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Review Article

Styloid Process Elongation VS. Eagle's Syndrome: Diagnostic Guidelines for Clinical Practice

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Abstract

Elongation of the styloid process is a common radiographic finding, yet it is often mistaken for Eagle's Syndrome, a rare neuropathic disorder presenting with symptoms such as cervicofacial pain, dysphagia, otalgia and a sensation of a foreign body in the throat, frequently mimicking other head and neck conditions. A clinical paradox is observed: whilst panoramic X-rays reveal a high incidence of elongation and calcification of the styloid process, the majority of patients are asymptomatic. The absence of this distinction creates a diagnostic maze, leading to erroneous treatments for Temporomandibular Disorders (TMD) or non-specific neck pain. Elongation of the styloid process requires only clinical management, whilst Eagle's Syndrome demands surgical intervention (styloidectomy) to resolve neuropathic symptoms. The purpose of this article is to present the anatomical, physiological and pathological differences between asymptomatic elongation and Eagle's Syndrome, addressing the challenges of differential diagnosis, treatment modalities and management protocols.

Keywords: *Eagle's Syndrome; Parapharyngeal Space; Differential Diagnosis; Panoramic Radiography; Facial Pain; Temporomandibular Joint Dysfunction Syndrome.*

Introduction

The styloid process is a slender, cylindrical bony projection that originates from the tympanic portion of the temporal bone, serving as an attachment point for various muscles and ligaments (the styloglossus, stylopharyngeus and stylohyoid muscles, and the stylohyoid and stylomandibular ligaments). Under normal anatomical conditions, the styloid process measures between 20 and 25mm. When this bony-ligamentous complex undergoes dimensional changes, exceeding 30mm, the presence of styloid process elongation or ligament calcification is considered. This condition may compress adjacent neurovascular structures, giving rise to Eagle's Syndrome. Eagle's Syndrome is defined as a rare neuropathic disorder affecting the head and neck region, primarily triggered by compression of cervical neurovascular structures by this abnormal bone[1-4].

Historically, elongation of the styloid process has been documented in ancient anatomical accounts, but it was not until 1937 that the American otolaryngologist Watt W. Eagle clinically described the syndrome, linking the bony elongation to symptoms of cervicofacial pain and a sensation of a foreign body in the throat following tonsillectomies[4]. In the medical literature, the condition has a wide range of synonyms, also being referred to as styloid syndrome, carotid artery syndrome, elongated stylohyoid complex and stylohyoid neuralgia[1,2].

Recent prevalence studies and meta-analyses based on imaging examinations show that an elongated styloid process can be found in a significant proportion of the global population, with rates varying according to demographics and the imaging technique used[2]. A study focusing on the Taiwanese population that evaluated digital panoramic radiographs found a considerable prevalence of elongation in this ethnic group[3]. However, it is important to note that the presence of radiographic elongation does not necessarily indicate the presence of the syndrome. It is estimated that only 4% to 10% of individuals with an elongated styloid process are actually symptomatic[1,2,5].

In clinical practice, a notable epidemiological paradox is observed. The prevalence of the elongated styloid process on imaging scans is considerably high in the general population[2], and it is a frequent finding in routine radiographic assessments, such as digital panoramic scans[3,5]. However, the incidence of Eagle's Syndrome is extremely low, occurring in only a small fraction of individuals with this bony abnormality[1-3,5].

Given this discrepancy between the frequency of radiographic findings and clinical presentation, the purpose of this article is to outline the anatomical, physiological and pathological differences between asymptomatic elongation and Eagle's Syndrome, addressing the challenges of differential diagnosis, treatment options and management protocols.

Discussion

Understanding the distinction between anatomical variation and pathology is essential to avoid iatrogenic complications and errors in the treatment of orofacial pain. One of the greatest challenges in dental and medical practice lies in the fundamental distinction between an incidental radiographic finding and a symptomatic clinical condition. As evidenced by the literature, elongation of the styloid process is a highly prevalent anatomical variation[1-3]. Table 1 pragmatically elucidates these differences. Eagle's Syndrome only develops when this bony anomaly begins to exert mechanical compression on neurovascular bundles (such as the carotid artery) and adjacent cranial nerves, triggering the neuropathic disorder and characteristic cervicofacial pain.

Table 1. Distinguishing between elongation of styloid process and Eagle's Syndrome.

Feature	Elongation of the Styloid Process	Eagle's Syndrome
Definition	Anatomical variation (finding on imaging).	Clinical condition (neuropathic disorder).
Symptoms	Asymptomatic.	Neck pain, dysphagia, tinnitus, sensation of a foreign body.
Incidence / Prevalence	Relatively common in the general population.	Rare (only a minority experience mechanical compression).
Management / Follow-up	No intervention. Just radiographic/clinical monitoring.	Surgical or medical treatment. Post-operative follow-up.

The clinical features of Eagle's Syndrome are wide-ranging and depend directly on the anatomical structures that are compressed (cranial nerves V, VII, IX, X or the carotid blood vessels). The most commonly reported symptoms include: cervicofacial pain; cervicobrachialgia; a foreign body sensation; dysphagia; odynophagia; otalgia; and tinnitus. Cervicofacial pain is chronic, dull or throbbing, in the region of the neck, face and jaw, and may worsen with head rotation or swallowing[4]. Cervicobrachialgia is characterised by chronic neck pain that may radiate to the arms, mimicking spinal problems or nerve compression[6,7]. In the sensation of a foreign body, there are frequent reports of a 'lump' or something stuck in the throat (globus pharyngeus)[1]. Otalgia is characterised by pain radiating to the ear and joint or auditory noises[4]. In addition, certain vascular symptoms may be observed - known as carotid artery syndrome. The patient may present with syncope, dizziness, unilateral headache and pain along the vascular course, caused by compression of the styloid process on the carotid artery[1,7]. Figure 1 shows a 32-years-old female patient with painful cervicofacial symptoms and elongation of the styloid process. However, the young patient presented with occlusal wear and bilateral bony exostoses of the mandibular angles, suggesting a parafunctional habit (bruxism or clenching). These vague symptoms do not allow for a definitive diagnosis and may occur frequently.

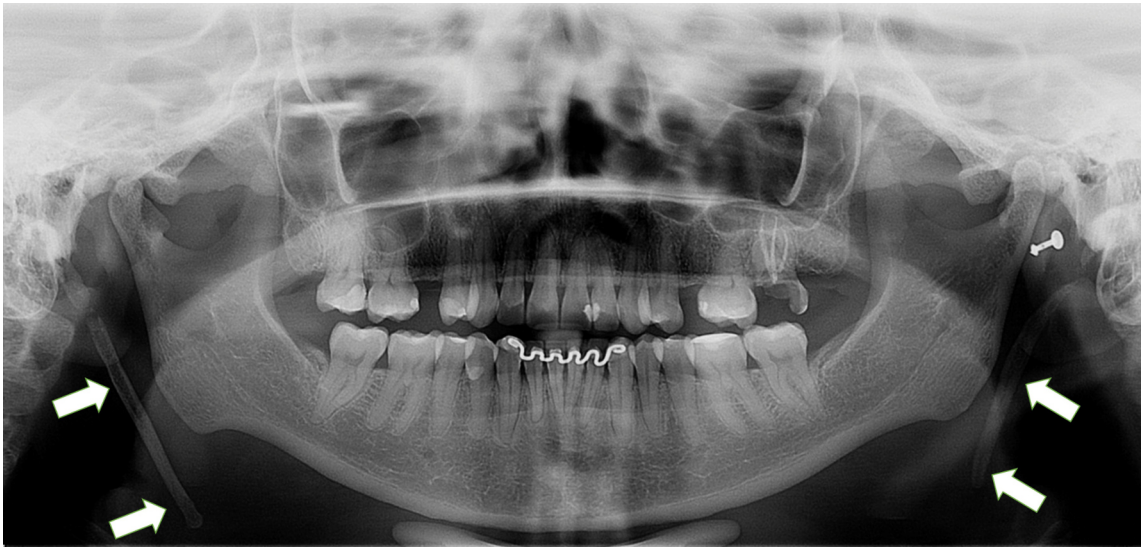

Figure 1. Panoramic radiography showing elongation of the styloid process (white arrows).

The diagnosis is based on detailed medical history, clinical examination and confirmation by imaging. Careful palpation of the tonsillar fossa often exacerbates the patient's pain. A classic diagnostic test involves injecting local anaesthetic (such as lidocaine) into the tonsillar fossa; if there is immediate pain relief, the clinical suspicion of Eagle's Syndrome is strongly supported[1,7,8].

The radiographic presence of the elongated styloid process is a common and incidental finding in individuals suffering from Temporomandibular Joint Disorder[5]. This fine line between anatomy and pathology makes the syndrome a major 'imitator'. This scenario frequently leads the clinician to the error of associating the panoramic image with the cause of the complaint[2,3,5]. Consequently, patients with true Eagle's Syndrome are chronically misdiagnosed with craniomandibular disorders and subjected to ineffective occlusal treatments[4,7,9].

In addition to craniomandibular disorders or temporomandibular dysfunctions, due to the presence of facial pain and restricted chewing, the differential diagnosis includes trigeminal or glossopharyngeal neuralgia, thoracic outlet syndrome (particularly when atypical cervicobrachialgia is present), odontogenic pain, chronic tonsillitis, migraines and pharyngeal tumours[1,4-6,8,9].

Similarly, diagnostic difficulties also extend to the medical field. Eagle's syndrome mimics severe musculoskeletal symptoms and is frequently confused with cervicobrachialgia and thoracic outlet syndrome[4,6]. In primary care, these patients consult various specialists and are diagnosed with 'chronic neck pain' of tension or postural origin, highlighting that a lack of clinical suspicion severely delays the correct diagnosis[7,9].

The persistence of diagnostic errors and the resulting confusion with other cervicofacial disorders is intrinsically linked to the limitations of conventional imaging examinations[4]. Historically, panoramic radiography has been the method of first choice for assessing the maxillomandibular complex and is often the examination in which elongation of the styloid process is noted incidentally. However, as it is a two-dimensional projection, it is subject to magnification distortions and the superimposition of complex anatomical structures of the skull base[3]. To resolve this technical impasse, computed tomography is recommended, demonstrating superiority and establishing itself as the gold standard in topographic diagnosis. In addition to allowing millimetric and exact measurement of bone length free from distortions, it also reveals the medial or anterior angulation of the styloid process. It is precisely this three-dimensional angulation, which cannot be assessed on a panoramic radiograph, that confirms the mechanical impact of the bone against adjacent soft tissues and cranial nerves, distinguishing mere elongation of the styloid process from Eagle's Syndrome[10].

Once the diagnostic challenge has been overcome and the presence of symptomatic mechanical compression has been confirmed by computed tomography, the therapeutic approach should be directed towards the anatomical elimination of the causative factor. For asymptomatic elongation, the approach is purely conservative, based on watchful waiting: regular clinical follow-up to ensure that the patient remains symptom-free. The therapeutic approach may be conservative or surgical, depending on the severity of the symptoms[8]. Conservative treatment is the first-line choice. It includes the administration of analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), neuromodulators/anticonvulsants (such as gabapentin) and local injections of corticosteroids combined with anaesthetics in the tonsillar pillar region. This therapeutic modality aims at symptomatic relief. However, the underlying cause of the symptoms (bone abnormality) is not treated[1,7-9]. Although conservative approaches may offer temporary palliative relief from neuropathic symptoms, the definitive treatment for true Eagle's Syndrome is surgical. Styloidectomy can be performed via an intraoral or extraoral approach. The choice of surgical technique requires individualised planning, weighing up the intraoral approach - which offers the benefit of no external scar, but with a restricted visual field - against the extraoral approach, which provides excellent exposure of critical structures and reliable vascular control, although it results in a cervical scar. Regardless of the surgical route selected based on the team's expertise, the effective removal of the hyperplastic bony process ceases the chronic trauma to the neurovascular bundles, ensuring remission of symptoms and restoring the patient's quality of life[8].

Follow-up is essential, particularly following surgical management. Patients should be monitored in the short and long term to assess the progressive remission of neuropathic and motor symptoms; wound healing; and the absence of complications such as infections or transient facial nerve damage. Continuous follow-up ensures that pain relief is maintained and allows for the immediate management of any recurrence, thereby ensuring the restoration of quality of life[7,8].

Conclusions

Styloid process elongation and Eagle's Syndrome, although sharing the same anatomical basis, represent radically distinct clinical entities. Elongation is an anatomical variation with a high radiographic incidence that requires only clinical observation. In contrast, Eagle's Syndrome is a rare neuropathic condition, characterised by a conflict of space and compression of the cervical soft tissues. The differential diagnosis requires careful consideration to avoid confusing the syndrome with temporomandibular dysfunction or non-specific cervical pain. Computed tomography is the gold standard for confirming pathological bone angulation. Once diagnosed, surgical intervention is established as the most effective and definitive treatment modality.

Conflict of Interest

The authors declare no conflict of interest.

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