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CLINICAL AND PARACLINICAL CHARACTERISTICS OF PATIENTS WITH SEPTIC ARTHRITIS TREATED AT HOSPITAL A, THAI NGUYEN

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ABSTRACT

Background: Septic arthritis and periarticular soft tissue infections are common conditions that cause pain, reduce function, and significantly affect patients' quality of life. However, clinical and paraclinical characteristics vary among populations and have not been fully described in our country. **Objective:** To describe the clinical and paraclinical characteristics of patients with septic arthritis treated at Hospital A, Thai Nguyen during the period 2021 - 2025. **Methods:** Across-sectional descriptive study was conducted on 102 patients treated for joint and periarticular soft tissue infections. **Results:** Periarticular soft tissue infections accountedfor 66.7%, higher than joint infections (31.4%). The most common location was the lower extremities (47.1%). Methicillin-resistant *Staphylococcus aureus* (*MRSA*) was the predominant pathogen in synovial fluid (66.6%) and abscess fluid (55.6%), whereas other bacteria, such as *Acinetobacter baumannii* and *Enterococcus*, accounted for only about 8% of cases. There was one case of joint fluid with positive tuberculosis staining. Among cases where the route of entry was identified, the most common

was following skin and soft tissue infections (36.3%), followed by adjacent spread (29.4%) and associated underlying diseases (20.6%). **Conclusion:** *MRSA* was the predominant pathogen in the majority of joint and periarticular soft tissue infections.
Keywords: Arthritis; Rheumatology; Septic arthritis; Periarticular soft tissue disorders; Musculoskeletal; Soft tissue rheumatism

NGHIÊN CỨU ĐẶC ĐIỂM LÂM SÀNG VÀ CẬN LÂM SÀNG NGƯỜI BỆNH VIÊM KHỚP NHIỄM KHUẨN ĐIỀU TRỊ TẠI BỆNH VIỆN A THÁI NGUYÊN

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TÓM TẮT

Đặt vấn đề: Viêm khớp nhiễm khuẩn và nhiễm trùng mô mềm quanh khớp là những bệnh lý phổ biến gây đau đớn, làm giảm chức năng và ảnh hưởng đáng kể đến chất lượng cuộc sống của bệnh nhân. Tuy nhiên, các đặc điểm lâm sàng và cận lâm sàng khác nhau giữa các quần thể và chưa được mô tả đầy đủ ở nước ta. **Mục tiêu:** Mô tả các đặc điểm lâm sàng và cận lâm sàng của bệnh nhân viêm khớp nhiễm khuẩn được điều trị tại Bệnh viện A Thái Nguyên trong giai đoạn 2021 - 2025. **Phương pháp:** Nghiên cứu mô tả cắt ngang được thực hiện trên 102 bệnh nhân bị nhiễm trùng khớp và mô mềm quanh khớp. **Kết quả:** Nhiễm trùng mô mềm quanh khớp chiếm 66,7%, cao

hơn nhiễm trùng khớp (31,4%). Vị trí phổ biến nhất là chi dưới (47,1%). Tụ cầu vàng kháng methicillin (*MRSA*) là tác nhân gây bệnh chủ yếu trong cả dịch khớp (66,6%) và dịch áp xe (55,6%), trong khi các chủng vi khuẩn khác như *Acinetobacter baumannii* và *Enterococcus* chỉ chiếm một tỷ lệ nhỏ (khoảng 8%). Có một trường hợp dịch khớp dương tính với xét nghiệm lao. Trong số các trường hợp xác định được đường xâm nhập, phổ biến nhất là do nhiễm trùng da và mô mềm (36,3%), tiếp theo là lây lan sang vùng lân cận (29,4%) và các bệnh lý nền kèm theo (20,6%).
Kết luận: Phần lớn các trường hợp nhiễm trùng khớp và mô mềm quanh khớp là do *MRSA* gây ra.
Từ khóa: Viêm khớp; Rối loạn mô mềm quanh khớp; Thấp khớp học; Cơ xương khớp; Viêm khớp nhiễm khuẩn

INTRODUCTION

Musculoskeletal infections are a group of diseases with bacterial damage to the tissues of the musculoskeletal system, including: joint infections, osteomyelitis and bacterial soft tissue infections. Worldwide, the rate of joint infections is 2 - $5/10^5$/year [1]. A study on disease patterns at the Department of Rheumatology, Bach Mai Hospital in the 10 years from 1991 to 2000 showed that the rate of joint infections (NKK) was 9.06% [2]. According to a cross-sectional study in Taiwan, the mortality rate due to joint infections increased from $9.8/10^5$ in 1998 to $13.4/10^5$ in 2012 [3].

Male, old age, diabetes, immunodeficiency or use of immunosuppressive drugs, intra-articular injections, skin infections, soft tissue infections, trauma... are favorable conditions for the development of the disease. Musculoskeletal infections, if not diagnosed

and treated promptly, can cause serious consequences, especially sequelae causing disability and even death for the patient. In recent years, the rate of patients with joint infections, osteomyelitis and periarticular soft tissue inflammation requiring inpatient treatment has tended to increase. The Department of Musculoskeletal Surgery at Hospital A, Thai Nguyen has only been established for more than 4 years, however, the rate of musculoskeletal infections accounts for a significant proportion and tends to increase. The causes and risk factors for the disease are very diverse, in which some risk factors can be changed to help limit complications and improve treatment effectiveness. Therefore, we conducted to *describe clinical and paraclinical characteristics of patients with septic arthritis treated at Hospital A, Thai Nguyen in the period 2021 - 2025*.

METHODS

Subjects: All patients with arthritis and periarticular soft tissue inflammation treated as inpatients at the Department of Internal Medicine, Musculoskeletal, Hospital A, Thai Nguyen, period 2021 - 2025.

- Selection criteria

+ Patients are diagnosed with septic arthritis based on Newman's criteria [4] when one of the following four criteria is met: (1) Bacteria are found in the synovial fluid or (2) Bacteria are found in the blood combined with clinical manifestations typical of joint infection or (3) Joint fluid aspiration reveals pus combined with clinical manifestations typical of joint infection or (4) There is histopathological or radiological evidence of joint infection.

+ The patient was diagnosed with soft tissue infection.

+ Patients agree to participate in the study.

- Exclusion criteria

+ The patient was diagnosed with bacterial spondylitis and paraspinal soft tissue infection.

+ Patients refused to participate in the study.

Location and time: From August 2021 to August 2025 at the Department of Rheumatologyl, Hospital A, Thai Nguyen.

Study design: Cross-sectional descriptive study. Data collection method: retrospective and prospective.

Sample size and sampling method: Conveniently select all patients who meet the sampling criteria during the study period. 102 patients were selected to participate in the study during the study period.

Research content

- Statistics on the number of patients, age, gender, route of entry, site of infection, length of hospital stay, CRP, mode of transmission, type of bacteria, blood culture results, fluid samples, etc., diagnosed with joint infections and soft tissue infections treated as inpatients at the Musculoskeletal Department of Hospital A during the period 2021 - 2025.

Data processing

Data were processed using IBM SPSS 25.0 software. Qualitative variables were presented as frequencies and percentages; comparisons between groups were made using the Chi-square test or Fisher exact test when the expected frequency was < 5.

Quantitative variables were presented as mean ± standard deviation; comparisons between two groups were made using the Independent t-test if the distribution was normal or the Mann - Whitney U test if the distribution was non-normal.

Statistical significance was determined with $p < 0.05$.

Ethical issue: The research topic was approved by the leaders of Hospital A, Thai Nguyen and the head of the Department of Internal Medicine and Musculoskeletal. This is a descriptive study, the researcher only plays an observational role, does not intervene in diagnosis and treatment, does not affect the patient's health. All information provided by patients and their families is encrypted, guaranteed to be confidential, only for research purposes and absolutely not used for other purposes.

RESULTS

Among 102 patients, the > 60 years old group accounted for 52.9% (54/102), the 45 - 60 years old group 41.2% (42/102) and the 16 - 45 years old group 5.9% (6/102); mean age 60.04 ± 11.7. Men accounted for 78.4%, higher than women (21.6%).

Table 1. Classification of infections by diagnosis and location

Diagnosis	Location	n	%
Joint infection	Upper limb	6	5.9
	Lower limbs	26	25.5
Bacterial soft tissue inflammation	Upper limb	20	19.6
	Lower limbs	48	47.1
	Other	2	1.9
Total		102	100

Soft tissue inflammation occurred mainly in the lower limbs 47.1% and upper limbs 19.6% and only 1.9% in other locations; joint infections in the lower limbs accounted for 25.5% and upper limbs accounted for 5.9%.

Pathogenesis of joint and periarticular soft tissue infections

Table 2. Etiology of joint and periarticular soft tissue infections by synovial fluid culture

Characteristic			Research group	
			n	%
Synovial fluid culture (n = 32)	Negative		8	25.0
	Positive	*MRSA*	16	66.6
		MSSA	5	20.8
		P. Aeruginosa	1	4.2
		E. coli	1	4.2
		Atypical bacteria	1	4.2
		Total	24	75.0
Bacille de Koch (BK) or PRR staining of joint fluid (n = 32)	Negative		31	96.9
	Positive		1	3.1

The results of joint fluid culture were positive in 75.0%, with the main bacteria being *MRSA* 66.6% (16/24), followed by *MSSA* with 20.8%, the remaining strains were *P. aeruginosa, E. coli* and atypical bacteria each 4.2%. In 32 cases of BK or PRR staining of joint fluid tuberculosis, there was 1 case with positive results for tuberculosis bacteria (accounting for 3.1%).

Table 3. Etiology of joint and periarticular soft tissue infections by abscess fluid culture

Characteristic			Research group	
			n	%
Abscess fluid culture (n = 70)	Negative		34	48.6
	Positive	*MRSA*	20	55.6
		MSSA	8	22.2
		P. Aeruginosa	2	5.6
		E. coli	3	8.3
		Atypical bacteria	3	8.3
		Total	36	51.4
BK or PRR staining of abscess fluid (n = 54)	Negative		54	100
	Positive		0	0

The number of cases with positive culture results of abscess fluid accounted for 51.4% (36/70), of which *MRSA* accounted for 55.6% (20/36), followed by *MSSA* (22.2%), *A. baumannii* and *Enterococcus faecalis* both accounted for 8.3% (3/36). There were 34 cases with negative results, accounting for 48.6%. In 54 cases of BK or PRR staining of abscess fluid, all had negative results.

Table 4. Etiology of joint and periarticular soft tissue infections by blood culture

Characteristic			n	%
Blood transfusion		Do not do	74	72.5
		Negative	25	24.5
	Positive	*MRSA*	2	2.0
		Burkholderia pseudomallei (Whitemore)	1	1.0

There were 3 cases of positive blood cultures, including 2 cases of *MRSA* bacteria (2,0%) and 1 case of *Burkholderia pseudomallei* bacteria (1,0%).

Classification of the entry routes of etiology of joint and periarticular soft tissue infections and related factors

Table 5. Classification of the entry routes of etiologies of joint and periarticular soft tissue infections

Bacterial entry route		n	%
Find a clear way in	By blood, sepsis	9	8.8
	After soft tissue infection	37	36.3
	Has adjacent access	30	29.4
	After specialized musculoskeletal procedures	5	4.9
	Have underlying disease risk factors associated	21	20.6
	Total	102	100

In cases where the route of entry was determined, 36.3% (37/102) were post-infection of soft tissue, 29.4% (30/102) were due to adjacent routes of entry, 20.6% were due to underlying disease risk factors,

8.8% were due to blood route (9/102) and 4.9% were due to specialized procedures (5/102).

Table 6. Relationship between length of hospital stay and inflammation index with infection status

Diagnose	Number of days in hospital	White blood cells	CRP
Joint infection (n = 32)	12.06 ± 5.08	12.12 ± 5.55	67.21 ± 67.02
Periarticular soft tissue infection (n = 70)	12.58 ± 5.52	15.62 ± 15.58	101.76 ± 97.87
Total (n = 102)	12.42 ± 5.4	14.55 ± 13.4	91.26 ± 90.7
p	0.66	0.23	0.04

Comparison results between the two groups showed no statistically significant differences in hospital stay and white blood cell count between the septic arthritis group and the periarticular soft tissue inflammation group (p = 0.66 and p = 0.23). However, CRP levels were significantly higher in the periarticular soft tissue inflammation group compared to the arthritis group (101.76 ± 97.87 vs. 67.21 ± 67.02), and this difference was statistically significant (p = 0.04). This suggests that the systemic inflammatory response in the periarticular soft tissue inflammation group is generally stronger than in the localized inflammation within the joint.

DISCUSSION

Characteristics of the patient's infection status

The study results showed that the rate of soft tissue infection (66.7%) was much higher than that of joint infection (31.4%), in which the lower limbs accounted for 47.1%, the upper limbs 19.6% for soft tissue; and the lower limbs 25.5%, the upper limbs 5.9% for joints. Soft tissue inflammation (soft tissue inflammation, periarticular abscess) had a higher rate than joint

infection, which is consistent with the pathogenesis in the soft tissues around the joint: skin/subcutaneous cell damage, minor trauma, cellulitis spreading into the synovial sac or joint. A review article showed that musculoskeletal infections of the foot and lower limbs are often spread from deep soft tissue or foot ulcers, especially in diabetic patients [5]. The lower limb location accounts for the majority (47.1%) which is also consistent with the fact that the lower limb has poorer venous circulation, is subject to higher mechanical stress and is more frequently damaged by skin/wounds than the upper limb, which facilitates the spread of soft tissue infections. Joint infections account for 31.4%, lower than soft tissue infections, reflecting that joints are "more difficult to penetrate" and often require special conditions such as hemolytic bacteria, underlying arthritis, and joint surgery.

Causes of joint and soft tissue infections near the joint

**** Through joint fluid culture***

In the cases where synovial fluid samples were obtained, the positive rate reached 75.0%; among the positive ones, *MRSA* accounted for 66.6% (16/24), *MSSA* 20.8%, each strain of *Pseudomonas aeruginosa*, *Escherichia coli*, and atypical bacteria accounted for 4.2% each; in 32 cases of BK/PCR staining of synovial fluid, all were negative. The results of this study are consistent with a number of domestic and international studies. According to the study of Cimatti et al. (2025) on joint infections, *Staphylococcus aureus* was the main agent (49% of positive samples, of which *MSSA was found* in 28 samples and *MRSA* in 7 samples) [6]. According to the study results of Nguyen Thi Huong et al., the rate of

positive bacterial culture in synovial fluid accounted for 45.9%. The main cause is multidrug-resistant *Staphylococcus aureus (MRSA)*, accounting for 60%. Some less common bacteria are *P. Aeruginosa* (2%) or *A. Baumanii* (2%) [7].

With *MRSA* being a major concern, this has important implications for initial antibiotic choice. Consider using an agent with *MRSA* spectrum or adjusting when the results of the susceptibility test are available. *MRSA infections* are often associated with longer hospital stays, higher costs, and higher recurrence rates. The low prevalence of Gram-negatives (only ~ 4.2% of each strain) may allow for a preference for Gram-positive antibiotics in initial treatment, but with the caveat that if the patient has a history of procedures, prosthetic joints, or hospital complications, Gram-negatives should still be considered.

**** Through culture of abscess fluid***

The study results showed that in 70 cases of abscess fluid culture, the positive rate was 51.4% (36/70); of which Methicillin resistant *Staphylococcus aureus (MRSA)* accounted for 55.6% (20/36), *MSSA* 22.2%, *Acinetobacter baumannii* and *Enterococcus faecalis* each 8.3% (3/36); 34 cases were negative (48.6%); 54 cases of BK/PCR staining of abscess fluid were all negative.

The rate of bacterial isolation in abscess fluid in our study was slightly higher than that of the study by author Nguyen Thi Huong and colleagues at Bach Mai Hospital. In this study, the rate of abscess fluid culture with positive results was 43.3%. In addition, there were 2 cases of BK staining or PCR of abscess fluid with positive results (accounting for 1.7%) [4].

The high rate of *MRSA* in periarticular abscesses indicates that the infectious environment is likely related to medical interventions, surgery, trauma or recurrent skin and soft tissue injuries, because *MRSA* is often found in hospital environments or after procedures. Therefore, in the musculoskeletal field, when encountering periarticular abscesses, *MRSA* should be immediately considered, affecting the initial choice of antibiotics. According to some domestic studies, *MRSA* (methicillin-resistant *Staphylococcus aureus*) is the main agent in abscess fluid infected with soft tissue and joints. For example, in a study by Nguyen Thi Huong at Bach Mai Hospital, *MRSA* accounted for 63.4% of abscess fluid (n = 33/52) in patients with joint and soft tissue infections [7].

The results showed that among 32 patients who had BK staining or PCR of synovial fluid, only 1 case (3.1%) was positive for *Mycobacterium tuberculosis.* Tuberculous arthritis is often caused by *M. tuberculosis* spreading from the primary tuberculosis focus (lungs, lymph nodes) to the joint through the blood or spreading directly from the paraarticular bone with tuberculous osteomyelitis. This is important because joint tuberculosis often progresses silently and chronically, easily overlooked or confused with other arthritis such as rheumatoid arthritis, nonspecific infectious arthritis, or osteoarthritis. Early detection of joint tuberculosis allows for a change in specific treatment (standard anti-tuberculosis regimen for 6 - 9 months), instead of prolonging conventional antibiotic treatment or intra-articular corticosteroid injections - which can make the disease worse. This result is similar to the research results of Nguyen Thi

Huong, with 2 cases positive for tuberculosis bacteria in joint fluid cultures [7].

**** Through blood culture***

In the study, there were only 3 cases of positive blood cultures (3.0%), of which 2 were *MRSA* and 1 was a bacterial case (Whitemore); the remaining 25.5% of samples were negative and 72.5% of patients were not indicated for blood cultures. The rate of positive blood cultures was also lower than that of Nguyen Thi Huong's study (24.5%). However, in this study, the rate of bacterial isolation through blood cultures was also the lowest among all types of specimens [4]. The reason is that most patients were hospitalized when the disease was localized in the joints or soft tissues, no longer in the septicemic stage. Many cases had been treated with antibiotics before blood cultures were taken, reducing the ability to detect bacteria.

**** Routes of Infection***

The study results showed that the main source of infection was after skin-soft tissue infection (36.3%), followed by adjacent access (29.4%) and related underlying disease (20.6%). The cases of blood-borne infection and after specialized procedures accounted for a lower proportion (8.8% and 4.9%). A prospective study at Bach Mai Hospital (Hanoi) from August 2020 to June 2021 on 194 patients with joint and soft tissue infections near the joint recorded similar results: 81.4% (n = 158/194) of patients had a clear access route, of which: after skin and soft tissue infection 48.1% (n = 76); after specialized musculoskeletal procedures 42.4% (n = 67); with adjacent access factors 25.9% (n = 41); after joint replacement surgery 9.5% (N = 15) [7].

These results emphasize that a history and examination of skin/soft tissue wounds around the joint, trauma, and procedures near the joint are important steps in the evaluation of patients with joint/soft tissue infections near the joint. When a skin wound, foot ulcer (especially in diabetic patients), or recent joint aspiration/injection is noted, physicians and nurses should be alert to the possibility of infection spreading adjacent to or directly to the joint.

**** Relationship Between Hospital Stay and Inflammatory Index***

The results of the study on the inflammatory index of 102 patients showed that the average leukocyte was 14.55 ± 13.4 G/L and the average CRP was 91.26 ± 90.7 mg/dL. These values were all higher than normal (leukocyte > 10 G/L; CRP > 10 mg/dL), reflecting a clear systemic inflammatory response in most patients with joint and soft tissue infections near the joint. The high CRP value (average > 90 mg/dL) confirmed the role of CRP as a sensitive marker in monitoring the level of infection and treatment response. This result is consistent with the research results of authors Hoang Dinh Au and Vuong Thu Ha, 23.2% of patients had increased leukocytes, 58.1% of patients had increased neutrophils and 72% of patients had increased CRP [8]. In addition, the joint infection group (N = 31) had 12.06 ± 5.08 days of hospitalization; 12.12 ± 5.55 white blood cells; and 67.21 ± 67.02 CRP, while the soft tissue infection group (N = 71) had 12.58 ± 5.52; 15.62 ± 15.58; and 101.76 ± 97.87, respectively. The average CPR index in the periarticular soft tissue infection group was statistically significantly higher than that in the joint infection group ($p < 0.05$).

CRP reflects the degree of systemic inflammatory response and the amount of tissue damage. A significantly higher CRP value in periarticular soft tissue inflammation suggests a more diffuse inflammatory response in soft tissue (subcutaneous tissue, fascia, tendon sheaths, etc.), which is rich in blood vessels/lymph and prone to cytokine release - this is consistent with clinical observations in cellulitis/abscesses with a sharp increase in CRP. Domestic evidence in patients with cellulitis treated at Bach Mai emergency department showed that CRPs averaged ~20.5 mg/dL (above the normal range), reinforcing the role of CRP as a marker of systemic inflammation in soft tissue diseases [9].

The mean WBC tended to be higher in the soft tissue group (15.62 vs. 12.12 G/L), along with a statistically significant higher CRP. This is consistent with the pathogenesis: soft tissue infections often have a large volume of infected tissue/abscess and rich blood flow, activating inflammation more strongly than simple synovial fluid infections. According to Nguyen Thi Huong et al., in a study on 194 patients with joint and periarticular soft tissue infections, WBC and CRPs were increased in most cases; the study emphasized the role of CRP in assessing severity and adjusting antibiotics, consistent with your results that CRP was higher in the periarticular soft tissue infection group [7].

CONCLUSION

Periarticular soft tissue infections accounted for 66.7%, higher than joint infections (31.4%), the most common location was the lower extremities (47.1%). *MRSA* was the main cause in both synovial fluid (66.5%) and abscess fluid (55.6%), while other

bacterial strains such as *Acinetobacter baumannii* and *Enterococcus* accounted for only a small proportion (about 8%). There was one case of joint fluid staining for tuberculosis bacteria with a positive result. In cases where the route of entry was determined: after skin and soft tissue infections (36.3%), next was the adjacent route of entry (29.4%) and related underlying diseases (20.6%). Bacteremia had 3 cases of positive blood cultures (3.0%), of which 2 cases were *MRSA* and 1 case was *Burkholderia pseudomallei* (Whitemore).

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