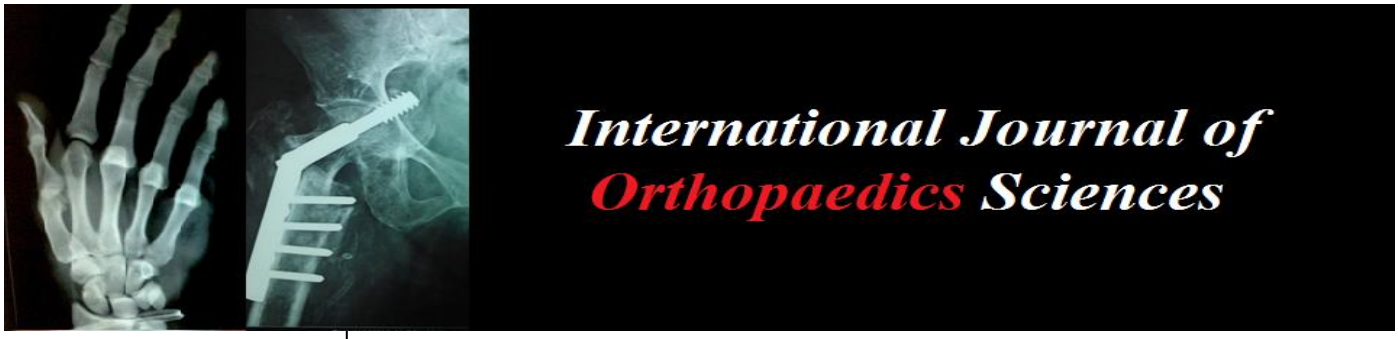

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Surgical site infection in orthopaedic and trauma surgery at Owendo University Teaching Hospital (Gabon): About 32 cases

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Abstract
Introduction: The appearance of a surgical site infection has the immediate consequences of increasing the length of hospital stay with a risk of reoperation. The aim of this work was to determine the frequency of this complication in the department, to specify the etiologies and to identify the factors favouring its appearance.
Patients and Methods: This was a prospective study that took place from March 01 to August 31, 2022 either 6 months at the orthopedic traumatology department of Owendo University Teaching Hospital. The study concerned the analysis of the files of patients operated for clean surgery and who presented an infection of the operating site treated and followed up in the service
Results: We collected 32 patients including 21 men (65.6%) and 11 women (34.4%), either sex ratio of 1.90. The average age was 39.5 years with extremes of 17 and 62 years. All patients received a sample either with a sterile syringe or by swab for bacteriological examination with antibiogram. Staphylococcus aureus was the predominant germ with 31.2% (N=10) while ciprofloxacin was the most sensitive antibiotic with 25% (N=8). The evolution was favorable in 84.4% (N=27).
Conclusion: Surgical site infection is common in the service. The staphylococcus aureus is the causative germ. Early samples taken with antibiograms and well-conducted local care have made it possible to obtain a favorable evolution.

Keywords: Infection, surgical site, orthopedic surgery, CHUO

Introduction
Surgical site infection (SSI) is a nosocomial infection occurring within 30 days following the surgical procedure or during the year in the event of osteosynthesis material placement [1]. SSI occupy first place among nosocomial infections among surgical patients and third place among all hospitalized patients after urinary and respiratory infections. According to specialties, orthopedic surgery occupies seventh place with a frequency of 1.5% [2]. The immediate consequences of the appearance of an SSI are an increase in the length of hospital stay, the risk of requiring reoperation and the risk of death [3]. Despite its easy diagnosis, the treatment of an SSI is on the other hand very difficult requiring real therapeutic determination. The occurrence of SSI is linked to several factors that are specific to the patient, the surgical procedure and the hospital context [4]. In certain developing countries such as Gabon, bone surgery is practiced under conditions different from those in developed countries. The resurgence of SSIs in the department led us to work on this problem, the objectives of which were to determine the frequency of this pathology in the department, to describe the contributing factors, to specify the etiologies, to identify the incriminated germs and to test their sensitivity to antibiotics.

Patients and Methods
This was a single-center prospective study with a descriptive aim which took place from March 1 to August 31, 2022, i.e. 6 months, in the orthopedic traumatology department of the Owendo University Hospital Center (CHUO).

The study concerned all patients who underwent clean surgery during the study period and who presented with an SSI and whose treatment and follow-up were carried out in the department. Patients who preferred to continue dressings in medical centers were excluded. The variables studied were the frequency, age and sex of patients, duration of hospitalization, type of SSI according to the Center for Disease Control (CDC) classification [5], which subdivides infections into three groups: Superficial infection, deep infection and infection of the organ or space; the type of pathology involved, the contributing factors, the operating time, the type of surgery according to Altemeier [6], which classifies surgeries into four types: Clean surgery, clean contaminated surgery, contaminated surgery and dirty surgery; the duration of intervention, the risk index of the National Nosocomial Infections Surveillance (NNIS) [7], the score of which is calculated from the rating sums of the Altemeier class, the ASA score [8] and of the duration of the intervention. Regarding the Altemeier class: Clean or contaminated surgery is rated 0, contaminated or dirty surgery is rated 1, regarding the ASA score: ASA I or ASA II is rated 0, ASA III, ASA IV and ASA V are rated 1. Concerning the duration of the intervention: A duration Less than or equal to 1 hour is rated 0 and a duration greater than or equal to 1 hour is rated 1. The NNIS score therefore varies between 0 and 3 points. The study variables also included the germs involved, their sensitivity and development. For all hospitalized patients, the identification of a surgical site infection was the subject of a sample for a bacteriological examination with antibiogram. Collections were collected using a sterile single-use syringe and infected wounds with little secretion were collected by swabbing. The sample products were sent to the laboratory within hours of collection. If the patient has a fever, additional tests including blood culture, complete blood count (CBC), C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), cytobacteriological examination of urine (ECBU), and chest x-rays were requested depending on the case. All data collected was entered and processed with Microsoft Excel version 2016 software. The interpretation of the data was made by comparing percentages.

Results

Out of 271 patients who underwent clean surgery, during the study period, 32 patients were diagnosed with a surgical site infection, representing a frequency of 11.80%. There were 21 men (65.6%) and 11 women (34.4%), i.e. a M/F sex ratio of 1.90. The average age was 39.5 years with extremes of 17 and 62 years. The age group most affected was 31-40 years old with 34.4% (N=11). Patients admitted through the emergency channel were the most represented with 62.5 (N=20). The consultation time was 1 to 72 hours in 56.3% (N=18) of cases. Patients from Libreville were the most numerous with 34.4% (N=11) of cases. Patients operated on between the 3rd and 7th day were the majority with 56.3% (=18). Patients operated on for fractures were the most numerous with 76.4% (N=207) of cases (Table 1).

Table 1: Distribution of patients according to diagnosis

Diagnosis	Effective	%
Closes fractures	159	58,7
Open fractures	48	17,7
Removal of Osteosynthesis material	31	11,4
Vicious Callus	11	4,1
Hand Wounds	8	3,0
Bone tumors	7	2,6
Pseudarthrosis	5	1,8
Graft site	2	0,7

Of the 32 patients who presented with SSI, screw plate osteosynthesis was the most commonly used surgical method in the series with 37.5% (Table 2).

Table 2: Distribution of patients according to treatment methods

Treatment method	Effective	%
Osteosynthesis by plate	12	37,5
Centro medullary nailing	7	21,8
Pinning	3	9,3
Trimming +Exo fixation	4	12,5
Trimming + Pinning	2	6,2
Trimming + Plaster cast	4	12,5
Total	32	100

The average hospital stay before the intervention was 8 days with extremes ranging from 1 to 21 days. Patients whose post-operative hospitalization duration was between 15 and 45 days were the most represented with 56.2% (N=18). All operated patients were classified Altemeier 1 in 82.3% (N=223) and Altemeier 2 in 17.7% (N=48). The intervention duration of between 1 hour and 2 hours was predominant with 51.7% (N=140) of cases. Patients with superficial infection were predominant in the series with 62.5% (N=20). All patients with an open fracture or wound received antibiotic prophylaxis and antitetanus serotherapy before the operation.

The onset of infection according to the Zimmerli classification [9] was early (during the first trimester) in 81.3% (N=26) of cases. This infection was superficial in 62.5% (N=20) of cases and deep in 37.5% (N=12) (figure 1).

Fig 1: 54-year-old patient who presented with a superficial infection of the surgical site following of screwed plate osteosynthesis of the right femur, healing was obtained after several sterile dressings and antibiotic therapy guided by the antibiogram

A cure of the infection with bone union was obtained in 84.4% (N=27) of the patients and a cure of the infection without bone union (pseudarthrosis) occurred in 15.6% N= (5) of the patients. Case. The NNIS score (National Nosocomial Infection Score) was equal to 0 in 78.1% (N=25). The bacteriological characteristics of the series are summarized in Tables 3 and 4.

Table 3: Distribution of patients according to the incriminated germs

Incriminates germs	Effective	%
Staphylococcus aureus	12	37,5
Enterobacter cloacae	4	12,5
Escherichia Coli	3	9,4
Pseudomonas Aeruginosa	2	6,2
Protenis Mirabilis	2	6,2
Sterile Culture	9	28,2
Total	32	100

Table 4: Distribution of patients according to antibiotic sensitivity

Sensitivity to antibiotics	Effective	%
Ciprofloxacine	9	37,5
Imipeneme	5	20,8
Amikacine	4	16,7
Norflox	3	12,5
Gentamycine	3	12,5
Stérile	8	25
Total	32	100

Discussion

Our study presented some biases the first concerns the transport time of samples which was long (beyond 2 hours for the majority) for certain samples; the second concerns some patients lost to follow-up who wanted to have dressings done in medical centers close to their homes, which reduced the size of our sample which was no longer large enough to determine the risk factors for SSI according to homogeneous groups ortho-traumatological pathologies (fractures, malunions, osteoarthritis). In our series, the frequency of SSI was 11.80% this rate is comparable to that of Idé Garba *et al*. in Benin [10] who found 9.59% of SSIs in their series. This could be explained by the hospital conditions common to African hospitals with the non-compliance with operating theater standards. In our structure, we often note non-compliance with operating room uniforms, clogs and sometimes poor dilution of the antiseptic soap used for surgical hand washing. If we add to these factors, the fact that the management of open fractures, in certain patients, is most often done beyond 6 hours, thus transforming certain Altemeier type I wounds into type II. Young male patients characterized this series, the same observation was made by several authors in the literature [11-13] and could be explained by an observed increase in road traffic accidents among men causing fractures which, in our series, represented 76.4% of those operated on. This predominance of occurrence of SSI on fracture was also reported by Madougou *et al*. In Benin [14] and by Malick *et al*. [15] in Mali who found respectively 88.7% and 75.2% of fractures in their series. In addition to the risks of SSI linked to the patient and the surgical procedure, the complexity of the fracture line and the instability of the fracture site constituted the factors favoring the occurrence of SSI [16]. In this series, screwed plate osteosynthesis was the most used surgical method with 37.5%. Our result is consistent with literature data [17, 18] and could be explained by the fact that screwed plates provide absolute stability in the surgical management of fractures, add to this their affordable cost and availability. In this series, patients operated between the 3rd and 7th day were predominant in the series. Those whose post-operative hospitalization duration was between 15 and 45 days were the most represented with 56.2%. This late treatment and the fairly long hospital stay seem to favor the occurrence of SSI; this same observation has been made by several authors in the literature [10, 19, 20]. It is the same for the duration of the intervention, which, in our series, was predominant between 1 hour and 2 hours with 51.7%, the risk of SSI increases from simple to double after each hour of intervention, the operations that last up to 1 hour have an infectious risk of 1.3%, while those that last 3 hours or more have a risk of almost 4% [21]. Andersen *et al*. showed that an intervention duration greater than 2 hours was an important risk factor for SSI [22]. In this series, superficial infections were predominant with 62.5% (N=20), this result is comparable to that of Abalo *et al*. in Togo [23] who found, in their series, a superficial SSI rate of 65.5%. This could be explained by the often easy diagnosis of superficial infections most often manifested by wound inflammation, suppuration, fistulization or delayed healing associated or not with fever. In the various bacteriological examinations carried out, Staphylococcus aureus was the most represented germ with 37.5% (N=12), this result is comparable to that of Ide Garba *et al*. [10] in Benin who found 53.4% of cases in their series, this could be explained by the fact that staphylococcus aureus is the commensal germ of the skin and nostrils and therefore the most encountered in SSI, this is also true both in Africa [24] and in Europe [25, 26]. In our series, the particularity of staphylococcus aureus was its multi-resistance to most of the antibiotics tested. All strains tested were resistant to ceftriaxone and amoxicillin clavulanic acid. These results reflect on the one hand the modification of the microbiological environment and on the other hand a change in the germ profile.

Conclusion

SSI are common in the service and are the prerogative of young adult males in full activity. They constitute a serious complication with multiple consequences the extension of the duration of hospitalization, the increase in the risk of re-intervention and the increase in the cost of care. SSIs are early and superficial and are due to Staphylococcus aureus, which is increasingly multi-resistant to most common antibiotics. The risk factors are essentially a long operating time, unsuitable antibiotic prophylaxis, contaminated surgical classes according to Altemeier and a duration of the intervention of more than 2 hours with most often non-compliance with the rules of asepsis in the operating room.

Declarations Funding

This work has not received any specific grant from public, commercial or associative funding bodies.

Ethical approval

Authorization for the study was obtained from the competent authorities of the CHUO, as well as the head of the orthopaedic-traumatology department of the said hospital. Provisions have been made for the implementation of the study to guarantee confidentiality. The consent of the patients or their families in the event of their incapacity was given. Patient anonymity was respected.

Conflict of Interest

The authors declare that they have no known competing

financial interests or personal relationships that could have appeared to influence the work reported in this paper

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