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Original Research Article

A DIGITAL PANORAMIC RADIOGRAPH STUDY OF LENGTH OF STYLOID PROCESS IN NEPALESE POPULATION

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ABSTRACT

Introduction and Objectives: The mean radiographic length of the styloid process has been reported to be between 20 to 30 mm. Although the reason for its variable development is not clear, elongation of the styloid process is recognized as one of the numerous causes of pain in the craniocervical region. Length of the styloid process in the Nepalese population has not been carried extensively to date. With this in mind our study aims to measure the length of styloid process on panoramic radiographs and determine the variation in age, sex and sides of the elongated styloid process.

Material and methods: A total of 200 digital panoramic radiographs which were available as soft copies in the department of Oral and Maxillofacial Radiology, Chitwan Medical College, were selected for the study. The unpaired t test, and two-way ANOVA were used for statistical analysis.

Results: Elongated styloid processes were present in 36% of the panoramic radiographs. The mean lengths of the elongated right and left styloid processes were 33.57 ± 6.02 mm and 36.21 ± 6.47 mm, respectively and the difference between them was statistically significant. Mean length of the right and left side styloid processes in males was 33.37±6.5 mm and 36.41±7.3 mm, whereas in females it was 34.24±6.24 mm and 37.01±6.12 mm respectively.

Conclusion: Elongated styloid process is frequently seen in the elderly population with no correlation to gender.

KEY WORDS: Elongated styloid process, panoramic radiography, Age group.

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INTRODUCTION

The styloid process (SP) is slender and pointed, and projects anteroinferiorly from the inferior aspect of the temporal bone. Its length varies, ranging from a few millimetres to an average of 2.5 cm.arises [1]. The styloid process develops from Reichert's cartilage of the second brachial arch [2]. The stylohyoid, stylopharyngeus, and stylogossus muscles, together with stylomandibular ligament attaches to this structure [1].

The length of the styloid process measures usually around 2 to 3 cm. When more than 3 cm it is called an elongated styloid process causing dull pain in the ears, throat or mastoid region, difficulty in swallowing, foreign body sensation, symptoms of temperomandibular dysfunction like limited or asymmetric jaw movements or even carotid artery compression syndrome with rare cases of strokes [3- 8]. Long styloid process was first described in 1652 by

Italian surgeon Pietro Marchetti. In 1937, Watt W Eagle coined the term stylalgia to describe the pain associated with elongation of styloid process [9]. In 4% of the general population styloid process is grossly enlarged. Although 4% of the population is thought to have an elongated styloid, only 4 to 10% of this group is symptomatic [9-13]. Panoramic radiograph is one of the most useful techniques that show the styloid process. It is frequently used for routine dental examinations and is a useful tool for early diagnosis of elongated styloid processes and referring the patients forward for additional tests [14]. Various studies have been conducted on its length and abnormal elongation in different geographical regions [15-19]. The purpose of this study was to evaluate the elongation of styloid process by using digital panoramic radiographs.

MATERIALS AND METHODS

This study involved a total of 200 digital panoramic radiographs which were available as soft copies in the department of Oral and Maxillofacial Radiology, Chitwan Medical College, of patients referred for radiography in the department. The selected radiographs were of patients above 10 years of age. Radiographs not showing or partially showing the styloid processes and having positioning and magnification errors were excluded from the study during the selection process. These radiographs were taken with a digital panoramic system (Gendex Orthoralix 9200) that used a fiber optic charged couple device (CCD) sensor as the image receptor. Exposure parameters used for the digital panoramic machine were 66 kVp, 12 mA current with an exposure time of 12 seconds as recommended by the manufacturer. The approximate length of the styloid process was measured with the help of the measurement tools accompanying the software (VixWin™ Platinum, Version 2). The magnification factor used for the machine was 1.27. The lengths of the styloid process were measured on its anterior aspect from the point of emergence of the process to their tips, regardless of whether or not the styloid process was segmented (Fig 1). Both unilateral and bilateral measurements were made and the prevalence of the same was recorded (Fig 2, Fig 3). The radiographs were measured by two experts who were blinded to the study. The study of radiographs was performed in a room with dimmed light.

The data was analyzed using SPSS software package for Windows version 16 .0. Values were expressed as mean and standard deviation. Student t-test and ANOVA were used to test the difference between mean elongation for the gender, age and the side affected. A p-value of less than 0.05 was considered statistically significant.

Fig. 1: Bilaterally elongated styloid process measured on its anterior aspect.

Fig. 2: Figure showing unilateral styloid process.

Fig. 3: Figure showing bilateral styloid process.

RESULTS

The radiographs of 200 patients were aged between 10 and 80 years. In Table 1 length of the styloid process shows a positive correlation with age. Out of 200 there were 72 radiographs

with elongated styloid process. The mean lengths of the elongated right and left styloid processes were 33.57 ± 6.02 mm and 36.21 ± 6.47 mm, respectively [Table-2]. Age group between 21-30 years has a significantly smaller elongated styloid process than the other age groups [Table-3]. Length of the styloid process in relation to gender was insignificant [Table 4]. Out of the 200 radiographs, 52 showed bilateral elongation of the styloid process and 20 showed unilateral elongated styloid processes (12 on the right side and 8 on the left side) [Table 5]. Thus, 72 panoramic radiographs (36%) showed at least one elongated styloid process.

Table 1: Mean Length of the styloid process in different age groups.

Age group	Number (%)	Average length of the styloid (mm)	
		LEFT SIDE	RIGHT SIDE
≤20	5(2.5)	28.90 ± 3.21	27.94 ± 3.08
21-30	40(20)	29.62 ± 4.01	28.87 ± 3.72
31-40	59(29.5)	29.75 ± 7.60	28.95 ± 5.77
41-50	36(18)	30.32 ± 7.67	29.80 ± 6.58
51-60	33(16.5)	31.62 ± 6.35	29.4 ± 7.61
61-70	19(9.5)	32.46 ± 6.15	30.34 ± 7.88
>70	8(4)	33.12 ± 6.47	31.54 ± 8.5

Table 2: Mean length of the left and right elongated styloid processes.

Side	Number (%)	Average length of styloid (mm)		
		Mean	SD	SEM
Right	64 (51.61)	33.57	6.02	0.83
Left	60 (48.38)	36.21	6.47	0.752
P value: 0.020				

SD- standard deviation, SEM- Standard error of mean

Table 3: Difference between the mean elongations of styloid process according to age group.

Age group (Years)	sample (n)	mean ±SD	significance
21 - 30	9	32.01±1.88	c, b
31 - 40	14	34.5 ±2.16	a
41 - 50	17	35.22 ±0.89	a
51 - 60	18	35.06 ±1.79	a , c
61-70	9	36.43 ± 1.62	a
>70	5	37.64 ± 0.54	a ,b, c

a: difference statistically significant with age group 21-30 years

b: difference statistically significant with age group 31-40 years

c: difference statistically significant with age group 41-50 years

In the 200 radiographs studied, a total of 400 styloid processes were evaluated. Out of these, 124 styloid (31%) were elongated [64 on the right side (51.61%) and 60 on the left side (48.38%)] [Table 2].

Elongated styloid processes were more prevalent in the age group of 51 – 60 years and in those > 70 years of age [Table 3].

Table 4: Mean length of the elongated left and right styloid processes in the two sexes.

Gender	Number (%)	Average length of the styloid (mm)	
		LEFT SIDE	RIGHT SIDE
Male	38	36.41 ± 7.3	33.37 ± 6.6
Female	34	37.01± 6.12	34.24 ± 6.24
P value:		0.7	0.56

Table 5: The percentage distribution of unilateral and bilateral elongation of styloid process.

Gender	Unilateral		Bilateral	
	N	%	N	%
Male	15	39.47	23	60.52
Female	5	14.7	29	85.29
Total	20	27.7	52	72.22

DISCUSSION

The morphological characteristics of the SP have been studied by several researchers [5, 3, 17, 20, 21] using different methodologies. The results of these studies show that the prevalence of elongated styloid process varies between 0,4-84,4% of the population. The result of our study (36%) is in agreement with the literature. Various outcomes could be due to dissimilarity in the age group and sample size. Comparing the outcomes of the prevalence of elongated styloid process is impossible because of racial, ethnical, anatomical variations, differences in the procedure of measurement devices and observer variation. Study suggests that panoramic radiograph are a suitable tool for epidemiological studies [21] though precise evaluation using two-dimensional radiographic as panoramic radiographs could be challenging due considerations like projection, magnification and distortion of the styloid process [21].

Elongated styloid process is often asymptomatic, and its pathogenesis is still unknown. Various hypotheses include ossification of the

stylohyoid ligament, reactive metaplasia/ hyperplasia, anatomic variation, ageing, developmental anomaly and trauma leading to loss of elasticity in the stylohyoid ligament [21]. Our result suggests that elongated styloid process is common in elderly people which may be due to the calcification of the stylohyoid ligament with aging [22]. Also left sided elongated styloid processes were significantly much longer than the right sided elongated styloid processes. Concerning gender no statistically significant variation was observed in the unilateral, bilateral or overall elongation of the styloid process which is in agreement with other studies [4, 23].

CONCLUSION

This study provides a data on elongated styloid process of Nepalese population visiting a tertiary center in the mid western part of Nepal. Elongated styloid process is commonly seen in the elderly people with no association to gender.

Conflicts of Interests: **None**

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