Int.J.Curr.Microbiol.App.Sci (2020) *9*(2): 311-315

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 2 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.902.039

A Study of Bacteriological Profile and Antibiotic Resistance Pattern in Central Venous Line Catheter Tip Culture in a Tertiary Care Hospital in Jammu Region, India

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Keywords

Central venous, catheter, *Staphylococcus aureus*

Article Info

Accepted:
05 January 2020
Available Online:
10 February 2020

A B S T R A C T

Central venous line catheter tip related infections are common in hospital settings. In our study our aim is to find to out the most common pathogen associated with central venous line catheter tip infections and checking its sensitivity pattern. We have taken 84 samples of tip of central venous line catheter tip for culture and sensitivity. Out of 84 samples, 45 reported no growth and 37 samples showed different growth pattern. As a result of our study we have seen the *Staphylococcus aureus* is the most common organism isolated, From its sensitivity report we have also seen presence of Methicillin resistant *Staphyloccus aureus*. Next most common organism isolated was *Klebsiella* followed by *Enterococcus.*

Introduction

Intravascular catheters are integral to the modern practices and are inserted in critically ill patients for the administration of fluids, blood products, medication, nutritional solutions and for hemodynamic monitoring. Central venous access is commonly performed in care of critically ill patient to receive fluid and medicine. However, this routine procedure is not immune to complications.(1)

Central venous catheter (CVC) central venous line or central venous access catheter is a catheter (small, flexible tube) placed into a peripheral vein for venous access to administer intravenous therapy such as medication fluids.

Catheter related blood stream infections (CRBSI) resulting from bacterial colonisation of an intravascular catheter are a significant clinical problem, magnified in recent years by the increasing use of intravascular catheters. Catheter related bloodstream infection is

defined as the presence of bacteremia originating from an intravenous catheter. It is one of the most frequent, lethal and costly complications of central venous catheterization and also the most common cause of nosocomial bacteremia.

Central venous catheters can cause blood stream infections by three routes i.e. intraluminal, extraluminal and haematogenous.(2,3)

Catheter related bloodstream infection is a severe condition with high rates of associated morbidity and mortality (4,5) It occurs after catheter tip colonization by microorganisms progressing along both the inner and outer surface of the catheter.

Tens of thousands of patients continue to experience CRBSIs each year in the US, resulting in thousands of deaths each year and billions of dollars in added costs to the US healthcare system (6)

CRBSI prevention depends on measures The most effective of these are hand hygiene before catheter insertion and maintenance, full-barrier precautions during catheter insertion, 2% alcoholic chlorhexidine use for skin preparation.(7)

CRBSI may be caused by Gram positive or Gram negative organisms but gram negative bacilli are responsible for a higher number of catheter related infections in Intensive Care Unit (ICU) than in Non-ICU patients.(8).

The diagnosis of CRBSI requires a positive culture of blood from a peripheral vein and clear evidence that the catheter is the source.

This study is done with the aim to find the incidence of culture positive central venous catheter tip, type of organisms isolated and their antibiotic sensitivity pattern.

Materials and Methods

This study was carried out in Department of Microbiology , GMC Jammu over a period of 1 year.

Patient detection

Antibiotic sensitivity and resistance reports were collected from various central venous line catheter tip samples .

A Short section of catheter was aseptically cut off and were aseptically sent to microbiology department for culture and sensitivity.

Processing of specimen

This section of catheter was rolled back and forth according to Extraluminal Maki's Roll Plate Method on the surface of Blood agar and MacConkey agar plate with sterile forceps.

After overnight incubation, the colonies were counted .A positive culture was defined as a count more than equal to 15 Colony forming unit / plate.(9)

Isolation of microorganisms from Central venous catheter segment indicates the colonization of catheter itself. (10)

Significant colonies were further processed. Organisms are identified on the basis of colony morphology, gram staining and biochemical tests.

Antibiotic sensitivity is also done by Kirby-Bauer disc diffusion method on Muller Hinton agar. Following antibiotics are used-(Table 1)

Table.1 List of antibiotics used in our laboratory

Penicillin	**Cefipime**
Ampicillin	Cefoxitin
Piperacillin-tazobactam	Cefoperazone-sulbactam
Oxacillin	Aztreonam
Cefuroxime	Amikacin
Cefotaxime	Gentamycin
Ceftazidime	Chloramphenicol
Doxycycline	Colistin
Tobramycin	Polymyxin-B
Ciprofloxacin	Vancomycin
Cotrimoxazole	Clindamycin
	Linezolid

Table.2 Different microorganisms isolated

Microorganism Isolated	Number	Percentage
Staphylococcus aureus	**14 (Out of 14 , 1 is MRCONS)**	**17.07%**
Klebsiella	**8**	**9.7%**
Enterococcus	**6**	**7.3%**
Escherichia coli	**6**	**7.3%**
Acinetobacter	**6**	**7.3%**
Yeast	**2**	**2.4%**
Citrobacter	**1**	**1.2%**

Results and Discussion

A total of 82 samples were received in our laboratory for culture and sensitivity over a period of one year. Out of these 45 samples reported No growth on blood and MacConkey agar. Rest 37 samples reported growth and the organisms were identified (Table 2).

Out of total 82 samples 14 are *Staphylococcus aureus* out of those 14, 1 is Methicillin resistant Coagulase negative staphylococcus. Staphylococcus shows resistance to Erythromycin, Penicillin, Cefoxitin. It is also shown that out of 13 cases of staphylococcus aureus detected 10 are Methicillin resistant *Staphylococcus aureus*. Next in list is *Klebsiella* which is followed by *Enterococcus* which is showing resistance to Clindamycin, Peniciliin, Cefepime. Out of 6 cases of *Enterococcus* detected 3 are Vancomycin resistant *Enterococcus.*

Next in the list are *Escherichia coli, Acinetobacter, Citreobacter* which are also showing multi drug resistance.

Table.3 Antibiotic sensitivity profile of different Microorganisms isolated

Microorganism isolated	Frequency of antibiotic showing senstivity	Frequency of antibiotic showing resistance
Staphylococcus aureus(13)	Vancomycin(13) Linezolid(11) Cholramphenicol(10) Tetracycline(8) Clindamycin(4) Cotrimoxazole(3) Gentamycin(1) Ciprofloxacin(1)	Erythromycin(12) Penicillin(11) Cefoxitin(10) Ciprofloxacin(9) Cotrimoxazole(9) Clindamycin(9) Tetracycline(6) Oxacillin(3)
Coagulase negative staphylococcus(1)	Cotrimoxazole(1) Vancomycin(1) Clindamycin(1) Linezolid(1) Chloramphenicol(1)	Penicillin(1) Cefoxitin(1) Ciprofloxacin(1) Erythromycin(1)
Klebsiella(8)	Imipenem(3) Chloramphenicol(1) Colistin(1) Cotrimoxazole(1) Polymyxin B(1) Tetracycline(1)	Ampicillin(8) Amoxyclavulanic acid(8) Cefuroxime sodium(8) Cefotaxime(8) Cefepime(8) Aztreonam(8) Gatifloxacin(8)
Enterococcus(6)	Linezolid(4) Chloramphenicol(3) Vancomycin(3) Cefotaxime(2) Tetracycline(1) Cefepime(1)	Clindamycin(6) Penicillin(5) Cefepime(5) Cefotaxime(4) Vancomycin(3)
Escherichia coli(6)	Colistin(3) Polymyxin B(3) Imipenem(2) Chloramphenicol(1)	Ampicillin(6) Amoxyclavulanic acid(6) Piperacillin-tazobactum(6) Cefuroxime sodium(6) Cefepime(6) Cotrimoxazole(6)
Acinetobacter(6)	Colistin(4) Polymyxin B(4) Cotrimoxazole(1) Tobramycin(1) Piperacillin tazobactum(1)	Cefotaxime(6) Cefepime(6) Ciprofloxacin(6) Piperacillm-tazobactum(5) Cotrimoxazole(5)
***Citrobacter*(1)**	Amikacin(1) Tobramycin(1) Colistin(1)	Penicillin(1) Amoxyclavulanic acid(1) Cefuroxime sodium(1) Ciprofloxacin(1) Cotrimoxazole(1) Chloramphenicol(1)

From the above data we can conclude that *Staphylococcus aureus* is the most common organism isolated. *Klebsiella* is also one of the prevalent organism in the central venous line tip samples.

It has also highlighted the issue of emerging antibiotic resistance especially the prevalence of MRSA and VRE. Resistance pattern shown above has made the treatment of such infections really difficult. These findings can help medical professionals for better management of health issues related to patients having these devices .

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How to cite this article:

Suharshi Gupta, Yuthika Bhandari and Shashi Sudhan Sharma. 2020. A Study of Bacteriological Profile and Antibiotic Resistance Pattern in Central Venous Line Catheter Tip Culture in a Tertiary Care Hospital in Jammu Region, India.. *Int.J.Curr.Microbiol.App.Sci.* 9(02): 311-315. doi: https://doi.org/10.20546/ijcmas.2020.902.039