

## Styloid Process Elongation and Calcification Patterns in a South Kerala Population - Radiographic Aspects

Mathew AL<sup>1\*</sup>, Cherian SA<sup>2</sup> and Joseph BB<sup>3</sup>

- 1 Department of Oral medicine and Radiology, Pushpagiri College of Dental Sciences, India
- 2 Department of Pedodontics and Preventive Dentistry, Pushpagiri College of Dental Sciences, India
- 3 Department of Oral Medicine and Radiology, Azeezia College of Dental Sciences, India

### Abstract

**Introduction:** Styloid process is a slender long pointed bony projection from the temporal bone. Normal styloid is around 30 mm long, it is considered elongated if it is greater than 30 mm.

**Objectives:** The objectives of our present study were 1. To determine the prevalence of elongated styloid process in South Kerala population 2. To investigate the calcification patterns of elongated styloid process using panoramic radiographs.

**Methods:** Retrospective analysis was done of 100 digital OPGs of subjects, aged between 20-80 years, who visited Oral Medicine and Radiology department, Pushpagiri College of Dental Sciences, Thiruvalla, Kerala, South India over a 2 month period. The length and pattern of calcification of the styloid process were assessed.

**Results:** Out of the 100 patients examined radiographically 51 were males and 49 were females. Styloid process was normal in 33 males and in 38 females. In our study there was a prevalence of 35% elongation of styloid process. Elongation of styloid process was noticed more in males 24(68.6%) as compared to females 11(31.4%). Elongation was more in the 41-60 year age group, with a prevalence of 19(54.4%), followed by 60-80 age group, 8(22.8%).

External calcification was the common calcification pattern seen 67(67%) in our study, followed by partial calcification 23(23%), complete calcification in 8(8%) and nodular calcification in 2(2%). External calcification was seen more in males 40(59.7%) than females 27(40.29%).

**Conclusion:** Oral physicians should have thorough knowledge aware of the styloid process elongation and the common calcification patterns.

**Keywords:** Elongation; Styloid process; Eagle's syndrome; Calcification

### \*Corresponding author:

Anuna Laila Mathew

✉ drmathedan@yahoo.co.in

Reader, Department of Oral medicine and Radiology, Pushpagiri College of Dental Sciences, Medicity, Perumthuruthy, Thiruvalla, Kerala, India.

Tel: +918547431225

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### Introduction

Elongated styloid process was first described by Eagle in 1937 [1]. Eagle's syndrome consists of elongation of the styloid process or stylohyoid ligament with associated pain. The normal length of the styloid process is around 30mm and if it is longer than 30mm it is considered elongated [2]. Not all morphological changes in the styloid process produce symptoms of Eagle's syndrome.

Misdiagnosis of Eagle's syndrome ultimately result in attributing it to some other cause [3,4].

Around 2% and 4% presents radiographic evidence of an ossified portion of the styloid process [5] and are usually asymptomatic [6]. Panoramic radiographs are widely used to determine the elongation of styloid process [7]. The objectives of our study were 1. To evaluate the prevalence of styloid process elongation

in South Kerala population and also to determine the common calcification patterns using panoramic radiographs.

## Methodology

A retrospective study of 100 digital OPGs of subjects from 20 to 80 years, who visited Oral Medicine and Radiology department, Pushpagiri College of Dental Sciences, Thiruvalla, Kerala, South India over a 2-month period was done. Panoramic radiographs were styloid process, was not clearly visible were excluded from the study. All panoramic radiographs were digitally generated on a Kodak 9000c Digital Panoramic and Cephalometric System.

A single trained examiner oral radiologist performed the radiographic examinations of the panoramic radiographs. The length of the styloid process in the radiograph was measured by a line drawn from the lowest point of the external acoustic meatus to the apex of the process.

Langlais [8] classification was used for assessing styloid process elongation in 1986.

Three types according to the degree of elongation.

- Type 0 - normal styloid process [8].
- Type 1- elongated greater than 30 mm.
- Type 2- pseudo segmented styloid process.
- Type 3- segmented, consists of length greater than 30 mm [8].

Classified according to the calcification pattern, four types Langlais (1986).

- External calcification (boundary) where the image of the styloid process is continuous with no signs of calcification [8].
- Partial calcification where the image of the styloid process with the presence of radiopaque calcified segments.
- Nodular calcification: styloid process image with nodular areas, radiopaque calcification.
- Completely calcified image: image of the styloid process radiopaque, calcified or totally homogeneous [8].

## Results

Out of the 110 digital panoramic radiographs were examined, 10 radiographs with questionable styloid process were excluded. 100 radiographs were examined for elongated styloid process and calcification pattern. Out of the 100 patients examined 51 were males and 49 were females. Styloid process was normal in 33 males and in 38 females. The results of our study revealed a prevalence of 35% elongation of styloid process. Elongation of styloid process was noticed more in males 24(68.6%) as compared to females 11(31.4%). Elongation was more 19(54.4%) in the 41-60 year age group, followed by 61-80 and 20-40 age group. **Table 1** External calcification was the common calcification pattern seen 67(67%) in our study, followed by partial calcification 23(23%), complete calcification in 8(8%) and nodular calcification in 2(2%). External calcification was seen more in males 40(59.7%) as compared to females 27(40.29%) (**Table 2**).

**Table 1** Distribution of cases of elongation of styloid process according to gender and age group.

Type of elongation	Gender	Age groups (years)			Total cases according to gender	Total cases according to type of elongation
		20-40	41-60	61-80		
Normal	F	18	13	7	38	65
	M	11	10	6	27	
Elongated	F	1	7	3	11	34
	M	7	11	5	23	
Pseudo-segmented	F	0	0	0	0	0
	M	0	0	0	0	
Segmented	F	0	0	0	0	1
	M	0	1	0	1	
Total		37	42	21		100

**Table 2** Distribution of cases of calcification of styloid process according to gender and age group.

Type of calcification	Gender	Age Group (in years)			Total cases according to gender	Total cases according to type of calcification
		20-40	41-60	61-80		
External	F	14	11	4	29	67
	M	15	14	9	37	
Partial	F	2	8	4	14	23
	M	3	4	2	9	
Nodular	F	1	1	0	2	2
	M	0	0	0	0	
Complete	F	2	0	2	4	8
	M	1	3	0	4	
Total		38	41	21		100

## Discussion

Term styloid process is derived from *stylos* means a pillar. It is derived mostly from the first and second brachial arches. It is attached to the stylopharyngeous, stylohyoid and to the styloglossus muscles and to the stylohyoid and stylomandibular ligaments.

Mechanism of ossification is not clearly understood [9,10]. Eagle's syndrome is a rare disease that develops because of the compression of the elongated or calcified stylohyoid ligament on the neural and vascular structures, commonly associated with persistent throat pain, foreign body sensation, dysphagia, referred otalgia, neck and facial pain [11-13].

Our study showed 35% prevalence of elongation of styloid process in a South Kerala population. This is greater than those recorded by Rizzatti-Barbosa et al. (20%) [14] and Leite et al. (19.56%) [15]. Radiographic studies have observed a prevalence of elongated styloid process from 1.4 to 83.6% [16-20]. The difference in the prevalence of elongated styloid process can be due to the diagnostic, image interpretation criteria and geographical location [11,19,21,22].

Styloid process elongation was found more in males than in females. This finding is in accordance with other authors who also identified a male predilection in different geographic locations [18,23-25].

High prevalence of elongated styloid process was observed in the 41-60 age group, but less in the 61-80 and 21-40 year old age groups. Anbiaee and Javadzadeh [26], Al- Khateeb et al. [12],

and Ekici et al. [19] also reported elongation of the styloid process with advancing age.

External calcification was the common calcification pattern seen in our study 67(67%). It was seen more in males than in females. This is in accordance to the study conducted in Saudi population by Shaik et al. [25] but not in accordance to Ilguy et al. [27] in Turkey. According to Reddy et al. [24] and Bagga et al. [28] completely calcified and partially calcified were the most prevalent calcification pattern in South and North Indian population.

## Conclusion

Oral physicians should be aware of the styloid process elongation, which is often a coincidental asymptomatic radiographic finding. Panoramic radiographs are economical and useful diagnostic tool for early detection of elongated styloid process with or without symptoms. To our best knowledge this is the first type of study in terms of prevalence of styloid process and calcification patterns in South Kerala. Further studies are required with a larger sample size should be performed to support this result.

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## Conflict of Interest

The authors declare no conflict of interest.

## References

- Chickooree D, Ram V (2014) Eagle's syndrome-View from the General Practitioner Perspective. *Clinical Medicine and Diagnostics* 4: 9-13.
- Balcioglu HA, Kilic C, Aykol M, Ozan H, Kokten G (2009) Length of styloid process and anatomical implications for Eagle's syndrome. *Folia Morphol* 68: 265-270.
- Reddy RS, Kiran CS, Mahadevi NS, Raghavendra MN, Satish A (2013) Prevalence of elongation and calcification patterns of elongated styloid process in South Indian. *J Clin Exp Dent* 5: e30-e35.
- Machado K, Almeida C, Aranha PC, Oliveira M (2012) Styloid process elongation and calcification in subjects with TMD: Clinical and Radiological Aspects. *Braz Dent J* 23: 443-450.
- Eagle WW (1949) Symptomatic elongated styloid process; report of two cases of styloid process artery syndrome with operation. *Arch Otolaryngol* 49: 490-503.
- Prasad KC, Kamath MP, Reddy KJ, Raju K, Agarwal S (2002) Elongated styloid process: A clinical study. *J Oral Maxillofac Surg* 60: 171-175.
- Langlias RP, Miles DA, Van Dis ML (1986) Elongated and mineralized stylohyoid ligament complex: A proposed classification and report of a case of eagle's syndrome. *Oral Surg Oral Med Oral Pathol* 61: 527-532.
- Jaju PP, Suvarna P, Parikh N (2007) Eagle's syndrome: An enigma to dentists. *J Indian Acad Oral Med Radiol* 19:424-429.
- Joshi V, Iyengar AR, Nagesh KS, Gupta J (2007) Elongated styloid process: A radiographic study. *J Indian Acad Oral Med Radiol* 19: 498-502.
- Okabe S, Morimoto Y, Ansai T, Yamada K, Tanaka T, et al. (2006) Clinical significance and variation of the advanced calcified stylohyoid complex detected by panoramic radiographs among 80 year old subjects. *Dentomaxillofac Radiol* 35: 191-199.
- Gokce C, Sisman Y, Ertas ET, Akgunlu F, Ozturk A (2008) Prevalence of styloid process elongation in the Turkey population from Cappadocia region. *Eur J Dent* 10: 18-22.
- Al-Khateeb TH, al Dajani TM, AL Jamal GA (2010) Mineralization of the stylohyoid ligament complex in a Jordanian sample: a clinicoradiographic study. *J Oral Maxillofac Surg* 68: 1242-1251.
- Bagga MB, Kumar CA, Yeluri G (2012) Clinoradiologic evaluation of styloid process calcification. *Imaging Sci Dent* 42: 155-161.
- Rizzatti-Barbosa CM, Ribeiro MC, Siva-Concilio LR, DiHipolito O, Ambrosano GM (2005) Is an elongated styloid process prevalent in the elderly? A radiographic study in a Brazilian population. *Gerodontology*. 2005; 22 (2): 112-15.
- Leite HF, Niccoli-Filho WD, Liberti EA, Madeira MC, Simoes S (1988) Prevalence of elongated stylohyoid ligament complex in human skulls. *Rev Odontol UNESP* 17: 145-151.
- Sisman Y, Gokce C, Ertas ET, Sipahioglu M, Akgunlu F (2009) Investigation of elongated styloid process prevalence in patients with torus palatinus. *Clin Oral Invest* 13: 269-272.

- 17 Kursoglu P, Unalan F, Erden T (2005) Radiological evaluation of styloid process in young adults resident in Turkey's Yeditepe University faculty of dentistry. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 100: 491- 494.
- 18 More CB, Ansari MK (2010) Evaluation of the styloid process on digital panoramic radiographs. *Indian J Radiol Imaging* 20: 261-265.
- 19 Ekici F, Tekbas G, Hamidi C, Onder H, Goya C, et al. (2013) The distribution of styloid chain anatomic variations by age groups and gender: An analysis using MDCT. *Eur Arch Otorhinolaryngol* 270: 1715-1720.
- 20 Oztunc H, Evlice B, Tatli U, Evlice A (2014) Cone-beam computed tomographic evaluation of styloid process: A retrospective study of 208 patients with orofacial pain. *Head Face Med* 10: 5.
- 21 Anderi F, Montoc AGM, Didilescu AC, Rusu MC (2013) A 3 D cone beam tomography study of styloid process of temporal bone. *Folia Morphol* 72: 29-35.
- 22 Basekim CC, Mutulu H, Gungor A, Silit E, Pek kafali Z, et al. (2005) Evaluation of styloid process by three dimensional computed tomography. *EurRadiol* 15: 134-139.
- 23 Gozil R, Yener N, Calgunner E, Araca M, Tunc E, et al. (2001) Morphological characteristics of styloid process evaluates by computerized axial tomography. *Ann Anat* 183: 527-535.
- 24 Reddy SR, Kiran CS, Ragavendra MN, Madhavi NS, Satish A (2013) Prevalence of elongation and calcification patterns of elongated styloid process in South India. *J Clin Exp Dent* 5: e30-e35.
- 25 Shaik MA, Naheeda, Kaleem SM, Wahab A, Hameed S (2013) Prevalence of elongated styloid process in Saudi population of Aseer region. *Eur J Dent* 7: 449-454.
- 26 Anbiaee N, Javadzadeh A (2011) Elongated styloid process: Is it a pathological condition? *Indian J Dental Res* 22: 673-677.
- 27 Ilguy M, Ilugy D, Guler N, Bayirili G (2005) Incidence of the type and calcification patterns in patients with elongated styloid process. *J Int Med Res* 33: 96-102.
- 28 Bagga MB, Kumar CA, Yeluri G (2012) Clinikoradiologic evaluation of styloid process calcification. *Imaging Sci Dent* 42: 155-161.