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Comparison Of Styloid Process Length Using Digital Orthopantomogram: An Institute Based Observational Study

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Abstract

Background: The research study assesses the side asymmetry and highlights clinical implications while determining the variability of the styloid process length in a Bareilly population and examining its effects on gender and age.

Methods: A total of 176 digital OPG, of patients aged above 18 years will be taken which will be divided into Group A (MALE) and Group B (FEMALE) for comparison of length of styloid process bilaterally. Length of the individual styloid process will be measured on the radiograph from the point where the SP left the tympanic plate to the tip of the process using metallic scale.

Results: In a study of 176 participants, the largest age group was 21-30 years, with a mean age of 25.65. The majority were male (56.80%). Styloid process lengths were nearly similar on both sides (2.912 cm on the right, 2.888 cm on the left), showing symmetry. There were no significant gender differences in length, suggesting the styloid process is symmetrical and not influenced by gender in this sample**.**

Conclusion: The study analyzed age, gender, and styloid process length in a young, predominantly male cohort. It found no significant gender differences in styloid process length. Both sides showed near symmetry, with slight variations in range and standard deviations. No abnormalities were detected. These findings enhance understanding of the styloid process, confirming its near symmetry across both sides of the body.

Keywords:

Introduction

The styloid process (SP) is a cylindrical bony projection from the petrous section of the temporal bone, located posterior to the vaginal process and tympanic plate. It extends inferiorly and anteriorly into the parapharyngeal space. The SP is part of the stylohyoid chain, which includes the stylohyoid ligament (SHL) and the smaller cornu of the hyoid bone. This chain has four segments: tympanohyal, stylohyal, ceratohyal, and hypohyal. The ossification of the SP begins before birth and continues for about eight years, as noted by Goss (1973).[1] The styloid process is involved in controlling movements of the jaw, tongue, and throat through associated ligaments and muscles.

The length of the SP can vary significantly and may be obscured by the hyoid bone or vaginal process or may be absent altogether. Moffat et al. (1977)[2] reported that SP lengths typically range from 1.5 to 4.8 cm, while Eagle (1949)[3] noted a normal range of 2.5 to 3 cm. An SP is considered elongated if its length exceeds 3 cm, which can lead to symptoms known as Eagle's syndrome, affecting around 4% of individuals with this condition.

Elongated SP is a common but often misdiagnosed cause of facial and neck pain. Due to its variable clinical presentation, identifying an extended SP through radiological methods, such as 3D CT scans, orthopantomograms, and lateral oblique mandibular X-rays, is crucial for proper diagnosis and treatment. These imaging techniques have proven useful for assessing SP length and aiding in the symptomatic and therapeutic management of individuals with an elongated styloid process.[4]

So, in this background we want to assess and compare the length of the styloid process in our study.

Materials And Methods

The study will be performed on archived OPGs to ascertain the length of the SP which are obtained from the Department of Oral Medicine and Radiology and Department of Oral & Maxillofacial Surgery. These radiographs will be from patients who are reporting on OPD basis subjected to digital radiographic examination for other dental problems. The inclusion criteria will consist of patients classified as ASA I or ASA II, aged 18 years and above, with clearly visible bilateral styloid processes on the radiographs. Exclusion criteria will include pregnant females, patients who have undergone radiation therapy, individuals with temporomandibular joint (TMJ) ankylosis or a postoperative history of TMJ ankylosis, and medically compromised patients.

A total of 176 digital OPG, of patients aged above 18 years will be taken which will be divided into Group A (MALE) and Group B (FEMALE) for comparison of length of styloid process bilaterally. Length of the individual styloid process will be measured on the radiograph from the point where the SP left the tympanic plate to the tip of the process using metallic scale. The data will be collected on Ms Excel spread sheet [Appendix I].

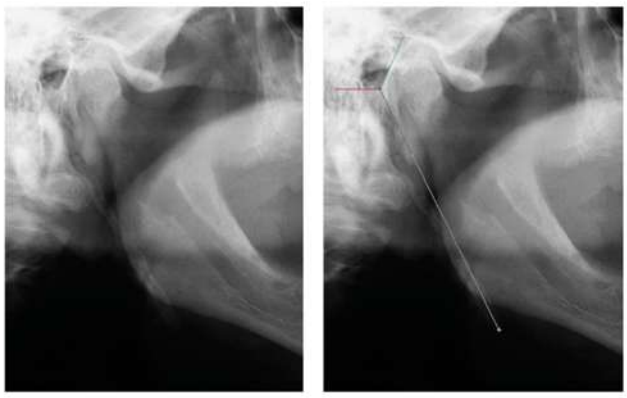

FIGURE 1: (a) Panoramic radiography showing the elongated styloid process. (b) Measurement of the styloid process using the software's rule (the red line shows the lower limit of the external ear canal and the green the previous limit).

The Statistical analysis was done and data will be entered in the excel spread sheet. Descriptive statistics like mean, standard deviation and percentage will be calculated. Inferential statistics like independent (unpaired) t-test along with will be applied, using SPSS (Statistical Package for Social Sciences) version 24. [IBM corp. released 2011] p-value less than 0.05 will be considered statistically significant. Any other necessary tests will be dealt with analysis based on data as per needed.

Results:

Age Distribution

The study included 176 participants with a mean age of 30.00 ± 7.75 years. The largest group (46.59%, 82 subjects) was aged 21-30 years (mean: 25.65 ± 2.57) while the smallest group, 11-20 years, made up 10.80% (19 subjects, mean: 18.63 ± 0.76). Mean age increased progressively across groups. (Table no.-1)

Gender Distribution

Overall, with a slight majority of male subjects. Specifically, 56.80% of the participants were male,

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comprising 100 subjects. Female participants accounted for 43.20%, with a total of 76 subjects. (Table no.-2)

Length Of Styloid Process

The styloid process length on the right side, it ranged from 1.40 cm to 5.00 cm (mean: 2.912 ± 0.757 cm), and on the left, from 1.50 cm to 5.30 cm (mean: 2.888 ± 0.806 cm). Despite slight differences in range and variability, the mean lengths were nearly identical, indicating symmetry between sides. (Table no.-3)

Length Of Styloid Process Genderwise On Right Side

The right styloid process length was similar between males (mean: 2.918 ± 0.806 cm) and females (mean: 2.903 ± 0.693 cm). The standard errors were 0.081 cm and 0.079 cm, respectively. A p-value of 0.903 indicated no significant gender difference, suggesting that styloid process length is not influenced by gender in this study population. (Graph no.-4)

Length Of Styloid Process Genderwise On Left Side

The left styloid process length was similar between males (mean: 2.935 ± 0.842 cm) and females (mean: 2.826 ± 0.757 cm). A p-value of 0.377 indicated no significant gender difference, suggesting that any variation is likely due to random factors rather than biological differences. (Graph no.-5)

Table No.-1: Age Distribution

Age group	Frequency	Percent	Mean Age
11-20 years	19	10.80	18.631±0.76
21-30 years	82	46.59	25.646±2.57
31-40 years	53	30.11	35.207±2.87
41-50 years	22	12.50	43.500±1.95
Total	176	100.0	30.00±7.75

Table No.-2: Gender Distribution

Gender	Frequency	Percent
Female	76	43.20
Male	100	56.80
Total	176	100.0

Table No.-3 Length Of Styloid Process

	N	Minimum	Maximum	Mean (in mm)	Std. Deviation
Right Side	176	1.40	5.00	2.912	0.757
Left Side	176	1.50	5.30	2.888	0.806

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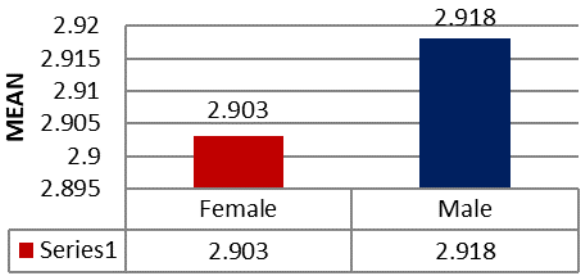
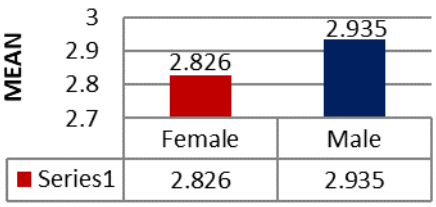
Graph No.- 4: Length Of Styloid Process Genderwise On Right Side



Graph No.-5: Length Of Styloid Process Genderwise On Left Side



Discussion:

"SP" is derived from the Greek word 'Stylos' meaning a pillar.5 The styloid process is a long, slender cylindrical bone arising from the temporal bone infront of the stylomastoid foramen. Embryologically, the styloid process and its ligaments are derived from the first and second branchial arches which also give rise to Reichert's cartilage.6 Radiological normal length of SP measures between 2.5 to 3 cms as reported by Eagle but kaufman et al has reported 30 mm as upper limit of normal SP. When it is longer than 30 mm, it is considered elongated.7,8

In this study of 176 participants, the largest age group was 21-30 years, with a mean age of 25.65 years. The percentage of SP distribution in this study was 56.80% in males and 43.20% in females. The styloid process lengths on the right and left sides were similar, with means of 2.912 cm and 2.888 cm, respectively, showing near same length. The maximum length noted in this study was 5.3cm and about 74 participants (42%) have more than 30 mm length. Out of 74 participants 46 were males (62.16%) and 28 were females (37.83%). Even in Konstantinos Natsis et al9 study, no statistically significant difference was established in SP length on the right and left side and between gender and age.

In several studies conducted by various authors reveals that the styloid processes were elongated more in males when compared to females and more on the left side when compared to the right side. 10,11,12 However, this finding differed from those of some other researchers, who found an increased incidence in female.13 In Bozkir et al14 study, 200 edentulous patients over 50 years (100 males, 100 females), elongated styloid process (>30 mm) was found in 8 patients (4%). Of these, 5 were males (63%) and 3 were females (37%). No significant sex-based difference in prevalence was observed. In our study the length was greater on the right side than the left side. In Balcioglu HA et al15 study, the length of the SP of males is statistically greater than the females in all age groups and on both sides. In Alaqeeli et al study16, maximum length of 8.5 cm was noted till now. In his study patient gave a history of headache, intermittent dysphagia, and left anterolateral neck pain radiating to the ear, especially during yawning and swallowing since last 3 years. Symptoms progressively worsened and became associated with tinnitus.

Conclusion:

The findings suggest that gender does not significantly influence the length of the styloid process, with no meaningful differences observed between males and females.

The styloid processes on both the right and left sides showed near same length, with only slight variations

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in the range and standard deviations and no any abnormalities were detected during the study.

These results contribute to the existing body of knowledge about the anatomical characteristics of the styloid process.

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