A 3D Cone-Beam Computed Tomographic Assessment of Styloid Process Length and Patterns of Segments Ossification

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Abstract

Background: To determine the radiographic assessment of the styloid proces using 3D images provided by cone beam computed tomography (CBCT).

Materials and Method: In this study, (50) CBCT scans of the (25) patients 13 females, 12 males, age range (18-65 years) were retrospectively evaluated for full length and number of segments ossificationanalyzed statically for both side and gender.

Results: The study results revealed that the mean length of styloid process according to gender was (18.7) mm in male and (20.4) mm in females, while according to side the mean length of styloid process on the right side was (19.7) mm and on the left side was (19.4) mm. The higher percentage of segments ossification was in one segment then followed by two and three segments respectively in both left and right sides

Conclusion: The full length and morphology of the styloid process can be measured accurately by 3D views provided by CBCT.

Keywords: *Styloid Process length,ossification, 3D cone beam computed tomography.*

Introduction

The word styloid is derived from the Greek word Stylos which means "pillar".(1) Styloid process is a cone-shaped eminence of the petrous region of the temporal bone. It projects downwards, forwards, and slightly medially from the temporal bone andit develops from Reichert's cartilage of 2nd branchial arch.(2,3,4)The average length of the styloid process is approximately 25 mm in length as described by Eagle in 1937 and it is considered elongated when the length is greater than 30 mm. However there are many authors who considered 30 mm as normal value for the length of styloid process.(5,6) The elongation of styloid process that accompanied with calcification is known as Eagle's syndrome that characterized by recurrent pain in the oropharynx and face it may be unilateral or bilateral.(7)

Styloid process assessement is based on thorough clinical examination which includes proper history, palpation of the tonsillar fossa and radiological imaging.(8) Previously the conventional radiographic imaging such asorthopantomogram (OPG) and lateral oblique view of the mandible has been used to detect elongated styloid process, However, numerous factors lead to difficulty in estimate an accurate length of styloid process such as magnification in different panoramic machines and the angle between the styloid and skull base can affect the measurements and management of patients(9,10) therefore cone beam computed tomography (CBCT) has been recommended for evaluation of these anatomical structures, so the length and morphology of styloid process can be clearly shown with elimination for the errors that caused by magnification or superimposition as it allows creation of images not only in the axial plane, but also three dimensional views.(8,11, 12)

The variations of styloid process depend on

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sociodemographic factors such as age and the geographic distribution, so the aim of this study is to determine the radiographic assessment of the styloid process in a sample of Iraqi population.

Material and Method

A retrospective study performed on CBCT imags for patients referred to the CBCT imaging unit at Ghazi Al-Hariri hospital as part of their radiographic assessment for different clinical problems in maxillofacial region during the period from January 2019 to June 2019. The study consists of (50) scans of the (25) patients(12) male and (13) female patients with age range 18-65 years using Kavo OP3D CBCT imaging device. The field of vision is 13x15cm working at (90) KV and (9.2) mA, and with specific exposure time seconds. 3D reconstruction was created for all images. Any Patients with fracture or pathology in the region of the styloid process were not included in the study. The images were evaluated carefully to measure the full length and the patterns of the styloid process according to gender, side, and the number of styloid process segments ossification. The collected dataanalyzed statistically.

Figure 1: 3-dimensional CBCT image showing measurement of left side styloid process.

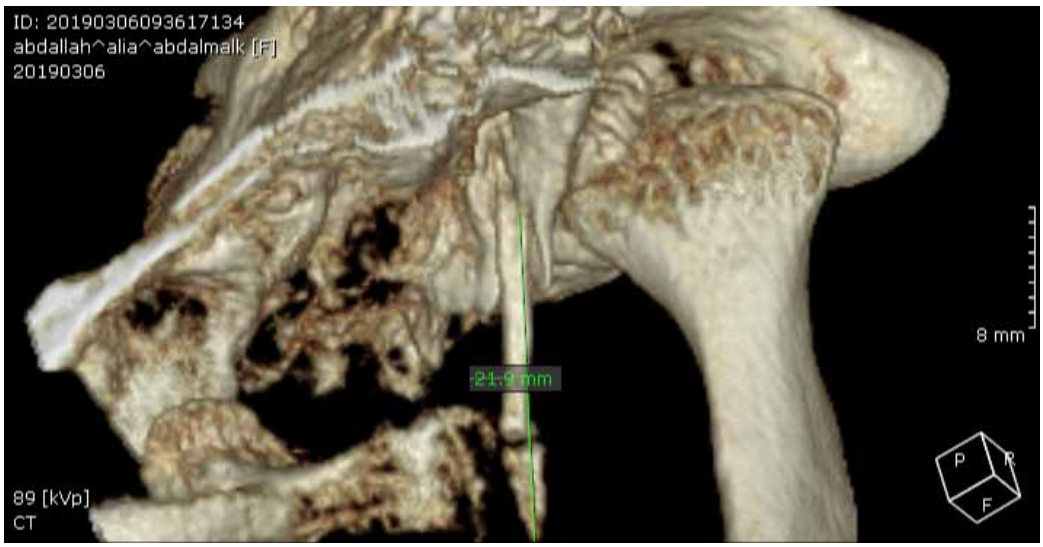

Figure 2: 3-dimensional CBCT image showing two segmented styloid process.

Result

Out of the 50 scans of the 25 patients, 13(52%) were females and 12(48%) were male patients, (Figure 3). in males the mean length of styloid process was (18.7) mm, while in females it was (20.4) mm, (Table 1). According to the side this study showed that the mean length of styloid process on the right side was (19.7) mm and that on the left was (19.4) mm, (Table 2).

The styloid process segments were subdivided into 3 types as one segment ossification, two segment ossification and three segment ossification segments, on the right side there were 13 (52%)one segment ossification, 8 (32%) with two segment ossification and 4 (16%) showed three segment ossification. On the left side there were 15(60%) one segment ossification, 8 (32%) with two segment ossification and 2 (8%) showed three segment ossifications (Table 3).

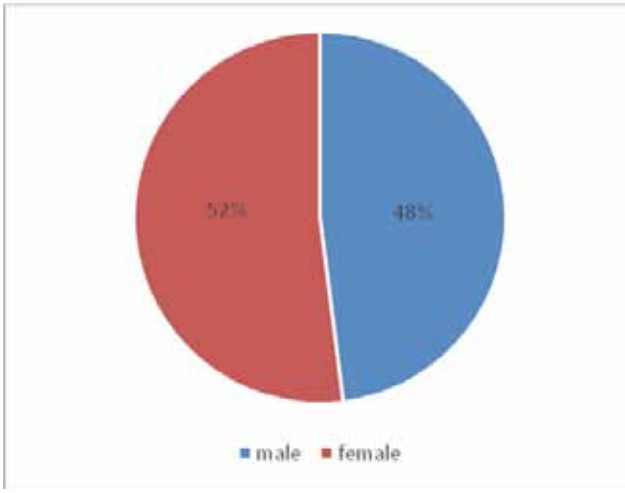

Figure 3: Gender distribution of the study group.

Table 1: Mean length of styloid process.

Gender	Mean of length/(mm)
Male	18.7
Female	20.4

Table 2: Side distribution of styloid process.

Side	Mean of length/(mm)
Lt	19.4
Rt	19.7

Table 3: Distribution of ossified segments.

Number of ossified segments	Side	
	Rt	Lt
One Segment	13 (52 %)	15 (60 %)
Two Segments	8 (32 %)	8 (32 %)
Three Segments	4 (16 %)	2 (8 %)
Total	25	25

Discussion

Cone beam computed tomography (CBCT) is an imaging technique that provides a real time image in all planes axial, coronal, and sagittal with the ability of producing a three dimensional image at lowdose of radiation as compared with medical CT scans [(12)].

In this study, the CBCT scans of 50 styloid processes distributed among 12 male and 13 female with a mean length of styloid processes 18.7 mm in male and 20.4 mm in female this results was close to a similar CBCT study on styloid processes assessment by Ilguy et al [(13)] with 22.2mm mean length. In many studies there was no significance difference between right and left side measurements, this study show close measurements between both side, 19.4mm mean of length at left side and 19.7 mm at right side which is in agreement with Ramadossand Sha[(14)] and Kosar et al.[(15)] studies. In the present study the styloid process was classified morphologically according to number of ossified segments. The higher percentage was atone segment then followed by two and three segments respectively in both left and right sides as follow: on the right side there were (52 %) one segment ossification, (32 %) with two segment ossification and (16 %) showed three segment ossification. On the left side there were (60%) one segment ossification, (32 %) with two segment ossification and 2 (8%) showed three segment ossifications, this result was nearly the study result by Ramadan et al. [(16)], while Ilguy et al [(13)]study revealed that two segments having the highest percentage. The variationin ossified segments number may be as a result of different number ofthe study samples. As a conclusion the CBCT imaging technique considereda necessary way forcomplete assessment of styloid process morphology and measurement using 3D view.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: This research has exemption as it a routine treatment (no new materials were used).

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