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Original Article

Cephalic Vein Cutdown Technique for Chemoport Insertion in Oncology Patients: A Prospective Observational Study

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ABSTRACT

Background: Totally implantable venous access ports (TIVAPs) are essential for long-term chemotherapy delivery. The cephalic vein cutdown technique allows direct visualization, reducing blind puncture complications, but literature on its outcomes remains limited in Indian oncology settings.
Methods: A prospective observational study was conducted from January 2024 to January 2026 at Karnataka Medical College and Research Institute, Hubli. Ninety-five patients undergoing chemoport insertion via the cephalic vein cutdown were included. Demographics, intraoperative success, and postoperative complications were recorded and analyzed. Intraoperative failures led to subclavian or internal jugular vein cannulation via the Seldinger technique.
Results: The mean age of patients was 55.3 years, with the majority presenting with Stage II–III breast carcinoma (97.8%). Successful port placement was achieved in 97.8% of cases, with intraoperative failure in 2.2%. No major complications (pneumothorax, hemothorax, vascular injury) were observed. Postoperative complications occurred in 15.8% of patients, including port blockage (9.5%) and port-site infection (6.3%). There were no significant associations between complications and age, BMI, clinical stage, or type of anesthesia. Right-sided insertions had a slightly higher failure trend.
Conclusion: The cephalic vein cutdown technique is a safe, effective, and reliable first-line approach for chemoport insertion in oncology patients, with high technical success and minimal life-threatening complications. This method is particularly valuable in resource-limited settings where percutaneous techniques carry increased risk.

Keywords: *Totally implantable venous access ports (TIVAPs), Cephalic vein cutdown technique, Chemoport insertion, Oncology chemotherapy access, Postoperative complications.*

INTRODUCTION

Cancer remains a leading cause of morbidity and mortality worldwide, with over 18 million new cases annually [1]. Chemotherapy is a mainstay treatment for both solid and hematologic malignancies; however, cytotoxic agents are vesicant, hyperosmolar, or extreme in pH, causing peripheral vein injury, thrombophlebitis, and tissue necrosis [2]. Repeated venous access increases patient discomfort and vascular compromise, necessitating safer long-term access solutions.

In 1982, Niederhuber et al. introduced the totally implantable venous access port (TIVAP), or chemoport, consisting of a subcutaneous reservoir connected to a central catheter, providing durable and cosmetically acceptable access [3]. Beyond chemotherapy, these devices facilitate parenteral nutrition, transfusions, and supportive care.

Two major insertion techniques exist: the cephalic vein cutdown and percutaneous methods via subclavian or internal jugular veins using the Seldinger technique [4]. While percutaneous approaches are popular for perceived simplicity, they carry risks including pneumothorax, hemothorax, arterial puncture, and catheter malposition [5]. The cephalic vein cutdown allows direct visualization, avoiding blind puncture complications, with reported high safety in multiple studies [6,7]. Anatomical variations or small-caliber veins may, however, limit success.

Complications of TIVAPs are classified as early (insertion-related) or late (infection, thrombosis, catheter malfunction, mechanical failure). Selection of the insertion technique should consider patient-specific factors and institutional expertise. This study evaluates the cephalic vein cutdown technique at our institution, analyzing success rates, complication patterns, and feasibility for long-term oncology care.

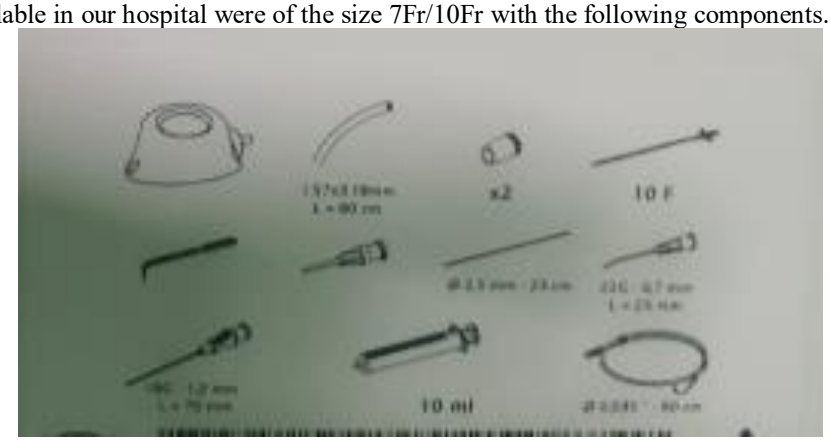
PATIENTS AND METHODS

This prospective observational study included 95 patients undergoing chemoport insertion at Karnataka Medical College and Research Institute, Hubli, between January 2024 and January 2026. Inclusion criteria: first-time chemoport insertion for adjuvant or palliative chemotherapy. Exclusion criteria: previous port placement, axillary vein thrombosis, or deltopectoral/shoulder injuries. Informed consent was obtained from all participants.

Demographic data, clinical stage, tumor laterality, and type of anesthesia were recorded. Patients were followed at regular intervals to assess port function and complications.

Parts of chemoport

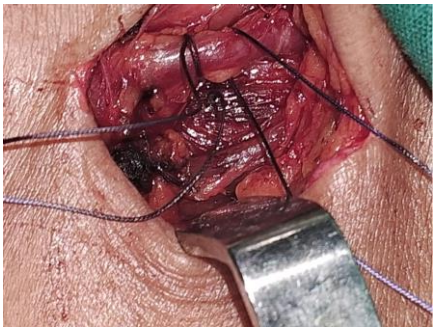
The chemoports available in our hospital were of the size 7Fr/10Fr with the following components.



1- Reservoir- the dome shaped silicone device implanted subcutaneously
2- Silicone catheter- the catheter which goes into the central vein(IJV/ subclavian). Lumen-1.5-1.7mm
3- Locking connectors- secure the port to the chamber
4- Dilator(10Fr)- used after guidewire to dilate the tract
5- Tunneler- used to create a subcutaneous tunnel from port pocket to the venous entry site
6- Introducer needle(small)- used to puncture the vein initially in seldinger technique
7- Peel away sheath- passed over guidewire then peeled away after the catheter is inserted
8- Small needle- usually for local anesthesia infiltration
9- Introducer needle(long)- different gauge introducer needle
10- 10 ml syringe- for flushing/aspiration during the procedure
11- Guidewire- the wire used in Seldinger technique to guide the dilator and sheath(60cm)

Chemoport Insertion Technique

- **Patient Preparation:** Supine, arm abducted 90°.
- **Incision:** 3–4 cm transverse in deltopectoral groove.
- **Vein Identification:** Cephalic vein exposed and mobilized.
- **Venotomy & Catheter Insertion:** Guidewire inserted, peel-away sheath introduced, followed by catheter placement.
- **Port Pocket Creation:** Subcutaneous pectoral pocket made.
- **Connection & Patency Check:** Catheter connected and flushed with heparinized saline.
- **Closure:** Layered closure and securement of port.



Cephalic vein identified

Peel away sheath inserted

Subcutaneous port inserted

In case of cephalic vein failure, the subclavian or internal jugular vein was accessed via Seldinger technique. Ports were flushed with diluted heparin (1:10, 5000 units/ml) before each chemotherapy cycle. Complications were categorized as intraoperative or postoperative, with early (<30 days) or late (>30 days).

Post chemoport X ray to check for position of chemoport

RESULTS

- **Patient Demographics:** Mean age 55.3 years; 30.5% >60 years. Predominantly Stage II–III breast carcinoma (97.8%).
- **Technical Outcomes:** Successful insertion in 97.8%, intraoperative failure 2.2%.
- **Intraoperative Complications:** None major (no pneumothorax, hemothorax, or vascular injury).
- **Postoperative Complications:** 15.8%—port blockage 9.5%, port-site infection 6.3%.

- **Predictors:** No significant association between complications and age, BMI, clinical stage, or anesthesia type. Right-sided insertions showed higher failure tendency, though not statistically significant.

Age Category	Frequency	No of Complications(Complication rate %)
21–30 years	4 (4.2%)	0
31–40 years	15 (15.8%)	3 (20%)
41–50 years	23 (24.2%)	4 (17.4%)
51–60 years	24 (25.3%)	3 (12.5%)
>60 years	29 (30.5%)	5 (17.2%)

Intraoperative Failure	Frequency	Percent (%)
Yes	2	2.2
No	93	97.8

Post-operative complications	Frequency	Percent (%)
Yes	15	15.8
No	80	84.2
Total	**95**	**100.0**

Post-operative complications	Frequency	Percent (%)
Port blockage	9	9.5
Port-site infections	6	6.3
No complications	80	84.2
Total	**95**	**100.0**

Clinical Stage	No Postop Complication n (%)	Postop Complication n (%)	Total n (%)
Stage I	1 (1.3%)	0 (0.0%)	1 (1.1%)
Stage II	29 (35.8%)	2 (14.2%)	31 (32.6%)
Stage III	51 (62.9%)	12 (85.7%)	63 (66.3%)
Stage IV	0 (0%)	0 (0.0%)	0 (0%)
Total	80 (100%)	15 (100%)	95 (100%)

DISCUSSION

TIVAPs are indispensable for safe, repeated chemotherapy administration, particularly for vesicant agents. Three primary insertion routes exist: cephalic vein cutdown, subclavian percutaneous, and internal jugular vein access [3–6]. Percutaneous techniques offer high success but carry life-threatening risks, including pneumothorax and vascular injury [5].

This study demonstrates a 97.8% success rate for cephalic vein cutdown, aligning with Barba Velez et al. (98.5%) [7] and higher than Kumar et al. (82%) [6] and Hataoka et al. (86.4%) [8]. Failures typically relate to small-caliber veins or anatomical variations. Absence of major complications underscores the superior safety of cutdown over percutaneous methods [6–8].

Table A: Comparison of Intraoperative Success Rates — Present Study vs. Literature

Study	n	Cephalic Vein Cutdown Success	Failure / Conversion Rate
Present Study	95	93 (97.8%)	2 (2.2%)
Kumar V et al (2024)[6]	500	410 (82%)	90 (18%)
Hataoka et al (2024)[8]	221	191 (86.4%)	30 (13.6%) — small vein diameter most common cause
Barba Velez (2023)[7]	1047	845/858 (98.5%) by CVC	1.5% within CVC arm; 18% routed to SVP upfront by PUS
Koketsu et al (2010)[12]	79	74 (93.7%)	5 (6.3%) — narrow vein, absent vein, abnormal angulation
Rhu J et al (2019)[9]	508 (119 cephalic)	87.5% (failure 12.5%)	12.5%
Kumar P et al (2024)[11]	23	23/23 (100%)	Retrograde axillary tip: 8.69%; inability to cannulate: 4.34%

Postoperative complication rates (15.8%) are within acceptable limits, comparable with Rhu et al. (12.5%) [9] and Ma et al. (6.86%) [10]. Most complications (port blockage, infection) were manageable. No significant predictors of complications were identified, confirming broad applicability across patient subgroups.

Study	n	Overall Postop Complication	Infection	Port Blockage / Thrombosis	Other
Present Study	95	15 (15.8%)	6 (6.3%)	9 (9.5%)	—
Kumar V et al (2024)[6]	500	~18% (all categories)	4.4%	DVT 4.3%; bacteraemia 4.4%	Hematoma 4.4%; tip malposition 7.6%
Hataoka et al (2024)[8]	221	7.7%	4.1%	Thrombosis 1.8%; occlusion 0.5%	Early complication rate 1.8%
Barba Velez (2023)[7]	1047	CVC: 4.4% late	CVC 2.0%	DVT 1.2%	No pneumothorax in CVC arm
Rhu J et al (2019)[9]	508	Comparable across groups	Infection: 2.2%	Malfunction: 3.5%	Immediate complication: 1.2%
Kumar P et al (2024)[11]	23	—	Hematoma + abscess: 4.34%	—	Retrograde axillary tip 8.69%
Ma L et al (2016)[10]	2996	Late: 5.41%; overall 6.86%	Bacteraemia 1.44%	DVT 0.63%; fibrin 1.84%	Pinch-off 0.20%
Becker F et al (2021)[13]	500 (IJV)	Short-term 0.8%; Long-term 6.6%	Infection: 4.6%	Thrombosis: 0.4%	Removal rate 5.6% at 1 year

Chemoport insertion by cephalic vein cutdown technique is a safe alternative to other techniques with no major life threatening complications.

Parameter	Cephalic Vein Cutdown	Subclavian Percutaneous	Internal Jugular (US-guided)
Pneumothorax risk	~0%	1–3%[17]	<0.5%[13]
Major vascular injury	Rare / none	Occasional	<1% with US[16]
Primary success rate	98.5%(present: 97.8%)[6-9]	>95%[15]	~99%[13]
Equipment required	No specialised kit	Percutaneous vascular kit	US machine + percutaneous kit

Pinch-off syndrome	Not reported in cut-down series	Reported (0.2–0.6%)[20]	Rare
Infection risk	Comparable / marginally lower	Comparable	Comparable

The cephalic vein cutdown remains a reliable, first-line option for safe, long-term venous access, particularly valuable in low-resource settings or when minimizing procedural risk is essential.

CONCLUSION

The cephalic vein cutdown technique for chemoport insertion is safe, effective, and reliable, achieving high technical success (97.8%) with minimal intraoperative failure (2.2%) and absence of life-threatening complications. Postoperative complications were infrequent, manageable, and consistent with literature. No patient or procedural factors significantly influenced outcomes, supporting broad clinical applicability. Right-sided failures warrant further investigation. This technique is particularly suitable for resource-limited settings and should be considered a first-line approach in oncology patients requiring long-term central venous access.

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