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### Histopathological Features of Myosarcoma in the Thigh Muscle of Cattle after Surgical excisions

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#### ABSTRACT

The aim of the study was to present the clinical conditions, operative approach and the histopathological appearances of a malignant skeletal muscle tumour (myosarcoma) in the thigh of an adult cow. It was done to the animal by slowly increasing a mass more than six months, which resulted in mild lameness, diminished weight-bearing of the affected limb, and disturbed normal locomotion. The tumor was excised surgically in aseptic conditions to alleviate functional impairment and to give tissues to make the definitive diagnosis. Representative tissue samples were fixed in 10% neutral buffered formalin, processed initially, embedded in paraffin, sectioned at 45 -5 0.1 and stained with hematoxylin and eosin to be examined under the microscope.

Histopathological examination allowed observing a massive invasion of normal skeletal muscle fibers with hyperchromatic and irregular nuclei, highly pleomorphic neoplastic cells, which are replaced, with a poorly defined cytoplasm, and without normal striations. Other observations were the evidence of significant vascular congestion, inflammatory cell infiltration, large zones of coagulative necrosis, and angiogenesis. These characteristics were also similar in all the analyzed sections and suggested aggressive malignant behavior.

This research establishes the malignancy of the tumor as being of high grade and the importance of a histopathological study in the achievement of a proper diagnosis. Surgical excision with the help of a microscopic examination not only makes it easy to diagnose but also enhance the clinical management by eliminating the mechanical barrier and dysfunctional effect of the tumor. The results are important in understanding the biological behaviour of rare skeletal muscle tumours in cattle, which increases the knowledge of recognition, diagnosis and treatment plans in veterinary practice.

## Introduction

In cattle neoplastic diseases are reported less commonly compared to companion animals, in part because of economic factors and cattle management approaches that encourage early culling or slaughter of affected cows before tumors have had enough time to form or be clinically diagnosed (Radostits et al., 2007). However, neoplasms can develop in a diverse variety of tissues in cattle such as epithelial, mesenchymal and hematopoietic ones. Among them, skeletal muscle-derived tumors are considered especially uncommon as skeletal muscle fibres are relatively inactive mitotically and are relatively resistant to neoplastic transformation (Thompson, 2007; Meuten, 2017).

Myogenic tumors can either be associated with primary neoplasia occurrence in the skeletal muscle or secondary to chronic trauma or repetitive intramuscular injections or ongoing inflammatory responses. These conditions are not uncommon with food-producing animals and they could lead to the predisposition of muscle tissue to abnormal cellular proliferation (Moulton, 1990). But the precise mechanism that is involved in the malignant transformation of the skeletal muscle cells have not been well understood.

The thigh muscles constitute one of the greatest locomotor units among cattle. Contagious diseases in this area may severely affect locomotion, weight-bearing ability, and altered productivity and economic loss to farm animals production systems (Radostits et al., 2007). On the clinical, deep muscular tissue tumors are typically characterized by nonspecific features as mild swelling, progressive enlargement or gait changes. Due to such inconclusive clinical presentation, histopathological analysis is still the standard of definite diagnosis and classification of muscular tumors (Zachary, 2017).

Myosarcoma is a malignant tumor that develops out of skeletal muscle cells and this is very infrequent in domestic ruminants. Since there are a few reported cases, its clinical behavior and histopathological features have not been described in the literature on veterinary medicine (Thompson, 2007).

Hence, the purpose of the current research was to report the clinical features, surgery, and histopathology of myosarcoma in the deep muscle of the thigh of cattle.

## Materials and Methods

### Sample Collection and Clinical Examination

A clinical study was done on ten cows with progressively increasing masses of the thigh musculature. The lesions began as small swellings which grew steadily with time in a few months, subsequently leading to slight lameness and impaired locomotion. As a diagnostic and curative procedure,

the masses were surgically removed. Histopathological analysis of representative tissues in various parts of the removed tumors was performed by taking representative samples immediately after surgery and placing them in 10% neutral buffered formalin (Maxie, 2016; Zachary, 2017). Figure 1 presents one of the pre-operative images of a tumor affixed on the thigh muscles..

### Surgical Management and Tumor Excision

Surgery took place in strict aseptic conditions in order to clear off the entire mass of the mass and reduce recurrence of the same in the area. After restraining and anesthesia, (Abduljaleel et al., 2025) a skin incision was made in the middle of the mass. Precise blunt and sharp dissection was applied to take the tumor out of the surrounding healthy muscular tissue and leave the immediate neurovascular structures intact. The intraoperative appearance of necrosis and vascular congestion areas is observed in figure 2, when tumor excision is performed.

Surgical excision of the tumor was done with sufficient surgical margins to guarantee removal of invasion of malignant cells. It was revealed that during the intraoperative observation, deep muscular involvement was detected, and some adjacent muscle fibers were partially destroyed. The bleeding was controlled by the ligation and compression of vessels. The operative area was well irrigated and after which muscular and skin layers were regularly sewn. Figure 5 represents the appearance of the post-operative view of the surgery site illustrating the closure of incisions using the simple interrupted suture design with non absorbable silk (Jasim et al., 2025; Ibrahim et al., 2025).

Localized soft tissue sarcomas in food animals have complete surgical therapy as the most important treatment modality, especially where metastasis is not apparent clinically. Clean-level wide resection is associated with a high level of function recovery and low recurrence rates (Meiten, 2017; Cullen et al., 2014; Zachary, 2017).

### Gross Examination

The gross examination of the excised tumors was done after surgical removal. Masses were assessed in terms of size, shape, consistency and hemorrhage or necrosis. Special focus was on the determination of infiltration into the immediate muscle mass and the absence of the normal skeletal muscle structure (Meuten, 2017). Figure 3 and figure 4 depict the uncultured appearance of the excised tumors showing lobulated appearance, hemorrhagic situations and fibrous feel of the malignant myosarcomas.

### Tissue Fixation and Processing

Collected tissue samples were stored in 10 percent neutral buffered formalin 24-48 hours to fix the tissue samples and inhibit autolysis. After the fixation, the samples were subject

to conventional histological procedures, such as dehydration followed with the use of graded ethanol, clearing with xylene and infiltration with molten paraffin wax (Bancroft & Gamble, 2013).

### Sectioning and Staining

The tissues that were embedded in paraffin were cut in 45 mm thickness with the help of a rotary microtome. Glass slides were embedded with sections which were dried and stained with hematoxylin and eosin (H&E) to examine cell morphology and tissue structure. Histological processing was done using light microscopy, with the photomicrographs representative being saved in documentation (Maxie, 2016; Mohsin et al., 2025).



Figure 1: Preoperative image showing the tumor's attachment to the thigh muscles prior to complete excision.



Figure 2: An intraoperative view showing the surgical removal of the mass with visible areas of necrosis and vascular congestion.



Figure 3: The overall appearance of the excised malignant fibroid shows a lobulated surface and areas of hemorrhage and congestion.



Figure 4: The overall appearance of the tumor removed from the thigh area shows a solid fibrous mass, accompanied by prominent hemorrhagic and necrotic areas on the surface; these are characteristic features of malignant muscle cancer.



Figure 5: The post-operative image shows the surgical site after the tumor was completely removed. The skin incision was closed with a simple, non-absorbable silk suture, ensuring the wound edges were properly aligned to facilitate early healing.

## Results

### Histopathological Findings

The histopathological observation showed that the normal skeletal muscle structure was destroyed severely and was almost replaced by pleomorphic neoplastic cells. The tumor cells had significant differences in size and shape, hyperchromatic nucleus and a weak demarcation of cytoplasmic boundary. Most parts of the lesion did not have normal skeletal muscle striations.

There were many overfilled blood vessels in the tumor tissue and inflammatory cells mainly lymphocytes and macrophages were often found to be infiltrating around the neoplastic cells (Figure 6). The changes were signs of a dynamic tumor microenvironment, which is associated with the changes in a vascular bed and inflammation.

Massive regions of coagulative necrosis were also found in the tumor mass which indicated excessive development of a tumor and the lack of sufficient vascularization (Figure 7). Moreover, angiogenesis was also observed, which is a new development of blood vessels that sustain the tumor growth and its survival.

The visual inspection of the removed tumors showed lobulated masses with irregular surfaces and hemorrhage and congestion areas (Figures 1 through 4). All animals were successfully subjected to surgical excision of the tumors and the wound healing was satisfactory with no signs of recurrence as observed in the follow up (Figure 5).

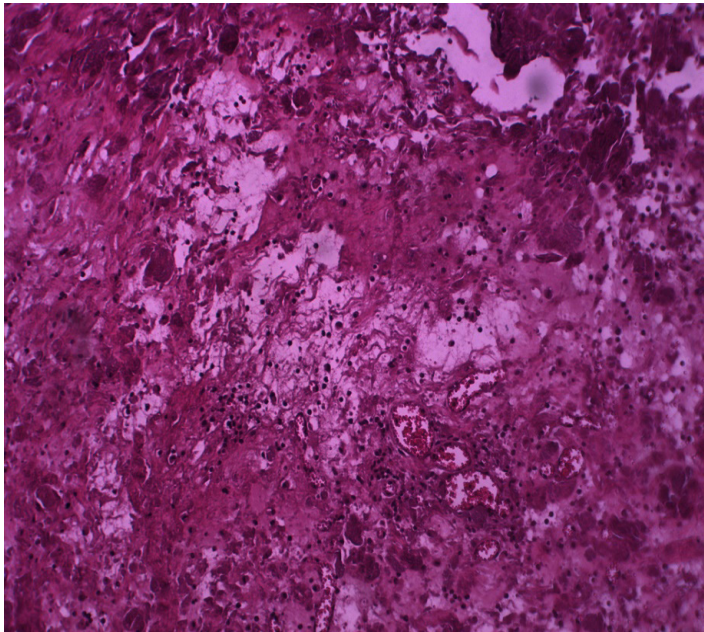


Figure 1: Histological section of the thigh muscle showing replacement of skeletal muscle fibers by pleomorphic tumor cells, vascular congestion, and infiltration of inflammatory cells (hematoxylin and eosin stain, 10 $\times$ ).

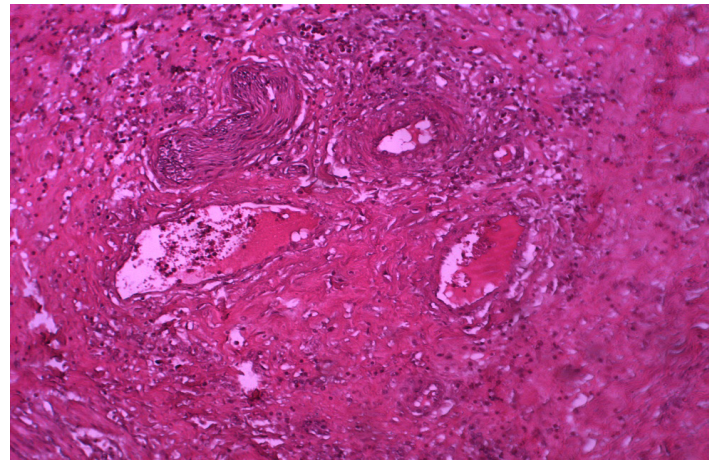


Figure 2: Histological section showing necrotic tumor cells and angiogenesis within the tumor lesion (hematoxylin and eosin stain, 10 $\times$ ).

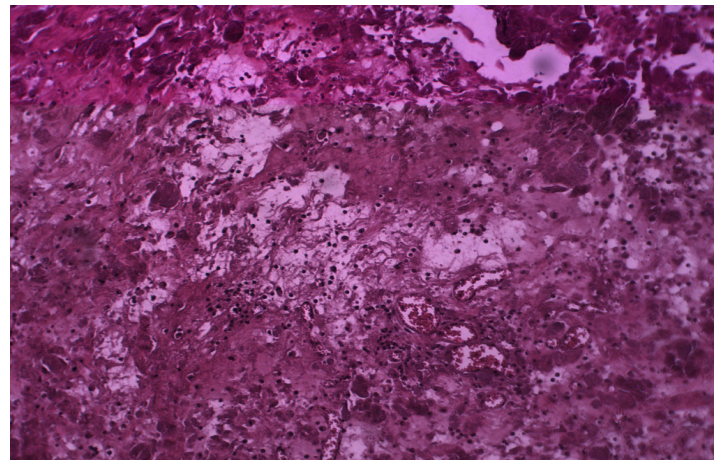


Figure 3: Histological sections showing a highly aggressive myoma characterized by rapid growth, tissue destruction and extensive new angiogenesis. (Hematoxylin and eosin stain, 10 $\times$ ).

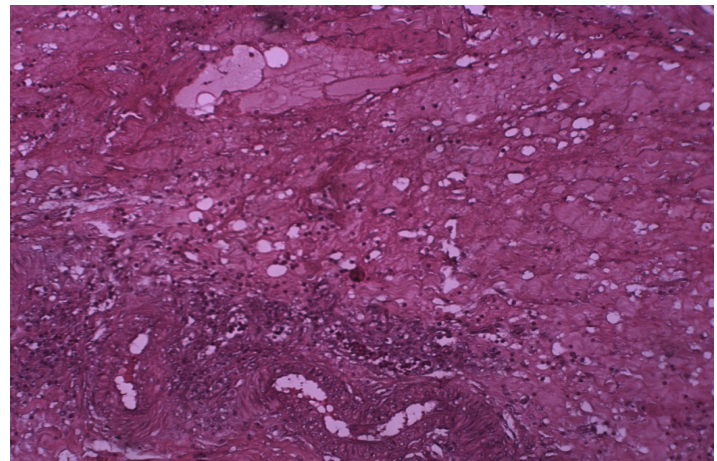


Figure 4: Histological sections showing rhabdomyosarcoma characterized by clusters of necrotic tumor cells and prominent angiogenesis (formation of new blood vessels) within the lesion (hematoxylin and eosin stain, 10 $\times$ ).

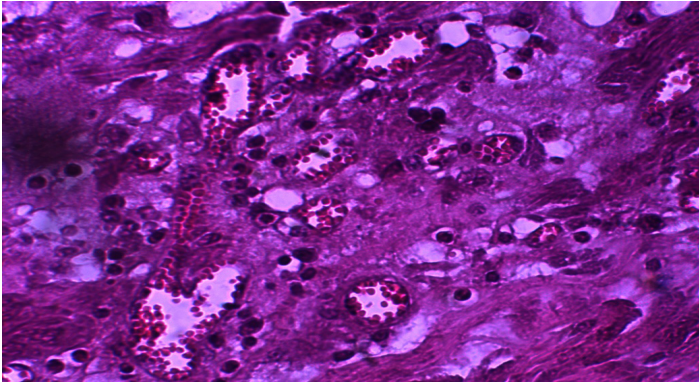


Figure 5: Histological sections showing the fibroma, which is characterized by the presence of pleomorphic tumor cells, extensive areas of coagulative necrosis, and prominent intravascular vascularization (hematoxylin and eosin staining, 10×).

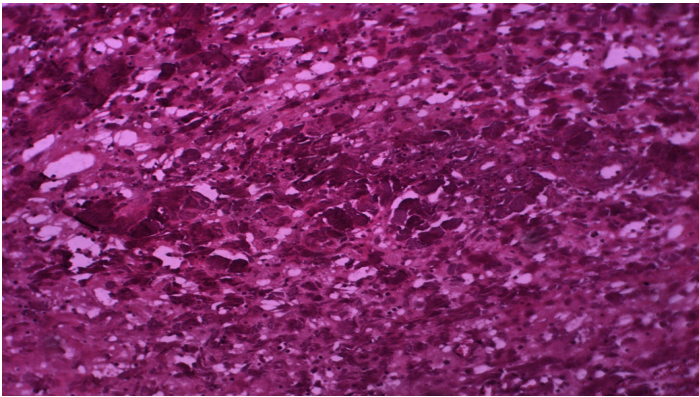


Figure 6: Histological sections showing intensive proliferation of myofibroblast cells characterized by marked pluripotency and nuclear heterogeneity, indicative of a high-grade myofibroblast with varying degrees of cellular differentiation (hematoxylin and eosin staining, 10×).

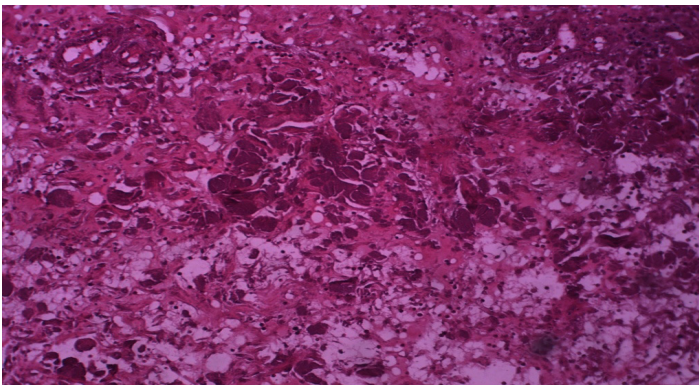


Figure 7: Histological sections reveal a high-grade malignant fibroid tumor, characterized by intense proliferation of fibroblast cells with marked size variation (pleomorphism) and hyperpigmented nuclei (intense color). The lesion shows prominent areas of thrombotic necrosis and active angiogenesis, reflecting the aggressive nature and rapid growth of the malignant tumor (hematoxylin and eosin staining, 10x magnification).

## Discussion

Skeletal muscle tumors that turn into malignant tumors are exceptionally uncommon in cattle, and the bulk of the information is limited to isolated case reports. The histopathological results presented in the current research align with the descriptions of myogenic sarcomas in domestic animals reported in the past (Meuten, 2017). The widespread substitution of normal skeletal muscle fibres by pleomorphic neoplastic cells that were seen in the specimens that were examined is a symptom of an aggressive malignant process with uncontrolled cellular proliferation and loss of normal muscular differentiation (Valli, 2007).

The obvious microscopic characteristics of the examined tumors were marked cellular pleomorphism and hyperchromatic nuclei. This type of cellular atypia is regarded as one of the features of high-grade malignant neoplasms and represents genetic instability and elevated mitotic activity in tumor cells (Maxie, 2016). The same histopathology has also been reported on soft tissue sarcomas in domestic animals, specifically mesenchymal tumors (Cullen et al., 2014).

The other significant characteristic in this study was marked vascular congestion as well as inflammatory cell infiltration. These observations indicate the existence of an active tumor microenvironment which is filled with inflammatory responses and hypoxia of the tissues. Inflammatory cells can also play a role in tumor progression by secretion of cytokines and growth factors that activate angiogenesis and increase tumor survival (Goldschmidt & Hendrick, 2002).

A characteristic histopathology was also tumor necrosis which was also prominent in the examined specimens. Necrosis is a common occurrence in fast growing malignant tumors where the rate of cell growth surpasses that of the local blood supply. It is indicative of the aggressive biological nature of the tumor and is normally linked to high-grade sarcomas (Meiten, 2017).

The angiogenesis in the tumor tissue is one of such adaptive mechanisms that allow the malignant cells to get the oxygen and nutrients to sustain their further growth and development. Recent blood vessels are important in tumor development and can also contribute to the metastatic proliferation of the body to other organs (Cullen et al., 2014). Chronic myositis and fibrosarcoma can be used as differential diagnosis of muscle masses in cattle. The chronic inflammatory myopathies normally show inflammatory infiltration and fibrosis but do not show the significant atypia and pleomorphism of cells as seen in malignant tumors (Zachary, 2017). Fibrosarcoma on the other hand is formed due to fibroblastic connective tissue and is not myogenic but spindle shaped fibroblastic (Valli, 2007).

## Conclusion

The current paper explains the clinical and histopathological features of myosarcoma in the thigh muscle of cattle. Through microscopy, it was observed that there was an irregular cellular pleomorphism, hyperchromatic nuclei, vascular congestion, inflammatory infiltration, tumor necrosis, and angiogenesis, which confirmed the existence of a high-grade malignant tumor of skeletal muscle.

The excision of the tumors surgically led to the successful removal of the lesions and the subsequent satisfactory recovery after the surgery with no recurrence symptoms in the long run. This study highlights the significance of early diagnosis, surgical intervention and histopathological analysis in ensuring a proper diagnosis and better clinical outcome in cattle with skeletal muscle tumors.

## Recommendations

Localized skeletal muscle tumors of cattle are treatable though early detection and timely surgical intervention are crucial to successful treatment. Clinical observations of the abnormal muscular swellings can be done regularly to enable early diagnosis and treatment. It is advisable that more research work should be carried out with more cases and use of immunohistochemical markers to get a clear picture of the biological behavior and diagnostic features of myogenic tumors in cattle.

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## Originality Statement

The author declares that this manuscript is original, has not been published previously, and is not under consideration for publication elsewhere.

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