CHAPTER 12: VASCULAR ACCESS INFECTION

Summary

- Vascular access infection is a major cause of morbidity and mortality in haemodialysis patients.
- The overall incidence of vascular access infection ranged from 0.67 to 1.71 percent.
- Risk factors for vascular access infection in our dialysis population include female gender, adult polycystic kidney disease, low serum albumin, low KT/V and usage of catheters and synthetic grafts.

Introduction

Vascular access infection accounts for 30 to 50% of bacteraemias in haemodialysis patients [1]. It also contributes significantly to the total cost of haemodialysis and is a frequent cause for hospitalisation [2]. In an infection surveillance by the Centres for Disease Control, USA, in 1999, vascular access infection with or without bacteraemia were experienced by 3.2% of patients each month [3]. Reported risk factors for vascular access infection include catheter use, low serum albumin level, diabetes and inadequate dialysis [1].

Results and Discussion

The overall incidence of vascular access infection ranged from 0.67-1.71% and appears to be decreasing (Table 12.1).

Table 12.2 shows the incidence of vascular access infection in relation to patient characteristics. Females have a higher incidence of vascular access infection. Tokars et al [1] have also noted a higher incidence of vascular access related bacteraemia in women. This may be due to smaller arm veins resulting in more usage of synthetic grafts or catheters [2,4]. Patients with autosomal dominant polycystic kidney disease appeared to have a higher incidence of vascular access infection. The cause for this is unknown.

Diabetes mellitus did not seem to increase the risk of vascular access infection. This finding was also noted in other studies [1,5]. Similarly, there was no apparent correlation between BMI and the risk of vascular access infection.

A low serum albumin level has been shown to be associated with higher mortality, as well as infections [5]. Similarly, our analysis showed that a low serum albumin level was an important risk factor. For instance, patients with a serum albumin of less than 30g/l had a 4 fold increased risk of vascular access infection compared to those with a serum albumin of more than 40g/l.

Kt/V of less than 1 was also associated with an increased risk of vascular access infection, similar to the findings of another study [1]. A low Kt/V or low serum albumin may be secondary to the use of catheters or may indicate problems with the vascular access. Inadequate dialysis and malnutrition can also suppress the immune function and predispose patients to infection.

The type of vascular access is an important determinant of infection risk [1,6] and mortality [2]. Our analysis showed a similar strong correlation between vascular access type and infection. The risk of vascular access infection was lowest with wrist arteriovenous fistulae (AVF), followed by brachiocephalic fistulae, grafts, and catheters. In particular, the use of catheters was associated with a 20-fold increase in risk of infection compared to native AVF. (Table 12.3)

As expected, vascular access usage problems, e. g., difficult needle placement, and access complications particularly venous outflow obstruction, access limb oedema and haematoma were associated with a high risk of infection. (Table 12.3)

Conclusion

A good and reliable vascular access is critical for successful chronic haemodialysis. Native fistulae have the longest patency rate and the lowest rate of complications including infection. Hence, we should aim for early creation of native AVF in all pre-dialysis patients to ensure adequate time for vascular access maturation and, thereby, prevent premature needling. This will also reduce the need for temporary catheter which is associated with a high risk of infection and possible future complications such as venous outflow obstruction.

Ensuring adequate dialysis and good nutrition is also of paramount importance to improve patient survival and prevent infection.

With the advancing age of our dialysis population and rising number of diabetic patients, graft and catheter usage may inevitably increase in the future. Future studies should look at ways of minimizing infections especially catheter related infections e.g., choice of catheter, catheter handling, policies on chronic nasal or skin Staphylococcus carriage, etc [7,8]. Outcomes of various treatment modalities, e.g., catheter removal, antibiotic duration, will need to be looked at. In addition, we should identify the organisms commonly associated with vascular access infection. This can provide a guide to empirical antibiotic therapy. Finally, we should study outcomes of vascular access infection such as access loss and the impact on patient morbidity and mortality.

Table 12.1 Incidence of Vascular Access Infection, HD patients 1997-2002

Year	1997	1998	1999	2000	2001	2002
No of patients	1697	2142	2998	4395	5196	5674
Incidence of Vascular Access Infection No. (%)	29 (1.71)	21 (0.98)	34 (1.13)	52 (1.18)	49 (0.94)	38 (0.67)

Table 12.2 Incidence of Vascular Access Infection in relation to patient characteristics, HD patients 1997-2002

Characteristics	N	Incidence (%)	P value
Age:			
0-14	121	0.00	0.203
15-24	1284	0.93	
25-34	3339	1.11	
35-44	4937	1.28	
45-54	5650	0.87	
55-64	4717	1.02	
>=65	2054	0.68	
Gender:			
Male	12841	0.75	0.000
Female	9261	1.37	
Primary diagnosis:			
Unknown	7244	1.05	0.000
Diabetes Mellitus	6194	0.86	
GN / SLE	3611	0.72	
Polycystic kidney	465	3.01	
Obstructive nephropathy	1285	1.48	
Others	3300	1.06	
Diabetes mellitus:			
No	15772	1.08	
Yes	6330	0.84	
BMI:			
<18.5	3419	1.14	0.560
18.5-<25	11491	1.01	
≥ 25	4100	1.20	
Serum albumin (g/l) :			
<30	694	3.03	0.000
30-<35	2374	1.31	
35-<40	7807	1.15	
≥ 40	9200	0.74	
KT/V:			
<1	980	2.14	0.002
1-1.2	2922	1.23	
1.2-1.4	4852	0.97	
1.4-1.6	4845	0.78	
>=1.6	7027	0.94	
Year start dialysis:			
1997-1998	5669	0.88	0.186
1999-2000	5618	0.98	
2001-2002	3006	0.60	
Location of HD:			
Centre HD	20466	1.02	0.940
Home/Office HD	1506	1.00	
Assistance on HD:			
Self care	7339	0.79	0.014
Assisted HD	14047	1.15	

Table 12.3 Incidence of Vascular Access Infection in relation to type of vascular access, HD patients 1997-2002

Type of vascular access:	N	Incidence (%)	P value
Wrist AVF	17612	0.49	0.000
BCF	3453	1.97	
Graft (venous/Gortex)	293	4.78	
Catheter (Permcath/ CVC)	526	10.46	
Vascular access difficulty:			
None	20408	0.67	0.000
Any reported difficulty*	16910	5.09	
Vascular access complications:			
Thrombosis	607	1.98	0.000
Haemorrhage or Haematoma	151	5.30	
Aneurysmal dilatation	918	1.20	
Access limb swollen/ oedema	247	8.91	
Access limb ischaemia	73	2.74	
Venous outflow obstruction	441	4.99	
Carpal tunnel syndrome	199	1.01	
Other complication(s)	352	2.84	

* Any reported difficulty includes difficult needle placement, difficulty getting desired blood flow, etc.

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