Complications of Central Line in Immuno-Compromised Children

Al-Harbi M, Machmouchi M

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Clinical Article

Complications of Central Line in Immuno-Compromised Children

Machmouchi Mahmoud, MD; Al Harbi Mohammed, MD

Abstract

We examined long-term central venous line catheter complications in 78 immuno-compromised children who underwent 81 porta-cath insertions. The rate of infection was 15% (12/81). Conservative treatment failed to clear the infection in all these cases (12/12) leading to the removal of the porta-cath. One catheter slipped in the right atrium of the patient and was retrieved by the interventional radiologist under general anesthesia. Another catheter was removed due to complete blockage by thrombosis. Our experience shows that complications following central venous line insertion can be markedly reduced by collaboration and regular communication between the surgical and nursing team. *Int Pediatr. 2004;19(4):230-233.*

Key Words: porta-cath, catheter related complication, central venous catheter, immuno-compromised children, febrile neutropenia, pediatric oncology

Introduction

Long-term central venous catheter (CVC) placement has improved the care and survival of sick infants, when peripheral intravenous access is tenuous or inappropriate. Although associated with a significant number of complications, long-term CVC plays an integral part in the management of pediatric patients, when repeated deep venous access is required. In this study, we review our experience with a specific group of patients (immuno-compromised), in a tertiary care hospital in Saudi Arabia, in order to delineate causes for such complications as well as to prevent or minimize their occurrence.

From the King Faisal Specialist Hospital and Research Center in Jeddah, Kingdom of Saudi Arabia (Dr. Machmouchi and Dr. Al Harbi).

Address reprint requests to Mohamoud Machmouchi, MD, hmmachmouchi@hotmail.com.

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Materials and Methods

A retrospective chart review was conducted for all long term CVCs placed in immuno-compromised children in the last 2 years in a tertiary care hospital. The charts were reviewed by the same surgeon; laboratory results were collected from an integrated clinical information system; clinical data were confirmed or corrected through a direct contact with the nurses taking care of these patients; and patients were followed-up in the outpatient department postoperatively.

All our CVCs were porta-cath, no Hickman or Broviac lines were used (according to our oncology department preferences). Most of the patients received a bath few hours pre-operatively. We first used Betadine soap, then Betadine iodine for the operative room scrubbing. Catheters were inserted through the external jugular vein, except for 7 cases in which these were inserted trough the internal jugular. When catheterization of the external jugular vein failed, the ports were positioned in the upper chest.

Prophylactic antibiotics were not used, and heparinization of the catheter was avoided when the platelet count was less than 50 000. At the end of the surgical procedure, a compressive dressing for 3 days was applied for patients who had a low platelet count to prevent the development of a hematoma. Sutures were removed within 10 days, even if they were of the absorbable type.

We diagnosed central venous line infection when any patient developed a suppurative collection around the ports, in the subcutaneous tract, or if septicemia ensued with positive blood culture from the central line.

Results

Seventy-eight patients were selected for this study, and they received 81 porta-cath insertions. Forty-five

patients were male, and the age distribution is shown in Table 1. Detailed information about patients who developed an infection is listed in Table 2. The cause of immuno-suppression was most commonly chemotherapy-related. Primary disease distribution is displayed in Table 3.

In all these cases, the central line was removed after failure of conservative treatment by adequate in-catheter lock therapy as well as systemic antibiotic treatment. In the case of HVDRR, the blood culture became negative during a 10-day treatment, but it became positive again, with the same organism, when antibiotics stopped. Ten patients had the insertion of porta-cath during a febrile neutropenia phase and 3 of them developed severe infections during the first 3 weeks. Eleven others were admitted for sepsis status (3 with sinusitis), but none of them had a positive blood culture and the CVC was not removed. Seven of the patients had dental extractions while taking antibiotics, but none of them developed sepsis.

Other complications observed included:

- One porta-cath was removed because of a complete obstruction that occurred after 5 months. Obstructions are treated with urokinase infusion in the catheter for 2 hours. This method was successful in 3 other cases, and in 1 case perforation occurred in the catheter by infusion under pressure to open the catheter after the use of urokinase. This perforation was within the inserted segment in the superior vein cava, and the CVC was functional with no further complication.

- One catheter was completely disconnected and slipped into the atrium. It was removed by the interventional radiology team.

- Three patients did not have blood return, so the catheters were still in use after confirmation of their normal position by direct opacification.

- Multiple episodes of periportal infusion occurred with local inflammation, which was treated conservatively by stopping the use of the CVC for 48 hours and with antibiotics. Most of these incidents occurred at different times after insertion.

Table 1 — Age Distribution

Less than 1 year	17
1 to 2 years	10
2 to 5 years	24
5 to 10 years	13
10 to 14 years	14

Follow up was variable; more than 1 year for those who had no complications, but interestingly all sepsis complications occurred during the first 5 months of insertion (Table 4).

Discussion

In all ages, major complications of central line insertion include massive bleeding; arterial trauma with its consequences, arrhythmia, and massive air entry in the blood stream with subsequent air pulmonary embolism reported.[1-3] Still, the most frequent complication is infection, which can be as minimal as suture infection and as severe as septicemia. The frequency of septicemia varies from 3% to 35%, according to the previous publications.[1,4,5,6]

These infections are not gender related, even though 7 in 12 affected patients were male in our study. But we found that certain factors do play an important role in the incidence of these complications. First, the severity of the disease. Seventy-five percent were cases of acute leukemia (9/12). Of the 10 patients who had febrile neutropenia, 3 developed sepsis with positive blood culture, and their porta-cath was removed. For this reason, and even though it was not recommended in previous literature, our current policy is to insert a short-term percutaneous central line for patients with febrile neutropenia, and after this acute phase, a permanent CVC is inserted (porta-cath). A second factor is the underlying disease of the patient: 4/5 patients with Down syndrome had porta-cath removal for sepsis reasons; however, in only one case of a diabetic patient, the porta-cath did not develop any complications within the 8-month follow-up.

Most of the sepsis complications occurred during the first months after insertion (7/12). Sepsis incidents occurred within the first month. This data is supported by the fact that during this period, the peri-portal collections (hematoma) are frequent, which is caused by the traumatic manipulation of the porta-cath pouch.

Table 2 – Detailed Information of Patients Who Developed Infections

Age - Sex	Diagnosis	From Insertion to Infection	Apparent cause	Culture	Organism	
1Y - F	Acute myeloid anemia (AML)	7 Months	Surg site not clean (preop)	Blood	MRSA	
1Y - M	AML	15 Days	Febrile neutropenia	Blood	Klebsiella-Strep	
1Y3 Month - F	AML - Down Syndrome	5 Months	?	Blood	E. coli	
1Y 4 Month - M	Acute Lymphoblastic Leukemia (ALL)	1 Month	?	Blood	Klebsiella	
	Same -reinsertion	1 Week	Low platelets - neutropenia	Pus around the porta-cath	Staph Aureus	
2Y	VDDR	3 Weeks	?	Blood	Acetinobacter	
	Same -reinsertion	1 Week	Culture from mother and Child noses MRSA+	Blood	MRSA	
3Y - M	ALL	5 Months	?	Blood	Pseudomonas	
6Y - F	ALL - Down Syndrome	2 Months	Leak around aorta-cath Surg site not clean	Pus from collection	Staph aureus	Second CVC no problem since 1Y
9Y - M	Aplastic anemia	2 Weeks	Febrile neutropenia	Blood	Negative	
12Y - F	Lymphoblastic Lymphoma	3 days	Febrile neutropenia Low platelets	Pus from peri portal collection	Staph aureus	
14Y	ALL- Down Syndrome	2 Months	?	Blood	Yeast +	

Table 3 – Primary Disease Distribution

Acute Leukemia	48 – (4 patients with Down syndrome)
Lymphoma	6
Solid malignant tumors	13
Hemophagocytosis	2
Aplastic Anemia	2
Immuno globulin deficiency	2
Nephrotic syndrome resistant to steroid treatment	1
Chloride losing diarrhea with cachexia	1
Down syndrome with recurrence of upper respiratory tract infection	1
End stage liver disease:	1
Hereditary Vitamin D dependent resistant rickets (HVDRR)	1

This patient is known to have recurrences of upper respiratory tract infection and porta-cath was inserted for calcium infusion

Table 4 – Sepsis Complications	
Before 1 week	3
1 week - 1 month	4
1 - 3 months	2
3 - 5 months	3

The most common isolated organism is Staph aureus. Two patients were multi-drug resistant in relation to the nosocomial infection problem. In these cases, it is important to emphasize the pre-operative and post-operative care to minimize the central line infection. Staff training in caring for central line reduces the incidence of CVC related sepsis.

In our data, we noticed that 4 patients were not adequately cleaned (site of insertion) when they came to the operation room (OR). These patients did not benefit from the showering before undergoing the CVC insertion. Two of them developed infection, but none of them before 2 months after insertion. This finding highlights the importance of parental education in order to keep the area of porta-cath access clean.

We also noticed that direct contact, repetitive discussions, explanations, and stimulation of the nursing staff from the surgeon and supervisor plays a big role in the prevention of central line sepsis as well as other complications (peri-portal infusion, blockage of the porta-cath by intraluminal thrombosis, development of peri portal hematoma, as well as the occurrence of sepsis, mainly in a tertiary care hospital).[7]

We did not use any preventive treatment for thrombosis, except heparin wash-out during the insertion procedure when we confirmed that the catheter was flushing and drawing well.

Conclusion

Intra-luminal thrombosis could be the second most frequent cause of CVC removal,[8-11] but as recommended, we try to open the catheter by using urokinase injected into the catheter. Unfortunately, this procedure is not always effective.[12-14] In 1 of our 3 incidents, the porta-cath was removed for complete blockage.

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