

An osteological study of styloid process in adult south Indian population

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Abstract

Introduction: The styloid process of temporal bone is a slender, pointed, bony projection from the inferior aspect petrous temporal bone. Its length varies, ranging from a few millimetres to an average of 2.5 cm. Its proximal part is ensheathed by the tympanic plate, while muscles and ligaments are attached to its distal part. **Materials and Methods:** The present study included 110 adult human dried skulls of South Indian origin obtained from the department of anatomy of a private medical college. The dried skulls with damaged base of the skull and damaged styloid process were excluded from the present study. The styloid processes were measured for their length, thickness at the base, mid-point and the tip using a vernier calliper. Interstyloid distance of the skull was also measured at their base and the tip. The data were recorded and tabulated. The values were statistically analyzed among the right and left sides by using the student *t* test (paired samples *t* test). The significance is given as the *P*-value less than 0.05. The data were represented as mean \pm standard deviation. The styloid process was considered elongated if its length is more than 30 mm. **Results:** The maximum length of the styloid process of the skulls in our study varied was 26mm and minimum length 10mm on the right side. The maximum length of the styloid process on the left side was noted to be 23mm and the minimum length was found to be 12mm. **Conclusions:** The dimensions of the styloid process observed in our study adds to the baseline reference data of South Indian population. Elongated styloid process must be considered as a differential diagnosis in adult patients with nonspecific pain.

Keywords: Styloid Process, Osteology, Dry skulls, Morphology

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Introduction

The styloid process of temporal bone is a slender, pointed, bony projection from the inferior aspect petrous temporal bone. Its length varies, ranging from a few millimetres to an average of 2.5 cm. Its proximal part is ensheathed by the tympanic plate, while muscles and ligaments are attached to its distal part[1]. Styloid process is an apophysis which provides an anchorage for the stylopharyngeus, stylohyoid, styloglossus muscles, stylohyoid ligament and stylomandibular ligament[2]. The mineralized and elongated styloid process can be unilateral or bilateral. It does not result in any significant pain, discomfort, or limitation of neck movement and often remains asymptomatic until it is discovered on extraoral radiographs. Eagle's syndrome refers to pain and discomfort in the cervicofacial region resulting specifically from the elongated styloid process. Surgical shortening may be the only treatment measure that will reduce the patient's symptoms[3]. The surgical approach does not significantly influence the cure or complications rate[4]. The objective of the present investigation was to study the morphology styloid process in the South Indian population.

Materials and Methods

The present study included 110 adult human dried skulls of South Indian origin obtained from the department of anatomy of a private medical college. The dried skulls with damaged base of the skull and damaged styloid process were excluded from the present study. The styloid processes were measured for their length, thickness at the base, mid-point and the tip using a vernier calliper. Interstyloid distance of the skull was also measured at their base and the tip. The data were recorded and tabulated. The values were statistically

analyzed among the right and left sides by using the student *t* test (paired samples *t* test). The significance is given as the *P*-value less than 0.05. The data were represented as mean \pm standard deviation. The styloid process was considered elongated if its length is more than 30 mm.

Result**Table 1: The morphometric data of the styloid process**

Styloid process	Mean \pm S.D (mm)	
	Right side	Left side
Length	18.8 \pm 8.2	17.4 \pm 5.6
Thickness at base	4.2 \pm 1.3	4.4 \pm 0.9
Thickness at midpoint	3.1 \pm 1.1	3.6 \pm 0.4
Thickness at tip	1.4 \pm 0.6	1.2 \pm 0.3

The difference in the length of the styloid process on the right and left side was not statistically significant. ($p < 0.05$)

Table 2: The mean interstyloid distance at the base, mid-point and tip of the styloid processes (n=110)

Interstyloid distance	Mean \pm SD (mm)
At the base of styloid processes	68.5 \pm 3.8
At the mid-point of styloid processes	63.4 \pm 2.1
At the tip of styloid processes	60.3 \pm 2.3

**Fig 1: Showing Styloid Process in one of the specimens under study.**

The maximum length of the styloid process of the skulls in our study varied was 26mm and minimum length 10mm on the right side. The maximum length of the styloid process on the left side was noted to be 23mm and the minimum length was found to be 12mm. Among the

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specimens in our study, none of the skulls exhibited the elongated styloid process (styloid process measuring more than 30mm in length).

Discussion

The normal styloid process measures between 2.5 and 3 cm. The cartilaginous tip of the styloid process is continued over to the lesser cornu of the hyoid bone as a band known as the stylohyoid ligament. Total calcification of the stylohyoid ligament has been observed[5].

Table 3: Comparison of Length of styloid process in different studies

	n	Length of the Styloid process	
		Right side	Left side
Vadgaonkar et al[8]	110	17.8±9.3 (mm)	18.2±5.6 (mm)
Rathva et al[9]	150	18.06±7.28 (mm)	18.08±7.35 (mm)
Patil et al[10]	114	1.39 + 0.81 (cm)	1.29 + 0.87 (cm)
Present study	110	18.8 ± 8.2 (mm)	17.4± 5.6 (mm)

In the present study, the length of the styloid process observed is similar to the results of other studies. There was no statistically significant differences between both the sides observed in this study. Elongated styloid process was observed in 4.5% of the cases by Vadgaonkar et al., 4% of the cases by Patil et al, 5% of the cases by Rathva et al[8-10]. However, we did not observe styloid process longer than 30mm in our study.

Table 4: Comparison of occurrence of elongated styloid process in different studies

	n	Elongated Styloid process
Vadgaonkar et al[8]	110	5 (4.5%)
Patil et al[9]	114	16(4%)
Rathva et al[10]	150	30(5%)

Sridevi et al evaluated 500 panoramic radiographs for the length of SP and the calcification patterns which were categorized into three types as described by Langlais. They observed that the length of the SP was significantly longer in females than in males. Type I was the most common SP and was more prevalent in females[11]. Patil et al studied 114 dry skull bones with intact styloid processes and opined that anterior angulation and distance between bases and tips decreased in elongated styloid processes while medial angulation showed no significant change[9]. Eagle syndrome (ES) is a clinical condition in which there is abnormal ossification of the stylohyoid apparatus, consisting of the styloid process, the attached stylohyoid ligament, and the lesser cornu of the hyoid bone. It can be idiopathic, congenital (due to the persistence of cartilaginous elements of precursors of the styloid process), or acquired (due to the proliferation of osseous tissue at the insertion of the stylohyoid ligament)[12]. There are two types of ES as described originally by Eagle: first is the classic styloid process syndrome due to fibrous tissue causing distortion of the cranial nerve endings in the tonsillar bed after tonsil removal; and a second type due to compression of the sympathetic chain in the carotid sheath[13]. Radak et al described a case with bilateral Eagle syndrome associated with ICA kinking on one side and significant stenosis on the other[14]. Eagle's syndrome represents a commonly unrecognized entity, clinically characterised by non-specific craniofacial pain. Differential diagnosis includes glossopharyngeal and trigeminal neuralgia, temporal arteritis, migraine, myofascial pain dysfunction and cervical arthritis. Eagle's syndrome should always be suspected, mostly in adult women when the pain is unilateral and not responsive to painkillers[12,15].

Conclusion

The dimensions of the styloid process observed in our study adds to the baseline reference data of South Indian population. Elongated styloid process must be considered as a differential diagnosis in adult patients with nonspecific pain.

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Langlais et al proposed a classification of the radiographic appearance of elongated and mineralized stylohyoid ligament complexes based on three types of complexes—Type I, elongated; Type II, pseudo-articulated; and Type III, segmented—is proposed. These types were further described by a pattern of calcification: calcified outline, partially calcified, nodular, and completely calcified [6]. Type I pattern of elongation was found to be more prevalent in elder age group and was completely calcified in most of the cases [7].

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