Original Article
http://mjiri.iums.ac.ir
Medical Journal of the Islamic Republic of Iran (MJIRI)

Med J Islam Repub Iran. 2022 (15 Jun);36.64. https://doi.org/10.47176/mjiri.36.64

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

Fariba Jahangiri[1]*, Mahmoud Salek[1], Seyed Javad Nassiri[1], Fariborz Samadi[1], Mina Koohian Mohammadabadi[2]

Received: 24 Mar 2021 Published: 15 Jun 2022

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 ±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
Funding: Iran University of Medical Sciences, Tehran, Iran.

*This work has been published under CC BY-NC-SA 1.0 license.
Copyright© Iran University of Medical Sciences

Cite this article as: Jahangiri F, Salek M, Nassiri SJ, Samadi F, Koohian Mohammadabadi M. Results of Port-A-Cath Implantation: A Cross-Sectional Study about a Single Tertiary Cancer Center Experience. *Med J Islam Repub Iran.* 2022 (15 Jun);36:64. https://doi.org/10.47176/mjiri.36.64

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-

Corresponding author: Dr Fariba Jahangiri, jahangiri.f@iums.ac.ir

1. Department of Pediatric Surgery, School of Medicine, Iran University of Medical Sciences, Tehran, Iran
2. Department of Medicine, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

↑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.

[Downloaded from mjiri.iums.ac.ir on 2026-11-09]

[DOI: 10.47176/mjiri.36.64]

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 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 excessing 30 days in the latter one. Furthermore, the complications were classified as local or systemic infectious complications, thrombotic or device failure.

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

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
Euwing	1	1
Burkitt lymphoma	5	5
Hodgkin	5	5
Retinoblastoma	3	3
Others	2	2
Total	100	100

[Downloaded from mjiri.iums.ac.ir on 2026-11-09]

[DOI: 10.47176/mjiri.36.64]

Table 3. Frequency of causes of port –a- cat 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 ±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 to1982 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 postoperative 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 postoperative nursing care and the early recognition of complications would significantly reduce the related complica-

[Downloaded from mjiri.iums.ac.ir on 2026-11-09]

[DOI: 10.47176/mjiri.36.64]

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

Acknowledgments

This study is part of the MD thesis of. Dr. Soosan Nahavandi that was approved by Iran University of Medical Sciences. We appreciate the staff of the Oncology Department of the Ali Asghar Hospital for their assistance in planning and performing this study. The authors have declared that there is no conflict of interest.

Conflict of Interests

The authors declare that they have no competing interests.

References

1. Povoski SP, Khabiri H. Persistent left superior vena cava: review of the literature, clinical implications, and relevance of alterations in thoracic central venous anatomy as pertaining to the general principles of central venous access device placement and venography in cancer patients. World J Surg Oncol. 2011;9(1):1-13.
2. Vinson DR, Ballard DW, Hance LG, Stevenson MD, Clague VA, Rauchwerger AS, et al. Pneumothorax is a rare complication of thoracic central venous catheterization in community EDs. Am J Emerg Med. 2015;33(1):60-6.
3. Klaiber U, Probst P, Hackbusch M, Jensen K, Dörr-Harim C, Hüttner FJ, et al. Meta-analysis of primary open versus closed cannulation strategy for totally implantable venous access port implantation. Langenbecks Arch Surg. 2021;406(3):587-96.
4. Niederhuber J, Ensminger W, Gyves J, Liepman M, Doan K, Cozzi E. Totally implanted venous and arterial access system to replace external catheters in cancer treatment. Surgery. 1982;92(4):706-12.
5. Glickman SW, Krubert C, Koppenhaver J, Glickman LT, Schulman KA, Cairns CB. Increased rate of central venous catheterization procedures in community EDs. Am J Emerg Med. 2010 Feb;28(2):208-12.
6. Elgehiny A, Ghanem K, Hussein HB, Ahmed M, Abohelwa M, Aboelella M, et al. Port-a-Cath fracture and migration in paediatric cancer patients: incidence and management at a tertiary care centre–a 15-year experience. Cardiol Young. 2020;30(7):986-90.
7. Tarantino MD, Lail A, Donfield SM, Lynn H, Peddle L, Hunsberger S, et al. Surveillance of infectious complications associated with central venous access devices in children with haemophilia. Haemophilia. 2003 Sep;9(5):588-92.
8. Horvath B, Norville R, Lee D, Hyde A, Gregurich M, Hockenberry M. Reducing central venous catheter-related bloodstream infections in children with cancer. Oncol Nurs Forum. 2009 Mar;36(2):232-8.
9. Bawazir O, Banoon E. Efficacy and clinical outcome of the port-a-cath in children: a tertiary care-center experience. World J Surg Oncol. 2020;18(1):1-8.
10. Niederhuber JE, Ensminger W, Gyves JW, Liepman M, Doan K, Cozzi E. Totally implanted venous and arterial access system to replace external catheters in cancer treatment. Surgery. 1982 Oct;92(4):706-12.
11. Blanchette VS, al-Musa A, Stain AM, Filler RM, Ingram J. Central venous access catheters in children with haemophilia. Blood Coagul Fibrinolysis. 1996 Mar;7 Suppl 1:S39-44.
12. Abdul-Rauf A, Gauderer M, Chiarucci K, Berman B. Long-term central venous access in patients with sickle cell disease. Incidence of thrombotic and infectious complications. J Pediatr Hematol Oncol. 1995 Nov;17(4):342-5.
13. Deerojanawong J, Sawyer SM, Fink AM, Stokes KB, Robertson CF. Totally implantable venous access devices in children with cystic fibrosis: incidence and type of complications. Thorax. 1998 Apr;53(4):285-9.
14. Al-Bassam A, Al-Rabeeah A, Fouda K, Al-Ashwal A, Ozand PT. Implantable central venous access devices in children with metabolic disease. Metabolism. 1998 Aug;47(8):900-2.
15. Wildhaber B, Kistler W, Caflisch U. [Experiences with the Port-A-Cath system in children]. Schweiz Med Wochenschr. 2000 May 20;130(20):732-8.
16. Hengartner H, Berger C, Nadal D, Niggli FK, Grotzer MA. Port-A-Cath infections in children with cancer. Eur J Cancer. 2004 Nov;40(16):2452-8.
17. Tobiansky R, Lui K, Dalton DM, Shaw P, Martin H, Isaacs D. Complications of central venous access devices in children with and without cancer. J Paediatr Child Health. 1997 Dec;33(6):509-14.
18. Biffi R, Orsi F, Pozzi S, Pace U, Bonomo G, Monfardini L, et al. Best choice of central venous insertion site for the prevention of catheter-related complications in adult patients who need cancer therapy: a randomized trial. Ann Oncol. 2009 May;20(5):935-40.
19. Ignatov A, Hoffman O, Smith B, Fahlke J, Peters B, Bischoff J, et al. An 11-year retrospective study of totally implanted central venous access ports: complications and patient satisfaction. Eur J Surg Oncol. 2009 Mar;35(3):241-6.
20. Rosenthal VD. Central line-associated bloodstream infections in limited-resource countries: a review of the literature. Clin Infect Dis. 2009 Dec 15;49(12):1899-907.
21. Revel-Vilk S, Yacobovich J, Tamary H, Goldstein G, Nemet S, Weintraub M, et al. Risk factors for central venous catheter thrombotic complications in children and adolescents with cancer. Cancer. 2010 Sep 1;116(17):4197-205.
22. Journeycake JM, Buchanan GR. Catheter-related deep venous thrombosis and other catheter complications in children with cancer. J Clin Oncol. 2006 Oct 1;24(28):4575-80.
23. Schroder H, Malchau E, Larsen LN, Bugge K, Olsen H, Kamperis K. [Tunnelled central venous catheters in children with cancer. Removal and duration]. Ugeskr Laeger. 2008 Jan 28;170(5):343-7.
24. Machat S, Eisenhuber E, Pfarl G, Stübler J, Koelblinger C, Zacherl J, et al. Complications of central venous port systems: a pictorial review. Insights Imaging. 2019;10(1):1-12.
25. Napalkov P, Felici DM, Chu LK, Jacobs JR, Begelman SM. Incidence of catheter-related complications in patients with central venous or hemodialysis catheters: a health care claims database analysis. BMC Cardiovasc Disord. 2013 Oct 16;13:86.
26. Lundgren IS, Zhou C, Malone FR, McAfee NG, Gantt S, Zerr DM. Central venous catheter repair is associated with an increased risk of bacteremia and central line-associated bloodstream infection in pediatric patients. Pediatr Infect Dis J. 2012 Apr;31(4):337-40.
27. Cesaro S, Tridello G, Cavaliere M, Magagna L, Gavin P, Cusinato R, et al. Prospective, randomized trial of two different modalities of flushing central venous catheters in pediatric patients with cancer. J Clin Oncol. 2009 Apr 20;27(12):2059-65.

[Downloaded from mjiri.iums.ac.ir on 2026-11-09]

[DOI: 10.47176/mjiri.36.64]