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Case Report

Successful Use of Dexamethasone, Vitamin B_{12} and Vitamin E Selenium in Management of Bilateral Obturator Nerve paralysis in a Cow

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ABSTRACT

Obturator nerve injury is a common cause of postpartum recumbence in cows that often lead to economic losses due to death or loss of production. Treatment of such downer cows is always a challenge since they often carry poor prognoses. Due to prolonged recumbence that comes along with the problem and for animal welfare reasons valuable cows end up being slaughtered as a salvage procedure. However, cases of obturator nerve paralysis have been managed with variable successes. In this case recovery was recorded after use of dexamethasone and vitamin B_{12} given in high doses three days apart, alongside Vitamin E, selenium. Coupled with prompt intervention of continuous massage of the limbs and sporting the cow in a standing position, the cow was able to rise without support in nine days. The combination was therefore useful and could be used in cases with non severe obturator nerve injuries in valuable cows.

Key words: Obturator nerve paralysis, Dexamethasone, Vitamin B_{12}, E Selenium, Downer cow

INTRODUCTION

Obturator nerve in the cow arises from the lumbosacral plexus, courses along the medial surfaces of either illial shafts of the pelvic girdle then leaves the pelvic cavity through the obturator foramen to innervate the adductor muscles of the thigh; the adductor muscle, gracilis muscle and the pectinius muscle (Kelly, 2012). This nerve can become compressed and damaged during difficult parturition as the foetus passes through the birth canal and presses on it against the bony wall of the pelvis, (Kelly, 2012).

Excessive pulling to deliver a calf, pulling a calf straight out from the cow rather than down and backwards or having the calf in the birth canal too long (several hours), predisposes the nerve to mechanical injury www.nadis.org.uk. This is common when assisted delivery is done without involving an experienced veterinarian and where there is feto-pelvic disproportion (Maharaj *et al.,* 2010). The close association of the obturator nerve with the origin of the ischiatic nerve can complicate the interpretation of clinical signs since injury to either nerve can result in recumbence (Kelly, 2012).

When a nerve is stretched or compressed the perineurium will usually protect the nerve fibres within the fascicles (Burnett and Zanger, 2004). With greater tension the fascicles will begin to elongate, thus elevating the intrafascicular pressure. Further pressure will then leads to damage to the axon (axonotmesis) or even complete severance (neurotmesis), (Lee and Wolfe, 2000). Partial nerve injuries will have variable therapeutical response compared to complete nerve laceration or resection. The generation of endogenous neurotrophic factors such as brain-derived neurotrophic factor (BDNF) and glial cell-derived neurotrophic factor (GDNF) is known to play a critical role in supporting axon regeneration during peripheral nerve repair, (Terenghi 1999).

In the current case it is demonstrated that use of dexamethasone, vitamin B_{12} and vitamin E and Selenium supplemented with supportive therapy could be used in treatment of obturator nerve paralysis in a downer cow.

Case History and Management

An adult Friesian cow was reported to the Department of Clinical Studies, University of Nairobi, Kenya with a history of recumbence following an assisted calving. The calf was delivered by traction by the farmer on realization that the cow could not make it alone due to what the farmer described as foetal oversize.

Upon clinical examination the recumbent cow was alert, with good appetite and had skin laceration wounds

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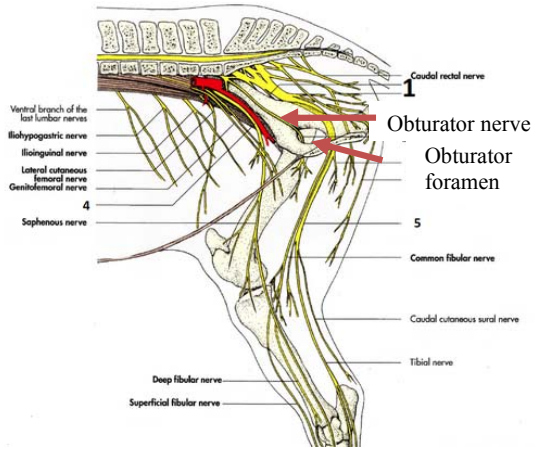

Fig 1: schematic drawing showing obturator nerve. (www. 7borneo.com)

Fig. 2: Recumbent cow with right hind limb abducted.

Fig. 3: Cow supported in a standing position, abduction of hind limbs restricted with a diagonal wooden bar (arrow).

on bony prominences. Her attempt to rise resulted into a short lasting sitting position and return to sternal recumbence position. Trans-rectal palpation of pelvic structures was done from a recumbent position and revealed an enlarged uterus a sign of recent calving. The pelvic bony structures did not show any evidence of fractures.

The cow was helped into a standing position for further visual examination. The hind limbs assumed slightly abducted posture with more abduction of the right limb. The cow barely stood for a few seconds wobbled and went down hind quarters first into a sitting position then sternal recumbence with the exposed hind limb stuck out. Both hind quarters were obviously weak, with left limb bearing most of the weight. Deep palpation of the hind limbs did not show any evidence of fracture or injury to the hip joints. Vital parameters were within the normal range.

Based on history and clinical examination a diagnosis of bilateral obturator nerve paralysis was arrived at. This resulted in 'downer' cow. The prognosis of this case was considered guarded to poor.

Case management

The treatment was commenced about 56 hours of recumbence. Intravenous drip containing 11.9g calcium borogluconate, 1.85g Magnesium hypophosphite and 6.84% boric acid (calciject®) was administered to the cow to rule the possibility of hypocalcemia but the cow failed to rise as would be expected. She was then treated with 20mg of Dexamethasone disodium phosphate (Interchemie, Holland), 0.75mg vitamin B_{12} (cyanocobalamine) plus 4g Butaphosphan (catasol®; Bayer Health care) given on every third day and treatment repeated five times. During the fourth treatment 2g of vitamin E, α-tocopherol acetate plus 20mg of sodium-selenite (introvit-E-Selen; Interchemie, Holland) was injected intramuscularly and repeated two weeks later.

The cow was isolated in housing with a thick layer of soft sand, bedded with hay. She was provided with good quality feed and clean water daily. The cow's hind limbs were massaged four times a day by flexing and stretching them daily during the first week of treatment. She was lifted to a standing position thrice a day for between 1-20 minutes. From the fourth day she managed to stand for over 12 hours supported within a wooden structure that limited lateral movements of the hind limbs. Two days later she was able to stand without support and made a few wobbly steps before going down hind quarters first. She progressed over time from little help, to rising without help and limited movement achieve by day nine.

DISCUSSION

To the best of researchers' knowledge this was the first reported case of obturator nerve paralysis successfully managed by the use of dexamethasone, vitamin B12 and selenium vitamin E alongside physical supportive therapy in a cow in Kenya.

Corticosteroids, vitamin B_{12} and selenium and vitamin E selenium have been demonstrated to have regenerative effect on nervous tissues in lab animals, but to the best of our knowledge there is limited literature on their successful use in management of bilateral obturator nerve paralysis in cows.

The therapeutic significance of dexamethasone in peripheral nerve regeneration has been demonstrated in laboratory animals including rabbits (Beck and Kienecker, 1987) and rats, (Kobayashi and Constanzo, 2009) and in human, (Misch and Resnik, 2012). In these studies dexamethasone (a gluccorticoid) decreased formation of scar tissue, (Beck and Kienecker, 1987) and formation of neuroma, (Misch and Resnik, 2012) supporting the process of nerve regeneration. In the work by Misch and

Resnik, the process resulted in reduction of fibroblasts in the new formation of the epineurium and the endneurium and certain protective effect on the perineurium. Dexamethasone also seemed to accelerate the breaking down of myelin and degenerating axons and the new formation of myelin sheath by activating schwan cells, (Beck and Kienecker, 1987; Misch and Resnik, 2012). Misch and Resnik, (2012) indicated that in management of peripheral nervous tissue damage, a high dose of dexamethasone is recommended to minimize neuropathy. In the current case 20mg (0.0625mg/kg body weight) of Dexamethasone disodium phosphate (Interchemie, Holland) administered on every third day, was used alongside other drugs that helped in nervous tissue regeneration.

Vitamin B_{12} has been used in management of peripheral-nerve and psychiatric disorders in humans since its isolation in 1948, (Edward Reynolds, 2006). Such nervous disorders were associated with deficiency of Vitamin B_{12} that was in turn associated with pernicious anemia. Vitamin B_{12} was used with folic acid before it was established that folic acid complicated the nervous problems, (Edward Reynolds, 2006). Recently, Hobbenaghi *et al*., (2013) using experimental rats demonstrated that the probability of nerve regeneration and healing could be increased by the increasing dosage and duration of administration of vitamin B_{12}, indicating that it was able to progress recovery process of peripheral nerves damage. Moreover, the results showed that vitamin B_{12} had a proliferative effect on the dorsal root ganglion sensory neuron but the mechanism of action remained unknown.

Sun *et al*., (2012) demonstrated that dexamethasone and vitamin B_{12} acted in synergy to promote peripheral nerve repair in a rat model of sciatic nerve injury through the up regulation of brain-derived neurotrophic factor (BDNF) expression and recommended them in clinical treatment of peripheral nerve injury.

While vitamin E stabilizes cell membranes due to the formation of phospholipids and induces antidystrophic muscular action that come as a result of prolonged pressure on muscles in downer cows, Selenium prevents lipid peroxidation due to the activation of the glutathione peroxidase, a selenium dependent enzyme, http:// www.goatbiology.com/selenium.html. Le *et al*., (2013), demonstrated significant interactive effect of vitamin E and Selenium in reverting myopathy in fish. Vitamin E - selenium combination used in the current case targeted management of myopathy that would arise due to the 'downer' situation.

The massage of the limbs, provision of good bedding, rolling the cow three times a day, lifting her to a standing position and provision of good quality feed and clean was important as supportive therapy in this case. This was consistent with findings by Muthoni and Ng'ang'a, (2009) and in the current case the cow was able to rise without help within 9 days.

Conclusion

This case demonstrated that non severe obturator nerve paralysis that have progressed to downer cow syndrome could be managed with dexamethasone, vitamin B_{12} and selenium vitamin E if the cases are attended promptly and where the patient's production is considered valuable compared to salvage of such cows which is usually the most commonly practiced intervention. It was strongly believed that these drugs contributed to obturator nerve regeneration as had been experimentally demonstrated in research documentations. The management of this case also agrees with other documentations on the importance of supportive therapy. It was believed that the combination of treatment and supportive massage therapy could be used to manage similar cases in the cow.

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