



PREVALENCE OF STYLOID PROCESS ELONGATION AND THE TYPE OF ELONGATION AMONG PATIENTS USING DIGITAL ORTHOPANTOMOGRAPH.

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ABSTRACT:

AIM: To evaluate the prevalence of styloid process elongation and the type of elongation among patients in a tertiary care dental hospital in Chengalpattu district using digital Orthopantomograph (OPG).

OBJECTIVE: The objective of this study was to measure the length of right and left styloid process; to assess for elongation; find the type of elongation based on Langlais classification; to understand the prevalence of unilateral /bilateral elongation of styloid process and also to evaluate any relationship between gender, age and styloid process elongation, using digital OPG.

MATERIALS AND METHODS: A Cross sectional Prevalence study was performed at Tagore Dental College and Hospital in the Department of Oral Medicine and Radiology. Patients of age above 18 years were included. The apparent length of the styloid process was measured with the help of the measurement tools on the accompanying software (Villa sistemi, Rotograph EVO D, India).

RESULTS: Elongation of styloid process was present among 25.2% of the study population. Bilateral elongation of styloid process is more than prevalent than unilateral elongation. Among unilateral elongation, right side showed more prevalence than left. Also, Langlais type I elongation is most prevalent followed by type II and III. No statistical significance was found in relation to Styloid process elongation, gender and age.

CONCLUSION: Patients who present with complaints related to tonsillar pain / dental pain / ear pain should be approached from the perspective of styloid process elongation. Misinterpretation of patient symptoms can be definitely eliminated with the usage of digital orthopantomography.

INTRODUCTION:

The styloid process is a cylindrical bone that arises from the temporal bone in front of the stylomastoid foramen.^[1] It normally measures about 25 mm in length, although it varies in length from person to person and even from side to side in the same person.^[2,3] Studies have estimated that in 2 – 28% of

the general population there is radiographic evidence of an elongated styloid process, although symptoms are present in only some individuals.^[4] When symptoms are associated with elongation of the styloid process, the condition is termed as an Eagle syndrome.^[3]

Turning or inclining the head causes a typical pain. Only in four cases was it possible by palpation and X-rays to establish an elongated styloid process; in two there was calcification of the stylohyoid ligament.^[5] The styloid process (SP) is a slender bone projecting immediately below the ear. It extends downward and forward from the inferior aspect of the temporal bone posterior to the mastoid apex. The tip of the SP is attached to the ipsilateral lesser cornu of the hyoid bone via stylohyoid ligament. The first case of elongated SP and ossification of the styloid ligament was described by Marchetti in 1652. In early 1872, Wein Lechner reported the first surgically treated case of a symptomatic elongated SP. Later, in 1937, Eagle, an otorhinolaryngologist first described a syndrome characterized by the simultaneous occurrence of elongated SP and orofacial pain. He described two cases of pharyngeal irritation associated with SP. ^[3,4,5]

MATERIALS AND METHODS:

The study obtained approval from the Institutional Ethics Committee – Tagore Dental College and Hospital (approval date: 5th June 2022) and was in accordance with the 1964 Helsinki Declaration and its later amendments.

A cross-sectional study was performed on a total of 500 digital Orthopantomograph of patients who reported to the oral medicine and radiology department, Tagore Dental College and Hospital. The study included participants with OPG Radiograph of the patients above 18 years and the OPG Radiograph that includes both right and left styloid process. OPG with image distortions, positioning or magnification errors and of patients below 18 years of age were excluded from the study.

The length of the styloid process was measured using linear measurement tool of the software (Villa sistemi, Rotograph EVO D, India). The length of the styloid process was measured from the point where the styloid process left the tympanic plate to the tip of the process, regardless of whether or not the styloid process was segmented **[FIGURE 1]**. Styloid process measuring more than 30 mm will be considered as elongated. If the stylohyoid or stylomandibular ligaments are found to be ossified, they were measured along with the styloid process, as part of the elongated styloid process. Langlais classification was recorded as type I (uninterrupted), type II (pseudo-articulation) and type III (segmented) **[FIGURE 2]**.

STATISTICAL ANALYSIS:

The data was analysed using IBM SPSS version 21 (SPSS version 21.0; IBM corporation, Armonk, NY, USA) statistical software. Statistical significance was set at 0.05 levels. Test of normality distribution resulted in $p\text{-value} < 0.05$. Hence, parametric test was used for analysis. Intergroup comparison was analysed using ANOVA test and Independent t test. Categorical data were analysed using frequency distribution and expressed in percentage.

RESULTS:

The study population included both male (**50.2%**) and female (**49.8%**) within the age group 18 to 60 years. **[FIGURE 3]** Elongation of styloid process was present among 25.2% of the study population. In this study, bilateral elongation of styloid process is more than prevalent than unilateral elongation. Among unilateral elongation, right side showed more prevalence than left **[FIGURE 4]**. Also, Langlais type I elongation is most prevalent followed by type II and III **[FIGURE 5]**.

Chi-square test showed there were no statistically significant differences seen between the elongation type, length, Langlais classification and gender. **[TABLE 1, 2, 3]** Independent t test showed were no

statistical significant differences between the styloid length (both right & left) of men and women Chi-square test showed no statistical significant differences between the elongation type, Langlais classification and different age categories [TABLE 4, 5] ANOVA test revealed no statistical significant differences between the styloid length (both right & left) across different age categories [TABLE 6]

DISCUSSION:

Eagle has reported that the normal styloid process measures 2.5 – 3 cm, whereas, Kaufman et al. reported 30 mm as the upper limit for the normal styloid process. Various investigators have reported the incidence of elongated styloid as 1.4, 4, 7, and 18.2% respectively. Eagles' syndrome is a combination of symptoms caused by an elongated ossified SP. An SP longer than 25 mm is considered elongated, but the elongated SP is not only diagnostic for Eagle's syndrome, because most patients with incidental findings of an elongated SP are asymptomatic. Eagle observed that mesial deviation of the SP leads to more severe symptoms. [6,7]

A salient symptom of Eagles' syndrome is constant pain in the neck persisting for years, which radiates into the ear and is associated with a feeling of pressure in the neck, difficulty of swallowing and occasional hoarseness. Turning or inclining the head causes a typical pain. [8, 9] Women around 40-years of age experience more symptoms of styalgia than men and women in other age groups. It presents a diagnostic challenge to the clinicians and often eludes for a long time. Hence, superior knowledge of this relatively rare entity is essential for all dentists. [10]

Various pathophysiological mechanisms proposed to explain the symptoms of Eagle's syndrome are Due to (a) Proliferation of granulation tissue secondary to traumatic fracture of the SP creating pressure on the surrounding structures (b) compressing adjacent lying glossopharyngeal nerve or chorda tympani nerve; (c) Degeneration and inflammation in the tendinous segment of the SP, called insertion tendon-itis or pseudo stylohyoid syndrome (d) irritation to the pharyngeal mucosa either through compression or by post tonsil surgery scarring and (e) irritation of the sympathetic nerve plexus in the arterial sheath due to impingement of the arterial vessels. [11]

The differential diagnoses which can be considered for Eagle's syndrome are atypical cervicofacial pain, TMD's, trigeminal or glossopharyngeal neuralgias, pharyngotonsillitis, otitis media, true pharyngeal foreign bodies, external otitis, mastoiditis, temporal arteritis, submandibular sialadenitis or sialolithiasis, and tumours of the floor of the mouth or pharynx. In the differential diagnosis, we can also consider histamine cephalgia, oesophageal diverticula, Sluder's syndrome, cervical vertebral arthritis, hyoid bursitis, and cluster and migraine type headache. [12, 13] Among the several imaging modalities used for diagnosis of the Eagle syndrome, panoramic radiography, lateral skull radiograph, Towne's view radiograph, antero posterior skull radiograph, and CT scan are some of them. The complete details of the length, angulation, and relation to adjacent structures can be obtained from a CT scan by formulating a 3D-CT. [14, 15]

CONCLUSION:

A cost effective radiographic (OPG) examination has proven to be useful in the diagnosis of styloid process elongation. Patients who present with complaints related to tonsillar pain / dental pain / ear pain should be approached from the perspective of styloid process elongation. Misinterpretation of patient symptoms can be definitely eliminated with the usage of digital orthopantomography.

FIGURES AND TABLES

FIGURE 1: OPG revealing bilateral styloid process elongation and its measurement



FIGURE 2: Langlais classification of Styloid process elongation a) uninterrupted b) pseudo-articulation c) segmented

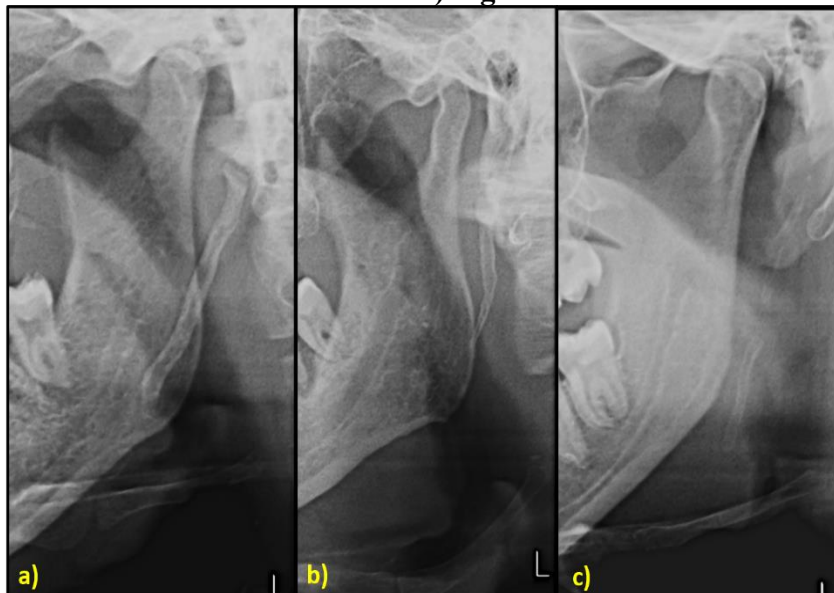


FIGURE 3: Pie chart of age distribution among sample

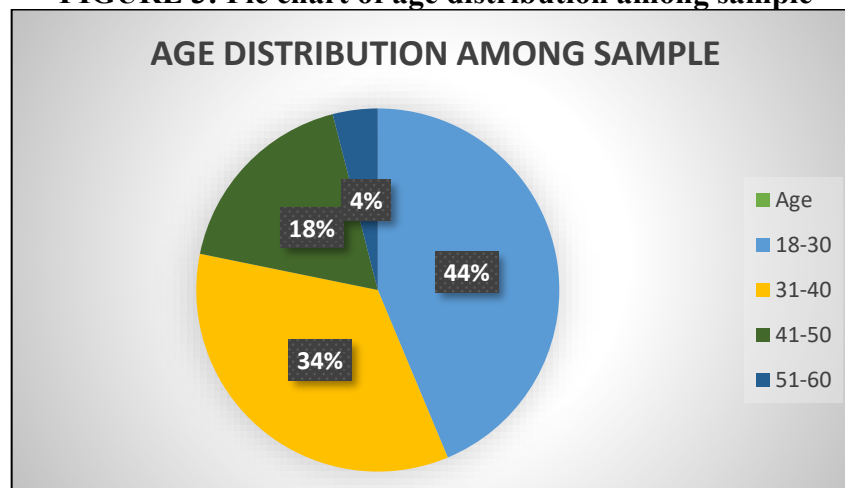


FIGURE 4: Prevalence of styloid process elongation among sample

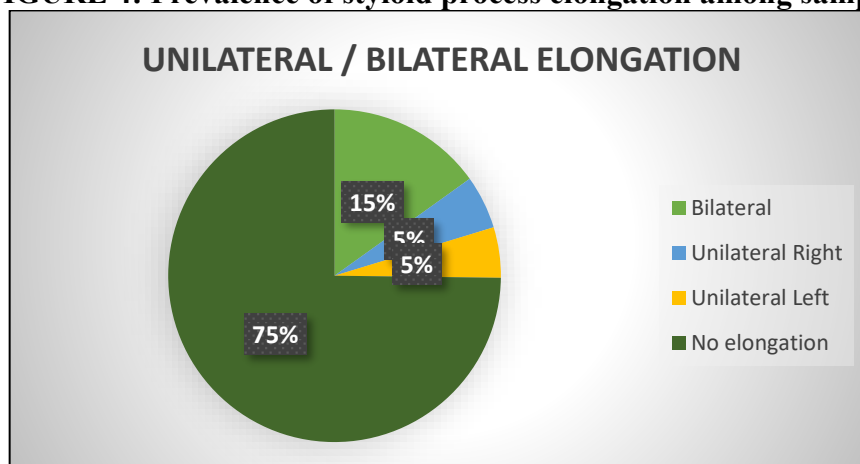
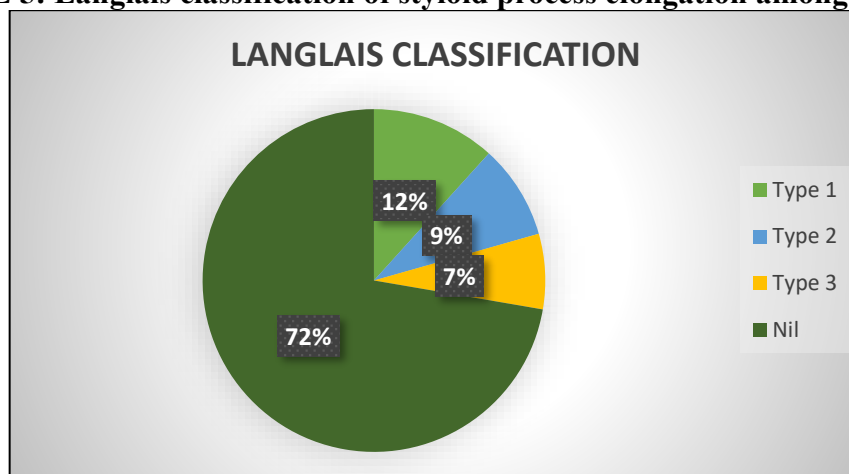


FIGURE 5: Langlais classification of styloid process elongation among sample



TABLES

Table 1: Chi-square test between Gender and Styloid Elongation type

Gender	Styloid Elongation type				Chi-square	p value
	No elongation	Bilateral	Unilateral Right	Unilateral Left		
Male	117(71.8)	27(16.6)	11(6.7)	8(4.9)	2.311	0.510
Female	126(77.8)	22(13.6)	6(3.7)	8(4.9)		

*p-value<0.05 – statistically significant

Table 2: Chi-square test between Gender and Styloid length

Gender		N	Mean	Std. Deviation	t statistic	p value
Right styloid length	Male	163	26.93	5.31	-.163	.870
	Female	160	27.01	4.22		
Left styloid length	Male	162	27.02	5.86	.977	.329
	Female	160	26.43	4.87		

*p-value<0.05 – statistically significant

Table 3: Chi-square test between Gender and Langlais classification

Gender	Langlais classification			Chi-square	P-value
	Type 1	Type 2	Type 3		
Male	19(39.6)	15(31.3)	14(29.2)	0.725	0.696
Female	19(45.2)	14(33.3)	9(21.4)		

*p-value<0.05 – statistically significant

Table 4: Chi-square test between Age categories and Styloid Elongation type

Age	Styloid Elongation type				Chi-square	P-value
	No elongation	Bilateral	Unilateral Right	Unilateral Left		
18-30	104(73.2)	23(16.2)	7(4.9)	8(5.6)	7.508	0.584
31-40	84(75)	14(12.5)	7(6.3)	7(6.3)		
41-50	43(74.1)	12(20.7)	2(3.4)	1(1.7)		
51-60	12(92.3)	0	1(7.7)	0		

*p-value<0.05 – statistically significant

Table 5: Chi-square test between Age categories and Langlais classification

Age	Langlais classification			Chi-square	P-value
	Type 1	Type 2	Type 3		
18-30	15(36.6)	15(36.6)	11(26.8)	3.505	0.743
31-40	15(46.9)	9(28.1)	8(25)		
41-50	8(50)	4(25)	4(25)		
51-60	0	1(100)	0		

*p-value<0.05 – statistically significant

Table 6: ANOVA test between Age categories and Styloid length

Styloid	Age categories	N	Mean	Std. Deviation	F statistics	P-value
Right styloid length	18-30	142	27.27	5.22	0.371	0.774
	31-40	110	26.68	4.44		
	41-50	58	26.91	4.41		
	51-60	13	26.44	4.89		
Left styloid length	18-30	141	26.57	5.45	1.078	0.358
	31-40	110	27.30	5.59		
	41-50	58	26.44	5.27		
	51-60	13	24.78	2.66		

*p-value<0.05 – statistically significant

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