

## A Case of Soft Tissue Fibroma in Wistar Rat (*Rattus norvegicus*)

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### ABSTRACT

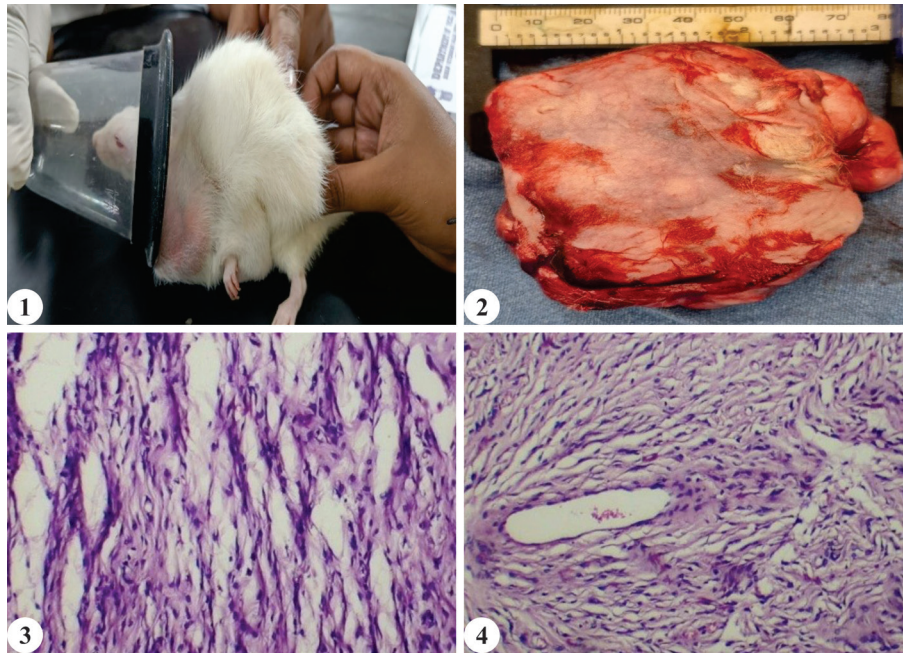
Fibromas are benign connective tissue tumours arising from fibroblasts and are occasionally observed as spontaneous neoplasms in laboratory animals. In laboratory rats (*Rattus norvegicus*), fibromas are considered uncommon but may occur in aging individuals, often as incidental findings during long-term toxicity or carcinogenicity studies. Present clinical case report management of a fibroma in an 18-month-old female wistar rat. The animal presented with a firm, slow-growing, non-ulcerated mass located on the dorsal thoracic region. Clinical examination revealed hard mass in thoracic region with problem in normal feeding. The mass was surgically excised and subjected to histopathological evaluation, which showed a well-circumscribed proliferation of mature fibroblasts arranged in interwoven bundles within a dense collagenous matrix, with no evidence of mitotic activity, nuclear atypia or tissue invasion. Based on these findings, a diagnosis of fibroma was confirmed.

**Keywords:** Fibroblast, fibroma, histopathology, mitotic activity, thoracic region

Neoplastic diseases in laboratory animals have long been a subject of interest in both basic and applied biomedical research. Rodents, especially rats and mice are widely used in toxicological studies due to their genetic uniformity, relatively short lifespan and well-documented background lesion profiles<sup>1</sup>. Among these, soft tissue tumours such as fibromas are considered relatively rare but important, especially when evaluating chronic toxicity or carcinogenicity studies<sup>2</sup>. Fibromas are benign mesenchymal tumours composed primarily of mature fibroblasts and dense collagenous stroma, typically presenting as well-demarcated, non-invasive masses in subcutaneous tissues<sup>3</sup>. While fibromas are more frequently encountered in domestic animals, their occurrence in laboratory rodents especially rats (*Rattus norvegicus*) is sporadic and generally limited to older animals or those involved in long-term studies<sup>4</sup>. In a retrospective analysis of 940 untreated Hannover Wistar rats (RjHan:WI), subcutaneous fibroma was observed in 4.7% of males and 3.6% of females while major neoplasms overall were most frequent in the endocrine, integumentary and reproductive systems. Fibroma was among the common mesenchymal tumours, alongside fibrosarcoma and thyroid C-cell adenoma<sup>5</sup>. In rats, fibromas most commonly arise in the subcutis of the trunk or limbs and are generally asymptomatic unless they reach a size that causes mechanical interference or ulceration<sup>6</sup>. The incidence may vary among rat strains and is often higher in aged males, particularly under prolonged housing conditions<sup>1</sup>. Differentiation of fibromas from other spindle-cell tumours, such as fibrosarcomas, is critical due to differences in biological behaviour and prognostic implications. While fibromas are typically non-invasive and lack mitotic activity, fibrosarcomas exhibit cellular atypia, infiltrative growth and frequent mitotic figures, necessitating careful histopathological assessment for accurate diagnosis<sup>2,3</sup>. This distinction is especially important in regulatory toxicology, where the nature of neoplastic lesions can influence the classification of a substance's carcinogenic potential<sup>7</sup>. This case report describes a spontaneous subcutaneous fibroma in an adult female wistar rat. The report aims to document the clinical, gross and histopathological features of this uncommon lesion, emphasizing the importance of distinguishing spontaneous background pathology from treatment-related effects in laboratory animal studies.

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An 18-month-old female wistar rat, weighing approximately 480 grams at the time of lesion detection, was presented to the Teaching Veterinary Clinical Complex, Bihar Veterinary College, Patna with a history of a slowly growing lump in the dorsal thoracic region, progressing over the past three months (Fig. 1). Clinical signs observed included shallow breathing, loss of appetite, drooling of saliva and weight loss. Further examination revealed that the animal appeared to be in pain and had a hard, palpable mass in the thoracic region of size 10.2 cm (Fig. 2). Based on these clinical findings, the lesion was tentatively diagnosed as a neoplasm and surgical excision was planned. Surgery was performed under general anaesthesia. The animal was premedicated with butorphanol at a dose rate of 0.1 mg/kg body



**Fig. 1.** Female Wistar Rat showing a prominent subcutaneous abdominal mass suggestive of a tumorous growth. The rat is being anesthetized using an induction chamber. The mass is hard in consistency and is in the ventral abdominal region; **Fig. 2.** Excised subcutaneous tumour mass of 10.2 cm from a rat. The mass is encapsulated with an irregular surface and prominent vascularisation; **Fig. 3.** Histological section of a fibroma of a rat (H&E 10x) showing a well-differentiated proliferation of spindle-shaped fibroblastic cells arranged in interwoven bundles within a dense collagenous stroma; **Fig. 4.** Histological section of a fibroma from a rat (H&E 10x) showing a well-circumscribed, hypocellular mass composed of spindle cells aligned in a storiform and fascicular pattern.

weight subcutaneously, followed by induction and maintenance with sevoflurane. An elliptical incision was made around the mass and the tumorous tissue was excised from its base. Haemorrhage was controlled by ligating the blood vessels using polyglactin 910 (Vicryl) No. 3. The excised tumour mass was submitted for histopathological examination. The skin incision was closed routinely using simple interrupted sutures.

Postoperatively, the animal was treated with syrup meloxicam at a dose of 2 mg/kg body weight on the first day, followed by 1 mg/kg body weight for the next two days. Additionally, cefpodoxime was administered orally at a dose of 15 mg/kg body weight for five days. The owner was advised to perform regular wound dressing.

Histopathological evaluation of the subcutaneous mass revealed classical features of a benign fibrous tumour. The lesion was composed predominantly of interlacing bundles of spindle-shaped fibroblasts, exhibiting uniform morphology with elongated, cigar-shaped nuclei and indistinct cell borders (Fig. 3). These cells were embedded in a dense, eosinophilic collagen matrix, which imparted a whorled appearance on low magnification. The tumour was well circumscribed and encapsulated (composed of collagen fibres, fibroblast and inflammatory cells) with no evidence of infiltration into adjacent skeletal muscle or dermis. The fibroblasts exhibited minimal pleomorphism and mitotic figures

were extremely rare (<1 per 10 high-power fields), suggesting low proliferative activity. There was a clear absence of features consistent with fibrosarcoma or other soft tissue sarcomas namely, cellular atypia, increased mitotic activity, invasive growth patterns and poorly defined margins<sup>2</sup>. These findings support the benign nature of the lesion and validate the histological diagnosis of a subcutaneous fibroma.

Fibromas are benign tumours originating from fibroblasts, the principal cells of connective tissue and are characterized by slow growth and non-invasive behaviour<sup>3</sup>. Although spontaneous fibromas are common in some domestic animals, their occurrence in laboratory rodents is rare. Reported prevalence rates vary by strain and study but generally range from approximately 1% to 5% in control populations, with Wistar and Sprague-Dawley rats showing fibroma incidences of around 1% to 4.7% in historical control data<sup>5,8</sup>. When they do occur, they are typically incidental findings during chronic studies in aged rats, particularly in control groups or those exposed to inert test substances<sup>4</sup>. Estrogen plays a crucial role in promoting the growth of fibrous tissues by stimulating the proliferation of fibroblasts and other connective tissue cells, leading to the development of fibromas, while progesterone regulates tumour growth by promoting differentiation over proliferation; however, the balance between estrogen and progesterone is vital for tissue homeostasis and when disrupted, such as by

chronic estrogen exposure or low progesterone levels, fibromas can form<sup>9</sup>. Fibromas in female rats may be associated with ovarian dysfunction, which can lead to hormonal imbalances that contribute to the development of fibromas<sup>10</sup>. In this case, the fibroma developed in an 18-month-old female rat. The absence of any treatment-related exposure supports the classification of this lesion as spontaneous in origin. Age is a known contributing factor in the development of spontaneous tumours in laboratory animals and fibroblastic proliferations are more likely to occur with advancing age<sup>1</sup>. The histopathological characteristics observed well-demarcated margins, low cellularity and absence of mitoses are consistent with previously published descriptions of rodent fibromas<sup>2</sup>. These features not only differentiate fibroma from fibrosarcoma but also from other mesenchymal tumours such as leiomyoma, lipomas or peripheral nerve sheath tumours. Although fibromas are benign, their clinical significance in laboratory studies lies in their potential to confound results, particularly if they become large, ulcerate or interfere with mobility or feeding. In this case, the tumour was localized, asymptomatic and affecting the overall health or behaviour of the animal.

## CONCLUSION

This case report describes a rare instance of a spontaneous subcutaneous fibroma in an aged female rat. The lesion was well-circumscribed, composed of mature fibroblasts within a dense collagen matrix and showed no evidence of malignancy or invasive behaviour. The absence of treatment-related exposure and the animal's advanced age support the classification of the tumour as a spontaneous lesion. While fibromas are uncommon in laboratory rats, their recognition is essential for accurate pathological assessment and the differentiation of incidental findings from potential compound-related effects in toxicological studies. This case emphasizes the

shared medical considerations for rats as both research models and pets.

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