Overview of the ossified stylohyoid ligament based in more than 1200 forensic autopsies

Theodore Vougiouklakis *

University of Ioannina, Department of Forensic Medicine and Toxicology, University Campus, 451 10 Ioannina, Greece

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Abstract

The human stylohyoid chain presents considerable anatomic variability. In a personal series of 1215 forensic autopsies, eleven cases of complete ossification of the stylohyoid ligament have been revealed. Nine cases were bilateral and two cases were unilateral ossifications. A fractured ossified stylohyoid ligament was found in one case. The embryology and clinical significance of this condition has been mentioned briefly.

Keywords: Stylohyoid; Ossification; Forensic; Autopsy; Incidence; Fracture

1. Introduction

The human stylohyoid chain includes the styloid process (SP), the stylohyoid ligament (SHL), and the lesser cornu of the hyoid bone. The stylohyoid chain is derived from the second branchial arch and is sub-divided into four parts: the segment known as tympanohyale, the stylohyale, the ceratohyale, and the hypohyale. The SHL is a connective tissue band originating from the apex of the SP and is attached to the lesser horn of the hyoid bone. For no obvious reason it occasionally ossifies and forms a solid structure. Various degrees of ossification may be observed in SHL because of the cartilaginous content of the ligament. Although the partial ossification of the stylohyoid ligament is not uncommon, the complete ossification is rare. Variable radiographic appearances may be present due to variations in ossification and fusion of elements.

To our knowledge this is the first report about ossified SHL presented in the forensic literature.

2. Methodology – Results

In a series of 1215 forensic autopsies performed in our department a careful dissection of the neck structures complex was done by 1 investigator. Only a macroscopic examination of the stylohyoid chain was carried out; radiographs and histological slices were not regularly made. Therefore only a completely ossification of the SHL could be detectable; for example, the extent of ossification could not be considered with this simple method. Ossifications of the SHL were found in 11 cases (0.9%). Males were 7/11 cases and females were 4/11 cases (male/female ratio: 1.75). Age distribution of the diseased showed: 2 cases in the 2nd decade, 5 cases in the 3rd decade, 3 cases in the 4th decade and 1 case in the 6th decade of life. Nine out of the eleven cases were bilateral and 2/11 cases were unilateral ossifications in the left side (Fig. 1). In one case was found a fractured ossified SHL. The case concerned a 23-year-old man who was involved in a fatal road incident as the passenger of a bus. Autopsy revealed several injuries on the left side of the neck consequence of blunt impact. Dissection of the neck structures revealed bilateral completely ossified stylohyoid ligaments. The left ligament was recently fractured in the middle.
3. Discussion

The presence of the ossified stylohyoid ligament and elongated styloid has been noted both, with and without symptoms, by various authors in the late nineteenth and early twentieth centuries. The reported incidence of radiographic stylohyoid ossification varied from 1.4% to 84.4%, most probably due to different definitions used to describe this phenomenon. The condition is usually bilateral, but it has been reported to occur unilaterally. Although the term calcification has been originally used, this terminology is considered erroneous. The definition as ossification is considered more precise, since histologically the specimen will exhibit either hyperplasia of the styloid process or metaplasia of stylohyoid ligament into bone (Fig. 2).

Different suggestions have been put forward regarding the extent of ossification versus age. Previous studies have suggested that the vast majority of ossified sites in the stylohyoid ligaments are established during childhood and adolescence. The mean length of these sites has shown a rapid, linear increase with age until the end of adolescence; any further increase has been not linear and has occurred at a much slower rate.

Fractures of an ossified SHL are an uncommon and unusual entity that could be seen incidentally during autopsy. Generalisations on the fractures of ossified SHL are impossible because of the limited reported cases in the literature. The inciting cause may be as mild as yawning but more often blunt trauma of a serious nature, like in our case, is the cause. In cases without ossification, specimens often remained macroscopically uninjured.

Symptoms are non-specific and rarely occur before the age of 40. An elongated SHL or SL process is considered to be the source of craniofacial and cervical pain commonly known as Eagle’s syndrome. An ossified SHL has been implicated as a cause of unanticipated difficulty in tracheal intubation. An immobile larynx, as direct result of SHL ossification and the elevation of the epiglottis due to forward traction of the hyoid bone would render direct laryngoscopy difficult. If not well managed, there may be serious traumatic consequences and possible risk of regurgitation and aspiration especially in emergency situation.

Moreover, a simultaneous occurrence of an ossified SHL and anomalies in the atlantic section of the vertebral artery has been also reported. The discovery of an ossified SHL seems to be a warning for potential arterial anomalies. These subjects may be more susceptible to a variety of head and neck insults resulting to disturbance in blood flow. Consequently, such anomalies should be recorded during autopsy in subjects who die as a result of fatal vertebral artery injuries. This consideration may have clinical and medico legal implications for therapists who perform spinal manipulation in the cervical region. It is important for the therapist to identify patients at risk of complications from minor trauma and in the presence of any signs of vertebrobasilar insufficiency such manipulation should be avoided.

References