Early Experience with Chemo port Placement in Children with Cancer: An Integrated Activity in the Surgical Oncology Unit of a Cancer Hospital in Nepal.

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Abstract

Introduction: Cancer patients require prolonged venous access for treatments, but repeated punctures can cause complications and distress, especially in children with fragile veins. Peripherally inserted central catheters like Broviac or Hickman pose infection risks and discomfort. Chemoports or sometimes also called vascular access port (VAP) being subcutaneous in placement, offer fewer complications and greater comfort, making them preferable in paediatric population. Although chemoports have long been used for adults in our hospital, their application in children is recent. This study shares our experience with paediatric chemoports placement and its application, focusing on indications, insertion techniques, efficacy, safety, and early outcomes to assess their feasibility and benefits.

Methods: This study included consecutive paediatric patients who underwent chemoport insertion between June 2023 and May 2025. The procedure was done under general anaesthesia with ultrasound-guided right IJV puncture. Catheter length was estimated between 8–11 cm, due to lack of intraoperative imaging. Post-insertion, patency was confirmed via aspiration/flushing, and placement verified by chest X-ray. Patients were monitored in the ICU before ward transfer. Nursing staff received regular training on port care. Follow-up data were prospectively recorded until port removal, death, or study end.

Results: Fifty chemoports were inserted in 49 patients (32 males, 17 females), with a median age of 9 years, (IQR: 7.7–12). Acute leukaemia (ALL: 9, AML: 4) and osteosarcoma (8) were the most common diagnoses. Most (44/49) received ports before chemotherapy initiation. The right IJV (43/50) was the preferred access site. Nine patients completed treatment, with a median port duration of 354 days (IQR: 257–501); overall median duration was 215 days (IQR: 129–451). Disease outcome wise, 16 completed therapy, 22 remain on treatment and 11 patients even already died. Complications included intraoperative arrhythmia (38), ICD insertion (2), infections (3), premature removal (1), and reinsertion (1). Most issues were minor, with only one port removed due to recurrent sepsis.

Conclusion: Chemoport insertion in paediatric oncology patients is safe and effective, with minimal complications. Standardized techniques and proper nursing care ensure successful outcomes. By improving patient comfort and treatment efficiency, chemoports serve as an excellent venous access option for paediatric cancer therapy, even in resource-limited settings like Nepal.

Keywords: chemo port, children, cancer

Introduction

Patients with cancer often require frequent and long-term venous access for the administration of chemotherapeutic agents, blood products, other medications and to draw blood sample for laboratory tests. However, maintaining a reliable intravenous line over an extended period poses significant challenges. Repeated venous punctures can result in vein rupture, thrombophlebitis, and considerable physical and psychological stress for both patients, their families and even to the caregivers. [1] In paediatric patients, venous access is even more difficult due to patient phobia and limited cooperation from child's side and the smaller calibre of veins and the increased fragility of their vascular structures.

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Peripherally inserted central venous catheters (PICC) such as Broviac and Hickman types has higher risks of infection and more patient discomfort as catheters are hanging outside the body. [2]over 85% were inserted radiologically under local anaesthetic. The total time in situ for Hickman lines and Port-a-Caths was 3539 days (median 83, range 6-585 The totally implantable access ports also known as chemo-port, which lies completely beneath the skin, has less risks of complications and greater patient comfort and is preferred in children. [3] While chemoports have been routinely used in adult patients for a long time in our hospital, we have only recently extended this service to paediatric patients as a part of integrated activity within our unit.

The aim of this study is to share our experience with this adaptation for children, including indications, insertion techniques, efficacy, safety, and early outcomes in the Nepalese population.

Methods

All consecutive patients who underwent chemoport insertion between June 2023 and May 2025 were included in the study. Data were extracted from the prospectively maintained database of surgical oncology department. Patients were referred from the paediatric oncology department when the treating team determined that a chemoport was necessary for treatment. Informed written consent was obtained from the parents or guardians. Pre-anaesthetic evaluations were conducted following standard protocols, and blood parameters were optimized as much as possible prior to the procedure. All cases were performed before the major resections, as the first surgery on the operating list for that day. Procedures were performed under general anaesthesia using a laryngeal mask airway (LMA), with local anaesthesia administered at the infraclavicular incision site. A single intravenous dose of prophylactic antibiotics was given before the procedure, followed by a five-day course of oral antibiotics. As far as possible all procedures were carried out a day before intended chemotherapy schedule.

Dressing and draping were performed after induction of anaesthesia. The right internal jugular vein (IJV) was preferentially punctured by a consultant anaesthesiologist and guidewire inserted under ultrasound (US) guidance. The other veins used were left IJV and right subclavian vein in case of difficult right IJV assess. Proper guidewire placement was confirmed using both transverse and longitudinal views, and the procedure proceeded only after both the surgical oncologist and anaesthesiologist agreed on the correct position of the guidewire. A peel-away sheath was then introduced, and the chemoport catheter was inserted through it, followed by removal of the sheath. The intended port site, which had been pre-infiltrated with lignocaine was incised, and a subcutaneous pocket was created. The catheter was tunnelled from the puncture site to the port pocket using a tunneller after it was threaded into it. Due to the unavailability of fluroscopy in the operating room, the catheter length was estimated based on the child's body habitus, typically ranging from 8 to 11 cm from the puncture site in neck. The catheter was trimmed to the appropriate length, connected to the port and locked. The skin was closed in layers using delayed absorbable sutures, Huber needle was inserted and dressing applied. The catheter was aspirated to confirm free flow and flushed multiple times with heparinized saline during the procedure to ensure patency. A chest X-ray was obtained after shifting the child in ICU and port used if Chest x-ray is normal. The child was kept for observation for 4-6hours before shifting to ward.

Before November 2024, full cost of chemoport and consumables was approximately USD $360, which has to be borne by patient. Subsequently, under a government healthcare scheme, patient expenses were reduced to USD $250 for the port device alone, with the remaining costs subsidized by the government.

Appropriate sterile precautions were taken during accessing the port. A training program for nursing staff on the care and management of chemoports was conducted regularly.

Data from the follow-up of these patients were entered into the register during rounds and later into prospective data-base. Follow up was ended once the chemoport was removed, or the child died or at the end of study on May 2025. The chemoport days were calculated from the interval between insertion and follow-up end point.

Results

Fifty chemoports were inserted in forty-nine patients, comprising 32 males and 17 females. The

median age of the patients is 9 years, IQR (7.7-12). The most common diagnosis is acute leukaemia followed by osteosarcoma as shown in table 1.

Forty-four patients had chemoport inserted before the first cycle of chemotherapy, while in six patients the port was placed during the course of chemotherapy. Out of forty-nine patients, 34 were treated with curative intent, 10 had metastatic disease, and 5 patients were undergoing treatment for relapse.

The most common vein puncture site is right IJV (43/50) followed by left IJV (4/50) and right subclavian vein (3/50).

Nine patients had their ports removed after completing treatment; with a median chemoport duration of 354 days (IQR: 257–501 days). When all patients were included, including those still undergoing treatment, the median chemoport duration was 215 days (IQR: 129–451 days). Eleven patients died during the study period, sixteen patients have completed treatment, and twenty-two patients are still undergoing treatment.

The complications are shown in table 2, in our series one patient required premature removal and re-insertion of a new port while 2 patients required intercostal drain (ICD).

Table 1: Disease profile of patients

Diagnosis	Frequency
ALL	9
Osteosarcoma	8
HL (Hodgkin's Lymphoma)	5
Medulloblastoma	5
AML	4
Ewing Sarcoma	2
B Lymphoblastic Lymphoma	2
Nasopharyngeal Carcinoma	2
Sarcoma	1
Hepatoblastoma	1
CNS Neuroblastoma	1
Anaplastic Large Cell Lymphoma	1
Pediatric Follicular Lymphoma	1
RMS (Rhabdomyosarcoma)	1
T Lymphoblastic Lymphoma	1

Discussion

Prolonged venous access is required during the treatment of cancer for administration of chemotherapy, blood products, other medications and to send sample for various blood tests. Prolonged and multiple access can lead to thrombophlebitis, vein rupture, extravasation and cellulitis and situation is more challenging in children.

Table 2: Complication of chemo port

Complications	Number
Intraoperative arrythmia	38
Intercostal drainage	2
Exposure	2
Infection (Pocket)	1
Surgical site infection	2
Unsightly scar	3
Granuloma	2
Premature removal	1
Re-insertion	1
Recurrent sepsis on usage	1
Inadvertent arterial puncture	2

Broviac and Hickman introduced indwelling tunnelled exteriorized catheters, however these were associated with higher risks of infection and increased patient discomfort.[4] Niederhuber and colleagues developed a totally implantation venous access port (TIVAP) in 1982, this innovation improved patient comfort and reduced infection rates.[3] Chemport has the advantage that the puncture needle is removed after the use and skin covering the port reservoir serves the natural protection against infection.

In our series, the most common diagnosis was haematological malignancy, followed by osteosarcoma, similar to findings reported in other studies.[5] Forty-four patients had port placed at the beginning of treatment while in 6 patients port was placed in between administration of chemotherapy. The most common vein puncture site in our study is right IJV (43/50) followed by left IJV (4/50) and right subclavian (3/50) which is consistent with other studies. [6] The advantages of IJV over SCV are lower incidence of complications like; pneumothorax, upper extremity vein thrombosis, chylothorax and catheter pinch-off.[4]

The complication rate on our series is comparable to most of the reports. [7],[3],[8] The re-insertion rate in our series is 2% (1/49). We had to reinsert the port in one patient due to catheter related blood stream infection presenting with fever and chills while using it. We removed the port and put a new one from other side. Two patients had port exposure for which secondary suturing was done. Two patients

developed haemothorax and pneumothorax which was managed by intercostal drainage (ICD); both of them had difficult vein access and required multiple punctures. Port was normally functioning on both children. We have not encountered any catheter related complications like disconnection, fracture, migration, twisted reservoir, extravasation or incorporation into vein wall in our study; which is reported as 2.3% in studies.[3],[6]

Transient intraoperative cardiac arrhythmias was a very common event in our study (76%); all arrhythmias reverted to normal rhythm simply by pulling the guidewire or catheter, some studies have reported serious situations like asystole and complete heart block. [9],[10] It is important to monitor ECG and movement of guidewire during the procedure. There was two arterial puncture which was managed by simply removing the needle and applying pressure for some time.

The other difficulties faced during usage is no backflow during aspiration but forward flow was good, hence used normally. There were some minor problems like thinned out skin above the hub, granuloma, unsightly scar; and few patients required oral antibiotics after secondary suturing and when there is suspicious catheter related blood stream infection.

The median chemoport days in our study is 354 days, IQR (257-501) which is comparable to other studies.[3],[5] The proper care of chemoports have helped us achieve the longer chemoport indwelling time, only one port has to be removed prematurely in our series. Eleven patients died during the study period, none of them related to port related complications.

We were routinely using ports in adults but were initially hesitant to use them in children due to the lack of a C-arm in our theatre for confirmation of puncture and adjustment of catheter length. Gradually, we began placing ports in older children, and with increasing experience, we extended this practice to younger children as well. Puncturing under ultrasound guidance has resulted in a low complication rate and no patients were taken back for catheter length adjustment.

Conclusion:

Chemoport insertion in paediatric oncology patients is a safe and effective method for long-term venous access, with low major complication rates in our study. Standardized surgical technique and proper nursing care contributed to successful outcomes. Chemoports enhance patient comfort and treatment efficiency, making them a valuable option for paediatric cancer care in settings like Nepal.

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