

Results of Port-A-Cath Implantation: A Cross-Sectional Study about a Single Tertiary Cancer Center Experience

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Abstract

Background: Identifying possible complications accompanying central venous catheterization may improve the results. The current study was conducted to clarify the complication rate among port-a-cath implantation in children referred to Ali-Asghar hospital from 2011 to 2015. This study was designed to determine complication rates among the pediatric population who underwent port-a-cath implantation for chemotherapy.

Methods: The current observational study reviewed the medical documents of children who were referred to Ali-Asghar hospital from 2011 to 2015. Factors such as underlying disease, demographic characteristics, complications and their management were considered. We analyzed the results of this study using multivariate logistic regression.

Results: A total number of 100 patients met the eligibility criteria. In Thirty-two cases, chemoport catheters were removed due to complication management or termination of adjuvant chemotherapeutic treatment. Fifty-one boys and forty-nine girls enrolled in the study. The mean duration of catheter preservation defined per patient was 693 days \pm 1 year SD. 14 catheters were removed followed by planned treatment termination, while 18 catheters were complicated due to port dysfunction, infection, skin necrosis, and extravasation, hematoma in order of decreasing.

Conclusion: Chemo port utilization is mandatory in pediatric patients with cancers demanding adjuvant treatment. The possible complications would be managed by a variety of protocols. Respecting anti-septic principles by trained personnel will prevent the majority of associated complications.

Keywords: Bloodstream Infection, Chemo Port, Implantable Venous Access Device, Pediatric/Child

Conflicts of Interest: None declared

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Introduction

Central Venous Catheterization procedure is an invasive surgery in those who demand adjuvant chemotherapy for malignancies (1). For this procedure, Internal jugular and Subclavian veins are the most common cannulating veins (2). The placement method and following accurate post-operative care principles have utterly affected the functional outcomes (3). The best functional used port system

was first introduced by Niederhuber et al. In 1982 (4). The number of applied catheters, especially in those patients who underwent chemotherapy treatment, has been remarkably increased and approximately two out of 1000 patients in the regarding group demand permanent catheter placement (5). The central vein permanent catheters act as foreign bodies and might superimpose associated com-

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↑What is “already known” in this topic:

Central Venous Catheterization is an invasive surgery in those who demand adjuvant chemotherapy for malignancies. These catheters act as foreign objects and may cause complications such as infection, sepsis, mechanical dysfunction, catheter disconnection, and embolization.

→What this article adds:

Our study suggests that the use of different management protocols and adherence to disinfection principles by trained personnel prevents many of its complications.

plications. Infection, sepsis, mechanical dysfunction, catheter disconnection, and embolization are the most reported complications. Dislodgement and migration of port-A catheter is a rare complication with serious consequences. Advanced search in PubMed reveals a few cases reports in neonates and only two case reports in pediatric cancer patients with venous catheter migration (6). The infectious complications are among the major probable complications with these catheters; reported as high as 44% which could be categorized into regional or systemic infections (7). Proper central venous catheter insertion by an expert team, might decrease the infectious complications to as low as 20% (8). The most common complication is infection and catheter dysfunction, and it is recommended that the catheter be removed before 2 years to prevent complications (9). Identifying the variety of complications and problem-oriented managements are considered in the very early steps to decrease possible complications. Accordingly, in this article we are presenting the prevalence of complications in those children who were undergone central venous catheter placement for chemotherapy in Ali-Asghar hospital during 2011-15.

Methods

In the current cross-sectional analytic study, we have reviewed 100 cancerous children referred to Ali-Asghar Children's hospital during 2011-15 for central venous catheter placement. The total number of thirty-two were removed as management of complications attributed to port-placement or adjuvant chemotherapy termination. Fifty-one boys and forty-nine girls were studied. The patient's age ranged from 2 months to 17 years with a median age of 7.7±4.6 years. The prevalence of catheter-related complications and possible associated risk factors were determined (Table 1).

Pre-operative considerations

Patients who met the following eligibility criteria were enrolled: 1. Platelet count equal to or more than 60,000/microliter 2.Absolute Neutrophil count equal to or more than 500/mm3 3.INR less than 1.5 Prophylactic antibiotic injections was mentioned for all the patients.

Operative considerations

Catheter placement was done under General Anesthesia. Our primary method was Percutaneous catheter placement with Seldinger's technique by ultrasonographic guidance, and an open venotomy technique was obtained in those who failed with the percutaneous attempt (Table 2).

Postoperative considerations

Postoperative dressing was administered for three days. The chemotherapy treatments assumed through inserted catheters followed by confirming the accurate insertion of the catheter by post-operative CXR. The principles of catheter care, including dressing, were issued by trained nurses. Regular daily dressing changes were done for five consecutive days. The predetermined antithrombotic strategy was issued as follows; Every four weeks after catheter placement and regularly followed by each chemotherapy

Table 1. Characteristics of the participants

Age, years	Frequency	Percent
0-9	63	48.8
10-12	41	31.8
13-15	22	17.1
>16	3	2.3

session, 10 ml of 0.9% saline were instilled into the catheters and they were subsequently blocked with 4-8 ml heparinized saline (100 IU/ml). Medical records of enrolled patients were reviewed for the following characteristics: Age, Underlying disease, an applied technique for catheter placement, complications associated with port catheters and the related management. Infectious complications were categorized into early and late subgroups; local or systemic infectious side effects were recorded in less than 30 days in the former group versus those exceeding 30 days in the latter one. Furthermore, the complications were classified as local or systemic infectious complications, thrombotic or device failure.

Detail of data gathering process

The extracted data from medical records were analyzed by SPSS software, version 16. Mean Standard deviation was obtained for quantitative variables, while qualitative variables were described via frequency and percentage.

Results

A hundred port-a-cath has been inserted in 100 patients. The lab test that has been tested for the patients was CBC and Diff and PT and PTT and INR. The total number of thirty-two were removed as management of complications attributed to port-placement or adjuvant chemotherapy termination. Fifty-one boys and forty-nine girls were studied. The patient's age ranged from 2 months to 17 years with a median age of 7.7±4.6 years.

The underlying disease demanding port-a-cath implantation were as follows, with the significantly most common pathology delineated as Acute lymphoblastic leukemia in 74% of patients: Acute myeloid leukemia (3%) non-Hodgkin lymphoma (5%), Hodgkin lymphoma (5%), Neuroblastoma (3%), Rhabdomyosarcoma (3%), Retinoblastoma (3%), Ewing's sarcoma/Primitive Neuroectodermal tumor (1%), Germ cell tumor (1%), and miscellaneous (2%). In other words, eighty-seven patients were suffering from solid tumors, while the remaining thirteen patients were affected by hematologic malignancies.

Table 2. The prevalence of catheter-related complications and possible associated risk factors

Various complications	Frequency	Percent
Acute lymphoblastic leukaemia	74	74
Rabdomyosarcoma	3	3
Acute myeloid leukemia	3	3
Germ cell	1	1
Neuroblastoma	3	3
Ewing	1	1
Burkitt lymphoma	5	5
Hodgkin	5	5
Retinoblastoma	3	3
Others	2	2
Total	100	100

Table 3. Frequency of causes of port –a- cath removal

Causes	Frequency	Percent
Treatment DC	14	43.8
Infection	4	12.5
No function	9	28.1
Skin necrosis	2	6.2
Hematoma	1	3.1
Extravasation	2	6.3
Total	32	100

The mean duration of port-a-cath preservation was 693 days \pm 1 year. No port-related mortality was recorded. The complication rate was 18 percent, and the other 14 catheters were removed solely due to treatment termination.

In those four Patients with infectious complications who underwent port-a-cath removal, prompt recovery occurred. Local complications regarding skin necrosis at the reservoir site were reported in a couple of cases of acute lymphoblastic leukemia. Skin necrosis was reported four months following port-a-Cath placement. The details are shown in (Table 3).

Discussion

Port-a-cath or chemo port is among permanent vascular appliances; containing an implantable subcutaneous reservoir that connects to a catheter-directed to the junction of SVC and right atrium. The first introduction of chemo port into clinical practice was referred to 1982 by Niederhuber et al. (10). Port-a-cath or Chemoport has been utilized as non-transient venous access in chronic diseases (11-14). Although port-a-cath implantation accompanies several complications, the meticulous surgical technique might decrease the infectious rate to 20% (1). Comprehensive knowledge of other possible complications including thromboembolic and traumatic consequences serves as the prerequisite for their prompt identification and appropriate management. Accordingly, we have reviewed the prevalence of Chemoport complications in those children who were referred to Ali-Asghar children's hospital during 2011-15. Thirty-two patients underwent catheter removal in order to approach the complications or simply due to treatment termination.

In this study, two types of complications were diagnosed at 4%: early or immediate postoperative complications (3%) and late or long-term complications (1%). Immediate perioperative complications were recorded in previous studies, and their rate ranged between 1.7% and 20.5% (12-14). The complications were in the form of pneumothorax, hemorrhage, catheter malposition and catheter embolization.

In our study, hematoma (inadvertent arterial rupture with consequent neck hematoma) was the only immediate perioperative complication encountered. It occurred in 1 case (3.1%). Moreover, skin necrosis and extravasation were reported in 3.1% and 6.25%, respectively. All were managed by conservative measures (intermittent compression and ultrasound follow-up). Rates of late complications consisting of infections, thrombosis, extravasation and catheter fracture have been described as 0.0–55.5% in the literature (14). There was no significant correlation

among age, gender, type of malignancy and treatment duration ($p < 0.05$). A wide range of 0.8-7.5% of intravenous catheters implanted in pediatric patients for oncologic purposes is complicated by infection. Generally, 0.9 to 2.8. Per 1000 catheter days might be complicated with infection (15-19). Host-related factors, type of implanted catheter, the longevity of catheter application and preservation approaches are the major infectious-related contributing factors. Moreover, the infectious rate might be higher in developing countries in comparison with developed countries with more medical resources (20). Interestingly, the current study revealed a similar infectious rate in developed countries which might be due to high post-operative care by trained nurses. In the conducted study, 3.1% of patients were complicated by delayed infection and the most common contributing organisms were *S.aureus* and *E.coli*. In another study by Revel-Vilk et al. in Israel, 212 patients have undergone catheterization. The complication rate was one per thousand implanted catheters. Thromboembolic complications were as high as thirteen per day (21). In the current study, no similar complication was reported.

In a cohort study by Journeycake et al. published in the United States, 287 patients with implanted catheters were assessed. (128403 catheters per day) Deep Vein Thrombosis occurred in seven percent of the patients (22). In the study by Amr Elgehiny et al. in Beirut, the result of extravasation of central catheterizations revealed one case in 1000 cases (6). In the study by Schroder et al. in Denmark, the results of 241 central catheterizations revealed a 32 percent complication rate demanding catheter removal (23). In the study by Sibylle Machat et al. in Austria, the rate of complications at our institution was 9.38% (24). In the study conducted by Napalkov et al. in the United States, the highest complication rate was during the first three months, followed by catheter implantation and in younger patients. The results were published after 1000 catheter per day assessment (25). In our study, there was no correlation between age and complication rate. In the study by Osama Bawazir and Elaf Banoon in Saudi Arabia in 2020, the most common reason to remove the catheter was the completion of the treatment (9). The study conducted by Lundgren et al. uncovered the 9.9 per thousand bacteremia rate in those who underwent central vein catheterization. There was a significant statistical correlation between days of oral antibiotic intake and infection rate (26). However, in our study, the infection rate was 4%. In other words, 12.5% of catheter removals were due to infectious complications. In another Italian study by Cesaro et al., a total number of 221 complicated cases among 75249 catheters implanted per day was reported (27). Finally, thirty-four percent of patients revealed complications such as obstruction or evidence of bacteremia.

Conclusion

The assessment of mentioned results unveiled a low rate of serious complications. Moreover, Ultrasound-guided catheter placement by an expert surgeon, precise post-operative nursing care and the early recognition of complications would significantly reduce the related complica-

tions. Finally, conducting further studies including more patients is highly recommended.

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Conflict of Interests

The authors declare that they have no competing interests.

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