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EVALUATION OF MICROBIOLOGICAL SPECTRUM OF BURN WOUND INFECTIONS

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Abstract: *Burn patients have high risk of local and systemic infections. Burn wound infections can be one of the serious complication of thermal injury that influence the patients prognostic. The study group has included the bacterial strains isolated from the infected wounds of burn patients hospitalized in the Clinical County Emergency Hospital of Braşov during a two years period. Most patients were adults and from urban areas. Men have been slightly higher in frequency. The apparition of the wounds infection could not be correlated with the grade, the extension on the skin surface or the mechanism of thermal injury. Wound infections were more frequent in burn patients that were hospitalized for more than 10 days. The percent of the positive cultures was very high (86,2%).* The etiological spectrum of the burn wound infections was dominated by Gram positive cocci (65%). *Of gram-negative bacilli, the most commonly isolated was Pseudomonas aeruginosa, followed by species of Acinetobacter and different species of Enterobacteriaceae. The relatively high percentage of multiresistant bacterial strains (MRSA, ESBL producing strains) emphasizes the importance of performing sensitivity testing in burn patients.*

Key words*: burn wounds, infections, gram positive cocci, gram negative bacilli.*

1. Introduction

Burns are one of the most common type of traumatic injury, representing a significant proportion of serious trauma. [3], [5]

Severe thermal injuries induce immuno-suppresion, condition that favors infections, serious complications that determine the increase of the mortality rate in patients. [2], [3], [13]

Burn patients have high risk of local and systemic infections like pneumonia, wound infections, urinary tract infections, catheter-related infections, thrombophlebitis. [2], [3], [4], [13]

Burn wound infections can be one of the most serious complication of thermal injury that can influence the patients prognostic. [6], [10]

The colonisation of the burn wounds with pathogen microorganism can be followed by the dissemination in the viable tissues and blood vessels causing sepsis and blood-stream invasion. [1], [14]

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The risk of burned wound infection depends on the mechanism and extension of thermal injury, and also on the pathogenic potential of germs and intensity of colonization. [10]

Numerous studies illustrate the diversity of germs involved in burned wound infection.

The spectrum of these infections includes gram negative bacilli, gram positive cocci and fungi. [1], [2], [7], [8], [9], [12]

From gram negative bacilli, Pseudomonas aeruginosa was the species the most frequent implicated in the wound infections of burn patients, followed by Acinetobacter sp. and different species from the Enterobacteriaceae family. [1], [4], [7], [9], [11], [12]

From gram positive cocci, the most frequent implicated in burn wounds infections was Staphylococcus aureus, especially MRSA strains (Methicillin Resistant Staphylococcus aureus). [1], [2], [4], [7], [8], [11], [13]

2. Material and methods

Our study was retrospective, based on data obtained from the laboratory registers.

The study group has included the bacterial pathogen strains isolated from the infected wounds of burn patients hospitalized in the Clinical County Emergency Hospital of Braşov during a two years period (1.01.2010 – 31.12.2011).

For the isolation of germs from the burn wound secretions there have been used Columbia Blood Agar Base, MacConkey Agar and Brilliance UTI Agar. To identify the bacterial genre or species there have been used classical biochemical tests and the automated Vitek2 Compact system.

For the detection of MRSA (Methicillin Resistant Staphylococcus aureus), cefoxitine disks and automated system Vitek 2 Compact were used.

For the detection of ESBL strains (Extended spectrum beta lactamases), the double-disk synergy test (DDST) with ceftazidime and amoxicillin-clavulanate was used.

For the identification of the isolated germs there were used clasical biochemical tests and the Vitek 2 Compact system.

The objectives of the study have consisted in the analysis of the spectrum of germs implicated in burn wounds infections and the evaluation of the multiresistant strains.

3. Results and discussions

The structure of the study group, based on genre, age and social environment of the burn patients are shown in Figures 1, 2 and 3.

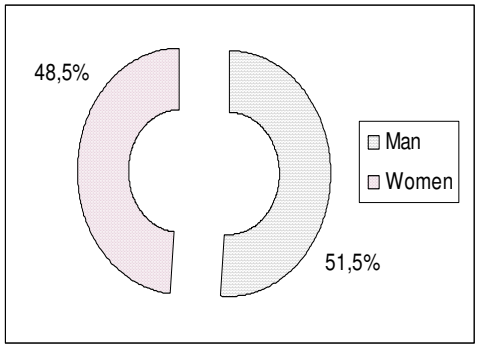

Fig. 1. *Distribution of the cases based on patient's genre*

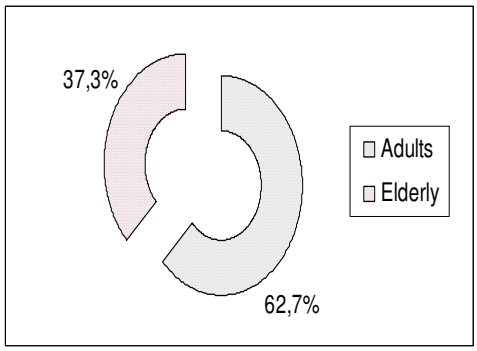

Fig. 2. *Distribution of the cases based on patient's age*

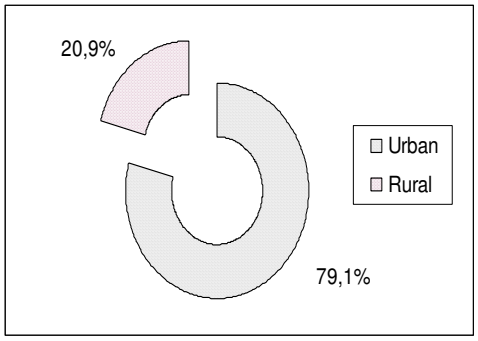

Fig. 3. *Distribution of the cases based on patient's social environment*

We have also analyzed the mechanism of burn production in case of the studied patients as shown in Figure 4.

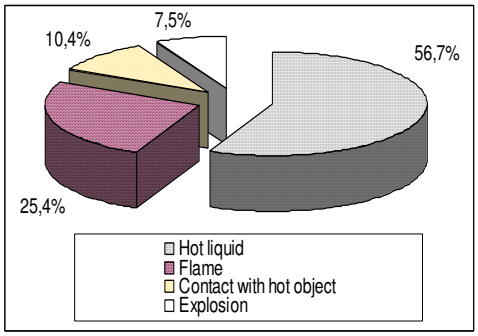

Fig. 4. *Mechanism of burn production*

As seen in Figures 5, the patients suffered of burns of maximum grade II, III or IV.

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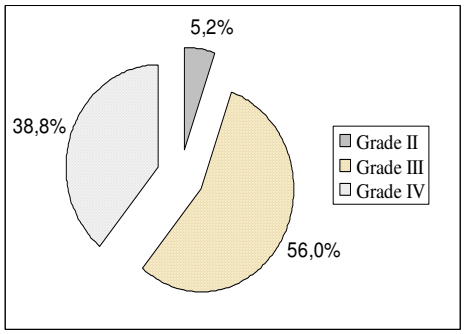

Fig. 5. *Distribution of the cases based on burn grade*

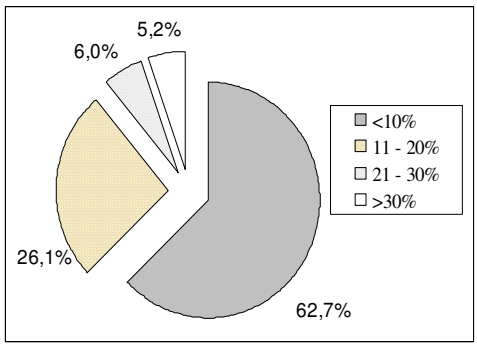

Fig. 6. *Distribution of the cases based on burn extension*

The apparition of the infection of the burn wound could not be significant correlated with its extension during the study

Another analyzed parameter has been the duration of hospitalization.

We observed that wound infections were more frequent in burn patients that were hospitalized for more than 10 days period, as resulting from Figure 7.

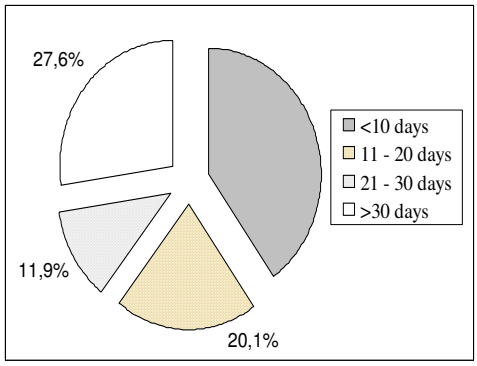

Fig. 7. *Distribution of the cases based on hospitalization duration*

The retrospective study has included 270 wound secretions prelevated from patients hospitalized in the Plastic Surgery Department in the studied period.

For the burn wound secretions prelevated during the study, the percent of the positive cultures is shown in Figure 8.

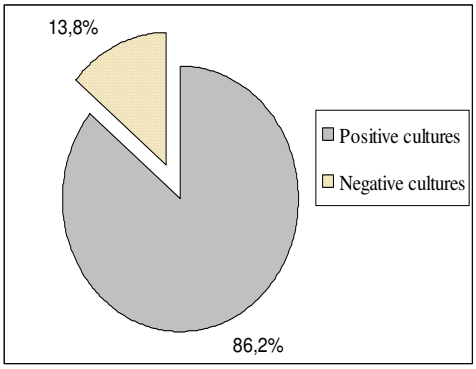

Fig. 8. *The percent of positive bacterial cultures*

Figure 9 shows the dynamics of the number of the burn wound infections, during the study period.

It can be observed the increasing number of infections from a study year to the other that can be correlated with the increase of the number of burn patients.

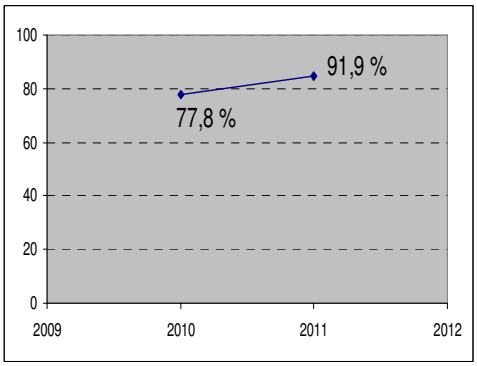

Fig. 9. *The dynamics of the burn wounds infections*

The pathogen microorganisms that were isolated during the study have been gram positive cocci and gram negative bacilli, as shown in Figure 10.

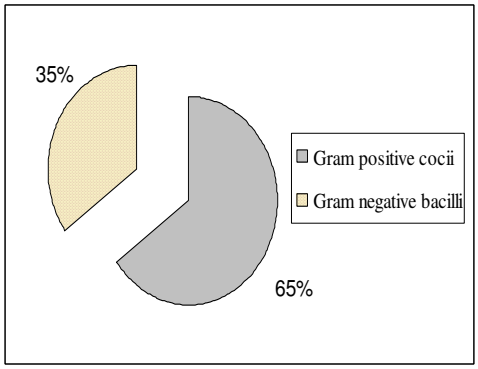

Fig. 10. *Categories of germs implicated in burn wound infection*

We can observe that burn wound infections etiology was dominated by Gram positive cocci (65%).

Figure 11 illustrates the share of various gram positive cocci that were isolated.

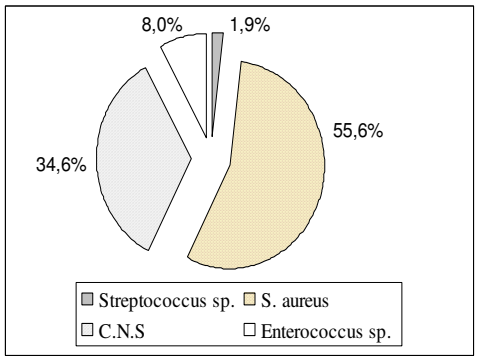

Fig. 11. *The share of gram positive cocci*

Analyzing the previous figure, it can be seen that the most commonly isolated germs were staphylococci, especially the species Staphylococcus aureus.

Figure 12 illustrates the share of various gram-negative bacilli isolated.

Of gram-negative bacilli, in case of our study, the glucose non-fermentative bacilli were predominated, first species in frequency being Pseudomonas aeruginosa. This was followed by Acinetobacter sp. and various genres of Enterobacteriaceae.

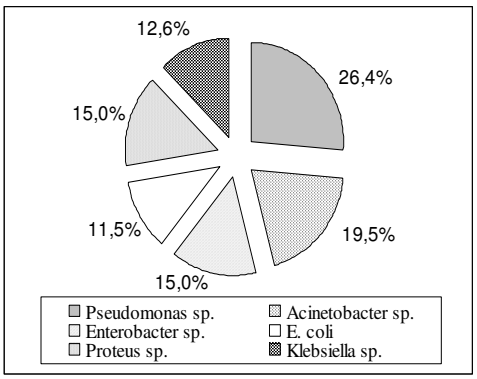

Fig. 12. *The percent of gram negative bacilli*

Another objective of the study was to evaluate the weight of drug multiresistant bacterial strains that create difficulties in the therapy of these infections.

Figures 13 and 14 shows the frequency of MRSA and ESBL Producing strains.

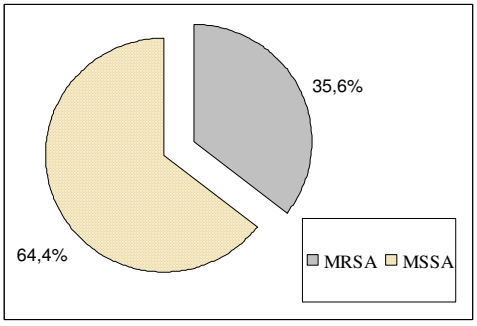

Fig. 13. *The share of MRSA strains*

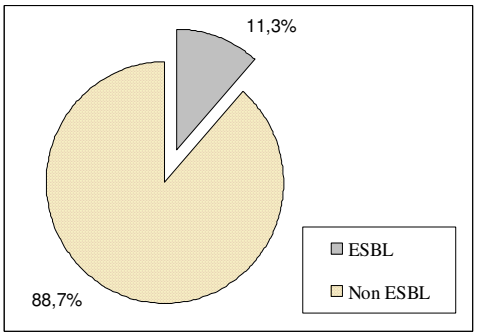

Fig. 14. *The share of ESBL strains*

4. Conclusions

1. The gender distribution of burned patients was relatively balanced, men being slightly higher in frequency. Most patients were adults and were from urban areas.
2. The apparition of the wounds infection could not be correlated with the grade, the extension on the skin surface or the mechanism of thermal injury.
3. Wound infections were more frequent in burn patients that were hospitalized for more than 10 days.
4. The percent of the positive cultures was very high (86,2%) for the studied group and there have been registred increases from one year to another.
5. The etiological spectrum of the burn wound infections was dominated by Gram positive cocci (65%).
6. Of gram positive cocci, the dominated have been staphylococci, especially S. aureus.
7. Of gram-negative bacilli, the most commonly isolated was Pseudomonas aeruginosa, followed by species of Acinetobacter and different species of Enterobacteriaceae.
8. The relatively high percentage of multiresistant bacterial strains especially MRSA, emphasizes the importance of performing sensitivity testing and especially the discerning use of the antibiotics in this patients.

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