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Sepsis in orthopaedic surgery: epidemiology, microbiology, treatment, consequences

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Background. Musculoskeletal sepsis is a region of orthopaedic surgery focused on the diagnosis and treatment of infections involving the bones, joints, muscles, and skin. The objective of our study was to point out things that should be taken into account by physicians faced with probable musculoskeletal sepsis.

Materials and methods. A retrospective study was carried out and included all of the orthopaedic patients with positive blood culture between January 1, 2009 and March 31, 2012 who were admitted to the Hospital of Traumatology and Orthopaedics.

Results. In total, thirty five patients were hospitalized. Thirty one patients met the criteria for admission to the ICU. The median time spent in the ICU was 8 days with a range from 1 to 70. The source of infection was recognized in twenty five patients, it was not obvious for six patients.

Moderate or severe septic shock developed in nineteen (61.3%) patients, twenty four (77.4%) required invasive monitoring, five PICCO monitoring, three of them required continuous haemodialysis. Overall mortality was 19.4% (six patients). 58.1% were artificially ventilated from 1 to 46 days. The main microbial culture was *Staphylococcus aureus* (45.2%), the second one was *Clebsiella pneumoniae* (12.9%), the third microbial cultures were *Escherichia coli* and *Enterobacter cloacae* (6.5%). More prevalent risk factors were diabetes mellitus, oncologic disease, ischemic heart disease and adipositas.

Conclusions. Patients with a history of pain, swollen and tender joints, extremities or back with restriction of movement should be regarded as having septic inflammation until proven otherwise. We should always take into account orthopaedic sepsis if any other source is not obvious.

Key words: musculoskeletal sepsis, orthopaedic surgery, diagnosis and treatment of infections

INTRODUCTION

Musculoskeletal sepsis is a region of orthopaedic surgery focused on the diagnosis and treatment of infections involving the bones, joints, muscles, and skin.

All critically ill patients with a systemic inflammatory response syndrome (SIRS) or a multiple organ dysfunction syndrome (MODS) look septic, but only half of them are infected. Looking upon our results of septic cases in orthopaedics, we found that patients might be infected but sill were not looking very sick for short time and did not

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meet the criteria of sepsis. A number of them have passed multiple hospitals with multimodal and inefficient therapy**.** The issues of the currently raised annual average of septic cases and the problem of slow diagnosis of the condition merit investigation. Only one third of patients were common for the profile of our hospital – major joint replacement surgery. Infections following artificial joint replacement, known as peri-prosthetic infections, are a very serious complication. Peri-prosthetic infections are a potential side effect, but rare occurrence, following artificial joint replacement. These infections are considered a serious complication and deserve a comprehensive and individualized treatment approach. Prosthetic infections do not always show up right after surgery. The classic symptoms of orthopaedic inflammation: fever, pain and limitation of movement are in fact atypical and are not presented in all patients. Most of these infections involve bacteria that have either entered the blood stream, have been shed from some other site, or were present in the skin and soft tissue. These bacteria can overwhelm the patient's immune system and produce septicaemia resulting in very serious consequences, ultimately leading to septic shock and multiorgan dysfunction.

Objective of our study was to point out main things that should be taken into account by physicians faced with probable musculoskeletal sepsis.

MATERIALS AND METHODS

A retrospective study was carried out and included all of the orthopaedic patients with the positive blood culture between January 1, 2009 and March 31, 2012 who were admitted to the Hospital of Traumatolgy and Orthopaedics. The patients were examined and treated, and their diagnoses were made based on the clinical and laboratory findings.

RESULTS

In total, thirty five patients were hospitalized. Twenty four of them were admitted to surgical departments at the first sight and only eleven directly to ICU. Thirty one patients met the criteria for admission to the ICU. The median time spent in ICU was eight days, 20% (6 patients) spent more than 1 month. Half of them – fifteen (48.4%) have not been ever operated before the admission. Nine patients were admitted from other hospitals in really bad condition and a couple died next day from severe septic shock. Less than quarter (seven) had joint replacement in the past, four were with ostheosyntesis, one patient had sigma's cancer resection and the rest were with spine surgery. Nine underwent surgery in the Hospital of Traumatology and Orthopaedics and five in different Latvian hospitals. Seventeen (54.8%) had different implants (not only metal plates or joint implants, but also stents, vascular prostheses etc.).

The source of infection was recognized in twenty five patients and there were common sites for musculoskeletal infection – coxitis, gonitis, arthritis, spondilodiscitis and compartment syndrome. But the main danger was an unrecognized source of infection and it was not obvious for six patients.

Moderate or severe septic shock developed in nineteen (61.3%) patients, twenty four (77.4%) required invasive monitoring, five PICCO monitoring, and three required continuous haemodialysis. The number of dialyzed patients could be higher, but in the years 2009–2010 some patients were transferred to university hospitals because of lack of facilities.

Overall mortality was 19.4% (six patients), three of them died soon after admittance from different hospitals. 58.1% were artificially ventilated from 1 to 46 days. An average time spent on ventilation was 3–5 days.

The main microbial culture was *Staphylococcus aureus* (45.2%), the second one was *Clebsiella pneumoniae* (12.9%), and the third microbial culture was *Escherichia coli* and *Enterobacter cloacae* (6.5%). We faced rare conditions like *Lactococcus lactis* and *Bacteroides fragilis* as well. More prevalent risk factors were diabetes mellitus, oncologic disease, ischemic heart disease and adipositas.

The main dangers were hardly recognized coxites and musculus ileopsoas abscesses in young male patients without any injuries and risk factors in the past. An uncommon clinical phenomenon, psoas muscle abscess is extremely difficult to diagnose and needs to be investigated with considerable thoroughness. Also, a suspected spondilodiscitis or epiduritis had under-recognized and potentially very harmful effect, where precise diagnosis was postponed for a week or even more or sometimes recognized only by pathologist's examination.

DISCUSSION

Several points deserve discussion with respect to the disease course and image studies of our patients. On examination, many of them had no fever, long tract signs, and multiorgan insufficiency. Both the plain films and CT were unremarkable. The main complaint was pain. The only abnormal findings were high level of CRP and sometimes leukocytosis over 10 thousands. After receiving a diagnosis of superficial infection or another source, the patient may be discharged. Other signs – high leukocytosis and anaemia – may appear only slightly or not at all. Physicians, confronted with circumstances such as these, would consider orthopaedic sepsis. Septic arthritis is a very serious condition, with a case fatality of 11% (2). Although iliopsoas abscess presents unclear signs and symptoms, often in the lower extremities, MRI aids in evaluating and diagnosing the abscess (1). Once the abscess is detected, successful treatment should include aggressive surgical drainage. Determinants of success include early diagnosis, complete drainage, and proper antibiotic use (3, 4). Spinal infections as spondylitis and discitis, besides being factors of severe morbidity because of the neurological sequelae, are an important problem due to the long-period hospitalization, high cost and invasive diagnostic investigations, and requirement of surgical treatment (5, 6).

CONCLUSIONS

1. Patients with a history of pain, swollen and tender joints, extremities or back with difficulties of movement should be marked as having septic inflammation until proven otherwise.

2. The absence of organisms in a synovial fluid culture, wound or puncture does not exclude the diagnosis of sepsis.

3. Blood cultures should always be taken.

4. Plain radiographs or CT scans of the affected site are of no benefit. Magnetic resonance imaging is the most appropriate imaging where required. Ultrasound may be needed.

5. We should always take into account orthopaedic sepsis if any other source is not obvious.

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SEPSIS ORTOPEDINĖJE CHIRURGIJOJE: EPIDEMIOLOGIJA, MIKROBIOLOGIJA, GYDYMAS IR PASEKMĖS

Santrauka

Atramos ir judėjimo sistemos sepsis – ortopedinės chirurgijos sritis, nukreipta į infekcijų, apimančių kaulus, sausgysles, raumenis ir odą, diagnostiką ir gydymą. Mūsų studijos tikslas buvo išskirti dalykus, į kuriuos reikėtų atkreipti dėmesį gydytojui, susidūrusiam su galimu atramos ir judėjimo aparato sistemos sepsiu.

Raktažodžiai: atramos ir judėjimo sistemos sepsis, ortopedinė chirurgija, infekcijos diagnostika ir gydymas