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Case Series

Orthopaedics Section

Synovial Haemangioma of the Paediatric Knee: A Case Series

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ABSTRACT

Synovial haemangioma is a rare benign vascular lesion arising from synovial tissue, accounting for approximately 0.07% of all soft-tissue tumours and 0.78% of resected haemangiomas. Because of its low prevalence, the diagnosis is frequently delayed or missed. The condition causes chronic or recurrent knee effusion and pain without a preceding history of trauma; if left untreated, it can progress to chondral damage. Magnetic Resonance Imaging (MRI) is the preferred investigation and guides surgical planning. Three paediatric patients- a six-year-old boy, a four-year-old boy and a 12-year-old girl presented between December 2021 and June 2025 with atraumatic knee pain and swelling of 8 to 18 months' duration. All three demonstrated lobulated intra-articular lesions on MRI that were hypointense on T1 and hyperintense on T2 and Computed Tomography (CT) angiography confirmed multiple dilated vascular channels in each case. Open en-bloc excision with total synovectomy was performed; histopathology confirmed synovial haemangioma in all cases. At six months, follow-up MRI showed no residual tumour and Visual Analogue Scale (VAS) scores had fallen to one in every patient. Synovial haemangioma should be considered in any child presenting with atraumatic, chronic knee pain and swelling. Early MRI, followed by en-bloc excision with synovectomy, is the treatment of choice and yields excellent short-term outcomes with low recurrence.

Keywords: Child, Knee joint, Magnetic resonance imaging, Synovectomy, Synovial membrane

INTRODUCTION

Synovial haemangioma is an uncommon benign tumour that arises from the synovial tissue. The synovial membrane covers a large surface area within the knee joint; consequently, most intra-articular tumours and tumour-like lesions are synovial in origin, despite their overall rarity [1]. Synovial haemangioma is a well-recognised yet frequently overlooked cause of prolonged knee pain and recurrent swelling in children, often occurring without antecedent trauma [2]. First described by Bouchut in 1856, these lesions were identified as soft-tissue tumours surrounded by a synovial lining [3]. The knee is the most commonly affected joint, accounting for the largest number of reported cases, although the ankle, elbow, temporomandibular joint, interphalangeal joints and tendon sheaths may also be involved [4]. The infrapatellar region is the most frequent site within the knee, more often than the suprapatellar pouch [5]. Histologically, these lesions arise from the mesenchymal layer beneath the synovial membrane and contain adipose, fibrous, muscular and thrombotic elements within vascular channels. Clinically, patients present with pain, swelling and, in advanced cases, restricted range of motion [3].

Three paediatric patients with histopathologically confirmed synovial haemangioma of the knee, all managed by open excision and total synovectomy are presented.

CASE SERIES

Three cases recorded between December 2021 and June 2025 are presented below. A summary of the clinical, radiological and operative findings is provided for each patient.

Case 1

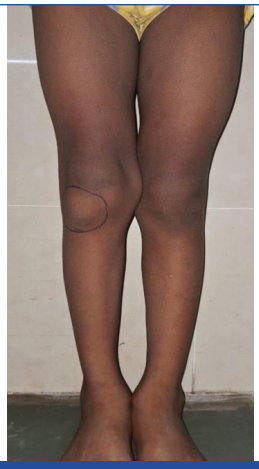
A six-year-old boy was brought by his mother with an 8-month history of right knee pain and swelling. The pain was moderate in intensity, intermittent in character and aggravated by physical activity. The preoperative VAS pain score was 7/10. There was no preceding trauma, fever, or history of similar complaints. The swelling had gradually increased in size over the 8-month period. No significant past medical, surgical, or family history was reported.

A firm, non pulsatile, non compressible swelling measuring approximately 4×3 cm was noted over the lateral infrapatellar region [Table/Fig-1]. Full range of motion was present at the knee, though terminal flexion was painful. The transillumination test was positive. Plain radiographs of the right knee revealed a soft-tissue shadow in the infrapatellar region without bony involvement. Ultrasonography demonstrated an ill-defined heterogeneous fluid collection around the patellar tendon. MRI showed a lobulated lesion measuring 3×4×4 cm in the infrapatellar region, hypointense on T1-weighted and hyperintense on T2-weighted sequences [Table/Fig-2a-c]. CT angiography identified multiple dilated vascular channels fed by the superior genicular artery. Doppler ultrasonography confirmed a slow-flow venous malformation. The differential diagnoses considered included pigmented villonodular synovitis, meniscal cyst, ganglion cyst, lipoma arborescens, juvenile idiopathic arthritis with synovial hypertrophy and haemophilic arthropathy. MRI signal characteristics and CT angiography findings were consistent with synovial haemangioma, distinguishing the lesion from these entities. Provisional Diagnosis was established as synovial haemangioma of the right knee.

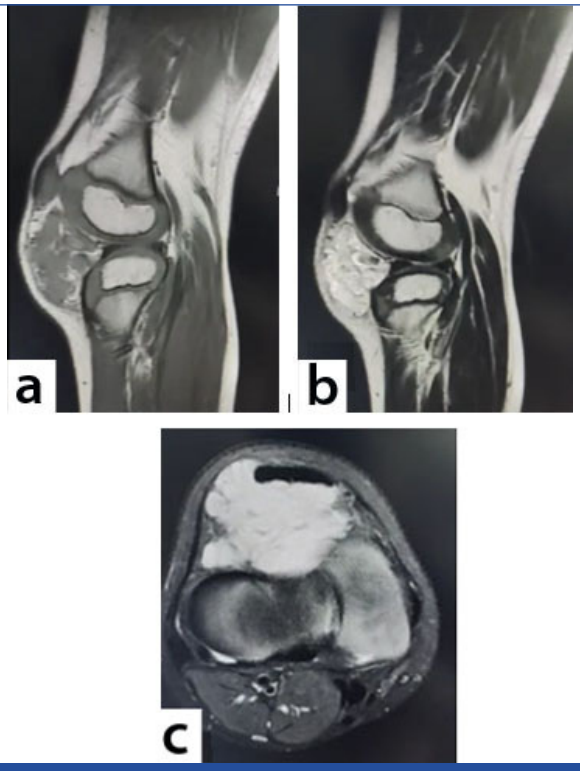
Open excisional biopsy with total synovectomy was performed [Table/Fig-3a,b]. Histopathological examination confirmed cavernous-type synovial haemangioma, showing cavernous vascular channels lined by flattened endothelium, multinucleated giant cells and organised thrombi on Haematoxylin and Eosin (H&E) staining [Table/Fig-4]. Postoperative rehabilitation was initiated immediately. At two months, the patient had resumed daily activities without pain. Follow-up MRI at six months showed no residual tumour; VAS score was 1.

Case 2

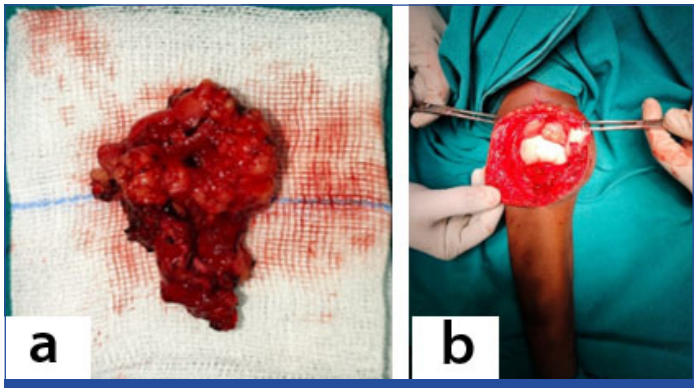
A four-year-old boy was referred with a 1-year history of left knee pain and swelling. The pain was moderate and constant, worsened by standing and ambulation. No trauma, systemic illness, or family history of joint disease was noted. The preoperative VAS pain score was 6/10. The swelling had increased progressively over the preceding year. Past medical and family history was unremarkable.



[Table/Fig-1]: Clinical photograph of Case 1 showing a palpable swelling (circled) over the lateral infrapatellar region of the right knee.

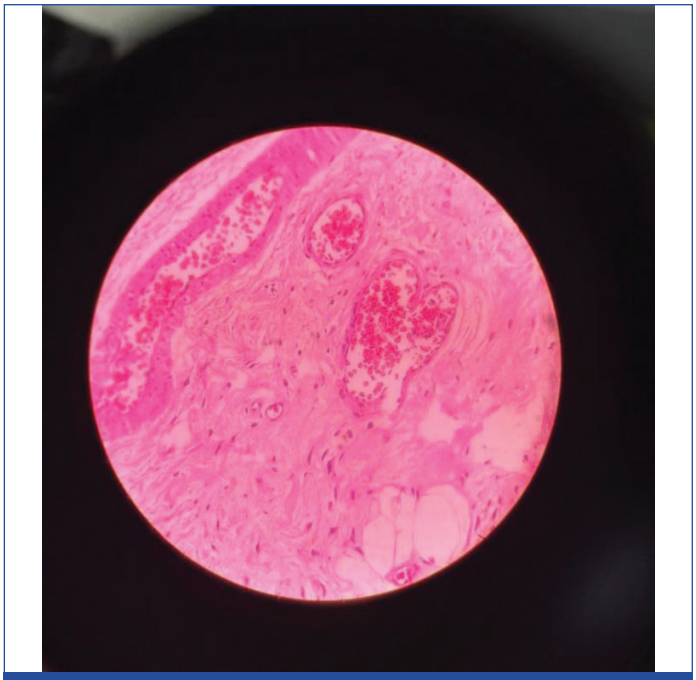


[Table/Fig-2]: (a-c): MRI of Case 1 showing an intra-articular haemangioma: a) Sagittal T1-weighted image demonstrating a hypointense lesion (arrow); b) Sagittal T2-weighted image demonstrating a hyperintense lesion (arrow); c) Axial T2-weighted image demonstrating a hyperintense lesion (arrow).



[Table/Fig-3]: a,b) Intraoperative findings of Case 1 - excised specimen and operative field.

On examination, the general condition was fair; the patient was conscious and oriented. Vitals were stable. On local examination, a soft, non pulsatile, non compressible swelling measuring 5×4 cm was palpable over the medial infrapatellar region. Range of motion at the knee was restricted from 0° to 40°. The transillumination test was positive. Plain radiographs showed a soft-tissue shadow in the medial infrapatellar region without osseous changes. MRI demonstrated a lobulated diffuse lesion measuring 5×4×4 cm, hypointense on T1 and hyperintense on T2 sequences. CT angiography revealed multiple dilated vascular channels within the lesion. The differential diagnoses considered included pigmented villonodular synovitis, meniscal cyst, ganglion cyst, lipoma arborescens, juvenile idiopathic arthritis with synovial hypertrophy and haemophilic arthropathy. MRI signal characteristics and CT angiography findings were consistent with synovial haemangioma, distinguishing the lesion from these entities. Provisional diagnosis of synovial haemangioma of the left knee was given.



[Table/Fig-4]: (Case 1) Multinucleated giant cells and organised thrombi within dilated vascular channels, consistent with synovial haemangioma (H&E, x100).

Open excisional biopsy with total synovectomy was performed. Histological sections showed cavernous vascular spaces lined by a single layer of flattened endothelial cells, surrounded by fibrous stroma, with areas of organising thrombus, consistent with cavernous-type synovial haemangioma. Postoperative rehabilitation commenced immediately. At two months, daily activities were resumed without pain. Follow-up MRI at six months was negative for residual tumour; VAS score was 1.

Case 3

A 12-year-old girl presented with an 18-month history of left knee pain and restricted movement. The pain was moderate-to-severe in intensity and constant in character, progressively worsening over 18 months. No history of trauma or systemic illness was elicited. The preoperative VAS pain score was 6/10.

On examination, general condition was fair; the patient was conscious and oriented; vitals were stable. A non pulsatile, non compressible swelling measuring 5×4 cm was noted over the lateral infrapatellar region. Knee range of motion was restricted from 0° to 30° of flexion, with associated quadriceps wasting, indicating a more advanced stage of disease.

Plain radiographs demonstrated a soft-tissue shadow in the infrapatellar region without bony destruction. MRI revealed a lobulated lesion measuring 5×4×6 cm, hypointense on T1 and hyperintense on T2 sequences. CT angiography identified multiple dilated vascular channels within the mass. Doppler ultrasonography confirmed a slow-flow venous malformation. The differential diagnoses considered included pigmented villonodular synovitis, meniscal cyst, ganglion cyst, lipoma arborescens, juvenile idiopathic arthritis with synovial hypertrophy and haemophilic arthropathy. MRI

signal characteristics and CT angiography findings were consistent with synovial haemangioma, distinguishing the lesion from these entities. Provisional Diagnosis was synovial haemangioma of the left knee.

Open excisional biopsy with total synovectomy was performed. Histopathological examination confirmed synovial haemangioma. Histological sections showed dilated thin-walled vascular channels of variable calibre, lined by a single layer of flattened endothelium, set in a fibrous stroma with focal areas of haemorrhage and organised thrombus, consistent with cavernous-type synovial haemangioma. Postoperative rehabilitation was initiated immediately. At two months, full daily activity was resumed without pain. Follow-up MRI at six months showed no residual tumour with VAS score of 1.

DISCUSSION

Synovial haemangiomas are rare benign vascular tumours of endothelial origin, accounting for roughly 0.07% of all soft-tissue tumours and 0.78% of resected haemangiomas [6]. The knee joint is involved in approximately 60% of cases and the condition predominantly affects children and young adults with a slight male preponderance [7]. Moon's series established that symptom onset occurs at a mean age of 10.9 years in girls and 12.5 years in boys, with 75% of patients symptomatic before the age of 16 [8]; the patient ages in the present series (4, 6 and 12 years) are consistent with this profile.

Diagnosis is frequently delayed because the clinical presentation-atraumatic joint pain, swelling and effusion closely mimics common paediatric conditions such as meniscal injury, pigmented villonodular synovitis, Diffuse-Type Tenosynovial Giant Cell Tumour (D-TSGCT), haemophilic arthropathy and juvenile idiopathic arthritis [9-11]. Previous case series report an average interval of 4.5 years from symptom onset to diagnosis [12]; in the present series, the mean interval was only 1.06 years, suggesting that heightened clinical awareness and early MRI referral can substantially shorten this delay.

Plain radiographs are rarely diagnostic, occasionally showing a soft-tissue shadow or, infrequently, phleboliths that are considered pathognomonic but appear in fewer than 5% of intra-articular lesions [13]. MRI is the preferred imaging modality: on T1-weighted sequences the lesion is typically hypo- or isointense, while T2-weighted and Short Tau Inversion Recovery (STIR) sequences reveal marked hyperintensity reflecting the vascular content [14]. CT angiography complements MRI by delineating the feeding vessels and is particularly valuable when embolisation is considered [3]. All three patients in the present series demonstrated characteristic MRI signal characteristics, with CT angiography confirming multiple dilated vascular channels in each case.

Histologically, synovial haemangiomas are subclassified into venous, venous vascular malformation, cavernous and capillary subtypes [15]. Bennett's original classification divides lesions into circumscribed (pedunculated) and diffuse forms, the latter infiltrating surrounding tissue and carrying a higher recurrence risk after incomplete excision [11]. All three lesions in the present series were of the diffuse type, occupying the infrapatellar fat pad and extending along the synovium, which guided the decision for open rather than arthroscopic excision.

The treatment of choice for diffuse synovial haemangioma is open en-bloc excision with total synovectomy. Arthroscopic excision is adequate for small, pedunculated, well-defined lesions but carries a higher risk of incomplete removal for diffuse lesions, which can lead to recurrence [15,16]. In the present series, open excision with total synovectomy was performed for all three patients without preoperative biopsy, consistent with the established approach of treating these lesions as an excisional biopsy to avoid tumour seeding and disruption of the vascular anatomy [11]. All patients resumed unrestricted daily activity by two months postsurgery and six-month follow-up MRI demonstrated no evidence of residual or recurrent tumour in any patient, consistent with outcomes reported in comparable Indian series. Kumar I et al., (2024) described a paediatric case managed by open excision with complete resolution at short-term follow-up, mirroring the present series' outcomes [2]. Deshmukh GK et al., (2025) reported synovial haemangioma in a four-year-old girl presenting with knee swelling, managed by open excisional biopsy, with no recurrence at short-term follow-up, consistent with the outcomes observed in the youngest patient in the present series [17]. Lingaiah P and Abraham VT (2024) highlighted the diagnostic challenge of chronic anterior knee pain in children and emphasised that MRI remains the cornerstone of preoperative characterisation, a finding corroborated across all three cases in the present series [18]. Ravichandran AK et al., (2025) similarly reported a rare paediatric case of synovial haemangioma managed by total synovectomy with excellent functional recovery, reinforcing that open en-bloc excision remains the definitive treatment for diffuse-type lesions [19]. Muramatsu K et al., (2019) reviewed nine paediatric cases and similarly reported no recurrence after complete synovectomy, with all patients returning to normal activity within three months [6]. The outcomes in the present series corroborate this conclusion. All three lesions in the present series were of the cavernous subtype on histopathology, consistent with reported literature in which the cavernous subtype predominates among paediatric intra-articular haemangiomas [15].

CONCLUSION(S)

Synovial haemangioma of the paediatric knee is uncommon and frequently misdiagnosed. The condition should be included in the differential diagnosis of any child presenting with chronic atraumatic knee pain and swelling. MRI is the investigation of choice for characterisation. Open en-bloc excision with total synovectomy provides definitive histopathological diagnosis and excellent functional recovery, with minimal risk of recurrence at short-term follow-up.

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