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Epidemiological and Bacteriological Profile of Osteoarticular Infections on Osteosynthesis Material: Retrospective Study Over 6 Years

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Abstract:
Among the complications of prosthetic orthopedic surgery, infection is a serious complication that affects the cost and especially the quality of life of the patient. It affects osteoarticular prostheses, making management difficult, because the clinical picture is often variable, microbiological exploration remains difficult, which makes medical and surgical therapeutic modalities diverse. The objective of our work is to describe the epidemiological and bacteriological aspects of osteoarticular infections on osteosynthesis equipment and to compare them with data from the literature. We found a predominance of Staphylococcus aureus and Escherichia coli species, with 35.64% and 15.84% respectively, which is consistent with the studies in the literature.

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I. Introduction

Infection is a serious complication of orthopedic prosthetic surgery, especially since it has a financial and morbidity impact on the patient. It concerns more the osteo-articular prostheses.

A strategy for the diagnostic and therapeutic management of osteoarticular infections on materials is difficult to establish because of the presence of many factors that influence healing, which makes the medical and surgical therapeutic modalities diverse.

Sepsis on material is characterized by the site (joint, long bones, etc.), the type of material used (osteosynthesis material; joint prosthesis), their evolution (acute, chronic), the germ(s) involved, the site (immunocompromised patient, diabetic patient, etc.), and the route of contamination (hematogenous, postoperative, contiguous, etc.) [1-2].

The objective of our work is to describe the epidemiological and bacteriological aspects of osteoarticular infections on osteosynthesis equipment and to compare them with data from the literature.

II. Materials And Methods

All samples have been pre-treated according to the following techniques: macroscopic examination, microscopic examination, culture, reading and identification according to CASFM and EUCAST recommendations.

This is a retrospective study carried out between January 2014 and November 2020, on the isolates of bacteria found in different samples from the trauma services. Bacterial identification as well as the realization and interpretation of the antibiotic susceptibility test were corrected according to conventional methods at the laboratory of bacteriology of the Hassan II University Hospital of Fez. The data retained are: date of sampling, age of the patient, sex, terrain, germs isolated and their resistance profile to the different antibiotics, location of the osteosynthesis equipment.

Microbiological samples were taken either by swabbing a drain, by aspiration of pus or joint fluid, or by intra-operative removal of deep trimming products or bone tissue.

A Gram stain was performed to look for bacterial flora on microscopic examination.

The bacterial culture was carried out on cooked blood agar (pvx), blood agar and on CLED and EMB media, and incubated at 37°C.

The identification of the isolated germs was carried out by conventional bacteriological methods, based on the colony and its criteria (mobility, a positive oxidase, a positive catalase, a coagulase for staphylococci and a biochemical identification gallery or automated identification on Pheonix).

III. Results :

101 pus samples are positive. The mean age of the patients was 47 years with a sex ratio of 2.15 with an estimated male predominance of 68.32% (n=69) and 31.68% female (n=32).

Infected patients under the age of 25 make up 15.84% of cases, 44.55% are over 60 years old and 39.60% of our patients are between 25 and 60 years old. Regarding the location of these infections, we note a clear predominance in the lower limbs with 84.09% against 31.68% of cases in the upper limbs.

The search for risk factors identified 6 diabetic patients with a percentage of 5.94%, and 2 patients undergoing chemotherapy 1.98%.

The analysis of samples allowed the identification of 101 isolates, including 12 cases with isolation of two bacteria at a time.

We found a predominance of Staphylococcus aureus and Escherichia coli species, with 35.64% (n=36) and 15.84% (n=16) respectively. The species Pseudomonas aeruginosa represented 7.92% (n=8), followed by Acinetobacter baumanii with 5.94% (n=6), followed by Enterobacter cloacae and Klebsiella pneumonia with 12.87% (n=13).Enterococcus faecalis, Citrobacter freundii and Protéus mirabilis represented 3.96% (n=4) of all positive cases. Finally the Morganella morganii species was isolated with a percentage of 2.97% (n=3).

For antibiotic susceptibility, we studied the different antibiotic susceptibility tests performed to evaluate the resistance rate.

Resistance differs according to the species, Staphylococcus aureus presents 99% resistance to penicillin G, with 50% resistance to quinolones, on the other hand we did not find cases resistant to glycopeptides with 100% sensitivity to vancomycin and teicoplanin, and 95% for amikacin, ceftazidime, cefotaxime, fusidic acid, gentamicin, nalidixic acid, trimethoprim - sulfamethoxazole, oxacillin, erythromycin, norfloxacin, amoxicillin + clavulonic acid, and spiramycin.

As for Escherichia Coli, resistance to Ampicillins reached 91%, protected amoxicillin 66%, third generation cephalosporin 30%, cotrimoxazole 75%, quinolones 40% and nalidixic acid 45%.

The percentage of methicillin-resistant S. aureus (MRSA) was 1% and the percentage of enterobacteria producing β-extended-spectrum lactamase (βLSE) was 9% and the percentage of carbapenemase 1%.

IV. Discussion:

Infection of osteoarticular prostheses is defined according to French and international studies: clinically by the presence of a fistulous path at the level of the prosthesis, or the presence of at least 2 positive peri-prosthetic microbiological cultures, or the presence of 3 or more parameters among the following criteria: Elevation of neutrophil polynuclear cells in synovial fluid or sedimentation rate and C-reactive protein, A single positive peri-prosthetic culture, or positive histological study of peri-prosthetic tissues [3,4,5].

Among the 101 positive cases, 69 infected patients were male with a rate of 68.32% and cases were female with a rate of 31.68%.The sex ratio of male to female is with a predominance of the age group over 60 years. This is in line with the results of the studies carried out by FANTIN and GOGOUA [3-4].

In our series, as in other studies, the lower limb was more frequently localized than the upper limb [6]. This is documented by Brook [7] J P Bru [8] and Hall [9].

Studies have been carried out showing that Staphylococcus aureus ranks first (with the highest percentage) followed by Enterobacter cloacae, Pseudomonas aeruginosa and Klebsiella pneumonia. According to a French study, the most incriminated germs were the following: Staphylococcus aureus (40%), coagulase-negative staphylococci (21%), enterobacteria (19%) including Escherichia coli (8%) and Enterococcus faecalis (5%) [1].

The results of our study confirm that Staphylococcus aureus is the primary infectious agent responsible for infections on osteosynthesis equipment. These results are also similar to those of the ELOUENNASS osteitis study and the SUZUKI study [10].

In most of the studies performed, the Staphylococcus aureus germ shows a very high level of resistance to Penicillin G [11-12], which is consistent with the results of our study.

Some strains of staphylococcus have become resistant to methicillin and other antibiotics unfortunately (MRSA) [13]. The percentage of MRSA we found in our study was 2%.

E.Coli is generally a commensal opportunistic enterobacterium in humans, resistant to Ampicillins up to 98%, protected amoxicillin 65%, C3G 20%, SXT 85%, Quinolones 50% and nalidixic acid 33%, a finding similar to that of DIAKITE Oumou KEITA in 2010 [12-13].

V. Conclusion :

The management of osteoarticular infections on osteosynthesis equipment must be multidisciplinary because they are a global public health problem, and this is based on preventive measures concerning the patient and his preparation for surgery, with rigorous asepsis, good surgical technique, and regular monitoring of sterilization procedures and equipment in the operating room.

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