

Intravascular Catheter-Related Infections in Haemodialysis Patients in an Indian Tertiary Care Hospital

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ABSTRACT

Introduction: Haemodialysis patients are more vulnerable to infections. Compared to permanent vascular access that is arterio-venous fistula or graft, intravenous Catheter related infections are more common. So we analysed in this study the incidence of access related infection in these groups of patients and also evaluated other non access related infections. The clinical manifestation of these infections, the etiological microorganism and antibiotic sensitivity in these patients were also analysed.

Materials and Methods: It is a case control study, haemodialysis' patients with intravascular catheters were considered as cases and with permanent vascular access as controls. Patients on haemodialysis in our center were analysed for a duration of 1 year these included patients with permanent vascular access and patients with temporary vascular access that is intravascular catheters. We have analysed the access related infection in these patients, other infections, spectrum of microorganisms isolated in these patients and antibiotic sensitive pattern in them.

Results: Haemodialysis Access related Infection was clinically considered in 17 % of subjects in whom intravascular catheter was inserted and 5 % in permanent vascular access. Confirmed infection in intravascular catheters in 80%. Other infections in patients with permanent vascular access included respiratory tract infection in 25%, Urinary tract infection in 5 %, tuberculosis in one patient. Other Infection in patients with temporary vascular access catheter included respiratory tract infection in 20%, Urinary tract infection in 25 %.

Conclusions: Compared to patients with permanent vascular access, patients with intravenous central vascular access had more incidence of infections. Hence Catheter-dependent patients have a high burden of infection and it is crucial to evaluate these patients with suspected infection for various access-related and nonaccess-related infections.

Keywords: Catheter related infection, chronic kidney disease (CKD), end stage renal disease (ESRD), temporary vascular access, permanent vascular access, acute renal failure (ARF).

of infection like respiratory tract infection, urinary tract infection and other foci of infection can occur in these patients.

MATERIALS AND METHODS

In our center we have given haemodialysis for 353 patients in one year. 40 Patients with Permanent vascular access and 40 patients with temporary central vascular access catheters are included in this case control study. All these patients were analysed for infection rate with specific importance to temporary central vascular access catheters related infections. This analysis was done between January 2015 to January 2016.

Inclusion criteria: Forty haemodialysis patient with Permanent vascular access and 40 patients with temporary central vascular access in whom infection was considered were included. Patients with temporary central vascular access catheters considered as cases and with Permanent vascular access were considered as control.

Exclusion criteria: Patients on immunosuppressive treatment, peritoneal dialysis, reports with inconclusive results. Infection in these dialysis patients were suspected by the nephrologist, resident, or the dialysis nurses. Whenever patients had symptoms like fever, rigors, localized infection at access site or symptoms suggestive of infection in other foci of infection like respiratory tract infection, urinary tract infection, decubitus ulcer etc infection was suspected. Intravenous central catheter-related infection was suspected whenever a patient developed fever (temperature $\geq 37.8^{\circ}\text{C}$) or rigors. Less commonly, it was suspected because of a purulent discharge from the catheter exit site, malaise, altered mental status, or refractory hypotension (systolic BP < 90 mmHg). In patient with permanent vascular access (fistula or graft), the surgical site was inspected for pustule, erythema, raised temperature locally, tenderness, swelling, or drainage.

Details for each patient: name, age, sex, laboratory investigations such as serum creatinine, 24-hour urinary protein, urine microscopy, virology (HBsAg, anti-HCV, HIV), com-

INTRODUCTION

Vascular access has been described as the "Achilles Heel" of haemodialysis but vascular access are associated with various complication, infection being the most common complication.¹

Among haemodialysis' patients temporary vascular catheters are inserted for a period of waiting before the permanent access can be created and utilised that is in ESRD patients and partial or complete recovery of renal failure is expected as in patients with acute renal failure² or in patients who have exhausted all options for a permanent access. Haemodialysis catheters are at increased risk of infection.^{3,4} Catheter-related bacteraemia are the common infection⁵ although other type

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plete blood count, urine routine, urine culture, blood culture, Catheter tip culture, renal function test, LFT, Ultrasound abdomen. Data were analyzed in both group that is group considered to be cases and group that was considered to be control.

STATISTICAL ANALYSIS

Simple descriptive statistics such as median and mean \pm SD were used for variables such as age, clinical and laboratory features. Percentage was used for categorical data.

RESULTS

Duration of study was one year. Mean age of study population in group considered to be cases included 42.42 \pm 6.51. Mean age of study population in group considered to be control included 43.6 \pm 6.6. Male to female ratio in case group was 1.3:1, and Male to female ratio in control group was 7:1. There were 353 haemodialysis subjects in this period in our hospital. Subjects who had permanent vascular access was 14.16 % and patients with intravenous temporary vascular access catheter was 88.84 % among all patients receiving hemodialysis in our center. Access related Infection suspected in permanent vascular access 5% and 17% patients with intravenous temporary vascular access. 80% Infection confirmed in intravenous temporary vascular access catheter. Hospitalization due to infection occurred 12% in permanent vascular access population and almost all infection requiring hospitalisation were for respiratory tract infection and only 2 patients were admitted for access related infection. Hospitalization in temporary vascular access related infection requiring hospitalisation were for catheter sepsis in 90 %, respiratory tract infection in 10%, septic shock 6 % MODS in 5%. Approximately 42% of all infections required hospitalization, whereas 58% were managed as outpatients. Among the study group that is both case and control group access-related infections accounted for 72% of all infection-related hospitalizations and Non Access-related infections accounted for 28%.

Among catheter-related bacteremia the clinical presentation of patients were analyzed. The patient presented with fever and rigors in 25%, fever without rigors in 16%, and rigors without fever in 30%. Finally, 18% of catheter-related bacteremia presented with symptoms other than fever or rigors and without clinical findings to suggest an alternative source of bacteremia. The presenting symptom in these patients included altered mental status, malaise, exit-site drainage, or hypotension. Only 41% of patients had fever at presentation. Access related infection occurred in 90% among all infection. Catheter related infection was confirmed in (80%) of cases with tip culture sensitivity. In 20% cases of suspected catheter related infection, the cultures were negative. A smaller number of episodes of probable access-related infections were purulent catheter exit-site infections (without concurrent bacteraemia). Nonaccess-related infections, including pneumonia, urinary tract infection, skin infections, lower extremity infection were seen in 10%

Among infection due to various organism gram negative infection was more common, klebsiella infection most common, it was 25.9%. Gram negative organism were most

	Case	Control
Total	40	40
Age, mean \pm SD	42.42 \pm 6.51	43.6 \pm 6.6
M/F	1.3:1	7:1
Diabetes	34%	8%
Coronary artery disease	5%	10%
Peripheral vascular disease	2%	5%
Congestive heart failure	10%	25%

Table-1: Epidemiology and associated diseases in cases and control group

Clinical Presentation	Number of Cases
Total cases	40
Temperature with rigors	25%
Temperature reported	16%
catheter exit site infection	16%
Malaise	22%
altered mental status	5%
Refractory hypotension	6%
MODS	5%

Table-2: Clinical presentation of probable catheter-related bacteremia

Infection in patients with Femoral catheter among all femoral catheter inserted	22%
Infection with patients with internal jugular catheter among all internal jugular catheter inserted	15%
Patients in whom single pathogen was isolated in tip culture sensitivity	25%
Patients in whom two pathogen was isolated in tip culture sensitivity	50%
Patients in whom three pathogen was isolated in tip culture sensitivity	25%
Multi drug resistance	12.5%

Table-3: Type of intravenous catheter related infection and pathogens isolated.

Catheter-related bacteremia by pathogen isolated by catheter tip culture sensitivity	Percentage(%)
klebsiella	25.9%
pseudomonas	19.4%
acinetobacter	19.4 %
MRSA	10.38%
enterobacter	6.49%
E.coli	3.89 %
staphylococcus aureus	2.59 %
Enterococcus	9.09 %
Streptococcus	1.29%

Table-4: Micro organisms isolated

sensitive to colistin followed by imipenem and then to older drug chloramphenicol. Gram positive organism were most sensitive to linezolid,erythromycin,azithromycin followed by pristinomycin

DISCUSSION

Catheter related infection in haemodialysis patients is of major concern of morbidity and mortality. Infection in these

patients are from the catheter insertion site, the catheter tip, haematogenous seeding from a distant infection, contaminated infusate or unhygienic handling of catheter by health personnel.

The catheter insertion site and the catheter tip are the important sources. catheter insertion site infection occurs in 65%, the catheter tip in 30% and 5% from other sources.⁶⁻⁸ Skin infection are the common sources of catheter infection in patients with lesser duration of central intravenous catheters. Catheter tip infection is more common patients with longer duration of infection.⁹

Various terminology used in catheter associated infections

Catheter related bloodstream infection: Catheter related bloodstream infection include Isolation of the same organism from culture of a catheter tip and from the blood of a patient with accompanying clinical symptoms of bacteraemia and no other apparent source of infection, defervescence after removal of an catheter from a patient with bacteraemia may also be considered to be catheter related bloodstream infection.

Exit-site infection: Erythema, tenderness, induration, or purulence within 2 cm of the skin at the exit site of the catheter are considered to have exit-site infection.

Tunnel infection: Tenderness, erythema, and/or induration >2cm from the catheter exit site, along the subcutaneous tract of a tunneled catheter are considered to have tunnel infection.

Pocket infection: This includes Infected fluid in the subcutaneous pocket near; the catheter often associated with tenderness, erythema, and/or induration over the pocket; spontaneous rupture and drainage, or necrosis of the overlying skin, with or without concomitant bloodstream infection, may also occur.

Staphylococci are the most frequently isolated pathogens in most cases of catheter sepsis.¹⁰⁻¹² But in our study it was gram negative sepsis with klebsiella being most common micro organism isolated. Fever most common symptoms was there in only 41% in our study so high grade of suspicion should be there for catheter associated infection and needs to be confirmed by culture sensitivity report at the earliest since this decreases mortality and morbidity in these patients.

High risk factors for catheter associated infection include prolonged catheterization, frequent manipulations, contaminated skin solutions, improper aseptic techniques during insertion and location of catheter.¹³ Risk for infection was significantly decreased with insertion into other site other than femoral catheterisation site so it has to be considered as last possible option.

Sterile Technique and Hand Hygiene practice during catheter insertion, manipulation, dressing and handling of catheter has to be done to decrease the incidence of infection. Most infection associated with catheters was seen with longer duration of catheters, in our study it most commonly occurred with duration more than 4 weeks and hence changing catheters according to some defined time period reduces the risk of infection associated with catheters. Since infection with permanent vascular access was lesser than intravascular catheters early permanent vascular access creation in CKD

cases decreases infection. Use of Antimicrobial/Antiseptic Impregnated catheters and cuffs will also decrease infection associated with intravenous catheters for dialysis.

Management in these patients include early start of empirical antibiotics and later changed according to culture sensitivity report.

In all cases infection was treated with appropriate antibiotics and catheter removal was considered only if they had severe sepsis with septic shock, multiorgan dysfunction, persistent bacteremia for >72 hrs in spite of optimal antibiotics or severe local infection in the form of tunnel or pocket infection.

CONCLUSION

Access related infection are very common in haemodialysis patients. Intravenous vascular access catheter infection more common than permanent vascular access. So in all CKD patients permanent vascular access created in IV CKD to avoid catheters or early creation even if catheters are inserted. In ARF cases timely replacement of catheters, aseptic precaution during catheter handling to be done. Since etiological micro organism are polymicrobial broad spectrum antibiotics to be considered in treatment of catheter associated infections.

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