



MAGNETIC RESONANCE IMAGING ASSESSMENT OF SOFT TISSUE TUMORS AND TUMOR-LIKE LESIONS OF EXTREMITIES

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ABSTRACT

This study aimed to assess the effectiveness of magnetic resonance imaging in diagnosis of soft tissue tumours and tumour-like lesions in extremities.

Methods: A prospective observational study was carried out, involving 73 patients with soft tissue lesions in their extremities. All participants underwent MRI using Siemens Magnetom Symphony 1.5 Tesla MRI equipment (Erlangen, Germany). The MRI findings were correlated with clinical data and histopathological examination.

Results: The study included 73 patients (50 males and 23 females) aged between six and 90 years. Out of the 45 patients diagnosed with soft tissue tumors, neurofibroma was the most common (17.4%), followed by lipoma and undifferentiated sarcoma, each accounting for 8.7%. Other tumors, including liposarcoma, myxoid liposarcoma, giant cell tumor, pigmented villonodular synovitis, and schwannoma, were each observed in 6.5% of patients. Soft tissue tumour-like lesions were identified in 28 (38,3%) patients, with slow-flow vascular malformations being the most common (33%). Actinomyces was the second most prevalent pathology, noted in four patients (14.8%). Out of the 44 cases of soft tissue tumors, 27 (61.4%) were benign, while 17 (38.6%) were malignant. Tumors larger than 5 cm were more prevalent in malignant cases (70.5%) than in benign cases (40.7%). Benign tumors showed smooth margins more often (70.3%), whereas malignant tumors predominantly displayed irregular or lobulated margins (70.5%). Heterogeneous enhancement was more prevalent in malignant tumors (82.3%) compared to benign tumors (62.9%). The probability of a histopathological diagnosis indicating benignity for a tumor suspected to be benign on MRI was 93.55 times greater than for a tumor suspected to be malignant on MRI.

Conclusion: MRI emerges as a highly valuable tool for evaluating diverse soft tissue masses, offering insights into their characteristics, extent, relationship to surrounding structures, bone involvement, multiplicity, composition, and enhancement patterns. Adopting a systematic imaging analysis approach facilitates the differentiation between benign lesions and malignant ones, as well as aids in discerning various soft tissue tumor mimics.

Categories: Radiology, General Surgery, Oncology



Introduction

Soft tissue originates from the mesenchyme during development, where it undergoes differentiation into various components, including fat, skeletal muscles, blood vessels, fibrous tissue, and peripheral nerves [1]. Soft tissue lesions cover a wide spectrum, extending from non-neoplastic conditions to benign and malignant tumors. Soft tissue tumors constitute a diverse array of mesenchymal neoplasms characterized by varying degrees of differentiation. While histological definition is often based on the soft tissue components within the lesion, it does not always imply the origin of the tumor [1]. The widely utilized World Health Organization classification for soft tissue tumours ensures consistency in reporting and treating different tumor types and reactive processes [2].

Lipoma emerges as the most prevalent soft tissue lesion, underscoring the significance of discerning between a benign lipoma and well-differentiated liposarcoma through imaging. In specific subtypes of liposarcoma, such as dedifferentiated, myxoid, and pleomorphic, the presence of fat may be minimal and not readily visible. Among benign peripheral nerve sheath tumors (PNSTs), schwannoma and neurofibroma are prominent. Malignant PNSTs are less frequent and often linked to type I neurofibromatosis [1]. Soft tissue tumours in the extremities are frequently found in the thigh and buttocks, with a higher likelihood of malignancy in these regions. A tumour located deeper than 5 cm proximally in the limb of a patient over 50 years old has a 52% likelihood of being malignant [3]. Hemangiomas, benign vascular lesions, are commonly found during the first ten years of life, histologically resembling normal blood arteries. Proliferative lesions, commonly referred to as hemangiomas, typically arise postnatally as a result of abnormal angiogenesis, exhibiting a phase of rapid growth during the early years before undergoing involution [4,5].

Patients suspected of having soft tissue masses are commonly referred to radiology for localization, characterization, and assessment of the lesion's extent, which helps determine the appropriate treatment plan. It is essential to differentiate soft tissue tumors from lesion-mimicking entities like be often encompass ganglia hematomas, foreign body granulomas, and vascular malformations. Ultrasound (US) serves as the initial investigation, providing information on size, anatomical location, differentiation between compact growths and fluid-filled lesions, and revealing vascularity using color Doppler [5]. Nevertheless, traditional imaging techniques such as X-rays, ultrasound (US), and computed tomography (CT) have their limitations and may yield inconclusive results in numerous cases [1]. Magnetic resonance imaging (MRI), renowned for its multiplanar imaging capability, superior spatial resolution, precise soft tissue characterization, and absence of radiation, stands out as the preferred modality for assessing soft tissue lesions. MRI provides clinically significant information and assists in establishing the treatment protocol [6-9]. Moreover, MRI facilitates surgical planning by delineating affected regions, distinguishing tumors from surrounding adipose tissue and muscular tissue, and identifying lesions in relation to adjacent neurovascular bundles. Timely diagnosis with MRI is crucial for mesenchymal tumors, as delays can exacerbate the prognosis of malignant tumours due to local complications, increased morbidity after surgery, and a higher risk of metastasis [10].

The objective of this study is to evaluate the role of MRI in assessing soft tissue tumours and tumour-like lesions in the extremities.



Materials and Methods

This prospective observational study took place from September 2022 to August 2023. Seventy-three patients with soft tissue lesions in their extremities underwent MRI by using the Siemens Magnetom Symphony 1.5 Tesla MRI scanner located in Erlangen, Germany. All patients or caretakers of minor patients provided informed and written consent for participation in the study. The inclusion and exclusion criteria are outlined in Table 1 and Table 2, respectively.

Selection criteria
Individuals of any age who exhibit clinical suspicion of soft tissue abnormalities in the limbs.
Patients referred for MRI due to a diagnosed soft tissue lesion identified through any alternative imaging method.

Table 1.

Exclusion criteria
Patients diagnosed with primary bone tumors involving soft tissue and lymph node masses.
Patients who have undergone previous surgery for soft tissue lesions and are referred for follow-up or suspected recurrence.
Patients with cochlear implants, metallic foreign bodies, or non-MRI compatible orthopedic implants.
Patients with a past medical history of claustrophobia.

Table 2.

MRI scan technique

Patient Positioning

Patients were positioned in a supine posture, with their head or feet facing the magnet based on the region of concern. Throughout the study, patients were instructed to remain still, and appropriate stabilization of the area of concern was carried out to ensure stability during the examination.

Scan Planes Used

Axial, sagittal, coronal and planes were employed, with the selection of orthogonal planes tailored to the lesion's location. The MRI sequences utilized in the study are detailed in Table 3. All lesions were assessed using T1-weighted, T2-weighted, short tau inversion recovery (STIR), diffusion-weighted imaging (DWI), gradient recalled echo (GRE), as well as non-contrast and post-contrast-enhanced fat-suppressed T1-weighted images. The choice and adaptation of MRI sequence scan planes were determined by the specific region of interest.

MRI sequences used (chosen and adjusted based on the area of focus)
Axial T1-weighted
Axial T2-weighted fast SE
Axial STIR



Coronal, sagittal, or oblique longitudinal T1-weighted
Coronal, sagittal, or oblique longitudinal STIR
Diffusion-weighted imaging (DWI)
Gradient recalled echo (GRE) T2*-weighted
Axial non-enhanced fat-suppressed (FS) T1-weighted SE
Axial contrast-enhanced FS T1-weighted SE
Coronal, sagittal, or oblique longitudinal contrast-enhanced FS T1-weighted SE
Dynamic contrast-enhanced magnetic resonance angiography and 3D fat-suppressed T1-weighted sequence

Table 3.

MRI analysis

MRI images from all patients were examined, and the imaging characteristics of the lesions were documented.

Location

Both appendicular and transspatial orientations were scrutinized during the analysis. Lesions were precisely localized within specific sites in the extremities (upper limb, lower limb, wrist, knee, etc.), and their distribution was assessed based on the extent of involvement, distinguishing whether they originated from the skin, subcutaneous fat, muscles, or the intramuscular layer.

Size

Size in maximum dimensions was classified as >5 cm and <5 cm, with the former denoting large lesions and the latter indicating small lesions respectively.

Margin

The lesions were divided into categories based on their margins: smooth, irregular, and lobulated.

Signal Characteristics

The signal characteristics of the lesions were meticulously examined on T1-weighted images, T2-weighted images, and fat-sat images to facilitate tissue characterization. The primary the structure of the lesion was scrutinized, considering the signal characteristics observed on MRI sequences. This involved identifying lesions with a predominant adipocytic component, as well as those with a fibrous component.

Contrast Enhancement Pattern

Two contrast enhancement patterns were considered for the lesions: homogeneous and heterogeneous enhancement.

Specific Signs

The tissue analysis of lesions on MRI included an analysis of various imaging features such as signal characteristics, the detection of calcification, necrosis, hemorrhage, and adipose tissue, etc. Additionally, the identification of diffusion restriction was documented. The study also encompassed the examination of enhancement features, adjacent relations, and extensions of the lesions. All MRI features were systematically correlated to differentiate between



soft tissue tumors and tumor-like abnormalities, as well as to differentiate between benign and malignant conditions.

Correlations were established through histopathological analysis and clinical observations, and, when available, alternative imaging techniques such as X-ray, ultrasound, and computed tomography to facilitate accurate diagnosis. The collected data were systematically gathered, compiled, and tabulated. For statistical analyses, relevant tools within Epi Info version 7.2.4 were employed.

Results

The study encompassed a total of 73 patients with soft tissue masses, ranging in age from 6 to 90 years (refer to Table 4). The majority of patients fell within the 20-40 years age group, constituting 32 (44%) cases, with the 60-70 years age group following closely with 11 patients. The youngest participant was a 6 years old male, undergoing imaging for a soft tissue mass located in the elbow region. The study population consisted of 50 males and 23 females, resulting in a gender ratio of 2.1:1. Out of the 73 patients, the predominant presenting symptom was soft tissue mass swelling, noted in 58 individuals (79%). Pain was the second most common complaint, cited by 43 patients (59%) (refer to Table 5). Furthermore, prevalent symptoms encompassed localized erythema, elevated body temperature, and tingling sensation.

Age group	Male	Female	Total
Less than 10	3	0	3
10-19	5	2	7
20-29	11	4	15
30-39	10	7	15
40-49	5	4	9
50-59	3	2	5
60-69	8	3	11
70-79	4	1	5
80-89	1	0	1
Total	49	22	75

Table 4.

Symptoms	Number (Total = 73)	SPercentage
Swelling	58	79
Pain	43	59
Redness	8	10
Fever	5	6
Tingling	6	8

Table 5.



In the study cohort of 73 individuals, the thigh emerged as the most frequently affected region in the lower extremities, observed in 20 cases (27%), followed by the leg, noted in 12 cases (16%). Within the upper extremity, the arm was the predominant location, identified in 7 cases (9.5%) (refer to Table 6).

Appendicular location	Number, n = 73 (%)	Benign	Malignant
Upper limb			
Shoulder	1 (1)	1	0
Arm	7 (10)	5	2
Elbow	3 (4)	2	1
Forearm	4 (6)	4	0
Wrist	2 (3)	3	0
Hand	6 (8)	6	0
Total	Total 23 (32.4)		
Lower limb			
Thigh	19 (27)	10	9
Knee	9 (12)	7	2
Leg	13 (18)	5	8
Ankle	3 (4)	2	1
Foot	6 (8)	5	1
Total	50 (67.6)		

Table 6.

Soft tissue tumours were identified in 46 (63%) out of the 73 patients included in our study (refer to Table 7). Out of the 46 patients diagnosed with soft tissue tumors, neurofibroma was the most common lesion, detected in 8 cases (17.3%) (see Figure 1). The subsequent most prevalent tumor types included lipoma (refer to Figure 2) and undifferentiated sarcoma, each observed in four patients (9.1%). Additionally, liposarcoma (refer to Figure 3), myxoid liposarcoma, giant cell tumor (GCT) of the tendon, pigmented villonodular synovitis (PVNS), and schwannoma were each found in two patients (4-5%).

Disease entity	Number (%)	Disease entity	Number (%)
Lipoma	4 (9.1)	PVNS	2 (4.5)
Liposarcoma	2 (4.5)	Hemangioma	1 (2.3)
Myxoid liposarcoma	2 (4.5)	Glomus tumor	1 (2.3)
Benign spindle cell neoplasm	1 (2.3)	Angioleiomyoma	1 (2.3)
Pleomorphic	1 (2.3)	Rhabdomyosarcoma	1 (2.3)

sarcoma			
Nodular fasciitis	1 (2.3)	Neurofibromas	8 (18.1)
Myxofibrosarcoma	1 (2.3)	Schwannoma	2 (4.5)
Fibrosarcoma	5 (6.8)	Malignant nerve sheath tumor	1 (2.3)
Desmoplastic fibroblastoma	1 (2.3)	Morton neuroma	1 (2.3)
Fibromatosis	1 (2.3)	Undifferentiated sarcoma	4 (9.1)
Desmoid tumor	1 (2.3)	Squamous cell carcinoma	1 (2.3)
GCT of tendon	2 (4.5)		

Table 7.

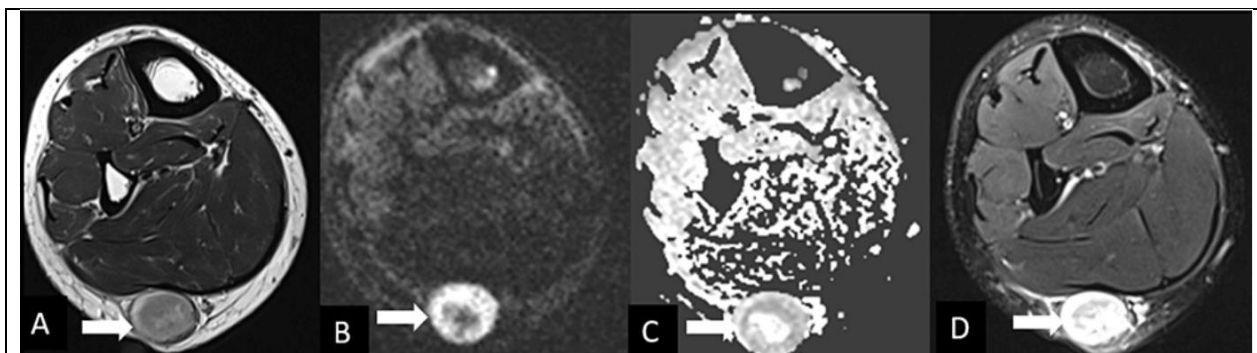


FIGURE 1: MRI of the calf showing neurofibroma

The MRI of the calf region in a 30-year-old male with gradually enlarging swelling of the right calf over four months reveals a distinct lesion in the subcutaneous layer on the posterior aspect of the leg. The lesion appears heterogeneously hyperintense on T2-weighted images with a thin peripheral hypointense rim (A), showing no notable diffusion restriction (B, C), and exhibiting moderate to strong heterogeneous contrast enhancement (D). The diagnosis is neurofibroma.

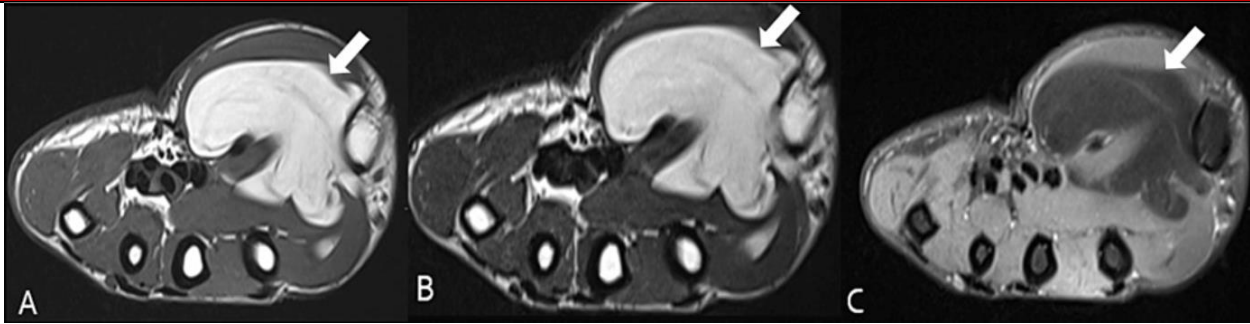


FIGURE 2: MRI of the wrist showing lipoma

The axial MRI images of the wrist in a 35-year-old female with swelling in the right thenar region depict a distinct lobulated lesion situated in the intermuscular plane beneath the thenar muscles. The lesion appears hyperintense on both T1-weighted (A) and T2-weighted (B) images and demonstrates signal suppression on two-dimensional (2D) fast spin-echo (FSE) fat-suppressed proton density image (C). The diagnosis is lipoma.

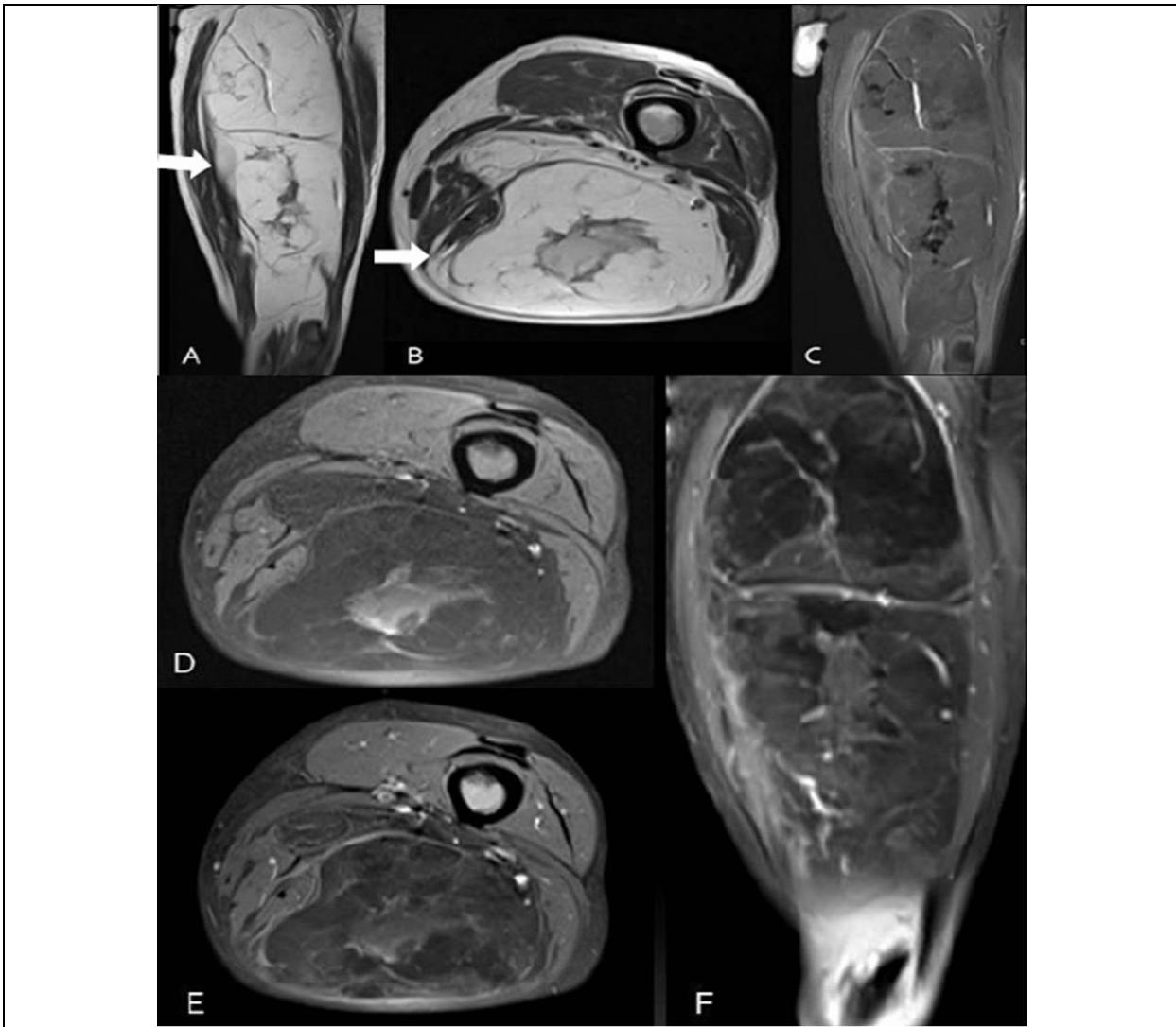


FIGURE 3: MRI of the thigh showing liposarcoma

The MRI of the left thigh in a 66-year-old male with progressive swelling reveals a well-defined encapsulated large soft tissue lesion situated within the intramuscular plane of the posterior aspect of the thigh. The lesion appears hyperintense on both T1-weighted (A) and T2-weighted images (B), with signal suppression on short tau inversion recovery (STIR) images (C). Following contrast administration, the lesion exhibits heterogeneous enhancement with enhancement of the septae and soft tissue component on T1 fat-suppressed (T1FS) images (D-F). The diagnosis is liposarcoma.

Soft tissue tumour-like lesions were detected in 28 patients (38.3%) among the total 73 individuals in our study. The primary lesion mimicking a tumor in our investigation was slow-flow vascular malformation, found in nine patients (32%) out of the 28 cases (refer to Figure 4). Actinomycosis emerged as the second most prevalent pathology, observed in four patients (14.2%) (refer to Table 8).

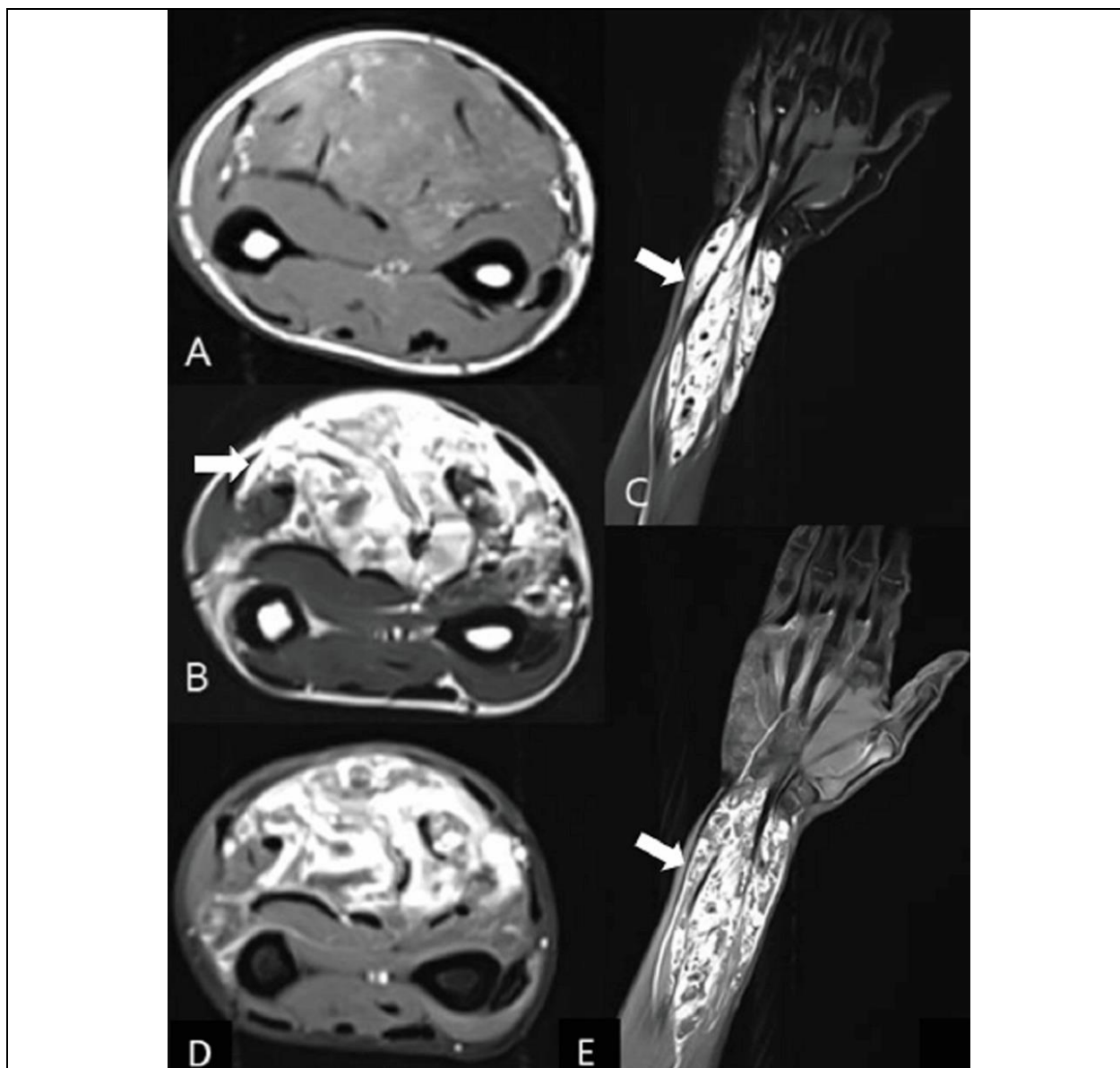




FIGURE 4: MRI of the forearm showing slow-flow venous malformation

The MRI of the right forearm in a 26-year-old female with a progressively enlarging swelling over the forearm spanning 10 years reveals a large lobulated septated mass lesion present in the subcutaneous, intermuscular, and intramuscular planes of the right forearm. The lesion demonstrates heterogeneous iso-hyperintensity compared to muscles on T1-weighted image (A), heterogeneous hyperintensity on T2-weighted image (B) and short tau inversion recovery (STIR) (C, D) images, and exhibits heterogeneous post-contrast enhancement with no apparent enlarged arterial feeders or early draining veins (E). These findings suggest a diagnosis of slow-flow venous malformation.

Disease entity	Number	Percentage (n = 28)
Abscess	1	3.7
Actinomycosis	4	14.2
Baker's cyst	2	7.4
Epidermal inclusion cyst	1	3.7
Gout	1	3.7
Hematoma	2	7.4
Hydatid cyst	1	3.7
Morel-Lavallée lesion	2	7.4
Parameniscal cyst	1	3.7
Prepatellar bursitis	1	3.7
Slow-flow vascular malformation	9	32.1
Ganglion cyst	2	7.4

Table 8.

Among the 45 patients diagnosed with soft tissue tumors, 28 (62.2%) were confirmed to be benign, while 17 (37.7%) were identified as malignant through histopathological examination (HPE). Within the group of patients with benign tumors, 15 (53.6%) were located in the deep plane, and 13 (48.1%) were situated in the superficial plane. In contrast, among the patients with malignant tumors, 13 (76.4%) were found in the deep plane, while four (23.5%) were located in the superficial plane (refer to Table 9).

Location	Benign (n = 28)	Malignant (n = 17)	Total (n = 45)
Superficial	13 (48.1)	4 (23.5)	17 (38.6%)
Deep (muscular, neurovascular, intermuscular)	15 (53.6)	13 (76.4)	27 (61.4%)



plane)		
Total	28	17

Table 9.

In our study, out of the 45 soft tissue lesions, 21 (47.7%) patients had tumor sizes of less than 5 cm, while the remaining 23 (52.3%) had tumor sizes exceeding 5 cm (refer to Table 10). Among the 26 patients with benign tumors, 16 (57.2%) had tumor sizes less than 5 cm, and 11 (40.7%) had tumor sizes greater than 5 cm. Conversely, within the 17 patients with malignant tumors, a higher percentage (70.5%) had tumor sizes exceeding 5 cm compared to the five (29.4%) patients with tumor sizes less than 5 cm.

Concerning enhancement patterns, out of the 44 soft tissue tumor patients, 31 (70.5%) exhibited heterogeneous enhancement, while 11 (25%) showed homogeneous enhancement. Among the 26 patients diagnosed with benign tumors, 17 (62.9%) exhibited heterogeneous enhancement, eight (29.6%) showed homogeneous enhancement, and two (7.4%) displayed no contrast enhancement. In the group of 17 patients with malignant tumors, 14 (82.3%) demonstrated heterogeneous enhancement, while three (17.6%) had homogeneous contrast enhancement. Additionally, among the total of 44 patients, 28 were found to have diffusion restriction, with 15 (53.5%) classified as malignant and 13 (46.4%) as benign, as presented in Table 10.

Size	Benign (n = 27)	Malignant (n = 17)	Total (n = 44)
Less than 5 cm	16 (59.2)	5 (29.4)	21 (47.7%)
More than 5 cm	11 (40.7)	12 (70.5)	23 (52.3%)
Margins			
Smooth	19 (70.3)	5 (29.4)	24 (54.5%)
Irregular	0	3 (17.6)	3 (6.8%)
Lobulated	8 (29.6)	9 (52.9)	17 (38.6%)
MRI appearance			
No enhancement	2 (7.4)	0	2 (4.5%)
Homogenous	8 (29.6)	3 (17.6)	11 (25%)
Heterogeneous	17 (62.9)	14 (82.3)	31 (70.5%)
DWI			
Diffusion restriction absent	14 (51.8)	2 (11.7)	16 (36.3%)
Diffusion restriction present	13 (48.2)	15 (88.2)	24 (54.5%)



Table 10.

Table 11 illustrates the correlation between MRI diagnoses of soft tissue tumors and histopathological examination (HPE), considered the gold standard. Among the 27 lesions proven to be benign on HPE, 25 were correctly identified as benign on MRI, while two were incorrectly diagnosed as malignant. For the 17 HPE-proven malignant lesions, MRI correctly diagnosed malignancy in 15 cases, but two lesions initially deemed benign on MRI were later confirmed as malignant on HPE.

In our cases, tumors suspected to be benign by MRI had odds of a benign histopathological diagnosis that were 93.75 times higher compared to tumors suspected to be malignant by MRI.

	Final histopathological diagnosis		
MRI benign/malignant	Benign	Malignant	Total
Benign	25	2	27
Row %	92.59%	7.41%	100.00%
Col %	92.59%	11.76%	61.36%
Malignant	2	15	17
Row %	11.76%	88.24%	100.00%
Col %	7.41%	88.24%	38.64%
Total	27	17	44
Row %	61.36%	38.64%	100.00%
Col %	100.00%	100.00%	100.00%

Discussion

In our investigation, the male population constituted a higher percentage (69%) compared to females (31%), resulting in a male-to-female ratio of 2.2:1. This gender distribution trend was consistent not only in soft tissue tumors but also in tumor-like lesions. This observation aligns with findings reported by Tacikowska [11] and Chung et al. [12], both of whom noted a higher prevalence of male patients in their respective studies on soft tissue tumors. The age range of our study participants spanned from six to 90 years, with a predominant age group being young adults, specifically those aged 20 to 40 years, exhibiting a median age of 35 years and an average age of 39.7 years with a standard deviation of 19.2 years. These results bear similarities to Tacikowska's findings, which included patients aged 16-84 years [11].

Among the 73 patients included in our study, the most frequently reported symptom was swelling, observed in 76% of cases. Additionally, 42 out of 73 patients reported pain associated with swelling, and 15 patients had asymptomatic swelling. Other symptoms presented included localized redness (10%), fever (6%), and tingling sensations (8%). The



clinical history, encompassing factors such as the location, duration, presence or absence of associated pain, growth rate, and the existence of multiple lesions, played a crucial role in the evaluation of soft tissue lesions [12,13].

Of the 73 cases analyzed, 44 were identified as soft tissue tumors, while the remaining 27 replicated soft tissue tumors. Among them, peripheral nerve sheath tumors (PNSTs) were the most prevalent soft tissue masses, accounting for 22.7% of cases. This observation aligns with the findings of Chung et al., who conducted a study on 266 patients and reported lipoma as the most common subgroup (24%), followed by schwannoma (16%) [14].

The location and depth of soft tissue tumours were also explored in our study. Thirty-one patients had tumors in the lower extremity, with the thigh being the most common location (12 patients), followed by the leg (seven patients). Remarkably, the majority of tumors situated in the thigh were malignant. Among the remaining 13 patients with soft tissue tumors in the upper extremity, the arm emerged as the most common location, accounting for six cases. Within this subset, four tumors were benign while two were malignant. Rydholm et al. noted that regardless of depth and size, lesions in the thigh were more likely to be sarcomas. Additionally, their study indicated that smaller lesions (less than 5 cm) located superficially were more likely to be benign, whereas larger lesions (more than 5 cm) in deeper soft tissue planes were more prone to malignancy, although exceptions existed, with approximately one-third of soft tissue sarcomas occurring superficially.

In our investigation, among the 45 cases of soft tissue tumors, 21 were smaller than 5 cm in size, while 23 were larger than 5 cm. Notably, 17 of the smaller tumors were benign, whereas 12 out of 17 malignant tumors exceeded 5 cm in size. This observation is consistent with previous research suggesting a heightened risk of malignancy in lesions surpassing 5 cm. The characterization of lesions based on margin features revealed that smooth margins were predominantly associated with benign tumors, while irregular margins were indicative of malignancy. Similarly, tumors with lobulated margins had a tendency toward malignancy. The study also explored contrast enhancement patterns, with most tumors (70%) exhibiting heterogeneous enhancement, and predominantly benign tumors showing no or homogeneous contrast enhancement. This aligns with the literature, emphasizing the utility of enhancement pattern analysis in diagnosing malignant lesions. The study's methodical imaging analysis strategy, which took into account parameters such as depth, location, size, margins, and contrast enhancement patterns, played a crucial role in accurately distinguishing between benign and malignant soft tissue tumours. The investigation also delved into the composition of lesions, recognizing the role of different matrix components in establishing pathological diagnoses. Different tissue matrices exhibited distinct signal intensity patterns in various MRI sequences, providing valuable information for characterization. The appearance of lesions on additional MRI sequences, including DWI and GRE sequences, was assessed, revealing the presence of diffusion restriction in a majority of malignant tumors.

The range of lesions classified within the soft tissue tumor-like category encompassed diverse entities including abscess, actinomycosis, gout, hematoma, Morel-Lavallée lesion, prepatellar bursitis, slow-flow vascular malformation, and cystic lesions. Notably, slow-flow vascular malformations and actinomycosis emerged as the most prevalent soft tissue mimics in the study. Through the analysis of imaging characteristics and histopathological

correlation, the study revealed significantly higher odds of a benign histopathological diagnosis for tumors initially suspected to be benign on MRI.

In conclusion, the study's comprehensive approach to imaging analysis, incorporating various MRI sequences and specific signs, proved instrumental in characterizing soft tissue lesions accurately. The findings contribute valuable insights into the clinical, radiological, and pathological aspects of soft tissue tumors and tumor-like lesions, emphasizing the significance of MRI in their diagnosis and differentiation.

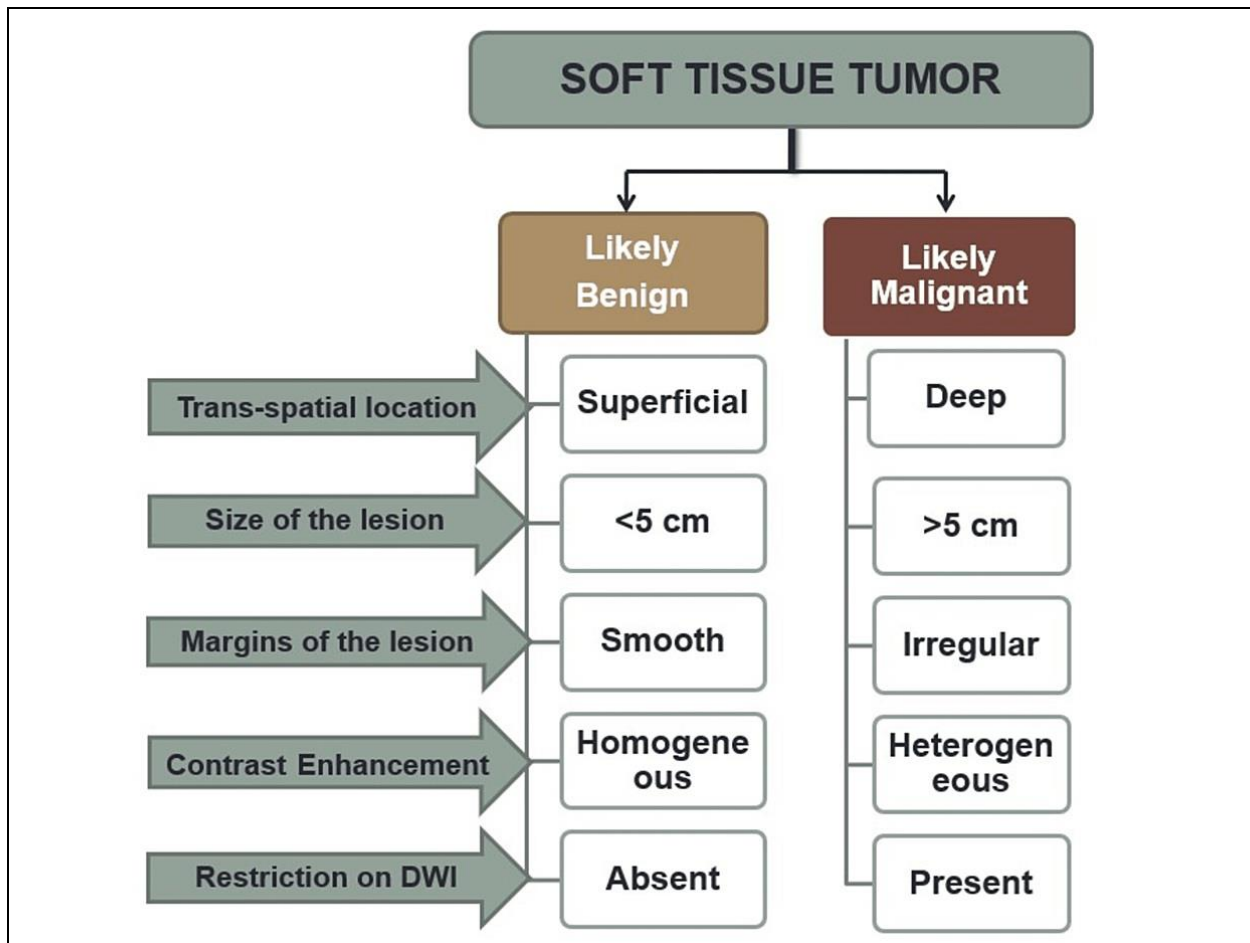


FIGURE 5: Systematic MRI analysis approach in the benign and malignant soft tissue tumors

DWI: diffusion-weighted imaging.

Limitations

MRI has limitations, including extended scan times, challenges for children and the elderly, and issues with claustrophobic patients. Accessibility to MRI scanners, especially in remote areas, can be sparse. Our study's small sample size may limit the generalizability of findings regarding soft tissue tumor distribution.

Conclusions

MRI plays a crucial role in evaluating various soft tissue masses by offering detailed information on characteristics, extent, relationship to surrounding structures, multiplicity, composition, and enhancement patterns. A systematic analysis of MRI images facilitates the



differentiation between benign and malignant lesions, taking into account factors such as depth, location, size, margins, and contrast enhancement. Furthermore, MRI assists in distinguishing soft tissue tumor mimics, thereby preventing misinterpretation based on clinical presentation and specific imaging features.

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