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Case Report

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# Ossification of Stylohyoid Ligament and its Clinical Significance: Case Report

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## Abstract

The styloid process, stylohyoid ligament, and the lesser horn of the hyoid bone form the stylohyoid chain which derives from the Reichert cartilage of the second brachial arch. Excessive or abnormal ossification of stylohyoid chain components may result in many variations which may be in the form of incomplete ossification, segmentation, pseudo-articulation and variations in thickness and angle, elongation of the styloid process. Abnormalities of stylohyoid chain may then compress or irritate nearby structures especially neurovascular structures i.e. carotid arteries, internal jugular vein and 7th 9th, 10th, 12th cranial nerves, leading to mild to severe symptoms, such as pain in throat, foreign body sensation in throat, cervico-facial pain etc. During routine dissection classes for MBBS, we reported two cases of ossification of stylohyoid ligament. In first case there was unilateral ossification of the stylohyoid complex and in second case there was a partial bilateral ossification of stylohyoid complex. Clinical symptoms of stylohyoid chain ossification vary from ear pain to dysphasia. It is important that clinicians should keep this entity in mind while considering the differential diagnosis of cervico-facial pain. Also, dentists, otolaryngologists and anesthetist are aware of the natural variations of the styloid process.

**Keywords:** Stylohyoid ligament, styloid process, variations, stylohyoid complex.

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## INTRODUCTION

The styloid process (SP) is a small, tapering, cylindrical bony projection from temporal bone and lying anteromedial to the mastoid process and anterior to the stylomastoid foramen. [1] It is placed caudally, medially, and anteriorly towards the maxillo-vertebro-pharyngeal recess which contains carotid arteries, internal jugular vein and 7th 9th, 10th, 12th cranial nerves. [1, 2, 3, 4] Its tip projects anteriorly and inferiorly between internal and external carotid arteries. It normally varies in length from 2 cm. to 3 cm, and a styloid process longer than 3 cm is found in 4 to 7 % of the population. [1, 2]

The styloid process, the stylohyoid ligament (SL) and lesser cornu of the hyoid bone forms the stylohyoid chain which is also known as stylohyoid complex or the stylohyoid apparatus and it arises from the Reichert cartilage of the second branchial arch. [2, 5] Excessive or abnormal ossification of stylohyoid chain components may result in many variations which may be in the form of incomplete ossification, segmentation, pseudo-articulation and variations in thickness and angle, elongation of the SP and thickening of the hyoid bone. [6, 7] The abnormalities of stylohyoid chain may then compress or irritate nearby structures especially neurovascular structures and is responsible for the stylohyoid syndrome. [8, 9, 10] A solid stylohyoid chain results when the entire SL ossifies, but complete ossification of it is a rare phenomenon. [11] The incidence of ossification of stylohyoid chain occurs with differing frequency and it occurs in 1-4 % of the general population. [6, 12, 13]

The elongation of SP and structural changes in SL with its clinical symptoms and signs were first described by Eagle in 1937 [2] and known as Eagle's syndrome (ES) or stylohyoid syndrome or Elongated styloid process syndrome (ESPS). [2, 14] Many important anatomical structures are closely related to the SP and SL and therefore it is worth to have a precise knowledge of normal anatomy and its variations for analyzing the possible effects of an ossified stylohyoid complex. The aim of this paper is to describe the morphological appearance of the fully ossified unilateral stylohyoid complex and a partial bilateral ossification of stylohyoid complex which were found during routine dissection in male cadavers.

## CASE REPORTS:

During routine dissection for undergraduate medical students, we observed one case of the fully ossified unilateral stylohyoid complex and second case of partial bilateral ossification of stylohyoid complex in male cadavers. In first case we observed complete ossified stylohyoid complex on left side (Fig 1). The length of the stylohyoid complex (styloid process plus the ossified stylohyoid ligament) from base of styloid process to lesser cornu of hyoid bone was 72 mm. It was difficult to determine the exact border between the top of the styloid process and the beginning of the styloid process. On right side, the styloid process was 2.5cm in length and styloid ligament were normal.

In second case we observed a partial bilateral ossification of stylohyoid complex (Fig. 2).The length of styloid complex on left side was 55 mm and 52 mm on right. In this case, close observation revealed a bulge of bony mass in the middle parts of ossified complex on both side and its presence may indicate the place of attachment of the stylohyoid ligament to the styloid process (arrow in Fig. 2).

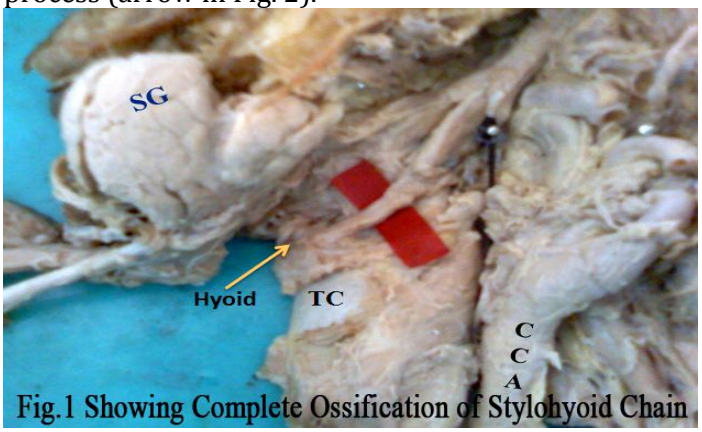


**Figure 1:** Complete ossification of stylohyoid chain

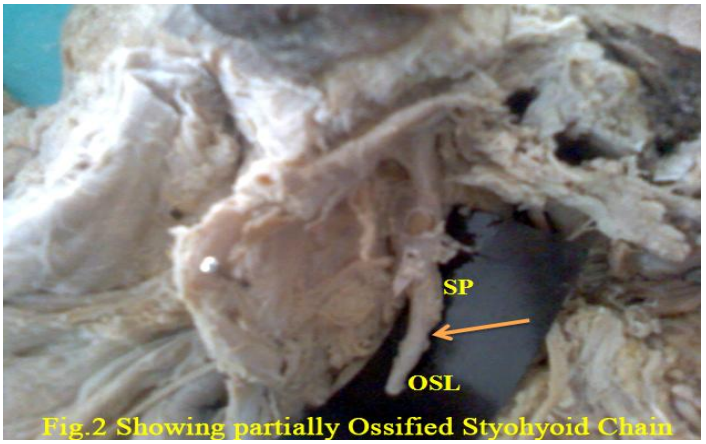


**Figure 2:** Partially ossified styohyoid chain

## Discussion:

An anatomical variation in the length of the styloid process and stylohyoid ligament is of profound anatomical, anthropological and clinical importance. The stylohyoid chain extends from the base of the temporal bone to the minor horn of the hyoid bone. [15] The components of the stylohyoid chain are derived in four distinct cartilaginous segments: tympanohyal, stylohyal, ceratohyal and hypohyal. The SP develops from the tympanohyal and stylohyal segments which usually fuse at puberty. The lesser cornu of the hyoid bone arises from the hyohyal. Connecting these two structures, the SL which connect the SP with lesser cornu of the hyoid, originates from

the ceratohyal. It is normally composed of dense fibrous connective tissue in adults but may retain its embryonic cartilage and thus have the potential for ossification which causes variations. [7, 8, 14, 16, 17] Ossified SL parts may merge or leave gaps in between. This ossification may arise where the stylohyoid ligament attaches to the styloid process due to unknown causes, such as osseous growth or trauma like tonsillectomy. [5]

According to Rodriguez-Vazquez et al [8] ossified stylohyoid chain extends downward from the base of the skull bilaterally and it may compress a number of vital structures adjacent to it, which produce inflammatory changes that include continuous chronic pain in the pharyngeal region, phantom foreign body sensation, radiating otalgia and dysphagia. In present case report in one case we observed an unusual unilateral ossified stylohyoid chain (Fig. 1) and in another case partial bilateral ossification of stylohyoid chain (Fig.2).

Normal range of the length of the SP differs among the studies in the literature. Eagle reported the normal length of SP as 2.5 cm; other authors measured the length as 3 cm. It has been reported that it is probably symptomatic when the length exceeds 4cm. [18] Furthermore, many variations such as absence of SP, double styloid outlet, localized or diffuse stylohyoid ossification have been reported in literature. [16, 18] Correlations between these variations and age, sex and symptoms were made in different studies and contradictory results were obtained. [6, 11, 18] Basekim et al. [19] evaluated styloid process in 138 patients by 3 dimensional CT but did not found diffuse SL. Diffuse ossification of stylohyoid chain is one of the rarest variations. Diffuse ossification of stylohyoid chain differs from other variations as it affects the entire chain thus, it may restrict head and neck movements or the fracture of the ossified chain during movement, trauma, during intubation. [20, 21] CT and 3D-CT can provide detailed information of stylohyoid chain variations as well as the possible relationship to adjacent structures like carotid artery. [19] Though partial ossification is common but complete ossification of the stylohyoid chain is rare which is observed in this case report and it is unilateral that is the uniqueness of this report.

In conclusion, diffuse ossification of stylohyoid chain is very rare and it may remain asymptomatic throughout life. But care should be taken to rule out this entity, especially in old patients because as it restricts the neck movements and difficulty may arise during intubation in such patients. Awareness of the elongated styloid process and partial or complete ossification of stylohyoid ligament is immensely important for dentist, otolaryngologist, surgeon, radiologist and for anatomist also.

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