



*Original Research*

## Gross Morphology and Radiographic Anatomy of Kyphosis and Arthrogyrophosis of a Foetal Monster causing Dystocia in Malnad Gidda Cow

K. T. Lakshmishree<sup>1</sup>, T. Mayakkannan<sup>1\*</sup>, M. Dhoolappa<sup>1</sup>, P. Mohan<sup>2</sup> and Ravi Raidurg<sup>3</sup>

Veterinary College, KVAFSU, Shivamogga-577204, Karnataka, INDIA

<sup>1</sup>Department of Veterinary Anatomy

<sup>2</sup>Department of Veterinary Gynecology and Obstetrics

<sup>3</sup>Department of Veterinary Surgery and Radiology

\*Corresponding author: [drmayakkannan66@gmail.com](mailto:drmayakkannan66@gmail.com)

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### Abstract

*A primiparous three year old Malnad Gidda was presented to Department of Teaching Veterinary Clinical Complex, Veterinary College, Shivamogga, with prolonged first stage of labour. It was diagnosed as dystocia due to congenital anomaly and relieved dystocia by zig-zag method. Fully developed stillborn female fetus with Crown Rump Length (CRL) of about 69.2 cm indicating of 229 days of gestation period and weighed about 6.68 Kg. The gross morphology of vertebral column showed a variations, where the cervical region has taken a bent with increased curvature in thoracic and lumbar region forming an arch. The joints of fore limb and hind limb were flexed indicating ankylosis. Left lateral radiography of calf showed dorsal curvature involving thoracic and cranial lumbar vertebrae along with ankylosis of fore and hind limb joints. Based on these gross morphology and radiographic details, the retrieved fetus was confirmed as kyphosis with arthrogyrophosis foetal monster.*

**Key words:** Arthrogyrophosis, Gross Morphology, Kyphosis, Malnad Gidda Calf, Radiographic Anatomy

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### Introduction

Congenital and inherited anomalies can result in the birth of diseased or deformed neonates. Congenital disorders can be due to viral infections of the fetus or to ingestion of toxic plants by the dam at certain stages of gestation. The musculoskeletal system can also be affected by certain congenital neurologic disorders. Mild developmental abnormalities of the ovum, embryo or fetus result in structural abnormalities in the fetus leading to monstrosities. Organic deviation in either structure or form or both, in one or several



parts of the body, is known as monster. Most of the anomalies occur in early stage of cell differentiation when the conceptus is subjected to genetic and maternal influences. Hereditary defects due to autosomal recessive genes are common. Monstrosities are common in the buffalo. The incidence of monstrosities reported for cow is 0.5 %, (Craig, 1930) whereas an incidence of 7.9% (Phogat *et al.*, 1992) to 12.8 % (Singla and Sharma, 1992) has been reported for river buffalo.

Fetus with congenital defects are dead at birth, and anomalies of muscular, skeletal and nervous systems are common in monsters. Dystocia due to monsters is usually relieved by cesarean section since fetotomy is of limited usefulness except in a few monsters. A large number of monstrosities have been reported both in cattle and buffalo but not all result in dystocia. It may be difficult for monsters to pass through the birth canal, either because of their altered shape or because of their relative size. The common monsters causing dystocia are Schistosoma reflexus, Perosomus elumbis, Double or conjoined monsters and Cyclopia. Fetal anomalies and monstrosities in cattle lead to economic losses as a result of dystocia and greater calf mortality. The dystocia condition is complicated in some cases, such as arthrogyriposis and defects of the spine/kyphosis. Arthrogyriposis is a rare congenital musculoskeletal anomaly and is seen in all breeds of cattle, with greater incidence in Angus and Charolais breeds (Goonewardene and Berg, 1976 and Windsor, 2011). The affected calves exhibit joints fixed in abnormal positions and frequently have scoliosis and kyphosis (Shupe *et al.*, 1967 and Keeler, 1974). The present article describes a rare case of dystocia in a Malnad Gidda cow due to kyphosis with arthrogyriposis.

### Materials and Methods

Stillborn fetus with congenital anomaly was collected from the Department of TVCC, Veterinary College, Shivamogga. The radiographs of the specimen with lateral position were taken in the Department of Surgery, Veterinary College, Shivamogga for radiographic anatomical study. Then the fetus was brought to the Department of anatomy for morphological and morphometrical study studies. Measurements were taken by using measuring scale. Photographs were taken by using a camera (Nikon Coolpix 5100). Radiographs were taken by using a radiographic machine (Allengers 60mA machine) with 48 KVP and 06 mAS. The age of the fetus was determined from the formula as follows-

$$\begin{aligned} Y &= 73.544 + 2.256 \times (\text{CRL} > 20 \text{ cm}) \\ Y &= 73.544 + 2.256 \times (\text{CRL} > 20 \text{ cm}) \\ &= 73.544 + 2.256 \times (69.2) \\ &= 73.544 + 156.115 \\ &= 229.65 \text{ days.} \end{aligned}$$

Where, Y is the age (days) and X is the CRL of fetus (cm) as per Soliman (1975).

## Results and Discussion

A three year old Malnad Gidda cow was presented to clinics with prolonged first stage of labour with the history of ruptured water bag by about 6 hours. During examination, head and both forelimb were in vaginal passage in anterior presentation with dorsal sacral position. Effort was taken to pull out the calf by applying the hook into the inner canthus of the eye, but failed to deliver the fetus because of hip lock condition. An attempt was made to deliver per vaginum, after lubrication with liquid paraffin. Moderate traction was applied over the fetus by applying snare over the fetal forelimbs. During traction it was able to deliver the fetus up to abdominal region due to anatomical malalignment at the lumbar vertebra. In order to deliver the fetus the dam was placed upside down (Dorso-Pubic) and traction was given in a zig-zag manner over the fetus, by careful traction a dead female calf was removed. Based on the appearance, the retrieved calf was confirmed as Kyphosis foetal monster along with hip lock condition with arthrogyphosis.

## Gross Morphology

The monster fetus was weighing about 6.68kg with Crown Rump Length (CRL) of about 69.2 cm indicating of 229 days of gestation period. Fetus was fully developed with broken left fore limb. The broken left fore limb in the present case suggest that a lot of unskilled traction had been applied on the fetus before veterinary intervention was sought.

In the present study gross appearance of vertebral column showed a variation, that the cervical region has taken a bent then increased curvature in thoracic and lumbar region forming an arch indicating kyphosis (Fig 1). This condition also reported in jersey cow representing of primary muscular dystrophy of genetic origin by Jeffrey *et al.*, 1985. Katiyar *et al.* (2015) reported that kyphosis and arthrogyphosis can lead to dystocia even in the absence of duplications and possibly served as additional contributing factors in cross bred cow. However, Sathiamoorthy *et al.* (2015) had mentioned malalignment of extremities also causes dystocia in non-descriptive cow.



Fig 1. Foetal monster showing Kyphosis (Red arrow) and Arthrogyphosis (Blue arrow)



Detailed examination of fetus revealed that the fore limb was shorter than that hind limb measuring for about 45 cm and 52.4 cm respectively (Table 1). Further, the joints of the fore limb like elbow, carpal and fetlock and hind limb joints like Stifle, hock, and fetlock were flexed indicating arthrogryposis or ankylosis. Sathiamoorthy *et al.* (2015) in non-descriptive cow reported that both the fore and hind limbs appeared shorter with marked ankylosis of joints.

**Table 1:** Gross morphometry of Malnad Gidda calf

S. No.	Parameters	Measurements
1	Weight of the animal	6.68 kg
2	CRL Length	69.2 cm
3	Maximum length of fore limb	45 cm
4	Maximum length of hind limb	52.4 cm
5	Maximum circumference of the body	42.2 cm
6	Cephalic index	21.5 cm

Arthrogryposis was caused by an autosomal recessive gene with complete penetrance in the homozygous state (Goonewardene and Berg, 1976). Shupe *et al.* (1967) and Keeler (1983) reported that teratogens identified as causing arthrogryposis included plants such as lupines (anagryne as the toxic agent) that were ingested by pregnant cows between day 40 and 70 of gestation. Whereas, Van Huffel and De Moore, (1987) described that prenatal infections with Akabane virus and Bluetongue virus can also cause arthrogryposis. However other skeletal defects of extremities for example arthrogryposis can also cause dystocia in animals as affected fetuses occupy more space in pelvic cavity and are difficult to manage (Mahajan *et al.*, 2006 and Singh *et al.*, 2008).

In the present study, we also observed, deviation in the ventral mid line position of the sternum along with ankylosis of all four limbs with kyphosis. The case was diagnosed as dystocia due foetal monstrosity. In the present case per vaginal delivery was successful with routine vaginal technique, with partial rotation method to ensure that the foetal hips enter the maternal pelvis in a diagonal.

### Radiographic Anatomy

Radiographical examination of malnad gidda calf revealed dorsal curvature involving the whole thoracic and cranial lumbar vertebrae (Fig. 2). Similar findings were observed by in sheep (Singh and Purbey, 1984) as multiple spine curvatures involving posterior one third of cervical, whole thoracic and lumbar vertebrae in radiography.



Fig 2. Radiography of foetal monster showing Kyphosis (Yellow arrow)

The dorsal curvature of the vertebral column in the present study reveals wedge shape with marked kyphosis from T<sub>7</sub> to L<sub>2</sub> which is similar with the observation of Hateley (2009) in sheep. As he reported pronounced kyphosis in the area of the thoracolumbar junction and marked kyphosis affecting the lower thoracic and upper lumbar vertebrae (T<sub>12</sub> to L<sub>2</sub>) with variation in the degree of severity. In the present study, ankylosis also observed in the elbow, carpal and fetlock joints of fore limb and stifle, hock and fetlock joints of hind limb (Fig 3).



Fig 3 . Radiography of foetal monster showing Arthrogryphosis (Yellow arrow)

Similar findings were observed in Marwari goat as kinked and ankylosed vertebral column with ventrolateral multiple curvatures involving cervical, thoracic and lumbar vertebrae. Further, fore limbs was ankylosed involving dorsal flexion of fetlock joint (Tripathi and Mehta, 2016).

## Conclusions

The gross morphology and radiographic anatomy of the kyphosis and arthrogryposis fetus provides basic research data and scope for the further research in identifying the exact etiology for the deformities like genetic/toxic, etc.

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