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## BILATERALLY SYMMETRICAL FORAMINA ON THE PARIETAL BONE OF THE BOVINE SKULL: A CASE REPORT

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### ABSTRACT

*Different bovine skull developmental defects have been reported with variable frequency of occurrence. We hereby report a bilaterally symmetrical parietal foramina in a processed skull meant for osteological practical at the Department of Veterinary Anatomy, University of Jos, Nigeria. The depths of each of the foramina were 4.3 cm, while the diameters were 1 cm. This appears to be the first report of such foramina in the skull of bovine in North Central Nigeria.*

**Keywords:** Bovine skull, Foramina, Parietal bone, Developmental defects

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### INTRODUCTION

Congenital defects are abnormalities of structures and functions that are recognizable before birth (prenatally), at birth (neonatally), or years later (Ünver *et al.*, 2007). It may be compatible with life, however some are lethal and thus account for an important part of neonatal mortality (Smolec *et al.*, 2010). The frequency of occurrence in all breeds of cattle varied with the aetiology arising from either genetic (recessive gene) or environmental factor. It also includes nutritional deficiencies, endocrine disturbances, and extremes of temperature during pregnancy, radiation, drugs, chemicals, toxic plants and infectious diseases (Ozmaie and Asghari, 2012). Irrespective of the cause, the defects may affect a single structure or function. It could involve several body systems, or combine structural and functional alterations; which consequently resulting in economic losses by increasing perinatal mortality, decrease maternal productivity and

reducing the value of defective animal (Sonfada *et al.*, 2010).

Considering the huge loss to the national economy and damages to the animals, it is paramount to report cases of congenital defects so as to trace the route cause and proffer measures in tackling future occurrences. This report therefore describes a unique congenital defect on the parietal bone of the skull of cattle. The length, diameter and depth of the foramina were measured to determine the extent of the defect.

### CASE PRESENTATION

Three slaughtered cattle heads were purchased at the Jos Metropolitan Abattoir for osteology practical demonstration to pre-clinical students of the Faculty of Veterinary Medicine, University of Jos, Plateau State, Nigeria. The ante and post mortem reports showed that the cattle were apparently healthy. In addition, there was no clear sign of abnormality from the purchased

head. They were flayed and defleshed and then subjected to chemical maceration using 3 % sodium hydroxide (NaOH) and then bleached using hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>).

On one of the skulls, bilaterally symmetrical foramina were observed on the parietal bone measuring 1 cm at both right and left half (Figure 1).



**Figure 1: Nuchal view showing bilaterally symmetrical foramina (red arrow) in the parietal bone of the skull of ox**

The depth of the foramina was determined using a calibrated iron rod, while the diameters were determined using meter rule. The skull was sagittally dissected using an electrical band saw (JG-Q300B, Newin, China) to determine the extent of the foramina. The result showed that the depth extended to the frontal sinus and diverted to the cornual diverticulum. The measurements showed that the foramen had a depth of 4.3 cm and a diameter of 1 cm (Figures 2 and 3).



**Figure 2: Sagittal section of the ox skull showing the depth of the foramen using an iron rod from the opening (black arrow) to the frontal sinus (red arrow)**



**Figure 3: Sagittal section of the ox skull showing diversion of the foramen into the cornual diverticulum (red arrow)**

## DISCUSSION

Bilaterally symmetrical parietal foramina are disorder of membranous ossification which leaves unossified portions in bilateral parietal regions (Chidambaram and Hamouda, 2015). The underlying genetic factor, the mutations of MSX2 and ALX4 has been attributed to this defect (Chung *et al.*, 2010; Wilkie and Mavrogiannis, 2012).

Similar defect has been reported in human where it was found to be asymptomatic; however it could manifest as epilepsy, resulting from meningeal or vascular abnormality (Wilkie and Mavrogiannis, 2012). It is presumed that similar clinical presentations can be exhibited by animals especially with the paucity of detailed records of the skull examination for its diagnosis.

The pathogenesis of this condition can be appreciated by understanding the morphogenesis of the frontal sinuses. The later developed by progressive osteoclastic resorption of cancellous bone tissue and planes of compact bone tissue that surround it (Rinderknecht *et al.*, 2005). The developmental arrest of both the cancellous and compact bone tissue at the foetal stage could be an explanation for the extension of the foramina into the frontal sinuses.

Dharwal (2012) estimated less than 1 in 25,000 cases in human with diameter of 17.38 x 27.67 mm (right) and 15.31 x 25.46 mm (left) in size. In animals, there is paucity of information regarding this abnormality, although Rinderknecht *et al.* (2005) reported a case of inconstant skull foramina in bovine and swine, where the foramina were not of equal size. It

therefore suffices to say that this appears to be the first reported case of bilaterally symmetrical foramina in the parietal bone of the skull of ox.

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