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ORIGINAL ARTICLE

Calcification of the stylohyoid complex in Libyans

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Abstract *Objective:* To investigate the prevalence and pattern of calcification of the stylohyoid complex in Libyan population.

Material and methods: Archived digital panoramic radiographs of 3343 patients were collected; 181 images were excluded for underage or poor image quality. Thus, the images of 3162 patients (1081 men, 2081 women; women-to-men ratio, 2:1; age range, 16–68 years; mean age, 36.7 years) retrieved and assigned to one of four morphological patterns of the stylohyoid complex: regular, elongated, calcified, and undetected. Data were analyzed with the X^2 test using SPSS (Chicago, IL, USA); P values lower than 0.05 were considered statistically significant.

Results: Out of 3162 images studied, the styloid process was demonstrated to be regular in 1935 (61.2%), elongated in 541 (17.2%), calcified in 565 (17.8%), and undetected in 121 (3.8%). Symmetric patterns were demonstrated on 2580 (81.6%) images. An elongated stylohyoid complex was significantly more common in women than in men ($P = .0404$).

Conclusion: The anatomical patterns of the stylohyoid complex in Libyans were highly variable. Dental clinicians should recognize the various morphological patterns of the stylohyoid complex on panoramic radiographs. Computed tomography studies are recommended for further morphometric analysis of the stylohyoid complex.

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1. Introduction

The stylohyoid complex (chain) consists of the styloid process, stylohyoid ligament and the lesser cornu (horn) of the hyoid bone. It is derived from the second pharyngeal arch (Reichart's cartilage). The stylohyoid process projects downward, forward, and slightly medially so that its tip is positioned between the internal carotid artery, internal jugular vein, and cranial nerves V, IX, and X. Langlais et al. reported that the styloid process varies in length between patients and often between the two sides of the same individual (Langlais et al., 1995). They

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suggested that an elongated styloid process results from ossification in the stylohyoid ligament.

Calcification of the stylohyoid complex is usually detected as an incidental finding on panoramic radiographs (Monsour et al., 1986). However, this finding may also be associated with a group of clinical symptoms that require surgical intervention (Eagle, 1948). O'Carroll reported that 8 of 103 (8%) patients with an elongated styloid process presented with related symptoms of deep neck pain, foreign body sensation in the throat, pain on turning the head, and odynophagia (O'Carroll, 1984).

Langlais et al. proposed a radiographic classification for the calcified stylohyoid complex, including three patterns of radiographic presentation (elongated, pseudoarticulated, segmented) and four patterns of calcification (calcified outline, partially calcified, nodular complex, completely calcified) (Langlais et al., 1986). However, only a few studies have presented the calcification of the stylohyoid complex in a manner that would be useful for clinicians. Therefore, the aim of this study was to investigate the prevalence and pattern of calcification of the stylohyoid complex in a Libyan population.

2. Material and methods

Records of digital panoramic radiographs treated at the University of Benghazi College of Dentistry between January 2010 and December 2013, were retrieved and evaluated for the prevalence and pattern of calcification of the stylohyoid complex. Patients younger than 16 years of age were excluded from the analysis as these patients would not have reached skeletal maturity. Radiographs with positioning or exposure errors were also excluded from the study. The panoramic images were generally obtained as part of routine radiographic screening for oral diagnosis. Therefore, no specific history related to the stylohyoid complex, e.g., tonsillectomy or cervical trauma, was obtained, so that it was not possible to diagnose Eagle syndrome or stylohyoid syndrome. The images were taken using paX-i (Vatech, Seoul, Korea) set at 60–80 kVp, 8–10 mA, and 10.1 s.

The native population of Libya is mainly a mixture of Arab-Imazighen ethnicities, with large minorities descending from African and Turkish origin. However, it was not possible to determine the ethnic background of each patient.

The classification of the stylohyoid complex used in this study was modified from MacDonald-Jankowski's study (MacDonald-Jankowski, 2001). He classified the stylohyoid complex according to the center of calcification as following: Region 1, tympanohyal; Region 2, stylohyal; Region 3, ceratohyal; Region 4, hypohyal.

The classification used in this study is as following: the styloid process was considered "regular" when it did not extend below the mandibular foramen (Patterns A to D); "elongated" when it extended below the mandibular foramen and appeared to be continuous with skull base (Pattern E); "calcified" when it extended below the mandibular foramen and did not appear to be continuous with the cranial base (Patterns F to K); "undetected" when it could not be seen on the panoramic image (Figs. 1 and 2). All radiographs were de-identified and reviewed by a board-certified oral and maxillofacial radiologist under ambient room lighting using the standardized Apple

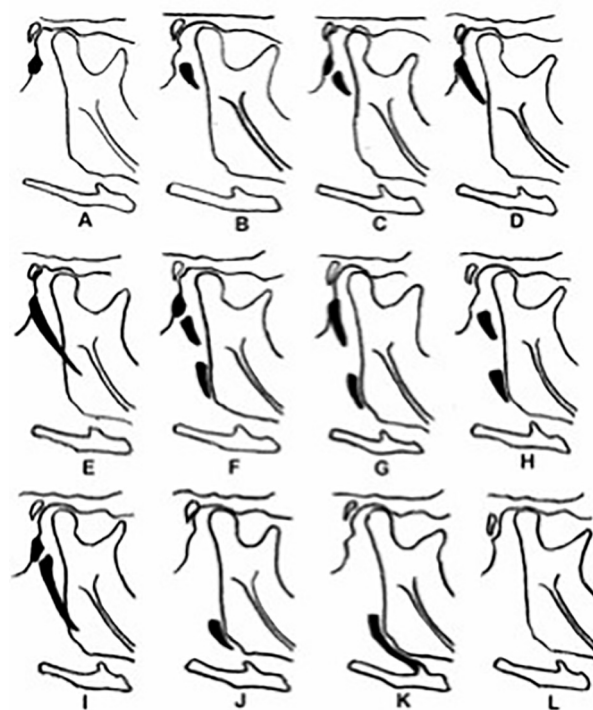


Fig. 1 O'Carroll's classification of the stylohyoid complex: Patterns A through D, regular; Pattern E, elongated; Patterns F through K, calcified; and Pattern L, absent.

software—iPhoto (Apple, Cupertino, CA, USA) on a 27-in. monitor (iMac, Apple) with a screen resolution of 2560 × 1440 pixels.

3. Results

The digital panoramic radiographs of 3343 patients were collected; 181 images were excluded because the patient was younger than 16 or because the image quality was poor as the result of errors in positioning or exposure. Thus, the images of 3162 patients (1081 men, 2081 women; women-to-men ratio, 2:1; age range, 16–68 years; mean age, 36.7 years) were included in the study.

The detailed distribution of the 12 patterns of O'Carroll's classification⁴ is shown in Table 1. The styloid process was classified as regular (Patterns A, B, C, and D) in 1935 images (61.2%), elongated (Pattern E) in 541 (17.2%), calcified (Patterns F, G, H, I, J, K) in 565 (17.8%), and undetected (Pattern L) in 121 (3.8%). However, 2580 (81.6%) of the regular, elongated, calcified, or undetected patterns were symmetrical on both sides. According to O'Carroll's classification, Pattern D was the most common symmetrical pattern (964, 30.5%), whereas Pattern D-C was the most common asymmetrical pattern (180, 5.7%). The elongated stylohyoid complex pattern occurred significantly more frequently among women ($P = .0404$). However, there was no significant difference between men and women in the occurrence of the calcified stylohyoid complex ($P = .0669$).

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