ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 49. 23
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 4, Issue – 2, April - 2019, Page No. : 55 - 60

To Study the Comparison of Pus Culture, Blood Culture, Tissue Biopsy Culture & Sensitivity and Their Role in Treatment of Burn Patients

Shyam Bhutra[1], Amit Singh[2], Vineet Kala[3], Ashima Jain [4], Piyush Jain[5], Ramjas Choudhary[6]

[1]Senior Professor and Unit Head, [2] Assistant Professor, [3,5-6] III[rd] Year Resident, [4] Dentist

Department of General Surgery, J.L.N. Medical College and Associated Group of Hospitals, Ajmer (Rajasthan) 305001.

Corresponding Author: Vineet Kala, III[rd] Year Resident, Department of General Surgery, J.L.N. Medical College and Associated Group of Hospitals, Ajmer (Rajasthan) 305001

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Background: Nowadays, the most widespread methods used for microbial monitoring of burn wounds are swab culture and biopsy culture. The biopsy method reveals the bacterial load of the full thickness of the wound. It also creates a full thickness skin defect.

Methods: This study was conducted in tertiary care Government hospital, Ajmer in central Rajasthan (India) after ethical clearance and includes 50 patients, who presented to emergency and surgical outpatient department during period of 2017 to 2018 with various degrees of burns. Patients having less than 20% and more than 80% of burns, less than 2 year and more than 60 year of age, burn patients with hospital stay less than 48 hours and patients with co morbidities were not included in the study.

Results: From 50 burn patients 91 swab and full thickness biopsy cultures were collected and cultured, the sign of sepsis were seen in 85% of the cases with swab culture as compared to 95% of patient with biopsy culture.

Conclusion: Full thickness biopsy culture offers a significant advantage over other techniques such as surface and blood cultures. Blood cultures are only of limited value due to the frequent absence of bacteremia in patients with severe infections.

Keywords: Biopsy Culture, Blood Cultures,Full Thickness Biopsy.

Introduction

A burn is a complex trauma that requires multidisciplinary care and ongoing therapy. Data from the National Centre for injury prevention and control in United States show that 2 millions fires are reported each year which result in 1.2 millions peoples with burn injuries[1]. Moderate to severe burn injuries requiring hospitalization account for approximately 100,000 of these cases and about 5,000 patients die each year from burn related complications. In Canada, the estimated number of burn victims and deaths in serious cases are proportionally smaller on a per capita basis[2].

Nowadays, the most widespread methods used for microbial monitoring of burn wounds are swab culture and biopsy culture. The biopsy method reveals the bacterial load of the full thickness of the wound. It also creates a full thickness skin defect. [3] The swab culture on the other hand, is a non-invasive and less expensive method than the serial dilution culture in differential and

selective media for burn wound biopsies, but it gives no information on deeper layers of the wound [4]There are some reports comparing swab and biopsy cultures of wounds of various etiologies or chronic wounds . This study was undertaken to determine the extent to which qualitative swab culture of the burn wound is consistent with tissue biopsy cultures and also to assess if they can predict the outcome.

This study was conducted in tertiary care Government hospital, Ajmer in central Rajasthan (India) after ethical clearance and includes 50 patients, who presented to emergency and surgical outpatient department during period of 2017 to 2018 with various degrees of burns. Patients having less than 20% and more than 80% of burns, less than 2 year and more than 60 year of age, burn patients with hospital stay less than 48 hours and patients with co morbidities were not included in the study.

After initial assessment of patients presenting with various degree of burns, who met inclusion criteria were subjected for detailed history taking, clinical examination, percentage and degree of burn and routine laboratory investigation were carried out.

Hemoglobin, Total leukocyte count, Differential leukocyte count, Erythrocyte sedimentation rate, Platelets counts.

Otherwise Blood sugar, blood urea, serum electrolyte, Liver Function Test was also done.

Cultures were collected from the burn area on 3rd day after occurrence of burn, 9th day and there after 21st post burn day of hospitalisation. Blood collected and processed to isolate the bacteria in similar fashion above. Topical antibiotic were applied in all patients for first 24 hours.

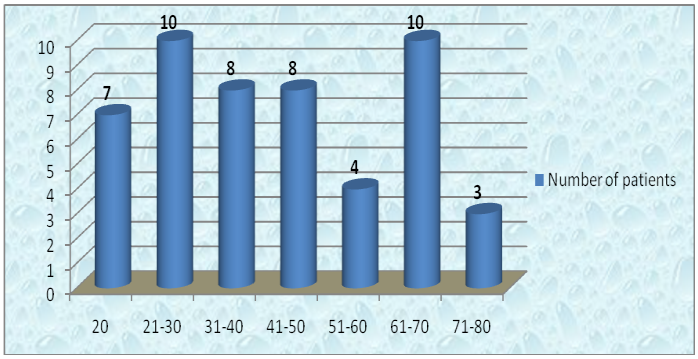
Statistical analysis was done by using the software program SPSS 20.00. Data were reported using mean±SD for descriptive results. The analytic results were made using t-test for quantitative variables and Fisher exact test for the qualitative ones. P less than 0.05 was considered significant

Results

Table 1: Age And Sex Distribution

Age group (in years)	Male	Female	Total	Percentage
2-10	5	5	10	20
11-20	3	3	6	12
21-30	9	9	18	36
31-40	6	3	9	18
41-50	3	1	4	8
51-60	1	2	3	6
Total	27	23	50	100

The maximum patients i.e. 27 were in the age group of 21-40 years. Sex: The male to female ratio was 27:23(1.17:1).



Graph 1: Percentage of Burns

Maximum number of burn patients was in 21-30% & 61-70% of burn i.e 20 (40%).

Table 2: Number Of Microbial Flora Of Burn Wounds Obtained By Swab Culture

Gram positive organisms	Number of organisms	%	Gram negative organisms	Number of organisms	%
Coagulase positive Staphylcocci	26	26.53	Escherichia coli	18	18.36
Coagulase negative Staphylcocci	11	11.22	Pseudomonas Spp.	26	26.53
Streptococcus Spp.	2	2.04	Citrobacter	1	1.02
Enterococcus Spp.	5	5.10	Klebsiella Spp.	9	9.18
Total	44	44.90		54	55.10

Total organisms isolated from swab cultures were 98. Gram positive organisms were 44.90% & Gram negative organisms were 55.10%.

Table 3: Blood culture & sensitivity

Post burn	Total number of Cases	Positive blood culture	Organism isolated	Antibiotics Sensitive	Antibiotics Resistance	Sterile
1st week	50	14	Klebsiella spp., Coagulase positive Staphcocci, Escherichia coli	8	6	36
2nd week	30	6	Klebsiella spp, Coagulase positive Staphylococci, Coagulase negative Staphylococci, Pseudomonas spp.	3	3	24
3rd week	11	-	-	-	-	11

In first post burn week, out of 50 cultures, 14 were positive for blood culture & 36 were sterile. In second week, out of 30 cultures 6 were positive & 24 were sterile, while in third week, remaining 11 patients were sterile for blood culture.

Table 4:Organisms isolated from sub eschar tissues

Gram positive organisms	Number of organisms	%	Gram negative organisms	Number of organisms	%
Coagulase positive Staphylcocci	15	15.625	Escherichia coli	22	22.91
Coagulase negative Staphylcocci	5	5.20	Pseudomonas spp.	43	44.79
Enterococcus spp.	5	5.20	Klebsiella spp.	6	6.25
Total	25	26.05		71	73.95

In full thickness biopsy culture, 25(26.05%) were Gram positive organisms, while 71(73.95%) were Gram negative organisms.

The most common organism isolated from the sub eschar tissue by full thickness biopsy culture was pseudomonas 43(44.79%).

Table 5: Relationship between number of bacterial counts in biopsy culture and post burn weeks

Post burn week	Number of biopsy culture	Bacterial count 10^4	Bacterial count 10^5	Bcaterial count $\geq 10^6$	Conta-minants	Sterile
1st week	**50**	**-**	**22 (44%)**	**15 (30%)**	**4 (8%)**	**9 (18%)**
2nd week	**30**	**4 (13.34%)**	**10 (33.33%)**	**16 (53.33%)**	**-**	**-**
3rd week	**11**	**-**	**4 (36.36%)**	**7 (66.64%)**	**-**	**-**

Bacterial counts less than 10^4/gm tissue biopsy culture was regarded as negative biopsy culture. The patients of tissue biopsy culture were sterile in 9(18%) out of 50 in first week, after that no negative biopsy culture was found. In first week the bacterial counts was $\geq 10^6$/gm

tissue in 15(30%) patients out of 50. But it increased up to 63.64% in third week.

Table 6:Organism isolated from the last sample of the patients who died

Organisms	Number of isolate Isolated from the patients who died(12)	Percentage	Drug Sensitive	Drug Resistance
Escherichia coli	2	16.66	1	1
Pseudomonas spp.	6	50	2	4
Coagulase positive Staphylococci	1	8.33		1
Coagulase negative Staphylococci	1	8.33	1	
Klebsiella spp.	1	8.33		1
Enterococcus spp.	1	8.33		1

The Escherichia coli (16.66%) and Pseudomonas spp. (50%) were most common isolate isolated from the last sample of the patients who died, due to burn wound sepsis. Remaining 33.34% were from other organisms.

Table 7: Relation of Mortality with blood culture

Total number of patients died	Positive blood culture	Negative blood culture
12	4	8

Out of 12 patients died, only 4 (33.34%) had the positive blood culture while remaining 8 (66.66%) had negative blood culture. Pseudomonas spp. and Escherichia coli two Gram negative organisms were isolated from the blood culture of the patients who died.

Discussion

Post burn wound sepsis has proven to be constant problem for the surgeon and this complication alone, has its own significant share to create high magnitude of morbidity and mortality in burn patients.

The major problem comes, in detection of causative factor and choosing the proper antibiotics in the burn wound sepsis. A major drawback of the various methodologies adopted for its proper diagnosis and adequate control of infection has been the inadequate documentation and incomplete statistical evaluation of the data generated from various studies. It was considered pertinent therefore, to execute a systemic study of a significant statistical group and to furnish data which will help to evaluate the data statistically.

The present study involving 50 cases of burn of more then 20% body surface area under going routine treatment in burn ward of J.L.N Hospital, Ajmer from the year 2017 to 2018, is a sincere attempt in this direction. These patients were studied to evaluate the relative merits and practicability of swab cultures, blood cultures and full thickness biopsy cultures in the diagnosis of burn wound sepsis. These culture were done within first, second and third post burn weeks of burn wound & simultaneously clinical monitoring of sign of sepsis was done with the following criteria:- disorientation, tachypnoea, hypothermia, hyperpyrexia, leucopenia & leukocytosis.

In our study, the swab cultures showing Gram positive organisms isolated within first week were 53.33% and the Gram negative isolates were 46.67%. In the second week Gram positive organisms isolated were 37.83% and Gram negative were 62.17%. In the third week the Gram positive organisms were 37.5% and Gram negative organisms were 62.5%.

Xiao-Guag-Xia et al (1990)[5], in their study observed that 68% of the total organisms were Gram positivev in the first 24 hours and the Gram negative organisms were only 20%, but after 2 week the 60% of the total were Gram negative organisms and only 31% were Gram positive organisms out of total isolates. In our study, Gram

negative organisms increased from 46.67% in first week to 62.5% in third week.

In our study the common Gram positive organisms isolated were Coagulase positive staphylococci, Coagulase negative staphylococci. Lowburry (1960) observed only two Gram positive isolates i.e. the Staphylococcus aureus and Streptococcus pyogenes in his studies.

Xiao-Guang-Xia et al. (1990)[5] isolated the Staphylococcus aureus, Staphylococcus albus and Streptococcus faecalis as the main Gram positive organisms, while Lawrence and Lilly (1992) [6]found staphylococcus aureus, Streptococcus faecalis, Streptococcus viridians as the main Gram positive organisms, Bhardwaj et al. (1993)[7] also isolated Staphylococcus aureus, Staphylococcus albus & Staphylococcus faecalis as the main Gram positive organisms in their studies. In our study, Gram positive organisms were Coagulase positive Staphylococcus, Coagulase negative Staphylococcus, Enterococcus & Streptococcus. T. Sjöberg, MD et al. (2003)[8] revealed in their studythat the bacterial colonization of the burn wounds consisted mainly of *Staphylococcus aureus and Pseudomonas aeruginosa.*

Xiao-Guang- Xia et al. (1990)[5] observed Pseudomonas aeruginosa, Klebsiella serretia, Escherichia coli, Proteus, Citrobacter, Bacillus anitratum and Flavo bacterium group of Gram negative organisms in their study at the third Military Medical College of PLA, Chongging. Lawrence et al. (1992)[6] observed Pseudomonas, Escherichia coli and Proteus group of Gram negative organisms in their studies.

In our study out of 91 specimens of sub eschar tissue obtained in different post burn weeks. It was found that even under meticulous wound care, the sub eshcar bacteria kept on proliferating as time went on. In the first post burn week the organisms $\geq 10^6$ per gram of tissue was only 30% but it increased up to 66.64% on the 3rd post burn week.

Xiao-Guang-Xia at al (1990)[5] in their studies observed that in the first post burn week the number of specimens with bacteria exceeding 10^6 per gram tissue was 11%. It increased to 55% in the second post burn week and 75% in the third post burn week. The similar results were obtained by Bhardwaj et al (1993) in their studies.

In our study out of 91 swab collected and cultured, The sign of sepsis were seen in 85% of the cases with swab culture as compared to 95% of patient with biopsy culture. Bhardwaj et al (1993)[7] observed that out of 228 swabs collected and cultured, 94.3% swabs had grown pathogenic organisms. Only 62.5% of patients with positive surface cultured showed sign of clinical sepsis, compared to 87.5% of patients with significant bacterial count on biopsy culture. They also observed that the blood culture were often negative in patients with life threatening sepsis, 16 of the 23 patients died of sepsis, had negative blood cultures.

Conclusion

Full thickness biopsy culture offers a significant advantage over other techniques such as surface and blood cultures. Blood cultures are only of limited value due to the frequent absence of bacteremia in patients with severe infections. Surface culture technique though simple to perform, but fail to predict accurately the presence or progressions of burn wound sepsis due to poor correlations between the surface flora and deep tissue invasion. Biopsy culture has the added advantage that they could be used to identify invasive anaerobic infections.

References

1. Murray PR, Baron EJ, Jorgensen JH, et al., eds. Manual of clinical microbiology, 8th edn. Washington, DC: ASM; 2003.
2. **Nasser, S., A. Mabrouk, and A. Maher.** 2003. Colonization of burn wounds in Ain Shams University Burn Unit. Burns 29**:**229-233.
3. Buchan Kay, Heimbach David M, Minshew Barbara H , Coyle Marie B. Comparison of quantitative and semiquantitative culture Techniques for burn biopsy. J Clin Microb 1986; 23 (2): 258-61
4. Pallua N, Fuchs PC, Hafmann B, Volpel U, Noah M, Lutticken R. Anew technique for quantitative bacterial assessment on burn wounds by modified dermabrasion. J Hosp Infect 1999; 42: 329-37
5. Xia, X.G. Wang: W.D, Ping, Z.Y., Zheng, L.M. The clinical significance of biopsy quantitative cultures in burns, burn centre, South western, Hospital. The 3rd Military Medical college of PlA, Chongging (1990).
6. Lawrence E.J,L., Lilly H.A.: A quantitative method for investigating the bacteriology of the skin In applicability to burns, Br. J. Exp Pathol. 53:550-558, (1992).
7. Bharadwaj R, Joshi BN, Phadke SA. Assessment of burn wound sepsis by swab, full thickness biopsy culture and blood culture-a comparative study. Burns Incl Therm Inj. 1983;10:124-6.