Original Article (II)

Experience with Venous Access Devices in Pediatric Cancer Patients

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ABSTRACT

Objective:- **To determine the incidence of nosocomial infections and catheter related complications in pediatric cancer patients with central venous access device (CVAD) during therapy.**

Design:- **A prospective surveillance study. All pediatric patients inpatient or outpatient (February 2001-December 2003) who had venous access problems and required central venous access device for treatment had them placed by doctors of the treating team and were followed to assess for complication risk.**

Methods:- **Cultures were drawn in all febrile patients and sent to the microbiology department, radiological evaluation was done to ascertain line placement.**

Results:- **A total of 18 patients received central venous access devices with few complications. In 44 CVAD line periods, the total number of febrile episodes was 22%, positive blood cultures were seen in 9%. No tunnel infections were seen. Non infectious complications were also observed. Blockage and phlebitis were uncommon.**

Conclusions:- **In high risk cancer patients it may not be possible to prevent nosocomial infections. However with appropriate use of CVAD devices and careful infection control measures, these devices may help to facilitate care without added risk of infection.**

INTRODUCTION :

The use of aggressive chemotherapy regimens requires adequate venous access in pediatric cancer patients for administering chemotherapy and for supportive care. Intravascular devices are divided into two groups -peripheral venous catheters, and central venous catheters. Peripheral venous catheters require a good venous access to insert, usually used for shorter time interval, and are associated with thrombophlebitis and blockage. They have low risk of serious complications. Non-tunneled central venous catheter devices and tunneled devices are inserted into the subclavian vein or internal jugular. They are reported to have a higher risk of catheter related blood stream infections (CRBSI) (table 1). CRBSI, include septic thrombophlebitis, endocarditis, metastatic infection (lung abscess, brain abscess, osteomyelitis and endophthalmitis) [1]. The benefit of CVAD is often counter balanced by the higher susceptibility of nosocomial infections (NI) in these patients. Some studies have shown higher incidence of NI in cancer patients on therapy than in non cancer intensive care patients [2,3], and varies from 11-52.5% [4,5]. Cancer patients also have an increased risk of thrombosis of the venous access device [6]. Low platelet counts and bleeding may make these devices difficult to insert and risk of pneumothorax may aggravate the patients condition. Hence the decision to use such devices need to be made keeping in mind the risks and benefits to the patient. In our hospital IRCH, AIIMS, CVAD are inserted in all transplant patients, acute myeloid leukemia (AML), high grade non hodgkin's lymphoma (NHL) patients and children in whom because of size, condition of veins, prior chemotherapy or planned aggressive therapy, venous access is difficult.

This study was performed to determine the overall incidence of nosocomial infections due to CVAD in pediatric cancer patients in our clinic. To determine what other complications occur to improve the practice of CVAD use at our centre.

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Table-1 Complications of Venous Access Device

Type	Insertion	Complications
Tunneled central venous catheters	Subclavian, internal jugular	CRBSI, pneumothorax
Peripherally inserted central venous catheter (PICC)	Basilic, Cephalic or Branchial vein and enter superior vena cava	Thrombophlebitis Extravasation CRBSI
Non tunneled central venous catheter	Percutaneously inserted into sub.clavian, internal jugular	CRBSI

(CRBSI= Catheter related blood stream infection)

PATIENTS AND METHODS This is a prospective surveillance study. A total of 18 patients were studied during this period, age ranged from 1-16 years, median age 5 years. The study included 7 patients with AML, ALL -3, high grade NHL -3, CML-BC -2, Neuroblastoma -2 and 1 patient of relapsed Ewing's sarcoma. Hickman catheters / IJ /subclavian lines were mostly placed under general anesthesia in the minor operation theatre, while PICC lines were placed in the treatment room of the ward. Informed written consent was obtained from parents after explaining the risks of the procedure. Routine catheter care included alternate day dressing change, instillation of heplock 1ml for children less than 10 kg and 3 ml for children greater than 10kg. All febrile patients with CVAD were assessed for infection –blood culture, chest x-ray, investigation if any localizing site of infection, and blood counts. Dressing care, was performed by the junior doctors. Blood cultures from the CVAD were sent in febrile patients at least once in all patients and in continuously febrile patients they were repeated. Blood cultures were sent for aerobic/anaerobic infections. For patients febrile greater than 4 days, fungal cultures were sent. The exit site was observed for erythema, induration and discharge. The tunnel track (in tunneled devices) was observed for erythema, induration and tenderness.

Results:- Of the number of CVAD line periods observed (44) the total number of febrile episodes was (10, 22%) (table 2). Only 3 episodes were associated with positive blood cultures. The positive cultures were in three patients, one patient had two organisms (9%). Blood cultures were sent, and most patients responded to empiric antibiotics. Organisms reported from positive culture reports were Staphylococcus aureus, Pseudomonas aeruginosa, Acinetobacter and E.coli. Acute myeloid leukemia patients accounted for the maximum number of CVAD related infections. Two patients experienced recurrent, multi organism infections during neutropenic periods. Only 1 febrile episode was not associated with neutropenia.

Three non-infectious complications occurred during the evaluation period, one pneumothorax from a subclavian line and one internal jugular line fell out, one subclavian line broke. Blockage and phlebitis were uncommon, in this group.

TABLE 2

	Type of line	No. of lines	Inf.	Other	ANC <500
ALL	Subclavian	1	–	P	+
AML	Hickman	1	+	–	+
NB	IJ	1	–	–	+
AML	PICC	4	–	–	+
AML	PICC	5	–	–	+
ALL	PICC	1	–	–	+
AML	PICC	2	+	__	+
	Subclavian	1	+		__
NHL	Hickman	1	+	–	+
AML	PICC	4	+	–	+
NHL	Hickman	1	__	__	+
	PICC	4	__	__	?
AML	PICC	4	+(2)	–	+
CML BC	Hickman	1	+	–	+
AML	PICC	3	+	–	+
NHL	PICC	5	+	–	+
ES (Rel)	Subclavian	1	–	B	–
ALL	Hickman	1	__	__	+
	Subclavian	1	–	O	__
CML BC	PICC	1	–	–	+
NB	Subclavian	1	–	–	–

PICC= peripherally inserted catheter device
IJ = internal jugular B= Breakage
P= Pneumothorax ?=Data not available
O= Came out

Non infectious complications may result from inappropriate insertion, inadequate care of device, poor wound healing and poor quality of the inserted line. With more experience these complications can be minimized.

As only 22 % CVAD episodes were associated with febrile episodes it leads us to believe that only patient characteristics were responsible. However this is a not the only factor, as patients were admitted at different time points and construction work, staffing problems, shifting of wards may have contributed to infectious disease control lapses.

Hickman catheters/ IJ /subclavian lines were mostly placed under general anesthesia in the minor operation theatre, while PICC lines were placed in the treatment room of the ward. This may also have contributed to the increased incidence of observed infections [7]. No tunnel infections were seen in either group.

CONCLUSIONS: CRBSI can be life threatening in neutropenic cancer patients. Further reduction in NI rates can be achieved by inserting lines with full aseptic technique as in operating theatres [8] . Appropriate and adequate skin preparation prior to insertion of device is important to reduce infection rates [9]. A dedicated team for venous access dressing and accessing the lines [10], use of antibiotic and antiseptic impregnated lines have all shown decreased blood stream infections [11]. In line filter devices have been recommended to decrease contaminated particulate matter, however there is no randomized trial to show that they decrease CRBSI at present [1]. Infectious complications were seen in 22% of patients, who were febrile and neutropenic. This is within the reported range, however with further efforts this can be reduced. CVAD care is an important component of supportive care in oncology, and should not be neglected.

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