Clinicoradiologic Evaluation of Eagle's Syndrome and its Management

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ABSTRACT

Background

Eagle's syndrome (Elongated styloid process) is often misdiagnosed due to its vague symptomatology. The diagnosis relies on detail history taking, palpation of styloid process in tonsillar fossa and imaging modalities.

Objective

To assess the length and medial angulation of elongated styloid process with the help of three dimensional computed tomography (3D CT) scan and to describe our clinical and surgical experience with patients suffering from Eagle's syndrome.

Method

Prospective, analytical study conducted from August 2011 to August 2012 among 39 patients with Eagle's syndrome. Detailed history taking, clinical examination and 3D CT scan was performed. Length and medial angulation was calculated. Patients with styloid process length longer than 2.50 cm underwent surgical excision via intraoral approach. Medial angulation of styloid process on both sides was correlated with each other using rank correlation coefficient. Wilcoxon Signed Rank test was applied to test significant difference between pre-operative and post-operative symptoms scores.

Result

Significant positive correlation was found between the medial angulation of styloid process on right side and left side (ρ =0.81, p<0.001). Significant difference was also observed between pre and post-operative symptoms scores (z=-5.16, p<0.001) .

Conclusion

Possibility of Eagle's syndrome should always be considered while examining patients with vague neck pain. 3D CT reconstruction is a gold standard investigation which helps in studying the relation of styloid process with surrounding structures along with accurate measurement of its length and medial angulation.

KEY WORDS

Eagle's syndrome, elongated styloid process, three dimensional computed tomography

INTRODUCTION

Styloid process is an elongated, conical projection that lies anterior to mastoid process near the inferior surface of temporal bone at the junction of petrous and tympanic portions.[1,2] Patients with Eagle's syndrome may present with various non-specific symptoms like cervical pain, otalgia, foreign body sensation, pain on changing head position, cervicofacial pain and pain on swallowing.[3] Hence, they may seek treatment in different clinics such as otolaryngology, family practice, neurology, neurosurgery, psychiatry and dentistry.[4]

Eagle defined the length of normal styloid process as 2.50-3 cm.[5,6] Although approximately four percent of the population is thought to have an elongated styloid process, only 4-10.30% of these groups are symptomatic.[7]

The diagnosis of Eagle's syndrome relies on symptoms,

clinical examination and imaging. Although conventional radiography (orthopantomogram, mandibular true occlusal view and lateral oblique view of mandible) helps in confirming diagnosis, it is often difficult to depict its length. Superimposition of anatomical structures also remains a constant problem. With this regard, 3D CT acts as a gold standard investigation which helps in visualization of entire stylohyoid complex with different axes and precise measurement of length and angulation of styloid process.[8,9] It also helps to study the anatomical relationship of styloid process with surrounding structures.[4]

The aim of this study is to assess length and medial angulation of elongated styloid process with the help of 3D CT scan and to describe our clinical and surgical experience with patients suffering with Eagle's syndrome.

METHOD

This was a prospective, analytical study conducted in the Department of Otorhinolaryngology and Head and Neck surgery at the Dhulikhel Hospital, Kathmandu University Hospital between August 2011 to August 2012 after obtaining ethical approval from Institutional Review Committee, Kathmandu University School of Medical Sciences. Thirty nine symptomatic patients suffering from Eagle's syndrome, who agree to give written consent, were enrolled in our study. A detailed history and clinical examination was performed along with careful palpation of the tonsillar fossa to elicit tenderness and data entered in the structured pro forma. Patients were asked about their symptoms and pre and postoperative symptoms scoring was done by using Visual Analogue method. 1 ml of 2% Xylocaine was injected in the tonsillar fossa of these patients to relieve the pain temporarily.

CT scan was obtained using HITACHI W2000AD single slice spiral CT scan in coronal plane in prone position with a slice thickness of 1 mm using 3×3 mm volumetric method. The other parameters chosen were 120 kV and 160 mAmps. Raw data was then processed at the workstation to acquire 3D images using surface shaded display software. The length of styloid process from the point of attachment to the temporal bone and the tip along with medial angulation of styloid process was then measured separately for each side in the workstation (Fig 1). Patients were divided into 2 groups according to the length of styloid process and into 4 groups according to the angle values. Analysis of the CT scan was performed by a same radiologist over the study period to avoid any inter-observer bias. Symptomatic patients with styloid process length longer than 2.50 cm underwent surgical treatment bilaterally as per 3D CT scan. Intraoral approach was used for excision of styloid process in all the patients (Fig 2). The patients were hospitalized for 5 to 7 days and a nasogastric tube was introduced for feeding for a period of five days to minimize the chances of developing deep neck space infection. Antibiotic prophylaxis was given in all patients for a period of 10 days. All the patients

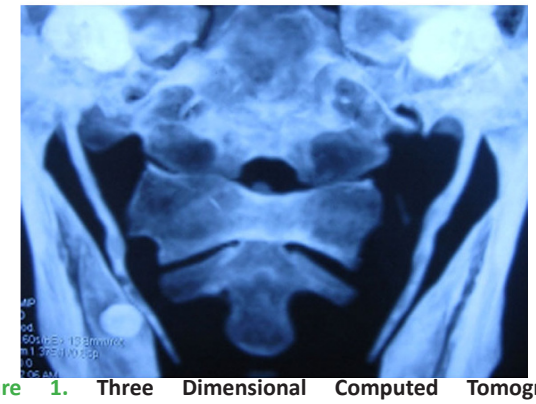

Figure 1. Three Dimensional Computed Tomography Reconstruction Showing Bilateral Elongated Styloid Process.

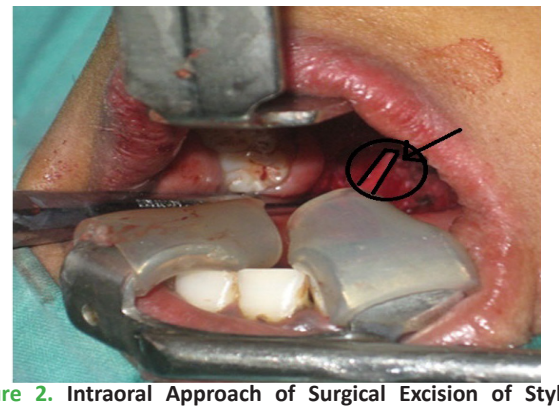

Figure 2. Intraoral Approach of Surgical Excision of Styloid Process left side (Intraoperative view) Showing Distal part of Styloid Process Fully Exposed.

underwent surgery via intraoral route under general anaesthesia with nasotracheal intubation. Tonsillectomy was performed using dissection and snare method. The tip of the styloid process was palpated in the tonsillar fossa. Using Negus curved artery forceps, the constrictor muscles in the tonsillar bed were bluntly dissected and the tip of elongated styloid process was visualized. The periosteum was stripped off and the distal part of styloid process was excised (Fig 3) using bone nibbler. The split constrictor muscle was sutured using 3-0 vicryl sutures and hemostasis was achieved.

Figure 3. Surgically Resected Portion of Elongated Styloid Process.

Collected data were entered and analyzed using SPSS software 16.0. Both descriptive and inferential statistics were measured. P values <0.05 was considered statistically significant. Medial angulation of styloid process on the

right and left side was correlated with each other using rank correlation coefficient.

Wilcoxon Signed Rank test was applied to test difference between pre-operative and post-operative symptoms scores.

RESULT

Among 39 patients, 8 (20.50%) patients were male and 31 (79.50%) were female (Table 1).The age of patients ranged from 21 to 50 years and 41% of the patients belonged to age group 30 to 39 years. Frequency and percentage of patients suffering from different symptoms of Eagle's syndrome are also shown in Table 1. Duration of symptoms ranged from 2 months to 48 months. Twenty one patients had bilateral symptoms whereas 18 patients had unilateral symptoms. Two patients gave a previous history of tonsillectomy. The length of styloid processes ranged from 2.70 to 4.80 cm on right side and 2.70 to 5.10 cm on the left side. The medial angulation ranged from 56° to 88° on the right side and 54° to 88° on the left side. The classification of styloid process according to length and angle values along with frequency and percentage are summarized in Table 2. There were no major complications after surgery. All our patients were operated by intraoral approach as it is simpler, avoids external scar and is easier.

Table 1. Demographic and Symptom Variables (n=39).

Variables	Frequency	Percentage(%)
Sex		
Male	8	20.5
Female	31	79.5
Age		
0 to 20	0	0
21 to 29	12	30.8
30 to 39	16	41.0
40 to 49	9	23.1
50 to 59	2	5.1
60 to 79	0	0
80 to 100	0	0
Symptoms		
Headache	20	51.3
Pain on swallowing	18	46.2
Vague neck discomfort	16	41
Foreign body sensation	10	25.6
Otalgia	10	25.6
Facial pain	8	20.5
Pain on changing head position	4	10.3

We observed a statistically significant difference in styloid process length between genders, that is, females had longer styloid processes as compared to males ($p < 0.05$).Medial angulation of styloid process on both sides was correlated with each other using rank correlation coefficient. Significant positive correlation was found between the medial angulation of styloid process on right side and left side ($\rho=0.812$, $p<0.001$). Similarly, Wilcoxon Signed Rank test shows significant reduction in post-operative symptoms scores and pre-operative ($z=-5.16$, $p<0.001$)(with while company).

Table 2. Classification of Styloid Process According to Length and Angle Values.

Variables	Frequency		Percentage(%)	
Length(cm)	Right	Left	Right	Left
2.5 to 4	31	33	79.48	84.61
>4	8	6	20.51	15.38
Angle(°)				
<65	11	5	28.20	12.82
65-70	13	13	33.33	33.33
70-80	6	18	15.38	46.15
>80	9	3	23.07	7.69

DISCUSSION

The symptoms associated with Eagle's syndrome may be due to compression of glossopharyngeal nerve, impingement on the carotid vessels by the elongated styloid process producing irritation of the sympathetic nerves in the arterial sheath or stretching and fibrosis of the IXth cranial nerves in the post tonsillectomy period.[10-12] Sometimes, traumatic fracture of styloid process may also lead to proliferation of granulation tissue that causes pressure on surrounding structures.[13]

The diagnosis and treatment of Eagle's syndrome pose a challenge due to its vague symptomatology and requires vigilance. Eagle's syndrome can be diagnosed by conventional radiographic techniques like orthopantomogram, Towne's radiograph, mandibular true occlusal view, lateral oblique view of mandible. Also barium swallow studies can show indentation of styloid process as a filling defect.[4] However, there are several limitations of conventional radiographs, in particular panoramic films, including superimposition of several osseous structures, and distortion and magnifications secondary to angulations.[14]

3D CT reconstruction of elongated styloid process avoids all these drawbacks and helps in accurate measurement of length, medial angulation and relation of the styloid process with the important surrounding structures. The use of 3D CT has become a useful adjunct in the diagnosis and management of this condition. It is a valuable tool for pre-surgical planning, documentation and counseling of patients. It is also useful in training surgeons and comparing the pre and post operative images to assess the impact of surgery.[8,15] Another advantage of the 3D CT images is, of course, 3D length measurements, which are impossible in 2D images such as in coronal or axial planes. In cross sectional imaging, even in coronal plane, most of the time the images will not be parallel to the styloid process, which

leads to underestimation of the actual length of the styloid process.[8]

The limitations of 3D CT imaging are (a) slight movement can degrade the images and (b) a slightly higher radiation dose is required, depending upon the number of sections taken.[16] The expertise of the radiologist imaging the specific site and reconstructing the images, as requested by the surgeon and the cost of imaging procedure can sometimes be a limiting factor.[8]

In this study, we found a statistically significant difference in styloid process length between genders. Females had longer styloid processes as compared to males ($p < 0.05$). Our results are similar to study performed by Bafaqeeh.[17] The reason behind this could be because we had included highly symptomatic group of patients with elongated styloid process length more than 2.50 cm as Bafaqeeh did in his study. However, our results are in contrast to some other authors who observed that there was no gender predilection for differences in length.[9,18-20] This may be due to the fact that these authors have randomly selected asymptomatic group of patients who underwent CT evaluation for different reasons other than Eagle's syndrome (cholesteatoma, tinnitus, chronic otitis media and evaluation of skull base for dental purposes) unlike our patients with highly symptomatic elongated styloid processes. This could also be due to racial and geographical variations.

We observed that six patients despite having very long styloid process of 3.50-4 cm were less symptomatic as compared to others with styloid process length of 2.50-3 cm. This could be explained by the fact that even though the styloid process was short, it was more medially angulated. This explains why severity of symptoms depends not only on factors like length but also on medial angulation. Our results are comparable with study performed by Bakesim et al.[21] The same could have been true with the female population in our study group, who presented with more medially angulated and elongated styloid processes as compared to male group of patients, accounting for higher preoperative symptom scores.

In the study performed by Basekim et al, found that the styloid process lengths varied between 1.58 and 5.48 cm, and the angles between the line connecting the base of the styloid process and the axis (transverse angle) were between 60.60° and 84.10°.[21] Onbas et al reported that the length of the bony styloid process on both sides ranged from 0 to 6.20 cm and the angulations from 55° to 90.50° in the transversal plane.[22] Ilgüy et al in their study showed that the mean length of stylohyoid complex was 2.82 cm for males and 2.25 cm for females.[23] The mean MLA (mediolateral angle) value was 66.4° ± 6.70°. In our study, we found that the length of styloid processes ranged from 2.30 to 4.80 cm on right side and 2.00 to 5.10 cm (mean 3.47 cm) on the left side whereas the medial angulation ranged from 56° to 88° on the right side and 54° to 88° on the left side.

Kosar MI in their study found a significant difference between the right side medial angulation and left side medial angulation in all persons ($p < 0.05$). Nayak et al found a statistically significant difference ($p=0.002$) in the medial angulation on the left side.[8,24] However, Onbas et al did not find any difference between the two sides in terms of angulation of styloid process.[22] In our study, when the medial angulation of styloid process was correlated between the two sides, significant positive correlation was seen ($\rho =0.81, p<0.001$).

To the best of our knowledge, this is the first study which documents the prevalence of length and angulation pattern of elongated styloid process in Nepalese population .There is no published literature concerning the comparison between the preoperative and postoperative symptom scores in the past. In our study, when the pre and post-operative symptoms scores were compared with each other, significant difference was observed ($z=-5.16$, $p<0.001$).

CONCLUSION

Possibility of Eagle's syndrome should always be considered while examining patients with vague neck pain. The diagnosis relies on history, palpation of the elongated styloid process in the tonsillar fossa, alertness of surgeon to diagnostic possibility and imaging.3D CT scan can be considered as a gold standard investigation for diagnosis as it helps in evaluation of the length, medial angulation, relation of the styloid process with the nearby structures and better explanation of the condition to patients.

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