

Post-Tonsillectomy Chronic Throat Pain: A Radiological Evaluation for Elongated Styloid Process

Taposhi Sarker^{1*}, Akhil Chandra Biswas², Arafat Rahman³, Subir Kumar Das⁴

ARTICLE INFO

Received: 22 Apr 2026
Accepted: 28 Apr 2026
Published Online: 5 May 2026

DOI: 10.5281/zenodo.20050321

Volume: 9, Number: 2, Page: 250-254

e-ISSN: 2789-5912
ISSN: 2617-0817

*Corresponding author



ABSTRACT

Background: Chronic throat pain following tonsillectomy is an under-recognized clinical concern that may be associated with elongation of the styloid process, a condition related to Eagle syndrome. Radiological assessment plays a pivotal role in identifying elongated styloid processes in symptomatic patients, yet limited prospective data exist in the Bangladeshi population. **Objective:** To evaluate the prevalence of elongated styloid process among patients presenting with chronic neck pain after tonsillectomy using radiological imaging. **Methods & Methods:** This prospective cohort study was conducted at Bangladesh Medical College and Hospital, Dhaka, and SENTH of SAHIC from January 2023 to December 2025. A total of 73 patients with a history of tonsillectomy and persistent neck pain for more than three months were enrolled using purposive sampling. Clinical evaluation was followed by radiological assessment with digital X-ray and/or computed tomography to measure styloid process length. Data were analyzed using SPSS version 23.0. **Results:** Among the 73 participants, 46 (63.0%) were female, and 27 (37.0%) were male, with a mean age of 34.8 ± 9.6 years. Radiological evaluation revealed an elongated styloid process in 41 patients (56.2%). Bilateral elongation was observed in 24 (32.9%) cases, while unilateral elongation was found in 17 (23.3%). A significant association was observed between an elongated styloid process and the severity of neck/throat pain ($p=0.01$). **Conclusion:** Elongated styloid process is a common radiological finding in patients with post-tonsillectomy chronic throat pain. Routine radiological screening may facilitate early diagnosis and appropriate management, improving patient outcomes.

Keywords: Chronic throat pain, Eagle syndrome, Elongated styloid process, Radiological evaluation, Tonsillectomy.

1. Associate Professor, Department of Radiology and Imaging, Delta Medical College and Hospital, Dhaka, Bangladesh (ORCID: 0000-0001-6092-6946)
2. Professor, Department of Otolaryngology-Head and Neck Surgery, Bangladesh Medical College Hospital, Dhaka, Bangladesh
3. Assistant Professor, Department of Otolaryngology-Head and Neck Surgery, Ad-Din Medical College and Hospital, Dhaka, Bangladesh
4. Medical Officer, Specialized ENT hospital of SAHIC, Mohakhali, Dhaka, Bangladesh

INTRODUCTION

Tonsillectomy is one of the most commonly performed surgical procedures in otorhinolaryngology and is indicated for recurrent tonsillitis, obstructive sleep apnea, and other chronic inflammatory conditions of the palatine tonsils [1]. Despite being considered a routine and relatively safe intervention, postoperative complications such as hemorrhage, infection, dysphagia, and persistent throat discomfort continue to be reported [2]. Chronic throat/neck pain after tonsillectomy, however, is less frequently discussed and may be overlooked or misdiagnosed as cervical spine pathology or temporomandibular joint dysfunction [3]. Emerging evidence suggests that structural abnormalities, particularly elongation of the styloid process, may contribute to persistent cervicofacial pain in such patients [4]. The styloid process is a slender, pointed osseous projection extending from the inferior aspect of the temporal bone. In adults, its normal length ranges from approximately 20 to 30 mm [5]. Elongation beyond 30 mm, or ossification of the stylohyoid ligament complex, may give rise to a constellation of symptoms collectively referred to as Eagle syndrome [6]. Patients typically present with throat pain, foreign body sensation, dysphagia, otalgia, headache, and radiating neck pain [7]. Depending on the structures

involved, the condition may manifest as the classic form associated with neural irritation or as the vascular type resulting from carotid artery compression [8]. Tonsillectomy has long been recognized as a potential precipitating factor for symptomatic elongated styloid process. Postoperative scarring and fibrosis in the tonsillar fossa may exert traction or compression on adjacent neurovascular structures, particularly the glossopharyngeal nerve [9]. Radiological studies have demonstrated that surgical manipulation may unmask previously asymptomatic elongation, leading to persistent postoperative pain [10]. In addition to neural involvement, vascular compromise has been described in rare cases, including carotid artery irritation and cerebrovascular symptoms [11]. Accurate diagnosis relies heavily on imaging. While panoramic radiography is commonly used as an initial screening modality, computed tomography (CT) provides superior visualization of styloid length, angulation, and its anatomical relationship with surrounding tissues [12]. Three-dimensional CT reconstruction, in particular, enhances diagnostic precision and facilitates surgical planning when intervention is required [13]. The reported prevalence of elongated styloid process varies widely across populations, ranging from 4% to 30%,

although only a small proportion of individuals become symptomatic [6,12]. This discrepancy highlights the importance of correlating radiological findings with clinical presentation. In many settings, especially in developing countries, routine radiological evaluation is not performed for patients presenting with chronic throat/neck pain after tonsillectomy, leading to potential underdiagnosis. In Bangladesh, where tonsillectomy remains a frequently performed procedure, structured prospective data examining the association between chronic postoperative neck pain and elongated styloid process are scarce. Most available literature consists of case reports and small retrospective analyses conducted in other populations [4,9]. Consequently, there is a need for systematic radiological assessment to clarify the clinic radiological relationship in affected patients. Therefore, this study aims to prospectively evaluate the presence of an elongated styloid process in patients presenting with chronic neck pain following tonsillectomy using radiological imaging. Establishing such evidence may improve diagnostic accuracy, guide appropriate management strategies, and reduce long-term morbidity associated with undiagnosed Eagle syndrome.

METHODS & MATERIALS

This prospective cohort study was conducted at Bangladesh Medical College and Hospital, Dhaka, and SENTH of SAHIC from January 2023 to December 2025. A total of 73 patients presenting to the Otolaryngology outpatient department with chronic throat/neck pain following previous tonsillectomy were enrolled. Patients were selected using purposive sampling based on predefined eligibility criteria.

Inclusion criteria

Patients of either sex aged 18 years and above with a documented history of tonsillectomy and persistent neck pain lasting more than three months were included. Participants who provided informed written consent and were willing

to undergo radiological evaluation were enrolled in the study.

Exclusion criteria

Patients with recent cervical trauma, known cervical spine disorders, temporomandibular joint disease, head and neck malignancy, active infection, or systemic inflammatory conditions were excluded. Individuals with incomplete medical records or those unwilling to undergo imaging studies were also excluded.

Study procedure

A detailed clinical history and physical examination were performed for each participant. Pain characteristics, duration, and associated symptoms were recorded.

Radiological evaluation was conducted using digital X-ray and/or computed tomography (CT) scan to measure the length of the styloid process. A styloid process length greater than 30 mm was considered elongated. Bilateral and unilateral elongations were documented accordingly.

Data analysis

Data were entered and analyzed using SPSS version 23.0. Descriptive statistics were calculated for demographic and clinical variables. Associations between the elongated styloid process and severity of neck pain were assessed using appropriate statistical tests, with $p < 0.05$ considered statistically significant.

RESULT

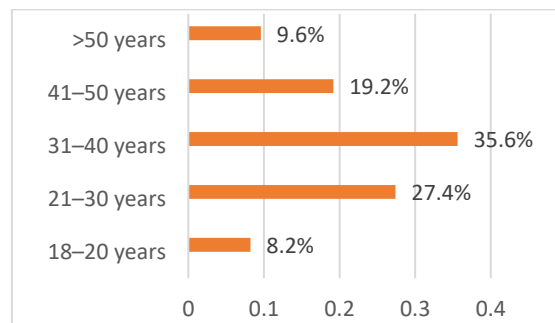


Figure 1 Age distribution of the study population (n=73).

A total of 73 patients with chronic neck pain following tonsillectomy were evaluated. The mean age of the participants was $34.8 \pm$

9.6 years (range: 18–56 years). The majority belonged to the 31–40 years age group

(35.6%), followed by 21–30 years (27.4%) *Figure 1*.

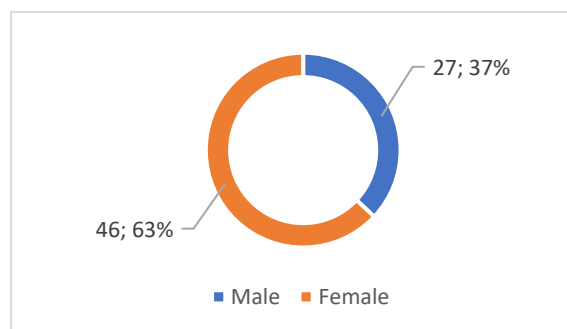


Figure 2 Gender distribution.

Female patients constituted 63.0% (n=46) of the study population, while males accounted for 37.0% (n=27) *Figure 2*.

Regarding duration of symptoms, 41.1% of patients reported pain lasting 3–6 months, 34.2% had symptoms for 7–12 months, and

24.7% experienced pain for more than one year (*Table I*).

Table I

Duration of symptoms.

Duration	n	%
3–6 months	30	41.1
7–12 months	25	34.2
>12 months	18	24.7
Total	73	100

The pain was unilateral in 54.8% of cases and bilateral in 45.2%. Radiological assessment revealed elongated styloid process (>30 mm) in 41 patients (56.2%), while 32 patients (43.8%) had normal styloid length (Table II).

Table II

Radiological findings of the styloid process.

Styloid length	n	%
Normal (≤ 30 mm)	32	43.8
Elongated (>30 mm)	41	56.2
Total	73	100.0

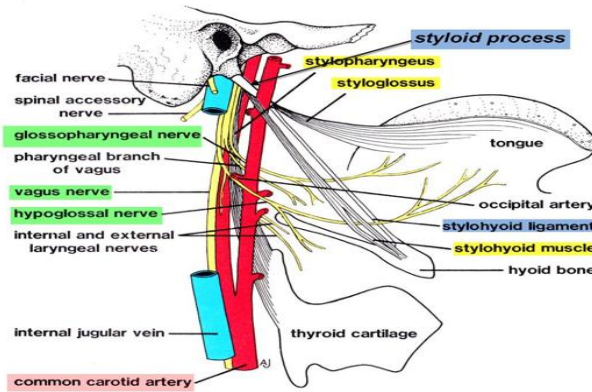


Figure 3 Showing styloid process and its relation.

Figure 3 illustrated the normal anatomical positioning of the styloid process.



Figure 4 Showing elongated styloid process.

In this clinical specimen, a significant elongation of the styloid process is observed. This structural variation demonstrates the abnormal downward extension of the bone, which is the primary anatomical precursor for Eagle's Syndrome (Figure 4).

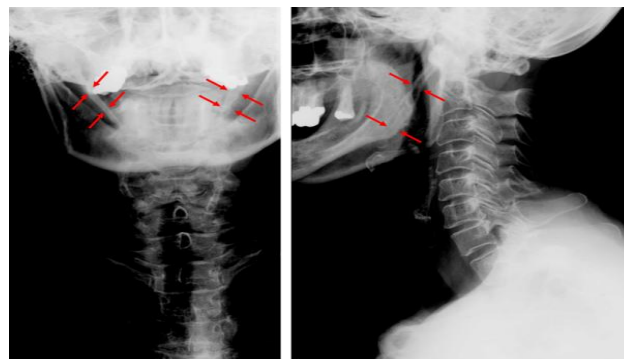


Figure 5 X-ray Neck Both View-Shows elongated styloid process.

The X-ray of the neck (both views) provides a clear radiological confirmation of the condition. The images display a visible, calcified projection extending beyond the physiological limit (typically >30 mm), confirming the presence of an elongated styloid process bilaterally/unilaterally (Figure 5).



Figure 6 CT scan of neck with 3D reconstruction showing elongated styloid process.

The CT scan with 3D reconstruction offers the most definitive visualization. It shows the precise length, angulation, and ossification of the stylohyoid ligament. This high-resolution 3D mapping allows for a

better understanding of how the elongated bone interacts with surrounding soft tissues and vessels (*Figure 6*).

Among patients with an elongated styloid process, 43.9% experienced severe pain, compared to 12.5% in the normal styloid group ($p = 0.003$) *Table III*.

Table III

Association between styloid elongation and pain severity.

Pain Severity	Normal	Elongated
	n (%)	n (%)
Mild	12 (37.5)	4 (9.8)
Moderate	16 (50.0)	19 (46.3)
Severe	4 (12.5)	18 (43.9)

$p = 0.003$, Statistical test used: Chi-square test

Additionally, patients with symptom duration greater than 12 months demonstrated a higher proportion of

elongated styloid processes (72.2%) compared to those with 3–6 months of

symptoms (43.3%), which was also statistically significant ($p = 0.021$) *Table IV*.

Table IV

Association between duration of symptoms and styloid elongation.

Duration	Normal	Elongated
	n (%)	n (%)
3–6 months	17 (56.7)	13 (43.3)
7–12 months	10 (40.0)	15 (60.0)
>12 months	5 (27.8)	13 (72.2)

$p = 0.021$, Statistical test used: Chi-square test

DISCUSSION

The present prospective group study demonstrated that 56.2% of patients presenting with chronic throat/neck pain following tonsillectomy had radiologically confirmed elongated styloid process. This finding supports the growing recognition that Eagle syndrome is an important yet frequently overlooked cause of persistent cervicofacial pain after pharyngeal surgery. Previous literature has emphasized that postoperative discomfort is often attributed to nonspecific causes without detailed structural evaluation [14]. Our findings reinforce the importance of targeted radiological assessment in symptomatic individuals. The predominance of female patients (63.0%) in the present study aligns with earlier reports suggesting a higher frequency of symptomatic elongated styloid process among women [15,16]. Although the gender association was not statistically significant in our analysis ($p=0.284$), the observed trend may reflect sex-related anatomical or hormonal factors influencing

ligamentous ossification. Similar demographic patterns have been documented in radiological prevalence studies conducted in Asian and European populations [17]. The mean age of 34.8 years and the clustering of cases within the third and fourth decades are also consistent with previous studies, which describe Eagle syndrome as more commonly symptomatic in early to middle adulthood [18]. It is hypothesized that progressive ossification of the stylohyoid ligament complex over time may contribute to symptom development, particularly when combined with postoperative fibrosis following tonsillectomy [19]. A key observation in this study was the statistically significant association between elongated styloid process and severity of neck pain ($p=0.003$). Nearly 44% of patients with elongation reported severe pain compared to only 12.5% in the normal styloid group. This finding corroborates earlier clinicroadiological investigations demonstrating a positive correlation

between increased styloid length and symptom intensity [20]. Mechanical irritation of adjacent cranial nerves, particularly the glossopharyngeal nerve, may explain the heightened pain perception in patients with elongated processes [21]. The study also found a significant relationship between longer duration of symptoms and presence of styloid elongation ($p=0.021$). Patients with symptoms exceeding 12 months exhibited the highest proportion of elongation (72.2%). Chronic inflammatory changes and scar tissue formation in the tonsillar bed may exacerbate neural compression over time, thereby sustaining or intensifying symptoms [22]. This observation emphasizes the need for early imaging in patients with persistent postoperative pain rather than prolonged empirical treatment. Radiological evaluation using digital X-ray and CT imaging proved essential for accurate diagnosis. Three-dimensional CT reconstruction, as highlighted in previous studies, provides superior visualization of

styloid morphology and its anatomical relationships [23]. While panoramic radiographs can serve as initial screening tools, CT imaging remains the gold standard for definitive assessment, particularly in complex or bilateral cases [24]. The overall prevalence of elongated styloid process in our symptomatic cohort (56.2%) is higher than prevalence rates reported in general population studies, which typically range from 4% to 30% [17,25]. This discrepancy underscores the importance of differentiating between incidental elongation and clinically significant cases. Our findings suggest that in patients with chronic neck pain following tonsillectomy, the probability of detecting an elongated styloid process is substantially increased, supporting a causal or contributory relationship. This study adds prospective evidence from a Bangladeshi tertiary care setting, where limited data previously existed. The clinicoradiological correlation demonstrated herein supports incorporating styloid process evaluation into the diagnostic workup of post-tonsillectomy chronic neck pain. Early recognition may facilitate appropriate management, including conservative therapy or surgical thyroidectomy in refractory cases. Nevertheless, the study is limited by its single-center design and purposive sampling technique, which may affect generalizability. Future multicenter studies with larger sample sizes and long-term follow-up are recommended to further validate these findings and explore treatment outcomes. In summary, the present study strengthens existing evidence that the elongated styloid process is significantly associated with chronic neck pain after tonsillectomy. Routine radiological evaluation should be considered in persistent cases to ensure accurate diagnosis and timely intervention.

LIMITATIONS

This study was conducted in a single tertiary care center with a relatively small sample size and purposive sampling, which may limit generalizability. Lack of long-term follow-up and absence of a control group without post-tonsillectomy pain may also restrict causal inference.

CONCLUSION

This study demonstrates a significant association between an elongated styloid process and chronic throat/neck pain following tonsillectomy. Radiological evaluation revealed a high prevalence of styloid process elongation among symptomatic patients, with strong correlation to pain severity and duration.

Early imaging assessment in persistent post-tonsillectomy pain may facilitate accurate diagnosis, guide appropriate management, and reduce prolonged patient morbidity through timely and targeted therapeutic interventions.

RECOMMENDATION

Patients with persistent throat/neck pain after tonsillectomy should undergo routine radiological assessment for an elongated styloid process. Early identification can guide appropriate conservative or surgical management, improve symptom control, and prevent prolonged morbidity associated with undiagnosed Eagle syndrome.

REFERENCES

1. Surgery 160 (2019): S1-S42.
2. Mitchell, Ron B., et al. "Clinical practice guideline: tonsillectomy in children (update)." *Otolaryngology—Head and Neck* Windfuhr, Jochen P., et al. "post-tonsillectomy hemorrhage—some facts will never change." *European Archives of Oto-Rhino-Laryngology* 272.5 (2015): 1211-1218.
3. Williams, David M., et al. "Eagle Syndrome: Case Report, Literature Review, Proposed Classification, and Role of Ultrasound in its Diagnosis and Management." *Journal for Vascular Ultrasound* 48.4 (2024): 225-232.
4. Badhey, Arvind, et al. "Eagle syndrome: a comprehensive review." *Clinical neurology and neurosurgery* 159 (2017): 34-38.
5. Ramadoss, T., and K. Sha. "Assessment of the styloid process by cone beam computed tomography." *Int J Radiol Radiat Ther* 2.5 (2017): 123-127.
6. Cullu, N., et al. "Radiological evaluation of the styloid process length in the normal population." *Folia morphologica* 72.4 (2013): 318-321.
7. Yavuz, Haluk, et al. "Angulation of the styloid process in Eagle's syndrome." *European archives of oto-rhino-laryngology* 265.11 (2008): 1393-1396.
8. Fusco, David J., Shahab Asteraki, and Robert F. Spetzler. "Eagle's syndrome: embryology, anatomy, and clinical management." *Acta neurochirurgica* 154.7 (2012): 1119-1126.
9. Moon, Chang-Sig, et al. "Eagle's syndrome: a case report." *Journal of the Korean Association of Oral and Maxillofacial Surgeons* 40.1 (2014): 43.
10. Czako, Ladislav, et al. "The Syndrome of elongated styloid process, the Eagle's syndrome—from anatomical, evolutionary and embryological backgrounds to 3D printing and personalized surgery planning. Report of five cases." *Medicina* 56.9 (2020): 458.
11. Obara, Kazuki, et al. "Convexity subarachnoid hemorrhage revealed contralateral internal carotid artery dissection due to Eagle syndrome: a case report." *BMC Neurology* 24.1 (2024): 380.
12. Sakhdari, Shirin, Sogol Saberi, and Ahmad Reza Shamshiri. "Prevalence and pattern of styloid process elongation and calcification on digital panoramic radiographs in an Iranian population." *Journal of Islamic Dental Association of Iran* 30.2 (2018): 44-51.
13. Kannan, Roghith, and M. S. Thenmozhi. "Morphometric study of styloid process and its clinical importance on Eagle's syndrome." *Research Journal of Pharmacy and Technology* 9.8 (2016): 1137.
14. de Ruiter, Ruben D., et al. "Eagle syndrome: tissue characteristics and structure of the styloid process." *JBMR plus* 8.10 (2024): ziae115.
15. Okur, Aylin, et al. "Is there a relationship between symptoms of patients and tomographic characteristics of the styloid process?" *Surgical and Radiologic Anatomy* 36.7 (2014): 627-632.
16. Nogueira-Reis, Fernanda, et al. "Prevalence and features of elongated styloid process on imaging studies: a systematic review and meta-analysis." *Clinical oral investigations* 26.2 (2022): 1199-1215.
17. Bagga, MunBhawani, Deepankar Bhatnagar, and Nishant Kumar. "Elongated styloid process evaluation on digital panoramic radiographs: A retrospective study." *Journal of Indian Academy of Oral Medicine and Radiology* 32.4 (2020): 330-334.
18. Naimo, Phillip, et al. "Ossification of the stylohyoid ligament and Eagle's syndrome." *Eur J Anat* 16.1 (2012): 27-32.
19. Yılmaz, Dilek, Kaan Orhan ve Emre Cesur. "Evaluation of the relationship between stylohyoid complex morphology and maxillary/mandibular position using cone beam computed tomography." *Folia Morphologica* 79.1 (2020): 148-155.
20. Singh, Rajeev, et al. "Styloid process; correlation between symptoms, palpability and measurements on three-dimensional computed tomography." *Indian Journal of Otolaryngology and Head & Neck Surgery* 74. Suppl 3 (2022): 5556-5561.
21. Constantinides, Fulvia, et al. "Eagle's syndrome: signs and symptoms." *CRANIO®* 31.1 (2013): 56-60.
22. Abuhaimed, Abdulaziz K., Reinier Alvarez, and Ritesh G. Menezes. "Anatomy, head and neck, styloid process." (2019).
23. Scavone, Giovanni, et al. "Eagle's syndrome: a case report and CT pictorial review." *Radiology case reports* 14.2 (2019): 141-145.
24. Khandelwal, Pulkit, et al. "Eagle's Syndrome-Enigma Behind Atypical Orofacial Pain." *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH* 16.1 (2022): ZD01-ZD03.
25. Santana, Fellepe Reale, et al. "Prevalence of elongated styloid process in panoramic radiographs of adult and elderly populations." *Revista de Cirurgia e Traumatologia Buco-Maxilo-Facial* 25.2 (2025): 56-64.