



## Original Research Article

## Eagle syndrome- An underdiagnosed diagnosis

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## ABSTRACT

Eagle syndrome occurs when an elongated styloid process or calcified stylohyoid ligament causes recurrent throat pain or foreign body sensation, dysphagia, or facial pain. Diagnosis is usually made on physical examination by digital palpation of styloid process in tonsillar fossa.

**Aim:** To study the significance of chronic throat pain and elongated styloid process.

**Materials and Methods:** 60 patients with chronic throat pain (excluding other causes) were assessed by palpation of styloid process was recorded according to age, gender of patients. The prevalence of elongated styloid process in age groups and gender determined correlation and significance of chronic throat pain, along with palpable styloid process in tonsillar fossa and length of styloid process in tonsillar fossa and length of styloid process was determined. **Results:** The maximum number of patients having chronic throat pain were between 40-49 years age group. The male to female ratio was 0.62:1. The prevalence of elongated styloid process was seen more in 50-70 years of age. There was a higher prevalence of elongated styloid process with moderate to severe pain. 76% patients with elongated styloid process had tonsillar fossa tenderness. 96.4% of patients with elongated styloid process had palpable styloid process in tonsillar fossa.

**Conclusion:** There is a significant correlation between patients having chronic throat pain and elongated styloid process. X ray Skull-Towne's view is very cost effective as a baseline radiological investigation to diagnose elongated styloid process in patients with chronic throat pain for which cause is unknown.

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## 1. Introduction

Styloid in Greek: Stylos meaning pillar which is a cylindrical cartilaginous sharp projection of bone located on the inferior aspect of temporal bone, posterior to mastoid apex, anteromedial to the stylomastoid foramen and lateral to jugular foramen and carotid canal. Medial to the SP is internal jugular vein along with 7<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> cranial nerves. The tip of the styloid process is close to the external carotid artery and accompanying sympathetic chain.<sup>1</sup> It is derived from Reichert's cartilage of second branchial arch. The normal length of styloid process is 20 to 30 mm.<sup>2</sup>

In 19<sup>th</sup> century, Eagle described symptoms indicative of styalgia due to an elongated styloid process or calcified stylohyoid ligament as recurrent throat pain, foreign body sensation in throat, difficulty in swallowing or facial pain. In addition to this symptoms may include neck or throat pain radiating to the ipsilateral ear. When the symptoms are associated with elongation of styloid process, the condition is termed as Eagle syndrome.<sup>3</sup>

The diagnosis of Eagle's syndrome can be made based on the case history, production of these symptoms during palpation of tonsillar fossa. It is confirmed by an X-ray skull in antero-posterior and lateral skull radiograph showing elongated styloid process.<sup>4</sup>

The purpose of our study was to study significance of chronic throat pain and elongated styloid process.

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## 2. Aims and Objectives

1. To study the prevalence of elongated styloid process in patients having chronic throat pain
2. To study significance of length of styloid process in relation to throat pain

## 3. Materials and Methods

The study was a prospective observational study comprising of study group with patients having chronic throat pain and tenderness in tonsillar fossa. The study was conducted over 2 years from February 2018 to January 2020.

### 3.1. Inclusion criteria

1. Patients having chronic throat pain.
2. Patients above 18 years of age
3. Both males and females.

### 3.2. Exclusion criteria

1. Patients having acute or chronic tonsillitis.
2. Patients having peritonsillitis.
3. Patients having ulcer on anterior pillar or tonsils
4. Pregnant women.

### 3.3. Methodology

The study was conducted in 60 patients presenting to ENT outpatient department for chronic throat pain.

A detailed history was taken regarding the onset, nature and duration of throat pain and associated symptoms. Routine clinical ear nose throat examination was done. Pain assessment was performed using a visual analogue scale (VAS), a numerical pictograph objective tool often employed for the measurement of pain severity. Patients were asked to indicate the severity of pain felt ranging from 0 (meaning no pain) to 10 (meaning severe intolerable pain) Both the tonsillar fossae palpated to look for the tenderness and the styloid process. X-ray Skull Towne's view was done in all these patients. On X ray patients showing more than 3cm(30mm)diagnosed as Eagle syndrome.

We treated the patients with standard treatment like oral carbamazepine. Those patients with no relief on conservative management were advised surgery. The treatment part was not included in our study.

### 3.4. Statistical analysis

Data analysis and all statistical tests were performed using SPSS 22.0 (IBM Corporation, USA) for MS Windows. All data was presented as means and standard deviation. The inter-group statistical comparison of distribution of categorical variables is tested using Chi-Square test or Fisher's exact probability test. p-values less than 0.05 are considered to be statistically significant. All the hypotheses

were formulated using two tailed alternatives against each null hypothesis (hypothesis of no difference).

## 4. Observations

**Table 1:** Age distribution of cases studied (n=60).

Age group (years)	No. of cases	% of cases
20 – 29	6	10.0
30 – 39	15	25.0
40 – 49	25	41.7
50 – 59	10	16.7
60 – 69	4	6.7
Total	60	100.0

Of 60 cases studied, 6 (10.0%) had their age between 20 – 29 years, 15 (25.0%) had age between 30 – 39 years, 25 (41.7%) had age between 40 – 49 years, 10 (16.7%) had age between 50 – 59 years, 4 (6.7%) had age between 60 – 69 years.

The mean  $\pm$  SD of age of cases studied was  $42.98 \pm 9.69$  years and the minimum – maximum age range was 27 – 66 years.

**Table 2:** Sex distribution of cases studied (n=60).

Sex	No. of cases	% of cases
Male	23	38.3
Female	37	61.7
Total	60	100

Of 60 cases studied, 23 (38.3%) were males and 37 (61.7%) were females. In the entire study group, the male to female sex ratio was 0.62 : 1.00.

Of 60 cases studied, 14 (23.3%) had normal styloid process and 46 (76.7%) had elongated styloid process on the right side assessed in the study group.

Of 60 cases studied, 20 (33.3%) had normal styloid process and 40 (66.7%) had elongated styloid process on the left side assessed in the study group.

Of 120 total assessments done, 34 (28.3%) had normal styloid process and 86 (71.7%) had elongated styloid process on either sides assessed in the study group.

### 4.1. Distribution of prevalence of elongated styloid process (right side) according to age:

Distribution of prevalence of elongated styloid process (right side) differs significantly according to various age groups in the study group (P-value<0.001).

### 4.2. Distribution of prevalence of elongated styloid process (left side) according to age:

Distribution of prevalence of elongated styloid process (left side) differs significantly according to various age groups in the study group (P-value<0.001).

**Table 3:** Distribution of prevalence of elongated styloid process in the study group (n=60).

	Styloid Process					
	Normal (n=34)		Elongated (n=86)		Total (n=120)	
	No. of cases	% of cases	No. of cases	% of cases	No. of cases	% of cases
Right	14	23.3	46	76.7	60	100.0
Left	20	33.3	40	66.7	60	100.0
Overall (Total assessments)	34	28.3	86	71.7	120	100.0

**Table 4:** Distribution of prevalence of elongated styloid process according to age (n=60).

Age group (years)	Styloid Process											
	Right		Left				Overall (total assessments)					
	Normal	Elongated	Normal	Elongated	Normal	Elongated	Normal	Elongated	Normal	Elongated		
	n	%	n	%	n	%	n	%	n	%	n	%
20 – 29 (n=6)	6	100.0	0	0.0	6	100.0	0	0.0	12	100.0	0	0.0
30 – 39 (n=15)	4	26.7	11	73.3	5	33.3	10	66.7	9	30.0	21	70.0
40 – 49 (n=25)	4	16.0	21	84.0	5	20.0	20	80.0	9	18.0	41	82.0
50 – 59 (n=10)	0	0.0	10	100.0	3	30.0	7	70.0	3	15.0	17	85.0
60 – 69 (n=4)	0	0.0	4	100.0	1	25.0	3	75.0	1	12.5	7	87.5
Total	14	23.3	46	76.7	20	33.3	40	66.7	34	28.3	86	71.7
P-value	0.001***		0.001***				0.001***					

P-value by Chi-Square test. P-value<0.05 is considered to be statistically significant. \*\*\*P-value<0.001.

**Table 5:** Distribution of prevalence of elongated styloid process according to sex (n=60).

Sex	Styloid Process											
	Right		Left				Overall (total assessments)					
	Normal	Elongated	Normal	Elongated	Normal	Elongated	Normal	Elongated	Normal	Elongated		
	n	%	n	%	n	%	n	%	n	%	n	%
Male (n=23)	4	17.4	19	82.6	5	21.7	18	78.3	9	19.6	37	80.4
Female (n=37)	10	27.0	27	73.0	15	40.5	22	59.5	25	33.8	49	66.2
Total	14	23.3	46	76.7	20	33.3	40	66.7	34	28.3	86	71.7
P-value	0.391 <sup>NS</sup>		0.133 <sup>NS</sup>				0.093 <sup>NS</sup>					

P-value by Chi-Square test. P-value<0.05 is considered to be statistically significant. NS - Statistically non-significant.

**4.3. Distribution of prevalence of elongated styloid process (both right and left side combined) according to age:**

Distribution of prevalence of elongated styloid process (both right and left side combined) differs significantly according to various age groups in the study group (P-value<0.001).

**4.4. Distribution of prevalence of elongated styloid process (right side) according to sex:**

Distribution of prevalence of elongated styloid process (right side) did not differ significantly between group of male and group of female cases studied in the study group (P-value>0.05).

**4.5. Distribution of prevalence of elongated styloid process (left side) according to sex:**

Distribution of prevalence of elongated styloid process (left side) did not differ significantly between group of male and group of female cases studied in the study group (P-value>0.05).

**4.6. Distribution of prevalence of elongated styloid process (both right and left side combined) according to sex:**

Distribution of prevalence of elongated styloid process (both right and left side combined) did not differ significantly between group of male and group of female cases studied in the study group (P-value>0.05).

**Table 6:** Distribution of prevalence of elongated styloid process according to level of pain (n=60).

Side	Pain Level	Styloid Process				Total	P-value		
		Normal		Elongated					
		n	%	n	%				
Right	Mild	11	91.7	1	8.3	12	100.0	0.001***	
	Moderate	3	7.0	40	93.0	43			100.0
	Severe	0	0.0	5	100.0	5			100.0
Left	Mild	14	93.3	1	6.7	15	100.0	0.001***	
	Moderate	6	15.8	32	84.2	38	100.0		
	Severe	0	0.0	7	100.0	7	100.0		
Overall	Mild	25	92.6	2	7.4	27	100.0	0.001***	
	Moderate	9	11.1	72	88.9	81	100.0		
	Severe	0	0.0	12	100.0	12	100.0		

P-value by Chi-Square test. P-value<0.05 is considered to be statistically significant. \*\*\*P-value<0.001.

#### 4.7. Distribution of prevalence of elongated styloid process (right side) according to level of pain:

Distribution of prevalence of elongated styloid process (right side) differs significantly across three levels of pain in the study group (P-value<0.001). Distribution of prevalence of elongated styloid process (right side) is significantly higher among the group of cases with moderate to severe pain score compared to group of cases with mild level of pain (P-value<0.001).

#### 4.8. Distribution of prevalence of elongated styloid process (left side) according to level of pain:

Distribution of prevalence of elongated styloid process (left side) differs significantly across three levels of pain in the study group (P-value<0.001). Distribution of prevalence of elongated styloid process (left side) is significantly higher among the group of cases with moderate to severe pain score compared to group of cases with mild level of pain (P-value<0.001).

#### 4.9. Distribution of prevalence of elongated styloid process (both right and left side combined) according to level of pain:

Distribution of prevalence of elongated styloid process (both right and left side combined) differs significantly across three levels of pain in the study group (P-value<0.001). Distribution of prevalence of elongated styloid process (both right and left side combined) is significantly higher among the group of cases with moderate to severe pain score compared to group of cases with mild level of pain (P-value<0.001).

#### 4.10. Distribution of prevalence of elongated styloid process (right side) according to Tonsillar fossa tenderness:

Distribution of prevalence of elongated styloid process (right side) is significantly higher in group of cases with presence of Tonsillar fossa tenderness compared to group of cases without Tonsillar fossa tenderness in the study group (P-value<0.01).

#### 4.11. Distribution of prevalence of elongated styloid process (left side) according to Tonsillar fossa tenderness:

Distribution of prevalence of elongated styloid process (left side) is significantly higher in group of cases with presence of Tonsillar fossa tenderness compared to group of cases without Tonsillar fossa tenderness in the study group (P-value<0.01).

#### 4.12. Distribution of prevalence of elongated styloid process (both right and left side combined) according to Tonsillar fossa tenderness:

Distribution of prevalence of elongated styloid process (both right and left side combined) is significantly higher in group of cases with presence of Tonsillar fossa tenderness compared to group of cases without Tonsillar fossa tenderness in the study group (P-value<0.001).

#### 4.13. Distribution of prevalence of elongated styloid process (right side) according to Tonsillar fossa palpable styloid:

Distribution of prevalence of elongated styloid process (right side) is significantly higher in group of cases with presence of Tonsillar fossa palpable styloid compared to group of cases without Tonsillar fossa palpable styloid in

**Table 7:** Distribution of prevalence of elongated styloid process according to Tonsillar fossa tenderness (n=60).

Side	Tonsillar fossa tenderness	Styloid process				Total	P-value	
		Normal		Elongated				
		n	%	n	%			
Right	Yes	10	18.2	45	81.8	55	100.0	0.009**
	No	4	80.0	1	20.0	5	100.0	
Left	Yes	16	28.6	40	71.4	56	100.0	0.010**
	No	4	100.0	0	0.0	4	100.0	
Overall	Yes	26	23.4	85	76.6	111	100.0	0.001***
	No	8	88.9	1	11.1	9	100.0	

**Table 8:** Distribution of prevalence of elongated styloid process according to Tonsillar fossa palpable styloid (n=60).

Side	Tonsillar fossa palpable styloid	Styloid process				Total	P-value	
		Normal		Elongated				
		n	%	n	%			
Right	Yes	0	0.0	43	100.0	43	100.0	0.001***
	No	14	82.4	3	17.6	17	100.0	
Left	Yes	3	7.3	38	92.7	41	100.0	0.001***
	No	17	89.5	2	10.5	19	100.0	
Overall	Yes	3	3.6	81	96.4	84	100.0	0.001***
	No	31	86.1	5	13.9	36	100.0	

P-value by Chi-Square test (Fisher’s exact probability test). P-value<0.05 is considered to be statistically significant. \*\*\*P-value<0.001.

the study group (P-value<0.001).

**4.14. Distribution of prevalence of elongated styloid process (left side) according to Tonsillar fossa palpable styloid:**

Distribution of prevalence of elongated styloid process (left side) is significantly higher in group of cases with presence of Tonsillar fossa palpable styloid compared to group of cases without Tonsillar fossa palpable styloid in the study group (P-value<0.001).

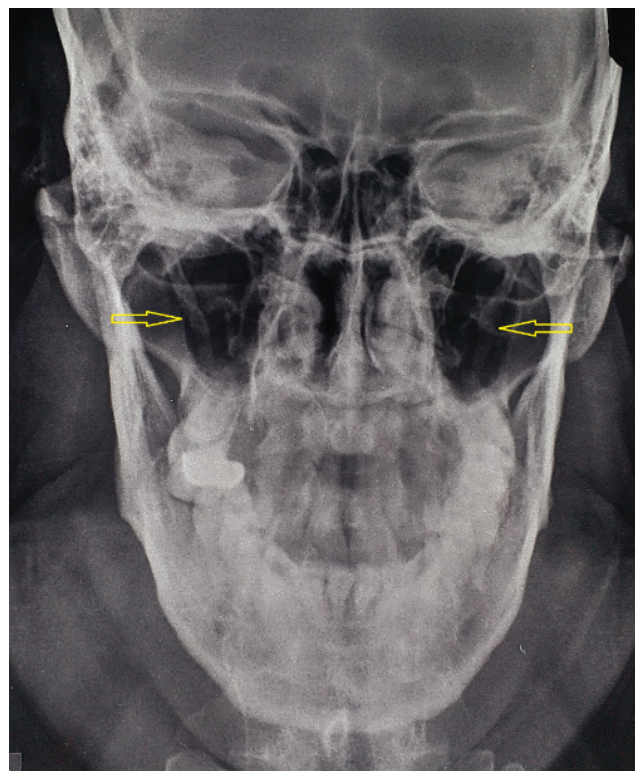
**4.15. Distribution of prevalence of elongated styloid process (both right and left side combined) according to Tonsillar fossa palpable styloid:**

Distribution of prevalence of elongated styloid process (both right and left side combined) is significantly higher in group of cases with presence of Tonsillar fossa palpable styloid compared to group of cases without Tonsillar fossa palpable styloid in the study group (P-value<0.001).

**5. Discussion**

This study mainly focusses on to study the prevalence of elongated styloid process (>30 mm) in patients having chronic throat pain.

We studied 60 cases with each side amounting to 120 observations. The maximum patients were in the age group



**Fig. 1:** X Ray Skull townes view. (Yellow arrow showing elongated styloid process).

of 40-49 years of age (41.7%). In a study conducted by M Ilgüy and N Güler the mean age of the patients with elongated styloid process were  $43 \pm 14$  years.<sup>5</sup>

In our study 37 out of 60 patients were females (61.7%) and 23 were males.

Among 120 assessment, 86 had elongated styloid process, out of which maximum were female i.e. 49(66.2%). But there was no statistical significance(0.093)

We did Xray skull Towne's view of patients having chronic throat pain and/or tonsillar fossa tenderness. Among 60 cases studies (i.e. 120 assessments, right and left side), 34(28.3%) had normal styloid process and 86(71.7%) had elongated styloid process on either side. Among 86 having elongated styloid process, 49 were females and 37 were male patients suggesting female preponderance for elongated styloid process. In a study conducted by Risto Härmä (1967) with Styalgia in 52 cases, there were 32 women and 21 men consistent with our findings.<sup>6</sup>

We studied correlation between elongated styloid process (>30mm) on Xray Skull Towne's view and level of pain. We found that the prevalence of elongated styloid process (both right and left side combined) is significantly higher among the groups of cases with moderate to severe pain score compared to group of cases with mild pain level.( $P < 0.001$ ).

We also correlated between elongated styloid process and tonsillar fossa tenderness and found that there is statistical significance ( $P < 0.001$ ).

It was observed that the patients having palpable styloid process in the tonsillar fossa, had elongated styloid process (On Xray Skull Towne's view) ( $P < 0.001$ ).

Giovanni Bruno et al conducted an epidemiological study by digital panoramic radiographs of 1003 Italian patients between 5 and 90 years of age. In their study 33.40% of patients showed an elongated styloid process.<sup>2</sup>

Among 120 assessments (60 cases) mean  $\pm$  SD length of styloid process was  $3.43 \pm 0.84$  cm.

Azin Shayganfar et al, in their retrospective study, radiological evaluation of styloid process length using 64 row multidetector computed tomography scan in 393 patients who suffered from trauma. They found mean length of styloid process was  $25.3 \pm 7.1$ mm. The length of styloid process is in association with height and number of symptoms as well.<sup>7</sup>

It is our pilot study showing correlation of chronic throat pain and prevalence of elongated styloid process.

## 6. Conclusion

Our study suggests that there is a significant correlation between patients having chronic throat pain (after excluding other causes) and elongated styloid process.

We found Xray Skull Towne's view, a baseline radiological investigation to diagnose elongated styloid process (Eagle syndrome) very cost effective, rather than doing multi slice CT scan, digital panoramic radiographs.

Though the present study does not have a large number of cases, we recommend that we should always have a perspective regarding stylalgia (Eagle syndrome) in patients having chronic throat pain.

## 7. Source of Funding

None.

## 8. Conflict of Interest

None.

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