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Brief Report

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Study of Factors Predisposing to Surgical Site Infections (SSI) in the Urology Department of the Cocody University Hospital

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Abstract

Introduction: The aim of this study is to determine the factors contributing to the occurrence of Surgical Site Infections (SSI) in the urology department at Cocody University Hospital.

Patients and Methods: This was a descriptive cross-sectional study with prospective data collection. It took place from February 2024 to January 2026 in the urology department of the Cocody University Hospital. Included in this study were all patients who underwent open surgery in the department and developed a SSI according to CDC criteria. We observed 52 SSIs out of 160 patients.

Results: Postoperative infections were observed in 32.5% of patients who underwent surgery. The mean age was 54.9 years [18-87 years]. Hypertension and diabetes were the most common comorbidities, found in 34.8% and 13% of patients, respectively. A preoperative urine culture had not been performed in 60.9% of patients. The majority of patients underwent surgery in the elective surgery operating room (63% of cases), while 23.9% were operated on in the treatment room. There were more than eight people in the operating room in 47.7% of cases. Preoperative hygiene

Conclusion: The most common risk factors for surgical site infections were: inadequate preoperative hygiene and a high number of people in the operating room.

Keywords: Infection; Open surgery; Surgical wound

Introduction

Since 1992, the Centers for Disease Control and Prevention (CDC) have defined a SSI as any infection occurring at the operative site within thirty (30) days of the procedure, or within one year if an implant or prosthesis is inserted [1]. Since then, this definition has been universally adopted by national and international surveillance systems. According to the WHO, 11% of surgical patients in resource-limited settings develop an SSI, resulting in a significant impact on morbidity, mortality, length of hospital stay, and healthcare costs [2]. At the Urology Department of the Cocody University Hospital, where open surgery remains common, we decided to study the factors contributing to the occurrence of SSI. This will enable us to implement preventive measures to significantly reduce their incidence.

Patients and Methods

This was a descriptive cross-sectional study involving prospective data collection. It was conducted over a 24-month period, from February 2024 to January 2026, at the Urology Department of the Cocody University Hospital (CHU). The study included all patients

who underwent open surgery in the department and subsequently developed a SSI according to CDC criteria. Patients operated on in another department and later transferred to urology, those with incomplete or unusable medical records, and those who declined to participate were excluded.

We observed 52 cases of SSI; 46 were retained for analysis after excluding 6 patients lost to follow-up. We examined socio-demographic, operative, and postoperative parameters.

Results

During the study period, we performed open surgery on 160 patients; 52 of these (35.2%) developed a SSI. We included 46 patients in the final analysis after excluding 6 who were lost to follow-up. The mean patient age was 54.9 years [range: 18-87 years]; patients over the age of 60 accounted for 51% of the cohort. Males represented 87% of the patients, with a male-to-female sex ratio of 6.66. Among the procedures performed, transvesical adenomectomy and bilateral orchiectomy were the most common, accounting for 26.3% and 30.4% of cases, respectively (Table 1).

Procedures	Number (n)	Frequency (%)
Open prostatic adenomectomy	**11**	**23.9**
Bilateral orchiectomy	**15**	**32.6**
Inguinal hernioplasty	5	10.9
Nephrectomy	4	8.6
Pyelolithotomy	2	4.3
Cystolithotomy	2	4.3
pyeloplasty	1	2.2
Partial cystectomy	1	2.2
Cystostomy	1	2.2
Unilateral orchiectomy	1	2.2
Hydrocelectomy	1	2.2
Cystectomy (head of right epididymis)	1	2.2
End-to-end urethroplasty	1	2.2
Total	46	100

Table 1: Distribution according to the surgical procedure performed.

The most common comorbidities were diabetes and hypertension, present in 13% and 34.8% of patients, respectively; half of the patients had no comorbidities. Preoperative urine culture was not performed for 60.9% of patients. None of the patients had undergone preoperative washing, and 45.6% had an indwelling urinary catheter. Bed linen was brought from home for 65.21% of the patients. Procedures were performed in the elective surgery operating room (60% of cases), the emergency surgery operating room (13.1% of cases), or the treatment room (23.9% of cases). Intraoperative contamination was observed in 39.2% of cases; this involved contamination of the surgical field by the surgeon's sweat in 6.6% of cases, and the use of non-sterile surgical equipment in 32.6% of cases. As noted, there were more than eight people in the operating room in 47.7% of cases. Class I surgery was the most common type performed (47.8% of cases (Table 2)).

Class	Count (n)	Frequency (%)
Class I (clean)	**22**	**47.8**
Class II (clean-contaminated)	**15**	**32.6**
Class III (contaminated)	7	15.2
Class IV (dirty/infected)	2	4.4
Total	46	100

Table 2: Distribution by type of surgery performed.

The various clinical signs of the observed surgical site infection are presented in Table 3.

Symptoms	Number (n)	Frequency (%)
Purulent discharge	**38**	**82.6**
Fever > 38°C	**4**	**8.7**
Redness	3	6.5
Pain	1	2.2
Total	46	100

Table 3: Distribution according to observed symptoms.

These symptoms appeared within 2 to 6 days in 28.2% of patients and within 7 to 10 days in 58.6%. The suppuration was superficial incisional in 65.79% of patients, deep incisional in 31.58%, and involved the operated organ in 2.63% of cases. Bacteriological sampling was performed on 34.8% of patients (16 patients). This led to the isolation of *Klebsiella pneumoniae* in 10 of the 16 patients and *Pseudomonas aeruginosa* in 3 of the 16 patients. *E. coli*, *Proteus mirabilis*, and *Staphylococcus aureus* were each isolated in one patient. The antibiotic susceptibility of these organisms is shown in Table 4.

Antibiotic	Pathogens				
	E. coli	*Klebsiella pneumoniae*	*Pseudomonas aeruginosa*	*Staphylococcus aureus*	*Proteus mirabilis*
Ceftriaxone	60.2%	72.7%	0	0	100%
Gentamicin	40.1%	60%	0	100%	100%
Imipenem	100%	100%	100%	0	100%
Meropenem	100%	100%	100%	0	100%
Amoxicillin + Clavulanic Acid	21.4%	12.2%	0	100%	0
Ciprofloxacin	33.8%	41.1%	12%	100%	0
Amikacin	80%	72%	100%	0	100%

Table 4: Distribution according to the sensitivity of microorganisms to antibiotics.

Following antibiotic therapy and local care, we observed a cure rate of 95.65%, and death occurred in 2 patients, representing 4.35% of cases.

Discussion

The mean age of the patients in our series was 54.9 years, ranging from 18 to 87 years, with a marked male predominance (87%). In their study at the Brazzaville University Hospital, Ondongo Atipo et al. found a mean age of 58.3 years among infected patients, with a male predominance, consistent with our figures [3]. Abdoulaye Ousmane et al. in Niamey [4-6] also noted a male predominance. This consistency is primarily explained by the patient profile seen in our departments: prostatic conditions (BPH, prostate cancer) and inguinal hernias account for the bulk of our open surgical activity and, by definition, affect older men. In our study, the surgical procedures most frequently associated with Surgical Site Infections (SSI) were transvesical prostate adenomectomy and bilateral orchiectomy, occurring in 26.3% and 30.4% of cases, respectively. Abdoulaye et al. in Niamey also observed a predominance of lower urinary tract procedures in their surgical practice [4]. Meanwhile, Ondongo Atipo et al. reported that prostate surgery accounted for 42.58% of their procedures, with an SSI rate reaching 47.91% within this specific group [3]. This significant figure confirms that patients with prostatic disease are particularly vulnerable to postoperative infections in our resource-limited settings. Late diagnosis of prostate cancer also explains why bilateral orchiectomy-primarily a palliative castration procedure-ranks among our most common surgeries. Due to a lack of access to LHRH analogues, which remain expensive, surgical castration continues to be the most accessible form of androgen deprivation therapy in our setting.

Half of our patients (50%) had no significant medical history. Among those who did, hypertension was the most common condition (34.8%), followed by diabetes (13%). Both conditions impair microcirculation and wound healing and are recognized risk factors for SSI. Ondongo Atipo et al. [3] found comorbidities in 43.75% of their infected patients and an SSI rate of 52.09% among ASA III patients. Furthermore, a meta-analysis by Ngaroua et al. [5], covering 11 studies from sub-Saharan Africa, identifies underlying medical conditions as one of the most frequently cited risk factors.

In our view, preoperative urine culture is the most problematic aspect of our series. 60.9% of our patients did not undergo this test prior to surgery. Among those who did, 38.8% showed an Escherichia coli infection. This figure should be compared with the findings of Ondongo Atipo et al. [3], who reported an SSI rate of 70% in patients with a positive preoperative urine culture. In surgery involving the urinary tract or performed in close proximity to it, operating without knowledge of the patient's urinary flora means accepting a risk of intraoperative contamination that could have been prevented. This practice, still too common in our department, must be rectified.

The predisposing factors identified in our study notably inadequate preoperative hygiene, comorbidities, failure to perform preoperative urine culture, the presence of more than eight people in the operating room, and inadequate bedding largely align with those reported by Ngaroua et al. [5]. In a sub-Saharan context, they identified the following factors: long operative duration, Altemeier classes 3 and 4, inadequate preparation, anemia, presence of a drain, prolonged preoperative stay, extremes of age, and underlying medical conditions. Typically, according to the Altemeier classification, the expected SSI rate for clean surgery ranges from 1% to 5%. However, in our series, the majority of SSI occurred in patients classified as Class I and II, accounting for 47.8% and 32.6% of cases, respectively. Most of our infections thus arose during surgeries considered to carry a low microbiological risk. This strongly suggests that the problem stemmed from deficiencies regarding the environment, asepsis, sterilization, or the conditions of the operating rooms, treatment

rooms, and patient wards. A lack of clean bed linen in the urology department constituted an additional risk factor. Indeed, due to an insufficient supply of sheets, some patients' families were forced to bring sheets from home, while other patients were left with no sheets on their beds. These substandard accommodation conditions represent a significant factor in the occurrence of SSI.

Regarding postoperative antibiotic therapy, ceftriaxone was used in 67.3% of cases, followed by ofloxacin (28.6%). This choice is noteworthy, given that guidelines from the CIAFU [6] and the WHO [2] recommend first- or second-generation cephalosporins (such as cefazolin or cefuroxime) for clean urological surgery. Ceftriaxone, a third-generation cephalosporin, should be reserved for specific indications. Its widespread use for prophylaxis presents two problems: firstly, it exerts selective pressure on extended-spectrum beta-lactamase (ESBL) producing Enterobacteriaceae; secondly, its long half-life offers no prophylactic advantage over cefazolin. Added to this is the significant use of ofloxacin, despite the fact that fluoroquinolone resistance rates in African hospital settings have risen considerably in recent years [7,8].

Purulent discharge was the predominant clinical sign of ISO, observed in 82.6% of patients. The majority of symptoms appeared between the 6th and 10th postoperative day (58.6%). These findings are consistent with the study conducted in Niamey [4], which showed that surgical site infection manifested within a similar timeframe and emphasized the importance of prolonged postoperative monitoring. Suppuration was observed in 38 patients; 81.5% of cases were superficial, 15.8% were deep, and 2.7% involved infection of the operated organ. Superficial surgical site infections suggest that contamination occurs primarily at the time of wound closure, in the immediate postoperative period, or during the first dressing changes.

Bacteriological samples were collected from only 34.8% of our infected patients. This low proportion limits the scope of our microbiological analysis; of the 16 samples analyzed, *Klebsiella pneumoniae* was the most frequently isolated organism (21.7%), followed by *Pseudomonas aeruginosa* (6.5%). The predominance of *Klebsiella pneumoniae* is a finding worth discussing, since in Niamey, Abdoulaye Ousmane et al. [4] identified *Staphylococcus aureus* as the most common pathogen (31%), followed by *E. coli* (23%) and *Pseudomonas aeruginosa* (9.5%), with Klebsiella not being predominant. In Conakry, Bah I. et al. [9] described *E. coli* as the dominant pathogen in postoperative urinary tract infections following adenomectomy. Several hypotheses may explain the prominent role of *Klebsiella pneumoniae* in our series. The first, already mentioned, is the selection pressure exerted by the widespread use of ceftriaxone: this bacterium is known for its potential to produce ESBL-producing strains. The second is environmental: Klebsiella is a typical nosocomial pathogen that colonizes surfaces, intravenous solutions, poorly sterilized equipment, and urinary catheters. However, 45.6% of our patients had an indwelling urinary catheter, which constitutes an ideal entry point. Finally, we cannot rule out a selection bias related to the low rate of specimen collection.

Imipenem and meropenem remained 100% active against all isolated Enterobacteriaceae (*K. pneumoniae*, *E. coli*, *P. mirabilis*). This result is consistent with the African literature [4,10,11]. Carbapenems therefore remain, to date, the most reliable antibiotics of choice in our setting. However, we must remain realistic, as their effectiveness depends on strictly regulated use; otherwise, as in other regions, we will see the emergence of Carbapenem-Resistant Enterobacteriaceae (CRE), which pose a nearly insurmountable therapeutic challenge in the African context.

Resistance profiles for other antibiotics are cause for concern. *Pseudomonas aeruginosa* was completely resistant to ceftriaxone and gentamicin, and 88% resistant to ciprofloxacin. *Klebsiella pneumoniae* retained only 12.2% susceptibility to amoxicillin-clavulanic acid and 72.7% to ceftriaxone. These figures are consistent with those reported in Niamey [4] and indicate the likely circulation of ESBL-positive strains. All of this reflects a phenomenon now well established in the subregion, which is further exacerbated by self-medication, unregulated prescribing, and the lack of structured microbiological surveillance. The outcome was favorable in 86.9% of patients, with two deaths (4.3%). While this mortality rate must be considered in light of our small sample size, it remains high for a complication that is theoretically preventable.

Conclusion

ISO is a common postoperative complication in the urology department at Cocody University Hospital. They occur in a context marked by deficiencies in perioperative hygiene, inadequate preoperative urine culture testing, and the presence of significant comorbidities. They most often manifest as purulent discharge. *Klebsiella pneumoniae* was the predominant pathogen in our study, reflecting selective pressure associated with the repeated use of third-generation cephalosporins for antibiotic prophylaxis. The prevention of surgical site infections (SSIs) in our setting relies primarily on the systematic performance of preoperative urine culture, strict enforcement of aseptic measures in the operating room, the rationalization of antibiotic prophylaxis, and the systematic collection of bacteriological specimens accompanied by an antibiotic susceptibility test. The implementation of an institutional program for monitoring nosocomial infections at the Cocody University Hospital appears to be an urgent necessity to improve the quality and safety of surgical care in urology.

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