

## Effectiveness of Permanent Implantable Catheter (Polysite) in Children with Cancer

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### Abstract

#### Background

Totally implantable central venous access devices (ports) have been available for over 10 years, but have not been achieved widespread use in pediatric oncology patients. Ports facilitate the administration of chemotherapy in children with cancer.

#### Materials and Methods

In this study, early complications of implantable central venous access devices in children with different type of cancer was taken under investigation. All of the complications were recorded by staff nurses by checklist for one week. The study included 68 patients with different cancer (lymphoma-leukemia-sarcoma and wilms' tumor) who were treated between April 2007 and November 2011 in oncology department of Dr Sheikh hospital, Mashhad University of medical science.

#### Results

Venous ports were placed in 26 (38.2%) girls and 42 (61.8%) boys aged between 2 and 12 years old (mean: 6 years). We implanted all of the venous ports in patients for chemotherapy, and port implantation procedures were performed by a experienced Pediatric Surgery. 3 cases (4.4%) have needle access site infections which were controlled with antibiotics. Catheter leakage in 3 cases (4.4%), port-catheter disconnection in 4(5.8%) cases and occlusion of the system in 5 cases (7.4%). In this period, there were no major complications.

#### Conclusion

With proper placement technique and adequate nursing care, they represent a definite improvement in child cancer therapy. Ports can provide satisfactory for the majority of pediatric oncology patients, with a low risk of line-related complications and a high degree of acceptability to children and their parents.

#### Key words

Catheterization; Central Venous, instrumentation, adverse effects, Child, Neoplasms

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## **Introduction**

Venous ports are preferred to external catheters, particularly in patients who have received intermittent long-term infusion therapies due to low infection rates and high patient comfort. Implantable central venous access devices are commonly used in patients with cancer to administer chemotherapy, blood and blood products, antibiotics, parenteral nutrition and to obtain blood samples for laboratory analysis. The catheter is usually placed in the subclavian or jugular vein under local anesthesia (1). Studies of long-term catheters for chemotherapy and hemodialysis have shown that the risk of venous stenosis and thrombosis is higher in subclavian vein accesses compared to jugular vein accesses. Therefore, the jugular vein is better than the subclavian vein (2, 3). Traditionally, port implantation is performed by surgery departments under anesthesia with venous cut-down in the operation room. Since the first port implantation performed in an angiography unit using interventional radiology techniques was reported by Morris in 1992, radiological venous port placement has become very common (4,5).

The aim of this study was to evaluate the complication rates and safety of central venous access devices. In this study, we investigated early complications of implantable central venous access devices in children who suffered from different types of cancer in our oncology unit for one week.

## **Materials and Methods**

This study was designed as a longitudinal analytic study. All of the complications were recorded for one week. This study evaluated 68 patients with different cancer (lymphoma-leukemia-sarcoma and wilms' tumor) who were treated from April 2007 to November 2011 in oncology department of Dr Sheikh hospital, Mashhad University of medical science. The diagnoses of all the cancers were identified in the patient file by

oncologists. Venous ports were placed in 26 (38.2%) girls and 42 (61.8%) boys aged 2 to 12 (mean: 6 years). To perform chemotherapy, all of the venous ports were implanted in patients by one experienced Pediatric Surgery. The patient took a shower or had a bath the night before surgery. All of the procedures were performed in the operation room under intravenous (IV) sedation with local anesthesia and supine position. Anesthesiologists administered all IV sedations using fentanyl and midazolam. Antibiotic prophylaxis was given to high risk patients and patients with absolute neutropenia (white blood cell count <500/mm<sup>3</sup>); prophylactic 25 mg/kg IV cefazolin sodium was given 30 minutes before the procedure. Patients with an international normalized ratio (INR) higher than normal and platelet count < 70,000 mm<sup>3</sup> received blood products before the procedure to correct the deficiencies. Right internal jugular vein access (IJV) was initially preferred in all patients. If the right IJV was occluded, then the left IJV was accessed. All were placed on the anterior chest wall. 75 % devices were of the so-called "pediatric" type (Port-A-Cath: 24, Vascuport: 1) and 25% were "adult" ports (Port-A-Cath: 8, Vascuport: 6, Infuse-A-Port: 6, Theraport: 5). Conventional dressing was removed following 3 days catheter implantation. Cleaning and washing of injection sites performed before and after of each injections. The distribution of the patients according to their primary disease is shown in Table I. Note that single lumen ports were used in all patients. The port was accessed and its function was confirmed with aspiration of blood and the reservoir was flushed with 100 U/ml of heparin solution while carefully observing any leakage at the connection site. Antibiotics are continued for 48 h after surgery (IV or oral). For 1-week follow-up, redness, swelling, increased local temperature,

catheter leakage, port-catheter disconnection, Occlusion of the system and hematoma were checked at the site of port placement by one staff nurse daily. Hemothorax and pneumothorax were checked by daily physician examination and chest X ray. Collected data, statistical analysis was performed using spss 16 program.

## Results

In 68 cases ( 82.3 % ) polysite (silicone) were inserted via internal jugular vein (Right side in 49 and left side in 7 cases) and in 12 cases ( 17.7 % ) polysite were inserted via external jugular vein (Right side in 11 and

left side in 1 cases). In total, 68 port implantations were successfully performed. There was no procedure related or early major complications seen. In 15 patients (22 %), procedure related minor complications occurred (Table 2) in which port removal was not needed. No arterial puncture complication, Hematoma, pneumothorax or hemothorax was noted. 3 cases (4.4%) have wound infection in injection site which were controlled with starting of antibiotics. Catheter leakage in 3 cases (4.4%), port-catheter disconnection in 4(5.8%) cases, Occlusion of the system in 5 cases (7.4%).There is no difference in internal (left and right) and external jugular vein (left and right) access for complications ( $p = 0.1$ ).

Table I: Distribution of patients according to their primary diseases

Diagnosis	Patient number	Patient percent
All, AML, HL , NHL	60	88.2
Others	8	11.8
<b>Total</b>	<b>68</b>	<b>100</b>

Table II: Distribution of early complications related to port implantation

Type of complication	Patient number	Patient percent
Needle access site infections	3	4.4%
Catheter leakage	3	4.4%
Port-catheter disconnection	4	5.8%
Occlusion of the system	5	7.4%
Hematoma	0	0
Hemothorax	0	0
Pneumothorax	0	0
<b>Total</b>	<b>15</b>	<b>22 %</b>

## Discussion

From the past decades for management of patients who need multiple or prolonged IV therapy, multiple blood sampling or chemotherapy insertion of central venous access devices has been offered by

specialists. By implantation of this device the peripheral veins of the patients are saved and patients do not suffer from numerous injection sites that are needed for injection of drugs or recurrent sampling of blood. So injection of hypertonic solutions or drugs that are used for chemotherapy cannot damage the blood vessel. Therefore the patients can be satisfied with this device and we can help them feel better and improve their quality of life (6). The patients must be informed of the risks, unwanted effects and complications of the insertion of an implantable catheter port. Some of these complications can be solved by conservative management and in some cases we must extract the port and implant another one (7). Early complications of implantable central venous access devices in this study are:

#### **Needle access site infections**

Its rate in the related literature was from 2.6% to 9% (8, 9, and 10). In this study we have 3 patients (4.4%) developed this type of infections which were controlled with starting of antibiotics. Infection can be local or systemic (bloodstream infection) in clinical settings. In this research we had local infections. Munro in their research reported 8% required removal because of systemic infection (11). In cases in which systemic infection had occurred, the device should be extracted. Needle access site infections presents with local tenderness, pain, erythema, and edema. The most common pathogen is *Staphylococcus epidermidis* (12). During past 10 years 234 central venous access ports (CVAP) were implanted in 225 patients at the Department of Pediatric Hematology and Oncology in Zabrze by Bucki. Mean exposure time was 745 days. Complications were encountered in 17 patients (7.6%). This mainly concerned central venous line infection, which led to removal of 10 CVAP (4.4%). The remaining complications necessitating removal of the CVAP consisted mainly of

mechanical problems (catheter fracture, occlusion, and erroneous implantation to artery). In the opinion of the authors, subcutaneously implanted CVAP are a safe and effective option for high-dose chemotherapy deliverance in childhood cancer patients (13). Vandoni reported (4.3%) infection in 228 patients (96 men, 132 women, average age 58 yr). Patients were followed from six days to 103 months (median 14.7 months) (14).

#### **Catheter leakage and port-catheter disconnection**

We had Catheter leakage in 3 cases (4.4%) and port-catheter disconnection in 4 cases (5.8 %). Backer reported catheter leakage (1 patients) from 45 patients (2.2%) and port-catheter disconnection (1 patients) (15). In the cases in whom medical leakage had occurred, we extracted the port and implanted another one. Vandoni reported (20.1%) rupture, displacement, disconnection, and occlusion of the catheter (14).

#### **Occlusion of the system**

Occlusion of the system was seen in 5 cases (7.4%). Munro reported 5% of blockage and Backer reported 3 port occlusions from 45 children (6.6%) (11). In cases in which complete obstruction had occurred; we changed the place of device. In these patients the entrance of catheter was external jugular vein. Erhan showed hematoma in 0.63% (total: 3 cases from 472 adult patients). Mean duration of catheter usage was 376 days. Late complications occurred at a rate of 10.7% (51 cases). Among those 51 cases, 36 (7.6%) developed minor complications in which port removal was not needed (16).

Malfunction of totally implantable venous access devices is a common complication. Of the 4,886 potentially relevant articles about totally implantable venous access devices (TIVADs) in PubMed, 57 were selected by Goossens. Malfunction

incidence rates were expressed in different ways, including the proportion of affected devices per inserted devices (incidence 0–47%); the number of affected devices per 1,000 catheter days (incidence 0–2.24 per 1,000 catheter days); and the number of malfunctions over the total number of accessing attempts (incidence 0–26%) (17).

## Conclusion

In our study, we experienced no early complication in 53 cases (78%) and also there were no major complications like hematoma and pneumothorax. So we offer using this device in any patient who needs prolonged IV injection or chemotherapy or blood sampling.

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## Conflict of interest

We have no conflict of interest.

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