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Implantable port devices in paediatric oncology patients: a clinical experience from a tertiary care hospital

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ORIGINAL ARTICLE

Implantable port devices in paediatric oncology patients: A clinical experience from a tertiary care hospital

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Abstract

Objective: To assess the frequency of infection of portacath in children having malignant tumours and undergoing chemotherapy, and to assess the association of the infection with already known risk factors.

Methods: The retrospective review was conducted at Aga Khan University Hospital, Karachi, and involved patient data related to the period between January 2005 to December 2010. A questionnaire was designed to collect the required data. A total of 67 children were included having portacath inserted for chemotherapy. Children in which portacath was inserted under local anaesthesia in Radiology department, reinserted or inserted because of a reason other than childhood malignancy were excluded. SPSS 19 was used for statistical analysis.

Results: Of the total, 46 (67%) patients were males and a majority of the total (n=31; 46%) was between 6-10 years of age. Besides, 42 (63%) patients had leukaemia, 7(11%) had lymphoma and 18(26%) had various solid tumours. Six (8.95%) ports were removed due to infection. There was significant difference between infection and non-infection groups with respect to absoulute neutrophilic count levels ($p < 0.001$). Positive association was found between low absoulute neutrophilic count level (≤ 500) and the occurrence of port infection.

Conclusions: Port infection rate is higher in children with low absoulute neutrophilic count. The issue needs to be addressed and one may have to alter the timings of port insertion. It is recommended to insert port when absoulute neutrophilic count is normal. To further evaluate the subject, a multicentre trial must be conducted.

Keywords: Portacath, Malignant tumour, Infection. (JPMA 63: 1248; 2013)

Introduction

The first indwelling central venous access catheter was introduced by Hickman et al. in 1979 which was subsequently modified and replaced by Broviac catheter.[1] Since then, Hickman and Broviac catheters are being used most commonly.[1,2] Central venous access devices are needed in the management of patients who need frequent blood products, antibiotics, blood sampling, prolonged surgical nutrition and chemotherapy.[3-5] These catheters are tunnelled under the skin, but have an external exit site which require local care and is associated with a relatively high complication rate.[6] Alternative devices have been developed in the hope of improving safety and acceptability. One such device is completely implanted vascular access device (Port-a-Cath)[7] commonly called portacath or port which is accessed via a subcutaneous valve situated in the chest wall. Port-a-Cath requires less frequent care, gives more freedom and enables participating in sports.[8]

Portacath is inserted under general anaesthesia in children. It is associated with lower complication rate.[9-13] In literature, the reported rate of infection of portacath is 15% to 48%,[14] blockage is 7-8%,[12,15] leak is 3.6% and dislodgement is 3.6%.[12] Other complications are rare. All published studies have comparable results.[6,11] However, one study showed infection rate of only 3.6%.[12] In a local study, portacath had an infection rate of 50% and parents of the children had clear preference for portacath over Hickman line to deliver chemotherapy.[16] Studies on the complications of portacath often have reported conflicting results.[3,5,17,18] This may be due to the variations in the method of insertion (radiological or surgical) and the definition of line infection.

The reported studies cover heterogeneous populations, but mostly adults. Furthermore, majority of these studies are done by oncologists and infective complications are addressed.[10,19] In literature, risk factors for portacath infection are high-risk Acute lymphocytic leukaemia (ALL), absolute neutrophilic count (ANC), nutritional status, fever on the day of surgery, induction of chemotherapy and use of steroids at the time of induction.[20]

At our centre, we deal with paediatric leukaemia, lymphoma and other solid tumours using portacath to deliver chemotherapy. The first paediatric portacath was

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inserted in 2003 at the centre to deliver chemotherapy. Since then, there has been an increase in the use of portacath. This study, shares our experience of using portacath in paediatric oncology patients.

Patients and Methods

The retrospective chart review comprised patient record from January 2005 to December 2010 at Aga Khan University Hospital, Karachi. A total of 67 children were included. In all the patients, ports were inserted electively by a paediatric surgeon and the position of the tip of the catheter was confirmed by fluoroscopy. As per routine platelets and prothrombin time were checked before insertion. Catheter of size 6 french, gauge of 1.33mm and length 75 cm was used in younger children of less than 5 years of age. For older children size 7.8 french, gauge 1.6mm and length 75cm was used. Portacath is a closed system and it is inserted in the internal juglar vein. After insertion, infusion pumps were used for chemotherapy with the port. Antibiotic impregnated devices were not used. Portacath was flushed after every use with normal saline and if not used, it was flushed with heparinised saline once a month.

Information regarding the occurrence of infection and outcome, i.e. whether infection settled with antibiotics or port was removed due to infection, was collected from the hospital records. The removed portacaths were sent for cultures. Basic descriptive statistics were calculated. Frequency of port infection was calculated and reported for the patient population as a whole and for sub-groups such as high-risk ALL, ANC, nutrition status, fever on the day of surgery, induction of chemotherapy and use of steroids at the time of induction. High-risk ALL was labelled on the basis of histology. ANC (=Total leukocyte count * Neutrophilic count * 10) of less than 500 was taken as low. Serum albumin level of $\leq$2.5 was taken as poor nutritional status. Fever on the day of surgery was recorded from the anaesthesia notes on the day of the surgery. Similarly, whether chemotherapy was started prior to portacath insertion or not and whether steroids (prednisolone) were used or not at the time of induction of chemotherapy were taken from the records.

SPSS 19 was used for analysis. Descriptive statistics were calculated like means and standard deviation for quantitative variables and frequencies and percentages for qualitative variables. Fisher exact test was used to assess significant differences between the groups. Multivariable logistic regression was used to assess associations of risk factors with infection occurrence.

Results

A total of 67 ports were inserted in children; majority of them (n=46; 67%) being males. Overall, 31(46%) patients were between 6-10 years of age. 42 (63%) had leukaemia, 7 (11%) had lymphoma and 18 (26%) had various other solid tumours. Out of 67 ports, 6 (9%)

Table-1:

	Adjusted OR			Unadjusted OR		
	OR	95% CI	pvalue	OR	95% CI	pvalue
ANC	65.222	4.939-861.339	0.002	59.000	6.498-535.741	0.000
High Risk All	0.305	0.020-4.747	0.397	4.5450	0.807-250596	0.086
Malnourishment	2.611	0.208-32.739	0.475	0.630	0.107-3.700	0.609
Fever	1.835	0.099-34.056	0.684	1.156	0.121-11.081	0.900
Chemo and Steroids	1.058	0.41-27.148	0.973	0.755	0.078-7.321	0.808

PMDC: Pakistan Medical and Dental Council.

Table-2:

Journal and Posters	[23]Paediatric Hematology and Oncology 1989	[22]European Journal of Cancer 1996	[14]Haemophilia 2000	[15]Pediatr Surg Int 2002	[17]Ann. N.Y. Acad of Science 2008	[21]51st meeting of American Society of Haematology 2009
Author	Muneef et al Swedon	Poorter et al Nether-lands	Bollard CM et al New Zealand	Spicer et al UK	Z Fadoo et al Pakistan	Oussama Alba et al Canada
Patients	34 Ports	169 Ports	23 Ports	55 Ports	52 All lines	192 Ports
Department	Oncology	Oncology & Surgery	Haematology	Surgery	Onco	Haematology
Population	Children	Children & Adults	Children	Children	Children	Children
Line Sepsis	44%	2.90%	15.36%	3.60%	50%	6.25%

were removed due to infection. Of these 6 patients, 5 (83%) were males, and in these 5 males, chemotherapy (with steroid used during induction) had been started before insertion of port, ANC was less than 500, and nutritional status (serum albumin ≤2.5) was poor. However, none of the patients was febrile on the day of the insertion of port.

There was significant difference in infection and non-infection groups with respect to ANC levels ($p < 0.001$). ANC levels were significant on univariate and multivariable analysis. Positive association was found between low ANC level (≤500) and infection. There was a possibility of association of infection with high-risk ALL and malnourishment due to wider confidence intervals of odd ratios and positive deviation towards the right of the null. However, no association of infection was seen with chemotherapy, steroids or fever (Table-1).

Discussion

Portacath is quite common in the West, but in Pakistan its use is rare due to the high cost of the device and the expertise required to handle it and obviously the complications that occur as a result of the use. But at our setup, we use portacath to deliver chemotherapy to children for a longer period of time. There are specialised trained nurses that look after the ports.

Portacath is gaining popularity in our oncology patients over the Hickman line and other central lines. Another study done showed parents' preference towards portacath for chemotherapy.[16] Portacth is cost-effective and used throughout the world for chemotherapy in children. It prevents frequent cannulation and pricks. Children can participate in sports as well and they have liberty of movement without fear of the catheter being pulled out, as there is no exit site.

The infection rate that has been reported in this study (9%) includes all those ports that have been removed due to infection, and all those ports in which infection settled with antibiotics were not included. So, our endpoint was the removal of port due to infection. The rate of infection reported from different institutes varies from 3% to 48% in literature. This difference is due to different definitions of infection that have been opted for the study[12,14,16,21-23] (Table-2).

Infection can be introduced at the time of surgery or subsequently when portacath is accessed with the gripper needle. There are standard guidelines for handling portacath so as to minimise the infection rate as well as other complications. In this study, all the infections occurred during the first 2 weeks of the surgery, signifying that infection may be introduced at the time of surgery. We do not routinely use pre operative antibiotics at the time of insertion. Also, role of pre-operative antibiotics at the time of port insertion is controversial in literature.

We have only found positive association of port infection with low ANC. If we inflate the sample size, there is a possibility of establishing other associations as well. This is evident from the wide confidence intervals of odd ratios. A trend of positive deviation towards the right of the null is seen in cases of high-risk ALL and malnourishment. However, no trends are seen in other cases (chemotherapy, steroids or fever). So, there is a possibility of positive association of infection with high-risk ALL and malnourishment with the increase in the sample size. In future, prospective studies shall be designed to establish these associations.

Conclusion

Port infection rate is higher in children with low ANC. We need to address this issue and may have to alter the timings of port insertion. Insertion of port when ANC is normal is recommended. To further evaluate the problem, multi-centre trials are needed.

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