

Morphometric Study of Styloid Process in Adult Skulls

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ABSTRACT

Introduction: the temporal bone's two long, slender bony projections make up the styloid process (SP). On the right and left sides of the skull's base, they can be found anterior to the stylo mastoid foramen. This process's location is crucial since it affects significant neurovascular systems. Following that, SP is situated in the pharynx's wall, between the carotid arteries, and just below the IJV. Evaluation of styloid process measurements in adult dry skulls is the main focus of the study.

Methods: in this study, 30 dry skulls from a medical college were evaluated for length and breadth of prolonged styloid processes on both the sides.

Results: the right side's styloid process averaged 2.56 cm in length, while on the left it was 2.72 cm. On the right and left sides, respectively, the breadth of the same is 0.64 cm and 0.72 cm. The same measures 0.64 cm and 0.72 cm wide on the right and left accordingly.

Conclusion: This study would add to the body of knowledge regarding the occurrence of elongated SP in the Indian community.

Keywords: Eagle syndrome; Neuralgia; Styloid apparatus; Stylocarotid syndrome; Temporal bone.

Introduction

'Stylos' which in Greek means "pillar," is where the phrase styloid process originates. The styloid process is a narrow, pointed bony projection originating in the lower section of the petrous region of the temporal bone. Its length ranges between a few millimeters and 2.5 cm on average. The tympanic plate surrounds its proximal end, while its distal end is where ligaments as well as muscles are attached. The cylindrical styloid process gradually narrows as it approaches the peak, resembling a pinnacle. The carotid arteries are located between its apex and the tonsillar region in the lateral wall of the pharynx. It is an apophysis that acts as an anchor for all the muscle and ligament attachments like stylohyoid, stylopharyngeus, and styloglossus muscles, as well as the stylohyoid ligament and the stylo mandibular ligament^{1,2}.

The location of the process is critical since it involves essential neurovascular systems. The glossopharyngeal, facial, accessory, hypoglossal, vagus, and other nerves have parallel paths to SP. The extension of this process may thus create discomfort in several structures nearby³.

The stylohyoid ligament serves as the anatomic

basis for neurological disorders brought on by the presence of the glossopharyngeal nerve in styloid process syndrome. The lengthy styloid process-related symptoms and complaints expressed by patients are referred to as "Eagle's syndrome"⁴.

Methodology

The current study used 30 dried human skulls of - descent available from the department of Anatomy at Medical College. The skulls with damaged styloid processes were excluded from the study. The temporal bone's styloid extension was examined on both sides of the skulls. The length and breadth of the styloid processes was determined. An electronic vernier caliper was utilized for measurements. The measurements were made from the base to the tip of the styloid process (Fig1). The data was recorded and tabulated. Using the Mann-Whitney test, the values obtained were compared between the right and left sides. An indication of significance is a P-value that is less.

The information from the present study's morphometric examination involving styloid process is displayed in Table 1. Analysis of the data from the right and left sides were statistically compared.



Figure 1. Showing measurements of styloid process.

Table 1. Morphometric data of the styloid process.

	Right Side	Left Side
Length	2.56±0.58	2.72±0.62
Breadth	0.64±0.43	0.52±0.13

The mean values are presented in mean±SD, the Mann-Whitney test revealed no statistically significant difference.

The length of either sides of the styloid process did not vary significantly. Although the left side's mean length was just barely longer rather than the right ($P>0.05$), there was no statistically notable variance between the two sides. The overall breadth, on the other hand, was bit higher on the right contrast to the left, however this disparity was not deemed statistically significant ($P>0.05$).

Discussion

The SP originates in Reichert's cartilage of the 2nd pharyngeal arch during embryological development. The stylohyoid complex develops in a variety of ways from the Reichert's cartilage. If it emerges from the styloid process's root, it is known as a tympanohyal. When the development comes from the styloid process' shaft, it is said to be stylohyal. Both Ceratohyal and Hypohyal are derived from the stylohyoid ligament and the lesser cornu of the hyoid bone, respectively⁵.

It is unclear what leads to SP elongation. Different explanations have been put out to account for differences in the styloid process' length and angulation. The three theories that are most commonly accepted are osseous tissue creation where the stylohyoid ligament gets in, congenital expansion of the styloid process, and calcification of the ligament by an unidentified mechanism^{6,7}.

The lengthening of the styloid process, irrespective of if there is an osseous stylohyoid ligament is described by the term eagle's syndrome. Eagle, an otolaryngologist who is the first one to identify this disease, classified it into two types⁸. A feeling of

something foreign in the throat, throat pain, and ear ache are symptoms of the classic styloid syndrome. The styloid process compresses the carotid arterial network and causes instability and headache, resulting in the stylocarotid syndrome⁹.

A proper diagnosis of distinction is essential to determine Eagle's syndrome from other disorders that share some of its symptoms and involve surrounding anatomical areas¹⁰. When determining a neck pain differential diagnosis, there are many conditions to take into account. Examples include cranial nerve neurological disorders, TMJ diseases, long term pharyngotonsillitis; molar teeth that do not have eruptions or were impacted and inappropriately fitted dental prostheses^{11,12}.

Several theories explain the stylohyoid ligament ossifying. The congenital explanation is the most widely recognised. Mechanical pressures during intrauterine life, according to the congenital theory, can sometimes cause expansion of second branchial arch and lengthening of the styloid process.

Population differences exist in the measure of the temporal bone's styloid process. According to Eagle, a typical styloid process ranges from 25 to 30mm, and that any length beyond these values is thought to be a diagnostic factor for Eagle syndrome. The styloid process in the current study spanned the range of 17mm to 45mm for the right styloid and between 15mm to 45mm for the left styloid, respectively. The breadth ranged from 3mm to 20mm and from 3mm to 8mm. With respect to Eagle's definition of SP length (25mm – 30mm)¹³, 5 extended SP were found amongst 30 dry skulls, representing an overall prevalence of 16.6%. In earlier research, extended styloid processes were found in 1%, 4%, 6.6%, 8.2%, and 2% of patients^{4,14,15,16}.

The mean length of 25.6±5.8mm and 27.2±6.2mm was observed in the present investigation in the right and left styloids, respectively. This was comparatively a smaller data. Other studies claimed that the specimens had styloid processes that measured 43.8±11.1 mm for

the right and 43.5 ± 10.4 mm for the opposite sides. This disparity in data from Indian subjects may be caused by variations in the tests performed to measure the variable; for example, some research used digital picture analysis using Adobe Photoshop^{15,16}.

The styloid process was investigated morphologically in this work, with an emphasis on its clinical consequences. We believe that a larger sample size might improve might increase the study's accuracy. The gender-related differences that was not taken into account which can be considered as one of the limitations of the study.

Limitations

Nonetheless, a bigger sample size would improve the accuracy of the research.

Conclusion

Eagle syndrome may be diagnosed more easily if the structural differences of the SP are known. Knowledge of this illness can help to avoid the elongated SP's painful symptoms from increasing. We feel that this study adds to our understanding of the prevalence of the extended styloid process.

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