

Clinical and epidemiological characteristics of septic arthritis of the hip, 2006 to 2012, a seven-year review

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OBJECTIVE: To epidemiologically characterize the population treated at our orthopedic clinic with a diagnosis of septic arthritis of the hip between 2006 and 2012.

METHODS: Fifteen patients diagnosed with septic arthritis of the hip between 2006 and 2012 were retrospectively evaluated. The patients' clinical and epidemiological characteristics were surveyed; a sensitivity profile relating to the microorganisms that caused the infections and the complications relating to the patients' treatment and evolution were identified.

RESULTS: Septic arthritis was more common among males. Most diagnoses were made through positive synovial fluid cultures, after joint drainage was performed using the Smith-Petersen route. Among the comorbidities found, the most prevalent were systemic arterial hypertension, diabetes mellitus, and human immunodeficiency virus. The pathological joint conditions diagnosed prior to joint infection were osteoarthritis and developmental dysplasia of the hip. The infectious agent most frequently isolated was *Staphylococcus aureus*. From the clinical and laboratory data investigated, 53.33% of the cases presented with fever, and all except one patient presented with increased measures in inflammation tests. Gram staining was positive in only 26.66% of the synovial fluid samples analyzed. Six patients presented with joint complications after treatment was administered.

CONCLUSION: *S. aureus* is the most common pathogen in acute infections of the hip in our setting. Factors such as clinical comorbidities are associated with septic arthritis of the hip. Because of the relatively small number of patients, given that this is a condition of low prevalence, there was no statistically significant correlation in relation to worse prognosis for the disease.

KEYWORDS: Hip; Infection; Arthritis; Infectious; Epidemiologic Studies.

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INTRODUCTION

Septic arthritis of the hip is a rare orthopedic disease, but it is extremely important because of the potential consequences (1,2). The age range for its incidence includes neonates to elderly individuals. Among children, the hip is the joint most affected (3-5); whereas in adults, the hip is second to the knee (6).

Even with advances in drainage techniques and antibiotic therapy, complications such as osteomyelitis, chronic pain, osteonecrosis of the femoral head, leg length discrepancy, joint stiffness, sepsis and even death may occur (1,7,8).

Treatment of this condition consists of correct diagnosis, early antibiotic therapy and surgical drainage (1,9-11). The most common limiting factors for successful treatment are a lack of suspicion of this disease at the initial stages of the symptoms, delay in aspirating the synovial fluid and lack of joint drainage (2,12,13).

With increasing numbers of reports of antibiotic-resistant bacteria in many centers, knowledge of the population-based epidemiological characteristics of each region is fundamental for adequate therapeutic planning (9,10,14).

The aims of this study were to epidemiologically characterize the population treated at our orthopedic clinic with a diagnosis of septic arthritis of the hip between 2006 and 2012 and to evaluate the results from the treatment instituted.

MATERIALS AND METHODS

A retrospective study was conducted on the medical files of patients diagnosed with septic arthritis of the hip

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between 2006 and 2012, who were treated at the Institute of Orthopedics and Traumatology, in São Paulo, Brazil.

The patients were selected by surveying the medical files and the inclusion criterion used was that the patients needed to have a diagnosis of septic arthritis that had been confirmed by at least one of the criteria defined by Newman (15) as follows:

- Positive culture from synovial fluid;
- Positive blood culture with negative synovial fluid culture;
- Patients with negative blood or synovial fluid cultures who presented with purulent puncture in the hip joint with a history of previous use of antibiotics.

Cases of infection subsequent to surgical procedures, including cases following total hip arthroplasty, were excluded because they were considered to be cases of postoperative infection.

The following data were gathered from the medical files: gender and age; cause of infection; patient's origin (to characterize whether the infection was from the community or related to healthcare services); leukocyte count, C-reactive protein (CRP) level and erythrocyte sedimentation rate (ESR) in the blood collected at the initial presentation to emergency services; Gram staining; synovial fluid culture and antibiogram; number of drainages; surgical route used for drainage; comorbidities; immunosuppression in the patient; time elapsed between the start of symptoms and drainage; previous joint disease; empirical antibiotic therapy; systemic and joint complications; and length of hospital stay.

Patients who presented with complications were evaluated statistically to search for factors indicative of poor outcome by means of the chi-squared test.

RESULTS

In relation to gender and age, there was a predominance of male cases (66.6%) and the mean age was 28.53 years, with a range from 3 to 76 years (6) (Figure 1).

Among the fifteen patients analyzed, fourteen presented with infection via hematogenic origin and only one presented with infection due to contiguity with a soft-tissue injury. An altered temperature (higher than 37.8°C) was found in eight patients (53.3%) at the time of their hospital admission.

Two patients presented with previous joint disease: one with osteoarthritis and the other with developmental dysplasia of the hip that had not been treated when the patient was a child and that had evolved with bilateral dislocation. At least one clinical comorbidity was observed in seven patients (46.6%), of whom two (13.3%) presented with systemic arterial hypertension (SAH), two (13.3%) had human immunodeficiency virus (HIV), and three (20%) had diabetes mellitus (DM). Three patients (20%) were immunosuppressed: one with dialytic chronic kidney failure and two with HIV.

In relation to laboratory parameters, eleven patients (73.3%) presented with leukocytosis, which was defined as a leukocyte count greater than 11000 and all patients except one presented with altered ESR and CRP levels at the time of hospital admission. The most frequent complaints were pain (86.6%) and difficulty in making hip movements (73.3%). Two patients (13.3%) presented with redness around the hip. No cases of swelling were observed.

Of the 15 cases studied, Gram staining in the synovial fluid was positive for bacteria in only four cases (26.6%), but 13 patients (86.7%) had intraoperative cultures that were positive for some type of microorganism.

Staphylococcus aureus was isolated in 11 patients (73.3%) in the synovial fluid analysis and this was the bacterium with the greatest prevalence. Another causative agent encountered was *Streptococcus pneumoniae*, which was found in two patients (13.3%). Two of the fluid cultures analyzed did not show any bacterial growth. Among the patients with infections due to *Staphylococcus aureus*, five (38.46%) carried bacteria that were resistant to oxacillin in the antibiogram analysis.

The time that elapsed from the start of symptoms to making the diagnosis and performing the joint drainage was, on average, 24 days, with a range from 1 to 120 days.

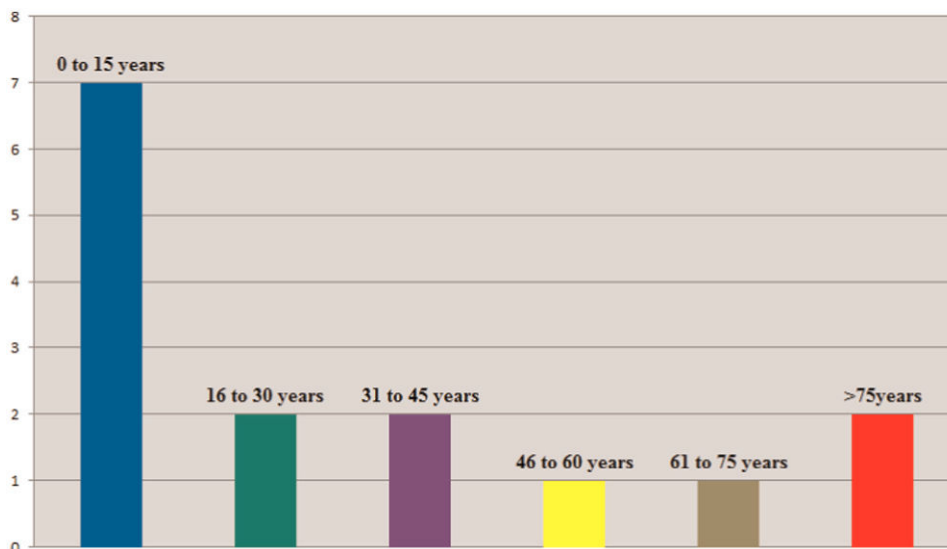


Figure 1 – Age distribution of septic arthritis cases.



All of the patients underwent open surgical drainage of the hip with access to the joint through the Smith-Petersen anterolateral route immediately after the diagnostic confirmation. Eight patients (53.3%) underwent a single joint cleaning procedure and seven patients (46.6%) underwent more than one surgical procedure for drainage.

All of the patients received empirical antibiotic therapy from the time of diagnosis until the final results from the cultures on material collected during surgery became available, followed by specific antibiotics targeting the bacteria identified in the cultures. Twelve patients were given antibiotics for six weeks, one received antibiotics for 8 weeks, and two patients received antibiotics for six months; the length of treatment for these last two patients was justified by the positive culture of bone fragments indicating osteomyelitis. Seven patients received oxacillin in association with gentamicin, seven received oxacillin in association with ceftriaxone and one was initially treated with oxacillin alone.

The mean length of hospital stay among the patients was 27 days, with a range from 10 to 80 days. Five patients had a final treatment with intravenous antibiotics: four cases were treated with teicoplanin and one with meropenem. Ten patients completed the regimen orally, of whom eight received cephalexin, one ciprofloxacin and one levofloxacin.

Six patients (40%) presented with joint complications during the follow-up period: three (20%) evolved with osteonecrosis of the femoral head, two (13.3%) evolved with chronic osteomyelitis and one evolved to an arthroplastic resection procedure on the femoral head. Among the patients who presented with joint complications, two (33.3%) had previously presented with a pathological condition in the hip, four (66.6%) presented with some type of associated clinical comorbidity and all of these patients had initially been admitted to the hospital with a high fever and alterations in the laboratory results (leukocytosis and increased levels in inflammation tests).

The results are summarized in Table 1.

A univariate statistical analysis did not show any statistically significant variables in relation to an unsatisfactory outcome, as the results show that all variables analyzed have $p > 0.05$.

■ DISCUSSION

The frequency of septic arthritis of the hip at the Institute of Orthopedics and Traumatology, our clinic, reached a mean of just over two cases per year.

Considering the sample of fifteen patients studied here, the mean age demonstrated that septic arthritis is a disease that affects all age groups (6,16): five patients were under 10 years of age, three were adolescents, four were adults, and three were elderly people. Although the complications encountered could not be directly linked with patients of greater age (16), it is important to note that when patients with lower functional reserves are affected by this pathological condition, the consequences may be more serious (8,17), given that the only case of death in this study occurred with a patient aged 71 years.

All of the infections except one were of hematogenic origin. The single case in which there was an infectious process contiguous with the joint emphasizes the warning that infectious processes around joints should be regarded

as serious because of the intra-articular complications that may arise (4,17).

Previous joint disease was found in 13.33% of the cases. The comorbidities more often found in the patients were systemic arterial hypertension (SAH), diabetes mellitus (DM) and human immunodeficiency virus (HIV) infection. Because of the advanced age of the patients with SAH, this cannot be considered to be a risk factor, unlike DM and HIV, which have already been widely studied and have been shown to be predisposing factors for infectious joint diseases (2,6).

As in other infections of the musculoskeletal system, systemic symptoms such as fever are of little help in making the diagnosis (4,18), given that just over 50% of the patients of this study initially presented with a high temperature. Leukocyte count and the levels in inflammation tests can be used to assist in diagnosis and as a form of disease follow-up (11,19). If these levels are within the normal range, this finding may suggest some other differential diagnosis (13). Although the patients studied presented with elevated values in inflammation tests, one patient presented with normal results, which means that the diagnosis of septic arthritis cannot be ruled out merely because of these test results (4).

The anterolateral approach was chosen instead of other hip access because it gives safe access to the hip joint. It exploits the internervous plane between the sartorius (femoral nerve) and the tensor fasciae latae (superior gluteal nerve) and the deep interval between the rectus femoris and the gluteus medius (20,21), and it is also the preferred approach in small children (22).

The present study did not show any increase in the number of surgical procedures or any greater number of systemic or joint complications with a delay in surgical treatment. Among the patients who had to undergo more than one surgical procedure, there was no relationship between a delayed diagnosis and the time when treatment started. However, based on the literature encountered, it is believed that a delay in treatment may lead to a worse prognosis (2,8,11,12,18,23,24).

Only a small number of cultures did not show bacterial growth (13.33%). The causative agent most often isolated was *S. aureus* (73.33%), which is in line with the epidemiological findings in many regions of the world and not only for the hip joint (3,7,18,25,26). Only 26.66% of the patients showed positive results for bacteria from Gram staining, which shows that a negative result for this test should not be taken as definitive in determining whether a joint should be drained in a suspected case of septic arthritis (19,27).

The diagnostic approach should be based not only on Gram staining but also on the local and systemic clinical state, on inflammation tests such as CRP and ESR, and on differential cell counts in the synovial fluid (4,13,18,19,24).

The incidence of oxacillin-resistant *S. aureus* was observed to be 45.45%. The presence of oxacillin-resistant bacteria was associated with prolonged hospital stay (2) in the present study, given that a resistant bacterium was isolated in all of the patients who remained in the hospital for longer times, but no statistically significant correlation was obtained.

The joint complications most often found were osteonecrosis of the femoral head and chronic osteomyelitis in three and two patients, respectively. It is not possible to be certain in the patients with chronic osteomyelitis which happened first, the joint infection or the bone infection, as these

**Table 1** - Epidemiological summary of study results.

| | | Number | Percentage | Observations |
|--|------------------------|-----------------------|------------|---|
| Sex | | | | |
| Male | | 10 | 66.66% | |
| Female | | 5 | 33.33% | |
| Age | | 28.53 (3 to 76 years) | | |
| Diagnostics | | | | |
| Leukocytosis | | 11 | 73.33% | >11.000 leukocytes |
| ESR and CRP elevation | | 14 | 93.33% | |
| Fever | | 8 | 53.33% | T>37.8° |
| Pain | | 13 | 86.66% | |
| Increase in articular volume | | 11 | 73.33% | |
| Gram stain | | 15 | 100% | Gram positive = 4 Gram negative = 11 |
| Positive synovial fluid culture | | 14 | 93.33% | |
| Positive blood culture | | 3 | 20% | |
| Etiology | | | | |
| Hematogenic | Distant Infection site | 3 | 20% | Pneumonia; ICU; meningitis |
| | Drug user | 1 | 6.66% | |
| | No site definition | 11 | 73.33% | |
| Contiguity | | 1 | 6.66% | |
| Previous articular disease | | 2 | 13.33% | |
| Osteoarthritis | | 1 | 6.66% | |
| Bilateral dislocation | | 1 | 6.66% | |
| Comorbidities | | 7 | 46.66% | |
| Hypertension | | 2 | 13.33% | |
| Diabetes | | 3 | 20% | |
| Congestive Heart Failure | | 1 | 6.66% | |
| Chronic Liver Failure | | 1 | 6.66% | |
| Paraplegia | | 1 | 6.66% | |
| Chronic Obstructive Pulmonary Disease | | 1 | 6.66% | |
| Ischemic Stroke | | 1 | 6.66% | |
| Senile Dementia | | 1 | 6.66% | |
| Hepatitis B | | 1 | 6.66% | |
| Thalassemia | | 1 | 6.66% | |
| Immunocompromised | | 3 | 20% | |
| HIV | | 2 | 13.33% | |
| Chronic Renal Disease | | 1 | 6.66% | |
| Isolated Bacteria | | 13 | 86.66% | |
| <i>S. aureus</i> | | 11 | 73.33% | MRSA = 5 MSSA = 6 |
| <i>Streptococcus</i> spp | | 2 | 13.33% | |
| Treatment | | | | |
| Procedures per patient | One hip drainage | 8 | 53.33% | |
| | More than one drainage | 7 | 46.66% | |
| Need to change empirical antibiotic | | 5 | 33.33% | |
| Hospitalization days per patient (Average) | | 24 (10 to 120) | | |
| Intensive care unit need | | 5 | 33.33% | |
| Septic shock | | 2 | 13.33% | |
| Amputation | | 1 | 6.66% | |
| Chronic osteomyelitis | | 2 | 13.33% | |
| Necrosis of the femoral head | | 3 | 20% | |

patients had no complaints before the septic arthritis and were diagnosed with osteomyelitis after surgical procedures. Some studies in the literature suggest concurrent occurrence in 17 to 33% of cases, especially in patients who received prior antibiotics (28-30).

S. aureus is still the most common pathogen in acute infections of the hip in our setting. Risk factors such as clinical comorbidities are important factors associated with this pathological condition. Oxacillin-resistant bacteria may increase the length of the hospital stay.

For there to be a statistically significant correlation for the variables associated with worse prognosis, studies on greater numbers of cases are needed.

■ AUTHOR CONTRIBUTIONS

Miyahara HS created the study protocol, analyzed the data and compiled the text. Helito CP gathered and analyzed the data and reviewed the text. Oliva GB gathered and analyzed the data. Aita PC gathered and analyzed the data. Croci AT served as reviewer. Vicente JR served as reviewer.



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