Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

Central line associated blood stream infections in postoperative patients

[1]Dr. Pravesh Mathur, [2]Dr. Arvind Rai, [3]Dr. Shradha Saxena

[1]Senior Resident, Department of Surgical Gastroenterology, SKIMS, Srinagar, India
[2]Professor and HOD, Department of General Surgery, Gandhi Medical College, Bhopal, India
[3]Junior Resident, Department of Pathology, RD Gardi Medical College, Ujjain, India

Corresponding Author:Dr. Pravesh Mathur

Article History: Received: 21-04-2023 **Revised:** 12-05-2023 **Accepted:** 23-05-2023

Abstract

Introduction- A primary blood stream infection in a patient who has a central line during the previous 48 hours before developing bacteraemia is known as central line associated blood stream infection (CLABSI), and it is unrelated to an infection at another site. It frequently leads to severe infection consequences that increase the risk of morbidity, lengthen hospital stays, and raise medical expenses. The present study aims to assess the Central line associated blood stream infections in postoperative patients.

Material & methods- The observational study was conducted among 100 postoperative patients for a period of one year at a tertiary care center. Patients fulfilling the inclusion criteria were enrolled. The results were analyzed using SPSS version 23.0.

Results- 60% subjects were male with predominance of 45% subjects in age group of 41-50 years. 20 % patients had bacteremia without obvious signs of sepsis, while the rest 80% patients developed frank sepsis. The most common pathogen observed was staphylococcous (38%) and mortalitry rate was 25%.

Conclusion– It is better to prevent CLABSI infection than to treat. Its mortality rate might reach 25% percent is better to prevent CLABSI infection than to treat it. It can show signs of sepsis with varied degrees of severity. For the purpose of developing guidelines and protocols for the prevention and treatment of CLABSI, more scientific research on the topic is necessary.

Keywords- Bacteraemia, Central line, CLABSI, Central venous catheter, Sepsis, Septic shock

Introduction

Infections that happen when a central venous catheter is present or within 48 hours of the catheter being removed and that cannot be traced to an infection unrelated to a catheter are referred to as Central Line Associated Bloodstream Infections (CLABSI) [1].The majority of CLABSIs are contracted by central venous catheters, and recent research has revealed that these catheters carry a 64-fold higher risk of contracting the infection than peripheral catheters do. [2].

About 14% of nosocomial infections are caused by bacteremia associated to central venous catheters, and central venous catheters are the main source of these blood stream infections [4]. Hospitals are using central venous catheters (CVCs) more frequently to treat critically ill patients who need long-term intravenous therapy. In the intensive care unit (ICU), central

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

line-associated blood stream infections (CLABSI) are frequent, expensive, and even fatal. For the provision of fluids, medications, and blood products for infusion therapy, nutritional support, hemodynamic monitoring, plasmapheresis, and hemodialysis in the ICU, central venous access may be required. Additionally, certain catheters may be placed in hasty circumstances, making it difficult to practice aseptic procedure to the highest standard. Compared to other indwelling catheters, CVCs have a higher risk of infection [5]. The critically ill patient suffers high morbidity and death as a result. One of the first and most avoidable kinds of nosocomial infections is central lineassociated blood stream infection (CLABSI) [6].

Patients who have CVCs have the risk of getting infectious side effects such endocarditis, septic thrombophlebitis, local insertion-site infections, CLABSI, and other metastatic infections. Bacteremia, sepsis, and mortality are the most significant side effects [7].A combination of clinical symptoms and blood culture tests are used to provide a conclusive diagnosis of central venous catheter infection. Femoral CVCs have the highest rates of CLABSI, although subclavian vein CVCs are associated with lower CLABSI rates than internal jugular CVCs [8].

Underlying condition, catheterization site, duration, technique of insertion, and goal are all potential risk factors for CLABSI. Local risk factors include sloppy personal hygiene, opaque dressing that is occlusive, and dampness at the exit site. The nasal colonization of S. aureus and adjacent infections provide credence to the pathophysiology of bacterial colonization. Other risk factors include contamination, insufficient water treatment, dialyzer reuse, advanced age, increased recombinant human erythropoietin doses, lower hemoglobin and albumin levels, diabetes mellitus, peripheral atherosclerosis, and recent hospitalization or surgery [9].

So far, there are very few studies that have been conducted on CLABSI in India. Hence the present study was conducted to assess the central line associated blood stream infections in postoperative patients.

Material & methods

The prospective observational study was conducted among 100 postoperative subjects at a tertiary care centre for the duration of one year. The ethical permission was obtained from the institutional ethical committee of hospital before commencement of study.

Patients were selected on the basis of following eligibility criteria:

Inclusion criteria

1. Patients with age above 18 years
2. Patients with Central venous catheter inserted as per defined institute asepsis antisepsis protocols postoperatively
3. Patients satisfying the criterion like having bacteremia, fungemia.

Exclusion Criteria

1. Patients not willing to participate on the study
2. Patients with other obvious source of infection
3. Immune-suppressed states.
4. Patients developing CVC insertion procedure related complications e.g. Hematoma, pneumothorax etc.
5. Patients with PICC lines, Tunneled catheters, totally implanted catheters.

48 hours after the CVC was inserted, all trial participants were checked on a daily basis for the beginning of new sepsis. Each alternate day, or sooner if sepsis was suspected, clinical and hematological values were collected. When two or more of the following characteristics

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

were present in addition to a suspicion of infection, new-onset sepsis was thought to be present.

A series of blood cultures were acquired both percutaneously from a single venipuncture site and through the catheter in cases of local or systemic sepsis. Blood cultures were regularly obtained from the catheter at the time of catheter removal in the absence of local or systemic sepsis. Each collection of culture bottles included a fungal blood culture tube, an aerobic bottle, and an anaerobic bottle. Blood cultures were treated using the radiometric technique at 35 degree for 7 days. Usual procedures were used to process fungus blood cultures. Central catheter placement using the Seldinger method.

For interpretation of observations made of categorical data. A two tailed P value of <0.05 was considered statistically significant. All statistical computations were performed using SPSS software.

Results

In the present study out of 100 patients 60 % were male and 40% were female. The most common age group was 41-50 years (45%) and least was in the age group of 31 to 40 years (5%). (Table 1)

Table 1 shows distribution of patients on the basis of age and gender

Variable		Percentage
Gender	Male	60%
	Female	40%
Age	21-30 years	5%
	31-40 years	20%
	41-50 years	45%
	51- 60 years	30%

Out of total 100 patients developing CLABSI, 20 % patients had bacteremia without obvious signs of sepsis, while the rest 80% patients developed frank sepsis. All cases with frank sepsis were further categorized based on severity of sepsis (i.e. Sepsis v/s Severe Sepsis v/s Septic Shock). 50% had mild sepsis, 30% progressed to developed severe sepsis, and 20% patients developed septic shock. (Table 2)

Table 2 shows distribution of patients according to severity of sepsis

Severity of sepsis	N (%)
Mild sepsis	40 (50)
Severe sepsis	24 (30)
Septic shock	16 (20)
Total	80 (100)

Number of patients having CVC in situ for more than 12 days were 55 while rest 25 patients had CVC in situ for less than 12 days. (Table 3)

Table 3 shows distribution of patients according to number of catheter days

Number of catheter days	Mild sepsis N (%)	Severe sepsis N (%)	Septic shock N (%)	Total N (%)
>12 days	28 (50.9)	15 (27.2)	12 (21.8)	55 (68.7)
<12 days	12 (3)	9 (2.25)	4 (1)	25 (31.2)

The most common pathogen observed was staphylococcus aureus (38%) followed by pseudomonas aeruginosa (19%), candida species (13%), E.coli (11%), coagulase negative staphylococci (9%), klebsiella pneumoniae (7%) and acinetobacter baumanii (3%). (Table 4)

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

Table 4 shows distribution of patients according to pathogen observed

Pathogen observed	Percentage
Staphylococcus aureus	38
Pseudomonas aeruginosa	19
Candida species	13
E. coli	11
Coagulase negative staphylococci	9
Klebsiella pneumoniae	7
Acinetobacter baumanii	3

Out of all the 100 patients developing CLABSI 75 patients recovered with treatment while rest 25 patients died. (Table 5)

Outcome	Mild Sepsis	Severe sepsis	Septic shock	Bacteremia	Total
Recovery	39	14	2	20	75
Death	1	10	14	0	25

Discussion

This study was designed to assess the course of infection, microbiology of CLABSI, & to identify the degrees of severity of sepsis. A total of 100 patients were evaluated during the course of this study.

Most common age group affected was found to be 41-50 years i.e. 45%. This finding was in accordance with the study accordance to a study by Mervyn Mer et al [10], and Johnson et al [11].

In the present study males (60%) were more as compared to females (40%) and the results were similar to previous studies where the ratio of male : female was 1.56:1. [10,11]

Out of total 100 patients developing CLABSI, 20 % patients had bacteremia without obvious signs of sepsis, while the rest 80% patients developed frank sepsis.this finding was similar to study done by Harsha V Patil et al [12] in which 7.41% of patients were having Central line related bacteremia and rest 92.59% had CLABSI with sepsis. All cases with frank sepsis were further categorized based on severity of sepsis (i.e. Sepsis v/s Severe Sepsis v/s Septic Shock). 50% had mild sepsis, 30% progressed to developed severe sepsis, and 20% patients developed septic shock.

In this study the number of patients having CVC in-situ for more than 12 days were 55 patients while rest 25 patients had CVC in-situ for less than 12 days. This result was comparable to the findings made by Parameswaran et al [13] who demonstrated that the risk of infection for catheters placed for more than 12 days was 2.21 times higher than that of those who had CVC in situ for less than 12 days.

The microbiology of CLABSI in this study showed Staphylococcus aureus as most common organism cultured in staphylococcus aureus (38%) followed by pseudomonas aeruginosa (19%), candida species (13%), E.coli (11%), coagulase negative staphylococci (9%), klebsiella pneumoniae (7%) and acinobacter baumanii (3%). In a study by Chopdekar K et al [14], the incidence of Staphylococcus aureus was 13.2%, Pseudomonas was seen in 16.95%, candida species in 22.64%, coagulase negative Staphylococcus in 11.32%, Klebsiella pneumoniae in 9.43%, Escherichia coli in 3.77% patients, Acinetobacter baumannii in 1.88%. Our results were at times in concordance with few studies and at times in contrast to other studies. These differences were mainly due to differences of antibiogram and isolates across various sites of studies and the differences in their infection management protocols and antibiotic policies .

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

The overall mortality observed in our study was 25%. In a study by Chopdekar et al [14] the mortality associated with CLABSI was found to be 33.3% which was comparable to the results of this study.

This study has limitations because it was conducted at a single site with a small sample size of only 100 participants. The generalizability of this study and its findings is thus constrained and may be flawed due to the geographic concentration of the study population, small sample size, convenience, and homogeneity of the sample.

Conclusion

Due to its high mortality rates, which in the current study reached 25%, CLABSI is an infection that is better avoided rather than treated. It can show signs of sepsis with varied degrees of severity. Regardless of location, the data and observations reported in this study are significant and provide guidance for the use of CVCs in critically sick patients, especially in light of the numerous disputes that exist as well as the recommendations made by various experts in the area. To create guidelines and methods for the prevention and treatment of CLABSI, further scientific research is needed.

References

1. Carlos Yébenes, J. and Capdevila, J.A. Intravascular Catheter-Related Infection. Medicina Clínica (Barc).2002; 119, 500-507.
2. Janum, S., Zingg, W., Classen, V. and Afshari, A. Bench-to-Bedside Review: Challenges of Diagnosis, Care and Prevention of Central Catheter-Related Blood Stream Infections in Children. Critical Care.2013; 17, 238.
3. Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J: Harrisons principles of internal medicine. 18 ed. New York. The McGraw-Hill Companies, Inc. 2011, p1116.
4. O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, Lipsett PA, Masur H, Mermel LA, Pearson ML, Raad II, Randolph AG, Rupp ME, Saint S; Healthcare Infection Control Practices Advisory Committee (HICPAC). Guidelines for the prevention of intravascular catheter-related infections. Clin Infect Dis. 2011 May;52(9):e162-93.
5. Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J. Harrisons principles of internal medicine. 18 ed. New York. The McGraw-Hill Companies, Inc.2011;1117.
6. Naomi P. O'Grady, Didier P. Catheter-Related Infections in the Critically Ill. Norvell. Kluwer Academic Publishers.2004;90.
7. Foster C, Mistry N, Peddi P, Sharma S.The Washington Manual of Medical Therapeutics. 33rd ed. New Delhi:WoltersKluver (India) Pvt Ltd. 2010;503.
8. Jordi R, Martin H, Emilio D, Alejandro R. Infectious Diseases in Critical Care, Berlin, Springer Science& Business Media. 2010;7.
9. Rijnders B, Intravascular Catheter-Related Infections: A Clinical Focus on Prevention, Diagnosis & Treatment.Belgium, Leuven University Press.2003:21.
10. Mer M. Intravascular catheter-related infectioncurrent concepts. Southern African Journal of Critical Care. 2006; 22(1):4-12.
11. Esherick J, The Tarascon Clinical Review Series: Internal Medicine, Chapter 48-Management of Catheter Related Blood stream infections, Jones & Bartlett Publishers, .2012; 217.
12. Patil HV, Patil VC, Ramteerthkar MN, Kulkarni RD. Central venous catheter-related bloodstream infections in the intensive care unit. Indian J Crit Care Med. 2011 Oct;15(4):213-23.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

13. Parameswaran R, Sherchan JB, Varma M, Mukhopadhyay C, Vidyasagar S. Intravascular catheterrelated infections in an Indian tertiary care hospital. The Journal of Infection in Developing Countries. 2010 ;5 (06):452-8.
14. Chopdekar K, Chande C, Chavan S, Veer P, Wabale V, Vishwakarma K, Joshi A. Central venous catheterrelated blood stream infection rate in critical care units in a tertiary care, teaching hospital in Mumbai. Indian J Med Microbiol. 2011 ; 29(2):169-71.