

# An unusually lengthy styloid process

Prabhu L V, Kumar A, Nayak S R, Pai M M, Vadgaonkar R, Krishnamurthy A, Madhan Kumar S J

## ABSTRACT

The close proximity of the styloid process to many of the vital neurovascular structures in the neck makes it clinically significant. Abnormal elongation of the styloid process may cause compression on a number of vital vessels and nerves related to it, producing inflammatory changes that include continuous chronic pain in the pharyngeal region, radiating otalgia, phantom foreign body sensation (globus hystericus), pain in the pharyngeal region, and dysphagia. The normal length of the styloid process is usually 2.0–2.5 cm long. We report a dry human skull that showed bilateral styloid processes measuring 6.0 cm on the right side and 5.9 cm on the left side. The variation in dimension of the process and its clinical implication are discussed.

**Keywords:** dysphagia, Eagle's syndrome, globus hystericus, long styloid process, neck pain, styloid process

*Singapore Med J 2007; 48(2):e34–e36*

## INTRODUCTION

The length of the styloid process normally varies from 2.0 to 2.5 cm in adults.<sup>(1)</sup> The apex of the styloid process is clinically important, because it is located between internal and external carotid arteries. The facial nerve runs anterior and medial to the styloid process. The glossopharyngeal nerve exists through jugular foramen and curves, in close proximity under the styloid process. The accessory and vagus nerves also run medial to the styloid process. The approximation of the glossopharyngeal nerve with the stylohyoid ligament is the basis for the glossopharyngeal neurological symptoms seen in Eagle's syndrome.<sup>(2)</sup> The persistent angulations of the cranial or styloid segment or Reichert's cartilage and its important neurovascular relationships may help explain the symptomatology of Eagle's syndrome.<sup>(3)</sup> Eagle's syndrome is an uncommon but important cause of chronic head and neck pain.<sup>(4)</sup> The elongated styloid process can cause craniofacial and cervical pain, difficulties in swallowing, secondary glossopharyngeal neuralgia, radiating pain into the orbit and maxillary region.<sup>(4-6)</sup>



Fig. 1 Photograph of the skull (right lateral view) shows the right styloid process (arrows).

Eagle's syndrome is a relatively common disorder that is frequently misdiagnosed, and it occurs more frequently in women.<sup>(7)</sup> Rizzatti-Barbosa reported that an anatomical variant of stylohyoid ligament complex was more frequent in the elderly female population, although this abnormality was present in both sexes. There was a greater tendency for the abnormality to be present in patients between 60 and 79 years of age.<sup>(8)</sup> The symptoms related to Eagle's syndrome can be confused with those attributed to a wide variety of facial neuralgias<sup>(9)</sup> or oral, dental and temporomandibular diseases.<sup>(10)</sup> We report a case of elongated styloid process.

## CASE REPORT

During a study on a fully ossified adult female skull (i.e. prominent superciliary arches, less prominent glabella, smooth muscle attachments), belonging to a patient from the Middle East, we found that the styloid process was abnormally long (Fig. 1). The lengths of the styloid process of both sides were measured in centimetres from the base of the skull to its tip. The lengths of both right and left styloid processes were almost the same, measuring 6.0 cm on the right side and 5.9 cm on the left side. This length is about 150% longer than the length of a normal-sized styloid process. The medial deviations were 24° and 26° for the right and left sides, respectively. The anterior deviations for the right and left sides were 30°

Department of Anatomy, Centre for Basic Sciences, Kasturba Medical College, Bejai, Mangalore 575004, India

Prabhu LV, MS  
Head

Nayak SR, MSc  
Lecturer

Pai MM, MD  
Assistant Professor

Vadgaonkar R, MD  
Assistant Professor

Krishnamurthy A, MD  
Assistant Professor

Madhan Kumar SJ, MSc  
Lecturer

Department of Anatomy, KS Hegde Medical Academy, Medical Sciences Complex, Deralakatte, Mangalore 575018, India

Kumar A, MS  
Professor and Vice Dean

**Correspondence to:**  
Mr Soubhagya R Nayak  
Tel: (91) 824 221 1746  
Fax: (91) 824 242 1283  
Email: ranjanbhatana@gmail.com

and 28°, respectively. The deviations were measured using protractors, perpendicular to the skull in normal lateral position.

## DISCUSSION

The stylohyoid complex is composed of the styloid process, stylohyoid ligaments and the stylomandibular ligament.<sup>(11)</sup> The length of the styloid process has been studied by Wang et al,<sup>(12)</sup> Basekim et al,<sup>(13)</sup> Savranlar et al,<sup>(14)</sup> and Jung et al,<sup>(15)</sup> from radiographs or three-dimensional computed tomography. Data on the osteometric values of the styloid process are scanty. Thot et al reported that the length of the left side styloid ranged from 0.7 to 1.6 cm, and on the right side, from 0.8 to 2.4 cm. The average lengths for the left and right styloids were 1.52 cm and 1.59 cm, respectively, in Indian subjects.<sup>(16)</sup> Jung et al suggested that the styloid process should be considered to be elongated, when its length exceeds 45 mm.<sup>(15)</sup> Keur et al stated that, if the length of the process or the mineralised part of ligaments which appeared in radiography was 30 mm or more, this could be considered an elongated styloid process.<sup>(17)</sup> Thot et al stressed that length in isolation is not a risk factor, but that its combination with increased acuity in deviation from the norm, both anteriorly and medially, makes the elongated styloid process the sole cause of Eagle's syndrome.<sup>(16)</sup>

The diagnosis can usually be made on physical examination by digital palpation of the styloid process in the tonsillar fosse, which exacerbates the pain and with radiographical work-up. In addition, relief of symptoms with injection of an anaesthetic solution into the tonsillar fosse is highly suggestive of Eagle's syndrome.<sup>(18)</sup> The treatment of Eagle's syndrome is surgical removal of the offending calcified structure. The entry path of the surgeon can be intra- or extra-oral, considering the multitude and magnitude of the major neurovascular tissues surrounding the styloid chain.<sup>(19)</sup>

The stylohyoid process and ligament are derived from the first and second brachial arches, in addition to Reichert's cartilage. It has been demonstrated that during foetal development, Reichert's cartilage links the styloid bone to the hyoid bone. In the adult, the stylohyoid ligament, which is normally composed of dense fibrous connective tissue, may retain some of its embryonic cartilage and thus have the potential to become partially or completely ossified. If these structures solidify, they can cause the pain and suffering present in Eagle's syndrome.<sup>(17,20)</sup> Steinmann proposed various theories to explain ossification. These were: (a) "Theory of reactive hyperplasia" – trauma can cause ossification at the end of the styloid process

down the length of the styloid ligament, since the styloid ligament contains remnants of its connective tissue and fibrocartilaginous origins, the potential for ossification remains; (b) "Theory of reactive metaplasia" – an abnormal post-traumatic healing response initiates the calcification of stylohyoid ligament; and (c) "Theory of anatomic variance" – the early elongation of the styloid process and ossification of the styloid ligament are anatomical variations that occur without recognisable trauma.<sup>(21)</sup>

In the present case, the skull possessed a styloid process which is 6.0 cm long on the right side and 5.9 cm long on the left side. There is a paucity of literature of such a long styloid process in the dry human skull, which makes it unique. The present variation might have caused severe pain and psychotraumatic stress to the person. The embryogenesis of the stylohyoid complex and the proper study on the pathogenesis of the structures near the styloid process, during trauma of the head and neck, will make Eagle's syndrome better understood and properly diagnosed.

## REFERENCES

1. Eagle WW. Elongated styloid process: further observations and a new syndrome. *Arch Otolaryngol* 1948; 47:630-40.
2. Eagle WW. The symptoms, diagnosis and treatment of the elongated styloid process. *Am Surg* 1962; 28:1-5.
3. Rodríguez-Vázquez JF, Mérida-Velasco JR, Verdugo-López S, Sanchez-Montesinos I, Merida Velasco JA. Morphogenesis of the second pharyngeal arch cartilage (Reichert's cartilage) in human embryos. *J Anat* 2006; 208:179-89.
4. Dinkar, Amonkar SS. Eagle's syndrome: review of literature and case report. *Indian J Dent Res* 2003; 14:162-8.
5. Soh KB. The glossopharyngeal nerve, glossopharyngeal neuralgia and the Eagle's syndrome – current concepts and management. *Singapore Med J* 1999; 40:659-65.
6. Nishihara K, Hanakita J, Kinuta Y, et al. [Three cases of Eagle's syndrome]. *No Shinkei Geka* 1986; 14 (3 suppl):441-5. Japanese.
7. Woolery WA. The diagnostic challenge of styloid elongation (Eagle's syndrome). *J Am Osteopath Assoc* 1990; 90:88-9.
8. Rizzatti-Barbosa CM, Ribeiro MC, Silva-Concilio LR, Di Hipolito O, Ambrosano GM. Is an elongated stylohyoid process prevalent in the elderly? A radiographic study in a Brazilian population. *Gerodontology* 2005; 22:112-5.
9. Pierrakou ED. Eagle's syndrome. Review of the literature and a case report. *Ann Dent* 1990; 49:30-3.
10. Zohar Y, Strauss M, Laurian N. Elongated styloid process syndrome masquerading as pain of dental origin. *J Maxillofac Surg* 1986; 14:294-7.
11. Kawai T, Shimozato K, Ochiai S. Elongated styloid process as a cause of difficult intubation. *J Oral Maxillofac Surg* 1990; 48:1225-8.
12. Wang Z, Liu Q, Cui Y, Gao Q, Liu L. [Clinical evaluation of the styloid process by plain radiographs and three-dimensional computed tomography]. *Lin Chuang Er Bi Yan Hou Ke Za Zhi* 2006; 20:60-3.
13. Basekim CC, Mutlu H, Gungor A, et al. Evaluation of styloid process by three-dimensional computed tomography. *Eur Radiol* 2005; 15:134-9.
14. Savranlar A, Uzun L, Ugur MB, Ozer T. Three-dimensional CT of Eagle's syndrome. *Diagn Interv Radiol* 2005; 11:206-9.
15. Jung T, Tschernitschek H, Hippen H, Schneider B, Borchers L. Elongated styloid process: when is it really elongated? *Dentomaxillofac Radiol* 2004; 33:119-24.

16. Thot B, Revel S, Mohandas R, Rao AV, Kumar A. Eagle's syndrome. Anatomy of the styloid process. *Indian J Dent Res* 2000; 11:65-70.
17. Keur JJ, Campbell JP, McCarthy JF, Ralph WJ. The clinical significance of the elongated styloid process. *Oral Surg Oral Med Oral Pathol* 1986; 61:399-404.
18. Balbuena L Jr, Hayes D, Ramirez SG, Johnson R. Eagle's syndrome (elongated styloid process). *South Med J* 1997; 90:331-4. Comment in: *South Med J* 1998; 91:43.
19. Carmarda AJ, Deschamps C, Forest D. I. Stylohyoid chain ossification: a discussion of etiology. *Oral Surg Oral Med Oral Pathol* 1989; 67:508-14.
20. Monsour PA, Young WG. Variability of the styloid process and stylohyoid ligament in panoramic radiographs. *Oral Surg Oral Med Oral Pathol* 1986; 61: 522-6.
21. Steinmann EP. Styloid syndrome in absence of an elongated process. *Acta Otolaryngol* 1968; 66:347-56.