

# Angulated Styloid Process - A Case Report

Angelie Jessica Subbiah<sup>1</sup>, Mukilan Ramadoss<sup>2</sup>

<sup>1</sup>Lecturer, Department of Anatomy, C.S.I.College of Dental Science and Research, Madurai, India

<sup>2</sup>Lecturer, Department of Physiology, C.S.I. College of Dental Science and Research, Madurai, India

**Abstract:** *Styloid process is a spinous projection from the temporal bone at the base of the cranium. Its dimensions are highly variable. Normally, the process is cylindrical, straight and tapers towards the tip but, occasionally it is angulated. The shape and the dimensions of the styloid process have great clinical significance since any morphological alterations of it may disturb the adjacent anatomical structures and their function which ultimately results in irritation and pain. The present study highlights the morphology, embryology, etiology and clinical implications of an angulated styloid process noticed during the osteology discussion with dental students.*

**Keywords:** Styloid process, angulated, morphological alteration, temporal bone, etiology, embryology

## 1. Introduction

Styloid process is a spinous osseous projection of the temporal bone at the base of the skull. Situated in front of the stylomastoid foramen (Sinnatamby 2011). It is directed downwards, forwards and medially. It is a cylindrical and straight process which taper towards its tip.

Styloid process is a derivative of the second pharyngeal arch, a remnant of the Reichert cartilage. The perichondrium of the Reichert cartilage between the styloid process and the hyoid bone regresses and forms the stylohyoid ligament. The styloid process ossifies from tympanohyal (proximal part) before birth and stylohyal (distal part) after birth and fuses during puberty. The process gives origin to stylohyoid, styloglossus, stylopharyngeus muscles and stylohyoid, stylomandibular ligaments.

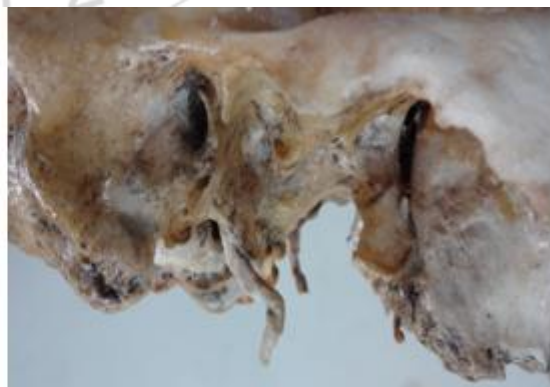
According to Gray, the normal length of the styloid process ranges from a few centimeter to 2.5cm and it is always straight often shows a curvature (Standring Susan 2008) but occasionally angulated.

Elongation of the styloid process may not always be symptomatic (Ferrario et al 1990). The morphological

variations are very common during the 3rd and 4th decades of life (Patil et al 2014) and are equally observed in both the sexes (Mun et al 2012) but females are predominantly symptomatic than males at a ratio of 3:1 (Kar et al 2013). There is no literature support for sexual dimorphism of an elongated styloid process. It may be unilateral or bilateral.

## 2. Case Report

An unusually angulated and curved styloid process of the right side temporal bone in an adult human dry skull of unknown sex and age was identified during the osteology discussion for undergraduate dental students. The styloid process of both sides is morphometrically analyzed. The right side styloid process is 45mm long, the proximal part of the process is directed downwards forwards and medially curved, it represents the styloid whereas, the distal part of the process is angulated and directed downwards representing the ossified stylohyoid ligament. The left side styloid process of the skull is 38mm long, straight and directed medially and downwards. The base of the process is 27mm thick on both the sides. All the measurements were recorded using a digital vernier calliper.



## 3. Discussion

The actual cause of the elongation of styloid process is not well understood one. But it has been suggested and explained by several authors. Eagle (1937) suggested that it is an outcome of a previous trauma. Gokce et al.(2008)

explained that mineralization and ossification of the styloid ligaments are due to the changes in the metabolism of calcium and phosphorus and vitamin D caused by liver disorders. Das et al (2008) suggested that the mechanical stresses during the fetal development may cause stretching of the Reichert's cartilage leading to elongation of the styloid

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process. Piagkou et al (2009) explained the etiology as a result of genetic alteration or due to three different theories as follows:

A hyperplastic reaction, pharyngeal trauma stimulating the styloid process leads to the ossification of the styloid ligament. The metaplastic reaction, Traumatic stimulus cause metaplastic changes in the cells of styloid ligament, results in complete or partial ossification of it.

Anatomic variation, Styloid process and the styloid ligament are not normally ossified, but rather, it's an anatomic variation.

Many vital structures like facial nerve (laterally), Internal and external carotid artery on either side of the tip of the process, Glossopharyngeal nerve which curves in close proximity to its exit out of the jugular foramen, the cranial part of accessory nerve and vagus nerve situated medially to the styloid process will be disturbed and compressed. The tip of the process lies in close proximity to the pharyngeal wall lateral to the tonsillar fossa. So any morphological variations of the styloid process may cause clinical symptoms like recurrent throat pain, foreign body sensation, dysphagia, odynophagia, ear pain, tinnitus, headache, trismus and facial pain. Alteration in taste or vocal changes are rarely observed (Fusco et al 2012)(Piagkou et al 2009). Compression of carotid arteries may cause stroke.( Jung et al 2004)(Rodriguez et al 2008).

Variations in the angulation rather than elongation of the process may be accountable for the irritation of the anatomical structures passing through the parapharyngeal space (Eagle WW 1948) (Strauss et al 1985). An exaggerated lateral angulation of the styloid process may cause its tip to compress the external carotid artery. Posterior angulation of an elongated styloid process can irritate the IX, X, XI and XII cranial nerves, internal carotid artery and internal jugular vein (Marcello et al 2013). Medial angulation of a styloid process could impinge the tonsillar fossa causing painful symptoms and anterior angulation may cause irritation of the mucosa and pressure over the vital structures in and around the tonsillar fossa (Haluk et al 2008). A considerable decrease in the anterior angulation may be associated with the increase in the intensity of tinnitus and dizziness because the styloid process is related medially to the internal jugular vein together with the accessory, hypoglossal, vagus and glossopharyngeal nerves. The trigeminal, facial, glossopharyngeal and vagus cranial nerves that are associated with the carotid arteries when stimulated can produce these clinical symptoms (Marcello et al 2013)

Eagle (1937) reported a styloid process with deviated tip, which may impinge both on the Internal or external carotid artery and upon the tonsillar area producing pharyngeal pain which extends towards the ear.

An elongated styloid process may cause pain which mimics the pain of dental origin. Due to the situation of the styloid process, the symptoms may also be confused with temporomandibular disorders and facial neuralgias(Jung et al 2004), sphenopalatine and glossopharyngeal neuralgia, migraine headache, temporal arteritis, an impacted molar

teeth and some faulty dental prostheses (Jaju et al 2007). So a thorough study on the differential diagnosis for the elongated styloid process should be performed. Eagle's syndrome should be suspected in presence of persistent throat pain exacerbated by rotation of head, tongue movements, mastication or deglutition and the diagnosis should be done by radiological and physical examination (Strauss et al 1985) (Beder et al 2005).

The pathophysiology of the symptoms is not clear. The theories have been proposed as follows (Murtagh et al 2001)

- a) Traumatic fracture of the styloid process causing proliferation of the granulation tissue, compresses the adjacent anatomical structures (Balasubramanian 1964).
- b) Compression of the nervous tissue surrounding it, the glossopharyngeal, lower branch of the trigeminal, or chorda tympani nerve (Harma 1966).
- c) Degenerative and inflammation at the insertion of stylohyoid, called stylohyoid insertion tendinitis.
- d) Irritation of pharyngeal mucosa by direct compression of an elongated process or post tonsillectomy scarring (involves V, VII, IX and X cranial nerves).
- e) Impingement of the carotid vessels, producing irritation of sympathetic nerves in the arterial sheath.

#### 4. Conclusion

Elongated styloid processes are often reported as a variant of the styloid process. The present study reported an unusually angulated styloid process, the anatomical knowledge of which is equally important for the radiologists, dentists and clinicians as it may also lead to clinical symptoms.

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