Surgical Management of Gangrenous Mastitis in a Dairy Cow: A Case Report

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ABSTRACT

This report details the management of acute gangrenous mastitis in a six-year-old Holstein-Friesian crossbred cow presented with systemic signs of inflammation, discoloured and necrotic udder tissue, and foul-smelling discharge. Haematological analysis revealed leukocytosis and mild anaemia, while milk culture identified *Escherichia coli*. Rapid progression of the condition necessitated surgical intervention. A partial mastectomy was performed to excise necrotic mammary tissue. Postoperative care included antimicrobial therapy, anti-inflammatory treatment and wound management. The cow recovered fully in 51 days and conceived three months post-surgery. This case highlights the efficacy of targeted surgical intervention, combined with supportive care, in managing gangrenous mastitis.

Keywords: Gangrenous mastitis, necrotic tissue, partial mastectomy

INTRODUCTION

Mastitis is a concern in dairy farming due to its impact on milk production and economic loss. Clinical mastitis, which presents noticeable signs like abnormal milk and systemic symptoms, leads to substantial economic losses through reduced milk yield, treatment costs, additional labor and reduction in animal value (Allen *et al.,* 2008; Das *et al.,* 2015; Gomes *et al.,* 2016). Clinical mastitis can be peracute, acute and subacute, based on the severity of inflammation (Kibebew, 2017). A severe form, gangrenous mastitis, results in the loss of the affected quarter, caused by gram-positive bacteria such as *Staphylococcus aureus, Clostridium perfringens,* and *Escherichia coli* (Phiri *et al.,* 2010; Shafi *et al.,* 2015; Singh *et al.,* 2018). Gangrenous mastitis is characterized by acute inflammation that progresses rapidly, often within 24 to 48 hours, leading to severe tissue necrosis, discoloured and cold udder skin and systemic signs of toxaemia (Warson *et al.,* 2017). The pathogenesis involves thrombosis of mammary vessels caused by bacterial toxins, leading to infarction and gangrene. The condition is challenging to manage due to its rapid onset and the severity of the systemic impact (Ribeiro *et al.,* 2007; Tufani *et al.,* 2010).

Surgical intervention, such as a partial mastectomy, is necessary to manage gangrenous mastitis, as medical treatment often fails. This procedure involves the removal of the affected quarter to preserve the functional quarters and to maintain milk production (Cable *et al.,* 2004). Postoperative care includes antimicrobial and anti-inflammatory therapies, with supportive treatment (Green and Bradley, 2004). This report details the incidence of acute gangrenous mastitis in a crossbred cow and describes the clinical management and surgical intervention through partial mastectomy.

CASE HISTORY AND OBSERVATIONS

A six-year-old Holstein-Friesian crossbred cow, recently calved, with an acute inappetence

and decreased milk yield, was attended. The cow was from a semi-intensive dairy herd in Ujroo village, Handwara block, Kupwara district, Jammu and Kashmir, receiving a balanced diet with mineral supplements. On examination, the cow, although displaying a normal posture, exhibited signs of discomfort. The udder appeared slightly swollen and warm to the touch. The left forequarter was firm and discoloured with a blue-black hue, and a foul-smelling, serosanguineous discharge was noted upon stripping the affected quarter (Figure 1).

Figure 1. Gangrenous mastitis showing enlargement and discoloration of the left-fore teat

The remaining quarters produced watery, yellowish milk. The cow showed systemic signs, including fever (40.5°C), tachycardia (95 bpm), and tachypnea (35 breaths per minute). A preliminary diagnosis of gangrenous mastitis was made. The calf was separated. Due to the rapid progression of the condition, a decision was made to perform a partial mastectomy to prevent further systemic complications. During surgery, the affected mammary tissue was found to be necrotic and malodorous. A blood sample was collected for haematology. The leukocytosis with a left shift and mild anaemia was found (Table I). Milk samples were collected for bacterial culture and sensitivity testing. The milk culture showed a heavy growth of *Escherichia coli*. The antibiotic sensitivity profile showed susceptibility to chloramphenicol, ceftriaxone, co-trimoxazole, enrofloxacin, oxytetracycline, sulfafurazole and trimethoprim, while resistance was noted to cefalexin, ciprofloxacin and penicillin (Table II).

Table I: Haematological profile of a cow affected with gangrenous mastitis

Parameter	Value
Total erythrocyte count ($x10^6/\mu l$)	6.10
Haemoglobin (g/dl)	7.15
Packed cell volume (%)	29
Mean corpuscular volume (fl)	51
Mean corpuscular haemoglobin concentration (%)	28
Total leucocyte count ($x10^3/\mu l$)	10.1

Neutrophils (%)	36
Lymphocytes (%)	46
Monocytes (%)	5
Eosinophils (%)	13
Basophils (%)	0

Table II: Antibiotic sensitivity profile of isolated organisms against common antibiotics

Organism	Antibiotype
Escherichia coli	A^S, Az^I, Cn^R, C^S, Ci^R, P^R, Ct^S, Co^S, E^S, G^I, N^I, O^S, S^S, T^S
Staphylococcus aureus	A^I, Az^R, Cn^R, C^S, Ci^R, P^R, Ct^S, Co^S, E^S, G^R, N^S, O^S, S^S, T^S
Clostridium perfringens	A^S, Az^R, Cn^R, C^S, Ci^R, P^R, Ct^S, Co^S, E^S, G^R, N^I, O^S, S^S, T^R

Note: A: Amoxyclav (30µg), Az: Azithromycin (15µg), Cn: Cefalexin (30µg), C: Chloramphenicol (30µg), Ci: Ciprofloxacin (5µg), P: Penicillin (10 units), Ct: Ceftriaxone (10 mcg), Co: Co-trimoxazole (25 µg), E: Enrofloxacin (10 µg), G: Gentamycin (10 µg), Ni: Nitrofurantoin (300 µg), O: Oxytetracycline (30 µg), S: Sulfafurazole(300µg), T: Trimethoprim (10µg); R: Resistant; I: Intermediate; S: Sensitive

TREATMENT AND DISCUSSION

The cow was sedated with xylazine (0.03 mg/kg intramuscularly). After 15 minutes, the skin over both jugular veins was clipped, and intravenous catheters were inserted. The area over the sacrococcygeal joint was also clipped, washed, and aseptically prepared. A cranial epidural block with 2% lignocaine (30 ml) was administered around the incision site. Once the cow was in right lateral recumbency on a padded floor, the udder area was clipped, cleaned, and prepared for surgery. The udder was draped, and the left hind limb was secured. An elliptical incision was made on the lateral aspect of the left fore udder to preserve enough skin for wound closure (Figure 2). Small blood vessels were clamped, ligated and transected. The incision was deepened through the subcutaneous tissue to expose the lateral fascia of the mammary gland. Blunt dissection was performed in all directions. Necrotic tissue was separated. The mammary artery and associated vein were double-ligated and transected. The udder, weighing about 2.3 kg (Figure 3), was excised, and about 360 ml of foul-smelling fluid was collected. The area was cleaned with dilute chlorhexidine, and open-weave bandages were packed in and left as drains. The subcutaneous tissue was sutured using a walking suture pattern to reduce the open space. The skin incision was closed with nylon (Figure 4). Before suturing, the wound was rinsed with 0.1% iodine solution, and a latex drain was placed on each side of the wound.

Postoperative management involved administering a combined enrofloxacin @ 5mg/kg and ceftriaxone @10 mg/kg, intramuscularly every 24 hours for 7 days. The incision site was inspected daily, and the drains were removed over 4 days. Every day, the incision was cleaned with diluted chlorhexidine. For inflammation and pain management, a dose of flunixin meglumine (1 mg/kg intramuscularly) was administered once daily for 3 days, followed by meloxicam (0.3 mg/kg intramuscularly) for 4 days. Local wound treatment consisted of flushing with dilute chlorhexidine daily. During the course of two weeks, the wound shrank and the deformity significantly decreased. Haematological profile of affected cattle is presented in Table I. The total erythrocyte counts of 6.10 x 10 /µl and a haemoglobin level of 7.15 g/dl indicated mild anaemia. The PCV of 29% was lower than the normal range.

However, the mean corpuscular volume (MCV) of 51 fl and the mean corpuscular haemoglobin concentration (MCHC) of 28% were within normal limits. The total leucocyte count of 10.1 x 10^3/µl was normal. The elevated percentages of neutrophils (36%) and eosinophils (13%) indicated a significant inflammatory response due to gangrenous mastitis. A reduced lymphocyte count of 46% suggested stress and inflammation, potentially impairing the cow's immune response. The mildly increased monocytes (5%) points to early chronic inflammation or tissue repair processes (Weiss and Wardrop, 2011). A total of 51 days elapsed between surgery and total wound healing (Figure 4), with no postsurgical complications observed. A healthy granulation tissue bed was visible 30 days after surgery, and the major portion of the surgical site was covered with skin. After the procedure, the cow recovered fully back to be productive. Three and a half months following the procedure, the cow became pregnant and gave birth to a female calf.

Figure 2: Blunt dissection of necrotic mammary tissue and ligation of the mammary artery following an elliptical incision

Figure 3: Removal of the affected quarter during a partial mastectomy, with approximately 2.3 kg of tissue excised

Figure 4. Ventral view of the surgical area two months post-mastectomy and treatment

Mastectomy, particularly when performed partially, has been shown to minimise complications and preserve the productive capacity of the animal (Ribeiro *et al.,* 2007). The most severe form of bacterial mastitis is the gangrenous type, and the prognosis is typically poor. In cases of gangrenous mastitis, partial mastectomy emerges as a practical option, effectively reducing the risk of severe complications while maintaining the animal's overall productivity and welfare.

CONCLUSION

The selection of appropriate treatment, such as surgery, must balance the economic implications with the potential benefits for the cow's welfare and long-term productivity. Effective management strategies, including strict hygiene practices and appropriate antimicrobial therapy, are essential in preventing the onset of severe forms of mastitis and minimising its impact. This case underscores the importance of a comprehensive approach to managing mastitis in dairy cattle, emphasising early detection, prompt surgical intervention, and supportive care to ensure optimal outcomes for both the animals and the dairy operation.

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