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Prevalence of Stylohyoid Complex Elongation among Patients Attending RAK College of Dental Sciences Clinic

Prevalencija izduženoga stilohioidnog nastavka među pacijentima na liječenju u Klinici za stomatološke znanosti RAK

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Abstract
Objective: To investigate into the prevalence of the SP complex elongation among patients attending RAK Dental College Clinic. **Material and Methods:** A 3234 radiographic images of patients aged ≥18 years were examined. The O'Carroll (1984) classification of stylohyoid complex was used. Age, gender, ethnicity and patterns of calcification were recorded and analyzed. Chi-squared and ANOVA tests were used to detect potential differences. **Results:** Male to female ratio was 1.9:1. There were 1150 (35.6%) subjects in age group-I (18-39) and 2084 (64.4%) subjects in the age group-II (≥40). The mean age was 38.12 (±13.2). Fifty seven % (1836) of the subjects were eastern Asians, 671 (21%) Africans, 325 (10%) Middle east, 254 (8%) Europe, and 148 (4%) other ethnicities. A normal SP was found in 1601 (49.51%) of the images, elongated in 903 (27.92%), calcified in 406 (12.55) and undetected in 324 (10.2 %). The elongated and the calcified styloid processes were more common in males (p=0.0078). The elongated and the calcified SP were more frequent in group II subjects (p=0.0004). Eastern Asians had higher percentage of elongated and calcified SP p= 0.00567. **Conclusion:** Although 1601 (49.51%) of subjects had normal SP, the study revealed a high prevalence of SP elongation among eastern Asians. There is a strong association between the age and the SP elongation. It is crucial to include the head and neck symptoms of non-odontogenic origin in the differential diagnosis of Eagle's syndrome. The study recommends further investigation using some advanced imaging techniques.

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Key words
Parapharyngeal Space; Calcinosis; Eagle's Syndrome; Ethnicity; Asian Populations

Introduction

Styloid process (SP) is a thin bony projection extending from lower surface of the temporal bone in an anterior-inferior route bilaterally. The stylohyoid complex comprises the styloid process, stylohyoid ligament, and the lesser *cornu* of the hyoid bone. It develops from the second pharyngeal pouch; the Reichart cartilage. Three muscles are attached to SP, namely the stylopharnygeous, stylohyoid and styloglossal muscles, in addition to the stylohyoid and stylomandibular ligaments. Anatomically, it has an intimate close contact with the upper portion of carotid space and its contents, including the cranial nerves V, IX (1). Its normal length ranges between 20-30 mm; however, it shows variation among different people (2).

It has been suggested that the stylohyoid ligament calcification refers to an elongated SP, which was invariably observed accidently on panoramic radiographs. When a SP extends beyond 30 mm in length, it is considered elongated and may be presented unilaterally or bilaterally (3, 4).

Uvod

Stiloidni nastavak (SN) tanki je koštani izdanak koji se proteže od donje površine temporalne kosti bilateralno u anteroinferiornom smjeru. Stilohioidni kompleks uključuje stiloidni nastavak, stilohioidni ligament i mali rog hioidne kosti. Razvija se iz druge ždrijelne vrećice – Reichartove hrskavice. Tri mišića pričvršćena su na SN – stilofaringealni, stilohioidni i stiloglosealni, uz stilohioidne i stilomandibularne ligamente. Anatomski je u bliskom kontaktu s gornjim dijelom karotidnog prostora i njegovim sadržajem, uključujući V. i IX. kranijalni živac (1). Njegova normalna dužina kreće se između 20 i 30 mm, no varira od pojedinca do pojedinca (2).

Pretpostavlja se da je kalcifikacija stilohioidnog ligamenta povezana s izduženim SN-om koji se slučajno opaža na panoramskim rendgenskim snimkama. Kada je SN duži od 30 mm, smatra se izduženim, a može se manifestirati unilateralno ili bilateralno (3, 4).

Mali postotak stanovništva (4 %) ima izdužen SN i uvijek je slučajan radiološki nalaz (5, 6). Među pacijentima s iz-

A small percentage of population (4%) exhibit elongation of the SP, and it has been invariably noticed as an incidental radiographic finding (5,6). Among patients with elongated SP, 4%-10% are presented with symptoms, known as Eagle syndrome (7, 8). The commonly associated symptoms are neck or throat pain, dysphagia, foreign body sensation, facial pain tinnitus, otalgia and occasionally limitation of mandibular movement (9-11]) O'Carroll (11) reported that about 8% of patients with elongated SP presented with associated symptoms including painful neck, pain on swallowing, sensation of blocked throat and pain on turning the head.

The etiology of the SP elongation is unknown. However, some authors suggested that it has a congenital back ground (12,13), while others believe that local chronic irritations, hormonal disorders, trauma from surgery, persistence of mesenchymal elements, osseous tissue growth and mechanical stress or trauma during development of SP may lead to calcification and elongation of the SP (14-18).

Several authors have described various classification patterns of an elongated SP including radiographic classification for the calcified stylohyoid complex. In general, the following three radiographic patterns are presented: elongated, segmented and pseudoarticuated. In addition, the author has stated the following four patterns of calcification: calcified outline, partially calcified, nodular complex and completely calcified (19, 20).

A diagnosis of SP elongation or stylohyoid ligament calcification is established using radiographic imaging such as Orthopantomograph (OPG), Cone Beam Computed Tomography (CBCT) and Computed Tomography (CT) Scan. Although the panoramic radiograph is a two dimensional x-ray, it has been found to provide adequate information for epidemiological studies and its imaging technique makes it convenient for imaging findings in the maxillofacial region (21).

The main aims of this study were to find out the frequency of elongated SP among patients attending RAK College of Dental Sciences (RAKCODS) Clinic and to investigate the calcification patterns of elongated SP using archived panoramic radiographs between the years 2017 and 2018. Our hypothesis was a high prevalence of SP elongation among the Asian subcontinent population.

Material and methods

This study was approved by the RAK Ethics and Research Committee of RAK Medical and Health Sciences University. All archived digital panoramic radiographs (OPGs) in the radiology department, RAK College of Dental Sciences taken between January 2017 and December 2018 were retrieved and analyzed anonymously for elongation of the SP and patterns of stylohyoid complex calcification. The radiographs were taken for oral diagnostic purposes using Panoramic X-ray (Model: GEN-XRAY25, Manufacturer: Gendex Panoramic, USA) under standard conditions. The OPGs were viewed using HP a 19-inch HP Flat Panel LCD Monitor, resolution at 1000:1 contrast ratio and 1440 x 900 resolutions. The subjects were given their consent during the

duženim SN-om od 4 do 10 % ima simptome poznate kao Eagleov sindrom (7, 8). Manifestira se kao bol u vratu ili grlu, disfagija, osjet stranog tijela, bol u licu, otalgija i povremeno ograničavanje pomicanja mandibule (9 – 11). O'Carroll (11) je izvijestio da je oko 8 % pacijenata s izduženim SN-om imalo pridružene simptome, uključujući bolni vrat, bol pri gutanju, osjećaj prepreke u grlu i bol pri okretanju glave.

Etiologija izduženog SN-a nije poznata. No neki autori sugeriraju da je riječ o prirođenom stanju (12, 13), a drugi smatraju da okalne kronične iritacije, hormonski poremećaji, traume od operacija, perzistentni mezenhimski elementi, rast koštanog tkiva i mehanički stres ili trauma tijekom razvoja SN-a uzrokuju njegovu kalcifikaciju i izduženost (14 – 18).

Nekoliko autora opisalo je različite klasifikacijske izduženog SN-a, uključujući radiološku klasifikaciju kalcificiranoga stilohioidnog kompleksa. Postoje uglavnom tri radiološka uzorka – izduženi, segmentirani i pseudoartikulirani. Uz to, autor je odredio četiri obrasca kalcifikacije – kalcificirani obris, djelomično kalcificirani, nodularni kompleks i potpuno kalcificirani (19, 20).

Dijagnoza izduženog SN-a ili kalcifikacija stilohioidnog ligamenta postavlja se na temelju radioloških snimki poput ortopantomograma, CBCT-a i CT-a. Iako je panoramska snimka dvodimenzionalni prikaz, otkriveno je da pruža odgovarajuće informacije za epidemiološka istraživanja, a tehnika snimanja pogodna je za dijagnosticiranje u maksilofacijalnoj regiji (21).

Glavni ciljevi ovog istraživanja bili su utvrditi učestalost izduženog SN-a među pacijentima koji se liječe u klinici Sveučilišta za medicinske i zdravstvene znanosti RAK (College of Dental Sciences – RAKCODS) i istražiti tipove kalcifikacije izduženog SN-a s pomoću panoramskih snimki arhiviranih između 2017. i 2018. Hipoteza je bila da postoji velika prevalencija izduženja SN-a među ljudima s azijskog kontinenta.

Materijali i metode

Istraživanje je odobrilo Povjerenstvo za etiku i istraživanja pri Sveučilištu za medicinske i zdravstvene znanosti RAK. Svi arhivirani digitalni ortopantomogrami (OPG) na Odsjeku za radiologiju snimljeni između siječnja 2017. i prosinca 2018. dohvaćeni su i analizirani anonimno s obzirom na izduženje SN-a i obrazac kalcifikacije stilohioidnog kompleksa. Rendgenske snimke snimljene su u svrhu oralne dijagnostike uređajem GEN-XRAY25 (proizvođač Gendex Panoramic, SAD) u standardnim uvjetima. OPG-i su pregledani na HP-ovu 19-inčnom monitoru s ravnim zaslonom u kontrastnom omjeru 1000 : 1 i rezoluciji 1440 x 900. Ispitanici su dali pristanak tijekom prvog posjeta te su izjavili da se prikupljeni podatci mogu upotrijebiti u istraživačke svrhe. U istraživa-

first clinical examination visit declaring that the collected data may be used for research purposes. Only the subjects aged18 years and above were included in the study. Any OPGs with technical fault, elongated or indistinct images were excluded. One of the authors went through a short intensive training under a certified radiologist in the radiology department to standardize the process of radiographic examination. The intra-observer consistency was tested by examining 22 randomly selected OPGs at different time intervals and the consistency of the interpretation was found to be satisfactory (Kappa= 0.813).

The OPG images are available only at the radiology department; therefore, O'Carroll (1984) method of stylohyoid complex classification was applied. The SP was ranked "regular" if the SP did not cross the mandibular foramen level (Figure 1, patterns A to D); "elongated" when it appeared extended beyond the mandibular foramen and continuous with the base of the skull (Figure 1, pattern E); "calcified" when it extended below the mandibular foramen but not continuous with the cranial base (Figure 1, pattern F to K); and "undetected" if it could not be traced on the panoramic image. In this study, patterns A, B, C and D were considered to be normal SP, pattern E an elongated SP and patterns F, G, H, I, J and K calcified stylohyoid (SH) ligaments. Figure 2 shows the four main classifications of stylohyoid complex followed in this study, regular (a); elongated (b); calcified (c); undetected (d).

The available details regarding age, gender, ethnicity, right and left sides, types and patterns of calcification were collected and were analyzed using the SPSS version 21 program (SPSS, Chicago, IL, USA). Chi-squared and ANOVA tests were applied to find out any significant differences between age groups, gender and ethnicity. Also, the subjects were stratified into two age groups; 18-39 years (group-I) and 40 years and above (group-II).

The current population of the United Arab Emirates is 9,653,558 as determined on April 20, 2019, based on the latest United Nations estimates. The UAE population is multiethnic in nature and the expatriates outnumber the local people (Emiratis). The males form about 72% of the entire population, while 28% are females. The local people (Emiratis) form only 11 % of the total population, while the majority of the expatriate are Indians (28%), Pakistan (13%), Bangladesh (7%), Philippines (6%) and rest from other countries including Middle East Arabs.

Results

A total of 6563 patients' digital panoramic radiographs were collected; 3329 images were excluded because of the age (subjects below 18 years) or poor image quality including errors in positioning or exposure. Only 3234 OPGs were considered valid for the study. The number of male subjects was 2112 (65%), and the number of female subjects was 1122 (35%). Male to female ratio was 1.9:1. There were 1150 (35.6%) subjects in the age group-I (18-39) and 2084 (64.4%) subjects in the age group-II (40 and above). The age range was 18-68 years, the mean age being 38.12 (±13.2). The ethnic group frequency of the subjects is shown in Figure 3, with the

nje su bili uključeni samo oni stariji od 18 godina. Isključeni su svi OPG-i s tehničkim pogreškama i izdužene ili nejasne snimke. Jedan od autora bio je na kratkoj intenzivnoj edukaciji kod certificiranog radiologa na Odjelu za radiologiju kako bi standardizirao postupak radiološkog pregleda. Dosljednost među promatračima testirana je analizom 22 nasumično odabrana OPG-a u različitom vremenskom intervalu, a dosljednost interpretacije utvrđena je kao zadovoljavajuća (Kappa = 0,813).

Za klasifikaciju stilohioidnog kompleksa primijenjena je metoda prema O'Carrollu (1984.). U skladu s tim, SN je ocijenjen kao *normalan* ako nije prelazio razinu mandibularnog foramena (slika 1., obrasci od A do D), kao *izdužen* kada se činilo da se proteže izvan foramena mandibule u kontinuitetu s bazom lubanje (slika 1., uzorak E), kao '*kalcificiran*' kada se širio ispod foramena mandibule, ali nije bio u kontinuitetu s kranijalnom bazom (slika 1., uzorci od F do K), i kao *neotkriven* ako ga se nije moglo pronaći na panoramskoj snimci. U ovom su se istraživanju tipovi A, B, C i D smatrali normalnim SN-om, tip E izduženim SN-om, a tipovi F, G, H, I, J i K kao kalcificirani stilohioidni ligamenti. Na slici 2. četiri su glavne klasifikacije stilohioidnog kompleksa koje su primijenjene u ovom istraživanju – normalna (a); izdužena (b); kalcificirana (c); neotkrivena (d).

Dostupni detalji o dobi, spolu, etničkoj pripadnosti, desnoj i lijevoj strani, vrstama i obrascima kalcifikacije prikupljeni su i analizirani s pomoću programa SPSS verzije 21 (SPSS, Chicago, IL, SAD). Za testiranje značajnosti razlika između dobnih skupina, spola i nacionalnosti primijenjeni su testovi Chi-kvadrat i ANOVA. Ispitanici su također bili podijeljeni u dvije dobne skupine – od 18 do 39 godina (skupina I) i od 40 godina naviše (skupina II).

Broj stanovnika Ujedinjenih Arapskih Emirata (UAE-a) 9. travnja 2019. iznosio je 9,653.558, na temelju najnovijih procjena Ujedinjenih naroda. Populacija te države je multietnička, a doseljenici su mnogobrojniji od lokalnog stanovništva. Muškaraca je oko 72 %, a žena 28 %. Lokalno stanovništvo čini samo 11 % ukupnoga stanovništva, a većina useljenika je iz Indije (28 %), Pakistana (13 %), Bangladeša (7 %), Filipina (6 %) i drugih zemalja, uključujući i Arape s Bliskog istoka.

Rezultati

Ukupno su prikupljena 6563 digitalna ortopantomograma pacijenata. Od toga broja je 3329 snimki isključeno zbog dobi (subjekti s manje od 18 godina) ili loše kvalitete, uključujući pogreške u poziciji ili ekspoziciji. Za ovo istraživanje smatrala su se valjanima samo 3234 OPG-a. Broj muških ispitanika bio je 2112 (65 %), a ženskih 1122 (35 %). Odnos muškaraca i žena bio je 1,9 : 1. U dobnoj skupini I (18 – 39) bilo je 1150 (35,6 %) ispitanika, a u dobnoj skupini II (40 i više) 2084 (64,4 %). Raspon dobi bio je od 18 do 68 godina, sa srednjom dobi od 38,12 (± 13,2) godina. Distribucija prema etničkim skupinama prikazana je na slici 3., a istočni

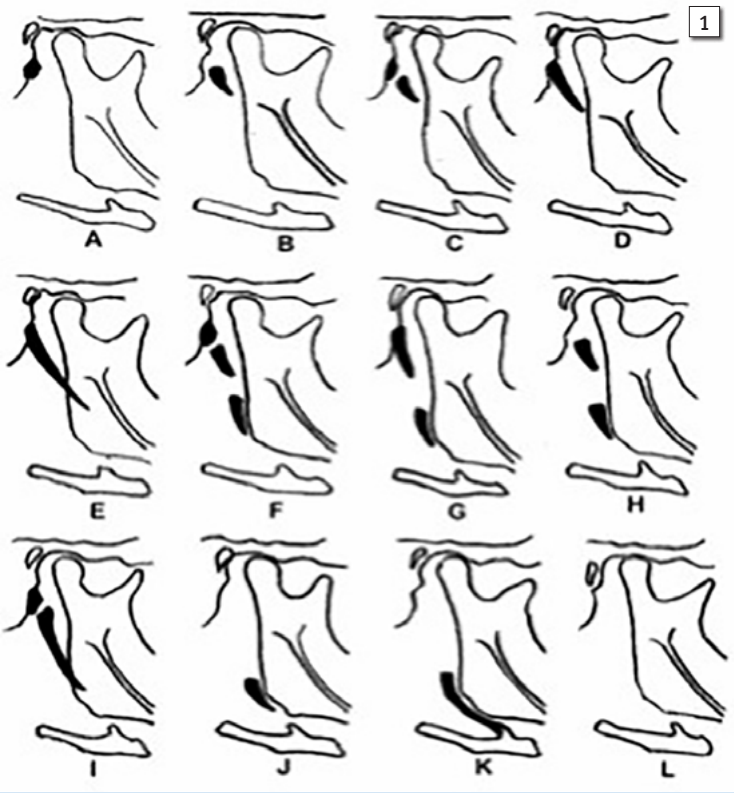
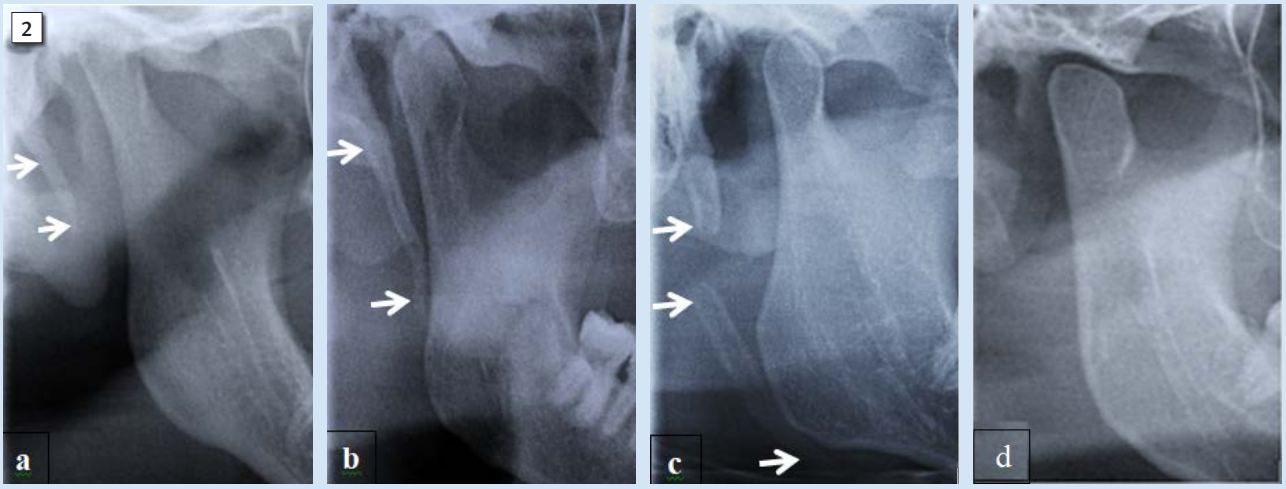
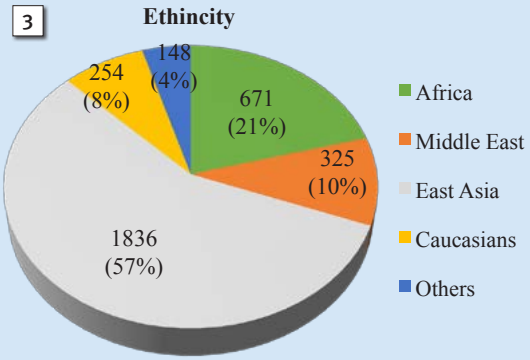
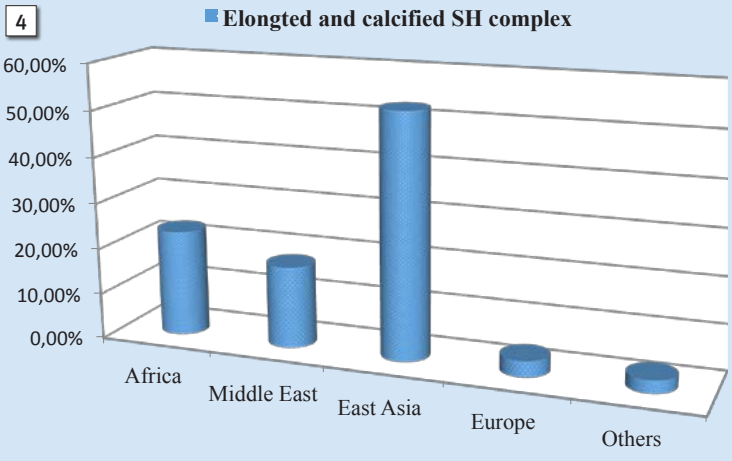


Figure 1 Demonstrates O'Carroll's classification of the stylohyoid complex: Regular; patterns A through D, Elongated; pattern E, Calcified; patterns F through K, and absent; pattern L (adapted from O'Carroll's, 1984).
Slika 1. O'Carrollova klasifikacija stilohioidnog kompleksa: normalan – obrasci od A do D, izdužen – uzorak E, kalcificiran – obrasci F do K i nije otkriven – uzorak L (prilagođeno prema O'Carrollu, 1984.)
Figure 2 The four main classification of stylohyoid complex followed in this study, regular (a); elongated (b); calcified (c); undetected (d).
Slika 2. U ovom istraživanju primijenjene su četiri glavne klasifikacije stilohioidnog kompleksa – normalan (a); izdužen (b); kalcificiran (c); neotkriven (d).
Figure 3 Frequency of ethnic population
Slika 3. Frekvencija etničkih populacija
Figure 4 High frequency of calcified stylohyoid complex elongation among East Asian; p= 0.00567
Slika 4. Visoka frekvencija elongacije stilohiodnog kompleksa među istočnim Azijcima; p = 0,00567







eastern Asians forming the majority of the subjects. Figure 2 shows the 4 main classifications of the stylohyoid complex that was used in this study. Table 1 demonstrates the 12 patterns of O'Carroll's classifications that were observed during years 2017 and 2018. The SP was classified as regular (normal) (A-D) in 1601 images (49.51%), elongated (E) in 903 (27.92%), calcified (F-K) in 406 (12.55%) and undetected (L) in 324 (10.2%). The distribution of the SH complex patterns among the various ethnic groups is shown in Table 2.

When the O'Carroll's SP classification was adapted, our results showed that the majority of the subjects exhibited regular pattern 1601 (49.51%), followed by elongated and calcified with 903 (27.92%) and 406 (12.55%) respectively. The

Azijci činili su većinu ispitanika. Na slici 2. četiri su glavne klasifikacije stilohoidnog kompleksa koje su primijenjene u ovom istraživanju. U tablici 1. je 12 obrazaca O'Carrollove klasifikacije koji su uočeni tijekom 2017. i 2018. SN je klasificiran kao normalan (A – D) na 1601 snimci (49,51 %), izdužen (E) na 903 (27,92 %) snimke, kalcificiran (F – K) na 406 (12,55 %) i nije otkriven (L) na 324 (10,2 %) snimke. Distribucija obrazaca stilohioidnog kompleksa među različitim etničkim skupinama prikazana je u tablici 2.

Kada se O'Carrollova klasifikacija prilagodi, naši rezultati pokazuju da je većina ispitanika imala normalan uzorak – 1601 (49,51 %), a zatim izdužen – 903 (27,92 %) i kalcificiran – 406 (12,55 %). Izduženi i kalcificirani stiloidni nastavci

Table 1 Patterns of the stylohyoid complex calcification among subjects.
Tablica 1. Obrasci kalcifikacije stilohioidnog kompleksa među ispitanicima

Classification • Klasifikacija	Pattern • Obrazac	Side • Strana	2018	2017	Total • Ukupno	Percentage • Postotak
Regular • Normalan	A	Rt • D	150	14	336	5.19%
		Lt • L	156	16		
	B	Rt • D	202	40	458	7.08%
		Lt • L	178	38		
	C	Rt • D	302	120	790	12.21%
		Lt • L	264	104		
	D	Rt • D	702	198	1618	25.02%
		Lt • L	560	158		
Elongated • Izdužen	E	Rt • D	448	512	1806	27.92%
		Lt • L	342	504		
Calcified • Kalcificiran	F	Rt • D	14	14	54	0.83%
		Lt • L	14	12		
	G	Rt • D	36	70	194	3.00%
		Lt • L	30	58		
	H	Rt • D	6	8	20	0.31%
		Lt • L	2	4		
	I	Rt • D	38	122	304	4.70%
		Lt • L	42	102		
	J	Rt • D	16	34	90	1.39%
		Lt • L	12	28		
	K	Rt • D	24	58	150	2.32%
		Lt • L	18	50		
Undetected • Neotkriven	L	Rt • D	242	142	648	10.02%
		Lt • L	174	90		

Rt, right; Lt, left • D – desno; L – lijevo

Table 2 Distribution of SH complex patterns among ethnic populations
Tablica 2. Distribucija obrazaca stilohioidnog kompleksa među etničkim populacijama

Stylohyoid complex classification • Klasifikacija stilohioidnog kompleksa	Ethnic populations • Etničke populacije					
	Africa • Afrika n (%)	Middle East • Bliski istok n (%)	East Asia • Istočna Azija n (%)	Europe • Europa n (%)	Others • Ostali n (%)	Total • Ukupno
Regular • Normalan	328 (10.1)	51 (1.6)	998 (30.9)	121 (3.7)	103 (3.2)	1601
Elongated • Izdužen	218 (6.7)	129 (4.0)	502 (15.5)*	31 (1.0)	23 (0.7)	903
Calcified • Kalcificiran	84 (2.6)	104 (3.2)	189 (5.8)*	15 (0.5)	14 (0.4)	406
Undetected • Neotkriven	41 (1.3)	41 (1.3)	147 (4.5)	87 (2.7)	8 (0.2)	324
Total • Ukupno	671 (20.7)	325 (10.0)	1836 (56.8)	254 (7.9)	148 (4.6)	3234

*East Asian shows high prevalence of SH complex calcification compared to other ethnic groups, p= 0.0056 • Istočna Azija ima visoku prevalenciju kalcifikacije stilohiodnih kompleksa u usporedbi s drugim etničkim skupinama, p = 0,0056

elongated and the calcified styloid processes are more common among males (p=0.0078). When age groups are considered, both the elongated and the calcified styloid process patterns were more frequent among subjects of group II (p=0.0004). Also, the coefficient of determination (R Square)) showed strong positive correlation (R^2=0.98).

There has been strong association between SH complex patterns and ethnic groups. The elongated and the calcified patterns were significantly prevalent among eastern Asians (46.55%), p= 0.00567 compared to other ethnicities (Figure 4). Generally, more than 80% of the subjects exhibited symmetrical patterns.

Discussion

An OPG is a widely used view in dental clinical practice and is accepted as a diagnostic tool for detection of stylohyoid complex elongation and calcification. To our knowledge, the sample size of this study is probably one of the largest ever investigating the SH complex calcification patterns. The current population of the United Arab Emirates is above 9.5 million, which is a diverse community comprising mainly eastern Asians (58%) in addition to other ethnicities including Middle Easterners, Africans, Caucasians and other minorities. Many studies have been carried out exploring the prevalence and patterns of stylohyoid complex elongation and calcification (2, 3, 12-14, 21), however, the majority of the studied samples were of the same population. In the current study, our sample is diverse comprising 4 main populations, thus making it a good comparative study model. It was the observation of the authors that many of the Asian patients attending the dental clinic of RAKCODS exhibited one form or the other of stylohyoid complex elongation or calcification and this was the underlying reason for this investigation. It was difficult to retrieve the clinical data of the subjects involved in this study; therefore, the correlation between the stylohyoid complex patterns and the clinical symptoms or signs was not sought.

Our findings reveal that the majority of the subjects presented with the regular pattern of SP 1601 (49.51%). In this study, the incidence of elongated SP is comparatively higher than many of the previously reported studies (19, 22). Mathew *et al.*, (23) studied the prevalence of elongated SP and calcification patterns in South Kerala population using panoramic radiographs, and they found higher incidence than our study (35%). Bader, 2017 (24) investigated the frequency of elongated SP among Saudi geriatric patients (> 60 years), and they found much higher incidence (44%). The variation in the reported incidences could be attributed to many factors including the age range of the samples, methods of classification used in analyzing radiographs and the ethnicity of the population. When both the elongated and calcified SP are combined, our results show male predominance (p=0.0078). The high male prevalence of elongated SP in this study is in line with many reported studies (23-25). However, a significant prevalence of elongated SP among females has also been reported (22) and in another report it was higher in females, but statistically insignificant (26). Jung *et al.*, 2004

bili su češći kod muškaraca (p = 0,0078). Kada se uzme u obzir dobna skupina, izduženi i kalcificirani stiloidni nastavci bili su češći kod ispitanika u skupini II (p = 0,0004). Koeficijent određivanja (R kvadrat) također je pokazao snažnu pozitivnu korelaciju (R^2 = 0,98).

Ustanovljena je snažna korelacija između obrasca stilohioidnog kompleksa i etničke skupine. Izduženi i kalcificirani obrasci prevladavali su među istočnim Azijcima (46,55 %), p = 0,00567 u usporedbi s ostalim etničkim skupinama (slika 4.). Općenito je više od 80 % ispitanika imalo simetrične uzorke.

Rasprava

OPG je slikovni prikaz koji se često upotrebljava u kliničkoj stomatološkoj praksi i prihvaćen je kao dijagnostički alat za otkrivanje izduženja i kalcifikacije stilohioidnog kompleksa. Prema našim spoznajama, veličina uzorka ovog istraživanja vjerojatno je jedna od najvećih do sada kada je riječ o obrascima kalcifikacije stilohioidnog kompleksa. Trenutačno je broj stanovnika u Ujedinjenim Arapskim Emiratima veći od 9,5 milijuna. Zajednica je multietnička, a sastoji se uglavnom od istočnih Azijaca (58 %), uz ostale etničke skupine, uključujući pripadnike naroda s Bliskog istoka, Afrike, Kavkaza i druge manjine. Provedena su mnoga istraživanja o prevalenciji i obrascima izduženja i kalcifikacije stilohioidnog kompleksa (2, 3, 12 –14, 21), no, većina ispitivanih uzoraka bila je iz iste populacije. U ovom istraživanju naš je uzorak bio raznolik, a sastojao se od četiriju glavnih populacija, što ga čini dobrim komparativnim modelom. Autori su uočili da su mnogi pacijenti azijskog podrijetla koji su se liječili u Stomatološkoj klinici RAKCODS imali neki oblik izduženja ili kalcifikacije stilohioidnog kompleksa, a to je bio glavni motiv istraživanja. Bilo je teško dohvatiti kliničke podatke ispitanika uključenih u ovo istraživanje, pa se prema tome nije tražila povezanost između obrazaca stilohioidnog kompleksa i kliničkih simptoma ili znakova.

Naši nalazi otkrivaju da je većina ispitanika imala normalan obrazac SN-a – 1601 (49,51 %). U ovom istraživanju prevalencija izduženog SN-a razmjerno je veća negoli u mnogim prije objavljenim istraživanjima (19, 22). Mathew i suradnici (23) proučavali su prevalenciju izduženog SN-a i obrasce kalcifikacije u populaciji Južne Kerale u Indiji primjenom panoramskih rendgenskih snimki i ustanovili su veću učestalost negoli naše istraživanje (35 %). Bader je 2017. (24) istraživao učestalost izduženog SN-a među saudijskim gerijatrijskim pacijentima (> 60 godina) i otkrio mnogo veću učestalost (44 %). Varijacije u objavljenim incidencijama mogu se pripisati mnogim čimbenicima, uključujući dobni raspon uzoraka, metode klasifikacije koje se primjenjuju u analizi rendgenskih snimki i etničku pripadnost stanovništva. Kada se kombiniraju i izduženi i kalcificirani SN-ovi, naši rezultati pokazuju veću prevalenciju kod muškaraca (p = 0,0078). Visoka prevalencija izduženog SN-a kod muškaraca u ovom istraživanju u skladu je s mnogim objavljenim rezultatima (23 – 25). No zabilježena je i visoka prevalencija izduženog SN-a među ženama (22), a u jednom je istraživanju bila veća kod žena, ali

(25) reported that the normal length of female SP is shorter compared to male SP and the SP increases in length by 0.05 mm per year. The latter probably explains the high incidence of SP elongation with age progress. Furthermore, the authors suggested that the SP should be considered elongated if it exceeds 45 mm according to their study. However, they made the proposal in 2004, and to our knowledge none of the investigators adapted their suggestion. A recent study by Sridevi *et al.,* (27) the length of SP was measured in 500 panoramic radiographs and revealed that the mean length of SP in females was 3.7 cm on the right side and 3.8 cm on the left side of the studied radiographs, whereas the mean in males was 3.4 cm on the right side and 3.3 cm on the left side. The authors concluded that the length of the SP was significantly longer in females than in males. The latter authors advocated the need for reevaluation of the normal range of SP length.

In the current study, a statically significant prevalence of SP elongation and calcification was found among the subjects of Eastern Asian (p=0.0056). Although, O'Carroll [11] revealed no specific ethnic predilection in his study, the studies on SP elongation and calcification among multiple ethnic populations in literature are scarce.

Our findings reveal a statistically significant prevalence of SP elongation and calcification among the subjects of the age group-II (40 years and above) compared to the group-I (18-39 years) subjects (p=0.0004). Considering the previous literature and our study as well, we believe that there is an obvious correlation between the age and the SP elongation. In a study including only subjects > 60 years (24) the prevalence of SP elongation was 39 (44%) among males. In contrast, Gokce *et al.*, (28) reported 54 (7.7%) prevalence of SP elongation and found no correlation between the age subgroups and the SP elongation. The authors attributed the lack of correlation to the abnormally distributed age groups in their study.

In the current study, the bilateral elongation was the most common pattern compared to the unilateral and this is consistent with other studies (20, 26, 28). A high degree of symmetry has also been reported by a recent study in Libya (22). However, there was inconsistency in the reported male and female distribution when unilateral or bilateral SP elongation is considered. It is inevitable to question the relevance of unilateral or bilateral SP elongation in the absence of any clinical symptoms. Since the etiology of the condition has not been defined yet, this feature is probably of little significance in this context.

In 324 (10.02%) of the subjects, the SP was radiographically invisible and we could not determine whether it was anatomically absent or it was radiographically invisible due to some technical reasons.

The stylohyoid ligament is comprised of fibrous tissue and may undergo partial or complete calcification causing various degrees of clinical symptoms in the head and neck region. There is always a potential for the clinicians to miss or fail to diagnose symptoms related to the SP elongation. Therefore, the latter should be considered in the differential diagnosis and management of head and neck symptoms not related to odontogenic origin.

statistički beznačajno (26). Jung i suradnici (25) izvijestili su 2004. da je normalna duljina SN-a u žena manja nego u muškaraca i da se SN povećava za 0,05 mm na godinu. To posljednje vjerojatno objašnjava veliku učestalost izduženja SN-a s dobi. Nadalje, autori su predložili da se SN treba smatrati izduženim ako premašuje 45 mm prema njihovu istraživanju. No taj prijedlog iz 2004,. prema spoznajama autora, nitko od ostalih istraživača nije prihvatio. Nedavno objavljeno istraživanje Sridevija i suradnika (27) u kojemu su izmjerene duljine SN-a na 500 panoramskih snimki, otkrilo je da je srednja duljina SN-a kod žena bila 3,7 cm na desnoj strani i 3,8 cm na lijevoj strani proučavanih snimki, a srednja vrijednost kod muškaraca iznosila je 3,4 cm na desnoj strani i 3,3 cm na lijevoj. Zaključili su se da je duljina SN-a znatno veća u žena nego u muškaraca. Ti su autori zagovarali ponovnu procjenu normalnoga raspona duljine SN-a.

U ovom istraživanju utvrđena je statički značajna prevalencija izduženoga i kalcificiranoga SN-a među ispitanicima iz istočne Azije (p = 0,0056). Iako O'Carroll (11) nije otkrio specifičnu etničku sklonost u svojem istraživanju, istraživanja o izduženju i kalcifikaciji SN-a u multietničkoj populaciji u literaturi vrlo su oskudna.

Naši nalazi otkrili su statistički značajnu prevalenciju izduženja i kalcifikacije SN-a među ispitanicima uz dobne skupine II (40 godina i više) u odnosu prema ispitanicima iz skupine I (18 – 39 godina) (p = 0,0004). Uzimajući u obzir dosadašnje podatke iz literature i naše istraživanje, vjerujemo da postoji očita povezanost između dobi i izduženja SN-a. U istraživanju koje je uključivalo samo ispitanike starije od 60 godina (24) učestalost izduženja SN-a bila je 39 (44 %) među muškarcima. Suprotno tomu, Gokce i suradnici (28) zabilježili su prevalenciju izduženja SN-a od 54 (7,7 %) i nisu otkrili povezanost između toga nalaza i dobnih podskupina. Autori su nedostatak korelacije u svojem istraživanju pripisali nenormalno raspoređenim dobnim skupinama.

U aktualnom istraživanju bilateralno izduženje bilo je najčešći obrazac u usporedbi s unilateralnim i to je u skladu s drugim istraživanjima (20, 26, 28). U nedavnom istraživanju obavljenom u Libiji (22) također se ističe visok stupanj simetrije. No bilo je nedosljednosti u distribuciji između muškaraca i žena kada se razmatralo unilateralno ili bilateralno izduženje SN-a. Nužno je dovesti u pitanje važnost unilateralnog ili bilateralnog izduženja SN-a ako ne postoji nijedan klinički simptom.

Kod 324 (10,02 %) ispitanika SN je bio radiološki nevidljiv i nismo mogli utvrditi je li anatomski odsutan ili je razlog bio tehničke prirode.

Stilohioidni ligament sastoji se od vlaknasta tkiva i može se dogoditi njegova djelomična ili potpuna kalcifikacija te uzrokovati različite stupnjeve kliničkih simptoma u predjelu glave i vrata. Uvijek postoji mogućnost da kliničari propuste ili ne dijagnosticiraju simptome koji se odnose na izduženje SN-a. Zato bi ovo drugo trebalo uzeti u obzir u diferencijalnoj dijagnozi i razjašnjavanju simptoma glave i vrata koji nisu povezani s odontogenim podrijetlom.

Budući da etiologija stanja još uvijek nije definirana, vjerojatno to svojstvo malo znači u ovom kontekstu.

Conclusions

The data available from the literature and the current study reveals potential association of SP elongation with age progression. Therefore, the age at which the SP is considered elongated should be revised. The eastern Asian population exhibited high prevalence of SP elongation and calcification compared to other populations. Therefore, oral physicians should be aware of the ethnic distribution of SP elongation and potentially related symptoms. To the best of our knowledge, this is the first study exploring the prevalence of the stylohyoid complex calcification among the United Arab Emirates population. The authors highly recommend further investigation to include clinical data record and standardized measurement of the SP including CBCT imaging.

Conflict of interesent

None declared

Zaključak

Podatci dostupni iz literature i ovo istraživanje otkrivaju potencijalnu povezanost izduženja SN-a i rastuće dobi. Zato se dob u kojoj se SN smatra izduženim treba preispitati. Stanovništvo istočne Azije pokazalo je veliku prevalenciju izduženja i kalcifikacije SN-a u odnosu prema ostaloj populaciji. Stoga kliničari trebaju biti svjesni etničke distribucije izduženja SN-a i mogućih povezanih simptoma. Koliko znamo, ovo je prvo istraživanje koje se bavi prevalencijom kalcifikacije stilohioidnog kompleksa među stanovništvom Ujedinjenih Arapskih Emirata. Autori preporučuju daljnja istraživanja u koja bi se uključili klinički podatci i standardizirano mjerenje SN-a, uključujući CBCT snimanje.

Sukob interesa

Nije bilo sukoba interesa.

Sažetak

Cilj: Željela se istražiti prevalencija izduženja stilohioidnog kompleksa među pacijentima koji su se liječili u klinici za stomatološke znanosti RAK. **Materijal i metode:** Analizirana su 3234 rendgenska snimka pacijenata u dobi ≥ 18 godina. Primijenjena je klasifikacija stilohioidnog kompleksa prema O'Carrollu (1984.). Zabilježeni su i analizirani dob, spol, nacionalnost ispitanika i obrasci kalcifikacije. Za otkrivanje potencijalnih razlika upotrijebljeni su testovi Chi-kvadrat i ANOVA. **Rezultati:** Odnos muškaraca i žena bio je 1,9 : 1. U dobnoj skupini I (18 – 39) bilo je 1150 (35,6 %) ispitanika, a u dobnoj skupini II (≥ 40) 2084 (64,4 %). Srednja dob iznosila je 38,12 (± 13,2) godina. Pedeset sedam posto (1836) ispitanika bili su istočni Azijci, 671 (21 %) bio je Afrikanac, 325 (10 %) bilo je s Bliskog istoka, 254 (8 %) iz Europe i 148 (4 %) ostalih nacionalnosti. Normalan stilohioidni kompleks pronađen je na 1601 (49,51 %) snimki, izduženi na 903 (27,92 %), kalcificirani na 406 (12,55 %), a na 324 (10,2 %) nije otkriven. Izduženi i kalcificirani stiloidni nastavci bili su češći kod muškaraca (p = 0,0078). Također su bili češći kod ispitanika iz skupine II. (p = 0,0004). Istočni Azijci imali su veći postotak izduženih i kalcificiranih stiloidnih nastavaka (p = 0,00567). **Zaključak:** Iako je 1601 (49,51%) ispitanik imalo normalan stiloidni nastavak, istraživanje je otkrilo visoku prevalenciju njegova izduženja među istočnim Azijcima. Postoji snažna korelacija između dobi i izduženja stiloidnog nastavka. Važno je uključiti simptome glave i vrata neodontogenog podrijetla u diferencijalnu dijagnozu Eagleova sindroma. Preporučuju se daljnja istraživanja primjenom naprednih tehnika snimanja.

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parafaringealni prostor; kalcifikacije; Eagleov sindrom, etnička pripadnost, azijska populacija

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