

Management of Osteoarticular Infections on Osteosynthesis Implants: A Retrospective Study About 76 Cases

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Abstract: This is a retrospective study conducted in the traumatology orthopedics department at Ibn Sina Hospital and on 76 infection cases due to osteosynthesis material spotted in limbs. The main objectives were to highlight the epidemiologic, diagnostic, therapeutic aspects of the osteoarticular infections after using osteosynthesis devices. The study covered a period of 5 years from January 2012 to December 2016. The average age of the patients was 38,08 years old with a male dominance (H/F= 3). 15,78% of the patients had an opened fracture before. All of our 76 patients were bearing osteosynthesis devices. The lower limb was mostly affected with 85% cases. The Staphylococcus aureus was identified in 24.4% of all cases. Our patients were operated following a protocol associating osteosynthesis material ablation, excision and drainage. General antibiotherapy was systematically instaurated. 44,7% of the patients were considered cured.

Keywords: Epidemiology, Implants, osteoarticular infections, diagnosis, Treatment.

INTRODUCTION

Orthopedic devices are increasingly used for fracture fixation, including intramedullary nails, external-fixation pins, plates, and screws. Infection on orthopedic material is related to the presence of microorganisms in the replication phase, generating both a local and general immune reaction. The colonization of the orthopedic devices corresponds to a simple presence of bacteria without anti-infectious reaction of the host. This infectious process can evolve towards a generalization and may cause an alteration of the expected functional results. Very weak bacterial inocula (less than 1000 germs) can generate an infection on material [1].

Despite measures to minimize its incidence, osteosynthesis infection devices remains a dreaded complication. In order to minimize their complications, osteoarticular infections management must therefore be fast and optimal. To do this, the diagnosis must be accurate.

MATERIALS AND METHODS

We report a retrospective descriptive study covering a period of 5 years from January 2012 to December 2017. The Archives department that lies within the orthopedic trauma department has been consulted to access databases on patients with osteoarticular infection on osteosynthesis implants in the period mentioned above, and 76 files were extracted for exploitation.

RESULTS

The average age of our patients was 38.08 years with extreme ages between 19 and 67 years. Of the 76 cases, there was a male predominance with 57 patients, while the females were represented by only 19 patients

with a sex ratio of 3. The antecedent of smoking was found in 37 patients, 8 patients had diabetes and one patient was on long-term corticosteroid therapy. 15 patients (19.7%) had an infection of the upper limb while 61 patients (80.2%) had an infection of the lower limb. Fever was present in 13 cases (17.1%). Cutaneous fistula was present in 34 patients (44.7%) (figure 1). Standard radiographs were performed in the 76 cases. The main radiological signs are summarized in (Table 1). Ultrasound exam was performed in 3 cases; the main signs were dominated by the presence of soft tissue and periosteum collections. Blood leukocytosis was obtained for 52 cases and the median value of the leucocytes was 10330 / mm³. CRP was obtained for 22 cases preoperatively and its average value before treatment was 57.1 mg / l. The median value of VS was 52 mm in the first hour. Surgical treatment was performed in 54 patients. Removal of foreign material was considered in 51 cases while 3 patients received only antibiotic treatment with material maintaining. The evolution was mentioned in 66 patients. 54 patients (71%) have evolved well with regression of clinical signs and

normalization of biological parameters. 12 patients have presented recurrences of their infections and were re-operated.

DISCUSSION

Staphylococcus aureus is the most frequently encountered causative agent during osteitis in the presence of osteosynthesis implants. Indeed, this microorganism easily adheres to bone, cartilage and surgical implants. Its adhesion capacity is due to the expression of the adhesins receptors of the bone elements and surgical implantation devices (fibronectin-binding adhesin) [2]. This pathogen is well equipped and has the ability to survive inside cells such as osteoclasts, in an altered metabolic state small colony variant (figure 2). Finally, its ability to generate resistance to antibiotics (methicillin-resistant *Staphylococcus*, MRSA) makes it a pathogen which is particularly difficult to eradicate [3-7].

Over a period of 5 years (2012 - December 2016), we have identified 76 ISM cases in the Traumatology-Orthopedics Department at Ibn Sina Hospital Rabat, an average of 15 cases per year. Our result was similar to that of the Rhatous study [8], concerning the bacteriological profile analysis of osteoarticular infections in 68 Patients who reports an average of 22 cases per year, against an average of 3 cases per year in the Belgassi study [9] concerning 21 cases. The average age of our patients was 38.08 years old and the oldest age group affected was 20 to 40 years of age (39.4%). These results can be explained by the fact that the young population is the most active, and then the most exposed to traumas of all types, including open fractures that are a significant risk factor for OAI [10].

The infections on orthopedic implants are most often post-traumatic and are usually following surgical procedures for closed or opened fractures [11, 12], which is perfectly suited to the Moroccan context where the number of car accidents continues to grow annually.

The diagnosis of IOA is clinical. The presentation varies according to the virulence of the pathogen, the mode of infection, the type of fracture and the conditions of consolidation. The existence of a fistula in relation to the material affirms the infection until proven otherwise. Acute IOA occurs in the first month after surgery [13]. From many studies, it can be concluded that in terms of biological markers, an increase in CRP and VS values is more significant than hyperleukocytosis in the diagnosis of IOA. However, the standardization of all these variables does not allow to exclude the diagnosis as well [14, 15]. From the bacteriological point of view, deep samples are precious and have an indisputable value. After one rigorous antiseptic skin preparation, they must be carried out remotely antibiotic therapy (at least 15 days after stopping antibiotic therapy) and prior to the administration of antibiotic prophylaxis, which may hide the presence of bacteria that are difficult to highlight [16]. Histologically, infections due to orthopedic devices is defined by the presence of more than five polymorphonuclear neutrophils per microscopic field, with strong magnification ($\times 400$), in at least five separate fields, on the osseous sample. The interest of histological examination lies also in its ability to direct specifically the diagnosis to a mycobacterium infection or to a fungal infection [17].

X-rays are not very sensitive to the early stage. Despite a low sensitivity and specificity, the standard radiographs are essential to evaluate the fracture consolidation and the implant stability [18] (figure 3, 4). CT scan with contrast product Intravenous injection allows a better analysis of soft tissue with a sensitivity of 100% and a specificity of 87% and allows appreciating the depth of the fistulas [19, 20]. The main goal of treatment is the eradication of the infection with preservation of the functional future. Today, the least invasive procedure leading to a total cure and not only to a suppression of the infection should be chosen, combined with long-term antibiotic therapy [21, 22] (figure 5).



Fig-1: Fistula in the thigh in a patient with an intramedullary nailing infection



Fig-2: Microcolonies (small colony variants) of S.aureus after 6 days of culture



Fig-3: 65-year-old patient with a coagulase negative Staphylococcal infection of the upper end of the humerus 6 weeks after a plate osteosynthesis. The infection was controlled with debridement, materiel removal, immobilization and 4 weeks of antibiotics. Despite the healing, the glenohumeral joint was destroyed with only 90 %of the shoulder elevation



Fig-4: X-ray of the pelvis showing a Staphylococcus aureus infection of a gamma nail implant with periosteal femoral reactions (arrows)

Table-1: Radiological signs Frequency

Sign	Presence	Absence	Percentage %
Osteolysis	45	31	59,2
Demineralization	34	42	44,7
Periosteum appositional	22	54	28,9
Soft tissues oedema	17	59	22,3
Non-union	03	73	3,9



Fig-5: Therapeutic diagram of osteoarticular infections in different clinical situations [22]

CONCLUSIONS

The infection of the musculoskeletal system is a redoubted pathology with a management which is often difficult. In most cases it generates a high morbidity and high medical cost. Through the use of a perioperative prophylactic antibiotic therapy, the improvement of the implants design, the surgical technique and the operating rooms equipped with a laminar flow, the rate of orthopedic implant infections could be decreased substantially.

DECLARATION OF INTEREST

The authors declare that they have no conflicts of interest in relation to this article.

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