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Surgical excision of mammary and mass in a geriatric captive rhesus macaque (*Macaca mulatta*) from Thiruvananthapuram Zoological Park, Kerala, India: a case report

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ABSTRACT

Mammary neoplasia in non-human primates is clinically significant, particularly in geriatric captive animals, where local invasion and suspected metastatic spread may complicate surgical management. This report describes the emergency surgical management of mammary neoplasia in a 22-year-old female rhesus macaque (*Macaca mulatta*) weighing 5.4 kg and housed at Thiruvananthapuram Zoological Park, Kerala, India. The animal presented with a progressively enlarging mammary mass with extension into deeper tissues and a concurrent abdominal mass suspected to be metastatic. Emergency surgical excision was performed under general anesthesia, resulting in removal of a 64-g mammary mass along with the abdominal mass. The case highlights the importance of timely surgical intervention in the management of advanced mammary neoplasia in geriatric captive non-human primates.

Keywords: Rhesus macaque, *Macaca mulatta*, Mammary tumor, Mammary neoplasia, Zoo animal surgery, Metastasis, Exotic animal medicine, Case report

Introduction

Mammary neoplasia is an important clinical condition reported in both human and veterinary medicine, with mammary tumours occurring in several non-human primate species (Cohen *et al.*, 2001; Tarara, 2007; Dewi *et al.*, 2021) [1, 2, 3]. Rhesus macaques (*Macaca mulatta*) are increasingly maintained in zoological and captive settings, where increased longevity may predispose them to age-associated neoplastic diseases (Simmons *et al.*, 2011; Simmons, 2016; Didier *et al.*, 2016; Uno, 1997) [4, 5, 6, 7].

Mammary tumours in non-human primates may present as progressively enlarging masses and can exhibit local tissue invasion and, in advanced cases, metastatic dissemination (Cohen *et al.*, 2001; Tarara, 2007; Dewi *et al.*, 2021) [1, 2, 3].

Diagnosis and management can be challenging in geriatric animals because of their age, physiological status, and the potential risks associated with anaesthesia and major surgical procedures (Simmons, 2016; Didier *et al.*, 2016; Uno, 1997) [5, 6, 7]. Early recognition and appropriate surgical intervention are therefore important for improving clinical outcomes and maintaining animal welfare. The present case describes the clinical and surgical management of an advanced mammary neoplasm in a geriatric female rhesus macaque maintained at a zoological park in Kerala, India.

Case presentation

Signalment and history

Malu, a 22-year-old female Bengal monkey (rhesus macaque; *Macaca mulatta*) housed at Thiruvananthapuram Zoological Park, Kerala, India, was presented for evaluation of a progressively enlarging mammary mass. The body weight at the time of surgery was 5.4 kg. The mammary mass had extended into the deeper surrounding tissues.

Diagnosis

Fine-needle aspiration cytology (FNAC) was performed for cytological evaluation of the mammary mass. A complete blood count (CBC) was performed as part of the pre-operative evaluation to assess the haematological status and suitability of the animal for anaesthesia and surgery. The CBC findings are presented in Table 1.

Histopathological examination

Microscopic observations

Histopathological examination of the excised tissue revealed disorganized and irregularly arranged glandular structures supported by a moderate amount of fibrous stroma. Multifocal clusters of glandular

epithelial cells were observed within the stromal tissue. The glandular lumina contained pale eosinophilic secretory material, as shown in Fig. 1. The histomorphological features were suggestive of a well-differentiated mammary gland fibroadenocarcinoma.

Table 1. Haematological parameters of the rhesus macaque during pre-operative evaluation

Test Name	Result	Unit	Reference	Remarks
WBC	14.2	$\times 10^3/\mu\text{L}$	8.7	Mild leukocytosis
RBC	5.8	$\times 10^6/\mu\text{L}$	5.7	Normal
Hemoglobin	12.7	g/dL	12.7	Normal
Hematocrit	40.3	%	10.1	Normal
MCV	70.8	fL	70.8	Normal
MCH	23.8	pg	23.8	Normal
MCHC	31.5	g/dL	31.5	Normal
Platelets	422	$\times 10^3/\mu\text{L}$	3774	Mild Thrombocytosis
Lymphocytes	16.1	%	43	Relatively Low
Monocytes	4.5	%	5.4	Normal
Eosinophils	12.7	%	1.9	Normal
Basophils	0	%	0	Normal

Clinical decision for surgery

Considering the progressive enlargement and suspected local invasion of the mammary mass, emergency surgical intervention was undertaken. Pre-operative CBC showed mild leukocytosis (WBC: $14.2 \times 10^3/\mu\text{L}$) and mild thrombocytosis (platelets: $422 \times 10^3/\mu\text{L}$). Other major

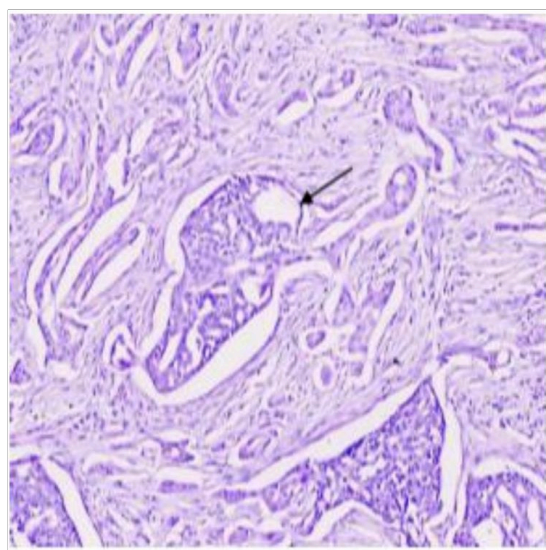


Figure 1. H&E-stained section of the mammary tissue showing irregular and disorganized glandular structures (arrow) at 1000 x magnification.

hematological parameters, including RBC ($5.8 \times 10^6/\mu\text{L}$), haemoglobin (12.7 g/dL), and hematocrit (40.3%), were within the reported normal range. Based on the clinical condition and blood parameters, the animal was considered suitable for surgery, and the mammary mass was surgically excised.

Anesthesia and surgical procedure

The surgical procedure was performed at Kudappanakunnu Multi-Specialty Veterinary Hospital under the Department of Animal Husbandry, Government of Kerala. Anaesthesia was induced using xylazine at 5 mg/kg body weight and ketamine at 15 mg/kg body

weight, both at a concentration of 100 mg/mL, and maintained with isoflurane at a flow rate of 0.6 L/min. The primary mammary mass, weighing 64 g, was surgically excised. The surgical incision was closed using PGA No. 1 suture material, followed by intradermal suturing of the skin.

Operative findings

The primary lesion was a large mammary mass with extension into the deeper surrounding tissues. The mass was surgically excised during the procedure. The available intra-operative images document the animal under general anaesthesia, preparation and sterile draping of the surgical field, surgical exposure, excision of the lesion, and immediate post-operative dressing.

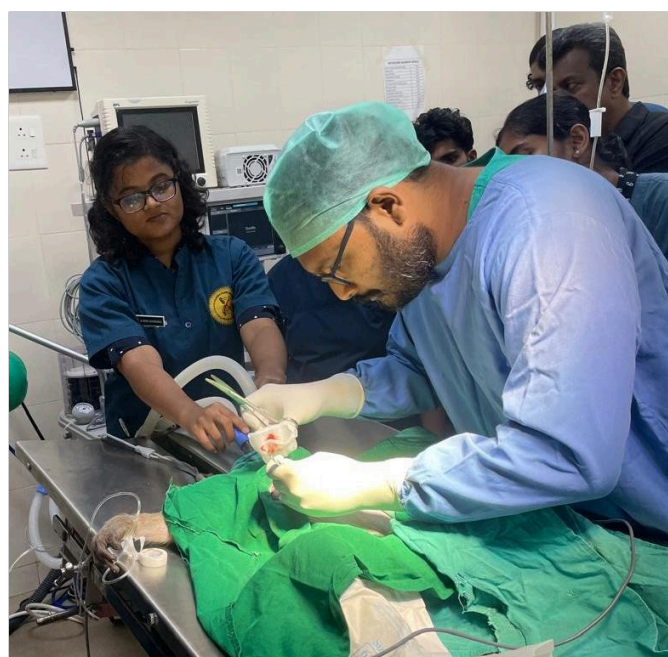


Figure 2. Pre-operative / intra-operative positioning and anesthetic setup

The patient was positioned on the surgical table during peri-operative management, with monitoring and anesthetic equipment in place.



Figure 3. Operative field after preparation and closure of one surgical site

Clipped and draped ventral surgical field with the incision site visible.

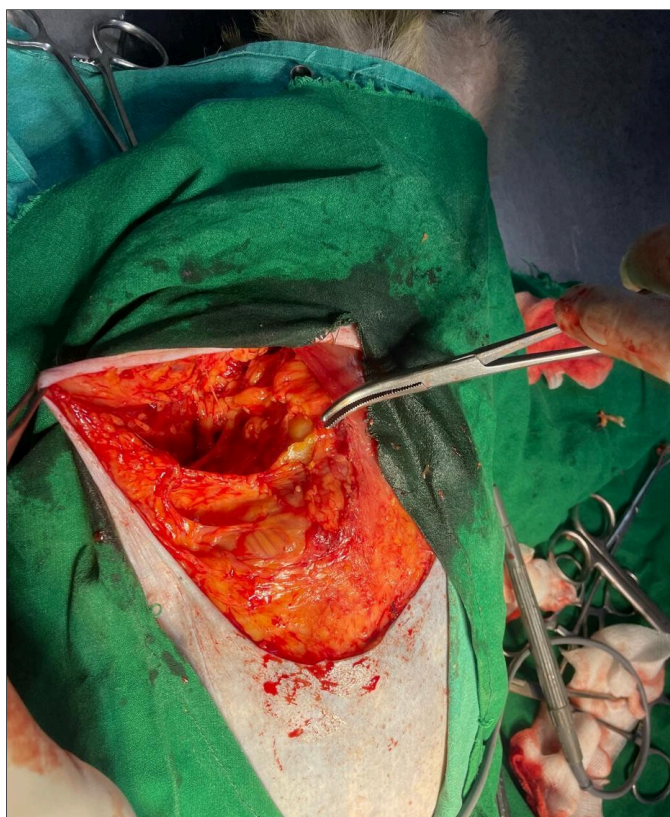


Figure 4. Intra-operative exposure of the deeper surgical field

Open surgical exposure during mass dissection, showing deep tissue involvement.

Post-operative patient with a protective thoraco-abdominal bandage in place.

Surgical management and outcome

Following excision of the mammary mass, the rhesus macaque recovered from general anaesthesia and showed clinical improvement during the post-operative period. No immediate post-operative complica-

tions were reported. Post-operative management included tramadol hydrochloride at 2 mg/kg body weight, once daily for 3 days, and ceftriaxone-tazobactam at 50 mg/kg body weight, once daily. Meloxicam + paracetamol (Melonex Plus) was administered at



Figure 5. Immediate post-operative bandaging

0.2 mg/kg body weight once daily for pain management, and Allu Spray was applied topically to the surgical wound. Wound dressing was performed daily for the first three days and subsequently on alternate days. The animal was monitored for appetite, wound healing, general

clinical condition, and any evidence of recurrence. Complete healing of the surgical wound was observed by the 20th post-operative day.

Discussion

The present case is clinically notable because of the occurrence of an advanced mammary neoplasm in a geriatric captive rhesus macaque and its management by surgical excision (Simmons *et al.*, 2011; Simmons, 2016; Cohen *et al.*, 2001; Tarara, 2007) [4, 5, 1, 2]. The progressive extension of the mammary mass into deeper tissues presented important challenges for clinical and surgical management. In geriatric non-human primates, advanced age may further increase the risks associated with anaesthesia and major surgical intervention (Simmons, 2016; Didier *et al.*, 2016; Uno, 1997) [5, 6, 7].

The successful recovery following excision of the mammary mass highlights the potential value of timely surgical intervention in selected cases of mammary neoplasia in captive primates.

Histopathological evaluation of the excised mammary mass is important for establishing the definitive diagnosis and determining the biological behaviour of the neoplasm.

This case also emphasizes the importance of careful peri-operative management and post-operative monitoring in geriatric zoological patients. Assessment of recovery, appetite, wound healing, general clinical condition, and recurrence is essential following surgical treatment.

Further documentation of long-term follow-up would provide additional information regarding the clinical outcome and prognosis in this case.

Conclusion

Mammary neoplasia in geriatric rhesus macaques can present with extensive local tissue involvement, making surgical management challenging. Timely surgical excision of the mammary mass resulted in satisfactory immediate post-operative recovery in the present case. This case highlights the importance of early recognition, appropriate surgical intervention, and careful peri-operative management of mammary neoplasia in geriatric captive non-human primates.

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