

ORIGINAL RESEARCH

Type And Pattern Of Styloid Process Elongation And Calcification- A Radiological Study

¹Shamshad Begum, ²Bashir Ahmad Wani, ³Zeeza Mehboob Qazi

¹Tutor, ²Registrar, ³MDS, Department of Oral Medicine and Radiology, Govt. Dental College, Srinagar, Jammu and Kashmir, India

Corresponding Author

Zeeza Mehboob Qazi

MDS, Department of Oral Medicine and Radiology, Govt. Dental College, Srinagar, Jammu and Kashmir, India

Email: qazizeezal11@gmail.com

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ABSTRACT

This study was carried out to evaluate the length and prevalence and type of elongation of the styloid process by using panoramic radiographs. A total of 650 OPG (384 males and 266 females) were included in the study. The mean length of right and left side of styloid process in males was 25.9 ± 8.16 and 25.3 ± 5.86 respectively and in females the right and left sided length was 21.78 ± 7.90 and 21.11 ± 6.40 respectively. The results were statistically significant in between gender (both left and right side) but not significant in between sides within each gender. The prevalence of eagle syndrome is 17.2% in the study population. most common type of elongation was TYPE I followed by Type II and Type III. OPG is most commonly used radiographic technique for detection of an elongated styloid process.

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INTRODUCTION

Styloid process is derived from the Greek word 'Stylos' meaning a pillar. The styloid process is a bony projection, situated immediately anterior to the stylomastoid foramen. It is of cylindrical form and projects downwards from the inferior surface of the temporal bone towards the front, downwards and medially narrowing towards the tip. The location of the tip is particularly important, which is situated between the internal and external carotid arteries, laterally from the pharyngeal wall and immediately behind the tonsillar fossa¹

The length of the styloid process is usually 20 to 30 mm. When it is more than 30 mm it is called as elongated styloid process, and it can cause pain in throat, difficulty in swallowing, foreign body sensation, carotid artery compression syndrome, etc. Eagle, an otorhinolaryngologist, first described Eagle's syndrome, also known as elongated styloid process, in 1937. It occurs in around 4% of the general population although it is usually asymptomatic, with only 4% of patients presenting with symptoms.²

The exact cause of the elongated styloid process due to calcified and ossified bone and ligament is unknown. It is believed that any trauma in the

cervicopharyngeal region, especially after tonsillectomy, might stimulate a subsequent growth of the styloid process. In addition, it was suggested that local chronic irritation, surgical trauma, endocrine disorders in female mechanical stress, or trauma during development of styloid process could result in calcified hyperplasia of the styloid process.³

AIM

To evaluate the length of the styloid process and various patterns of calcification on panoramic radiographs.

MATERIALS AND METHOD

This study was conducted in the Department of Oral Medicine and Radiology, Government Dental College and Hospital Srinagar, J&k, India. The purpose of this study was to evaluate the length and prevalence and type of elongation of the styloid process by using panoramic radiographs. A total of 650 OPG (384 males and 266 females) were included in the study. These radiographs were taken with a digital panoramic system and NNT viewer software under standard exposure factors, as recommended by the manufacturer.

The inclusion criteria were as following:-

1. Radiographically visible styloid processes of both sides.
2. OPG free of positioning and magnification errors..
3. Patients above 20 years of age and below 65 years.

The apparent length of the styloid process was measured as the distance from the point where the styloid process left the tympanic plate to the tip of the process, regardless the styloid process was segmented or continuous. The linear measurement tools on the accompanying software used for obtaining the length of the styloid process.(FIG 1) If measured length was more than 30 mm, elongated or eagle syndrome would be considered. Pattern of calcification classified according Langlais (1986)⁴ (FIG 2).

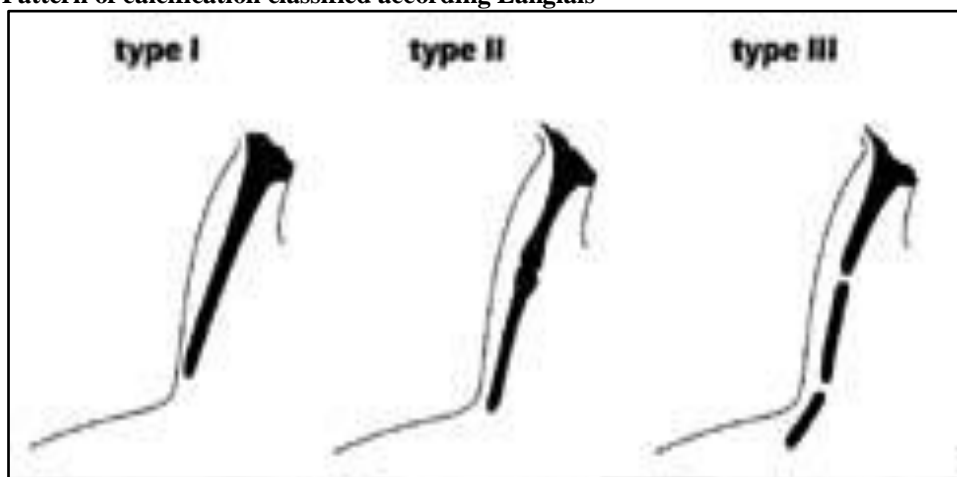
Three types of radiographic appearance which are as under:-

- 1) **Type I (ELONGATED):-** characteristic by an uninterrupted integrity of the styloid process. The normal reported length of the styloid process ranges from 25 to 32 mm. Measurement upto 28mm may be considered within the normal range because of the inherent magnification in the most radiographs.
- 2) **Type II (PSEUDOARTICULATED):-**The styloid process is apparently joined to the mineralized stylohyoid.
- 3) **Type III (SEGMENTED):-** short or long non continuous portions of the styloid process or interrupted segments are seen either above or below the level of the inferior border of the mandible.

Figure 1:- Measurement of styloid process.



Figure 2:-Pattern of calcification classified according Langlais



Study group divided into three groups:- group I(20-35yrs), group II(36-50yrs), group III(51-65yrs).The length of styloid process was calculated as per gender, side and age of patients. The normal and type of elongation also considered. Statistical analysis was done in order to find out any possible statistical significance of length of styloid process in terms of

age, gender and sides. When the comparison was done between the right and left side in the same the gender paired t test was used and between genders comparison for the right and left side was done with unpaired t test. The level of significance was fixed at p of 0.05.

RESULTS

In our study total 650 subjects were included out of which 384 are males and 266 are females. (Table 1)

Table 1:- Gender wise distribution of study subjects.

Gender	Number
Males	384
females	266
Total	650

The mean length of right and left side of styloid process in males was 25.9±8.16 and 25.3±5.86 respectively and in females the right and left sided length was 21.78±7.90 and 21.11±6.40 respectively. The results were statistically significant in between gender (both left and right side) but not significant in between sides within each gender. (Table 2)

Table 2:- Gender and sidewise mean length if styloid process.

Gender	Number	Right side (mm)	left side (mm)	p- value
Males	384	25.9±8.16	25.3±5.86	P>0.5
females	266	21.78±7.90	21.11±6.40	P>0.5
P- Value		P<0.5	P<0.5	

The elongation of styloid process is seen in 112 cases out of total 650 cases. Thus the prevalence of eagle syndrome is 17.2% in the study population (Fig 2). The distribution of type of elongated styloid process is given in table 3.

Fig-2:- prevalence of elongated styloid process

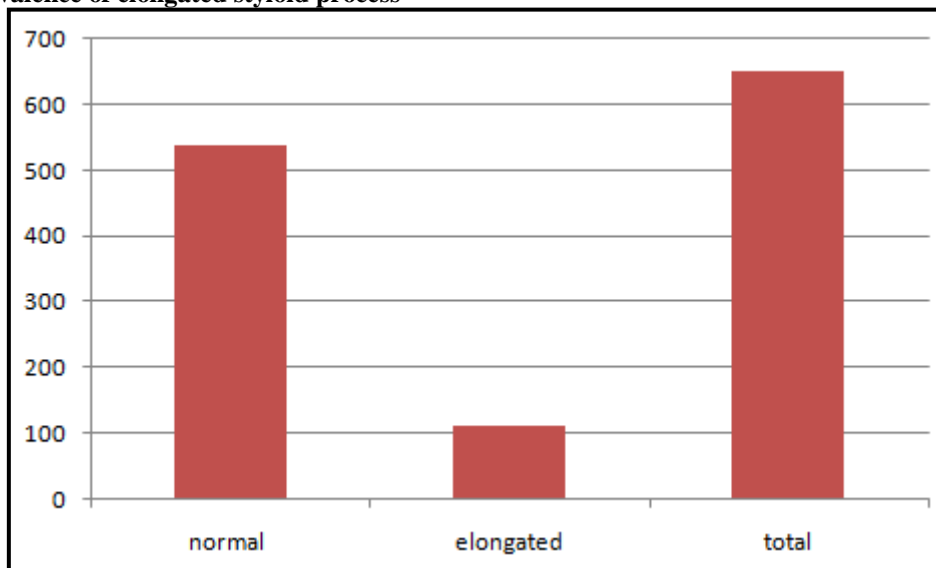


Table-3:- Distribution of type of elongated styloid process

Type of elongation	Number	Percentage (%)
Type I	92	82
Type II	16	14.2
Type III	4	3.6

Table 4 showing that the length of styloid process significantly increases with age with right sided length are greater than the left side in all the three groups.

Table 4:- age wise mean length of styloid process.

Age group (in years)	n	Average length of the styloid (mm)	
		Left side	Right side
GROUP I	185	23.50 ± 4.97	23.51 ± 5.45
GROUP II	250	24.91 ± 5.21	25.11 ± 5.32
GROUP III	215	25.97 ± 6.05	26.12 ± 5.45
P value		0.02	0.02

DISCUSSION

There are number of radiographic imaging techniques used for diagnosis of the Eagle syndrome such as

panoramic radiography, lateral skull radiography, Towne’s view radiograph, AP skull, and CT scan. Our study done on OPG in order to evaluate the length of

styloid process and prevalence of eagle syndrome. In the present study, the average lengths of the left and right styloid were 25.9 ± 8.16 mm and 25.3 ± 5.86 mm in males and 21.78 ± 7.90 and 21.11 ± 6.40 in females respectively. Eagle² has reported that the normal styloid process measures 2.5 – 3 cm, whereas, Kaufman *et al*⁵. reported 30 mm as the upper limit for the normal styloid process.

The exact cause for styloid process elongation is poorly understood. it can be due to growth of osseous tissue at the insertion of stylohyoid ligament or it could be due to calcification of stylohyoid ligament.^{6,7}

The mean length of males and female (right and left styloid process) was (26.55 mm and 25.89 mm) and 23.78 mm and 24.71 mm respectively.⁸ the results were in consistent with our study. The mean length of Males and female (right and left) styloid process was (3.34 cm and 2.95 cm) and (3.35 cm and 3.05 cm) respectively.⁹ Gucci *et al* in Turkey population where the mean length of styloid process was found to be $3.81 \text{ cm} \pm 6.2$ in males and $3.66 \text{ cm} \pm 6$ in females.¹⁰ These above studies showed greater mean length of styloid process than our study.

The prevalence of eagle syndrome was found 17.2% in our study population. Various investigators have reported the incidence of elongated styloid as 1.4, 4, 7 and 18.2%, respectively.^{2, 11, 12}

Eagle's syndrome is divided into two main sub types based on cranial nerve impingement and carotid arterial impingement. compression of cranial nerves V, VII, IX and X leads to facial pain while turning the head, dysphasia, foreign body sensation, pain on extending tongue, change in voice and tinnitus are diagnostic features of cranial nerve impingement. Carotid artery impingement produces eye pain, visual symptoms, parietal pain and syncope.⁸

CONCLUSION

OPG is most commonly used radiographic technique for detection of an elongated styloid process in patients with or without symptoms. Tonsillar pain or pain of dental, pharyngeal or muscular origin can

mimics this condition; hence OPG is helpful in order to avoid misdiagnosis.

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