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RESEARCH ARTICLE

BACTERIOLOGICAL PROFILE OF INFECTIONS IN BURNS UNIT - PLASTIC AND RECONSTRUCTIVE SURGERY DEPARTMENT - MOHAMMED VI CHU MARRAKECH

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Abstract

The nosocomial bacterial infection being one of the main causes of morbidity and mortality in burn patients, our work aimed on describing the nosocomial bacterial infections in order to establish the bacteriological profile to adapt the antibiotic therapy to our service. This is a retrospective study of 502 bacteriological samples taken from 65 patients hospitalized in the Resuscitation of burns of the plastic surgery department of the CHU Mohamed VI of Marrakech, over a period of 3 years, from January 1, 2016 to December 31, 2018. For this which is characteristic of bacterial infections, the infected sites were mainly the skin (50.1%) and blood (37.7%). The main germs were: Coagulase Negative Staphylococcus (32.1%), Acinetobacter Baumannii (13.8%) Staphylococcus Aureus (8.45%) AND Pseudomonas Aeruginosa (8.2%). Staphylococci were metabolic-resistant in 16.6% of cases Pseudomonas and Acinetobacter were multidrug resistant (60%). Establishing the bacterial ecology of the service, allowed us to set the right rules for prescribing antibiotic therapy, which was a function of the infected site, the type of germ, its sensitivity, the molecule used and the particular pharmacokinetics in the burn patient.

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Introduction:-

Infection has long been the leading cause of death in burn victims. In clinical practice, the attending physician is often led to resort to a powerful but often empirical antibiotic treatment. The inappropriate use of antibiotic therapy can have major consequences, including morbidity, mortality, sequelae, length of stay and additional cost. It is therefore essential, once the diagnosis of infection is made, to have recourse to effective antibiotics in a probable manner firstly then adapted to the microorganisms involved and their susceptibility to antibiotics in a second step.

The objective of our work is to:

1. Establish the microbiological profile of infections encountered in our burn victims.
2. Identify the incidence of resistance of the main strains to available antibiotics.
3. Establish a probabilistic antibiotic therapy protocol for burn victims hospitalized in our department.

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Material and Methods:-

We carried out a retrospective analytical study over a period of 3 years from January 1, 2016 to December 31, 2018 which allowed us to collect the various data concerning the experience of the plastic surgery department with regard to burned infection.

The assays of Vancomycinaemia and Amikacinaemia were carried out by immunological techniques: EMIT technique (Enzyme Multiplied Immunoassay Technique).

Resultats:-

Infectious sites:

During the study period, our patients benefited from 502 bacteriological samples from which we were able to identify 351 strains.

Among the strains identified, 181 (50.99%) are identified on skin swabs, 134 (37.75%) on blood cultures, 25 (7.04%) on EBCU and 15 (4.23%) on cultures of proximal tips of central venous catheters.

Germs found in bacteriological examinations:

Staphylococcus is the most frequently encountered germ in our series; we find 30 cases of golden staphylococci (8.45%), coagulase negative staphylococci (mostly staphylococcus epidermidis) were found 114 times (32.11%).

In second position, we find Acinetobacter Baumanii with 49 isolates (13.80%).

Klebsiella Pneumoniae, Pseudomonas Aeruginosa and Escherichia Coli also constitute a large part of the germs encountered (Table I).

Table I :- Germs identified on samples taken from our patients.

	Number	Percentage
BGN		46,19%
BGN non-fermenting	79	22,25%
Acinetobacter baumanii	49	13,80%
Pseudomonas aeruginosa	29	8,17%
Stenotrophomonas maltophilia	1	0,28%
Enterobacteriaceae	85	23,94%
Escherichia Coli	25	7,04%
Enterobacter Cloacae	16	4,51%
Serratia marcescens	2	0,56%
Klebsiella pneumoniae	35	9,86%
Pantoea spp	1	0,28%
Proteus mirabilis	5	1,41%
Providencia stuartii	1	0,28%
Cocci gram positive	172	48,45%
Entérocoques faecalis	15	4,23%
Enterococcus faecium	6	1,69%
S. Aureus	30	8,45%
SCN	114	32,11%
Streptococcus spp	7	1,97%
Bacille Gram positive	1	0,28%
Bacillus	1	0,28%
others	18	5,07%
Candida Albicans	10	2,82%
Candida no albicans	8	2,25%

Distribution of germs according to the infectious site:

Staphylococcus was identified 80 times on skin samples (44.1%) including 21 Staphylococcus Aureus and 59 Staphylococci with Negative Coagulase.

The germ most frequently encountered in blood cultures is Negative Coagulase Staphylococcus (40.29%) followed by Acinetobacter in 22 cases (16.42%),

Among the 25 strains identified on ECBU, 6 (24%) are Klebsiella Pneumoniae. The other germs identified are Acinetobacter Baumannii, Pseudomonas Aeruginosa, Escherichia Coli (20% each) and Enterobacter Cloacae 4 times (16%).

The germ most frequently identified on the cultures of the tips of central venous catheters is Acinetobacter Baumannii which was isolated 5 times (33.33%), followed by Klebsiella Pneumoniae and Pseudomonas Aeruginosa identified 3 times each (20%).

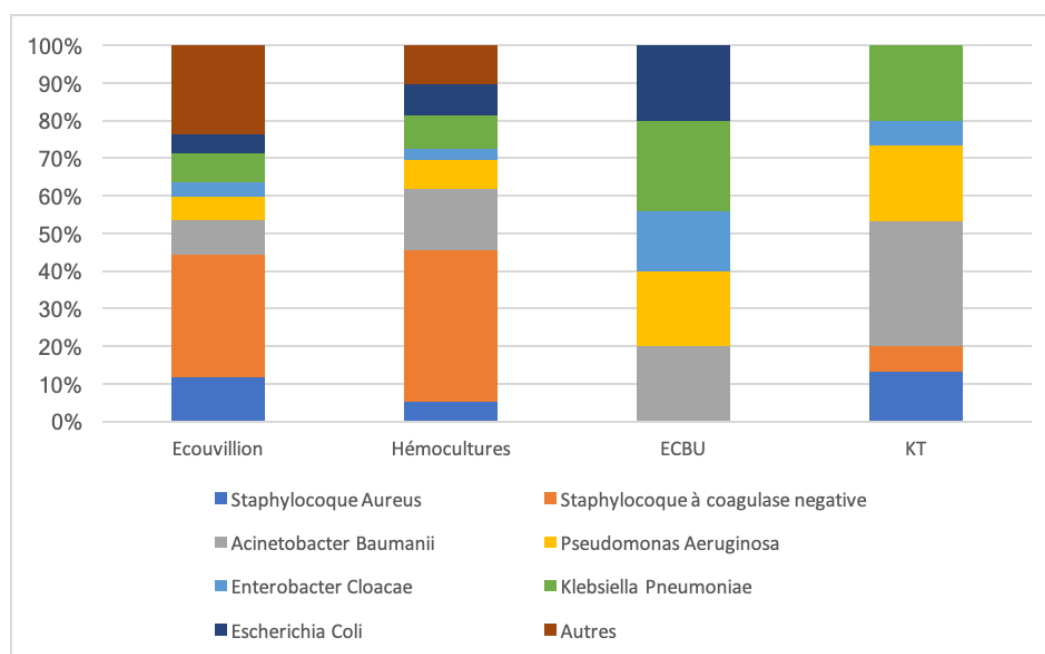


Figure 1:- Distribution of isolated germs according to the infectious site.

The distribution of germs according to the age of the burn

The germs most frequently identified on the samples taken before D7 of the burn are Staphylococcus Aureus and Staphylococcus with Coagulase negative (48.9%)

After D7 of the burn, coagulase-negative staphylococcus (32.4%) is still frequent but there is an increase in the occurrence of infection with non-fermenting BGN (28.8%) and enterobacteria (17.1%).

Antibiotic resistance profile:

Among the 30 Aureus Staphylococci identified, 5 (16.6%) are resistant to Meticillin. We note that no resistance to methicillin was observed on the samples taken before D5 of the burn.

All Aureus Staphylococci in our series are sensitive to glycopeptides.

All the identified SCN strains identified on our samples are multiresistant but they remain sensitive to glycopeptides.

Regarding enterobacteria, We mainly studied the sensitivity to C3G. However, they are sensitive to Amikacin, Imipenem, and colistin.

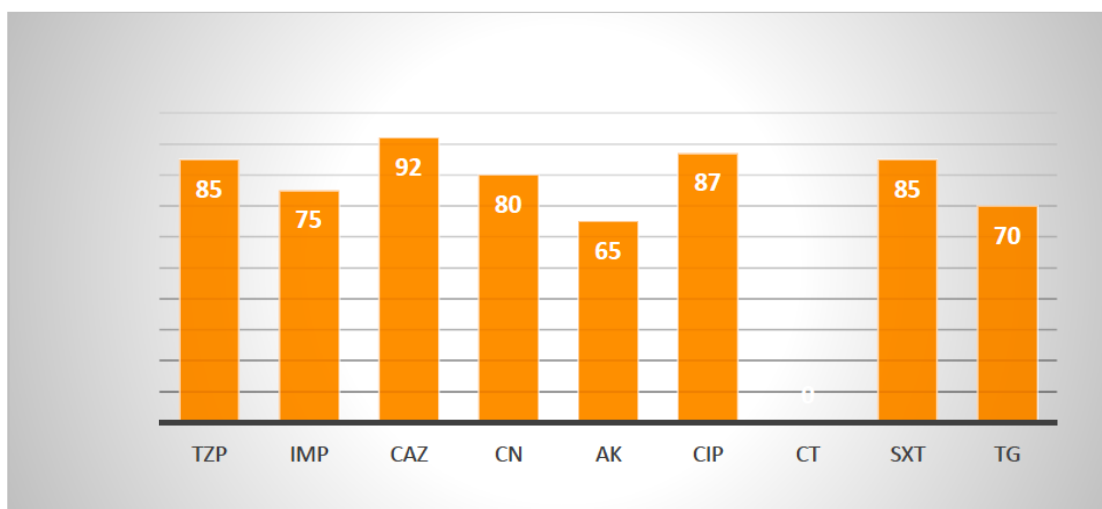


Figure 2:- Resistance profile of *Acinetobacter baumannii* isolates expressed as a percentage.

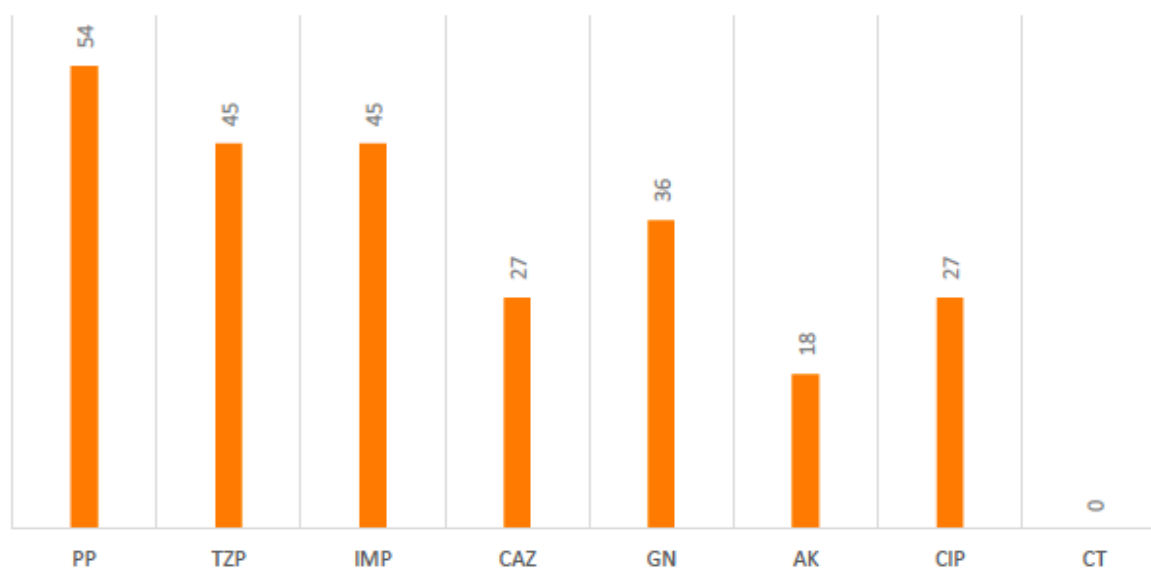


Figure 3:- Resistance profile of *Pseudomonas Aeruginosa* isolates expressed as a percentage.

Table II:- Prevalence of ESBL enterobacteria in burn patients.

	Numbre	Percentage
Enterobacteries BLSE	61	71,8%
<i>K. pneumoniae</i>	29	34,1%
<i>E.coli</i>	14	16,5%
<i>Enterobactercloacae</i>	10	11,8%
<i>Autres</i>	8	9,4%
Enterobacteries Sensibles aux C3G	24	28,2%
TOTAL	85	100%

Discussion:-

In our study, the skin site is the most frequent: it represents 50.1% of nosocomial infections. It is the least frequent in the study by Badetti [2] and Wurtz [3]. In the work of Cremer [1] and Taylor [19], skin infections are also the most frequently encountered. The low incidence of skin infections found by Wurtz [3] (3% of infections) is attributed to the common practice of excision of early transplant surgery.

The predominance of skin infection in our series can be correlated with the high frequency of skin samples compared to other studies or to manual delivery and the rules of asepsis which are sometimes forgotten.

In our study, the isolates were mainly composed of Staphylococci (SA and SCN) representing 41% of the total isolates, this predominance of Staphylococci, also reported by certain studies [4-5], is not confirmed by others [6- 7] where *Pseudomonas aeruginosa* is the predominant germ. The frequency of isolation of *Acinetobacter baumannii* in our study was 13.8%. The emergence of *Acinetobacter baumannii* is reported by numerous studies which report an increase in its incidence from 0.83% to 14.5% in five years [8-9]. It testifies to the colonization then to the infection of burned patients from the environmental flora where this bacteria is able to resist several months [10,11].

Bahemia [12] finds a predominance of *Acinetobacter Baumannii* followed by *Pyocyanic* and then MRSA in blood cultures. This difference from our series can be explained by the high predominance of SNA linked to aseptic faults during sampling and which is not always pathogenic.

Lesens [13] reports that only 12-25% of SCN positive blood cultures are bacteremia. To make sure that it is an infection, you must: Have clinical signs of sepsis and have at least 2 blood cultures taken at different times under good aseptic conditions. The germs most frequently identified on the cultures of central catheters are the BGN contrary to the literature which describes a predominance of staphylococci. The place occupied by Gram-negative bacilli is more and more important, in particular when the catheters are inserted in the lower cavity territory [14].

The authors differentiate early infections occurring less than 7 days after the burn from late infections occurring more than 7 days.

According to this scheme, in our series, the germ most frequently encountered in early infections is *Staphylococcus Aureus*. The results of our study are then similar to what is found in the literature.

As for late infections, they are most often caused by CNS, non-fermenting BGN and enterobacteria. Indeed, Bahemia reports that *Acinetobacter Baumannii* is isolated on average on D16 of hospitalization and *Pseudomonas Aeruginosa* is isolated on D12 on average.

This difference in bacterial ecology depending on the time it takes for the infection to settle guides the clinician in his choice of probabilistic antibiotic therapy.

Concerning the resistance profile of germs found to antibiotics, The associated resistance complicates the management of *S. aureus* infections justifying the treatment with glycopeptides for late infections.

The MRSA rate in our series is lower than that reported in a multicenter study of *S. aureus* isolates from skin and soft tissue infections in the USA (44.4%), Europe (32.4% in Spain, 34.7% in France) , 41.8% in Italy ...) [15], in China (66%) [20] than in Tunisia (41%). [16]

Table III:- Antibiotic resistance of *Acinetobacter baumannii* worldwide.

Studies	<i>A. baumannii</i> (%)				
	CN	CIP	IMP	TZP	CAZ
Our study	80	87	75	85	92
Wonkeun Song [120] (Corea)	21	42	71		
Lamia T. et al [121] (Tunisie)			36.1		7.3
Song and al [122] (Corée)	21	42	15		15
G. Khorasani and al [123] (Iran)					
L. Tilouch et al [116] (Tunisia)			100		

The resistance of *Acinetobacter baumannii* to imipenem is 75%. This high resistance rate to the imipenem of *Acinetobacter baumannii* isolates poses a real problem in our training and also in all Moroccan university hospitals. This situation is linked, among other things, to an uncontrolled prescription of this molecule selecting resistant strains and to a lack of control of nosocomial infection especially in hot departments.

It is noted that only 27% of the strains of *P. aeruginosa* presented a resistance to Ceftazidime and Ciprofloxacin it is the antibiotic most, this is comparable to a recent study of 2017 where Ceftazidime represented the antibiotic of the family of most effective betalactamines with a sensitivity of 78% associated with a sensitivity to ciprofloxacin of 75%. [16]

In our series, 718% of the strains of enterobacteria secrete ESBL broad spectrum betalactamases.

The rate of ESBL varies from one burn unit to another. For example, G. Khorasani et al [17] found a rate of 80.4% while that of Hamid Karimi E. et al [18] found 37%.

None of the enterobacteriaceae strains isolated in our center were resistant to imipenem. Resistance to imipenem has been described in enterobacteria recently with the production of carbapenemases. The emergence of enterobacteriaceae resistance to carbapenems is linked to the uncontrolled use of carbapenems motivated by the very high rates of ESBL enterobacteria. This vicious circle will lead to a therapeutic impasse.

In the light of our study, it is therefore necessary to establish a suitable therapeutic protocol in order to optimize the probabilistic antibiotic therapy established in burn patients infected with resuscitation of burn victims in the plastic surgery department of the CHU Mohamed VI.

This antibiotic therapy must concern patients with serious infections and whose life prognosis is committed, therefore requiring immediate care. For burns of lesser severity, therapeutic management should preferably refer to bacteriological documentation.

The probabilistic therapeutic scheme proposed for invasive infection in burn victims could be : Infection précoce : A considérer le SASM principalement + Entérobactéries sensibles aux C3G

C3G + Aminocide

• Late infection: Consider MRSA, *Acinetobacter Baumannii* and *Pseudomonas aeruginosa*

Imipénème + Amikacine + Vancomycine

1. A clinical-biological reassessment of antibiotic therapy is necessary after 48 to 72 hours to judge the effectiveness of the prescribed probabilistic antibiotic therapy.
2. An adaptation of the antibiotic therapy is essential upon reception in the antibioticogram, whether in the context of therapeutic de-escalation or to broaden the spectrum of activity.

Conclusion:-

Burns represent an excellent bacterial culture medium, infection in burns is therefore a compulsory and inevitable phenomenon. Knowing the bacterial flora of the burn will allow us to reduce this risk as much as possible. Good vigilance with a rigorous application of hygiene measures and epidemiological surveillance of bacteria are necessary, at the scale of burn unit and hospital, to better guide probabilistic antibiotic therapy.

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