Two New Standard Lines of the External Base of Skull

Kriengkrai Urusopon, M.D., Jantima Roongruangchai, D.D.S., Ph.D.
Department of Anatomy, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

ABSTRACT

Objective: To propose another two new standard lines for the external base of the skull which pass across almost all significant foramens, for easier observation and to remember the sites of the foramen.
Methods: 50 Thai dry skulls 24 males and 26 females were observed from the external base of skull. All of them were photographed and the imaginary oblique lines were drawn by the Photoshop program. 2 lines were drawn, firstly the medial oblique line and secondly the lateral oblique line.
Results: The medial and lateral oblique lines, 50 right and 50 left sides of Thai skulls were passed along the same canals and foramens. There was no significant difference between the 2 sexes. These could be proposed to be standard lines. Firstly, the medial oblique line extends from the tip of the mastoid process medialward to the alar of vomer. This imaginary line passes across the stylomastoid foramen, the lateral border of the jugular foramen, the carotid canal, the foramen lacerum, the pterygoid canal and the alar of vomer. Secondly, the lateral oblique line extends from the anterior margin of the base of mastoid process medialward to the medial pterygoid plate. This imaginary line passes across the external auditory meatus, the mandibular fossa, the spine of the sphenoid bone, the foramen spinosum and the foramen ovale.
Conclusion: We proposed another 2 imaginary lines at the external base of the skull for better alternative landmarks in finding the nerves and blood vessels that pass through the foramens in and out of the skull. The previous imaginary planes, the anterior and posterior transverse lines do not pass across the carotid canal and foramen spinosum. Therefore, we can alternatively use the medial and lateral oblique lines as landmarks to find almost all the important structures such as the facial nerve, the common carotid artery etcetera.

Keywords: Base of skull; standard line

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The exterior of the base of the skull or the under surface of the base of the skull can be considered in three areas, the anterior, the intermediate and the posterior by the anterior and the posterior transverse lines. These are 2 immaginary lines cross most of the foramens at the base of the skull. Accordinly, they serve as reliable keys to the relationships of the nerves and blood vessels transmitted by these foramens. The anterior transverse line is the line passing through the mandibular notches of the right and left sides. This line is seen to cross the foramen ovale, the root of the lateral pterygoid plates, the foramen lacerum, the pterygoid canals the root of the medial pterygoid plates and the synchondrosis between the basi-occipital and the sphenoid. The posterior transverse

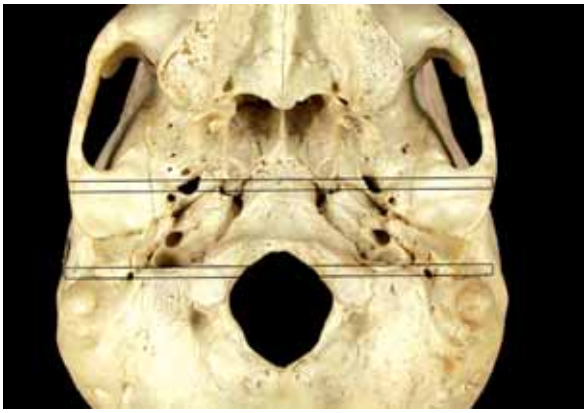


Fig 1. Anterior and posterior transverse lines.

Correspondence to: Jantima Roongruangchai
E-mail: headsian@mahidol.ac.th

line unites the anterior margins of the right and left mastoid processes. It crosses the stylomastoid foramens the posterior margin of the jugular foramens, hypoglossal canals and the junction between the anterior one third and the posterior two thirds of the occipital condyle.

Another line at the base of skull is the oblique line at the base of skull[3]. This imaginary line extends from the tubercle at the root of the medial pterygoid plate which lies on the anterior transverse line to the front of the external auditory meatus. At the midpoint of this oblique line the spine of the sphenoid stands out like a sentinel guarding many strategic points. This line doesn't pass across the foramens but all foramens lie anteriorly and posteriorly along it. Thus on the anteriorly line lies the foramen spinosum which transmits the middle meningeal vessels. The posteriorly line is the opening of the carotid canal. The medially is the orifice of the bony auditory tube and a bristle entering here emerges through the external auditory meatus. The laterally line is the mandibular fossa. In the half of the line anteromedial to the spine lodges the cartilagenous part of the auditory tube, the half posterolateral is the tympanosquamous fissure.

The external base of the skull is very complicated and essential whereas there are many foramens and canals which transmit essential nerves and blood vessels. It takes a little more difficulty and medical students have to put more attention and effort to study the details. Many of the standard lines were imagined to help decrease the difficulties[1-7]. In this study we proposed another 2 standard lines which pass across more significant points at the external base of the skull than those previously proposed.

MATERIALS AND METHODS

50 Thai dry skulls, 24 males and 26 females, of the Department of Anatomy, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand, were used in this study. They were observed from the external base of the skull. All of them were photographed by the digital camera and the 2 immaginary oblique lines were drawn by the Photoshopp program of the computer. Firstly, the medial oblique line passed from the tip of the mastoid process to the alar of vomer. The second, the lateral oblique line passed from the anterior margin of the base of the mastoid process medialward to the medial pterygoid plate. Totally there were 100 medial and another 100 lateral oblique lines from both right and left sides. All the lines were carefully studied concerning the foramens they passed across.

RESULTS

The 100 medial and another 100 lateral oblique lines at the external base of the skulls of the Thais have no significant difference between sexes or sides. Therefore if there is not any variation, both lines are proposed here as standard lines. The medial oblique line stretches from the tip of the mastoid process to the alar of vomer. This imaginary line passes across the stylomastoid foramen, lateral border of the jugular foramen, carotid canal, foramen lacerum, pterygoid canal and the alar of vomer. The lateral oblique line extends from the anterior margin of the base of the mastoid process medialward to the medial pterygoid plate. This imaginary line passes across the external auditory meatus, mandibular fossa, spine of sphenoid bone, foramen spinosum and foramen ovale. The canals or the foramens mentioned above transmit essential nerves and blood vessels such as the foramen ovale transmits the mandibular division of the trigeminal nerve, the foramen spinosum transmits the middle meningeal vessels.

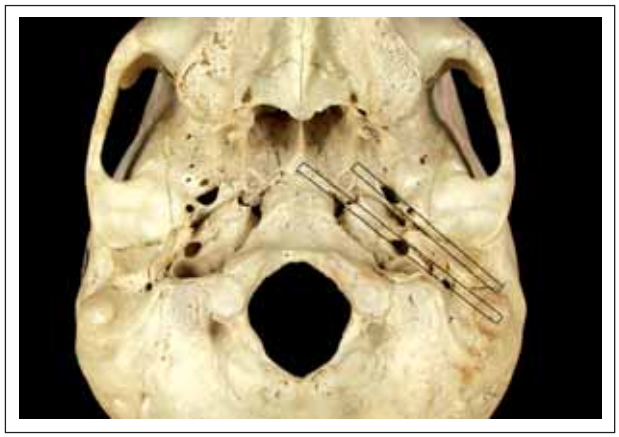


Fig 2. Medial and lateral oblique lines.

DISCUSSION

The external base of the skull is very complicated and essential because there are many foramens and canals which transmit essential nerves and blood vessels. When one has to study the detail of this area, he or she should pay more effort and attention. The anterior and the posterior transverse lines are standard lines tha were proposed many decades ago. The former is the landmark of the foramen ovale and the foramen spinosum of both sides which joins both the mandibular notches. The latter joins the two anterior margins of the mastoid processes and is the landmark for the styloid and mastoid processes, the jugular foramen, the hypoglossal canal, the occipital condyles and the foramen magnum.

The anterior and posterior transverse lines are helpful in noticing the structures of the area, and also helpful for remembering. Even though these lines do not pass across the carotid canal and foramen spinosum, this study proposes 2 new standard lines, the medial and lateral oblique lines, which pass across all the essential foramens at the external base of the skull. The medial oblique line passes across the stylomastoid foramen which transmits the facial nerve, the carotid canal which transmits the internal carotid artery, the jugular foramen which transmits the CN.IX, X, XI and the foramen lacerum. The lateral oblique line passes across the foramen ovale and the foramen spinosum at the same line. These 2 new standard lines, therefore, are very meaningful because they pass across all of the significant foramens. These help in easier memorization and understanding and may serve as landmarks in application viewing of X-Ray films.

CONCLUSION

We propose 2 new standard lines of the external base of skull, the medial and lateral oblique lines, by studying 50 Thai dry skulls. Both lines have no variation among sides and sexes. The medial oblique line extends from the tip of the mastoid process and passes medialward across the stylomastoid foramen, the lateral border of the jugular foramen, the carotid canal, the foramen lacerum, the pterygoid canal and the end at the alar of vomer. The lateral oblique line extends from the anterior margin of the base of the mastoid process and passes medialward

across the external auditory meatus, the mandibular fossa, the spine of the sphenoid bone, the foramen spinosum and the foramen ovale. These two new standard lines we propose here can be alternatively used to find almost all the important structures transmitted by the foramen at the base of skull.

REFERENCES

1. Agur HRA, Dally AF. Grant's Atlas of Anatomy. 2nd ed. London: Williams & Wilkins, 2005: 595.
2. Romances GJ. Cunningham's Textbook of Anatomy. 12th ed. New York: Oxford University Press, 1981: 113-7.
3. Boileau GJC, Basmajian JV. Grant's Method of Anatomy. 7th ed. London: Williams & Wilkins, 1965: 645-51.
4. Snell RS. Clinical Anatomy. 7th ed. London: Williams & Wilkins, 2004: 790-9.
5. Netter FH. Atlas of Human Anatomy. 3rd ed. New Jersey: Icon Learning System, 2003: 1-14.
6. Roger AW. Textbook of Anatomy. 1st ed. London: Churchill Livingstone, 1992: 178-96.
7. Williams PL, Warwick R, Dyson M, Bannister LH. Gray's Anatomy. 37th ed. London: Churchill Livingstone, 1989: 354-60.