Morphometric Study of a Huge Elongated Styloid Process

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Summary: An elongated styloid process (ESP) is present in 4% of the general population. It is sometimes found incidentally by panoramic radiography or computed tomography in the clinical setting. Few detailed morphometric studies of this phenomenon have been performed, however, especially regarding its histologic aspects. During anatomic dissection of a 71-year-old man who had died from cardiac failure and whose body had been donated to our department for medical student training, an ESP was found while disconnecting the stylohyoid muscle from the hyoid bone. It measured 88 mm in length. After resection, the ESP was examined using computed tomography and was assessed histologically. The results showed that it consisted of bone and cartilage. It was composed mainly of three types of cartilage with a beaded appearance. Masson trichrome staining revealed scattered collagenous fibers around the cartilage. Although ESP is not uncommon in the clinical setting, this huge ESP found during a dissection course and its detailed histologic investigation were considered sufficiently valuable to be reported.

Key words elongated styloid process syndrome, radiography, panoramic, computed tomography, hyoid bone, ossification

INTRODUCTION

An elongated styloid process (ESP) is considered to be the result of ossification of the stylohyoid ligament or the styloid process. It causes dysphagia, pharyngalgia, and prosopalgia, among other symptoms. In 1937, Eagle [1] designated ESP “Eagle’s syndrome.” According to Dwight [2], the first report of ESP was by De Marchetti in 1652, who described “ossification of the styloid process.” Although ESP is sometimes found incidentally by dental panoramic radiography or computed tomography in the clinical setting, there have been few detailed morphometric studies, especially regarding its histology. We describe a huge ESP found during a gross anatomic dissection course for medical students. We analyzed it anatomically, radiologically, and histologically.

CASE REPORT

The body of a 71-year-old man who had died from cardiac failure was donated to our department. During his anatomical dissection, he was found to have had a good constitution, with no anatomical variations found in his head and neck region until the tongue, pharynx, and larynx were resected en bloc. The right stylohyoid muscle was about to be resected with scissors near the lesser cornu of hyoid bone when hard tissue was detected between the styloid process and the hyoid bone. It proved to be a huge ESP, measuring 88 mm in length. After resection, the ESP was examined using computed tomography and was assessed histologically. The results showed that it consisted of bone and cartilage. It was composed mainly of three types of cartilage with a beaded appearance. Masson trichrome staining revealed scattered collagenous fibers around the cartilage. Although ESP is not uncommon in the clinical setting, this huge ESP found during a dissection course and its detailed histologic investigation were considered sufficiently valuable to be reported.

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Abbreviations: ESP, elongated styloid process; HB, hyoid bone, MP, mastoid process; T, tongue; TB, temporal bone; TC, thyroid cartilage.
separated from the other tissues. After resection, the ESP was found to be fractured 23 mm distant from the base of the styloid process. The sagittal plane of the ESP was observed anatomically and histologically. Hematoxylin and eosin and Masson trichrome staining revealed that the ESP consisted mainly of bone and cartilage. The center of ESP had a beaded appearance, which was found to be cartilage. In addition, there were scattered collagenous fibers around the cartilage (Fig. 2). The left styloid process had a length of 24 mm and was unremarkable.

DISCUSSION

The styloid process is derived from the second branchial bar of Reichert’s cartilage. The styloid apparatus is divided into four parts: tympanohyal, stylohyal, ceratohyal, hypohyal [3]. The tympanohyal is the portion embedded in the petromastoid and extends from the periotic capsule to the lower surface of the temporal bone. The stylohyal forms the major portion of the styloid process, the ceratohyal forms the stylohyoid ligament, and the hypohyal forms the lesser cornu of the hyoid bone [4]. Many studies have addressed ESP over the years using anatomic and radiologic methods [1,5,6]. Eagle [1] stated that the normal styloid process measures 25–30 mm, whereas Lins [6] noted that an ESP is usually > 30 mm long. After evaluating 1000 panoramic radiographs of a normal population, Jung [7] proposed that the styloid process be considered elongated on a panoramic radiograph only if its length exceeds 45 mm. Elongated ESPs > 80 mm have rarely been reported [8].

ESPs occur in 4% of the general population, al-

Fig. 1. Macroscopic (a) and computed tomography (b) images of the resected temporal bone and soft tissue around the tongue and larynx. (a) Note the soft tissue between the apex of the elongated styloid process and hyoid bone that seem to form a joint (black arrow). (b) The apex of the elongated styloid process was close to the lesser cornu of the hyoid bone (white arrow). ESP, elongated styloid process; HB, hyoid bone; MP, mastoid process; T, tongue; TB, temporal bone; TC, thyroid cartilage. Scale bar: 10 mm.
though only about 4% of that group is symptomatic [9]. There are no sex or bilateral differences. Approximately 85% of ESPs occur bilaterally [6]. In the present case, the ESP was found unilaterally in the right side. The cause of unilateral ESP has not been discussed in the previous literature and remains unknown. The major symptoms of ESP are pharyngalgia, malaise, mandibular and neck pain, otalgia, trismus, dysphagia, and prosopalgia [10]. There is only one report of mental nerve paresthesia due to ESP [11].

Two therapeutic surgical approaches are known: intraoral and transcervical [12]. Lengelé [13] noted that there is no calcification of soft tissues, and calcification increases the diameter of the process, not its length. Lengelé [14] identified no evidence of postnatal elongation of the styloid process. According to Von Eicken [15], there are originally two ossification centers along the stylohyoid ligament. They ossify superiorly, resulting in the connection with the styloid process. Originally, the ceratohyoid is cartilage that becomes the stylohyoid ligament during fetal life. ESP results from intracartilaginous ossification.

In the present case, there were three cartilaginous tissues, implying that the cartilage remained as a result of a secondary ossification center. Langlais classified ESP by its physical type (elongated, pseudoarticulated, segmented) and its calcification pattern (calcified outline, partially calcified, nodular, completely calcified) [16]. Although the elongated type with a calcified outline accounts for the greatest number of ESPs [17],

Fig. 2. Macroscopic and hematoxylin and eosin-stained images of the elongated styloid process in the sagittal plane (a). The ESP consisted mainly of bone and cartilage. (b–e) Magnified figures of (a). Masson trichrome-stained area of the similar region to (d) is shown in (e). (a) Macroscopically, there were three areas with a beaded appearance (arrow). Cortical and cancellous bone configured the elongated styloid process as a whole. (b, c, d) Fibrous connective tissue (black arrow) and cartilage were the main components of the beaded area. (e) Collagenous fibers (black dotted arrow) are seen around the cartilage. Scale bar: 100 μm.
the present case was the elongated type with nodular calcification. We presume that the elongated type and calcification pattern are related to the histologic findings. It will take many more histologic studies, however, to reveal the relation between classification of the ESP and its histology. Cone-beam computed tomography, which has become popular in dentistry, is also useful for diagnosis and evaluation of ESP [17]. The combination of histology and radiology as well as gross anatomy will contribute to the clinical considerations of ESP.

We found a huge ESP during an anatomic dissection course for medical students and examined it morphometrically to define its details. Although ESPs are not uncommon in the clinical setting (4%), we believe that this huge ESP and its detailed histologic evaluation are sufficiently valuable to be reported.

ACKNOWLEDGMENTS: The authors are grateful to those individuals who donate their bodies and tissues for the advancement of education and research. We also thank Dr. Keita Todoroki for technical assistance with the pathology.

CONFLICT OF INTEREST: The authors have no conflicts of interest to declare.

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