



Case report

A rare incidence of primary Synovial Spindle Cell Sarcoma in a 46-year-old male, successfully managed by surgical intervention-A Case Report

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ABSTRACT

Introduction and importance: Synovial sarcoma (SS) is a rare form of Soft Tissue Sarcoma (STS) which results from the malignant proliferation of mesenchymal cells. Specific etiologies are not yet known, and its incidence rate ranges between 0.81 and 1.42 per 1 million individuals. Its gender-specific prevalence is almost the same between males and females and it is unique from other subtypes of STS in that it's slow growing and in almost half the cases, patients present with distant metastasis at the time of diagnosis.

Case presentation: We present the case of a 46-year-old previously healthy male patient, who complained from a right lower extremity painless bulge, which began to be visibly noticeable by the patient 2 months prior to admission. There were no signs of allocated inflammation nor lower limb ischemia. Radiology revealed an irregular mass formation conformant with neoplasia.

Clinical discussion: Surgical resection of the mass along with synthetic graft replacement of the concomitant vascular bundle. Histopathological analysis of the resected mass revealed a monophasic synovial spindle cell sarcoma.

Conclusion: SS is a rare neoplasm poses a grave risk for patients due to its malignant pathophysiology and the wide margin of misdiagnoses. It is pivotal to set-up proper preoperative diagnostic guidelines for it and maintain high clinical suspicion so that we can bring down the high rates of the morbidity and mortality which ensue from this malignancy.

1. Introduction

Synovial sarcoma (SS) is the nomenclature which defines a soft tissue neoplasia of mesenchymal origin that shows variable levels of epithelial cell differentiation [1]. SS is an astoundingly rare neoplasm. It is a vivid representative of a Soft Tissue Sarcoma (STS) of ill-defined cellular differentiation levels. It is estimated to comprise 5 to 10 % of all STSs [2,3]. The established research studies have adjusted the SS incidence rate according to population age groups. In the pediatric population, its incidence rate is approximately 0.81 per 1 million, whereas it is 1.42 per 1 million in the adult population. [4].

Various forms of STSs exist, SS is an especially rare form of STS due to

several defining features, such as the clinical onset at very young ages, specifically adolescent and early adulthood populations -with an average age of presentation of 39 years- and the lack of gender-specific prevalence as it arises in males and females in almost equal ratios [5].

The gold standard for treatment approach for SS is thorough surgical resection of the lesion with adequate free margins whenever feasible. This is in part due to the lack of undisputed guidelines for the efficacies of chemotherapy and/or radiotherapy [6].

The work has been reported in line with the SCARE criteria and the revised 2020 SCARE guidelines [7].

Abbreviations: SS, Synovial sarcoma; STS, Soft Tissue Sarcoma; DUS, Doppler Ultrasound; MRI, Magnetic Resonance Imaging; CT, Computed Tomography; PET, Positron Emission Tomography; ePTFE, Expanded Polytetrafluoroethylene; H&E, Hematoxylin and Eosin; IHC, Immunohistochemistry; EMA, Epithelial Membrane Antigen; RMH, Royal Marsden Hospital.

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2. Presentation of case

2.1. Patient information

We are demonstrating the case of a 46-year-old previously healthy Middle Eastern male, who was admitted through our Vascular Surgery university hospital's clinic with a chief complaint which began 2 months ago. It was in the form a visible painless bulging in the medial side of his right thigh. It wasn't associated with local signs of inflammation, such as redness, hotness, or swelling. Moreover, it wasn't associated with limb paresthesia nor coldness of the diseased extremity. There was no report of intermittent claudication, night or cold sweats, fever, weight changes, malaise, general weakness, or overlying skin changes. Furthermore, there were no changes in bowel habits or noteworthy genitourinary symptoms.

His Body Mass Index was 25 kg/m².

His surgical, family, drug, psychosocial, and allergic histories were negative.

2.2. Clinical findings

Vital signs measurements yielded normal readings.

Via inspection, no noted skin ulceration, overlying skin discoloration, ecchymoses, pin-point spotting, cyanosis, or pallor.

Via palpation, a relatively deep solid mass was palpated. It was painless, immobile, and exerted no overlying skin movement, and no

palpable bruits were demonstrated. The arterial pulses were palpable along the entirety of the arterial axis of both lower limbs. Palpable Grade I edema was demonstrated over the shin of the ipsilateral tibia.

Through auscultation, no thrills were heard over the mass nor along the ipsilateral arterial access.

2.3. Laboratory investigations

The entirety of preoperative laboratory panel revealed normal results.

2.4. Diagnostic assessment

Duplex Ultrasound demonstrated a solid mass formation, in the lower segment of the medial side of the right thigh. It is well-demarcated and measured (2.2 × 2.5 cm). It was hyperechoic with turbulent content. Heavy vascularization was seen in its superior part. The remaining examination of the arterial tree of both lower limbs yielded normal results.

Magnetic Resonance Imaging (MRI) was performed to better study the soft tissue mass. It revealed a heterogenous mass arising on the surface of the Adductor Longus muscle of the right lower limb and engulfed the concomitant vascular and nerve bundles. It was intensely vascularized and measured (2.6 × 4 cm). This was accommodated by marked edema. Findings were suggestive of neoplasia (Fig. 1A-B).

To clearly visualize the situation, a Computed Tomography (CT) scan was performed to exclude metastasis. The vital organs (i.e., Lungs,

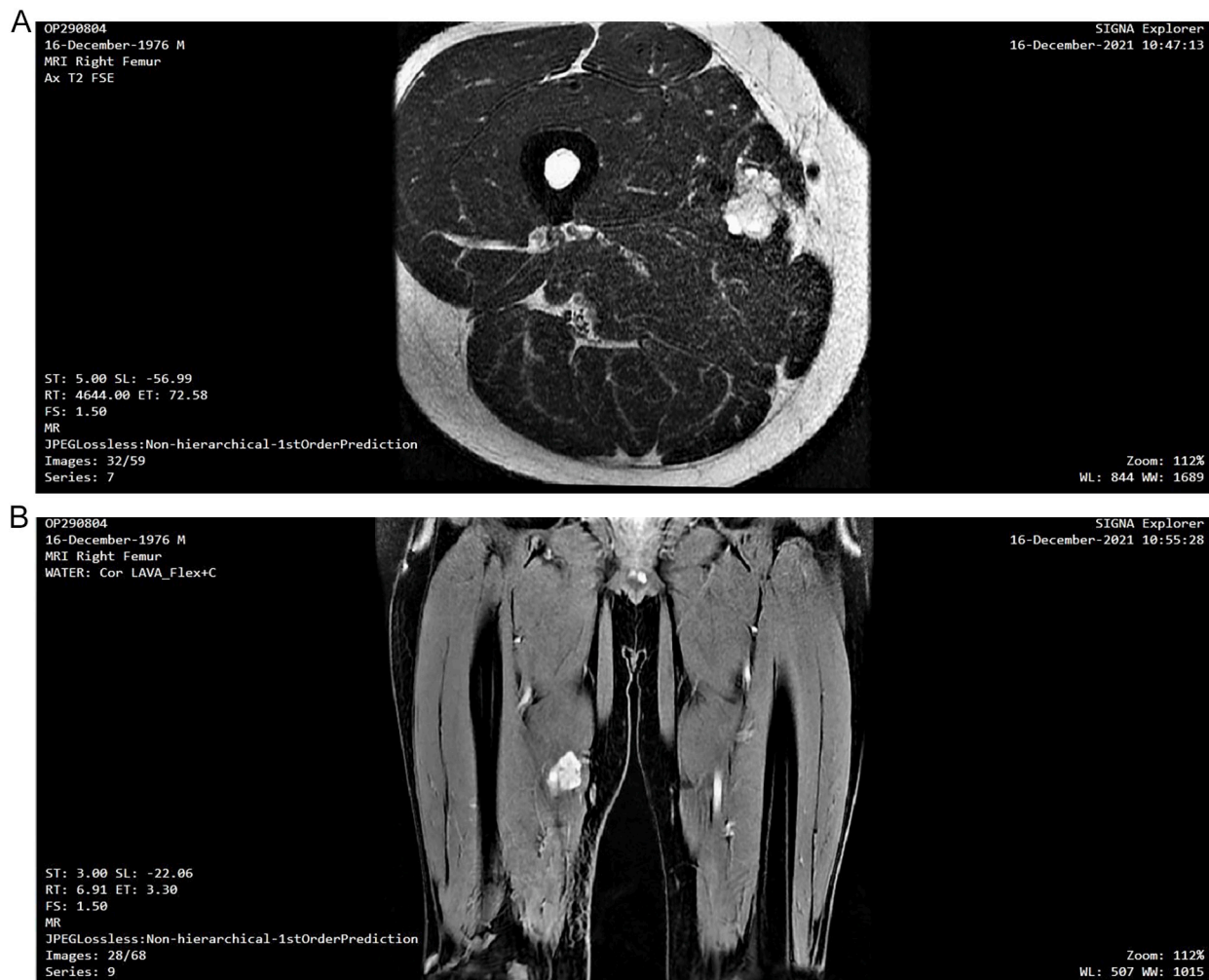


Fig. 1. (A-B): Preoperative MRI imaging showing the Synovial Spindle Cell Sarcoma in cross-sectional and coronal views, respectively.

regional lymph nodes, abdominal and pelvic organs) were free of signs of neoplastic involvement [Fig. 2](#).

Preliminary patient preparation was comprised of maintaining a nil-per-mouth patient status, setting-up intravenous access, administrating suitable preoperative intravenous antibiotics, blood sampling and crossmatch to prepare for surgical intervention. Notable obstacles were the device unavailability of a Positron Emission Tomography (PET) scan.

2.5. Therapeutic intervention

Taking all the known factors into consideration, surgical intervention was warranted. The surgery took place at our tertiary university hospital by a Vascular Surgery specialist having 18 years of Vascular Surgery experience. Furthermore, it was carried-out under general anesthesia with no perioperative complications whatsoever. A longitudinal incision along the medial side of the right thigh was performed. The mass was then isolated from its surrounding structures. We noted concomitant Superficial Femoral Artery and Vein infiltration by the neoplasm, thus, the affected segments were resected along with the mass with adequate free margins. Afterwards, we performed a bypass graft of said artery and vein with a synthetic Expanded Polytetrafluoroethylene (ePTFE) protease graft connecting the Superficial Femoral Artery and Vein with the Supra-geniculate Popliteal Artery and Vein, respectively. ([Fig. 3A-B-C](#)).

Histopathological analysis via Hematoxylin and Eosin (H&E) revealed monophasic monomorphic Spindle Cell Sarcoma formation possessing distinct levels of epithelial cell differentiation. The morphology was comprised of oval-shaped spindle cells with pleomorphic features, in addition to rounded epithelial cells which coalesce to devise cellular nests with fibrous tissue along the perimeter. No prominent mitotic activity noted ([Fig. 4A-B-C-D](#)).

Immunohistochemistry (IHC) stained positive for Epithelial Membrane Antigen (EMA) marker. However, it yielded negative staining for Keratin, SMA, CD34, CD99, S100, and CK7. Moreover, Ki67 proliferation activity marker was low/10 % ([Fig. 5A-B-C-D](#)). Said patient had a satisfactory postoperative surgical recovery and as a result, he was discharged to the oncology department within 6 days of his operation. We provided him with protocol directives, which aided his recovery (i.e., daily sterile dressings of his wound, suitable analgesia for any concomitant pain, and an appropriate prescription of antibiotics).

He was later referred to a specialized tertiary oncology facility where he would receive his necessary adjuvant treatment and gets regularly surveilled for any tumor recurrence and/or metastasis.

Follow-up surveillance is still being carried out in the outpatient

clinic for 7 months thus far. We scheduled him regular visitations at the Vascular Surgery hospital clinic to thoroughly conduct physical examination and perform serial DUS imaging. All of which yielded normal results. Six months postoperative MRI scans were conducted to ensure no neoplastic metastasis and/or recurrence have occurred. Said imaging revealed no traces of such problems ([Fig. 6A-B](#)).

3. Discussion

In 1865, Simon was the pioneer who first depicted the clinical and morphological features of SS, and this was later in 1934 validated and termed by Sabrazes et al. [8]. SS are vividly designated as neoplasm of mesenchymal cell origin, which has tendency to arise from the lower extremity juxta-articular areas. Nevertheless, the primary progenitor cell for this malignancy is still yet unknown. The foremost age populations affected by this malignant tumor are adolescents and young individuals with a male-to-female prevalence ratio of approximately 1.2:1 [9,10]. It is frequently erroneous that SS is a sarcoma of the synovium, whereas isn't a sarcoma of synovial origin. It merely resembles the synovial tissue histopathological features. It is perceived that SS originates from pluripotent stem cells, which possess the capability to differentiate into mesenchymal and/or epithelial tissues and cannot differentiate into synovial tissue [11,12]. SS is indeed a rare malignant tumor, which conventionally originates prevalently from joint capsules and articulation tendons. SS comprises 5–10 % of all STSs [13]. Chiefly, SS clinically presents in the form a soft tissue mass [14]. It even possesses the ability to originate from any part of the human body. Nevertheless, the majority of said neoplasia arise from soft tissues of the extremities, especially the lower ones in anatomical areas across from the knee joint [4,15].

SS primarily does not clinically manifest in the typical fashion of an STS where a rapidly proliferating sizeable mass is manifested [20]. Rather, the vast majority of SSs present as sluggishly growing masses with an average period of growth of 2 years prior to the patient's first established diagnosis [16].

When compared to other forms of STSs, SS has a considerably long duration of symptoms and affected patients might complain from pain or contractures which occur prior to the ensuing swelling [17]. The current radiological method of choice for diagnosing SS is MRI, whether it is with or without the utilization of contrast materials [18].

On the other hand, CT with contrast can be relied on when subjugating the patient to an MRI is either contraindicated or simply not possible due to unavailability. SS radiologically manifests as a hypointense lesion when compared to muscle tissue and possesses heterogenic characteristics when compared to larger lesions [19]. The main

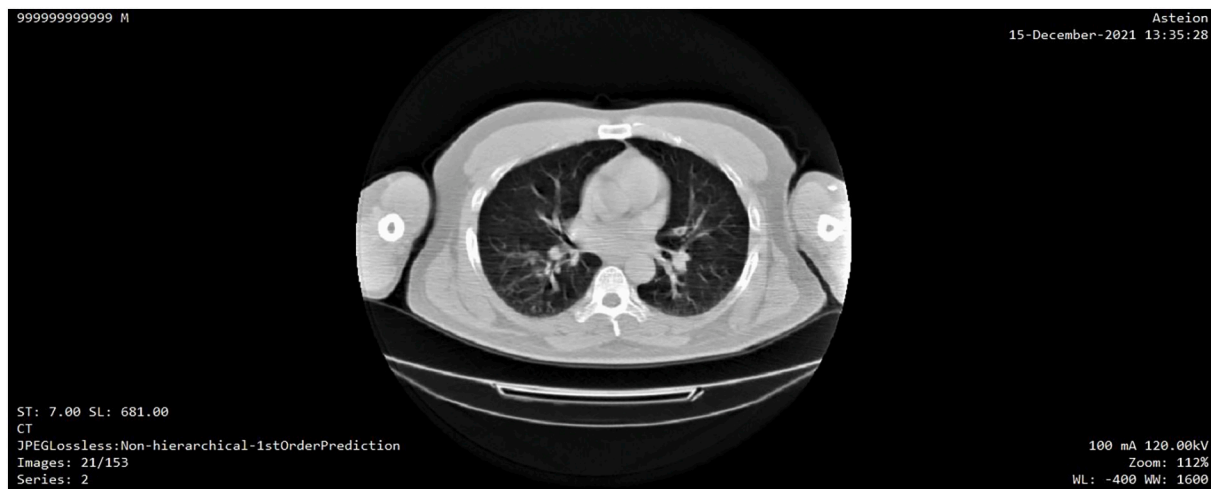


Fig. 2. Preoperative CT scan showing no tumor metastasis in the Lungs.

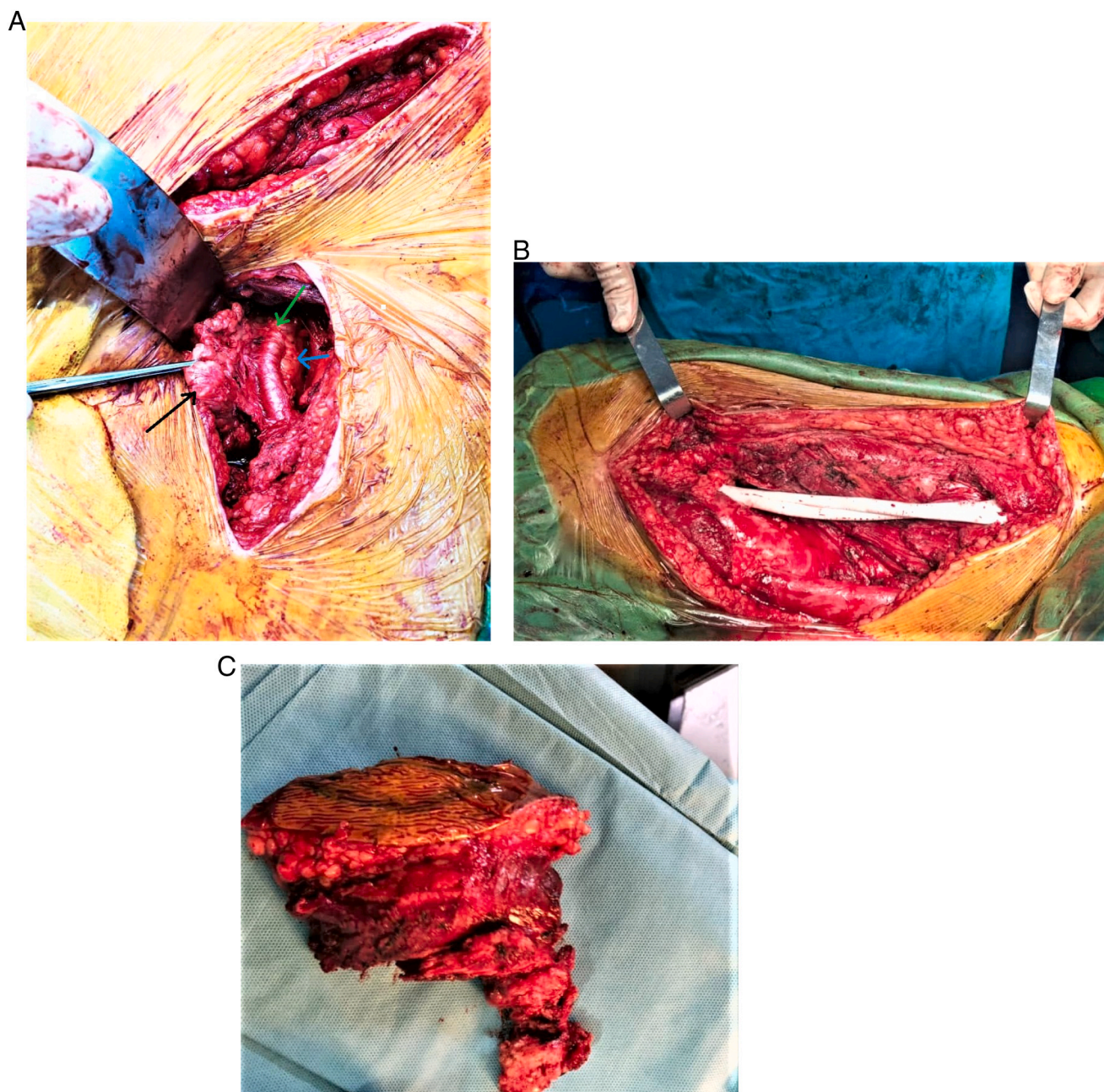


Fig. 3. A: Intraoperative image showing the mass infiltrating the concomitant vascular bundle. Black Arrow points towards the mass. Green Arrow points towards the affected arterial segment. Blue Arrow points towards the affected venous segment.

B: Intraoperative image showing the site post-resection with the utilized ePTFE protease graft.

C: Intraoperative postresection image depicting the excised tumor. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

advantage of a CT scan is that it permits a more enhanced visualization of calcifications which occur within the affected soft tissue and the concomitant bone reaction [18].

With regards to establishing a definitive diagnosis, the sole reliance on classical histopathological analysis is insufficient. IHC is the cornerstone in reaching an ironclad diagnosis. It also aids in excluding other neoplasia from the differential diagnoses [20].

Upon the utilization of H&E stains, the morphology is comprised of oval-shaped spindle cells with pleomorphic features, in addition to rounded epithelial cells which coalesce to devise cellular nests with fibrous tissue along the perimeter [21].

The prime traits of the IHC analysis consist of high affinity for Keratin in the regions rich in epithelial and spindle cells. Furthermore, EMA,

BCL-2, Vimentin, and CD99 are also positive stains for SS. Said stains via IHC analysis pave the path for establishing a definitive diagnosis for SS [22].

Staging SSs is essential for the setting-up the proper treatment plan for patients. According to the Royal Marsden Hospital (RMH) staging system, our patient's neoplasm was in Stage IA. This stage is established when a Synovial sarcoma is of low-grade and is smaller in size than 5 cm [23].

In their pathophysiology, SSs are exceptionally malignant and have high tendencies to metastasize. Well-known organs of metastasis are primarily the lungs then lymph nodes and then bone marrow, with a percentage of almost 13 % of patients suffering from distant site metastases when they are diagnosed by a professional [5,13]. The pivotal

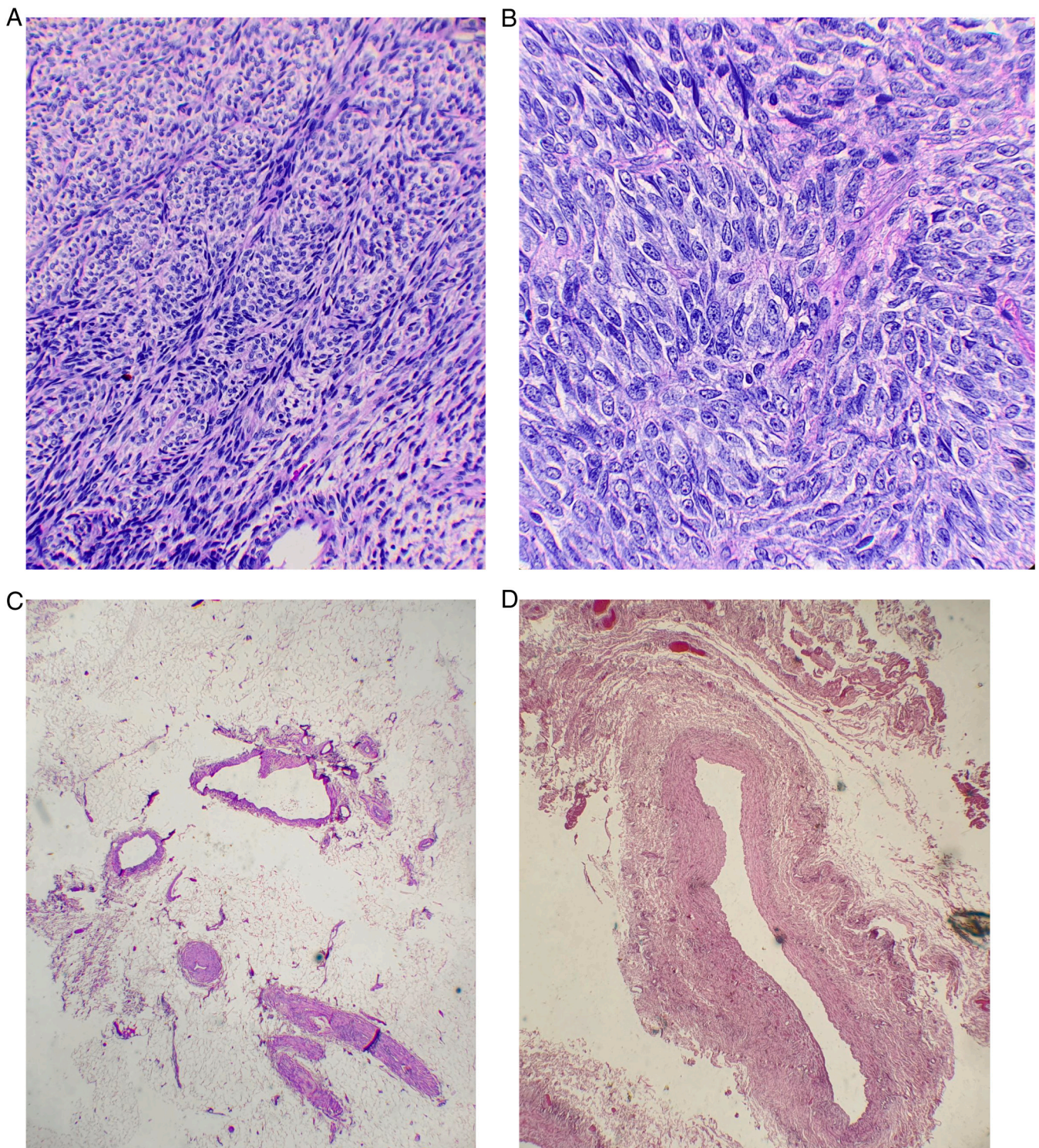


Fig. 4. A: H&E staining $\times 200$ magnification showing Monomorphic Spindle Cell Synovial sarcoma having Fibrosarcoma-like pattern with distinct fascicles. B: H&E staining $\times 400$ magnification showing malignant cells which are conformant with monotonous spindle cells having vesicular and tightly packed nuclei. C: H&E staining $\times 20$ magnification showing the surgical margins free of tumor involvement. D: H&E staining $\times 40$ magnification showing the surgical margins of the Femoral Vein free of tumor involvement.

treatment modality for SS is utter surgical resection of said tumor along with wide negative margins. This is consolidated by the utilization of adjuvant therapy based on each patient's individual tumor growth and features [24].

Throughout time, when SS is discovered in an extremity, it was often dealt with via amputation of said limb. However, the vast contemporary

breakthroughs in radiological diagnostic methods and adjuvant treatment protocols have enabled physicians to spare the affected extremity through limb-salvage surgical interventions [25]. The purpose of limb-salvage surgical techniques in treating SS is to reach optimal control over the neoplastic situation of the patient whilst maintaining an extremity with adequate functioning, which patients can still use despite

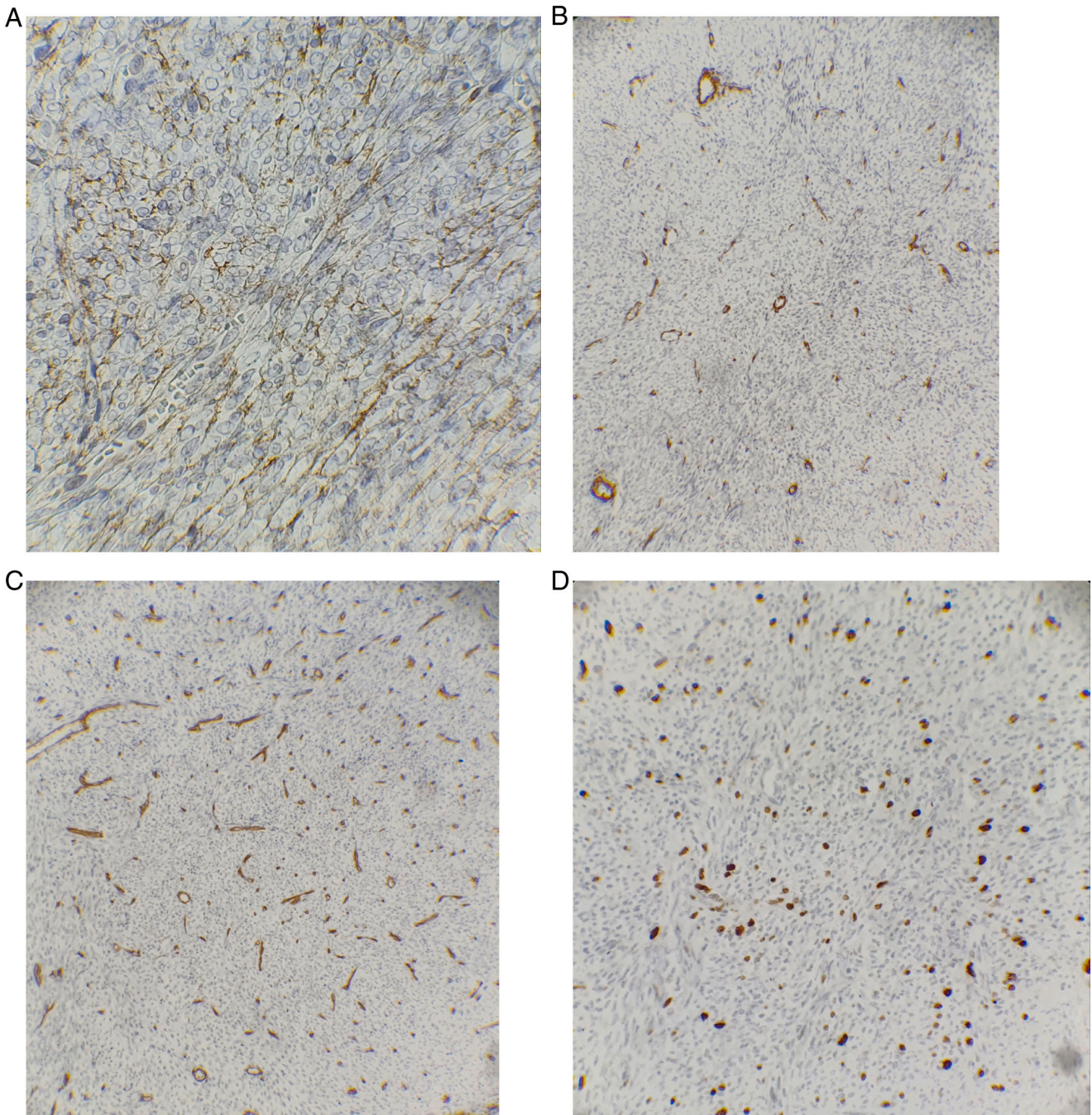


Fig. 5. A: IHC $\times 400$ magnification showing positive staining for EMA.
 B: IHC $\times 100$ magnification showing negative staining for SMA.
 C: IHC $\times 100$ magnification showing negative staining for CD34.
 D: IHC $\times 200$ magnification showing low Ki67 Proliferative Index 10 %.

the SS. It was inaugurated that the most vital factor which could aid physicians in predicting local neoplastic recurrence and general patient survival, is negative surgical margins [26,27].

No current guidelines are united with regards to the “Perfect” free margins which should be excised during an operation to resect a SS. Moreover, the main surgical technique is somehow resemblant to others for treatment of STS. Nonetheless, for neoplasia which are superficial or deep ones with a size < 5 cm but aren't intercalated with vital organs, a plausible negative margin of 1 to 2 cm should be achieved [28].

Stage-specific survival rates for patients with SSs are 90 % for Stage I, 81 % for Stage II, 56 % for Stage III, and 40 % for Stage IV [6,22,29].

Various validated prognostic factors have been demonstrated in the published literature. These include tumor grade, size, anatomical site, free margins, age of patients at the time of diagnosis, and the utilization of adjuvant radiotherapy [30,31].

Since SS has shown high affinities towards metastasis and recurrence, which is documented in the first couple of years postoperatively. This mandates meticulous postoperative follow-up protocol adherence during said timeframe [32].

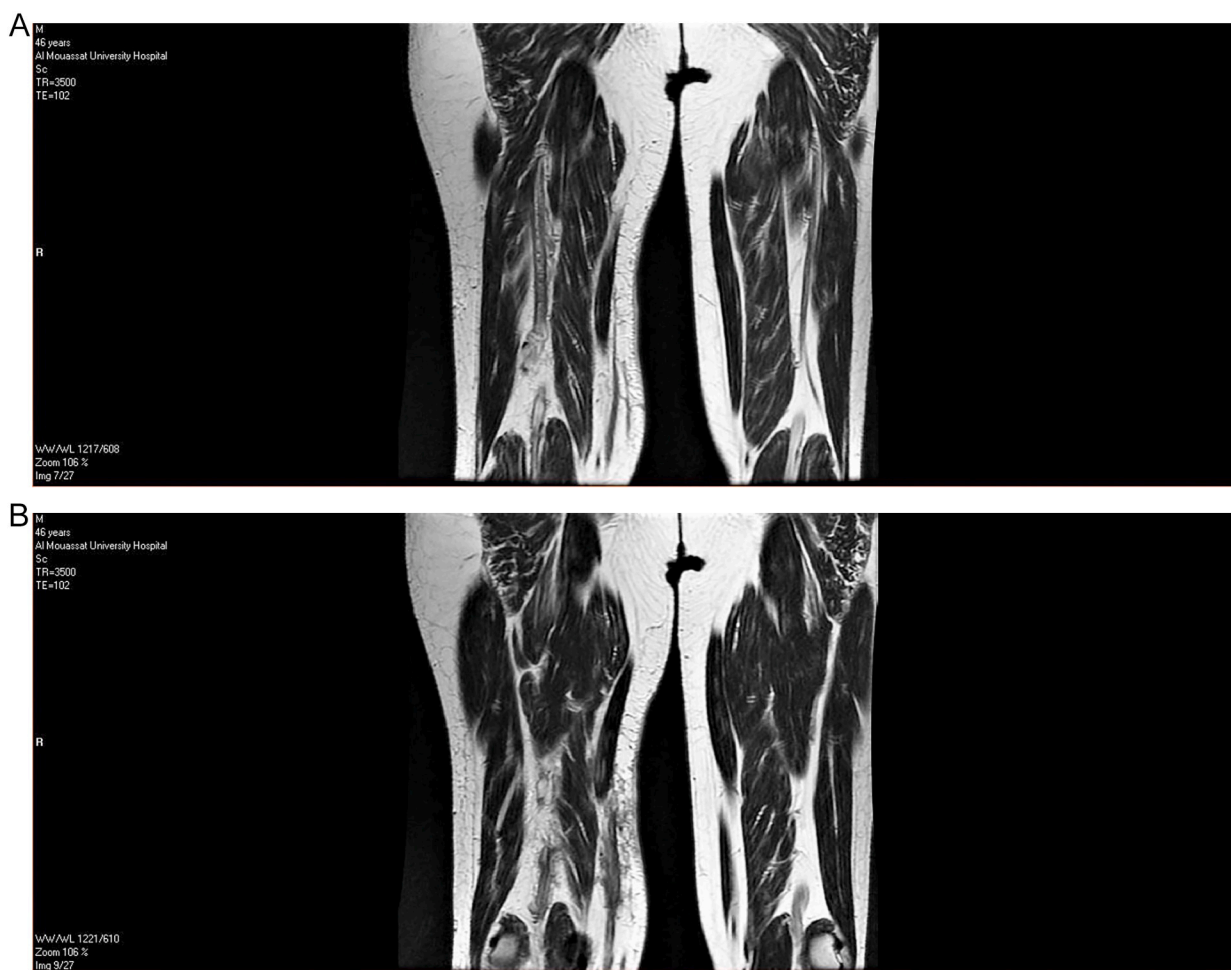


Fig. 6. A: Postoperative MRI imaging depicting the used vascular graft in coronal view.

B: Postoperative MRI imaging in coronal view, depicting the muscular structures after tumor excision. This shows no neoplastic recurrence.

4. Conclusion

Synovial sarcomas are eminently rare neoplasia and result in high mortality rates. Adequate clinical awareness ought to exist when presented with such a clinical scenario. This enables the surgeon to carry-out suitable interventions which plunge the rates of adverse effects. Since prognosis is daunting, surgery accommodated by adjuvant therapy are vital in saving lives.

Documenting such instances is crucial because such rare neoplasia could be either fatal or lead to the loss of the affected limbs. This encourages physicians to set-up novel preoperative diagnostic, screening methods, attempt innovative surgical techniques, and achieve satisfactory postoperative results.

Abbreviations

SS	Synovial sarcoma
STS	Soft Tissue Sarcoma
DUS	Doppler Ultrasound
MRI	Magnetic Resonance Imaging
CT	Computed Tomography
PET	Positron Emission Tomography
ePTFE	Expanded Polytetrafluoroethylene
H&E	Hematoxylin and Eosin
IHC	Immunohistochemistry
EMA	Epithelial Membrane Antigen
RMH	Royal Marsden Hospital

Ethical approval

This study is exempt from ethical approval in our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Availability of data and materials

The datasets generated during and/or analyzed during the current study are not publicly available because the Data were obtained from the hospital computer-based in-house system. Data are available from the corresponding author upon reasonable request.

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Author contribution

OA, OH: Conceptualization, resources, who wrote, original drafted, edited, visualized, validated, and literature reviewed the manuscript.

ZI: Histopathology PhD student, who read and analyzed the microscopic specimens to reach a definitive diagnosis, and review of the manuscript.

HH: Vascular Surgery Specialist, who performed and supervised the operation. Supervision, project administration, and review of the manuscript.

OA: The corresponding author who submitted the paper for publication.

All authors read and approved the final manuscript.

Research registration

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Declaration of competing interest

The authors declare that they have no competing interests.

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