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IMAGING PATTERNS OF MUSCULOSKELETAL INFECTIONS ON MRI/USG AND THEIR CLINICAL CORRELATION: AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Musculoskeletal infections encompass a wide spectrum of conditions involving bones, joints, muscles, and soft tissues, which can lead to significant morbidity if not diagnosed early. Clinical presentation is often variable and nonspecific, making imaging modalities such as magnetic resonance imaging (MRI) and ultrasonography (USG) crucial for early detection, characterization, and management. Understanding imaging patterns and their correlation with clinical and laboratory findings is essential for improving diagnostic accuracy and guiding treatment. **Aim:** To evaluate the imaging patterns of musculoskeletal infections on MRI and USG and to correlate these findings with clinical presentation and laboratory parameters in patients presenting to a tertiary care hospital.

Materials and Methods: This observational study included 50 patients with clinically suspected musculoskeletal infection who underwent MRI and/or USG. Clinical data including symptoms, examination findings, and comorbidities were recorded. Laboratory parameters such as total leukocyte count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and culture results were analyzed. Imaging findings on MRI and USG were assessed systematically for features such as soft tissue edema, abscess formation, joint effusion, marrow edema, cortical destruction, and deep fascial extension. Statistical analysis was performed using SPSS version 27.0, and correlation between imaging findings and clinical/laboratory parameters was evaluated.

Results: The majority of patients were in the 21–40 years age group (38.00%) with male predominance (64.00%). Pain (92.00%), tenderness (82.00%), and swelling (78.00%) were the most common clinical features. Raised CRP (74.00%) and ESR (70.00%) were frequently observed. Lower limb involvement (48.00%) and osteomyelitis (28.00%) were the most common anatomical and diagnostic patterns, respectively. MRI demonstrated significant superiority in detecting marrow edema, cortical destruction, and deep fascial extension ($p<0.05$), whereas USG was comparable in identifying soft tissue edema, joint effusion, and abscesses. Abscess formation showed significant association with fever, elevated inflammatory markers, positive culture, and need for surgical intervention ($p<0.05$).

Conclusion: MRI and USG are complementary modalities in the evaluation of musculoskeletal infections. MRI is superior for detecting deep and osseous involvement, while USG is valuable for superficial lesions and procedural guidance. Imaging findings, especially abscess formation, correlate well with clinical severity and laboratory parameters, aiding in timely diagnosis and management.

Keywords: Musculoskeletal infections, Magnetic resonance imaging, Ultrasonography, Osteomyelitis, Clinical correlation.

INTRODUCTION

Musculoskeletal infections comprise a broad spectrum of infective processes involving bone, bone marrow, joints, muscles, fascia, tendon sheaths, bursae, and subcutaneous soft tissues. These infections range from relatively localized conditions such as cellulitis and infective bursitis to more aggressive diseases such as osteomyelitis, septic arthritis, pyomyositis, and necrotizing soft tissue infection. If diagnosis is delayed, these entities may lead to rapid tissue destruction, joint damage, chronic disability, sepsis, and the need for extensive surgical intervention. Because the clinical presentation is often variable and may overlap with traumatic, inflammatory, degenerative, or neoplastic conditions, musculoskeletal infection remains an important diagnostic challenge in routine practice.[1] The diagnosis of musculoskeletal infection requires close integration of clinical findings, laboratory parameters, microbiological data, and imaging. Patients may present with pain, swelling, tenderness, fever, limitation of movement, redness, or a discharging sinus, but these features are not uniformly present in all cases. In many patients, particularly in early disease, immunocompromised states, or partially treated infection, the symptoms may be nonspecific and laboratory abnormalities may be subtle. As a result, imaging plays a pivotal role not only in detecting infection but also in defining its exact location, determining its extent, identifying complications, differentiating soft tissue from osseous involvement, and guiding aspiration or drainage procedures.[2] Among the available imaging modalities, ultrasonography and magnetic resonance imaging are especially valuable in the assessment of suspected musculoskeletal infection. Ultrasonography is widely available, cost-effective, portable, and free of ionizing radiation. It is particularly useful for evaluating superficial soft tissues, tendon sheaths, bursae, periarticular structures, and joint recesses. It can readily demonstrate soft tissue edema, cobblestoning, fluid collections, abscesses, synovial thickening, tenosynovitis, and joint effusions. In addition, Doppler imaging allows assessment of hyperemia, and ultrasound can be used dynamically and in real time to guide diagnostic or therapeutic aspiration and drainage. These advantages make USG a highly practical first-line or adjunctive modality, especially in superficial and accessible lesions.[3] Magnetic resonance imaging, on the other hand, offers superior soft tissue contrast resolution and multiplanar capability, allowing detailed assessment of bone marrow, cortex, cartilage, synovium, fascia, muscle compartments, and deep soft tissue planes. MRI is highly sensitive for early marrow edema and is particularly useful in osteomyelitis, septic arthritis with adjacent bone involvement, pyomyositis, deep abscesses, sinus tracts, and fascial extension of infection. It also helps delineate the full anatomical extent of disease, identify skip lesions or multifocal involvement, and detect associated complications such as cortical destruction, subperiosteal abscess, deep fascial spread, cartilage damage, and soft tissue necrosis. For these reasons, MRI is generally regarded as the most comprehensive imaging modality for musculoskeletal infection when deeper tissue or bone involvement is suspected.[4] In contemporary imaging algorithms, the roles of USG and MRI are complementary rather than competitive. Ultrasonography is often the preferred modality for rapid bedside evaluation of superficial infection, joint effusion, and drainable collections, whereas MRI is more useful for demonstrating occult bone and deep soft tissue disease. The choice of modality depends on the clinical scenario, suspected site of infection, patient factors, and resource availability. Current imaging guidance also emphasizes that radiographs may be the initial examination in many settings, but when suspicion persists or there is concern for septic arthritis, osteomyelitis, or deep soft tissue extension, advanced imaging with MRI and targeted ultrasound becomes essential for accurate diagnosis and treatment planning.[5] The imaging patterns of musculoskeletal infections are diverse and reflect both the tissue involved and the stage of disease. Cellulitis typically manifests as skin thickening, subcutaneous edema, and hyperemia, while abscesses appear as localized fluid collections with internal debris or peripheral vascularity. Infectious tenosynovitis and bursitis are characterized by distended tendon sheaths or bursae with fluid and synovial thickening. Osteomyelitis is associated with marrow edema, cortical breach, periosteal reaction, and adjacent soft tissue infection, whereas septic arthritis is suggested by joint effusion, synovial thickening, enhancement, periarticular edema, and possible adjacent marrow changes. Because many of these patterns overlap, careful clinical correlation is required to distinguish infection from inflammatory arthropathy, trauma, stress reaction, postoperative change, neuropathic arthropathy, and neoplastic mimics.[6]

MATERIALS AND METHODS

This observational study was conducted at a tertiary care hospital and included 50 patients with clinically suspected musculoskeletal infection who were referred for imaging evaluation. The study was designed to assess the imaging patterns of musculoskeletal infections on magnetic resonance imaging (MRI) and ultrasonography (USG), and to correlate these findings with the clinical presentation, laboratory profile, and final diagnosis. All eligible patients were evaluated in a structured manner using predefined clinical, imaging, and laboratory parameters. The study population comprised 50 consecutive patients presenting with symptoms and signs suggestive of musculoskeletal infection. Patients of both sexes and all relevant age groups who

were advised MRI and/or USG for evaluation of suspected bone, joint, soft tissue, or periarticular infection were included. Clinical suspicion was based on the presence of one or more features such as localized pain, swelling, fever, restricted movement, erythema, tenderness, discharging sinus, suspected abscess, or raised inflammatory markers. Patients were enrolled after fulfilling the selection criteria and after obtaining appropriate consent as per institutional protocol.

Inclusion Criteria

Patients with clinical suspicion of musculoskeletal infection, including osteomyelitis, septic arthritis, pyomyositis, cellulitis, infective bursitis, tenosynovitis, soft tissue abscess, and infective spondylodiscitis where applicable, were included in the study. Patients who underwent MRI and/or USG as part of diagnostic workup and whose clinical and laboratory details were available for correlation were considered eligible. Cases with sufficient imaging quality for interpretation were included for final analysis.

Exclusion Criteria

Patients with traumatic musculoskeletal lesions without evidence of infection, purely neoplastic lesions, non-infective inflammatory arthropathies without superadded infection, postoperative changes without suspicion of infection, and inadequate or inconclusive imaging records were excluded. Patients with contraindications to MRI, such as non-compatible implanted devices or severe claustrophobia, were excluded from MRI-based analysis where relevant. Cases lacking essential clinical data or laboratory correlation were also excluded from the study.

Clinical evaluation: A detailed clinical assessment was performed for each patient using a structured proforma. Demographic variables including age and sex were recorded. Relevant clinical parameters included presenting symptoms, site of involvement, duration of symptoms at presentation, presence of fever, pain severity, swelling, redness, tenderness, limitation of movement, discharging sinus, antecedent trauma, history of diabetes mellitus, immunocompromised state, prior surgery, prior antibiotic intake, and known comorbidities. Clinical examination findings were documented and patients were categorized according to the suspected anatomical site of infection, such as bone, joint, muscle, tendon sheath, bursa, or subcutaneous soft tissue.

Laboratory parameters: Laboratory data were collected from patient records and correlated with imaging findings. The parameters analyzed included hemoglobin level, total leukocyte count, differential leukocyte count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), blood culture results where available, pus culture and sensitivity in drained collections, and other relevant microbiological investigations. These laboratory markers were used to assess the inflammatory and infective status of the patient and to determine their association with the imaging patterns observed on MRI and USG.

Imaging protocol: Ultrasonography

Ultrasonography was performed using high-resolution linear transducers, with curvilinear probes used when deeper structures required evaluation. USG examination was carried out according to the site of involvement and included gray-scale and color Doppler assessment. The sonographic parameters recorded included soft tissue edema, skin thickening, fluid collection, abscess formation, internal echoes, septations, sinus tract, tenosynovitis, bursitis, muscle involvement, joint effusion, synovial thickening, periarticular collection, cortical irregularity, and vascularity on Doppler imaging. USG was also used to determine the extent, echotexture, compressibility, and loculation of collections and to identify imaging features suggestive of infective rather than non-infective pathology.

Imaging protocol: Magnetic resonance imaging

MRI was performed using standard musculoskeletal protocols tailored to the affected anatomical region. The MRI sequences assessed included T1-weighted, T2-weighted, short tau inversion recovery (STIR), proton density fat-suppressed sequences where applicable, diffusion-sensitive sequences when available, and post-contrast fat-suppressed T1-weighted images in indicated cases. The MRI parameters evaluated included marrow edema, cortical destruction, periosteal reaction, intraosseous abscess, sequestrum, involucrum where applicable, soft tissue edema, muscle edema, pyomyositis, intramuscular abscess, fascial thickening, sinus tract, joint effusion, synovial enhancement, cartilage involvement, erosions, subperiosteal collection, disc space involvement in spinal infection, epidural extension where relevant, and post-contrast enhancement characteristics. MRI findings were used to define the pattern, site, extent, and severity of musculoskeletal infection.

Imaging interpretation: All imaging studies were reviewed systematically using predefined diagnostic criteria. The imaging pattern of infection was categorized into major groups such as osteomyelitis, septic arthritis, cellulitis, pyomyositis, soft tissue abscess, infective tenosynovitis, bursitis, necrotizing soft tissue infection where suspected, and combined involvement of bone and soft tissue. On MRI, bone involvement was identified by marrow signal abnormality, cortical breach, and contrast enhancement pattern, while on USG, soft tissue and superficial collections were characterized by echogenicity, loculation, wall definition, and Doppler vascularity. In cases where both modalities were performed, the complementary role of MRI and USG was analyzed. The final imaging diagnosis was correlated with clinical impression, laboratory markers, operative findings, aspiration results, or treatment response wherever available.

Clinical correlation: Clinical correlation was carried out by comparing imaging findings with presenting symptoms, physical examination findings,

laboratory inflammatory markers, and microbiological results. Correlation was specifically sought between the type of infection and factors such as fever, pain, swelling, restricted movement, leukocytosis, raised ESR, raised CRP, and culture positivity. The relationship between imaging-defined abscess formation and clinical severity was noted. Similarly, the concordance between MRI and USG findings for superficial and deep-seated lesions was evaluated. Imaging findings were also correlated with the need for conservative treatment, aspiration, drainage, or surgical intervention where applicable.

Outcome measures

The primary outcome measure was the pattern of musculoskeletal infection identified on MRI and/or USG. Secondary outcome measures included anatomical distribution of infection, frequency of bone, joint and soft tissue involvement, presence of abscess or collection, association of imaging findings with inflammatory laboratory markers, and concordance between imaging diagnosis and clinical or microbiological diagnosis. Additional parameters studied included the role of MRI in detecting marrow and deep soft tissue involvement and the utility of USG in identifying superficial collections, joint effusions, and image-guided localization of drainable lesions.

Statistical Analysis

The collected data were compiled and analyzed using Statistical Package for the Social Sciences (SPSS) software version 27.0. Descriptive statistics were used to summarize the study variables. Continuous variables such as age and laboratory values were expressed as mean and standard deviation or median with interquartile range, depending on data distribution. Categorical variables such as sex, site of involvement, type of infection, imaging features, and clinical findings were expressed as frequencies and percentages. Association between imaging findings and clinical or laboratory parameters was assessed using the chi-square test or Fisher's exact test for categorical variables, and independent sample t-test or Mann–Whitney U test for continuous variables as appropriate. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the demographic profile of the study population. Among the 50 patients included in the study, the highest number of patients belonged to the 21–40 years age group, accounting for 19 cases (38.00%). This was followed by the 41–60 years age group with 15 patients (30.00%). Patients aged less than 20 years and more than 60 years each constituted 8 cases (16.00%) respectively. These findings indicate that musculoskeletal infections were more commonly encountered in young and middle-aged adults in the present study, with relatively fewer cases at the extremes of age. With regard to sex distribution, male patients were more commonly affected than females, with 32 males (64.00%) and 18 females (36.00%).

Table 2 summarizes the clinical presentation and laboratory profile of the patients. Pain was the most common presenting complaint and was observed in 46 patients (92.00%), highlighting that pain is the predominant symptom in musculoskeletal infections. Tenderness was the next most frequent clinical finding, present in 41 patients (82.00%), followed by swelling in 39 patients (78.00%). Fever was noted in 31 patients (62.00%), indicating that although fever was common, a substantial proportion of patients presented without systemic manifestations. Restricted movement was present in 27 patients (54.00%), suggesting functional limitation due to joint or soft tissue involvement in over half of the cases. Redness or erythema was seen in 18 patients (36.00%), while discharging sinus was noted in 9 patients (18.00%), reflecting that chronic or advanced infective disease with sinus formation was present only in a smaller subset of patients.

The laboratory findings further supported the infective and inflammatory nature of the lesions. Raised C-reactive protein (CRP) was observed in 37 patients (74.00%), making it the most frequently abnormal laboratory marker in the study. Raised erythrocyte sedimentation rate (ESR) was seen in 35 patients (70.00%), while raised total leukocyte count was noted in 29 patients (58.00%). These results suggest that inflammatory markers, especially CRP and ESR, were more consistently elevated than leukocyte count and may therefore be useful supportive indicators in clinically suspected musculoskeletal infection. Positive culture results were obtained in 21 patients (42.00%), showing microbiological confirmation in less than half of the cases, which may be due to prior antibiotic exposure, difficulty in sample collection, or deep-seated lesions. Diabetes mellitus was present in 14 patients (28.00%), identifying it as an important comorbidity in a considerable proportion of cases. Prior antibiotic use was documented in 17 patients (34.00%), which may have influenced culture positivity and disease presentation.

Table 3 describes the distribution of musculoskeletal infections according to anatomical site and final imaging diagnosis. The lower limb was the most commonly involved anatomical region, seen in 24 patients (48.00%), indicating that nearly half of the infections affected the lower extremities. The upper limb was involved in 11 patients (22.00%), while spinal involvement was seen in 7 patients (14.00%). Pelvis and hip region involvement accounted for 5 cases (10.00%), and chest wall or other less common sites were involved in 3 patients (6.00%).

With respect to final imaging diagnosis, osteomyelitis was the most common diagnosis, identified in 14 patients (28.00%). This was followed by cellulitis in 10 patients (20.00%) and septic arthritis in 8 patients (16.00%). Soft tissue abscess was seen in 7 patients (14.00%), while pyomyositis was diagnosed in 6 patients (12.00%). Tenosynovitis

or bursitis accounted for 3 cases (6.00%), and infective spondylodiscitis was the least common diagnosis, seen in 2 patients (4.00%).

Table 4 compares the imaging findings detected on MRI and USG. Soft tissue edema was identified in 34 patients (68.00%) on MRI and 32 patients (64.00%) on USG, with no statistically significant difference between the two modalities (p = 0.673). This suggests that both MRI and USG were comparably useful for detecting soft tissue edema. Similarly, abscess or collection was detected in 21 patients (42.00%) on MRI and 23 patients (46.00%) on USG, with no significant difference (p = 0.684), indicating that USG performed nearly as well as MRI, and slightly better numerically, in identifying collections, likely due to its superior utility in evaluating superficial fluid accumulations. Joint effusion was observed in 16 patients (32.00%) on MRI and 15 patients (30.00%) on USG, again without significant difference (p = 0.832). Synovial thickening was seen in 12 patients (24.00%) on MRI and 10 patients (20.00%) on USG, with the difference not being statistically significant (p = 0.629).

In contrast, MRI showed clear superiority over USG for detection of deeper and osseous abnormalities. Marrow edema was detected in 19 patients (38.00%) on MRI but in only 4 patients (8.00%) on USG, and this difference was highly statistically significant (p < 0.001). This confirms the major advantage of MRI in detecting early bone marrow involvement, which is crucial for diagnosis of osteomyelitis. Cortical irregularity or destruction was identified in 15 patients (30.00%) on MRI as compared to 6 patients (12.00%) on USG, with a statistically significant difference (p = 0.026). Deep fascial extension was also better demonstrated on MRI, being seen in 11 patients (22.00%) versus only 3 patients (6.00%) on USG, and this difference was statistically significant (p = 0.021). Muscle involvement was detected more often on MRI, in 18 patients (36.00%), compared to 13 patients (26.00%) on USG, although this difference did not reach statistical significance (p = 0.284). Sinus tract formation was seen in 8 patients (16.00%) on MRI and 7 patients (14.00%) on USG, with no significant difference (p = 0.779). Tenosynovitis or bursal fluid was observed slightly more often on USG, in 8 patients (16.00%), compared to 6 patients (12.00%) on MRI, but this difference was also not statistically significant (p = 0.564).

Table 5 demonstrates the clinical and laboratory correlation with abscess formation on imaging. Among patients with abscess formation, fever was present in 17 out of 21 cases (80.95%), whereas among patients without abscess, fever was present in only 14 out of 29 cases (48.28%). This difference was statistically significant (p = 0.021), indicating that fever was significantly associated with the presence of abscess. Raised total leukocyte count was observed in 16 patients (76.19%) in the abscess group compared with 13 patients (44.83%) in the non-abscess group, and this difference was also statistically significant (p = 0.028). Raised ESR was present in 19 patients (90.48%) with abscess versus 16 patients (55.17%) without abscess, showing a significant association (p = 0.009). Similarly, raised CRP was seen in 20 patients (95.24%) in the abscess group and in 17 patients (58.62%) in the non-abscess group, with a statistically significant difference (p = 0.004).

Positive culture results were obtained in 13 patients (61.90%) with abscess compared to 8 patients (27.59%) without abscess, and this association was statistically significant (p = 0.017). This suggests that abscess-containing lesions were more likely to yield microbiological confirmation, probably because drainable collections provide better material for culture analysis. The need for drainage or surgical intervention was found in 15 patients (71.43%) in the abscess group compared with only 6 patients (20.69%) in the non-abscess group, and this difference was highly statistically significant (p < 0.001).

Table 1: Demographic profile of study population (n = 50)

Variable	Number of patients	Percentage (%)
Age group (years)		
<20	8	16.00
21–40	19	38.00
41–60	15	30.00
>60	8	16.00
Sex		
Male	32	64.00
Female	18	36.00

Table 2: Clinical presentation and laboratory profile (n = 50)

Variable	Number of patients	Percentage (%)
Pain	46	92.00
Swelling	39	78.00
Fever	31	62.00
Restricted movement	27	54.00
Redness/Erythema	18	36.00
Tenderness	41	82.00
Discharging sinus	9	18.00
Raised total leukocyte count	29	58.00
Raised ESR	35	70.00

Raised CRP	37	74.00
Positive culture result	21	42.00
Diabetes mellitus	14	28.00
Prior antibiotic use	17	34.00

Table 3: Distribution of musculoskeletal infections by anatomical site and final imaging diagnosis (n = 50)

Variable	Number of patients	Percentage (%)
Anatomical site involved		
Lower limb	24	48.00
Upper limb	11	22.00
Spine	7	14.00
Pelvis/hip region	5	10.00
Chest wall/other sites	3	6.00
Final imaging diagnosis		
Osteomyelitis	14	28.00
Septic arthritis	8	16.00
Cellulitis	10	20.00
Pyomyositis	6	12.00
Soft tissue abscess	7	14.00
Tenosynovitis/Bursitis	3	6.00
Infective spondylodiscitis	2	4.00

Table 4: Imaging findings on MRI and USG (n = 50)

Imaging finding	MRI positive, n (%)	USG positive, n (%)	p value
Soft tissue edema	34 (68.00)	32 (64.00)	0.673
Abscess/collection	21 (42.00)	23 (46.00)	0.684
Joint effusion	16 (32.00)	15 (30.00)	0.832
Synovial thickening	12 (24.00)	10 (20.00)	0.629
Marrow edema	19 (38.00)	4 (8.00)	<0.001
Cortical irregularity/destruction	15 (30.00)	6 (12.00)	0.026
Muscle involvement	18 (36.00)	13 (26.00)	0.284
Sinus tract	8 (16.00)	7 (14.00)	0.779
Tenosynovitis/Bursal fluid	6 (12.00)	8 (16.00)	0.564
Deep fascial extension	11 (22.00)	3 (6.00)	0.021

Table 5: Clinical and laboratory correlation with abscess formation on imaging (n = 50)

Variable	Abscess present (n = 21)	Abscess absent (n = 29)	p value
Fever	17 (80.95%)	14 (48.28%)	0.021
Raised total leukocyte count	16 (76.19%)	13 (44.83%)	0.028
Raised ESR	19 (90.48%)	16 (55.17%)	0.009
Raised CRP	20 (95.24%)	17 (58.62%)	0.004
Positive culture result	13 (61.90%)	8 (27.59%)	0.017
Need for drainage/surgical intervention	15 (71.43%)	6 (20.69%)	<0.001

DISCUSSION

In the present study, the largest proportion of patients belonged to the 21–40 year age group (38.00%), followed by 41–60 years (30.00%), and there was a clear male predominance, with 64.00% males and 36.00% females. This pattern is broadly comparable with the observations of Jiang et al (2015),[7] who analyzed 394 patients with extremity chronic osteomyelitis and found a median age of 42 years, with nearly 80.00% of patients occurring between 15 and 65 years of age, along with a marked male predominance of 307 males versus 87 females. The similarity suggests that musculoskeletal infections, particularly those involving bone and adjacent soft tissues, tend to affect economically active age groups more commonly and are seen more frequently in males, possibly because of greater occupational exposure, trauma risk, and delayed presentation in this population.

The symptom profile in our study was dominated by pain in 92.00%, tenderness in 82.00%, swelling in 78.00%, and fever in 62.00% of patients. These findings are in line with Gaujoux-Viala et al (2011),[8] who reported in adult long-bone osteomyelitis that patients commonly presented with moderate pain with or without swelling, while fever was absent initially in 5 of 6 patients. Compared with that series, our study recorded a higher frequency of overt inflammatory symptoms and fever, which may be because our cohort included not only osteomyelitis but also cellulitis, septic arthritis, pyomyositis, and abscesses, conditions that often produce more obvious local inflammatory signs at presentation. At the same time, the fact that fever was absent in 38.00% of our patients reinforces the clinical principle that musculoskeletal infection cannot be excluded on the basis of afebrile presentation alone.

Our clinical results also compare reasonably with pyomyositis-focused literature. In the current study, pain was present in 92.00% and fever in 62.00% of cases overall, whereas Sharma et al (2010),[9] in a North Indian series of 67 primary pyomyositis patients, reported myalgias in 74.62% and fever in 73.13%. The somewhat higher pain frequency in our study probably reflects the inclusion of osteomyelitis

and septic arthritis, both of which are typically very painful, while the slightly lower fever rate may reflect earlier imaging-based diagnosis and inclusion of more localized infections such as cellulitis and tenosynovitis. Sharma et al also found iliopsoas involvement in 46.26% of pyomyositis cases, whereas our pyomyositis burden was lower at 12.00% of all infections, showing that the spectrum in our cohort was wider and not dominated by a single muscle infection phenotype.

The laboratory profile in our study showed raised CRP in 74.00%, raised ESR in 70.00%, and leukocytosis in 58.00% of patients, indicating that CRP and ESR were more consistently abnormal than total leukocyte count. This trend is supported by Mitchell et al (2018),[10] who prospectively evaluated 100 children with limp or pseudoparalysis and found that among infective cases, ESR was raised in 97.00% while CRP was raised in 70.00%. Our ESR positivity was lower than that reported by Mitchell et al, likely because their imaging pathway selectively included children with elevated inflammatory markers, whereas our study enrolled a mixed hospital-based cohort on clinical suspicion. Nevertheless, both studies support the practical value of ESR and CRP as useful adjunctive markers in suspected musculoskeletal infection, especially when correlated with MRI or USG findings rather than interpreted in isolation.

In our series, diabetes mellitus was present in 28.00% of patients, prior antibiotic use in 34.00%, and culture positivity in 42.00%. These findings compare well with Radcliffe et al (2021),[11] who reported diabetes mellitus in 33.00% of pyomyositis and infectious myositis patients, blood culture positivity in 28.00%, and a substantial proportion of culture-negative cases after antibiotic exposure. The close similarity in diabetes prevalence suggests that metabolic disease is an important host factor across different musculoskeletal infection patterns. Our culture yield was higher than the blood culture yield in the Radcliffe study, probably because our analysis included pus and operative cultures in addition to blood cultures. At the same time, prior antibiotic use in one-third of our patients likely contributed to reduced microbiological confirmation, which is consistent with their observation that antecedent therapy commonly lowers culture recovery.

With respect to anatomical distribution and final diagnosis, lower-limb involvement was the commonest site in our study (48.00%), and osteomyelitis was the most frequent final imaging diagnosis (28.00%), followed by cellulitis (20.00%) and septic arthritis (16.00%). A similar predominance of lower-extremity and bone infection patterns was reported by Metwalli et al (2013),[12] in 165 pediatric lower-extremity MRI examinations performed for suspected musculoskeletal infection, where osteomyelitis was diagnosed in 33.00% of scans. Our osteomyelitis proportion is therefore close to that series, despite differences in age profile and case selection. The somewhat lower proportion of osteomyelitis in our study may be explained by the inclusion of a broader range of soft tissue infections and periarticular infective conditions, whereas Metwalli et al focused on lower-extremity MRI referrals, a setting in which osseous pathology is more likely to be enriched.

The predominance of lower-limb disease in our study is also consistent with classic osteomyelitis literature. Labbé et al (2010),[13] reviewed 450 children with acute hematogenous osteomyelitis and reported limb involvement in 90.00% and lower-limb involvement in 70.00% of cases. In our study, lower-limb disease accounted for 48.00% of all musculoskeletal infections, which is lower than their figure because our cohort also included spine, pelvis/hip, chest wall, and upper-limb infections, as well as soft tissue and joint infections not confined to long bones. Even so, both studies indicate that the lower extremity remains the most frequent anatomical region for clinically important musculoskeletal infection, likely because of its greater vascular demand, weight-bearing stress, and susceptibility to trauma and contiguous spread.

Regarding modality-wise imaging performance, our study showed no significant difference between MRI and USG for soft tissue edema (68.00% vs 64.00%, p=0.673), abscess/collection (42.00% vs 46.00%, p=0.684), joint effusion (32.00% vs 30.00%, p=0.832), or synovial thickening (24.00% vs 20.00%, p=0.629). These findings support the practical usefulness of ultrasound in superficial and fluid-containing lesions. Tayal et al (2006),[14] demonstrated that soft-tissue ultrasound changed management in 56.00% of patients with clinically suspected cellulitis, including identifying occult collections requiring drainage and avoiding unnecessary procedures in others. Our comparable abscess detection rates between MRI and USG, and the slightly higher numerical yield of USG for collections, fit well with that observation and emphasize that ultrasound is especially valuable as a rapid bedside tool for superficial abscess localization and procedural decision-making.

By contrast, MRI was clearly superior in our study for detecting marrow edema (38.00% vs 8.00%, p<0.001), cortical irregularity/destruction (30.00% vs 12.00%, p=0.026), and deep fascial extension (22.00% vs 6.00%, p=0.021). This is concordant with Massel et al (2021),[15] who showed that MRI findings such as confluent T1 marrow signal abnormality and cortical erosion were strongly associated with osteomyelitis, with cortical erosion remaining an independent risk factor on multivariable analysis. Their study also highlighted diabetes as an independent risk factor, which is relevant to our cohort where 28.00% had diabetes. Taken together, these data reinforce that MRI should be regarded as the superior modality when osseous involvement, marrow infiltration, or deep-compartment spread is suspected, while USG serves as a complementary rather than competing technique.

Our finding that abscess formation was significantly associated with fever (80.95% vs 48.28%, p=0.021),

raised leukocyte count (76.19% vs 44.83%, p=0.028), raised ESR (90.48% vs 55.17%, p=0.009), raised CRP (95.24% vs 58.62%, p=0.004), positive culture (61.90% vs 27.59%, p=0.017), and need for drainage or surgery (71.43% vs 20.69%, p<0.001) is clinically important. A similar imaging-clinical relationship was reported by Yu et al (2004),[16] in 40 MRI-evaluated bacterial pyomyositis patients, where 36 of 40 had abscess formation and 30 required surgical intervention or image-guided drainage in addition to antibiotics. Their observation that patients with larger or more mature abscesses more often needed intervention parallels our finding that imaging-demonstrated abscess strongly predicted invasive treatment. Thus, in routine practice, demonstration of abscess on MRI or USG should be interpreted not merely as a descriptive radiologic sign, but as a marker of greater inflammatory burden, better likelihood of microbiological yield, and higher probability of drainage-based management.

CONCLUSION

The present study demonstrates that musculoskeletal infections are more common in young to middle-aged males, with pain, swelling, and elevated inflammatory markers being the predominant clinical features. MRI proved superior in detecting marrow involvement, cortical destruction, and deep soft tissue extension, while USG was effective in identifying superficial collections and guiding interventions. Osteomyelitis and soft tissue infections were the most frequent patterns observed, with lower limb predominance. Imaging findings, particularly abscess formation, showed strong correlation with clinical severity and laboratory markers. Thus, a combined MRI and USG approach with clinical correlation is essential for accurate diagnosis and optimal management of musculoskeletal infections.

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