Journal of Morphology and Anatomy

Review Article Open Access

Morphometric Surface Anatomy of the Pre and Postcentral Gyrus

Adel Hajjay M[1]*, Mohamed MEF[3], Al Tahir O[2], Kamal B[2] and Meriam IS[4]

[1]Lecturer of Anatomy,Batterjee Medical College, Prince Abdullah AlFiasal Street, Obhur Al-Shamaliyah, Jeddah 23819, Saudi Arabia
[2]Burri Dist, Nile Street, Khartoum 55, Sudan
[3]Shebin el-kom, Yassin Abdel Ghaffar Street, from Gamal Abdel Anasar Street, Menoufia 32511, Egypt
[4]Almahjar Street, Jeddah 22421, Saudi Arabia

Abstract

Objective: This research was especially aimed to build the knowledge of surface anatomy regard the pre and post central gyrus with their bone relationships.

Methods: Ten Sudanese formalin-fixed adult heads (right and left sides) were used to evaluate the craniometric measurement of Pre and Post central gyrus of the cerebral hemisphere. Scalp was removed then the skull was marked as two windows by blue marker (Superior parietal window and Inferior parietal window) the blue marked lines were cut by autopsy electrical saw and the meninges were removed and the cerebral cortex was exposed. The pre and post central gyrus were measured from the nearest bony landmarks of coronal suture, sagittal suture and superior temporal line.

Results: Precentral gyrus superior part was measured from the coronal suture posteriorly at a point crossing the sagittal suture (right 4.10 ± 0.74 cm, left 4.12 ± 0.79 cm), Precentral gyrus inferior part was measured from the coronal suture posteriorly at a point crossing the superior temporal line (right 3.18 ± 0.67 cm, left 2.97 ± 0.76 cm), Postcentral gyrus superior part was measured from the coronal suture posteriorly at a point crossing the sagittal suture (right 5.32 ± 1.02 cm, left 5.22 ± 0.95 cm), Postcentral gyrus inferior part was measured from the coronal suture posteriorly at a point crossing the superior temporal line (right 4.64 ± 0.61 cm, left 4.31 ± 0.79 cm).

Conclusion: The research found that there were clear relations between the pre and post central gyrus with the cranial bony landmarks.

Keywords: Precentral gyrus; Postcentral gyrus; Craniometric measurements

Introduction

A detailed study of neuroanatomy through dissections in cadavers can provide the best orientation in that regard [1-3]. Despite considerable knowledge of intracranial anatomy, little is known clearly about brain parts and their bony relationships. The functional areas of the cerebral cortex are described by Brodmann in 1909 and the Cranial-cerebral relationships, firstly described in the 19th century by Broca. Disorientation for anatomical brain topography of the gyri and sulci may increase pre- and intra operatively complication rates [4-6]. Proper craniotomy of the brain lesion and correct interpretation of the gyral structures under the craniotomy site is one of the most important steps in successful surgery [7-10]. Therefore, this research is especially aimed to highlight the methods to identify the pre and post central gyri as two of the most significant functional areas of the cerebrum (primary motor and primary somatosensory area) with the guidance of the craniometrical landmarks and sutures such as: sagittal suture, coronal suture and superior temporal line to provide a surface anatomy for different cortical functional areas such as: primary motor area and primary sensory area.

Material and Methods

Sample size

20 samples were studied. 10 formalin-fixed Sudanese adult heads 9 male and 1 female (ten left sides and ten right sides)

Study population

Inclusion criteria: Adult normal heads were included

Exclusion criteria: skulls with the signs of CNS trauma, disease and congenital malformation were excluded

Sample preparation

A circumferential incision was made by regular scalpel blade around the head passing in points made earlier one finger breadth above the eye brows, the auricle and posteriorly following the hair border.

The scalp was removed with the temporalis muscle and its fascia. The skull was left to dry (Figures 1 and 2), then by blue marker a window was draw bordered by coronal suture, superior temporal line, sagittal suture and lambdoid suture (Figure 3). Then cut by autopsy electrical saw (Mopec, Tri-Drive).

The dura matter was removed by scalpel blade and the adhesive arachnoid and pia matter were stripped off with the superficial cerebral veins from the cerebral cortex by toothed forceps. Then the target area was exposed (Figure 4).

The distances to the precentral gyrus - midgyral point - from the coronal suture crossing point at the sagittal suture and at the superior temporal line were measured (Figures 5 and 6) by regular measuring tape (precision 0.1 mm), and the same landmarks and techniques were applied in the postcentral gyrus (Figures 7 and 8).

***Corresponding author:** Adel Hajjay M, Lecturer of Anatomy, Batterjee Medical College, Prince Abdullah AlFiasal Street, Obhur Al-Shamaliyah, Jeddah 23819, Saudi Arabia, Tel: +966 12 656 1111; E-mail: dr.hajjay@gmail.com

Received May 29, 2017; **Accepted** June 05, 2017; **Published** June 09, 2017

Citation: Adel Hajjay M, Mohamed MEF, Al Tahir O, Kamal B, Meriam IS (2017) Morphometric Surface Anatomy of the Pre and Postcentral Gyrus. J Morphol Anat 1: 106.

Figure 1: Dry skull after scalp removal (lateral view)

Figure 2: Dry skull after scalp removal (superior view).

Figure 3: Skull marked the target area (window no. 3).

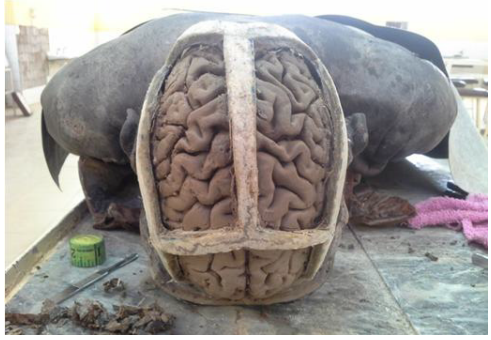

Figure 4: Cerebral cortex exposure after meninges stripped off.

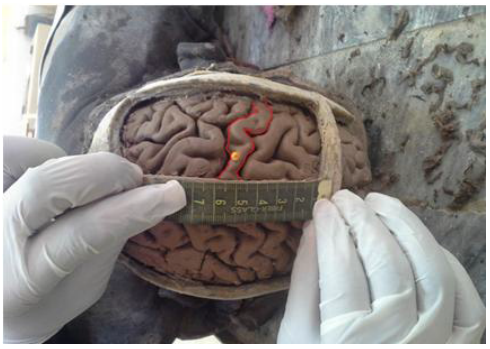

Figure 5: Distance to the precentral gyrus from the coronal suture.

Figure 6: Distance to the precentral gyrus from the coronal suture at crossing point with superior temporal line

Figure 7: Distance to the postcentral gyrus from the coronal suture.

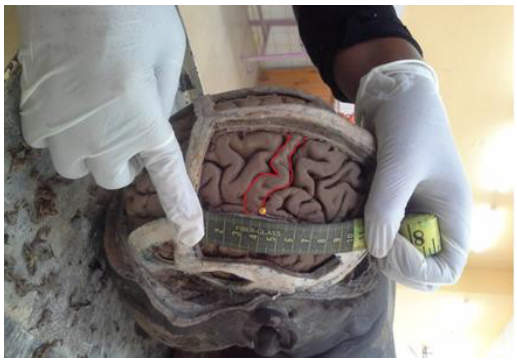

Figure 8: Distance to the postcentral gyrus from the coronal suture in the crossing point at the superior temporal line

Results interpretation

All laboratories quality control measures were adapted during dissection process.

Statistical analyses

The data were analyzed by using SPSS software version 16. P value > 0.5 was considered as statically significant. An analysis of the measurements (mean ± SD) was performed.

Ethical consideration

The research is ethically approved by ethical committee of the Faculty of Graduate Studies and Scientific Research and Faculty of Medicine in the National Ribat University, Khartoum, Sudan.

Results

The Pre and Post central gyrus of both hemispheres did not show the mirror image. Duo to the oblique course of the pre and post central gyrus downward forward, two points were measured. The distances from the coronal suture to the gyrus in the crossing point with sagittal suture and superior temporal line in both side right and left.

The distance was measured from the coronal suture to the precentral gyrus in the crossing point with sagittal suture and the mean distance was (right 4.10 ± 0.74 cm/left 4.12 ± 0.79 cm). And the distance to postcentral gyrus was (right 5.32 ± 1.02 cm/left 5.22 ± 0.95 cm).

Another distance was measured from the coronal suture to the precentral gyrus in the crossing point with superior temporal line and the mean distance was (right 3.18 ± 0.67 cm/left 2.97 ± 0.76 cm). And the distance to postcentral gyrus was (right 4.64 ± 0.61 cm/left 4.31 ± 0.79 cm) (Tables 1 and 2).

Discussion

Studying the anatomy of the actual brain structures is still one of the most important requirements. Therefore, this research is especially aimed to highlight the methods to identify the pre and postcentral gyri with the guidance of the craniometrical landmarks in different gender in Sudanese population.

The bony relationship of the pre and postcentral gyrus had been studied previously.

In this research the mean positions for them in the sagittal suture point were (right 4.10 ± 0.74 cm/left 4.12 ± 0.79 cm and) and (right 5.32 ± 1.02 cm/left 5.22 ± 0.95 cm), respectively, and in the superior temporal line point were (right 3.18 ± 0.67 cm/left 2.97 ± 0.76 cm) and (right 4.64 ± 0.61 cm/left 4.31 ± 0.79 cm), respectively.

This results strongly agree with study conducted in Turkey 2009, by Kendir et al. [11] who found the mean positions of the precentral gyrus superior (right 4.34 ± 1.06 cm, left 4.66 ± 0.91 cm) behind the bregma on the midline, precentral gyrus inferior (right 2.46 ± 0.63 cm, left 2.54 ± 0.54 cm) behind the stephanion, postcentral gyrus superior (right 6.50 ± 0.68 cm, left 6.50 ± 0.65 cm) behind the bregma on the midline and postcentral gyrus inferior (right 4.07 ± 0.52 cm, left 4.13 ± 0.45 cm) behind the stephanion.

In this study, ordinary dissection steps were used to measure and evaluate the relationships which were an obvious method to

Case Number	Sex	Distance to the Precentral gyrus from the coronal suture (cm)			
		Cross sagittal suture		Cross sup. Temporal line	
		Right	Left	Right	Left
1	M	4.5	4	2	2.5
2	F	3	3	4	2.5
3	M	4.5	4.8	3.8	3.5
4	M	5	5	3	2
5	M	5	5.5	3.3	3.5
6	M	4.7	4.5	4	3.7
7	M	4	3.7	2.8	2.7
8	M	3.1	3.5	2.3	1.8
9	M	3.7	3.5	3.4	3.5
10	M	3.5	3.7	3.2	4
Mean ± SD		**4.10 ± 0.74**	**4.12 ± 0.79**	**3.18 ± 0.67**	**2.97 ± 0.76**

Table 1: Distance measurements of the precentral gyrus in two points from coronal suture to the crossing point of the sagittal suture and the superior temporal line.

Case Number	Sex	Distance to the Postcentral gyrus from the coronal suture (cm)			
		Cross sagittal suture		Cross sup. Temporal line	
		Right	Left	Right	Left
1	M	5.3	5	3.5	3.5
2	F	3.7	4	5.5	4.5
3	M	5.3	6	4.8	5.3
4	M	6	5.7	4.7	4
5	M	7.3	7	4.2	4.7
6	M	6.3	6	5.5	5
7	M	5	4.4	4.7	3.5
8	M	4.3	5	4	3
9	M	5.2	4.1	4.8	4.3
10	M	4.8	5	4.7	5.3
Mean ± SD		**5.32 ± 1.02**	**5.22 ± 0.95**	**4.64 ± 0.61**	**4.31 ± 0.79**

Table 2: Distance measurements of the postcentral gyrus in two points from coronal suture to the crossing point of the sagittal suture and the superior temporal line.

assessment. But may be radiographic with three dimension images is needed in further studies.

No significant differences were found between males and females as the previous studies found. No significant differences were found between right and left sides of the measured skull in this study.

From this study and previous ones, neuroanatomist, radiologist and anatomist can use the cranium bony landmarks and their relationships with intracranial structures in description and further studies.

Conclusion

This study included 10 heads, 9 male and 1 female. The pre and post central gyrus are running obliquely forward downward. Behind the bregma the precentral gyrus located at 4 cm and the postcentral gyrus at 5 cm. obliquely behind the coronal suture the precentral gyrus crosses the superior temporal line at 3 cm and the postcentral gyrus at 4 cm.

It is not always easy to correlate the surface anatomy of the cortical areas using craniotomy but in this research it successfully provided significant results.

Acknowledgements

I am thankful to all the dignitaries mentioned below for their cooperation during my work.

Reham Abdulqader MRCP and from Anatomy Department, National Ribat University; Dalia Ibrahim M.Sc., Ahmed Awad El Kareem M.Sc., Khalid Taha M.Sc., and Mohamed Hammad M.Sc.

Technician and doctors of International University of Africa, Ahfad University, National Ribat University, Sudan International University, Omdurman Islamic University, Technology and Sciences University and Yarmouk Medical College for helping in cadavers preparation and dissection and providing me with the all necessary facilities in Dissection halls.

Last but not least great thanks to Professor Dr. Tahir Osman, professor of human anatomy and Dean of faculty of Graduate Studies and Scientific Research, The National Ribat University for his unlimited support and for providing me the needed guidance and work letters.

I am thankful to all those unnamed people who extended their helping hand during my work and research.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

1. Rhoton AL Jr (2002) The lateral and third ventricles. Neurosurgery 51: 207-271.
2. Tanriover N, Rhoton AL, Kawashima M, Ulm AJ, Yasuda A (2004) Microsurgical anatomy of the insula and the Sylvian fissure. J Neurosurgery 100: 891-922.
3. Tubbs RS, Salter G, Oakes WJ (2000) Superficial surgical landmarks for the transverse sinus and torcular herophili. 93: 279-281.
4. Reinges MH, Nguyen HH, Krings T, Hütter BO, Rohde V, et al. (2004) Course of brain shift during microsurgical resection of supratentorial cerebral lesions: limits of conventional neuronavigation. Acta Neurochir (Wien) 146: 369.
5. Wen HT, Rhoton AL Jr, Marino R Jr (2006) Gray matter overlying anterior basal temporal sulcus an intraoperative landmark for locating the temporal horn in amygdalohippocampectomies. Neurosurgery 59: 221-227.
6. Wolfsberger S, Rössler K, Regatschnig R, Ungersböck K (2002) Anatomical landmarks for image registration in frameless stereotactic neuronavigation. Neurosurgery Rev 25: 68-72.
7. Ersoy M, Evliyaoglu C, Bozkurt MC, Konuskan B, Tekdemir I, et al. (2003) Epipteric bones in the pterion may be a surgical pitfall. Minim Invasive Neurosurgery 46: 363-365.
8. Figueiredo EG, Deshmukh V, Nakaji P, Deshmukh P, Crusius MU, et al. (2006) An anatomical evaluation of the minisupraorbital approach and comparison with standard craniotomies. Neurosurgery 59: 212-220.
9. Ribas GC, Yasuda A, Ribas EC, Nishikuni K, Rodrigues AJ Jr (2006) Surgical anatomy of microneurosurgical sulcal key points. Neurosurgery 59: 177-211.
10. Ucerler H, Govsa F (2006) Asterion as a surgical surgical landmark for lateral cranial base approaches. J Craniomaxillofacial Surgery 34: 415-420.
11. Simel Kendir, Halil Ibrahim Acar, Ayhan Comert, Mevci Ozdemir, Gokmen Kahilogullari, et al. (2009) Window anatomy for neurosurgical approaches Laboratory investigation. Journal of Neurosurgery 111: 365-370.