



Success Rate and Safety of Totally Implantable Access Ports Placed by the Cephalic Vein Cutdown Technique in Oncological Patients – a Single-Center Study

Martin Karamanliev^{1,2}, Tsanko Yotsov^{1,2}, Dobromir Dimitrov^{1,2}

¹ Department of Surgical Oncology, Dr. Georgi Stranski University Hospital, Pleven, Bulgaria

² Department of Surgical Propaedeutics, Faculty of Medicine, Medical University of Pleven, Pleven, Bulgaria

Corresponding author: Martin Karamanliev, Department of Surgical Oncology, Dr. Georgi Stranski University Hospital, Pleven, Bulgaria; Email: martinkaramanliev@gmail.com

Received: 5 June 2022 ♦ **Accepted:** 20 July 2022 ♦ **Published:** 31 Aug 2023

Citation: Karamanliev M, Yotsov T, Dimitrov D. Success rate and safety of totally implantable access ports placed by the cephalic vein cutdown technique in oncological patients – a single-center study. *Folia Med (Plovdiv)* 2023;65(4):577-581. doi: 10.3897/folmed.65.e87401.

Abstract

Introduction: Totally implantable access ports (TIAPs) are commonly used in oncologic patients undergoing ongoing chemotherapy. The methods of choice for implantation are the subclavian vein puncture approach and the cephalic vein cutdown technique, followed by internal jugular vein access and external jugular vein access.

Materials and methods: We analyzed all patients who had a central venous access implanted by a single surgeon at the University Hospital in Pleven between October 2018 and January 2022, with the aim of determining the success rate and safety of the cephalic cutdown technique for placing totally implantable access ports.

Results: 135 totally implantable access ports were inserted in the study period. Median age of patients was 69.2 years (range, 35-86 years). There were 71 (52.59%) women and 64 (47.41%) men. In 7 patients, the tip of the catheter was reported to go at the distal part of the subclavian vein and axillary vein on the ipsilateral side after initial placement and was repositioned under real-time fluoroscopic guidance. Successful placement of a totally implantable access port using the cephalic cutdown technique was reported in 127 patients (94.07%). No postoperative pneumothorax, hemothorax, or vessel injury were reported. One case of surgical site infection was seen on postoperative day (POD) 7. Late postoperative complications occurred in 3 patients with catheter-related bacteremia all after POD 30 (81, 95, and 172 days after the procedure). One patient died.

Conclusions: Totally implantable access ports placed using the cephalic vein cutdown technique can be used safely and with high success rates in oncological patients.

Keywords

cancer, chemotherapy, port-a-cath

INTRODUCTION

The totally implantable access ports (TIAPs) are commonly used devices in oncologic patients undergoing ongoing chemotherapy. In comparison to frequent vein puncture and cannulation, the main advantages of these devices are the quick, simple, and easy placement of a vein access for medication administration with minimal discomfort experienced by patients.^[1,2] The methods of choice for implantation are the subclavian vein puncture approach and the cephalic vein cutdown technique followed by internal jugular vein access and external jugular vein access.^[3-5] The cephalic vein cutdown technique has been reported to have fewer complications but lower success rates.^[6-8]

AIM

In the present study, we aimed to determine the success rate and safety of the cephalic cutdown technique for placement of totally implantable access ports.

MATERIALS AND METHODS

We analyzed all patients who underwent a surgery for placement of implantable central venous access performed by a single surgeon from October 2018 to January 2022 at our institution. The inclusion criteria were (1) patients >18 years old; (2) indications for totally implantable access port placement; and (3) histologically proven cancer. The exclusion criteria were (1) patients <18 years old and (2) indications for totally implantable access port placement other than cancer. The data, including patient demographics, operative time, success rate, oncological reason for insertion, complications, time and reason for removal, were collected and analyzed. All procedures were performed by a single surgeon and started as a cephalic cutdown technique.

Procedures

The patients were positioned supine on the operating table. The surgical site was prepared and draped in the standard manner. All procedures were performed under 1% lidocaine anesthesia. A 4-cm long incision was made at the deltopectoral groove on the right side. After sharp and blunt dissection in the subcutaneous tissue and facial structures, the cephalic vein was exposed between the deltoid and pectoral major muscle. Two 3/0 vicryl sutures were placed around the vein proximally and distally, as the distal suture was tied. A transverse venotomy was done with Potts-scissors between the ligatures. Back-bleeding was controlled by applying traction on the proximal suture. Then, the catheter was inserted in the cephalic vein with the help of a vein pick and advanced until the tip reached the cranial part of the superior vena cava. The proximal suture was

tied to prevent bleeding and catheter migration attached to the port and the port was sutured in a prepectoral pocket. A test for functionality was performed by attempting to aspirate blood and then flushing the system with a 20 cc saline solution. Layer-by-layer closure of skin and subcutaneous tissue was done with resorbable sutures.

RESULTS

A total of 135 totally implantable access ports were inserted in the study period at our institution. Median age of patients was 69.2 years (range, 35–86 years). There were 71 (52.59%) women and 64 (47.41%) men. Oncological reason for insertion was colorectal carcinoma in 115 patients (85.19%), ovarian cancer in 4 patients (2.96%), breast cancer in 11 patients (8.15%), and endometrial or cervical cancer in 5 patients (3.70%) (Fig. 1). Median operative time was 42.6 min (range, 30–105 min). In 7 patients, the tip of the catheter was reported to go at the distal part of the subclavian vein and axillary vein on the ipsilateral side after initial placement and was repositioned under real-time fluoroscopic guidance. Successful placement of a totally implantable access port using the cephalic cutdown technique was reported in 127 patients (94.07%). The reasons for the inability to place the catheter were small cephalic vein or several small branches in 7 patients and missing cephalic vein in 1 patient. Of these 8 patients, the totally implantable access port was inserted in 1 patient by the cephalic cutdown technique on the contralateral side and in 7 patients using the subclavian vein puncture approach on the ipsilateral side.

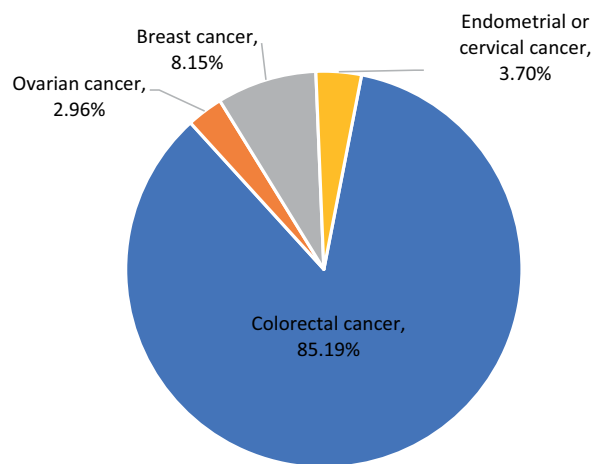


Figure 1. Reasons for the insertion of TIAP.

No postoperative complications, such as pneumothorax, hemothorax, or a vessel injury were reported. One case of surgical site infection was seen on POD 7, treated locally for 5 days. Late postoperative complications occurred in 3 patients with catheter-related bacteremia all after POD 30 (81, 95, and 172 days after the procedure) and all 1-3 days

after using the system for chemotherapy or routine flushing. One patient died at home after 48 hours of fever up to 40°C. The other two patients were septic, the port was removed and intravenous antibiotics were administered after antibiograms and were discharged on POD 5. Aseptic non-touch technique protocol for usage and flushing of ports was introduced after these cases. No other catheter-related bacteremia was seen 16 months after the introduction of the protocol.

DISCUSSION

Cancer patients benefit from totally implantable access ports because of the need for frequent and long-term i.v. drug administrations. Compared to the subclavian percutaneous approach, the cephalic cutdown technique has been reported to have fewer complications but lower success rates.^[6,8] As a result, a subclavian percutaneous approach was preferred in the past. This study confirms that by using the cephalic cutdown technique, we can successfully insert totally implantable access ports with a success rate of up to 94.07%. Other studies report success rates of 70% to 100%. Comparison between studies accessing the safety and feasibility of totally implantable access ports is shown in **Table 1**.^[1,9-16]

The higher success rates and lower complication rates of the cephalic cutdown technique reported in the last few years suggest that it should be preferred over puncture techniques. When the cephalic cutdown technique fails, access via the internal or external jugular veins is usually used as an alternative. Reasons for failure were too small vessel or missing vessel, as reported in most of the studies. The percutaneous subclavian puncture method is associated with significantly higher rates of pneumothorax, hemothorax, and great vessel injuries.^[17,18] However, an external jugular cutdown technique is also described in cases where cephalic cutdown fails.^[11] Nevertheless, a comparative pro-

spective study by Iorio et al. suggests that external jugular cutdown could be superior to cephalic cutdown technique and could be considered a first choice in totally implantable access ports placement.^[4] Cases of catheter-related bacteremia are probably due to improper non-aseptic technique in the use of the system. Management of infections related to totally implantable venous-access ports has been thoroughly described elsewhere.^[19] In most of the cases, removal of the device and treatment with intravenous antibiotics are needed. As an alternative, combined systemic antibiotics and antibiotic lock therapy could be used.^[20]

CONCLUSIONS

Totally implantable access ports placed by the cephalic vein cutdown technique can be used safely and with high success rates in oncological patients.

Acknowledgments

This work was supported by the European Regional Development Fund through the Operational Programme “Science and Education for Smart Growth” under contract No. BG05M2OP001-1.002-0010-C01(2018-2023).

Author contributions

All authors participated in the writing process, analysis of the results, and final revision of the article.

Competing Interests

The authors have declared that no competing interests exist.

Table 1. Comparison between studies accessing the safety and feasibility of totally implantable access ports

Author	Year	Number of patients (n)	Success rate (%)	Pneumothorax (%)	Wound complications (%)	Long-term post-operative infections (%)
Present study	2022	135	94.07	0	0.74	2.22
Hashimoto et al. ^[9]	2019	212	95.8	0	1.9	5.5
Mudan et al. ^[10]	2015	1000	95	1.2	0.4	0.8
Palezny et al. ^[11]	2013	220	94.4	1.5	not reported	not reported
Lin et al. ^[11]	2013	758	92.6	0.13	not reported	not reported
Koketsu et al. ^[12]	2010	79	93.7	0	not reported	not reported
Ignatov et al. ^[13]	2008	550	not reported	0.36	0	7.63
Seiler et al. ^[14]	2006	400	79.5	0	0.75	3.5
Di Carlo et al. ^[15]	2001	344	100	0	0.52	1.7
Torramade et al. ^[16]	1993	234	70	0	not reported	not reported

REFERENCES

1. Paleczny J, Banyś-Jafernik B, Gazurek K, et al. Long-term totally implantable venous access port systems - one center experience. *Anaesthesiol Intensive Ther* 2013; 45(4):215–22.
2. Minichsdorfer C, Füreder T, Mähr B, et al. A cross-sectional study of patients' satisfaction with totally implanted access ports. *Clin J Oncol Nurs* 2016; 20(2):175–80.
3. Rhu J, Jun KW, Song BJ, et al. Cephalic vein approach for the implantable central venous access: A retrospective review of the single institution's experiences; Cohort Study. *Medicine (Baltimore)* 2019; 98(46). Available from: https://journals.lww.com/md-journal/Fulltext/2019/11150/Cephalic_vein_approach_for_the_implantable_central.73.aspx
4. Iorio O, Gazzanelli S, D'ermo G, et al. A prospective, comparative evaluation on totally implantable venous access devices by external jugular vein versus cephalic vein cutdown. *Am Surg* 2018; 84(6):841–3.
5. Otsubo R, Hatachi T, Shibata K, et al. Evaluation of totally implantable central venous access devices with the cephalic vein cut-down approach: Usefulness of preoperative ultrasonography. *J Surg Oncol* 2016; 113(1):114–9.
6. Povoski SP. A prospective analysis of the cephalic vein cutdown approach for chronic indwelling central venous access in 100 consecutive cancer patients. *Ann Surg Oncol* 2000; 7(7):496–502.
7. Fischer L, Knebel P, Schröder S, et al. Reasons for explantation of totally implantable access ports: a multivariate analysis of 385 consecutive patients. *Ann Surg Oncol* 2008; 15(4):1124–9.
8. Chang HM, Hsieh HF, Hsu SD, et al. Guidewire assisted cephalic vein cutdown for insertion of totally implantable access ports. *J Surg Oncol* 2007; 95(2):156–7.
9. Hashimoto S, Otsubo R, Adachi M, et al. Cephalic vein cut-down for totally implantable central venous access devices with preoperative ultrasonography by surgical residents. *In Vivo* 2019; 33(6):2079–85.
10. Mudan S, Giakoustidis A, Morrison D, et al. 1000 Port-A-Cat® placements by subclavian vein approach: single surgeon experience. *World J Surg* 2015; 39(2):328–34.
11. Lin C-H, Yu J-C, Lee Y-T, et al. Conversion from cephalic vein to external jugular vein: success rate increased on totally implantable access ports with cut-down method. *Surg Innov* 2013; 20(6):566–9.
12. Koketsu S, Samesima S, Yoneyama S, et al. Outcome of cephalic vein cut-down approach: A safe and feasible approach for totally implantable venous access device placement. *Oncol Lett* 2010; 1(6):1029–32.
13. Ignatov A, Hoffman O, Smith B, et al. An 11-year retrospective study of totally implanted central venous access ports: Complications and patient satisfaction. *Eur J Surg Oncol* 2009; 35(3):241–6.
14. Seiler CM, Frohlich BE, Dorsam UJ, et al. Surgical technique for totally implantable access ports (TIAP) needs improvement: a multivariate analysis of 400 patients. *J Surg Oncol* 2006; 93(1):24–9.
15. Di Carlo I, Cordio S, La Greca G, et al. Totally implantable venous access devices implanted surgically: a retrospective study on early and late complications. *Arch Surg* 2001; 136(9):1050–3. doi:10.1001/archsurg.136.9.1050
16. Torramadé JR, Cienfuegos JA, Hernández JL, et al. The complications of central venous access systems: a study of 218 patients. *Eur J Surg* 1993; 159(6-7):323–7.
17. Samad AMA, Ibrahim YA. Complications of Port A Cath implantation: A single institution experience. *Egypt J Radiol Nucl Med* 2015; 46(4):907–11.
18. Machat S, Eisenhuber E, Pfarl G, et al. Complications of central venous port systems: a pictorial review. *Insights Imaging* 2019; 10(1):86.
19. Lebeaux D, Fernández-Hidalgo N, Chauhan A, et al. Management of infections related to totally implantable venous-access ports: challenges and perspectives. *Lancet Infect Dis* 2014; 14(2):146–59.
20. Fernández-Hidalgo N, Almirante B. Antibiotic-lock therapy: a clinical viewpoint. *Expert Rev Anti Infect Ther* 2014; 12(1):117–29.

Частота успеха и безопасность полностью имплантируемых портов доступа, размещённых с помощью техники вырезания цефалической вены у онкологических пациентов – одноцентровое исследование

Мартин Караманлиев^{1,2}, Цанко Йоцов^{1,2}, Добромир Димитров^{1,2}

¹ Отделение хирургической онкологии, УМБАЛ „Д-р Георги Странски“, Плевен, Болгария

² Кафедра пропедевтической хирургии, Факультет медицины, Медицинский университет - Плевен, Плевен, Болгария

Адрес для корреспонденции: Мартин Караманлиев, Отделение хирургической онкологии, УМБАЛ „Д-р Георги Странски“, Плевен, Болгария; Email: martinkaramanliev@gmail.com

Дата получения: 5 июня 2022 ♦ **Дата приемки:** 20 июля 2022 ♦ **Дата публикации:** 31 августа 2023

Образец цитирования: Karamanliev M, Yotsov T, Dimitrov D. Success rate and safety of totally implantable access ports placed by the cephalic vein cutdown technique in oncological patients – a single-center study. Folia Med (Plovdiv) 2023;65(4):577-581. doi: 10.3897/folmed.65.e87401.

Резюме

Введение: Полностью имплантируемые порты доступа (ТИАПс) обычно используются при онкологических больных, проходящих химиотерапию. Методами выбора для имплантации являются пункционный подход к подключичной вене и техника вырезания цефалической вены с последующим доступом к внутренней яремной вене и доступу к наружной яремной вене.

Материалы и методы: Мы проанализировали всех пациентов, которым был имплантирован центральный венозный доступ одним хирургом в университетской больнице в Плевене в период с октября 2018 г. по январь 2022 г., с целью определения степени успеха и безопасности метода цефалического разреза для полной установки имплантируемых портов доступа.

Результаты: За исследуемый период было установлено 135 полностью имплантируемых портов доступа. Медиана возраста пациентов составила 69.2 года (диапазон 35–86 лет). Женщин было 71 (52.59%), мужчин - 64 (47.41%). Сообщалось, что у 7 пациентов кончик катетера прошёл в дистальную часть подключичной вены и подмышечную вену на ипсилатеральной стороне после первоначальной установки и был перемещён под рентгеноскопическим контролем в режиме реального времени. Успешное размещение полностью имплантируемого порта доступа с использованием техники вырезания цефалической вены было зарегистрировано у 127 пациентов (94.07%). О послеоперационном пневмотораксе, гемотораксе или повреждении сосудов не сообщалось. Один случай инфекции области хирургического вмешательства наблюдался на 7-й послеоперационный день. Поздние послеоперационные осложнения возникли у 3 пациентов с катетер-ассоциированной бактериемией, у всех по истечении 30-го дня после операции (81, 95 и 172 дня после операции). Один пациент умер.

Заключение: Полностью имплантируемые порты доступа, установленные с использованием техники вырезания цефалической вены, можно безопасно и с высокой степенью успеха использовать при онкологических больных.

Ключевые слова

рак, химиотерапия, катетеризация
