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Short Communication

Bacteremia in burned patients admitted to Sina Hospital, Tabriz, Iran

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Abstract

Introduction: One of the most important causes of mortality and morbidity in burn wards is infection, and it is the major reason of death in burn injuries. There are several reasons that make burn victims predisposed to infection. The current study aimed to investigate the role of different factors that have an effect on bacteremia occurrence in burn patients and factors which are relevant to mortality in these patients.

Methods: This descriptive-analytic study conducted in a 1 year period in Sina Hospital, Tabriz University of Medical Sciences, Iran, and 81 burn were included. We collected patients' data about their age, body weight, cause of burn, lesion color, place and percentage of burn by getting history and studying of their files. Then we documented all interventions. Blood tests and cultures and colonies criteria were recorded.

Results: In this study, 39 patients were male (48.1%), and 42 was female (51.9%). Mean age was 32.06 ± 17.46 years. In patients without bacteremia, 57 patients did not need catheterization (89.1%), however in patients with bacteremia 9 patients demanded catheter insertion (52.9%). In patients with bacteremia 12 patients survived (70.9%), however in the without bacteremia group 56 patients survived (92.2%). Then, the relationship between type of burn, wound infection and bacterial species investigated, (P = 0.650, P = 0.210 and P = 0.110 respectively).

Conclusion: We concluded, invasive interventions increased bacteremia susceptibility in our studied burned patients. Mortality rate is directly related to bacteremia prevalence and increased by extent of burn area in these patients. The three most frequent microbial agents responsible for bacteremia were Pseudomona aeruginosa, Klebsiella and Staphylococcus aureus.

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Introduction

One of the most important causes of mortality and morbidity in burn wards, and a major reason for death is infection.[1-4] Several reasons make burn victims predisposed to infection, such as widen of burn area, necrotic tissue presence, immune-compromising effects of burn wound, prolonged hospital stay, patients overcrowding inwards, inability of blood to reach the affected environment, and moist area in wound (which is susceptible for proliferation and colonization).[2,5-7] Now it has been proved that, 75% of burn injury deaths are due to infection rather than osmotic shock or hypovolemia and the majority of infection related burn-death is following by septic shock and severe bacteremia.[2,8-10]

Burn wound is susceptible to colonization with most kinds of microorganisms; however bacteria play an important role which leads to infection and its complications in burn patients. Type and sensitivity of bacteria in burn victims are mostly related to the site of injury, but during the time predominant bacterial flora of burn wound will be changed. It means that Gram-positive bacteria are dominant in the early phase, and it switches to Gram-negative species 4-10

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days later. In a research results proved that, severe type of burning that involves more than 29% of body surface can cause bacteremia; however there is controversy in time of bacteremia occurrence among other studies.[11,12]

Prevalence of bacterial infection and colonies varies between developed and developing countries. This information will help health care system in different regions or hospitals to offer effective treatment for the patient and improving the rate of recovery. There are some properties that help to identify the microorganism responsible for infection before paraclinical tests. One of the important factors is the color of lesion and wound, which has been confirmed by several articles. On the other hand, some studies approved that the infection in burn victims with a history of an acute illness like hypertension can be a reason of special bacteria like Acinetobacter.[2,13-16]

Almost all of studies approve that, Pseudomona aeruginosa is the major reason of colonization, in burn injuries. Although Gram-positive cocci (especially methicillin-resistant Staphylococcus aureus type) has increasing prevalence among nosocomial infections, but followed by initial management of wound area, Gram-negative species has become less common in recent years.[6,12,13,17] In the current study, our aim was to investigate the role of different factors, which have an effect on bacteremia occurrence in burn patients and factors relevant to mortality in these patients.

Methods

This cross-sectional study performed from September 2012 to September 2013 in Sina Hospital, Tabriz University of Medical Sciences, Iran. This study was approved by Local Ethical Committee of Tabriz University of Medical Sciences. Regarding to some previous studies, 81 burn patients who directly admitted to burning ward enrolled in our study. Patients who referred from other centers and who were treated before, referring after 24 h of burn accident and patients with immune system disorders (such as leukopenia or patients on immunosuppression therapies) were excluded.

Patient demographic information such as their age, body weight, and length, cause of burn, lesion color, and place and percentage of burn were recorded completely. Interventions such as central venous pressure (CVP) insertion or intubation and other instrumentation were also recorded. Blood and lesion samples cultures obtained in 1st and 7th days of admission, although whenever an evidence of infection or sepsis were seen (such as disorientation, hypothermia, hypotension, petechial hemorrhage, lesion color changing, increasing in peripheral edema and leukocytosis) were happened new samples were collected too. All these process performed by sterilized swap and incubation samples performed in a general microbiology laboratory in Sina Hospital.

More than one colony in a culture proved microorganism existence in sample. Antibiotics sensitivity test performed by disk diffusion method of Kirby-Bauer in Mueller-Hinton agar medium and outcomes expounded as Clinical and Laboratory Standards Institute suggestion. To find out samples antibiotic sensitivity colonies anti-bio gram prepared, and results documented. Blood test such as complete blood count, arterial blood gases, electrolytes, urea, creatinine and blood sugar measured during 1st days of admission and once after bacteremia in involved cases.

Finally, the length of admission time and discharge date or date of death documented in studied patients. All process of diagnosis, treatment, and study with patients was clearly explained to patients and their family, and a written consent was obtained from them. All of them were free for quitting the research process whenever they want. This research was approved by local Ethical Committee of Tabriz University of Medical Sciences. Data analyzes were performed with the use of SPSS software (version 19, SPSS Inc., Chicago, IL, USA) Qualitative variables analyzed by using chi-square test and quantitative variables, with independent t-test, and $P < 0.05$ considered to be significant.

Results

81 patients enrolled in this study, and 39 patients were male (48.1%) and 42 female (51.9 %). Mean age was 32.06 ± 17.46 years old. The youngest patient was 1-year-old and the oldest was 78 years old. Primarily, relationship between age of patient and bacteremia in burn victims was considered. 64 patients without bacteremia with a mean age of 33.20 ± 16.95 and 17 patients with bacteremia with a mean age of 27.79 ± 19.19 years old, there was no significant difference (P = 0.250).

There was no significant relationship between lesion color and infectious agent (P = 0.060). We considered relationship between gender and bacteremia occurrence, in 64 patients without bacteremia 34 (53.1%) were male and in 17 patients with bacteremia, males were 5 (29.4%) (P = 0.070). There was no statistically significant difference. Among 64 patient without bacteremia, in 57 patient's catheterization was not used (89.1%), and there were 7 patients needed catheterization (10.9%). On the other hand, patients with bacteremia (9 patients) required catheterization (52.9%) and 8 patients did not (47.1%) (P = 0.002). This shows that catheterization increased occurrence of infection. Then, in group of patients with bacteremia 12 patients survived (70.9%) among 17 patients, however in 64 patients without bacteremia 56 patients survived (92.2%) (P = 0.030).

The relationship between type of burn and wound infection bacterial species evaluated. Among 40 patients involved with infection 16 patients (40.0%) infected with P. aeruginosa, 8 (20.0%) with Klebsiella, 7 (17.5%) with S. aureus, 6 (15.0%) with multi-microbial infection and 3 (7.5%) with others (Figure 1).

Type of burn divided into three groups: water, flame and chemical materials. In patients with Gram-positive organism infection, 3 patients affected by chemical materials (18.4%), 11 by water (63.2%) and 3 affected by fire flame (18.4%). On the other hand, in patients with Gram-negative organism infection, 6 patients affected by chemical materials (25.1%), 12 persons by water (53.5%), and 5 patients affected by fire flame (20.9%) (P = 0.650). Finally, relevance of mortality rate and burn area extent investigated. For this reason, patients divided into two groups: 71 survived patients and 10 died. Mean rate of affected area extent was 56.4% in dead people, but it was 38.83% in survived group (P = 0.010).

Discussion

This study describes the relationship between gender and type of bacterial infection and also relevance of bacterial species and burn cause among burn victims in Iranian burn

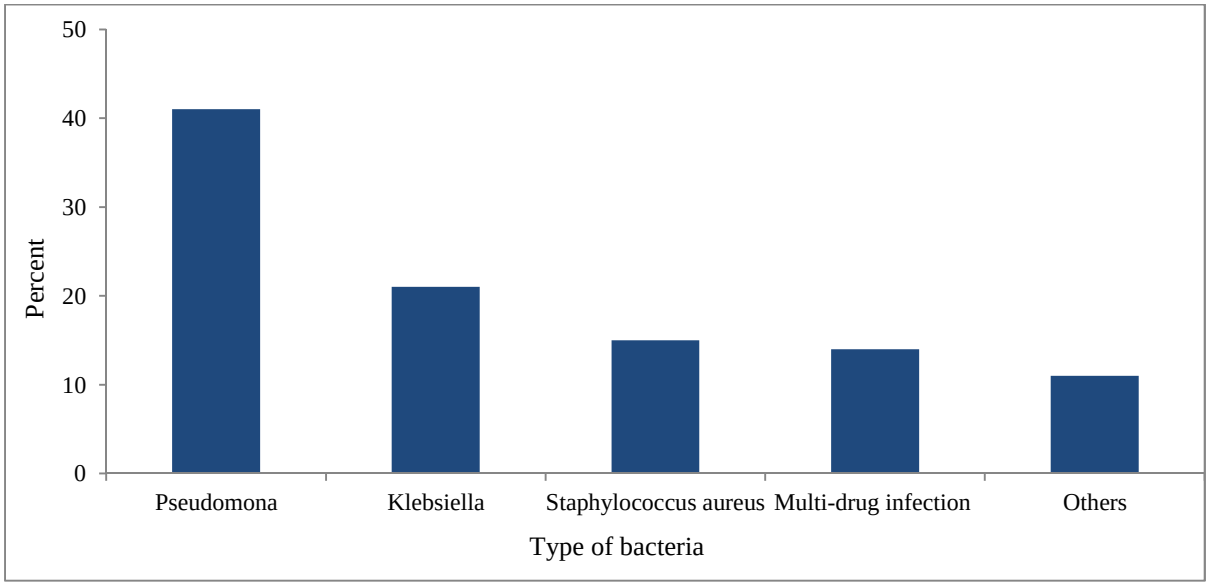

Figure 1. Type of bacteria responsible for bacteremia

accidents referral hospital. All studies, estimated infection as a major problem in burn victims, and its mortality rate which is even more than osmotic shock and hypovolemia.[18-21] Among pathogens causing wound infection and colonization in burn patients, Psudomona was the most common in this study, it similar to some other studies, which were done in other centers.[22-25] Klebsiella was the second most isolated microorganism from infected wounds in our study, but in other studies S. aureus as the second organism.[26]

At the third place S. aureus was the most common microorganism among our specimens, but it reported as first cause of colonization in developed countries and as it is mentioned before, second reason in studies from our region is S. aureus. The relationship between age of the patient and bacteremia occurrence has not been reviewed separately in past studies, but they discussed correlation of age and infection. There was a controversy between two reports performed before. One of the researches showed that, the risk of admission, length of the hospitalization period, and risk of mortality after burn injury became more when age increases. Hence, this study estimated great risk of mortality and morbidity due to nosocomial infection in elder patients (P = 0.010).

Although, in another study, it is approved that, there is no significant relationship between the mean age of both groups of patients with nosocomial infection and non-infected patients and their mortality rate.[3] In the current study, results proved no significant correlation between age of patients and bacteremia occurrence, in other words, there was no difference in mean age of patients with bacteremia and patients without bacteremia (P = 0.250).

Some previous studies showed a difference between mortality in patients with burn injury regarding gender. This study showed that mortality and gender have not statistically significant relationship (P = 0.070). Hence, we can say sexuality has no effect on bacteremia beginning. In some previous studies, there were information about relationship of lesion color and infectious agent in burn victims, but in this survey, infectious agent species had no effect on the color of lesion and hence lesion color cannot be diagnostic and cannot specify the infectious bacteria type.

CVP line is using in some of patient's to perform serum therapy and preventing hypovolemia and its complications. There are some reports that show CVP line effect on infection of burn victims.[27] Bang et al. approved that CVP line cannot be incriminated as a source of infection or sepsis, and its culture sample were negative and clear,[2] however in present study, results revealed that having a CVP line increases prevalence of bacteremia occurrence, so invasive interventions like CVP line insertion makes patient susceptible for bacteremia.

Bacteremia and mortality have a close relationship in burn victims. Other studies also showed this point, so prevention of bacteremia is essential in reducing of mortality in this patients.[28] Other studies just discussed about bacteremia occurrence rate in patient with different type of burning. It was reported that fire flame induced burns as the most susceptible patients for sepsis.[29] Others cannot show any relationship between type of burn and microorganisms that are responsible for bacteremia.[30] This study could not show any relationship between type of microorganism and burning type (flame, water or chemicals). Most of the reports suggested the important role of burn area extent on bacteremia onset and mortality rate of burn victims. Burn area extent also leads to a directly increase in mortality rate of patients in current research and hence it is concluded that when burn area is extensive (especially more than 50%) the mortality rate increases more significantly.

Limitations

It is better that this type of studies done with a greater amount of sample sizes. On the other hand, burned victims must be visited and followed by an infectious disease specialist, but unfortunately in our wards

only responsible person is a plastic or general surgeon and only after remarkable infective complications consultation with infectious disease section is done and it is not acceptable and will affect the outcome and results.

Conclusion

There is no relevance between age of the patients and bacteremia onset in burn patients, and sexuality does not affect bacteremia occurrence. Lesion color and exudates are not diagnostic factors for determining of infectious agents in burn victims. However, invasive interventions like central venous (CV) line insertion increases bacteremia susceptibility in burn wards. Bacteremia prevalence is in a direct relationship with mortality rate in burn patients. Although, burn accident reason (flame, water or chemicals) has no effect on species of an infectious agent.

Conflict of Interests

Authors have no conflict of interest.

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References

1. Oncul O, Yuksel F, Altunay H, Acikel C, Celikoz B, Cavuslu S. The evaluation of nosocomial infection during 1-year-period in the burn unit of a training hospital in Istanbul, Turkey. Burns 2002; 28(8): 738-44.
2. Bang RL, Gang RK, Sanyal SC, Mokaddas E, Ebrahim MK. Burn septicaemia: an analysis of 79 patients. Burns 1998; 24(4): 354-61.
3. Pruitt BA, McManus AT, Kim SH, Goodwin CW. Burn wound infections: current status. World J Surg 1998; 22(2): 135-45.
4. Lari AR, Alaghehbandan R. Nosocomial infections in an Iranian burn care center. Burns 2000; 26(8): 737-40.
5. Chong SJ, Song C, Tan TW, Kusumawijaja G, Chew KY. Multi-variate analysis of burns patients in the Singapore General Hospital Burns Centre (2003-2005). Burns 2009; 35(2): 215-20.
6. Rastegar LA, Bahrami HH, Alaghehbandan R. Pseudomonas infections in Tohid Burn Center, Iran. Burns 1998; 24(7): 637-41.
7. Mandell GL, Bennett JE, Dolin R. Mandell, Douglas, and Bennett's principles and practice of infectious diseases. 7th ed. London, UK: Churchill Livingstone/Elsevier; 2010.
8. Husain MT, Karim QN, Tajuri S. Analysis of infection in a burn ward. Burns 1989; 15(5): 299-302.
9. Gudaviciene D, Rimdeika R. Analysis of burn-related deaths in Kaunas University of Medicine Hospital during 1993-2002. Medicina (Kaunas) 2004; 40(4): 374-8.
10. Shannon T, Edgar P, Villarreal C, Herndon DN, Phillips LG, Heggers JP. Much ado about nothing: methicillin-resistant Staphylococcus aureus. J Burn Care Rehabil 1997; 18(4): 326-31.
11. Ressner RA, Murray CK, Griffith ME, Rasnake MS, Hospenthal DR, Wolf SE. Outcomes of bacteremia in burn patients involved in combat operations overseas. J Am Coll Surg 2008; 206(3): 439-44.
12. Vostrugina K, Gudaviciene D, Vitkauskiene A. Bacteremias in patients with severe burn trauma. Medicina (Kaunas) 2006; 42(7): 576-9.
13. Keen EF, III, Robinson BJ, Hospenthal DR, Aldous WK, Wolf SE, Chung KK, et al. Incidence and bacteriology of burn infections at a military burn center. Burns 2010; 36(4): 461-8.
14. Atoyebi OA, Sowemimo GO, Odugbemi T. Bacterial flora of burn wounds in Lagos, Nigeria: a prospective study. Burns 1992; 18(6): 448-51.
15. Azimi L, Motevallian A, Ebrahimzadeh NA, Asghari B, Lari AR. Nosocomial infections in burned patients in motahari hospital, Tehran, Iran. Dermatol Res Pract 2011; 2011: 436952.
16. McManus AT, Mason AD, McManus WF, Pruitt BA, Jr. Twenty-five year review of Pseudomonas aeruginosa bacteremia in a burn center. Eur J Clin Microbiol 1985; 4(2): 219-23.
17. Nakhla LS, Sanders R. Microbiological aspects of burns at Mount Vernon Hospital, UK. Burns 1991; 17(4): 309-12.
18. Rezaei E, Safari H, Naderinasab M, Aliakbarian H. Common pathogens in burn wound and changes in their drug sensitivity. Burns 2011; 37(5): 805-7.
19. Pandit DV, Gore MA, Saileshwar N, Deodhar LP. Laboratory data from the surveillance of a burns ward for the detection of hospital infection. Burns 1993; 19(1): 52-5.
20. Shankowsky HA, Callioux LS, Tredget EE. North American survey of hydrotherapy in modern burn care. J Burn Care Rehabil 1994; 15(2): 143-6.
21. Cremer R, Ainaud P, Le BH, Fabre M, Carsin H. Nosocomial infections in a burns unit. Results of a prospective study over a year. Ann Fr Anesth Reanim 1996; 15(5): 599-607.

22. Sharma S, Hans C. Bacterial infections in burns patients: a three years study at RML Hospital, Delhi. J Commun Dis 1996; 28(2): 101-6.
23. Revathi G, Puri J, Jain BK. Bacteriology of burns. Burns 1998; 24(4): 347-9.
24. Komolafe OO, James J, Kalongolera L, Makoka M. Bacteriology of burns at the Queen Elizabeth Central Hospital, Blantyre, Malawi. Burns 2003; 29(3): 235-8.
25. Donati L, Scamazzo F, Gervasoni M, Magliano A, Stankov B, Fraschini F. Infection and antibiotic therapy in 4000 burned patients treated in Milan, Italy, between 1976 and 1988. Burns 1993; 19(4): 345-8.
26. Saxena N, Dadhich D, Maheshwari D. Aerobic Bacterial isolates from burn wound infection patients and their antimicrobial susceptibility pattern in Kota, Rajasthan. Journal of Evolution of Medical and Dental Sciences 2013; 23(10): 4156-60.
27. Zayakova Y, Vajarov I, Stanev A, Nenkova N, Hristov H. Epidemiological analysis of burn patients in East Bulgaria. Burns 2014; 40(4): 683-8.
28. Pande KC, Ishak HL. Epidemiology of burns in a major referral hospital in Brunei Darussalam. Singapore Med J 2012; 53(2): 124-7.
29. Rafla K, Tredget EE. Infection control in the burn unit. Burns 2011; 37(1): 5-15.
30. Vyles D, Sinha M, Rosenberg DI, Foster KN, Tran M, Drachman D. Predictors of serious bacterial infections in pediatric burn patients with fever. J Burn Care Res 2014; 35(4): 291-5.