleboliths, tonsilloliths and the triticeous cartilage (3,7,11,12). Despite their contribution to an early diagnosis of atheromas in the carotid artery, the ISCCAA observed on panoramic radiographs should be confirmed by some more specific imaging tests, such as Doppler- Ultrasound (13) and computed tomography (5).

The present study aimed to screen the prevalence of ISCCAA on panoramic radiographs and to determine the association with sex and age, thus highlighting the importance of an early diagnosis. In addition, the aim was to raise the awareness of atypical findings that dentists may encounter in the course of radiographic examination.

Material and Methods

The local Research Ethics Committee has approved the research protocol and the study (protocol number: 980.997).

The sample consisted of 8.338 digital panoramic radiographs obtained between 2013 and 2014 from female (n=5.049, 60.6%) and male (n=3.289, 39.4%) patients under dental treatment aged 4 - 94 years (mean age: 34 years). The inclusion criteria consisted on sampling subjects that fit the range of patients aged 4-94 years. The exclusion criteria consisted of the lack of demographic data, such as age and sex, and low quality radiographs. Panoramic radiography, justified for dental treatment purposes, was performed using an Orthopantomograph® OP200 D (Instrumentarium Dental®, Tuusula, Finland) radiologic unit.

The analysis of panoramic radiographs included the search for radiopaque images in cervical soft tissue, adjacent to the cervical vertebra C3 and C4 compatible with ISCCAA (Figure 1). The obtained data were tabulated for association with sex and age applying Chi-square test and Mann-Whitney U test, respectively. The statistical analyses were per-

Slika 1. Radiogramski prikaz struktura za koje se sumnja da su kalcificirani ateromi karotidnih arterija

Figure 1 Radiographic representation of images suggestive of calcified carotid artery atheroma

mom SPSS® 19.0 (SPSS® Inc., Chicago, SAD), a statistička važnost bila je postavljena na 5 posto.

Rezultati

Ukupno je na pregledanim panoramskim radiogramima otkriveno 576 (6,90 %) ISCCAA-e. Ti radiogrami bili su blago prevalentniji kod žena (n = 363; 7,19 %) negoli kod muškaraca (n = 216; 6,57 %) (tablica 1.).

Nađeno je 180 ISCCAA (2,15 %) na desnoj strani i 182 (2,18 %) na lijevoj. Obostrane ISCCAA-e uočene su na 217 (2,60 %) panoramskih radiograma (tablica 2.).

Statistički značajna povezanost nađena je između ISCCAA-e i dobi (p < 0,001). Veća prevalancija uočena je u dobnom rasponu između 40 i 70 godina. Pacijenti s ISCCAA-om (n = 579) imali su u prosjeku 50 godina. Pacijenti bez ISCCAA-e (n = 7 759) bili su u prosjeku u dobi od 33 godine (tablica 3.).

formed with SPSS® 19.0 (SPSS® Inc., Chicago, EUA) considering statistical significance of 5%.

Results

A total of 576 (6.90%) ISCCAA were detected in the examined panoramic radiographs. These images were discretely more prevalent in females (n= 363; 7.19%) than in males (n=216; 6.57%) (Table 1).

In the right and left sides, 180 (2.15%) and 182 (2.18%) ISCCAA were found, respectively. Bilateral ISCCAA were observed in 217 (2.60%) panoramic radiographs (Table 2).

A statistically significant value was found regarding the ISCCAA association with age (p<0.001). A higher prevalence was found in the 40-to-70- year-old age range. The patients with ISCCAA (n=579) had mean age of 50 years. The patients without ISCCAA (n=7.759) had mean age of 33 years (Table 3).

Tablica 1. Raspodjela uzoraka prema spolu s naglaskom na broju sumnjivih struktura – pretpostavlja se da je riječ o kalcificiranom ateromu karotidnih arterija
Table 1 Sample distributed by sex highlighting the number of images suggestive of calcified carotid artery atheroma in each sex group

Spol • Sex	Ispitanici • Subjects	%	ISCCAA	%
Ženski • Female	5.049	60.55	363	7.19
Muški • Male	3.289	39.45	216	6.57

ISCCAA: Broj slika za koje se sumnja da su na njima uočeni kalcificirani ateromi karotidnih arterija • Number of images suggestive of calcified carotid artery atheroma

Tablica 2. Broj struktura otkrivenih na panoramskim radiogramima za koje se sumnja da su kalcificirani ateromi karotidnih arterija – raspodjela ovisno o strani na kojoj su uočeni
Table 2 Number of images suggestive of calcified carotid artery atheroma detected in panoramic radiographs distributed according to the side

Strana • Side	ISCCAA	%
Desno • Right	180	2.15
Lijevo • Left	182	2.25
Obostrano • Bilateral	217	2.60
Ukupno • Total	579	6.9

ISCCAA: Broj slika za koje se sumnja da su na njima uočeni kalcificirani ateromi karotidnih arterija • Number of images suggestive of calcified carotid artery atheroma

Tablica 3. Broj struktura otkrivenih na panoramskim radiogramima za koje se sumnja da su kalcificirani ateromi karotidnih arterija – raspodjela ovisno o dobi
Table 3 Number of images suggestive of calcified carotid artery atheroma detected in panoramic radiographs distributed according to the age range

Raspon dobi • Age range	ISCCAA		Ukupno • Total	%
	Odsutnost • Absence	Prisutnost • Presence		
4 - 10	674	1	675	0.17
11 - 20	1234	9	1243	1.58
21 - 30	2054	46	2100	8.08
31 - 40	1154	91	1245	15.99
41 - 50	1083	122	1205	21.44
51 - 60	830	138	968	24.25
61 - 70	434	113	547	19.85
>70	150	49	199	8.61
Total	7.613	569	8.182	100

ISCCAA: Broj slika za koje se sumnja da su na njima uočeni kalcificirani ateromi karotidnih arterija; srednja dob pacijenata bez ISCCAA-e – 33 godine; raspon dobi; postotak izražen ovisno o ukupnom uzorku (n = 8338). • Images suggestive of calcified carotid artery atheroma; Mean age of the patients presenting ISCSS: 50 years old; Mean of the patients not presenting ISCCAA: 33 years old; Age range calculated in years of age; % expressed considering the total sample (n=8.338).

Rasprava

Kalcificirani ateromi karotidnih arterija usko su povezani s cerebrovaskularnim inzultima (9). Te radiografski vidljive kalcifikacije postaju potencijalno uočljive na rutinskim medicinskim pregledima (10). Panoramski radiogrami uobičajeno su dopunsko sredstvo tijekom pregleda u dentalnoj medicini, jer dobro prikazuju dentomaksilofacijalne i vratne anatomske strukture (9). Posljedično su doktori dentalne medicine važni za ranu dijagnozu kalcificiranih ateroma karotidnih arterija jer mogu otkriti sumnjive strukture na panoramskim radiogramima. Ovom istraživanju svrha je bila procijeniti prevalenciju ISCCAA-e u velikoj bazi podataka panoramskih radiograma te povezati stupanj prevalencije s podatcima o dobi i spolu.

Prevalencija ISCCAA-e u proučavanom uzorku iznosila je 6,9 posto. U usporedbi s podatcima iz znanstvene literature, rezultat je usko povezan s homogenošću distribucije uzorka s dobi. Meyer u suradnici (14) pronašli su 2012. godine stupanj prevalencije ISCCAA-e od 1,67 posto na uzorku od 1500 radiograma. Ipak, u tom je istraživanju samo 15,66 posto pacijenata bilo starije od 40 godina (14). U našem istraživanju imali smo 35,67 posto pacijenata (n = 2919) u istom dobnom rasponu te smo tako povećali vjerojatnost pronalaska više slučajeva ISCCAA-e. U skladu s tim su Tuñas i suradnici (12) (2012.) pronašli stupanj prevalencije ISCCAA-e od 20,68 posto na uzorku od 29 pacijenata i svi su bili u dobi iznad 50 godina. Ti rezultati ne samo da nalažu metodološke standarde za izbor uzorka, nego i potvrđuju rizičan dobni čimbenik za nastanak kalcificiranoga ateroma karotidnih arterija. Opisi drugih rizičnih čimbenika pronađeni su u istraživanjima u kojima se tražila povezanost s kroničnim bolestima jetara (stupanj prevalencije 25,71 %) (2) i amenorejom (stupanj prevalencije 31 %) (15).

U literaturi se sugerira da se ISCCAA češće pojavljuje ako je pacijent stariji od 50 godina (16). Ipak, pacijenti mogu biti pogođeni u širem dobnom rasponu. Kad povezujemo podatak o dobi u ovom istraživanju, prevalancijom ISCCAA-e pronađena je statistički značajna povezanost (p > 0,001) kod pacijenata između 40 i 70 godina (srednja dob 50 godina). S druge strane, Friedlander i suradnici (17) (2007.) izvijestili su o stupnju prevalencije ISCCAA-e od 3,3 posto i o srednjoj dobi od 66 godina. To upućuje na to da se, unatoč statističkoj povezanosti dobi i ISCCAA-e, moraju pregledavati panoramski radiogrami svih pacijenata bez obzira na dob. Još jedna potvrda za to pojavila se kod mlađih pojedinaca (tablica 3.), no može biti povezana s lažnim pozitivnim nalazima ili čak s iznimkama u uzorku.

Spol i strana na kojoj su se pojavili ateromi nisu pokazivali ni statističku ni opisnu povezanost u provedenom istraživanju. Spol nije utjecao na prevalenciju ISCCAA-e, a strana na kojoj su se pojavili nije bila važna za prisutnost ateroma. Oba podatka upućuju na to da se pretraga u slučaju ISCCAA-e mora obavljati obostrano na panoramskim radiogramima, bez obzira na spol pacijenta.

Zaključak

Doktori dentalne medicine moraju biti osposobljeni i svjesni potencijalnih nalaza na panoramskim radiogramima

Discussion

Calcified carotid artery atheromas are closely related to cerebrovascular accidents (9). Such calcifications can be radiographically detected while performing routine medical procedures (10). Panoramic radiographs are a common complementary tool used in dentistry for properly recording dentomaxillofacial and cervical anatomical structures (9). Consequently, dentists play an important role in an early diagnosis of calcified carotid artery atheromas by detecting suggestive images in panoramic radiographs. The present study aimed to assess the prevalence of ISCCAA in a large database of panoramic radiographs associating prevalence rates with sex and age information.

The prevalence of ISCCAA reached 6.9% of the studied sample. When compared with the data in the literature, the results of this study are closely related to the homogeneity of the sample distribution in age ranges. Meyer et al. (14), (2012) observed the ISCCAA prevalence rate of 1.67% in 1.500 radiographs. However, only 15.66% of the examined patients were over 40 years old (14). 35.67% of the patients (n=2.919) who participated in this study were in the same age range, thus increasing the probability of finding more cases of ISCCAA. Corroborating this evidence, Tuñas et al. (12), (2012) found a prevalence rate of 20.68% of ISCCAA in a sample of 29 patients, all aged above 50 years. These results not only suggest methodological standards for the sample selection but also confirm the age as a risk factor for calcified carotid artery atheroma. Reports for other risk factors are found in surveys investigating associations with chronic liver disease (prevalence rate of 25.71%), (2) and amenorrhea (prevalence rate of 31%), (15).

The literature suggests that ISCCAA is more often found in patients aged above 50 years (16). However, patients can be affected in a large age range. When associating age information, the present study demonstrated a statistically significant (p>0.001) higher prevalence of ISCCAA in patients aged between 40 and 70 years (mean age 50 years). On the other hand, Friedlander et al. (17), (2007) observed a prevalence rate of 3.3% of ISCCAA in patients with mean age of 66 years. These results suggest that despite statistically significant findings related to age, ISCCAA must be searched in panoramic radiographs of patients of any age. Another clear justification for that is the presence of ISCCAA in younger individuals (Table 3), which may be related to the presence of false positives or even outliers in the sample.

Sex and side of occurrence consisted of other statistical and descriptive associations performed in present study, respectively. The former revealed no influence on the prevalence of ISCCAA, while the latter revealed the absence of influence of the ISCCAA manifestation. Both combined suggest that the search for ISCCAA must be performed bilaterally in panoramic radiographs regardless of the patient's gender.

Conclusion

In addition to theoretical training, dentists are expected to have received adequate practical training. They should be

poput ISCCAA-e, te tako pridonositi ranoj dijagnozi složenih patologija i vaskularnih inzulta. Pregledavanje i traženje ISCCAA-e u rutinskoj dentalnoj praksi mora se obavljati neovisno o spolu i dobi pacijenata.

aware of the fact that potential findings in panoramic radiographs, such as ISCCAA, can contribute to an early diagnosis of complex pathologies and vascular accidents. In routine dental care, the search for ISCCAA must be performed regardless of gender or age.

Sukob interesa

Nije bilo sukoba interesa.

Conflict of interest

None declared.

Abstract
Objectives: To assess the prevalence of images suggestive of calcified carotid artery atheromas (ISCCAA) in panoramic radiographs of patients under dental treatment. **Materials and methods:** The sample consisted of 8.338 panoramic radiographs from female (n=5.049) and male (n=3.289) patients under dental treatment between 4 and 94 years of age. The panoramic radiographs were evaluated searching for ISCCAA. The obtained findings were statistically associated with sex and age. **Results:** ISCCAA were found in 579 radiographs (6.9%). No statistically significant differences were observed between females and males (p>0.05). ISCCAA were more prevalent in patients having a mean age of 50 (p<0.05). **Conclusion:** The potential cases of ISCCAA that were assessed on panoramic radiographs are of utmost clinical significance because they can ensure early and correct diagnosis.

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