

Three-dimensional computed tomography of a complete stylohyoid ossification with articulation

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Abstract The stylohyoid chain presents considerable anatomic variability. Three-dimensional (3D) CT is accepted as the method of choice for morphological assessment of the stylohyoid complex. We present volume-rendered, 3D multislice CT images of an unusual, incidental case of bilateral complete stylohyoid ossification with articulations.

Keywords Styloid process · Stylohyoid chain · Ossification · Variation · 3D-computed tomography

Introduction

Although elongation of the styloid process or partial ossification of the stylohyoid ligament is not uncommon, the complete stylohyoid ossification is rare [3, 7]. We present three-dimensional (3D) multislice CT images of an unusual, incidental case of bilateral stylohyoid bone with joint formations. To the best of our knowledge, volume-rendered 3D CT images of a complete stylohyoid ossification with articulation have not been published before.

Case report

A 26-year-old male patient with nasal obstruction and headache was referred for CT. The CT examination was performed using a multislice CT scanner (Brilliance 16, Philips Medical Systems) with 16×0.75 mm collimation. From the raw data, 1-mm thick transverse sections were reconstructed at 0.5-mm intervals. CT revealed a nasopharyngeal soft tissue density and paranasal sinusitis. Additionally, bony structures with cortex and medulla, extending between the temporal bone and the hyoid bone, were recognized bilaterally. The CT data were transferred to a workstation (Extended Brilliance Workspace, Philips Medical Systems), and 3D CT images were obtained with volume rendering technique. Between the temporal bones and the hyoid bone, the presence of bilateral stylohyoid bones including four segments and three joints were well visualized in all views (Fig. 1a, b). The lengths of proximal segments were asymmetric and a focal thinning was also seen on the right proximal segment, but otherwise the bone and joint surfaces were smooth with no evidence of fracture or degenerative changes. Since the symptoms of the patient were thought to be unrelated with the stylohyoid ossifications, no surgical intervention was planned.

Discussion

The stylohyoid chain ossification correlates with the anatomy and embryology of the second pharyngeal arch cartilage, which is the origin of several structures such as the styloid process of the temporal bone, the lesser horn of the hyoid bone, and the stylohyoid ligament between these portions [1–4, 6–8]. The styloid process is formed by the ossification of the longer and larger cranial segment of the

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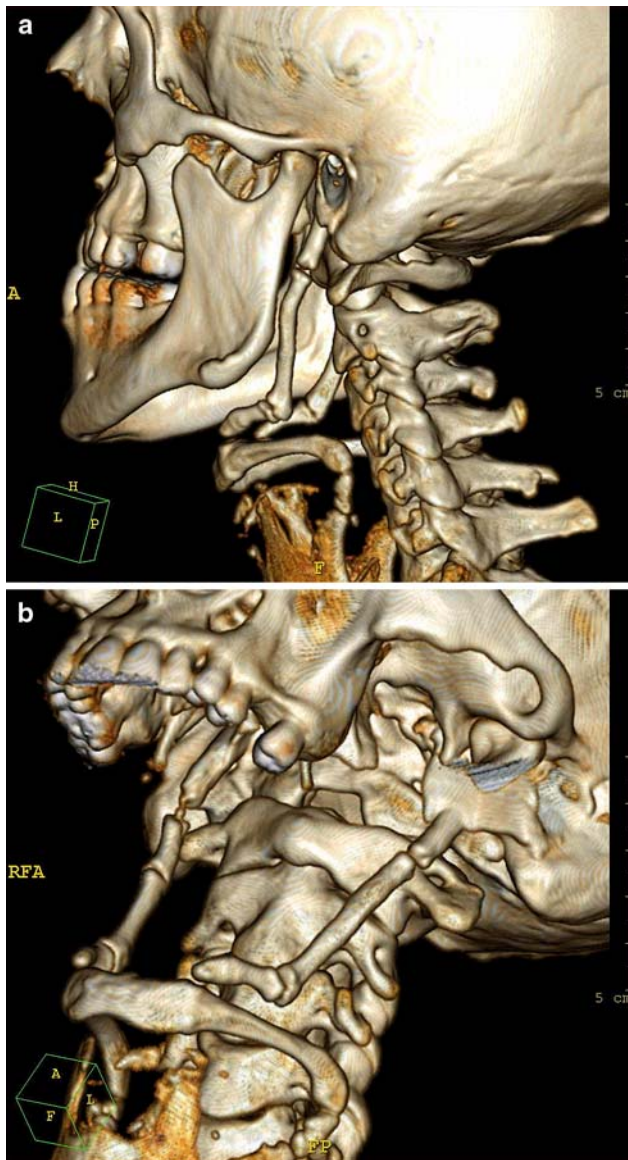


Fig. 1 a, b Volume-rendered 3D CT images show bilateral stylohyoid bones with joint formations. The mandible was excluded in **b**

second pharyngeal arch cartilage. The length of the adult styloid process varies depending on the form and length of this cartilaginous segment. On the shorter caudal end, the lesser horn of the hyoid bone is formed. In a recent study performed on human embryos [6], the formation of a non-cartilaginous mesenchymal tissue has been described between the styloid (stylohyal) and the hyoid (hypohyal) cartilaginous segments. This portion, also known as the ceratohyal segment of second pharyngeal arch cartilage, forms the stylohyoid ligament. Occasionally, various degrees of ossification of the second arch cartilage may extend from the styloid process along stylohyoid ligament. Several theories have been proposed to explain calcification of the stylohyoid ligament. These include degenerative changes,

metaplastic alterations due to a traumatic stimulus, and an anatomical variation in which the stylohyoid ligament is ossified in early stages or contains cartilaginous remains that are later ossified [6]. Styloid process and stylohyoid chain ossifications have been classified according to their shapes and lengths: normal, elongated, bent, segmented, pseudoarticulated, and distally ossified and fixed to the lesser horn of the hyoid bone [2]. The incidence of the complete ossification of stylohyoid chain has been reported as 0.09% in a series of 1,215 forensic autopsies [8].

Although most patients are asymptomatic, elongated styloid process or stylohyoid ossification may compress on the surrounding neurovascular structures and may produce a variety of clinical symptoms known as Eagle Syndrome. The most common symptom is vague neck pain. Other symptoms include foreign body sensation, throat pain, odynophagia, and pain upon changing head position. However, there is little correlation between the extent of the ossification and the severity of the symptoms [1, 4].

Variable radiological appearances may be present due to variations in ossification and fusion of elements. However, the visualization of stylohyoid chain ossifications may not be easy on conventional radiographs because of superimposition of bones. 3D CT is an effective method in the evaluation of morphological characteristics of the stylohyoid ossification [1, 5]. The radiological anatomy of our case showed that the cranial segment correlates with the styloid process, and the caudal segment correlates with the lesser horn of hyoid bone. The middle ossified segments correlate with the stylohyoid formed from ceratohyal segment. These bony segments with cortex and medulla were separated by joints to allow for movement. Formation of the stylohyoid joints may be related to the segmentation of second pharyngeal arch cartilage and pseudoarthrosis secondary to fractures due to neck movements or trauma.

Conclusion

Bilateral stylohyoid chain ossification is rare and frequently asymptomatic. 3D volume-rendered reconstructions of multislice CT images can reveal these variations clearly and may play a critical role in the pre-operative evaluation of symptomatic patients.

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