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「CASE REPORT」

Cyclopia in a calf

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Abstract

Cyclopia is a congenital ocular abnormality in which two orbits are fused together due to an arrest in the normal process of embryonic tissue development. Reported here is a case of cyclopia in a calf observed from the uterus of cow slaughtered in an abattoir in Korea on March 24, 2004. The calf possessed a spherical-shaped head and only one centrally placed eye. The one eyeball showed complete eyelashes on the defective eyelids. The nasal region and the anterior nares were absent along with a dorsally curved mandible extended beyond the defective maxillae.

Key words: Cyclopia, Calf

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Introduction

Cyclopia is a teratologic developmental anomaly in the fetus characterized by the presence of either a single median eye or incompletely fused, closely placed eyeballs within a single orbit[1)]. The latter case is most commonly observed. Cyclopia is also characterized by the absence of a nose and the defective formation of maxillae[2-5)].

Cyclopia has been reported in virtually all species, but it is most common in the pig and sheep[4-8)]. In humans, approximately 1.05 in 100,000 births, including stillbirths, are identified as cyclopean[2,3,9)]. A number of factors have been suggested to contribute to the development of this anomaly. In recent studies, investigators have suggested that genetic disorders, ingestion of a weed, *Veratum californicum*, or prolonged gestation are possible contributors in the develop-

ment of cyclopia[10,11]. Also, studies of a loss-of-function mutation in several growth-related genes responsible for early eye development in vertebrates indicate that removal of such growth factors during the early stages of eye development may instigate cyclopia[1].

The following report utilizes macrography and radiography to describe on anatomical abnormality of the facial region of a fetal calf with cyclopia.

Fig 1. Lateral view of the head showing the dorsally curved mandible

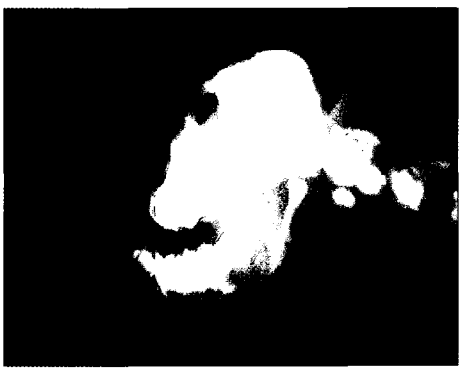

Fig 2. Anterior view of the head revealing cyclopia. The calf had a single orbit located in the middle of the face

Fig 3. Lateral radiograph of the skull. Hypoplasia of the maxillae is prominent

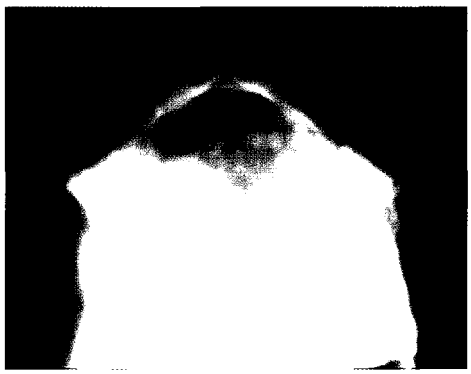

Fig 4. Rostal caudal radiograph of the skull exposing the zygomatic arch and incomplete orbit

Symptoms

A female calf with cyclopia was discovered in the uterus of a cow slaughtered in abattoir in Jeonbuk province. This was the third pregnancy of Holstein cow. Previous pregnancies produced normal calves after a full term, and there was no historical suggestion of a teratogenic insult. The crown-rump length of the fetal calf was 66 ㎝, indicating that the cow was approximately 7 months of gestation. Observation of the severe form of cyclopia, holoprosencephaly, consisted of the presence of a single central orbit containing a single eyeball in the mid-forehead. The length of lower jaw (mandible) was longer than that of defective upper jaw (maxillae) and significantly curved dorsally at its cranial

end (Fig 1). The eyelids, complete with eye-lashes, were clearly defective (Fig 2). The nasal cavity and proboscis were absent from the midline. Conversely, the external ears were normal, no cleft lip or cleft palate was observed and the mandibula and tongue were well developed. Following necropsy, no remarkable abnormalities were shown in other organs.

Based on lateral radiography of skull, the incisive and nasal bones were absent. Hypoplasia of frontal bones, incomplete caudal maxillae with maxillary teeth and curved mandible with incisions were prominent (Fig 3). Upon rostal caudal view, the zygomatic arch along with an incomplete orbit was visible (Fig 4).

Discussion

Cyclopia is the most severe facial developmental anomaly characterized by a single median orbital fossa. This malformation is most commonly associated with a defect in the division of the telencephalic vesicle. There may be one large fused hemisphere with a single ventricle or fusion may be restricted to the frontal region. During embryogenesis, the prechordal mesoderm forms the median facial bones and also induces the rostal neuroectodermal differentiation and morphogenesis. Defects in the prechodal mesoderm caused by mechanical, genetic, or environmental teratogens can lead to the arrest of malformation of the facial bones and organo-genetic cleavage of the prosencephalon[1,3,9].

It has been reported that most cases of cyclopia are sporadic cases submitted from the agricultural area. Congenital defects may be due to environmental or genetic factors, or both. Evidences are accumulating to indicate that many congenital defects result from environmental influences[6,11]. Furthermore, inevitable animal occurrences of cyclopia are often attributed to prolonged gestation. In sheep, cyclopia has been produced by ingestion of *Veratrum californicum* and anorexia has been incriminated in cyclopia in poultry and dogs[8,11]. Occasionally these cases may be associated with congenital cyanotic heart disease in humans[9]. Cyclopic embryos have also been associated with defects in other organs, such as brain, nose, mouth and ear[1,9]. The absence of a nasal region and a defective mouth as well as the presence of a single median eye observed in the present study may be due to severe defects during embryonic development that affected the chordamesoderm. Unfortunately, the specific cause of the cyclopia reported here could not be determined, but environmental factors should be considered. Furthermore, additional attentive analysis of morphology and embryology of this defect should contribute to our understanding and possible prevention of this anomaly.

In this brief report, a malformation, cyclopia, is described in a calf. The calf had an almost spherical head with only one centrally situated eye. The eye consisted of a single eyeball complete with prominent eyelashes and defective eyelids. The nose region was absent. Radiologic observation uncovered malformation of the facial bones along with hypoplasia of the maxillae. The other organs in thoracic and abominal cavity were normal.

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