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Surgical Site Infection in Orthopedic Surgery at Dantec University Hospital Center

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Abstract

Surgical Site Infections (SSI) is a dreaded complication of orthopedic surgery. The authors report a prospective study to this effect in the orthopedic traumatology department of the Aristide Ledantec hospital over one year from July 2011 to August 2012. The study concerned all the patients operated in emergency during this period and who had developed an infection during their hospitalization period. Among the 266 osteosyntheses performed, we observed 24 early surgical site infections, including 20 which were shallow and 4 deep, were observed. The overall incidence was 9%. There were 17 cases of clean surgeries and 7 cases of contaminated surgery. There were 13 men and 11 women. The time of infection onset after osteosynthesis was 8, 84 days on average. Globally 16 cases of monobacterial infection, 2 cases of polybacterial infection and 6 negative cultures were reported. Klebsiella peumoniae and Escherichia Coli were the most frequently encountered germs. Debridement of the operative wound was performed in 8 cases or 33% associated with antibiotherapy adapted to the antibiogram. Mainly Imipènme was used as antibiotic.

Introduction

Surgical Site Infection (SSI) is one of the most serious complications in orthopedic and traumatological surgery. They most often require a surgical revision, altering the results and calling into question the medical liability of the surgeon [1,2].

The definition of SSI is still subject to controversy in the literature [3]. Their prevalence has not been much studied in our developing countries, unlike in Western countries.

The objective of this study is to determine the frequency, the risk factors and finally the ecology of the germs which are responsible for these infections in our countries.

Material and Method

This is a prospective study conducted over a period of one year from 01 August 2011 to 31 July 2012. It was carried out at the Orthopedic-Traumatology Department of Aristide Le Dantec University Hospital in Dakar. Included were all patients over the age of 15 operated on in the traumatic emergencies of the hospital who had a detected infection on osteosynthesis material. During this period, 266 patients aged 40 years on average (20 and 83 years) underwent emergency osteosynthesis. The average consultation time was 64 hours with one-hour and 624-hour extremes.

The average operation time was 115 hours [24-576 hours]. All interventions were performed with open focus without image enhancement. An antibioprophylaxis based on cefuroxime 1.5g at induction was performed with reinjection of 750mg every 2 hours.

Postoperatively, patients were on amoxicillin + clavulanic acid until wound healing combined with anticoagulation with Enoxaparin 0.4mg / day until complete recovery. The first dressing was performed on day 4 postoperatively. Postoperative follow-up was based on local, regional and general clinical examination, X-rays and biological assessment. A bacteriological examination was performed in all patients who had an SSI. Surgical site infections were classified according to the criteria of the CDC Center for Disease Control (Table 1) [3].

Results

Twenty four patients out of 266 operated on had an infection of the operative site. There were 13 men and 11 women with a sex ratio of 1.18. The overall impact of ISO is 9%. The average time to onset of infection was 8.84 days with extremes of 5 and 25 days.

The pain was present in all our patients. The temperature was between 37°C and 38°C in 17 patients (70.83%) and between 38°C and 39°Cin 7 patients (29.17%).

Table 1: Classification of Surgical Site Infections (SSI), according to the criteria of the Centre of Disease Control (CDC).

Type d'infection	Criteria
Shallow infection of the incision	Occurred within 30 days after surgery, skin and subcutaneous tissue affection, at least one of the following signs are noted Pus from the superficial part of the incision
	A germ isolated from a culture of a liquid or tissue removed aseptically from the superficial part of the incision
	A sign of infection (pain, sensibility, redness, heat, etc.) associated with the opening on purpose of the superficial part of the incision by the surgeon unless the culture is negative
	A diagnosis of infection of the superficial part of the incision carried by the surgeon
Deep infection of the surgical site	**Deep infections in the area of the surgical site met the following criteria:** Occurred within 30 days (if no prosthesis in place) or in the year (if there is prosthesis or material) following the intervention; Probable relationship with the intervention. Affection of deep soft tissues (fascia muscles) or surgical site space. Notification of at least one of the following signs: pus from the deep end of the incision; opening of the deep part of the incision either spontaneously or on purpose by the surgeon when the patient suffered from any of the following signs: fever> 38^{0}C, localized pain or sensibility, unless the culture was negative. Abscess or any other obvious sign of infection of the deep part of the incision or the surgery environment found on gross examination during reoperation or by radiological or histo-pathological examination. Diagnosis of infection of the deep part of the incision or the surgical environment performed by the surgeon.

Table 2: Division of patients according to the occurrence of the post-operative infection.

Apparition time	number
Less than or equal to 7 days	4 (16.66%)
Beyond 7 days	20 (83.34%)
Total	24

According to CDC criteria, we have 83.33% of superficial infections. The remaining 16.77% had a deep infection with purulent discharge from the operative wound. No purulent flow was observed at the Redon drain.

The time to onset of infection was above 7 days in 83.34% (20 cases) and the remaining 16.66% in less than 7 days (Table 2). It was localized to the lower limb, with in 5 cases the femur; in 11 cases the 2 bones of the leg in 6 cases the knee (5 tibial trays and a patella), and in 2 cases the ankle (bimalleolar).

Lesions were open in 6 cases (5 open leg fractures and an open bimalleolar fracture). The implants used were screwed plates in 7 cases; intramedullary nails in 8 cases; DHS in 2 cases; external fixators in 4 cases and Kirschner pins in 3 cases.

Sixteen patients (66.6%) had a monobacterial infection; 2 cases of polybacterial infection (8.4%) and 6 cases of negative culture (25%).

The most common pathogens were Escherichia coli (22.22%), Klebsiella pneumoniae (22.22%), Enterobacter (22.22%) and Acinetobacter (16.66%). Debridement of the operative wound was performed in 8 cases or 33% associated with antibiotherapy adapted to the antibiogram. The antibiotic mainly used was Imipènme.

Discussion

Surgical site infections are the most common nosocomial infections with urinary and pulmonary infections [4,5]. Their incidence would be between 5.2 and 14.8% for all surgical interventions combined [5,6]. This study is the second of its kind at the national level.

Our hospital is 100 years old with a pavilion-style layout. The operation ward is located behind the hospitalization unit. The proximity between clean room hospitalization and septic room hospitalization, as well as the proximity to visceral surgery are also very important risk factors. A large number of operation ward staff would increase the risk of SSI from 1.5 to 3.8 % in rooms with no laminar flow system [7].

This human factor is the reason why there is a frequency of SSI according to Makasimovic [5] and Abalo [8].

Our wards are not equipped with laminar flow consequently the cleaning of the operation ward causes a disruption of the air conditions and sometimes imposes a rest period. The use of laminar flow has the effect of reducing the rest period time and the risk of infection as well [9].

Some authors [8], as well as us think that prevention measures are not always well imposed to the various inexperienced surgeons in a training center like ours. The sterilization system in our developing countries is most often done by hot air. This type of sterilization respects neither the ideal temperature which must be between 160°C and 200°C; nor the sterilization time of the material especially the implants and the linen. This might increase the risk of SSI.

After an intervention, our hospitalization services are in an impractical environment. The lack of air conditioning and storage cabinets in hospital wards, increase infection factors.

This study is one of the few publications in developing countries with complete and regular monitoring [6,8,9,11,12]. The prevalence of SSI in our series is 9%. This incidence is very high compared to those reported in developed countries (1.28% for Lecuire [12], 1.2% for Savey [13], 1.4% for Gastmeier [14]). This rate is comparable with those in developing countries according to Chevalier [15]; Chadli [16], Mayikoua [17] and Madougou [18] with 5% respectively; 5.2%; 5.2% and 8.2%.

However, Abalo [8], Bercion [11], Ericken [19], Ouédraogo [20] brought higher rates with respectively 23.2%, 18%, 19.4% and 23.35%.

The average age of our series is 41 years (20 and 81 years) comparable with the result of Chevalier [15] 39 years. The sex ratio is 1.18 close to those of Matit [21] and Chadli [16] who found a sex ratio of 1.6. Thus, the risks of contracting an SSI do not depend on age or sex.

Only post-operative infections during hospitalization were studied. They belong to the group of so-called early infections because

they occur within a month. In the majority of cases, the infection appeared at the beginning of the second postoperative week. This finding is available in the works of Madougou [18] and Chadli [16]. It is the period during which dressings are performed. This task is generally assigned to nurses most often in training because of lack of qualified human resources. This situation can be considered as an important risk factor.

Other factors such as the operation time, open surgery, osteosynthesis method and the intervention duration of must be taken into account. Indeed, the operation time in our study is 4.8 days. This is explained by the low socio-economic conditions of the patients and the lack of social security systems. Our results are close to those of Chadli [16] and Dumaine [22] with respectively 4 days and 4.9 days. However, Abalo [8] found in his series a much longer delay of 21 days.

All our interventions have been performed in open foci, but open foci during osteosynthesis is a major risk factor [11,23]. In addition, trauma surgery itself has been reported in the literature as a factor favoring SSI [7,23]. The proportion of the clean surgery class according to Altemeier [3] is important in our series. Closed-end osteosynthesis should be the treatment of choice for fractures, especially for long bones. This would minimize the occurrence of SSIs. It is important to remember that the Redon drain [24], as in our habits, is an active, open, aspirational system. The change of the device may be accompanied by a potential contamination via the external environment. Raves have shown that the infectious risk associated with drainage is a real fact [25].

In our series seven bacterial strains were isolated with a predominance of gram-negative bacilli. The fact that you observe poly-microbial infections suggests the possibility of aseptic faults either at a given time of the intervention or during post-operative care.

Studies have shown that the majority of microorganisms responsible for SSI directly contaminate the surgical site during surgery [26,27].

Regarding bacterial ecology, our results are not similar to those found in the majority of studies published in the literature. Forty to sixty percent of the isolated bacteria are aureus and epidermidis Staphyloccocus [28,29]. Chevalier et al [15] observed a strong predominance of Pseudomonas aeroginosa. Ouedraogo et al [20] found in their series a predominance of Escherichia coli. The isolated organisms in our series are mainly Klebsiella pneumoniae and Escherichia coli. This leads to very high economic costs in antibiotic therapy in addition to the long hospital period. The duration of hospitalization being 39.7 days with extremes of 11 and 84 days.

Conclusion

This study achieved its primary objective by setting the prevalence of SSIs in the early follow-up of the most common surgical procedures of trauma surgery. This rate of 9% is among the lowest rates found in developing countries. This study also identified a number of risk factors for the occurrence of SSIs. Most of these factors are available for prevention. The results of this study must be taken into account by our national nosocomial infection control programs.

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