CASE REPORT

UNUSUAL FINDINGS ON OCCIPITAL BONE OF DRY SKULL OF A PAKISTANI ADULT

ZAHID A.,[1] KHAN B.[2] AND KHAN M.W.[3]
[1]*Department of Anatomy, Allama Iqbal Medical College*
[2]*Shalamar Medical and Dental College and* [3]*Central Park Medical College, Lahore – Pakistan*

ABSTRACT

Background and Objective: The morphological variations of skull have been the source of interest since long for many scientists because of their clinical, neurosurgical, anthropological, forensic and racial significance. This article describes three unusual findings on the occipital bone of the same skull.

Methodology: During the routine osteology demonstration classes for medical undergraduate students in Anatomy department, Khawaja Muhammad Safdar Medical College Sialkot, a dry human adult skull with three unusual findings was observed.

Results: The first finding was the presence of an unusual shallow incomplete median bony canal on the clivus in the basiocciput region.In addition, a bony spur (osteophyte) on medial side of right occipital condyle was found. The third finding on the same skull was the presence of an unusual large jugular foramen divided by a bridge of bone lateral to the right occipital condyle in front of condylar fossa. The skull was closely observed and photographed. The probable etiological factors attributing to such findings are also discussed in the present study.

Conclusions: The present study findings will add to data of anatomical variations of occipital bone in Pakistani population, which may be important from clinical, neurosurgical and forensic point of view.

Key Words: Clivus, jugular foramen, occipital condyle, Pakistani skull.

INTRODUCTION

The occipital bone of skull can be described as being perforated by the foramen magnum with the basilar part in front, the squamous part behind and the condylar parts lateral to the foramen magnum[1]. Neurosurgeons have to be familiar with the anatomical probable variations of the occipital bone in order to achieve the widest exposure with the best surgical outcome, also the knowledge of such variations may aid the radiologists in interpretation of imaging of occipital bone. This paper describes the three unusual variationsof the occipital bone on the same skull.

There are very few studies in literature about the presence of a bony canal on the clivus on basiocciput. Researchers described a canal in median plane on the posterior third of the clivus. They termed it as median clival canal. They proposed that this canal is more likely due to the persistence of remnant of notochord. The presence of canal in clivus might interfere with neurosurgical operations in the clival region and possibly provoke symptoms of the basilar artery, as well as of the basilar plexus.[2] In a study, bony canal was found on the lower half of the clival surface in 3 out of 100 adult cranial bases studied and named inferior median clival canal" to this anatomical variation.[3] Persistence of canal on basilar part of clivus is a rare congenital defect of skull base representing an embryological remnant depicting the cephalic end of the notochord and corresponds to the course of the notochordal canal in the basiocciput caudally. At about the end of seventh week of embryonic period, notochord traverses the occipital plate in an oblique manner, at first nearer to dorsal surface and then lying ventrally. Later in development, notochord re-enters the cranial base, runs ventrally to end just caudal to the pituitary gland.[4] Researchers describe the two types of canals on clivus i.e. complete and incomplete. Further classification of complete clival canal includes superior, inferior and bifurcated. The incomplete clival canal is further classified as blind ending space on the intracranial surface, a blind ending canal on the nasopharyngeal surface (inferior foveolapharyngica recess) and a canal running through posterior sphenoid and basiocciput[5].

The jugular foramen may be considered as the complex foramen due to its irregular shape, surgical access, and contribution of two bones in its formation.[6] It lies between the occipital bone and petrous part of temporal bone. The sigmoid sinus, inferior petrosal sinus, meningeal branches of occipital and ascending pharyngeal arteries, glossopharyngeal nerve, vagus

Corresponding Author: Dr Aliya Zahid, Associate Professor Anatomy
Allama Iqbal Medical College, Lahore. Cell: 0333-4219025

nerve and accessory nerve with their ganglia traverse the foramen. The tympanic branches of 9th and 10th cranial nerves also pass through jugular foramen. Jugular foramen may be classified into three parts (petrosal, sigmoid and intrajugular part) according to the structures which passed through the jugular foramen. Jugular foramen is a complex anatomical area and pathology in the area may manifest with dysfunction of the traversing nerves.[7]

The occipital condyles which articulate with the atlas are oval in shape convex downward and laterally and have their long axes directed forward and medially. It has been postulated that bony spur on occipital condyle represents an acquired ossification of ligaments induced by the pulsation of the vertebral artery or an activation of existing osteogenetic potency in the craniovertebral region.[8]

CASE REPORT

During the routine osteology demonstration classes for medical undergraduate students in Anatomy department of Khawaja Muhammad Safdar Medical College, Sialkot, a dry human adult skull of unknown sex with three unusual findings was observed. The skull showed the presence of an unusual shallow incomplete median bony canal on the clivus in the basiocciput region. It was a blind canal and there was no opening on the internal aspect of clivus. In addition, a bony spur projecting from the medial side of right occipital condyle was found. The third finding on the same skull was a presence of an unusual large jugular foramen divided by a bridge of bone arising from occipital bone lateral to the right occipital condyle in front of condylar fossa. The skull was closely observed and photographed.

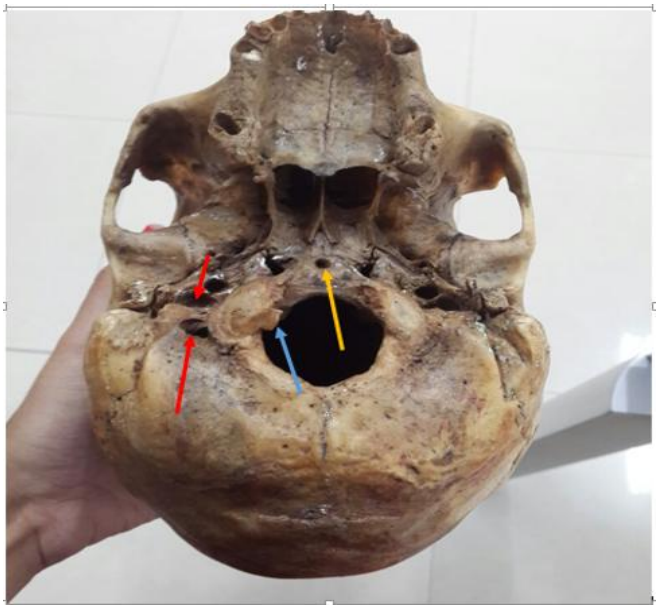

Fig. 1: *Base of skull showing three unusual findings on occipital bone.*

- *Yellow arrow showing a shallow incomplete median clival canal.*
- *Blue arrow showing bony spur arising from medial side of right occipital condyle.*
- *Red arrow showing unusual right jugular foramen divided by a bridge of bone into anterior and posterior part.*

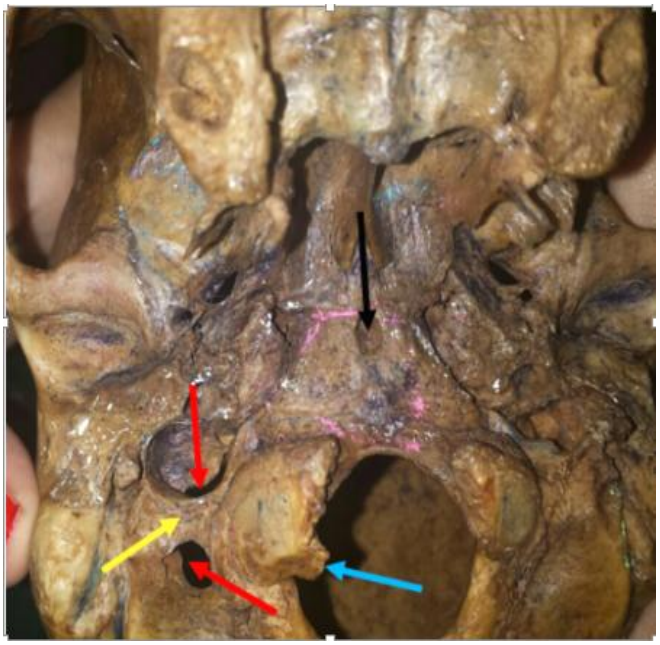

Fig. 2: *Magnified view of basiocciput showing occipital bone having three variations.*

- *Black arrow shows shallow incomplete clival canal on basiocciput*
- *Blue arrow shows a spur on medial part of right occipital condyle.*
- *Red arrow shows a big right jugular foramen.*
- *Yellow arrow shows a bar of bone dividing jugular foramen into anterior and posterior parts.*

DISCUSSION

Present report shows an unusual and unique morphology of occipital bone in dry skull of a Pakistani adult that emphasizes the importance of surgical treatment of lesions involving the area. In present study an incomplete shallow canal on clivus was found in the median plane and it can be concluded that this canal may be due to the persistence of remnant of notochord. In a study on skull of an Indian adult, the canal on clivus was found that was directed downwards and forwards but not in the median plane, so the possibility of presence of notochord in the canal was excluded.[9] It is observed that a complete clival canal traverses through the basiocciput, while an incomplete canal extends partially through either the superior or inferior portions of the basiocciput.[10] In present study the canal is incomplete and partially extends through pharyngeal

(inferior) surface and considered to be foveolapharyngica type.

In a study of jugular foramen, it was found that the right jugular foramen was divided into two compartments by the intrajugular process; the anterior and the posterior part, same as in present study[11].In a research on dried skulls and cadavers, osteophytes on the articular surfaces of the median atlanto-axial joint (n = 63), third occipital condyles (n = 3) and the free ossicles (n = 22) were found.[12] It was observed in a case of pediatric Bow Hunter's stroke which resulted from a nearly complete occlusion of the vertebral artery of right sidedue to an abnormal spur arising from the right occipital condyle.[13] This finding is similar to the present study where a spur originates from right occipital condyle.

In ***conclusion*** it is emphasized that while studying such anatomic variations in the skull maximum attention should be given to them because their presence and description is very significant from clinical, radiological and neurosurgical point of view.

ACKNOWLEDGMENTS

The authors thank to the administrative staff of Anatomy Department of Khawaja Muhammad Safdar Medical College, Sialkot. We are also grateful to the reviewers for critical reading of this paper and valuable suggestions.

REFERENCES

1. Avci E, Dagtekin A, Ozturk AH, Kara E, Ozturk NC, Uluc K, Akture E, Baskaya MK. Anatomical variations of the foramen magnum, occipital condyle and jugular tubercle. Turk Neurosurg. 2011; 21 (2): 181-90.
2. Jalsovec D, Vinter I. Clinical significance of a bony canal of the clivus. Eur Arch Otorhinolaryngol. 1999; 256: 160–161.
3. Zhang WH, Yen WC. A new bony canal on the clival surface of the occipital bone. Acta Anat (Basel). 1987; 128: 63–66.
4. Williams PL, Warwick R. Gray's Anatomy. 36th Ed., Churchill Livingstone, New York. 1980: 138–143.
5. Jacquemin C, Bosley TM, al-Saleh M, et al. Canalisbasilarismedianus: MRI. Neuroradiology, 2000; 42 (2): 121-3.
6. Kumar A, Ritu, Akhtar J, Kumar A. Variations in jugular foramen of human skull. Asian J of Med Sci. 2015; 6 (2): 95-98.
7. Vaidyanathan V, Nair D, Juvekar S L, D'Souza C. Jugular foramen chondrosarcoma. Ind J Otol. 2014; 20: 86-8.
8. Leonardi R, Santarelli A, Barbato E, Ciavarella D, Bolouri S, Härle F, Palazzo G, Lo Muzio L. Atlanto-occipital ligament calcification: a novel sign in nevoid basal cell carcinoma syndrome. Anticancer Res. 2010 Oct; 30 (10): 4265-7.
9. Navneet KC, Jyoti C, Anita R, Archana R, Ajay KS.A bony canal in the basilar part of occipital bone Int J of Anat Var. 2010; 3: 112–113.
10. Lohman BD, Sarikaya B, McKinney AM, Hadi M. Not the typical Tornwaldt's cyst this time? A nasopharyngeal cyst associated with canalisbasilarismedianus. The British J of Radio, 2011; 84 (1005): e169-e171.
11. Kapakin S. An Unusual Anatomic Variation of the Jugular Foramen with Doubled Posterior Condylar Canal Int. J. Morphol. 2011; 29 (4): 1186-1188.
12. Ishwarkumar S, Naidoo N, Lazarus L, Pillay P. and Satyapal KS. An osteometric evaluation of the jugular foramen. Int. J. Morphol. 2015; 33 (1): 251-254.
13. Yoshihara H, Kepler C, Hasegawa K, Rawlins BA. Surgical treatment for atlantooccipital osteoarthritis: a case report of two patients. European Spine J. 2011; 20 (Suppl. 2): 243-247.