Original Research Article

MORPHOLOGICAL AND MORPHOMETRIC ANALYSIS OF STYLOMASTOID FORAMEN IN DRY HUMAN SKULLS AND ITS CLINICAL IMPLICATIONS

ABSTRACT

Introduction: Stylomastoid foramen present between two processes which are styloid process and mastoid process. Facial nerve and stylomastoid arteries are transmitted through the stylomastoid foramen. Facial canal gets terminated in the stylomastoid foramen. Stylomastoid foramen has a site for facial nerve block. Complications reduced by localization of foramen.

Aim: The aim of this study was to analyse the morphology and morphometry of stylomastoid foramen.

Materials and Methods: Damaged skulls were excluded and 60 dry human skulls without any damage were taken for this study. By using digital vernier caliper length and breath of the stylomastoid foramen was measured. Then the statistical analysis was done using SPSS software and paired t-tests were done for comparison.

Results: The length and breadth of the right stylomastoid foramen was 2.39 ± 0.18 mm and 0.85 ± 0.12 mm and the left stylomastoid foramen was 2.18 ±0.33 mm and 1.13 ± 0.38 mm. From the paired t-tests it was very clear that the difference between the breath of right and left stylomastoid foramen was significant ($p<0.05$) and difference between the length of right and left stylomastoid foramen was not significant ($p> 0.05$).

Conclusion: Because of the very narrow size of stylomastoid foramen we cannot measure the accurate value for length and breath, only approximate value of length and breath can be measured. The length and breath of stylomastoid foramen vary from one person to another.

KEYWORDS: Styloid process; mastoid process; stylomastoid foramen; Facial nerve; base of skull; clinical implications.

INTRODUCTION

Stylomastoid foramen, a small opening present on the lower surface of the petrous part of the temporal bone (1,2). This foramen is present between two processes which are the styloid process and the mastoid process (3). The name stylomastoid foramen derived from Latin name 'Foramen Stylomastoideum' (4). Facial canal which connects the internal auditory meatus to the base of the skull gets terminated in stylomastoid foramen (5). Facial nerve and stylomastoid arteries are transmitted through the stylomastoid foramen (6). Through this foramen the main motor position of the facial nerve passes (1). For facial nerve stylomastoid foramen acts as an exit gateway (7).

The facial nerve trunk blockage is at risk of nerve injury and neurological complications at the position of the facial nerve passes (9). The facial nerve blockage of stylomastoid foramen is also called a Nadbath block (8). Complications reduced by localization of foramen (6). Anatomical variation in stylomastoid foramen leads to nerve injury which is the major risk factor in Bell's palsy (unilateral facial nerve paralysis) (9).

Bell's Palsy means inflammation on the facial nerve at the portion where it passes through stylomastoid foramen (10). Bell's palsy is the compression of a facial nerve in or just outside stylomastoid foramen due to inflammation and oedema of the nerve (11). Infranuclear lesion of the facial nerve, at the stylomastoid foramen is known as Bell's palsy (12). Muscles of, upper and lower quarters of the face on the same side get paralysed and loss of facial expression on the affected (13). The face becomes asymmetrical and is drawn up to the normal side (14). The

affected side is motionless (15). Result is asymmetry of corner of mouth, inability to close the eye and disappearance of nasolabial fold (16). Articulation of labials is impaired (17).

In the foetal skull/neonatal skull, stylomastoid foramen is exposed on the lateral surface of the skull because the mastoid portion is flat. Facial nerve -palsy in newborn: The mastoid process is absent in newborn and stylomastoid foramen is superficial. Manipulation of the baby's head during delivery may damage the VII nerve(18). This leads to paralysis of facial muscles especially the buccinator, required for sucking the milk (19). Our team has extensive knowledge and research experience that has translated into high quality publications (20–27),(28),(29),(30), (31,32),(33),(34),(35–39). The aim of this study was to analyse morphological and morphometrical measurements of stylomastoid foramen.

MATERIALS AND METHODS

By excluding the damaged skulls the study settings are done using sixty undamaged dry human skulls in the Department of Anatomy in Saveetha Dental college. By using a digital vernier caliper the length and breath of stylomastoid foramen on both right and left side were measured for all the 60 skulls. Then by using SPSS software mean value was obtained from descriptive statistics and significant value was obtained from paired t-test which was used to compare the means of the right and left sides of the foramina.

Statistical analysis:

From the above measurements mean, std deviation, correlation and significance were calculated. Statistical data analysis was done using SPSS software in which paired t-test was adopted for two indifferent means and $p<0.05$ was considered as statistically significant (95% Confidence Interval of the difference).

RESULTS

The minimum and maximum length of right stylomastoid foramen was 1.81mm and 3.16mm respectively. The minimum and maximum breath of right stylomastoid foramen was 0.40mm and 1.51mm respectively. Minimum and maximum length of left stylomastoid foramen was 1.75mm

and 3.62mm. Minimum and maximum breath of left stylomastoid foramen was 1.13mm and 1.98mm (Table 1). The mean length of the right and left stylomastoid foramen is 2.39 ± 0.18 mm and 2.18 ±0.33 mm. The mean breath of the right and left stylomastoid foramen is 0.85 ± 0.12 mm and 1.13 ± 0.38 mm.The paired sample correlation of right length and left length of stylomastoid foramen is 0.17 and the paired sample correlation of right breath and left breath of stylomastoid foramen is 0.27 (Table 2).

Significance value obtained from paired t-test of right and left length of stylomastoid foramen is 0.19 ($p>0.05$) this shows that the difference between the length is not significant. Significance value obtained from paired t-test of right and left breath of stylomastoid foramen is 0.03 ($p<0.05$) this shows that the difference between the breath is significant (Table 3).

Table 1: Shows the morphometric measurements of right and left stylomastoid foramen. The values are expressed as Mean ± SD.

Parameters	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Right length	1.81	3.16	2.3992	0.18336
Right breath	0.40	1.51	0.8572	0.21664
Left length	1.75	3.62	2.1863	0.33258
Left Breath	0.50	1.98	1.1333	0.38631

Table 2: Shows the Pair 1 correlation of length of right and left stylomastoid foramen. Pair 2 shows the correlation of breadth of right and left stylomastoid foramen. $p<0.05$ was considered statistically significant.

Parameters	**N**	**Correlation**	**Significance**
Pair 1 - Right length & Left length	60	0.171	0.190

Pair 2 - Right breath & Left breath	60	0.279	0.031

DISCUSSION

In terms of shape stylomastoid foramen were observed to have 8 variations. Round, oval, square are commonly known variants whereas triangular, rectangular, serrated,bean and irregular are rare variants (9). Wide variations have been observed between the distance from the center of stylomastoid foramen and the styloid process in several studies justifying the racial possibility behind it, this helps to determine the precise location of stylomastoid foramen with respect to various anatomical structures (40).The distance from the center of stylomastoid foramen to the tip of the mastoid process on both the right and left sides were measured. This measurement will aid neurosurgeons in doing surgeries near the stylomastoid foramen (2).

Previous research done on this topic indicates the variation in shape of the stylomastoid foramen, the precise location of stylomastoid foramen with respect to various anatomical structures and measurement which helps the surgeons in doing surgeries. But in no other research length and breath of stylomastoid foramen were measured so I measured the length and breath of stylomastoid foramen and by using paired t-test we came to know that the difference of right and left breath of stylomastoid foramen is significant ($p<0.05$). Less sample size seems to be the limitation of the study. Future studies with large sample sizes can be encouraged for more reliable results.

CONCLUSION

The parameters of this study are useful for anesthetists to accurately locate the facial nerves because its exit gateway is stylomastoid foramen. This study may also be useful for trunk surgeons to prevent injury by identifying the facial nerves. Because of the very narrow size of stylomastoid foramen we cannot measure the accurate value for length and breath, only approximate value of length and breath can be measured.

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