International Journal of
Recent Innovations in Medicine and Clinical Research
Open Access, Peer Reviewed, Abstracted and Indexed Journal

ISSN: 2582-1075
https://ijrimcr.com/
Volume-2, Issue-4, 2020: 92-96

Research Article

Epidemiology of Post-Operative Infections in Traumatology Services, Hospital Ibn Tofail, Mohammed VI UHC of Marrakech

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Received: October 27, 2020 **Accepted:** November 17, 2020 **Published:** November 25, 2020

Abstract: Introduction: Post-operative infections are one of the leading causes of mortality and morbidity in surgery. They represent a serious complication in trauma surgery and limit the potential benefit of surgical interventions. **Material and method:** Our work is a prospective descriptive study carried out over a period of one year, going from January to December 2017, the samples of which were taken at the level of the traumatology-orthopedics department, then analyzed in the bacteriology laboratory, the Ibn Tofail hospital, CHU Mohamed VI of Marrakech. All patients who had undergone surgery and subsequently developed postoperative infection at least 72 hours after surgery were included in the study. **Result:** During the study period 55 postoperative infections were diagnosed in 78 operated subjects. The number of germs isolated is 112, 70% of which are BGN and 30% CGP. The distribution by bacterial family demonstrated the predominance of Enterobacteriaceae which represented 46% of isolates, followed by Staphylococci (26%), then non-fermenting BGNs (24%), and Streptococci (4%). The level of resistance of bacteria had shown that all *A. baumannii* strains were resistant to imipenem, 70% of Enterobacteriaceae showed high level resistance, then 50% of *P. aeruginosa* were resistant to ceftazidime, and the MRSA rate was 47%. Multidrug resistant bacteria are dominated by ABRI (34%), followed by ESBL-producing Enterobacteriaceae (EBLSE) (29%), MRSA (20%), Carbapenemasous Enterobacteriaceae (ECARBA) (10%) and PARC (7%). ECARBAs exhibit a high level of resistance to aminoglycosides. Both EBLSEs and ABRI were resistant to aminoglycosides and quinolones. For MRSA, only teicoplanin and vancomycin remain active on these bacteria. Finally, PARC showed strong resistance to all antibiotic families. All strains were sensitive to colistin. **Conclusion:** There are multiple risk factors for postoperative infections in trauma, the most important of which are related to inadequate practices in adequate care, sometimes unsatisfactory technical platforms, advanced state of pathologies.

Keywords: Infection, post-operative, traumatology.

Introduction

Post-operative infections represent a serious complication, ruining the benefit of an intervention intended to improve function or repair the consequences of trauma, if sometimes they do not involve the life-threatening [1]. The objective of this work was to describe the epidemiological aspect and post-operative infections in orthopedic-trauma surgery.

Material and Method

Our work is a prospective descriptive study carried out over a period of one year, going from January to December 2017, whose samples were taken at the traumatology-orthopedics department, then analyzed in the bacteriology laboratory, of the Ibn Tofail hospital, Mohamed VI University Hospital of Marrakech. It concerns patients hospitalized in the department with a post-operative infection were included in the study, all patients who underwent surgery and subsequently developed a post-operative infection at least 72 hours after surgery. Excluded were patients with documented infection on admission prior to surgery.

The patient samples were seeded on selective and non-selective media, namely, mannitol agar (Chapman), cooked horse blood agar (Chocolate), lactose agar (Mac Conkey) and Columbia 5% agar of sheep's blood. The identification of the strains was based on the study of the characters of the bacterial families, their morphological, cultural and biochemical characters.

Antibiotic resistance was detected by the diffusion method on agar medium. The choice of antibiotics and the criteria for interpretation of the antibiogram were made according to the standards of the Antibiotic Committee of CASFM / EUCAST 2017.

Results

During the study period, 55 postoperative infections were diagnosed in 78 operated subjects, a frequency of 70%. It was 68% men and 39% women (sex ratio M / F 2.1). The average age of the patients was 56.51 years. The average length of stay in hospital was 36.14 days + 37.1.

51.9% of patients received probabilistic antibiotic therapy. The most commonly administered antibiotics were 3rd generation cephalosporins (40.4%), gentamycin (36.5%) and metronidazole (32.7%). The patients were operated on for a fracture, open or closed, following which osteosynthesis material was implanted.

The number of isolated germs is 112 including 70% of gram negative bacilli (GNB) and 30% gram psotove cocci (GPC). In 45% of the cases, it was a polymorphic culture and 24% a monomorphic one. The distribution by bacterial family objectified the predominance of enterobacteria which represented 46% of isolates, followed by Staphylococci (26%), then non-fermenting GNB (24%), and Streptococci (4%). The distribution of bacteria by species showed the predominance of *S. aureus* (21%), followed by *A. baumannii* (17%) and *K. pneumoniae* (14%) (Table 1).

Table 1. Distribution of isolated germs

Germs	Number	Percentage (%)
Cocci à Gram positif	34	30
Staphylocoques	**28**	**25**
S. aureus	23	20
SCN	5	5
Streptocoques	**6**	**5**
Streptococcus spp	3	2,5
Enterococcus faecalis	3	2,5
Bacilles à Gram négatif	78	70
Entérobactéries	**56**	**50**
K. pneumoniae	17	15
P. mirabilis	16	14
E. cloacae	11	10
E. coli	9	8
Serratia marcescens	3	3
Bacilles à Gram négatif non fermentant	**22**	**24**
A. baumannii	14	13
P. aeruginosa	8	7
Total	**112**	**100**

The resistance level of bacteria had shown that all strains of *A. baumannii* were resistant to imipenem, 70% of enterobacteria had high resistance, then 50% of ceftazidime-resistant *Pseudomonas aeruginosa* (CRPA)**,** and Methicillin-resistant *Staphylococcus aureus* (MRSA) levels was 47% (Table 2).

Table 2. Bacterial resistance to different families of antibiotics

Antibiotics	**Enterobacteriaceae (%)**	***A. baumanii* (%)**	***P. aeruginosa* (%)**	***S. aureus* (%)**
Penicillin G	-	-	-	100
Ampicillin	100	-	-	-
Amoxicillin	89	-	-	-
Ticarcillin	84	100	83	-
Ticarcillin-clavulanic acid	-	100	66	-
Piperacillin	-	100	83	-
Piperacilline-tazobactam	-	100	66	-
Ceftazidime	57	100	50	-
Cefepime	-	100	-	-
Cefoxitine	-	100	-	47
Imipenem	22	100	50	-
Gentamycin	34	93	50	47
Tobramycin	-	28	50	-
Amikacin	3	28	50	-
Ciprofloxacin	75	100	50	47
Erythromycin	-	-	-	29
Lincomycin	-	-	-	6
Pristinamycin	-	-	-	6
Vancomycin	-	-	-	0
Teicoplanin	-	-	-	0
Tigecycline	0	-	-	0
Fusidic acid	-	-	-	53
Trimethoprim-sulfamethoxazole	84	-	-	6
Colistin	**0**	**0**	**0**	**0**

Multidrug-resistant bacteria are dominated by imipenem resistant *Acinetobacter baumannii* (IRAB) (34%), followed by ESBL-producing enterobacteria (ESBL) (29%), MRSA (20%), Carbapenaemic enterobacteria (ECARBA) (10%) and CRPA (7%). ECARBAs have a high level of resistance to aminoglycosides. Both ESBL and IRAB were resistant to aminoglycosides and quinolones. For MRSA only teicoplanin and vancomycin remains active on these bacteria. Finally, CRPA was highly resistant to all families of antibiotics. All strains were sensitive to colistin (Table 3).

Table 3. Profile of Co-resistance of MDRs identified with other families of antibiotics

Antibiotics	**ECARBA (%)**	**ESBL (%)**	**MRSA (%)**	**IRAB (%)**	**CRPA (%)**
Ciprofloxacin	75	91	87	100	100
Tobramycin	100	8	100	28	100
Gentamycin	100	83	100	93	100
Amikacin	100	8	100	64	100
Tigecycline	25	8	100	28	100
Colistin	0	0	-	0	0
Vancomycin	-	-	0	-	-
Teicoplanin	-	-	0	-	-
Erythromycin	-	-	62	-	-
Lincomycin	-	-	100	-	-
Pristinamycin	-	-	100	-	-
Trimethoprim-Sulfamethoxazole	75	50	12	50	0

Discussion

This study describes the bacterial epidemiology within trauma-orthopedic departments based on the analysis of antibiograms of the strains isolated in osteo-articular samples from patients who have undergone an implant of osteosynthesis material. The NGB remain the most predominant with 70% of the isolates. This rate is significantly higher than that reported by Lafosse et al. (7%) [2] as well as Titécat et al. (12.3%) [3]. On the other hand, the Malagasy series [4], had also reported a predominance of NGB. Regarding the level of resistance of NGB, our study sounded the alarm about the sensitivity to betalactamines within our establishment. Indeed, we report a resistance of more than 50% to ceftazidime. As for imipenem, the resistance of Enterobacteriaceae, *Pseudomonas aeruginosa* and *Acinetobacter baumanii* was 22%, 50% and 100% respectively. The emergence of multi-resistant strains should prompt an urgent installation of a post-operative surveillance program.

In the literature, Staphylococcus is the germ most frequently found in postoperative infections in orthopedic surgery, with or without equipment. Thus, the majority of European studies report the predominance of Staphylococcus [2,3,5-7]. African series [8-10] are analogous to European epidemiology, with the exception of certain authors [4,11] who report the predominance of other germs in their series, like ours. Titécat et al. [3] as well as other authors [12-14], report the predominance of the CoNS. In 2011 the rate of CoNS was 43% with 22% of resistance to teicoplanin, 2.3% to vancomycin and 17.7% [3]. *Staphylococcus aureus* is the most represented in our context (80%) and was methicillin resistant in 47% of cases. However, no resistance to glycopeptides or rifampicin was encountered.

Broad-spectrum antibiotic prophylaxis is often necessary [15]. This exposes the patient to the selection of resistant bacteria and is not without consequences for the bacterial ecology of the department [3]. The most frequently used antibiotic prophylaxis in our context was C3Gs as well as gentamycin. This explains the emergence of resistance to these molecules. On the other hand, glycopeptides and rifampicin are not commonly used, hence the preservation of sensitivity to these antibiotics. Regarding the risk factors for postoperative infection in trauma, diabetes mellitus, smoking, immunosuppressive state, advanced age and obesity have been established, in multivariate studies, as related risk factors to the patient [16]. Surgical factors include the length of the procedure, the number of people in the operating room, and major blood loss during the procedure [16,17]. This requires adherence to strict protocols both pre-, per- and postoperative as well as closer and prolonged monitoring postoperatively.

Conclusion

This study achieved its objective by addressing the rate of infections in post-operative consequences in orthopedic surgery. It highlighted the seriousness of the situation in relation to the frequency of these infections and the emergence of resistance to antibiotics as well as MRB. The results of this work should encourage the identification of risk factors specific to our context as well as the establishment of a postoperative surveillance program.

Conflicts of interest: None

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Citation: Khayati S, Rada R, Said LA, Zahlane K. Epidemiology of Post-Operative Infections in Traumatology Services, Hospital Ibn Tofail, Mohammed VI UHC of Marrakech. Int J Rec Innov Med Clin Res. 2020;2(4):92-96.