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CORRELATION BETWEEN SEVERITY OF CERVICOFACIAL PAIN AND THE LENGTH OF STYLOID PROCESS – A CROSS SECTIONAL ANALYTICAL STUDY

Otolaryngology

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ABSTRACT

Background: Cervicofacial pain is a common presentation in patients presenting to an ENT OPD. It can be because of various reasons. It may be due to sinusitis, trauma, surgery, carious teeth, temporomandibular dysfunction, migraine, cluster headaches, tension type headache, Sluder's neuralgia and other neuralgia. Amongst the neuralgia, glossopharyngeal neuralgia is a rare process characterized by a severe lancinating pain in the tongue base, tonsillar fossa and posterior pharyngeal wall. It is often precipitated by swallowing or yawning and it lasts for weeks and also has a tendency to reoccur–. Glossopharyngeal neuralgia due to elongated styloid process is known as Eagle's syndrome. The vagueness of symptoms is often misleading. These patients are often seen by a varied specialist group of general surgeons, ENT surgeons, dentists, neurologists and even by psychiatrists and they receive various painkillers but still are unhappy and symptomatic. Stylalgia doesn't strike very evidently as a possible cause of such indistinct cervicofacial pain. The diagnosis of Eagle's syndrome requires awareness and vigilant examination and investigations. Effective management of the facial pain of the patients coming to OPD requires psychological evaluation as well.

Aim: To study the correlation between severity of cervicofacial pain and the length of styloid process reporting to the ENT OPD of a Tertiary Care Hospital.

Materials and methods: Correlation between the pain on the basis of VAS and the length of styloid processes on the basis of X-ray Skull Towne's view studied on a total of 80 patients

Results: There was no significant correlation between VAS and length of styloid on either side, based on value of Spearman's Rho and p-value.

Conclusion: In view of confounding factors like individual pain endurance/ tolerability and varying degree of calcification of styloid processes, the association between length of styloid processes and cervicofacial pain cannot be concretely established. Although this study does not find a statistically significant correlation between the pain and the length of the styloid process, it cannot be altogether ruled out. A larger study may be needed to further study the correlation between the styloid length and cervicofacial pain localisation.

KEYWORDS

Eagle's syndrome, Glossopharyngeal neuralgia, Cervicofacial pain

INTRODUCTION

Cervicofacial pain is a common presentation in patients presenting to an ENT OPD. Patients before seeking medical attention generally go through various internet sources to find solutions to their problem and often attribute it to either sinus aetiology or otalgia.

Consultations pertaining to cervicofacial pain may be difficult for clinicians as well as the patients as sometimes vague complaints and findings generally do not match and certain patients may even come with fixed ideas about the cause of their pain, thus leading to dissatisfaction of clientele.

Majority of the painful stimuli from the cervico-facial region are transmitted to the spinal tract via trigeminal nerve as well as facial, glossopharyngeal and vagus nerve. Pain from the deep structures tend to be a dull and poorly localized pain as the afferent nerves innervating them are unmyelinated.

Cervicofacial pain can be because of various reasons. It may be due to sinusitis, trauma, surgery, carious teeth, temporomandibular dysfunction, migraine, cluster headaches, tension type headache, Sluder's neuralgia and other neuralgia. Amongst the neuralgia, glossopharyngeal neuralgia is a rare process characterized by a severe lancinating pain in the tongue base, tonsillar fossa and posterior pharyngeal wall. It is often precipitated by swallowing or yawning and it lasts for weeks and also has a tendency to reoccur–(1). Glossopharyngeal neuralgia due to elongated styloid process is known as Eagle's syndrome. The vagueness of symptoms is often misleading. These patients are often seen by a varied specialist group of general surgeons, ENT surgeons, dentists, neurologists and even by psychiatrists and they receive various painkillers but still are unhappy and symptomatic.

Typically there are various sets of vague complaints in patients present with. Dr Eagle WW described these symptoms as nagging sensation in the throat, similar to the chronic pharyngitis, pain radiating to ear, dysphagia, and foreign body sensation in throat(2). Elongated styloid process or the calcified stylohyoid ligament can initiate inflammatory changes or impinge on the adjacent arteries or nerves, leading to the above mentioned symptomatology. Eagle's syndrome may be caused by tonsillectomy or traumatic fracture of a mineralized stylohyoid ligament. Diagnosis is generally made after excluding all other causes of the above symptoms. On physical examination, digital palpation of the styloid process in the tonsillar fossa exacerbates the pain. Radiographic assessment of the length of styloid process also helps us reach the diagnosis. In addition, relief of symptoms with injection of anaesthetic agent into the tonsillar fossa is highly indicative of this diagnosis(3).

Stylalgia doesn't strike very evidently as a possible cause of such indistinct cervicofacial pain. The diagnosis of Eagle's syndrome requires awareness and vigilant examination and investigations. Effective management of the facial pain of the patients coming to OPD requires psychological evaluation as well. It may have a real cause and sometimes it may just be the emotional distress or anxiety post trauma or post-surgery with a dissatisfied outcome. The very important thing which is to be kept in mind is that the pain is real to the patient and an empathetic approach is essential.

The aim of the present study is to study the correlation between severity of cervicofacial pain and the length of styloid process reporting to the ENT OPD of a Tertiary Care Hospital.

MATERIALS AND METHODS

This study is a cross sectional analytical study on the correlation of

cervicofacial pain and length of styloid process.

The study was conducted in the Dept of Otorhinolaryngology & Head and Neck surgery in a Tertiary care hospital from May 2018 to May 2020 and all the patients reporting to ENT OPD with varied complaints of

- Cervicofacial pain
- Foreign body sensation in the throat
- Dysphagia and/or odynophagia
- Pain in TM Joint
- Referred otalgia

Inclusion criteria –

a. Age between 18 to 70 years
b. Any gender
c. No known dental problems
d. No other known causes of cervicofacial pain

Exclusion criteria –

a. Patients unwilling to be the part of the study
b. Patients undergoing treatment for sinus or ear pathology
c. Patients who had undergone neck or oropharyngeal surgeries
d. Patient with history of trauma to head and neck region

Evaluation of cases –

After detailed history taking and complete systemic and ENT examination including Hopkins laryngopharyngoscopy, the selected cases then underwent X-Ray skull Towne's view using Siemens digital radiography unit with Model No. 10093864 and Serial No. 1165. The same x-ray machine was used throughout study and all the efforts were made to rule out variables which may have been introduced by technique.

The lengths of the styloid processes, including any calcification of the attached ligaments, were measured and recorded along with name of each patient. Measurement of length was taken from the base of the styloid process extending from the temporal bone till the tip of the process using the same metric ruler and calliper.

The length of the styloid processes were correlated with the severity of the cervicofacial pain of the patients which was evaluated on a Visual Analog Scale with numerical rating in which '0' corresponds to 'No pain' and '10' corresponds to 'Worst pain imaginable'.

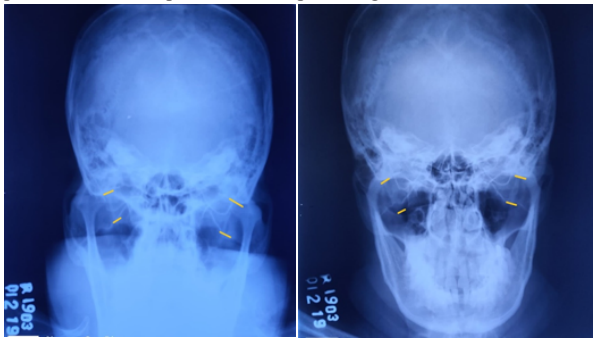


Fig 1 & 2 – Points of measurement of styloid processes from the base till the tip

Data collection and analysis –

Correlation between the cervicofacial pain and the length of the styloid process was studied using 'R' statistical software with jamovi GUI.

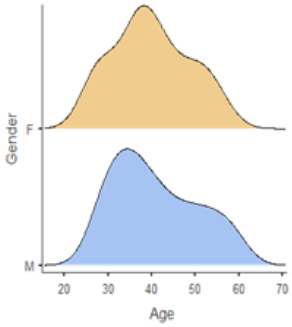
RESULTS

In our study of total of 80 patients presenting to ENT OPD with complaints of varying degree of cervicofacial pain, 41 were females & 39 were males. Mean age distribution of females & males in this study was 39.8 and 40.8 years respectively with maximum age in females & males being 56 and 59 years respectively and minimum age being 27 years for both females & males. The study population was normally distributed for age (Table 1, Graph 1)

Table 1

	Gender	n	Age
n	F	41	
	M	39	
Mean	F	-	39.8
	M	-	40.8
Median	F	-	39
	M	-	39
Minimum	F	-	27
	M	-	27
Maximum	F	-	56
	M	-	59

Graph 1



Mean length of styloid process of right and left side among females was 2.80 cm and 3.15 cm respectively and among males was 2.95 cm and 2.94 cm respectively. Mean length of the combined population of right and left side were 2.87 cm and 3.05 cm respectively (Table 2)

Table 2

	Gender	Styloid Right	Styloid Left
n (years)		41	41
	M	39	39
Mean (cm)	F	2.80	3.15
	M	2.95	2.94
Standard ceviation	F	0.686	0.711
	M	0.745	0.672
Maximum (cm)	F	4.10	4.20
	M	4.00	4.20
Minimum (cm)	F	1.60	1.80
	M	1.50	1.90
Combined mean (cm)		2.90	3.05
Standard deviation		0.692	0.719

Binomial logistic regression was carried out to study the relationship between localisation of cervicofacial pain, styloid length and gender. (Table 3)

Table 3 : Odds Ratio of Cervicofacial Pain Localisation with respect to Styloid Length and Gender

						95% Confidence Interval	
Predictor	Estimate	SE	Z	p	Odds ratio	Lower	Upper
Intercept	-0.7562	1.383	-0.547	0.585	0.469	0.0312	7.06
Styloid Left	0.0719	0.330	0.218	0.827	1.075	0.5631	2.05
Styloid Right	-0.0851	0.342	-0.249	0.804	0.918	0.4697	1.80
Gender:							
M – F	0.8474	0.474	1.787	0.074	2.334	0.9213	5.91

Note. Estimates represent the log odds of "Cervicofacial Pain Localisation = MIDFACE AND EAR" vs. "Cervicofacial Pain Localisation = MIDFACE AND NECK"

There was no significant association of cervicofacial pain localisation with either right or left styloid length or with gender.

Spearman correlation coefficient (Spearman's Rho) was calculated between the styloid length and the Visual Analogue Scale (VAS) (Table 4 & Plot 1).

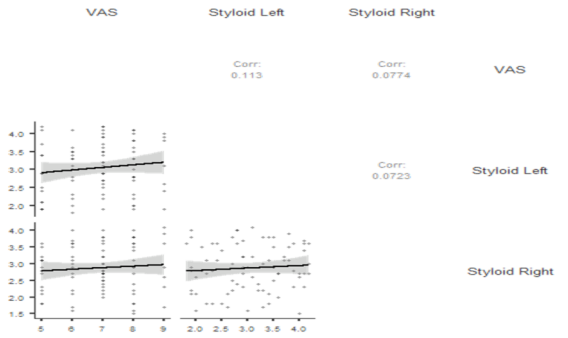
Table 4: Spearman Correlation Coefficient for VAS and Styloid Length

		VAS	Styloid Left	Styloid Right
VAS	Spearman's rho	—		
	p-value	—		

Styloid Left	Spearman's rho	0.113	—	
	p-value	0.318	—	
Styloid Right	Spearman's rho	0.077	0.072	—
	p-value	0.495	0.524	—

There was no significant correlation between VAS and length of styloid on either side, based on value of Spearman's Rho and p-value.

Plot 1: Correlation Matrix between VAS and Styloid Length



DISCUSSION

The credit of describing Eagle's syndrome as an entirely new disease entity goes to Dr Eagle WW, an Otorhinolaryngologist, who first presented two cases elaborating symptomatology of elongated styloid processes, in his article of 1937(2). The Greek word 'Stylos' meaning pillar is the origin of the styloid process. Styloid process is a slender cylindrical bone which arises from the base of the temporal bone, posterior to the mastoid tip, anteromedial to the stylomastoid foramen, and lateral to the jugular foramen and carotid canal. The direction of this structure is downwards anteriorly and slightly medially. The apex of the styloid process is connected to the ipsilateral lesser cornu of hyoid bone via stylohyoid ligament(4).

In the adults, the stylohyoid ligament, which is composed of dense fibrous connective tissue, may retain some of its embryonic cartilage and thus have the potential to become partially or completely mineralized in the due course of time.

Numerous terminologies are used to express Eagle's syndrome like elongation of styloid process and/or mineralization of stylomandibular or stylohyoid ligament. Some authors consider the calcification of stylohyoid complex the best terminology(5). Elongated styloid processes are generally asymptomatic, but in certain cases it can present as an atypical facial pain.

Eagle et al in 1949 described two types of Eagle's syndrome namely Classic form and Carotid artery syndrome. Classic form develops post tonsillectomy, characterized by throat pain & globus pallidus. This is due to impingement of cranial nerves: V, VII, IX or X, may be attributed to post- tonsillectomy scar contracture in the direction of elongated Styloid process(6). In Carotid artery syndrome, there is periodic compression of carotid artery. Rotation of Head causes ephemeral compression of Sympathetic chain and Internal Carotid artery, which results in Ipsilateral Headache, Orbital pain and Syncope. There may be pain in the distribution of temporal and maxillary branches of trigeminal nerve due to compression of External carotid artery(6).

Enthesitis ("insertion tendinosis") may also be regarded as one of the pathophysiology which can cause symptoms, that parallels between Eagle's syndrome and Tennis Elbow–(7). In many cases, symptoms of Eagle's Syndrome were seen to develop following fracture of Styloid process. Few of them were as a result of trauma. Few also reported characteristic symptoms following sudden laughter, coughing and epileptic seizures—(8,9). Predisposing factors for fracture of Styloid process may be Enthesitis or metaplastic change, these qualitative changes may be a possible explanation to fracture of Styloid process following chewing–(10).

Myofacial syndrome usually develops from localized cause such as Rheumatoid arthritis, Osteoarthritis or chronic myopathies. The frequent coexistence of localized pain disorders of the head and neck region such as neck pain, TMD, headache, whiplash injuries raise the evidence of the hypothesis that the irritating focal pain due to the chronic minor trauma and may have a pathophysiologic role —(11,12). Two main mechanisms that explains this are first is increased recruitment and activation of neurons by nociceptive stimulation. Secondly referral of widespread pain due to prolonged tonic nociceptive input. Studies show that the misinterpretation in the pain localization is because of the upper cervical roots and trigeminal afferents convergence, which in turn results in the referred pain associated with deeper structures like elongated Styloid processes—(13,14).

Digital palpation of tonsillar fossa may reveal elongated styloid process which may induce or worsen the pain, thus helping in the diagnosis. Ravinder Verma et al classified digital palpation into 3 grades, On the basis of location of palpation Tip of Styloid Process in tonsillar fossa: Grade I, Tip is palpable over upper pole; Grade II, Tip is palpable in the middle, and Grade III, Tip is palpable in Lower pole–(15). Injection of a local anaesthetic agent in the tonsillar fossa will relieve pain, thus giving indirect evidence of Eagle's syndrome–(16). Investigations mainly include Radiology i.e., Plain Xray radiograph of antero-posterior and lateral views, Towne's view, orthopantomogram and CT scan.

Many methods have been used for measuring length of styloid process. Goldstein and Scopp derived following criteria for radiologic evaluation of elongated styloid process by plain radiograph. 1) Area not observable- Area of stylomandibular ligament is indefinable. 2) Normal range- Radiopacity of styloid process is not more than 1/3rd of the length of ramus of mandible. 3) Partially calcified- radiopacity is more than 1/3rd but not till the angle of mandible. 4) Completely calcified- radiopacity is touching the angle of the mandible–(16). Similarly, Chandler et al in 1977 described anatomical variations of Stylohyoid complex using Panorex view (17). Studies show that 3D CT confirms the diagnosis of Elongated Styloid process and it is relatively easy to co relate with the clinical signs and surrounding anatomical structures, and plan for surgery –(18). However, X ray skull Towne's view was used by us in this study to measure the length of the styloid process.

An elongated styloid process occurs in about 4% of the general population, but of these, only about 4% present with symptoms that are attributable to elongation–(19). The usual length of the styloid process generally varies, although in the majority of patients it is 20 to 30 mm and more than 30 mm was considered as an elongated styloid process. Saheb et al. observed that the mean length of styloid process was 2.398 ± 0.432 cm and the mean among males was 2.492 ± 0.506 cm and females were 2.301 ± 0.402 cm. The right and left in males and females measured 2.512 ± 0.42 cm, 2.365 ± 0.330 cm, 2.499 ± 0.520 cm and 2.315 ± 0.402 cm respectively. It is also observed that males had greater length than the females and the differences in length on both the right and left side were also significant(4). In our study, mean length of styloid process of right and left side among females was 2.80 ± 0.711 cm and 3.15 ± 0.686 cm respectively and among males was 2.95 ± 0.672 and 2.94 ± 0.745 cm respectively. Mean length of the combined population of right and left side were 2.87 ± 0.692 cm and 3.05 ± 0.719 cm respectively indicating left side of the styloid process to be longer than the right side in our study population. In our study, there was no significant association of cervicofacial pain localisation with either right or left styloid length or with gender and there was no significant correlation between VAS and length of styloid on either side, based on value of Spearman's Rho and p-value.

CONCLUSION

Looking at the varying symptoms of the patient clientele coming to the ENT OPD, thorough knowledge and examination of the oral cavity, oropharynx and neck is a must to rule out sinister causes of such symptoms. Because of many factors causing cervicofacial pain, all of which cannot be accurately measured like TM joint arthralgia, glossopharyngeal neuralgia, calcification of stylohyoid ligament, it is difficult to attribute this pain to styloid process alone for cervicofacial pain. Eagle's syndrome should be kept as one of the differential diagnosis of the causes of cervicofacial pain. In view of confounding factors like individual pain endurance/ tolerability and varying degree of calcification of styloid processes, the association between length of styloid processes and cervicofacial pain cannot be concretely established. Although this study does not find a statistically significant correlation between the pain and the length of the styloid process, it cannot be altogether ruled out. A larger study may be needed to further study the correlation between the

styloid length and cervicofacial pain localisation.

REFERENCES:

1. Bannister K ah-S, Miles. Scott Brown. 8th Edition. Clarke JCW, W R, editors. 2019. 845– 850 p.
2. Eagle WW. Elongated styloid processes: report of two cases. Archives of otolaryngology. 1937 May 1;25(5):584-7.
3. Balbuena L. Jr., Hayes D., Ramirez S.G., Johnson R.. Eagle's syndrome (elongated styloid process). South Med J 90: 331-4, 1997.
4. Saheb HS, Shepur MP, Haseena S. Study the length of styloid process in South Indian adults dry skulls. Journal of Pharmaceutical Sciences and Research. 2011 Sep 1;3(9):1456.
5. Scaf G, Freitas DQ, Loffredo LD. Diagnostic reproducibility of the elongated styloid process. Journal of Applied Oral Science. 2003 Jun;11(2):120-4.
6. Eagle WW, Durham NC. ELONGATED STYLOID PROCESS Further Observations and a New Syndrome.
7. Steinmann EP. Styloid syndrome in absence of an elongated process. Acta Otolaryngol (Stockh). 1968;66(1–6):347–356.
8. Steinmann EP. A New Light on the Pathogenesis of the Styloid Syndrome. Arch Otolaryngol. 1970 Feb;91(2):171–174.
9. Babbitt JA. LVIII. Fracture of the Styloid Process and its Tonsil Fossa Complications, with Report of a Case. Ann Otol Rhinol Laryngol. 1933 Sep;42(3):789–798.
10. Blythe JNSJ, Matthews NS, Connor S. Eagle's syndrome after fracture of the elongated styloid process. Br J Oral Maxillofac Surg. 2009 Apr;47(3):233–235.
11. Leffler AS, Kosek E, Lerndal T, Nordmark B, Hansson P. Somatosensory perception and function of diffuse noxious inhibitory controls (DNIC) in patients suffering from rheumatoid arthritis. Eur J Pain. 2002 Apr;6(2):161–176.
12. Staud R. Future perspectives: pathogenesis of chronic muscle pain. Vol. 21. Baillière Tindall; 2007. 581–596 p.
13. Goadsby PJ, Bartsch T, Dodick DW. Occipital Nerve Stimulation for Headache: Mechanisms and Efficacy. Headache J Head Face Pain. 2008 Jan;48(2):313–318.
14. Ge HY, Wang K, Madeleine P, Svensson P, Sessle BJ, Arendt-Nielsen L. Simultaneous modulation of the exteroceptive suppression periods in the trapezius and temporalis muscles by experimental muscle pain. Clin Neurophysiol. 2004 Jun;115(6):1399–1408.
15. Verma R. Stylalgia. Indian J Otolaryngol Head Neck Surg. 1996 Oct;48(4):312–314.
16. Goldstein GR, Scopp IW. Radiographic interpretation of calcified stylomandibular and stylohyoid ligaments. J Prosthet Dent. 1973;30(3):330–334.
17. CHANDLER JR. ANATOMICAL VARIATIONS OF THE STYLOHYOID COMPLEX AND THEIR CLINICAL SIGNIFICANCE. The Laryngoscope. 1977 Oct;87(10):1692???1701.
18. Beder E, Ozgursoy OB, Ozgursoy SK, Anadolu Y. Three-Dimensional Computed Tomography and Surgical Treatment for Eagle's Syndrome. Ear Nose Throat J. 2006 Jul;85(7):443–445.
19. Prasad KC, Kamath MP, Reddy KJM, Raju K, Agarwal S. Elongated styloid process (Eagle's syndrome): A clinical study. J Oral Maxillofac Surg. 2002;60(2):171–175.