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Clinical correlation between palpability of styloid process with its length on CT scan

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ABSTRACT

Background: The aim of the study is to correlate the clinical palpability of the styloid process with its length which is determined by CT scan.

Methods: A prospective study of 50 patients who presented to ENT OPD from January 2011 to January 2016 with cervicofacial pain and features of Eagle's syndrome were clinically evaluated for elongated styloid process by palpating the tonsillar fossa. These patients were subjected to a detailed CT scan with coronal, axial and 3D cuts. The length of the styloid process in the CT scan was correlated with the clinical palpability of the styloid process.

Results: It was noticed that only styloid process of length greater than 28 mm was clinically palpable. Correlation between the clinical palpability and the minimum length required was established in this study.

Conclusions: Patients with cervicofacial pain should be evaluated for styalgia by imaging and clinically by palpating the tonsillar fossa.

Keywords: Eagle's syndrome, Styalgia, Styloidectomy, Cervicofacial pain, Elongated styloid

INTRODUCTION

Eagle's syndrome is one of the causes for cervicofacial pain and is characterized by dysphagia, odynophagia and referred otalgia. Eagle had first described the syndrome and it is attributed to elongated styloid process or calcification of stylohyoid ligament. A number of theories have been cited to explain the reason for elongation of the styloid process. It can be detected by thorough history and physical examination and diagnosed by imaging. Various modalities of imaging like X-ray and CT scan are currently being used. Eagle's syndrome can be treated conservatively or by doing styloidectomy.

METHODS

This prospective study includes 50 patients who presented with features suggestive of Eagle's syndrome to our tertiary health care centre in Dharwad, between

January 2010 to January 2016. Inclusion criteria was patient presenting with upper lateral neck pain. We have excluded patients below 18 years in this study as elongated styloid process is not seen in younger age groups. Out of the 50 patients had upper lateral neck pain, 22 were male and 28 were female. 32 patients had aural symptoms of earache and tinnitus and 18 patients complained of dysphagia. 21 patients presented with hemifacial pain. The patients were clinically examined by palpating the tonsillar fossa for elongated styloid process. No local anaesthetic was used at the time of initial palpation to elicit tenderness as one of the finding. All the patients were subjected to detailed CT scan with coronal, axial and 3D images irrespective of whether the styloid was palpable or not. The length of styloid process was considered from the base to the tip of the styloid. We have considered styloid length of minimum 25 mm as elongated, in accordance with Eagle's criteria for the syndrome. Comparison of the length of the styloid process on CT and the clinical palpability was done.

Descriptive statistics was used to analyze the data in this study.

RESULTS

All the 50 patients in this study were subjected to CT scan and it was deduced that the minimum length

required to palpate the styloid process in the tonsillar fossa is 28 mm. There was a female preponderance and side to side variability and the longest styloid process in this study was 56 mm.

Descriptive statistics was used.

Table 1: Comparion of prevalence and palpability of elongated styloid in both gender.

Number of patients	Average length of styloid assessed on CT	Number of cases with palpable styloid	Standard deviation
Male -22 (44%)	27 mm	12 (24%)	4.6
Female-28 (56%)	34 mm	16 (32%)	7.31
Total- 50		Total-28 (56%)	

Table 2: Number of patients presenting with each symptom.

Symptoms	Number of patients
Upperlateral neck pain	50 (100%)
Earache	32 (64%)
Tinnitus	16 (32%)
Hemifacial pain	21 (42%)
Dysphagia	18 (36%)
Trismus	2 (4%)
Odynophagia	4 (8%)



Figure 1: 3D CT image showing right elongated styloid process.



Figure 2: Length of right styloid process is 5.6 cm and the left is 2.6 cm.



Figure 3: Axial cuts showing right styloid process impinging to lateral pharyngeal wall

DISCUSSION

"Stylos" in Greek means pillar. Styloid process is a bony outgrowth of variable length in the skull base arising from the petrous part of the temporal bone, immediately behind the mastoid apex. It lies anterior to the

stylomastoid foramen, and both lie anterior to the digastric groove in close relation to the facial nerve. The tip of the styloid process lies between the internal and external carotid arteries. Apart from the facial nerve, the glossopharyngeal, vagus and accessory nerves are in close proximity with the styloid process. This proximity with the neurovascular bundle leads to myriad of neurovascular manifestations of elongated styloid.

The styloid process is a derivative of second branchial arch, so are the stylohyoid ligament and the lesser cornu of hyoid. Other derivatives of second branchial arch cartilage (Reichert's cartilage) are the handle of malleus, the long process of incus and suprastructure of stapes. The derivatives of second arch mesoderm are the muscles of facial expression, stapedius, posterior belly of digastric and stylohyoid, which are supplied by nerve of second arch, the facial nerve. The stylohyoid chain is made of 4 parts stylohyal which forms the base of styloid, the tympanohyal which forms the body of styloid, the ceratohyal which gives rise to the stylohyoid ligament and the hypohyal which forms the lesser horn of hyoid bone. These components may be variably ossified or unossified, leading to variations in the morphology of the stylohyoid apparatus. If ossified, they may be completely fused or may be connected by one or more pseudoarthrosis. A congenitally elongated styloid process is smooth, regular and well corticated whereas a calcified stylohyoid ligament results in irregular surface and variably thickened outgrowth with remarkable medial angulation. This could be the reason for non-palpability in some cases of elongated styloid process as they may not impinge against the lateral pharyngeal wall. There are different theories postulated to explain the reason for elongation of the styloid process like age-related changes, postoperative trauma, persistent mesenchymal tissue, developmental aberration resulting in hyperplasia of styloid process and hormonal changes in females during menopause.1-3

It has also been proposed that extra skeletal calcification or ossification may have a role in styloid process elongation.⁴ Metastatic calcification due to increased serum calcium and phosphate levels, dystrophic calcification due to mineral deposition in dead soft tissue in the presence of normal serum calcium and phosphate levels and ectopic ossification are the three mechanisms of extra skeletal calcification.⁵

The parapharyngeal space is divided into prestyloid and poststyloid space by styloid process and the three muscles arising from it: stylohyoid, stylopharyngeus and styloglossus. This space is bounded by the pterygomandibular raphe and medial pterygoid anteriorly and prevertebral fascia posteriorly. The superior constrictor, tensor and levator palatine muscles form the medial boundary whereas the parotid gland, mandible and lateral pterygoid muscle form the lateral boundary. The poststyloid compartment contains the internal carotid

artery, internal jugular vein, glossopharyngeal nerve, vagus and accessory nerve, hypoglossal nerve, cervical sympathetic chain and occipital artery. The prestyloid space is bounded medially by buccopharyngeal fascia overlying the superior constrictor muscle and laterally by medial pterygoid and the ascending ramus of mandible. It contains the inferior alveolar nerve, lingual nerve, auriculotemporal nerve, internal maxillary artery, fat, styloglossus, stylopharyngeus, lymph nodes and the deep lobe of parotid. This space lies lateral to nasopharynx superiorly and tonsillar fossa inferiorly. parapharyngeal space resembles an inverted pyramid with its apex at the lesser cornu of hyoid bone and base being the skull base. The tip of styloid process is closely related to internal carotid artery and internal jugular vein and pressure on these major vessels may lead to carotid artery syndrome which may manifest as transient ischemic attack due to temporary impingement and syncope or thromboembolic stroke due to permanent injury to the great vessels. Hence Eagle's syndrome should be considered in patients presenting with position induced cerebrovascular symptoms.

In 1949, Eagle described a syndrome named after him which is characterized by elongated styloid process with or without calcification of stylohyoid and stylomandibular ligament. The common symptoms that patients present with Eagle's syndrome are dysphagia, odynophagia, trismus, tinnitus, earache, headache, facial pain, upper lateral neck pain, globus pharyngeus and pain on head rotation.

Plain radiographs are the commonest modality of imaging to ascertain the diagnosis. The anteroposterior view detects bilateral elongation of styloid process and the medial angulation and the lateral view helps to determine the length of styloid process but superimposition with other skeletal structures may lead to misdiagnosis. Multislice CT is better than panoramic radiographs as it not only gives the accurate length of the styloid process but also depicts its anteromedial angulations which is also a determinant of severity of symptoms. ⁶⁻⁸

According to Eagle, the normal length of styloid process was 25- 30 mm. Monsour and Young have reported styloid less than 4 cm being normal. Balcioglu has reported normal length as 40±4.72 mm. The incidence of elongated styloid process in general population that is symptomatic is only 4-10%. Palpating the tip of styloid process exacerbates the cervicofacial pain which can be further confirmed by imaging. The patient will notice a relief in symptoms when local anesthetic is injected into the tonsillar fossa. The Pterygoid hamulus can be mistaken for an elongated styloid process. The styloid process longer than 28mm was clinically palpable. The longest styloid process was seen in a 32 years old female measuring 56 mm on right side. Desai et al has reported an 8 mm long styloid in a male patient.

The length of styloid process not only varies from person to person but also from side to side. ¹⁶ The mean average length, in our study, of the styloid process on right side was 30.6 mm and the left side was 32 mm and the average length of styloid process in males was 27 mm and in females it was 34 mm approximately. More et al has reported a higher incidence of elongated styloid process in males whereas Okabe et al has reported a higher female preponderance. ^{17,18} Bilateral elongation was seen in 31 patients and unilateral elongation was seen in 19 patients.

All the patients were put on Carbemazepine 100 mg twice daily. The dose was increased to 200 mg twice daily for patients who had partial or no relief. Some patients were given Pregabalin for pain relief. Temporary relief was noticed in some patients with conservative line of treatment with relapse after 3-6 months. Surgical intervention was reserved for patients who failed medical line of treatment with anticonvulsants antidepressants. Patients were advised styoidectomy with guarded prognosis as post-operative scarring in the tonsillar fossa is known to cause worsening of symptoms after few years of surgery. We had 2 female patients who presented with pain 5-6 years post styloidectomy. Infiltration of steroids into the tonsillar bed under local anesthesia can relieve the symptoms and has been tried by few authors in patients with worsening pain. 19 The patients undergoing styloidectomy are at risk of injury to the carotids, facial nerve, and deep neck space infection. The intra-oral transpharyngeal route used to extract the styloid process offers poor access and visualization of the styloid with the only advantage being no external scarring. On the other hand, the extra-oral approach with a generous incision that extends from the mastoid process along the sternocleidomastoid to the level of the hyoid bone extending up to the mentum, offers better exposure and lesser morbidity though it results in an external scar.²⁰ As the ligaments and muscles arising from the styloid process are severed during styloidectomy, it may affect the play of muscles of deglutition and the movement of the temporomandibular joint leading to worsening of cervicofacial pain.

CONCLUSION

This study highlights the clinical correlation between palpability of styloid process and their length on CT scan. The minimum length of the styloid process to be clinically palpable is 28mm. However, medial angulations of the styloid will determine its impingement into lateral pharyngeal wall. A patient can have covert elongated styloid process and may present with a myriad of neurological symptoms due to pressure on the nerves and great vessels. Hence, a patient with longstanding cervicofacial pain should be evaluated for styalgia.

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