Multidetector-row computed tomography demonstration of Eagle syndrome

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Eagle syndrome is a symptom complex of recurrent throat pain, dysphagia, foreign body sensation, otalgia or orofacial pain resulting from elongated styloid process or mineralization of stylohyoid ligament. Elongated styloid process may stretch the cranial nerves in its vicinity, or compress the perivascular sympathetic fibers around the carotid arteries. Multidetector-row computed tomography helps in the easy and accurate diagnosis of Eagle syndrome by means of enhanced demonstration of the elongated styloid processes. We present the case of Eagle syndrome in a 35-year-old woman with a long history of facial pain. Multidetector-row computed tomography with three-dimensional reconstruction was performed, which demonstrated bilateral elongated styloid processes.

Keywords:
3D-CT, Eagle syndrome, multidetector-row computed tomography

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Introduction

Eagle syndrome is a rare clinical condition caused by elongation of the styloid process or ossification or calcification of the stylohyoid ligament. The condition is named after Watt Weems Eagle, who defined it as stylalgia in 1937 [1–3]. This syndrome has two types: classic and styloid–carotid syndromes [1]. The classical form is seen after pharyngeal trauma or tonsillectomy, and patients complain of dull and persistent pharyngeal pain, centered in the ipsilateral tonsillar fossa exacerbated by rotation of the head. A mass or bulge may be palpated in the ipsilateral tonsillar fossa, which on compression exacerbates patient's symptoms [1,2]. Other symptoms include dysphagia, foreign body sensation in the throat, tinnitus, hypersalivation, transient voice change, or cervicofacial pain. The second form of the syndrome is called stylocarotid syndrome, which results from the compression of the internal or external carotid artery and their perivascular sympathetic fibers by an elongated styloid process. In case of internal carotid artery impingement, patients often complain of supraorbital pain and parietal headache [1–3]. In case of the external carotid artery irritation, the pain radiates to the infraorbital region of face. An elongated styloid process is seen in about 4% of the general population on radiography; only a small percentage (between 4 and 10.3%) of these patients are symptomatic because of them. Hence, the true incidence of symptomatic elongated styloid process is about 0.16%, with a female-to-male ratio of 3 : 1 [2–4].

Elongated styloid process can be visualized with plain radiography or computed tomography (CT). CT overcomes the limitation of superimposition of structures seen in the plain radiography of the skull. Three-dimensional reformations of the multidetector-row computed tomography (MDCT) raw data help in determining the true length, angulation, and anatomic relationships of the elongated styloid process and planning surgery [3–6].

Case report

A 35-year-old woman presented to a maxillofacial surgeon with the chief complaint of facial pain over the right face and the temple region. This discomfort had been bothering her for the last 2 years. There was no history of trauma or any other relevant medical history. She had been prescribed analgesics and carbamazepine, which did not result in any significant improvement.

On examination, the buccal and pharyngeal mucosa was normal. All teeth were present and in good shape. No tonsillar enlargement was seen. External auditory canal, eardrum, and nasal cavity were unremarkable. Her cervical lymph nodes were not palpable. Firm swelling was palpable in the submandibular region on both sides, which on compression excacerbated the patient's discomfort. CT of the neck was performed using 64-slice MDCT. Transverse CT images showed elongated styloid process on both sides, with the horizontal segment of the right and the vertical segment of the left styloid process seen in the section above hyoid

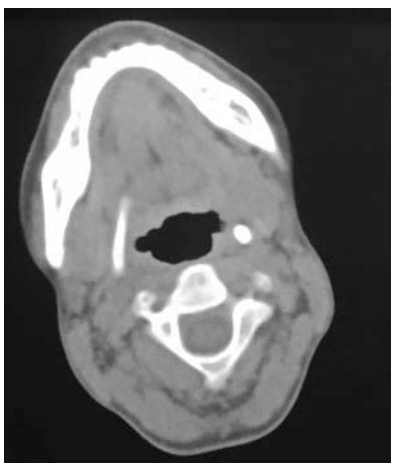
(Fig. 1). Three-dimensional (3D) reconstruction of the CT dataset revealed the entire extent of the bilateral elongated styloid processes (Figs 2–4). Elongated styloid process was seen as ossific density extending from the stylomastoid foramen region through the stylohyoid ligament and down to the hyoid bone on both sides (Figs 2–4). A diagnosis of Eagle syndrome was made and the patient was planned for resection of the styloid process through extraoral route.

Discussion

The styloid process is a part of the temporal bone that originates from its petrous portion lying medial to the stylomastoid foramen and lateral to the tonsillar fossa. The stylohyoid ligament connects the apex of the styloid process to the lesser horn of the hyoid bone. The stylohyoid complex is derived from the second branchial arch (Reichert's) cartilage [3–6].

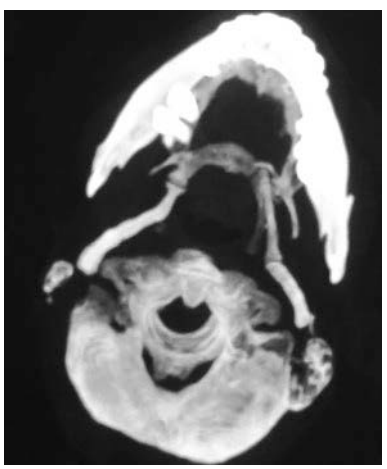
Normal length of the styloid process is 2.5–3 cm; when the length exceeds 3 cm, it is said to be elongated [7]. Various etiologic theories have been proposed to explain the development of Eagle syndrome. The first one stresses the congenital elongation of the styloid process due to the persistence of the cartilaginous precursor. The second theory proposes calcification of the stylohyoid ligament and the third one the development of osseous tissue at the insertion of the stylohyoid ligament. Underlying mechanisms for mineralization include either a reactive

Figure 1



Axial computed tomographic image above the level of the hyoid bone shows elongated styloid process bilaterally. On the right side, transverse segment of the elongated styloid process is seen, and, on the left side, vertical segment of the styloid process is seen lateral to tonsillar fossa.

Figure 2



Three-dimensional reconstructed computed tomographic image showing elongated styloid process on both sides, seen as bone density from the stylomastoid foramen region down to the hyoid bone.

Figure 3

Three-dimensional reconstructed computed tomographic image showing elongated styloid process on the right side, seen as bone density extending from petrous temporal down to the hyoid bone.

Figure 4

Three-dimensional reconstructed computed tomographic image showing elongated styloid process on the left side, seen as bone density extending from temporal down to the hyoid bone.

hyperplasia due to trauma activating the remnants of the original connective and fibrocartilaginous tissue cells, or a reactive metaplasia following trauma that initiates ossification of the stylohyoid ligament [2,4,7,8].

The clinical manifestations of Eagle syndrome have been explained by varied pathophysiological explanations. Fracture of the styloid process may lead to granulation tissue proliferation, which causes pressure on surrounding structures. Intact elongated styloid process or post-tonsillectomy scarring may compress adjacent cranial nerve branches such as the glossopharyngeal and trigeminal nerves. Degenerative and inflammatory changes (insertion tendonitis) involving the stylohyoid complex have also been suggested as the cause of symptoms. Impingement of the carotid vessels may result in irritation of the sympathetic nerves in the arterial sheath [2,4,7,8].

Diagnosis is suspected from the clinical history and local physical examination. Radiologic evaluation in the form of panoramic radiography, lateral skull radiograph, or preferably CT confirms the diagnosis. Plain radiographs in anteroposterior and lateral projections may show an elongated styloid process and its direction [5–7]. Despite the valuable information it can provide about the anatomy, there are some difficulties in reading the plain radiographs due to superimposed bones. Superimposition of the bone density of the mandible and the teeth can cause difficulty in viewing the styloid process, especially if it is not significantly elongated. Besides, calcification of the stylohyoid ligament is difficult to evaluate in plain films [3–6]. Superimposition of osseous structures of the skull and distortion and magnification secondary to angulation are thus the potential disadvantages of the conventional radiographs and panoramic films for making a diagnosis of Eagle syndrome. CT in the axial and coronal planes renders the styloid process and calcifications clearly visible, thus overcoming the problem of superimposition of plane radiography. The entire extent of the stylohyoid complex may not be depicted in a single two-dimensional (2D) coronal image due to angulation of the styloid process compared with true coronal plane [5–8]. MDCT imaging overcomes all these drawbacks of radiography and conventional CT by providing all details about the styloid process, including its length, direction, and its anatomical relations. MDCT allows the original axial 2D dataset to be reformatted into a 3D representation of the imaged region, which can be viewed from a coronal, sagittal, or transverse perspective. 3D-CT is an objective diagnostic tool that not only outlines the anatomy and thus tailors the surgical plan but also offers a detailed explanation to the patients. Another advantage of the 3D-CT images is 3D length measurements, which is not possible in 2D images such as in the coronal or axial planes. In cross-sectional (2D) imaging in coronal plane the images will not be parallel to the stylohyoid complex most of the times, leading to underestimation of the actual length of the styloid process [6–8].

Eagle syndrome can be treated medically with NSAIDs or by means of transpharyngeal infiltration of steroids or anesthetics locally into the tonsillar fossa [2,9]. Surgical resection of styloid process through the intraoral or extraoral route is the preferred treatment method. In the intraoral approach, the styloid process is approached from the mucosal aspect. This approach is good for esthetic consideration as external scarring is avoided. An extraoral approach involves making a cervical incision and then removing the styloid process. The external approach has the advantage of good anatomic exposure of the styloid process, but requires more intervention [1,2,9].

Conclusion

In the radiological evaluation of Eagle syndrome, MDCT with its 3D reformats enhances the depiction of elongated styloid process and provides the roadmap for its excision.

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Conflicts of interest

There are no conflicts of interest.

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