



Surgical Site Infections: Epidemiological, Clinical and Bacteriological Aspects in the Urology Department of the Regional Hospital of Saint-Louis

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ABSTRACT

Introduction: Surgical site infections occur within 30 days or one year after operation. They are important factors of morbidity and mortality in surgery, with a significant economic impact especially in developing countries. In sub-Saharan Africa, rate is estimated between 6.8-26% and 3.36% in Senegal. The objective of this study was to evaluate SSI in urology of Regional Hospital of Saint-Louis and study bacteria isolated. **Material and Method:** A prospective, descriptive and analytical study was conducted in urology department with patients operated on and hospitalized from february 2019 to january 2020 and who presented suppuration of surgical site. Samples were taken by swabbing wound or by puncture. Microbiology examination was done by microscopic, culture and identification of bacteria who were tested with antibiotics according to the CA-SFM 2019. Data entry was done with Excel 2019 and analysed by SPSS version 22. **Results** : 134 patients were concerned with mean of age 49.69 years and the most risk factors were hypertension (23.88%), and diabetes (5.97%). Stage I (70.90%) of ASA and stage I (37.31%) of Altemeier were predominant. Eighteen patients (13.43%) had an SSI and 27 bacterial strains were isolated with predominance of enterobacteria (81.5%). Six isolates produced extended spectrum beta-lactamase with multi-resistant bacteria associated by longer hospital stay. **Conclusion:**

Surgical Site Infections are a real factor of morbidity and mortality in surgery. In addition, increasing emergence of antibiotic-resistant makes treatment more difficult. It is urgent to set up a system of coordinated control of these SSI and all action undertaken must be multidisciplinary.

Keys words : Surgical Site Infections, Urology, Saint-Louis, Senegal.

Surgical site infections (SSI) are infections that occur at the surgical site within 30 days after the operation, a period that can be extended up to one year in the case of prosthetic devices [1]. SSIs are important factors of morbidity and mortality in surgery, with a significant economic impact. They are therefore a real public health problem in developed countries, but especially in developing countries where the means of management are limited. Their incidences vary considerably according to the type of surgery and are moreover on the inequalities of development existing between the countries. In the USA, the rate of SSI is estimated to be between 2 and 6% [2], with an estimated additional cost of 6.65 billion dollars [3,4]. In addition, SSI are directly or indirectly responsible for 4% of deaths in surgical settings [5].

A study conducted in France on the continuous surveillance of SSI between 2002 and 2007 showed rates ranging from 3.7% in the first year to 1.9% in the last year. This study also showed a decrease in SSIs over the years and a variability in rates according to surgical specialties [6]. In prostatectomies, Peyronnet estimated the rate of SSI at 3%, but it could be as high as 20% in certain situations [7], while the overall rate of SSI in urological surgery in France in 2012 was 1.36% [8].

In sub-Saharan Africa, the rate of SSI is estimated to be between 6.8 and 26%[9].

In Senegal a study conducted at the urology department of the Aristide Le Dantec between 2016 and 2018 found an SSI rate of 3.36% [10].

The emergence of antibiotic-resistant bacteria makes the management of these SSIs increasingly difficult with serious repercussions on functional and vital prognosis. At the same time, there has been a clear advance in the diagnostic and therapeutic management of SSI, which is evidenced by their regression in developed countries.

The objective of our study was to make an inventory of SSI in the urology department of the Regional Hospital of Saint-Louis (CHRS) and study the bacteria responsible and their sensitivity profiles to the antibiotics tested.

MATERIAL AND METHOD

This study is prospective descriptive and analytical, conducted in the urology department of the Regional Hospital of Saint-Louis. The study population consisted of patients operated on and hospitalized in the aforementioned department from february 2019 to january 2020 (one year) and who presented with suppuration of the surgical site. Samples were taken by swabbing the wound or by puncture with a syringe and sent to the bacteriology laboratory. Macroscopic examination was performed to assess the characteristics of the pathological products. Microscopic examination was used to identify cells after staining with May Grunwald Giemsa and also bacteria after Gram staining. Samples were cultured on blood agar and brain

heart broth. Positive cultures were identified by cultural and biochemical characteristics of the bacteria. Isolated bacteria were tested with antibiotics according to the CA-SFM version 2019 procedure with search for resistance types.

The parameters studied in the patients were: age; sex; terrain; type of anesthesia, antibiotic prophylaxis. For bacteria, this is the strain identified, the antibiotics tested and the antibiotic resistance.

The data were obtained by exploiting the patients' files, the anaesthesia sheets, and the bacteriology laboratory registers. The data entry was done with Excel 2019 software and their descriptive and analytical study by SPSS version 22 software.

RESULTS

During the period from February 01, 2019 to January 31, 2020, 134 patients were collected, the mean age of patients was 49.69 years with a standard deviation of 24.36 and extremes of 3 and 90 years. Patients aged 60 years and older represented 46.26% (N=62) (figure 1).

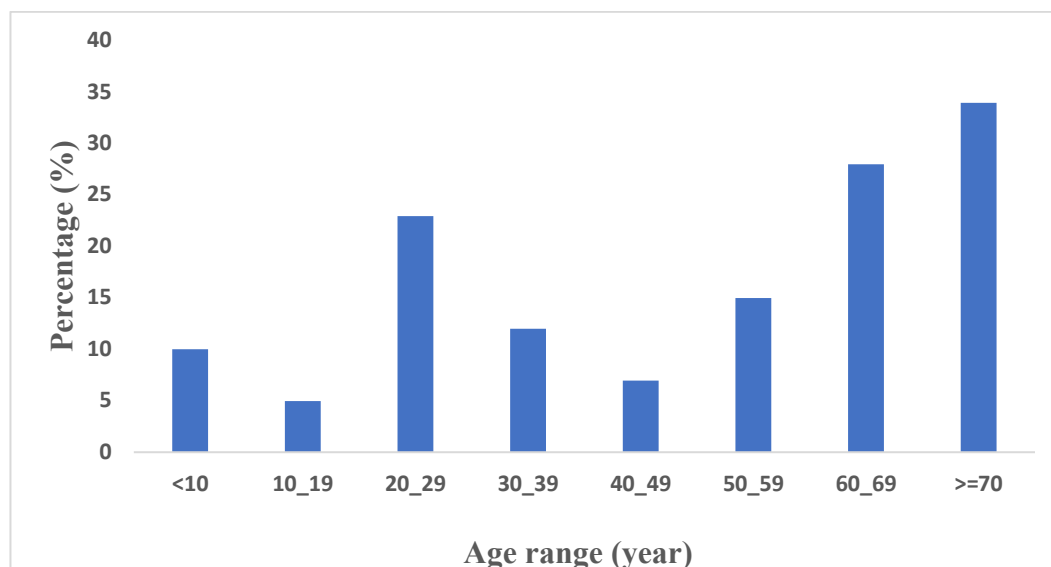


Figure 1 : Distribution of patients by age group

Male patients represented 97.76% (N=131). A total of 40 patients (29.85%) had a specific medical condition, including hypertension in 23.88%, diabetes in 5.97%, and a combination of both in 2.98% of patients. Concerning the ASA classification, 70.90% of the patients were of stage 1, 27.61% of stage II and 1.49% of stage III, stages IV and V were not represented, the patients classified ASA II had 4 times more SSI than the others.

According to the Altemeier classification 37.31% of the patients were stage 1 (clean surgery), 54.48% of the patients were stage 2 (clean contaminated surgery), 5.97% of the patients were stage 3 (contaminated surgery), 2.24% were stage 4 (dirty surgery). No SSI was noted in patients classified as Altemeier 1, SSI was present in 21.92% of Altemeier 2 patients and 25% of Altemeier 3 patients.

BPH was the most common diagnosis (24.63%), followed by urethral stenosis (13.43%), prostate cancer was found in 8.21% of patients. Locoregional anesthesia was the main type of anesthesia, it was performed in 82.84% of patients. Antibiotic prophylaxis was documented in 60.45% of patients; patients who received antibiotic prophylaxis had the same protocol based on the combination of amoxicillin + clavulanic acid administered before the incision.

The duration of surgery was reported in 124 patients with a mean of 72.41 minutes, a standard deviation of 32.36 and extremes of 20 and 210 minutes. Patients with surgery exceeding one hour had 7.1 times more SSI than others. The average length of hospital stay was 9.05 days with extremes of 1 and 65 days. This duration was greater in patients with SSI with a mean of 24.66 days and extremes of 12 and 65 days. It should also be noted that among patients with SSI, those infected with multi-resistant bacteria had a longer hospital stay with an average of 29.8 days. Eighteen patients (13.43%) had an SSI. These SSIs were superficial in 55.56% of cases and deep in 33.33% (Figure 2).

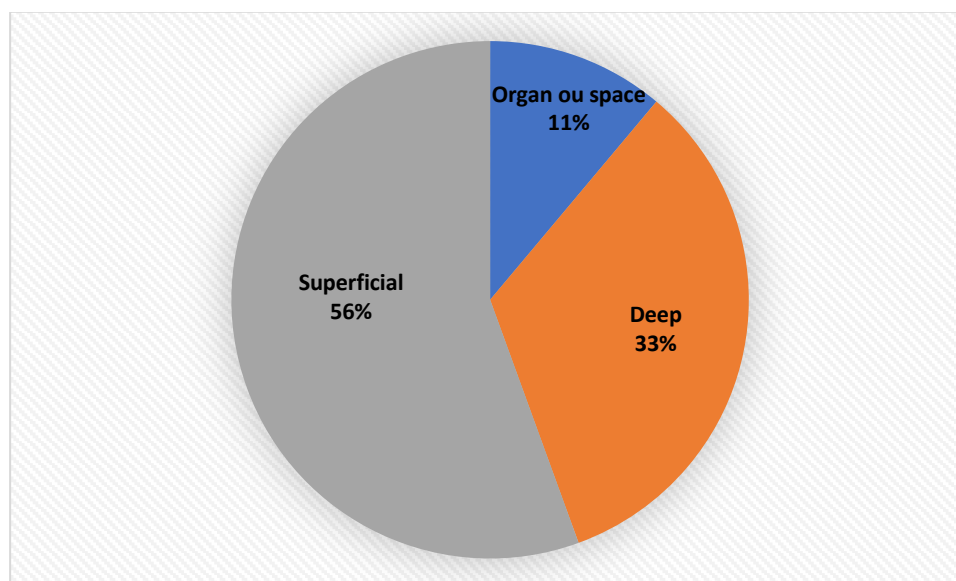


Figure 2 : Distribution of Patients by SSI Type

Almost all patients had received their first dressing on the fourth postoperative day and 61.11% of SSIs were diagnosed at the first dressing.

A total of 27 bacterial strains belonging to eight species were isolated with a strong predominance of enterobacteria, which represented 81.5% of the bacteria isolated (Table I).

The culture was monomicrobial for 10 patients (55.56%), bimicrobial for 7 patients (38.89%) and for three patients (5.56%) three bacteria were isolated.

Table 1 : Frequency of isolated bacteria

Bacteria isolated	Number	Percentage (%)
Enterobacteria N = 22 (81,5 %)		
<i>Enterobacter spp</i>	6	22,22
<i>Klebsiella spp</i>	6	22,22
<i>Morganella spp</i>	6	22,22
<i>Escherichia coli</i>	2	7,4
<i>Proteus vulgaris</i>	1	3,7
<i>Citrobacter diversus</i>	1	3,7
Other bacteria N = 5 (18,5 %)		
<i>Pseudomonas aeruginosa</i>	4	14,84
<i>Staphylococcus aureus</i>	1	3,7
Total	27	100

For the bimicrobial culture, the different combinations were: *Enterobacter spp* with *Escherichia coli*, *Morganella spp*; *Klebsiella spp* with *Pseudomonas aeruginosa*, *Morganella spp* or *Proteus vulgaris*. For the three-bacteria culture, it was *Morganella spp*, *P. aeruginosa* and *S. aureus*.

Concerning the sensitivity of the 22 strains of Enterobacteriaceae, 13 (59%) had a wild-type phenotype towards beta-lactams. In addition, 6 isolates produced an extended spectrum beta-lactamase (ESBL) including *Klebsiella spp* (n=3), *E. coli* (n=2) and *Enterobacter spp*. Multi-resistant bacteria (MRB) were also identified and consisted of *Klebsiella spp* (n=2), *E. coli* (n=2), one of which was ESBL, and *Enterobacter spp* (n=2). For all enterobacteria, no resistance to imipenem was observed. For *Pseudomonas aeruginosa* isolates, 3rd generation cephalosporins (C3G) had good activity. The only *Staphylococcus aureus* strain isolated was susceptible to methicillin. Five of the 27 strains isolated (19%) were BMR belonging to the species *E. coli* (n=1), *Klebsiella pneumoniae* (n=2) and *Enterobacter spp* (n=2). Patients with BMR SSI had a longer hospital stay with a mean of 29.8 days.

DISCUSSION

Most of the contaminations of the surgical site occur intraoperatively from the flora of the patient, the staff or the operating environment and surgical instruments [11]. Despite a better knowledge of the determinants of SSI and their prevention measures, they still remain a real public health problem, thus distorting the expected results in many surgeries. The incidence of SSI is based on the inequalities in development between countries, and the rate is estimated to be between 0.72 and 1.64% in France [12], 5.2% in Morocco [13] and between 6.8 and 26% in sub-Saharan Africa [9]. In Senegal, there is no global estimate of the incidence of SSI, but a number of studies have been conducted showing wide variations in SSI rates depending on the services.

In our series, an SSI rate of 13.43% was found, this rate only took into account patients who presented an SSI during hospitalization. It is within the range of averages found in sub-Saharan Africa [9] but is much higher than the 2.90% found by Tanguy in urology in France [14]. The

occurrence of SSI depends on several factors such as the type of surgery (specialty, degree of contamination), the operating conditions (technical platform, personnel, etc.), the patient's terrain, etc. In our study, the average age of all the patients operated on was 49.49 years and 64.05 years for patients with SSI. Older age was an important factor influencing the occurrence of SSI, as patients aged 60 years and over were 5 times more likely to develop SSI than patients under 60 years. This high average age is observed in most studies in urology [15,16]. This finding could be explained by the fact that the majority of patients managed in these services have prostatic pathologies. SSIs were more frequent in the elderly, which can be explained by the multiplication of comorbidities with age, in particular diabetes, which induces immunosuppression.

The incidence of SSIs varied greatly according to the terrain : hypertensive patients had 3.07 times more SSIs than normotensive patients and diabetics had 4.44 times more SSIs than non-diabetics. This increase in the incidence of SSI in diabetics is found in the literature [17,18] and can be explained by the immune deficiency induced by this disease, especially when the latter is not balanced.

The type of surgery, in particular the degree of contamination, the patients classified as clean surgery (Altemeier 1) had no SSI, those classified as contaminated clean surgery (Altemeier 2) had presented an SSI in 21.92% of cases and in the contaminated surgery class (Altemeier 3), 25% of SSI were found. This increasing distribution of SSI according to the degree of contamination has been found by several authors [19,20]. The duration of the surgery was a determining risk factor in the occurrence of SSI. This observation can be explained by the fact that the increase in the duration of the operation exposes the tissues to a risk of hypoxia, which promotes infection, but on the other hand, the longer the surgery lasts, the greater the risk of contamination of the surgical site by bacteria belonging to the patient's flora or that of the operating environment increases. This relationship between the duration of surgery and the risk of SSI has been demonstrated by Hajjar et al. [21].

A total of eight bacterial species were isolated from the eighteen patients for whom cultures returned positive. Gram-negative bacilli represented seven of the eight bacterial species. A clear predominance of Enterobacteriaceae (81.5%) was noted, with *Morganella spp*, *Klebsiella pneumoniae* and *Enterobacter spp* each being found in 22.22% of cases. This predominance of enterobacteria was found by Seni et al. in Uganda with a high representation of *Escherichia coli* (23%) [22]. This predominance of *Enterobacteriaceae* is explained by their frequency in urinary tract infections, especially since most of the patients in our study suffered from uropathy that promoting urinary infections.

Resistance to antibiotics, in particular to beta-lactams (except imipenem which is active on all the bacteria tested), was found. This resistance was also found on other families of antibiotics tested (aminoglycosides, quinolones, cyclines). These results were reported by many authors. Indeed, a study conducted at the CHR-SL between 2011 and 2012 Lo had found a high level of resistance in enterobacteria responsible for urinary tract infections [23]. Outside our borders also this observation is made on the emergence of enterobacteria secreting beta-lactamases with extended spectrum and multi-resistant [22,24]. This high resistance of bacteria to the antibiotics tested is partly explained by the misuse of antibiotics. In our study, a large proportion of the patients were operated on for uropathy, some of which required permanent

catheterization, a situation known to promote urinary tract infections and consequently the iterative prescription of antibiotics.

CONCLUSION

SSI are a real factor of morbidity and mortality in surgery, especially in our countries where the means of management are limited. They considerably prolong the duration of hospitalization with important repercussions on the costs of management. The increasing emergence of antibiotic-resistant bacteria makes the treatment of these SSI more difficult. It is urgent to set up a system of coordinated control of these SSI at the national level with a continuous monitoring of the resistance of the responsible bacteria to antibiotics. All action undertaken must be multidisciplinary, involving surgical services, bacteriology laboratories.

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