The Unique Case of Arthrogryposis in Indigenous Gir Cow Calf

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Abstract
Arthrogryposis or arthrogryposis multiplex congenital (AMC) comprises non-progressive conditions characterized by multiple joint contractures found throughout the body at birth. During this case study the calf borne with arthrogryposis was dead during distoci delivery. The arthrogrypotic calf had varying expressions of the defect with all 4 limbs (tetramelic) affected and curvature and multiple articular rigidity of joints. The arthrogrypotic Gir calf was the offspring of phenotypically normal parents. These observations plus the fact that no medication was administered during pregnancy strongly suggest involvement of genetic factors in the etiology of the disease, probably an autosomal recessive trait.

Introduction
Arthrogryposis is ankylosis of the limbs, usually combined with a cleft palate and other growth deformities. It is seen in all breeds of cattle, human beings, lambs, piglets and foals. Kittens and puppies are infrequently affected (Jubb et al., 1993). At birth, affected calves exhibit joints fixed in abnormal positions and frequently have scoliosis and kyphosis. Muscle changes, notably atrophy, have also been seen. In the spinal cord, necrosis of neurons and lesions of the white matter may be seen. Arthrogryposis has more than one etiological and pathological entity. The arthrogryposis syndrome in Charolais is caused by an autosomal recessive gene with complete penetrance in the homozygous state. Prenatal viral infections with the Akabane or Bluetongue virus can also cause arthrogryposis. Arthrogryposis with associated malformations may be hereditary or a phenocopy of a mutant gene(s) effect produced by unknown factors (Nawrot et al., 1980).

In domestic animals hereditary arthrogryposis has been associated with forms of myelodysplasia in cattle and pigs (Leipold et al., 1972). Akabane virus infection in uterus, resulting in arthrogryposis, is also reported (Konnos et al., 1982). Many toxic plants are also associated with the disorder, particularly in cattle and swine (Keelert et al. 1980).

The principal cause of AMC is believed to be decreased fetal movements (akinesia) caused by maternal or fetal abnormalities. It is associated with neurogenic and myopathic disorders. It is believed that the neuropathic form of AMC involves deterioration in the anterior horn cell leading to muscle weakness and fibrosis. In most cases, arthrogryposis is not a genetic condition. The risk of recurrence for these cases varies with the type of genetic disorder. There is a rare autosomal recessive form of the disease known to exist.

This case study reports arthrogryposis in Gir calf delivered after manual reliving of dystokia.

Case History
Gir cow of 3rd parity at Cattle Breeding Farm with complete gestation period was observed with the labor pain for the last 3-4 h. Clinical parameters (temperature, pulse, heartbeat) were within the normal range. Per vaginal examination observed oedematous birth canal, fully dilated cervix with no fetal movements and reflexes. Position, posture and presentation of the fetus revealed retained forelimb and hind limb (Head presentation). Retained forelimb was converted to flexed carpus and applied simultaneous repulsion to the carpus in a forward-upward-lateral direction and traction on the hoof in a medial-backward direction and
thus dystokia was relieved.

**Description of the monster calf**

The calf borne with arthrogryposis (Fig 1) was dead during distotic delivery. The arthrogryptotic calves had varying expressions of the defect. All the four imbs (tetramelic) were affected and curvature and multiple articular rigidity of joints were observed so it was named “arthrogryposis”. The lesions were most frequently found in all the joints of fore limbs and hind limbs viz., metacarpophalangeal joints, the elbow, interphalangeal joints of the forelegs and in the metatarsophalangeal joint, followed by the stifle and hock joints of the hindlimbs. The affected Gir calf had scant muscle development. The rest of the anatomical features and internal organs were normal in the fetus.

**Treatment of cow**

The cow was relieved from dystokia and treated with i/m Oxytetracycline (Altramycine) @ of 7 mg/kg bw repeated after 48 h along with anti-inflammatory injection Meloxicame (melonex) @ 0.2 mg/kg of bw for 3 days and Liquid Ecobic (Liq. Metratone) @ 200 ml orally given for 2 days. The cow was normal within a week with all normal physiological parameters.

**Results and Discussion**

Macroscopically, the arthrogrypotic calf was in poor condition, with severe malformations of the all four legs. The mobility of all the four legs was reduced due to partial contracture of all the joints, which prevented full extension of the limbs. Following the removal of the skin, subcutaneous haemorrhages and slight swelling of the joints were observed. The arthrogrypotic Gir calf was the offspring of phenotypically normal parents. These observations plus the fact that no medication was administered during pregnancy strongly suggested involvement of genetic factors in the etiology of the disease, probably an autosomal recessive trait. Furthermore, the herd management was similar to the entire herd thus eliminating any extraneous source such as toxic plants in the fodder supplied to the herd.

Arthrogryposis has been described as one of the most frequent defect of the musculoskeletal system and each distinct syndrome could be etiologically different (Greene et al., 1973). It is associated with a single or multiple congenital defects In Charolais cattle and Hereford cattle the most common combined defects are palatoschisis, and kyphoscoliosis, respectively. Hereditary arthrogryposis investigated in Canada, in Charolais calves from different farms, showed a wide variety of expressions. This probably occurred as a consequence of differences in the genetic background, action of modifying genes or differences in an environmental component (Nawrot et al., loc. cit.). In all affected buffaloes arthrogryposis was observed as a single defect except for one that had additionally brachygna-tia (Schild et al., 2003).

Looking to the muscular limb volume of monster cow calf, it is to be suspected that there was reduction in number of motor neurons in ventral horns of the spinal cord without significant CNS lesions. Hartley and Wanner (1974) reported sporadic cases of arthrogryposis with multiple associated defects without microscopic lesions in the brain, spinal cord and peripheral nerves, but with a possible reduction in the number of ventral horn neurons. Destruction of neurons in the fetus is a well documented component of arthrogryposis in cattle induced by infectious, physical and toxic neurotropic agents (Mathew, 1984).
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Reference


National Institute of Animal Nutrition and Physiology Receives Outstanding ICAR Institution Award for 2012

The National Institute of Animal Nutrition and Physiology, established in 1995 at Bangalore under the aegis of Indian Council of Agricultural Research, Ministry of Agriculture, Govt. of India was awarded with the most coveted Sardar Patel Outstanding Institution Award on 16th July 2013, from Shri Pranab Mukherjee, Hon’ble President of India. Dr. C.S.Prasad, Director of the Institute said that the Institute was established to conduct basic and fundamental research in animal nutrition and physiology for understanding the biophysical translation of the nutrients in animals. He said that the Institute in its journey of 18 years has developed farmer-friendly technologies like area specific mineral mixture for improving the reproduction in livestock, areca sheath as a use of dry roughage, use of red light for enhancing poultry production, nutraceuticals from agriculture waste for improving gut health, herbal compounds for improving feed and fodder quality and molecular markers for assessing semen quality. The Institute has excellent infrastructure facilities and state of art equipments for conducting genomic and molecular research. The Institute provides training in skill development for scientists, extension workers, field officers and livestock farmers. Dr. Prasad received the Award, which carries a plaque, citation and Rs 10 lakhs. He stated that this achievement has been possible due to the teamwork of all the staff of the Institute.

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