International Journal of Otorhinolaryngology and Head and Neck Surgery
Gandham M et al. Int J Otorhinolaryngol Head Neck Surg. 2025 Jun;11(3):221-225
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937
DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20251500

Original Research Article

Post-operative evaluation of Eagle's syndrome and comparison of symptomatic relief with styloid excision versus styloid fracture

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Received: 06 December 2024
Revised: 17 March 2025
Accepted: 18 March 2025

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ABSTRACT

Background: This study was done to evaluate symptomatic relief of patients with Eagle's syndrome post-surgical treatment, and to compare the symptomatic relief in the styloid process excision with fracture of styloid process transorally.
Methods: A sample size of 25 patients was taken and each patient was counselled regarding surgical treatment: styloid process excision (styloidectomy), or fracture of styloid process, using transoral approach. Patients were then followed up and evaluated based on symptomatic relief, particularly pain while swallowing and throat pain using numerical rating scale.
Results: Majority of participants (56.8%) were in the 31-40 age range. The sample was predominantly female, comprising 86.4% of the participants, while males comprised 13.6%. All participants reported throat pain as their primary complaint. Radiating pain varied, with 43.2% of participants reporting headaches, followed by pain radiating to the ear (11.4%) and the jaw (4.5%). The preoperative pain levels were at a mean of 7.70±1.11, which decreased post operatively to 7.11±1.13 on day 0, 4.55±1.61 on day 7, and 3.73±1.91 after 12 weeks. There was no statistically significant difference in the mean reduction of numeric rating scale (NRS) scores between the excision and fracture groups (p=0.868).
Conclusions: Styloidectomy is an effective method for treating Eagle's syndrome. Both styloid process excision and fracture of styloid process, through transoral route, are equally effective in providing symptomatic relief to patients with Eagle's syndrome.

Keywords: Eagle's syndrome, Excision, Fracture, Styalgia, Styloidectomy

INTRODUCTION

Styalgia is a type of neuralgia arising due to elongated styloid process or mineralization of stylohyoid ligament.[1] Styloid process is considered to be elongated if it is greater than 4 cm in length, as compared to the normal length of approximately 2.5 cm.[2] As the condition was first described by Eagle in 1937, it eventually came to bear his name.

There are various mechanisms to explain the symptom of pain experienced by individuals diagnosed with styalgia, some of which are compression of the hypoglossal nerve, impingement of the carotid vessels and inflammation at stylohyoid ligament insertion. The individuals present with a cluster of symptoms such as dull pharyngeal pain in tonsillar fossa, radiating to ipsilateral ear, odynophagia or foreign body sensation in throat.

An elongated styloid process can be palpated by intraoral palpation where the examiner places the index finger in the tonsillar fossa and applies gentle pressure. If the pain is reproduced by palpation and either referred to the ear, face, or head, the diagnosis of an elongated styloid process is

most likely. A styloid process of normal length is usually impalpable.

The diagnosis of the elongated styloid process is then confirmed by imaging. It can be diagnosed on orthopantomography, X ray Towne's view or computed tomography (CT) scan.

Surgical reduction of the styloid process is considered the preferred treatment.[3,9] Excision can be performed either transorally through the tonsillar fossa or via an external transcervical approach.

Objectives

To evaluate postoperative symptomatic relief in patients diagnosed with Eagle's syndrome, and to compare the same in those who underwent styloid process excision with those who underwent controlled fracture of styloid process.

METHODS

Source of data

This study was designed as a comparative study and was conducted at Bapuji Hospital and Chigateri District Hospital, Davangere (teaching hospitals affiliated to J. J. M. Medical College, Davangere) between September 2023 to November 2024. Twenty-five patients, of either sex, between the ages of 18 years to 60 years were recruited by consecutive sampling.

Inclusion criteria

Male and female patients aged above 18 years, patients with odynophagia, referred otalgia, elongated styloid process on Towne's view X-ray, palpable elongated styloid process, and patients who are willing to take part in the study in a fully conscious and oriented state of mind were included.

Exclusion criteria

Patients below 18 years of age, uncontrolled hypertension, uncontrolled type 2 diabetes mellitus, bleeding disorders, Down syndrome, and patients with acute tonsillitis/acute pharyngitis/acute upper respiratory tract infection were excluded.

Methodology

Patients attending ENT OPD who fulfil both the inclusion and exclusion criteria, who were consenting to participate in this study where included. After obtaining a written and informed consent patients were counselled about the condition and educated about their diagnosis along with the benefits and risks of surgical management.

Patients were assessed based on symptom severity, with focus upon painful swallowing, that is, odynophagia. Assessment of odynophagia was done with numerical rating scale (NRS), in which a rating of 0 would indicate that there was no pain while swallowing, 1-3 indicated there was mild pain, 4-6 as moderate, and finally, 7-10 indicated there was severe odynophagia.

Those counselled and willing for surgical management were made aware of the need for styloidectomy under general anaesthesia, the procedure, risks and complications of surgery. They were once again assessed on post-operative day 0, 1 week and 12 weeks following surgery, having followed the same analgesic regimen.

A subset analysis was done comparing the postoperative pain relief following excision of elongated styloid process versus fracturing of elongated styloid process within the tonsillar fossa.

The decision for either styloid excision or styloid process fracture was done based on the length of styloid process as well as the surgical expertise and facility available at the treatment centre.

The study was done conforming to ethical standards.

Sample size and statistical analyses

About 4% of population have an elongated styloid process, and about 4% of this population present with symptoms of Eagle's syndrome.[3] Sample size was estimated and 25 patients who presented to the ENT OPD at the study centre, fulfilling all inclusion and exclusion criteria were recruited.

Statistical analyses were performed using IBM statistical package for the social sciences (SPSS) Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

RESULTS

Results on continuous measurement are presented as mean±SD/median (interquartile range) and categorical as frequency (percentage). A comparison of NRS values over time was done using the Friedman test. A p value less than 0.05 was considered statistically significant.

The age distribution shows that the majority of participants (56.8%) were in the 31-40 age range. The distribution skews towards younger adults, with fewer participants aged 41-50 (18.2%) and even fewer in the 51-60 range (4.5%). The 21-30 age group accounted for 20.5% of the total. The sex distribution highlights that the sample was predominantly female, comprising 86.4% of the participants, while males only comprised 13.6% (Table 1).

All participants (100%) reported throat pain as their primary complaint, followed closely by odynophagia (95.2%), indicating that these symptoms were highly

prevalent among the study group. Dysphagia was less common, reported by only 18.2% of participants.

Table 1: Age and sex distribution of the study participants (n=25), total elongated styloid processes=44).

Variables	Frequency	Percentage
Age (years)		
21-30	9	20.5
31-40	25	56.8
41-50	8	18.2
51-60	2	4.5
Total	44	100
Range	28-53	
Mean±SD	36.95±6.25	
Sex		
Female	38	86.4
Male	6	13.6
Total	44	100

Radiating pain varied, with 43.2% of participants reporting headaches, followed by pain radiating to the ear (11.4%) and the jaw (4.5%). Notably, 40.9% of participants reported no radiating pain, showing that while some experienced related symptoms, a significant portion did not (Table 2).

Most participants (86.4%) had bilateral ESP, 9.1% had unilateral left-side involvement, and 4.5% had unilateral right-side involvement. This suggests that bilateral involvement was a common presentation among participants.

Surgical intervention was predominantly bilateral, with 75% of participants undergoing bilateral procedures. Unilateral surgeries were less common, with 9.1% performed on the left side and 15.9% on the right (Table 3).

NRS scores significantly improved over time, with preoperative pain levels at a mean of 7.70±1.11. Postoperative scores decreased to 7.11±1.13 on day 0, 4.55±1.61 on day 7, and 3.73±1.91 after 12 weeks. The consistent decrease indicates effective pain management post-surgery, with a p value of 0.001 showing statistical significance.

Table 2: Frequency of presenting complaints and site of radiating pain experienced by the study participants.

Variables	Frequency	Percentage
Chief complaint		
Throat pain	44	100
Odynophagia	42	95.2
Dysphagia	8	18.2
Radiating pain		
Headache	19	43.2
Ear	5	11.4
Jaw	2	4.5
None	18	40.9

Table 3: Frequency of incidence of side of ESP and side on which surgery was performed.

Variables	Frequency	Percentage
Side of ESP		
Bilateral	38	86.4
Unilateral left	4	9.1
Unilateral right	2	4.5
Total	44	100
Side of surgery		
Bilateral	33	75
Unilateral left	4	9.1
Unilateral right	7	15.9
Total	44	100

The mean length of the styloid process was similar for both sides, with the right side at 3.56±0.65 cm and the left at 3.51±0.62 cm (Table 4). The Mann-Whitney U test indicates that there is no statistically significant difference in the mean reduction of NRS scores between the "excision" and "fractured" groups (p=0.868). This suggests that both treatment methods result in similar reductions in NRS scores, implying comparable effectiveness in terms of pain reduction (Table 6).

Table 4: Median length of styloid process on either side and comparison of pain experienced in numerical rating scale pre and post operatively.

Variables	N	Mean length (in cm)	SD (in cm)	Range (in cm)	Median (in cm)	IQR (in cm)	P value
Styloid process							
Right	44	3.56	0.65	1.80-4.5	3.70	2.98-4.1	
Left	44	3.51	0.62	2.4-4.5	3.50	2.85-4.0	
NRS							
Preop	44	7.70	1.11	5-9	8.0	7-9	0.001*
Postop day 0	44	7.11	1.13	3-9	7.0	7-8	
Postop day 7	44	4.55	1.61	2-7	4.50	3-6	
Postop 12 weeks	44	3.73	1.91	1-7	3.50	2-5	

*P value statistically significant; Friedman test, IQR: interquartile range

Table 5: Frequency of two methods of styloidectomy performed.

Styloidectomy	Frequency	Percentage
Excision	20	45.5
Fractured	24	54.5
Total	44	100

Table 6: Mean reduction in NRS score.

Reduction in NRS score	N	Mean	P value
Excision	20	4.10±2.24	0.868
Fractured	24	3.88±2.74	

DISCUSSION

The styloid process is a slender bone projecting from base of temporal bone posterior to mastoid tip. Embryologically, it is derived from the cartilage of second branchial arch, the Reichert's cartilage, which can be developed into tympanohyal, stylohyal, ceratohyal and hypohyal segments. The stylohyal segment of Reichert's cartilage develops into the proximal segment of styloid process and stapes, and similarly, the stylohyal segment into the distal segment of styloid process. The ceratohyal segment degenerates in utero to form the stylohyoid ligament, whereas, the hypohyal segment forms the lesser cornu of hyoid.[4]

The styloid apparatus or the Riolan's bouquet consists of the styloid process and its attachments, which are the stylohyoid and stylomandibular ligaments, and the stylohyoid, styloglossus and stylopharyngeus muscles.[5]

Eagle's syndrome can be of two types- the classic type and the stylo-carotid artery type. The cause of classic type being compressive cranial neuropathy, most often of the trigeminal, facial, glossopharyngeal and vagus cranial nerves, which clinically presents as odynophagia and dysphagia. The carotid type is attributed to pressure over the internal carotid artery which results in headache in the parietal and superior orbital regions. In addition, pressure over carotid can cause visual symptoms and syncope due to interruption of blood flow.[6]

This study was conducted in Department of Otorhinolaryngology and Head and Neck Sciences, J. J. M. Medical College, in Bapuji Hospital and Chigateri General Hospital, from the September 2023 to November 2024. A total of 25 patients were diagnosed and studied based on their symptomatology and severity based on numerical rating scale. The study showed that the participants were aged between 31 and 40 years and were predominantly female, with mean age of 36.95 years and standard deviation of 6.25 years. All of them presented with throat pain as most common symptom, with painful swallowing or odynophagia and difficulty swallowing or dysphagia as lesser common symptoms. Furthermore, the pain was noted to radiate and present as headache, ipsilateral ear pain and jaw pain in order of frequency. Presentation of symptoms was bilateral in most participants of the study, therefore, so was the surgical intervention. All participants underwent bilateral tonsillectomy by dissection and snare technique as an intra oral approach to the styloid process.

Sandev et al discovered that 30% men and women have elongated styloid process.[7] Prasad et al found that ESP incidence in men and women with male to female ratio of 1:3, and that the mean age of incidence ranged between 30 and 40 years of age.[8] In our study, a female preponderance was noted and the mean age of incidence was noted to be in the 31-40 years group.

Ceylan et al found that 93.4% of the patients with ESP were symptom free after resection of styloid process. The study however, used the external approach styloid process resection.[9]

Blythe et al reported of a case of Eagle's syndrome as a result of fracture of styloid process which was managed conservatively. The study shows that Eagle's syndrome could in turn, be a sequel of the fracture of styloid process.[10]

Balbuena et al found the mean length of styloid process to be 2.5 cm, and suggested it projects between internal and external carotid arteries just lateral to the tonsil bed.[11] The study done by us however, does not measure and classify the styloid processes with respect to length alone, rather, includes the symptomatic severity on the patient.

Ahmed et al concluded that the orthopantomogram was a sufficient tool for the diagnosis of elongated styloid process and that most often, elongated styloid process is an asymptomatic entity unless associated with craniofacial pain.[12]

Our study is beyond the scope of observation of patients that have not undergone surgical treatment. In other words, there exists a limitation with respect to lack of a control group, that is, patients diagnosed with Eagle's syndrome who have not undergone surgical treatment.

CONCLUSION

In this study, the average length of the styloid process was similar on right and left sides. The NRS scores for pain showed a statistically significant decline in postoperative period compared to preoperative period, that is, from 7.70 to 3.73. 45.5% of participants underwent intraoral excision of styloid process, whereas, 54.5% underwent intraoral fracture of styloid process. However, comparison of reduction in NRS scores on symptomatic relief in excision versus fracture of styloid process revealed that there was no significant difference in the above two methods. Thus, intraoral styloidectomy following tonsillectomy is an effective treatment method in patients with Eagle's syndrome and both the techniques: excision and fracture

of styloid process, are comparable in their success in symptomatic relief.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Gandham M, Dhayalan S, Prakash NS, Swathi Kamal S. Post-operative evaluation of Eagle's syndrome and comparison of symptomatic relief with styloid excision versus styloid fracture, India. Int J Otorhinolaryngol Head Neck Surg 2025;11:221-5.