World Journal of Surgical Oncology

BioMed Central

Research

Open Access

External jugular vein cutdown approach for chronic indwelling central venous access in cancer patients: A potentially useful alternative

Stephen P Povoski*

Address: Division of Surgical Oncology, Department of Surgery, Arthur G. James Cancer Hospital and Richard J. Solove Research Institute, The Ohio State University, Columbus, Ohio 43210-1228, USA

Email: Stephen P Povoski* - povoski-1@medctr.osu.edu

* Corresponding author

Published: 16 April 2004

World Journal of Surgical Oncology 2004, **2**:7

Received: 30 January 2004
Accepted: 16 April 2004

This article is available from: http://www.wjso.com/content/2/1/7

Abstract

Background: Cephalic vein (CV) cutdown approach for chronic indwelling central venous access device (CICVAD) placement has previously been shown to be technically feasible in 82% of cancer patients. No data are available as to the potential utilization of external jugular vein (EJV) cutdown approach in cancer patients when CV cutdown approach is not technically feasible.

Patients and methods: One hundred and twenty consecutive cancer patients were taken to the operating room with the intention of placing a CICVAD. All patients were first subjected to attempted CV cutdown approach. If CV cutdown approach was unsuccessful and there were no contraindications to establishing central venous access in the ipsilateral neck region, an ipsilateral EJV cutdown approach was attempted.

Results: Ninety-five cancer patients (79%) underwent CICVAD placement via CV cutdown. Of those 25 patients in which CV cutdown was not technically feasible, 7 had a contraindication to establishing central venous access in the ipsilateral neck region and a CICVAD was placed via the ipsilateral subclavian vein percutaneous approach. Of those remaining 18 patients in which CV cutdown approach was not technically feasible, 17 (94%) underwent CICVAD placement via ipsilateral EJV cutdown approach. Combined success of the CV and EJV cutdown approaches, excluding those 7 patients with a contraindication to central venous access in the ipsilateral neck region, was greater than 99%.

Conclusions: Venous cutdown approaches for CICVAD placement are viable alternatives to subclavian vein percutaneous approach in cancer patients. EJV cutdown approach appears to be a highly successful and safe alternative route when CV cutdown approach is not technically feasible and may be considered a potentially useful primary route for CICVAD placement in cancer patients.

Introduction

The vast majority of chronic indwelling central venous access devices (CICVAD) are placed in cancer patients by the subclavian vein percutaneous approach [1]. Venous cutdown approaches can be useful alternatives; however, they appear to be infrequently utilized. The cephalic vein (CV) cutdown approach has been previously shown to be technically feasible in 82% of cancer patients [2]. Likewise, the external jugular vein (EJV) cutdown approach has been previously shown to be technically feasible in 88% of cancer patients [3]. Although the EJV cutdown approach for central venous access is well described in the literature [3-8], there is no data available which specifically addresses the question of the potential utilization of EJV cutdown approach for CICVAD placement in cancer patients when the CV cutdown approach is not technically feasible. This question is specifically addressed in the present study.

Patients and methods

Between March 27, 2000 and June 25, 2001, 120 consecutive cancer patients evaluated for placement of a CICVAD were taken to the operating room by a single surgeon (S.P.P.) with the intention of placing a CICVAD. Two types CICVAD were used: BardPort® titanium implanted single lumen (9.6 French) ports (Bard Access Systems, Salt Lake City, Utah) or Leonard® (10 French)/Hickman® (12 French) dual-lumen tunneled central venous catheters (Bard Access Systems, Salt Lake City, Utah). Each CICVAD described above was equipped with a radiopaque silicone catheter.

We have previous reported that preoperative venous duplex ultrasound to the upper extremity veins and central veins can be useful in demonstrating residual abnormalities in upper extremity venous anatomy (specifically to the brachial vein, axillary vein, subclavian vein and internal jugular vein) in patients with a history of previous upper extremity central venous access and a documented history of a previous upper extremity deep venous thrombosis [9]. However, this is not the case for assessment of the innominate vein, and superior vena cava. Therefore, all such patients with a history of previous upper extremity central venous access and a documented history of a previous upper extremity deep venous thrombosis underwent preoperative bilateral venous duplex ultrasound to the upper extremity and accessible central veins to rule out such venous abnormalities that could potentially preclude successful CICVAD placement. If such a venous abnormality was identified on preoperative venous duplex ultrasound, the contralateral side was selected for placement of the CICVAD.

Each patient brought to the operating room was placed on the operating room table in a supine position with a rolled sheet placed vertically in the small of the patient's back to rotate the patient's shoulders posteriorly. The procedure was generally performed under monitored intravenous sedation, utilizing local anesthetic. However, if the patient requires general anesthesia for other concurrent surgical procedures or requested general anesthesia, then the procedure was performed under general anesthesia. The entire chest and neck of the patient were bilaterally prepped and draped in a sterile fashion. All patients were first subjected to an attempted CV cutdown approach at the deltopectoral groove, using the method previously described [2].

If the CV cutdown approach was unsuccessful and there were no contraindications to establishing central venous access in the ipsilateral neck region, an ipsilateral EJV cutdown approach was attempted. The patient's head was turned slightly to the contralateral side. In this fashion, the EJV was then generally easily transcutaneously identified. However, if necessary, the patient was briefly placed into Trendelenburg position to transcutaneously identify the course of the EJV. The course of the EJV was marked on the skin with a marking pen and the patient was taken out of Trendelenburg position. Then, a longitudinal 1.5 cm skin incision was made overlying the EJV in the mid neck region. The EJV was circumferentially dissected out and two separate 2-0 silk sutures were then placed around the EJV, with one 2-0 silk suture placed proximal and one 2-0 silk suture placed distally around the EJV. The 2-0 silk suture placed distally around the EJV was then securely tied down. The EJV was then partially transected with a #11 blade in a transverse fashion along its exposed midportion. Back-bleeding from the proximal end of the EJV was controlled by applying mild traction to the proximally placed 2-0 silk suture. With the assistance of a vein-pick, the catheter was then passed into the lumen of the partially transected EJV and directed centrally. Using real-time fluoroscopic guidance, the catheter was then advanced centrally towards the subclavian vein, the innominate vein and the superior vena cava. The tip of the catheter was positioned in the superior vena cava, usually at the junction of the superior vena cava and right atrium. Once correctly positioned, the proximally placed 2-0 silk suture around the catheter and the proximal end of the EJV was then tied down around the catheter in a non-constricting fashion to prevent back-bleeding and catheter migration. The catheter was tunneled from the mid neck incision and over the clavicle to the ipsilateral infraclavicular incision using a tendon passer. The techniques for positioning/securing, testing function, and heparinizing the implanted port or tunneled catheter were performed using the method previously described [2].

If the ipsilateral EJV cutdown approach was unsuccessful or if there was a contraindication to establishing central

venous access in the ipsilateral neck region, an ipsilateral subclavian vein percutaneous approach with the patient in Trendelenburg position was attempted.

For all three approaches to establishing central venous access, intraoperative venography was selectively utilized for difficult cases of central venous access placement and has been previously described [9]. However, during the study period, intraoperative ultrasound was not available for difficult cases. For all three approaches to establishing central venous access, the patients were monitored for immediate postoperative complications.

All patient data were entered into a prospectively maintained central venous access database by the operating surgeon. All analyses were performed utilizing the statistical software program SPSS for Windows© (version 11.0, SPSS, Incorporated, Chicago, Illinois). Since all of the patients undergoing either the EJV cutdown approach or the subclavian vein percutaneous approach had also first undergone an unsuccessful attempt at the CV cutdown approach, no direct comparative analysis of the results from the CV cutdown approach, the EJV cutdown approach, or the subclavian vein percutaneous approach was undertaken.

Results

Of the 120 consecutive patients taken to the operating room with the intention of placing a CICVAD, median patient age was 53 years (range 23–81), of which 72 were females and 48 were males. Thirty-one patients had breast cancer, 25 had gastrointestinal malignancies, 16 had leukemia, 15 had lymphoma, 8 had multiple myeloma, 7 had head/neck malignancies, 4 had lung cancer, and 14 had other malignancies. The procedure was performed utilizing monitored intravenous sedation and local anesthetic in 63 patients. Thirty-seven patients requested general anesthesia for the procedure and 18 patients required general anesthesia for the performance of another concurrent surgical procedures. Only 2 patient required conversion from monitored intravenous sedation to general anesthesia during the procedure. Eighty, BardPort® 9.6 French implanted ports, 31, Leonard® 10 French tunneled catheters, and 9 Hickman® 12 French tunneled catheters were placed. Median operating time for CICVAD placement for all the 120 consecutive patients was 48 minutes (range 23–210).

Of the 120 consecutive patients taken to the operating room with the intention of placing a CICVAD, 95 patients (79%) underwent successful CICVAD placement via the CV cutdown approach and 25 patients (21%) did not. Median operating time for those 95 patients undergoing a successful CV cutdown approach was 45 minutes (range 23–84). Of the 25 patients in whom successful CICVAD placement via the CV cutdown approach was not technically feasible, 17 patients had too small CV thus making the catheter placement difficult and 8 patients had no detectable CV. Likewise, of those 25 patients in whom successful CICVAD placement via the CV cutdown approach was not technically feasible, 7 patients had a contraindication to establishing central venous access in the ipsilateral neck region. This included 2 patients with a history of carotid artery surgery, 2 with a newly diagnosed esophageal cancer requiring neoadjuvant chemotherapy, 1 with a history of neck surgery for a head/neck malignancy, 1 with a neck mass associated with a newly diagnosed head/neck malignancy requiring neoadjuvant chemotherapy, and 1 with adenopathy of the neck associated with metastatic breast cancer.

Of those 18 patients in whom successful CICVAD placement via the CV cutdown approach was not technically feasible and in whom there was no contraindication to establishing central venous access in the ipsilateral neck region, 17 (94%) underwent successful CICVAD placement via the ipsilateral EJV cutdown approach. Median operating time for those 17 patients was 68 minutes (range 44–125). The single patient who failed both the CV cutdown approach and ipsilateral EVJ cutdown approach also failed the ipsilateral subclavian vein percutaneous approach. In this case, a CICVAD was eventually placed during the same operative setting by way of a contralateral CV cutdown approach.

All of the 7 patients, in whom successful CICVAD placement via the CV cutdown approach was not technically feasible and in whom there was a contraindication to establishing central venous access in the ipsilateral neck region, successfully underwent CICVAD placement via the ipsilateral subclavian vein percutaneous approach. Median total operating time for those 7 patients was 68 minutes (range 34–210).

The combined success the CV cutdown approach and the ipsilateral EJV cutdown approach for CICVAD placement, including those 7 patients with a contraindication to central venous access in the ipsilateral neck region after unsuccessful CV cutdown, was 93% (112 of 120 patients). The combined success the CV cutdown approach and the ipsilateral EJV cutdown approach for CICVAD placement, excluding those 7 patients with a contraindication to central venous access in the ipsilateral neck region after unsuccessful CV cutdown, was greater than 99% (112 of 113 patients).

No instances of immediate postoperative complications, such as pneumothorax, hemothorax, or injury to great vessels, was seen in the group of patients undergoing successful CICVAD placement by way of the CV cutdown

approach, by way of the ipsilateral EJV cutdown approach after unsuccessful CV cutdown approach, or by way of the ipsilateral subclavian vein percutaneous approach after unsuccessful CV cutdown approach. However, a single case of postoperative ipsilateral pneumothorax was recognized intraoperatively in a patient who failed the ipsilateral CV cutdown approach, failed the ipsilateral EVJ cutdown approach, and failed the ipsilateral subclavian vein percutaneous approach prior to successful CICVAD placement by way of the contralateral CV cutdown approach.

Discussion

Although most CICVAD are placed in cancer patients by the subclavian vein percutaneous approach [1], venous cutdown approaches can be useful alternatives. In the present study, we specifically address the question of the potential utilization of EJV cutdown approach for CICVAD placement when the CV cutdown approach is not technically feasible.

In the present study, the CV cutdown approach alone was successful in 79% of cases. These results for the CV cutdown approach are virtually identical to those previously published [2,10]. Additionally, the ipsilateral EJV cutdown approach, after an unsuccessful CV cutdown approach, was successful in 94% (17/18) of cases. These results for the EJV cutdown approach after an unsuccessful CV cutdown approach are also virtually identical to those previously published for utilization of the EJV approach alone [3]. Finally, the resultant combined success of the CV cutdown approach and of the ipsilateral EJV cutdown approach, excluding those patients with a contraindication to central venous access in the ipsilateral neck region after unsuccessful CV cutdown approach, was greater than 99% (112/113). Such an impressive success rate for venous cutdown approaches could virtually eliminates the need for consideration of the subclavian vein percutaneous approach for CICVAD placement in appropriately selected cancer patients.

Previous studies have shown that the subclavian vein percutaneous approach for CICVAD placement has a well-documented risk of pneumothorax in approximately 1% to 4% of cases [11-14]. In contrast, previous studies have shown an absence of immediate perioperative complications, including pneumothorax, for both the CV cutdown approach [2,10,15-18] and the EJV cutdown approach [3,16]. Further confirmation of this is demonstrated in the current report in which no single instance of an immediate postoperative complication, such as pneumothorax, hemothorax, or injury to great vessels, was seen in either group of patients undergoing successful CICVAD placement by the CV cutdown approach alone or successful CICVAD placement by subsequent ipsilateral EJV cutdown approach after an unsuccessful CV cutdown approach. The lack of such complications with venous cutdown approaches does add further support to the utilization of venous cutdown approaches for CICVAD placement in cancer patients, however, the current report was not designed to specifically address and compare the risk of immediate postoperative complications between venous cutdown approaches and the subclavian vein percutaneous approach.

It is the author's opinion that several general statements can be made with regards to CICVAD placement by way of the CV and EJV cutdown approaches in cancer patients. First, utilization of a venous cutdown approach (whether it be by way of the CV or the EJV), as compared to the subclavian vein percutaneous approach, appears to give a uniformly high success of catheter placement and appears to give considerable perioperative safety to CICVAD placement in cancer patients. Second, the EJV cutdown approach itself appears to be a highly successful and safe alternative route for CICVAD placement in cancer patients when the CV cutdown approach is not technically feasible. Third, the EJV cutdown approach may be considered as a potentially useful primary route for successful CICVAD placement in cancer patients in place of consideration of the CV cutdown approach or in place of the subclavian vein percutaneous approach. In the future, it is this author's hope that such information may encourage others to give consideration to and to broaden their utilization of venous cutdown approaches to CICVAD placement in cancer patients. However, randomized controlled trials comparing various methods of venous access device placement are needed to answer some of the unresolved issues.

List of abbreviations

Chronic indwelling central venous access devices: CICVAD

Cephalic vein: CV

external jugular vein: EJV

Competing interests

None declared.

Authors' contributions

SPP was responsible for all aspects of the submitted manuscript

Acknowledgments

The authors wish to gratefully acknowledge the assistance of Cynthia A. Mike, R.N., Veronica F. Staron, R.N., and Monica L. Schnopp, R.N.

References

1. Povoski SP: **Long-term venous access.** In: *Cancer Management: A Multidisciplinary Approach. Medical, Surgical, and Radiation Oncology* 7th edition. Edited by: Pazdur R, Coia LR, Hoskins WJ, Wagman LD. Melville: PRR, Inc; 2003:897-908.
2. Povoski SP: **A prospective analysis of the cephalic vein cut-down approach for chronic indwelling central venous access in 100 consecutive cancer patients.** *Ann Surg Oncol* 2000, **7:**496-502.
3. Puig-La Calle J Jr, Sánchez SL, Serra EP, Honorato LA, Raventós VA, Puig-La Calle J: **Totally implanted device for long-term intravenous chemotherapy: Experience in 123 adult patients with solid neoplasms.** *J Surg Oncol* 1996, **62:**273-278.
4. Rams JJ, Daicoff GR, Moulder PV: **A simple method for central venous pressure measurement.** *Arch Surg* 1966, **92:**886.
5. Wade JC, Newman KA, Schimpff SC, VanEcho DA, Gelber RA, Reed WP, Wiernik PH: **Two methods for improved venous access in acute leukemia patients.** *JAMA* 1981, **246:**140-144.
6. Wile AG: **Technique for placement of an implantable venous access system.** *Am J Surg* 1986, **152:**543-544.
7. Raaf JH, Heil D: **Open insertion of right atrial catheters through the jugular veins.** *Surg Gynecol Obstet* 1993, **177:**295-298.
8. Redo SF, Dinner MH: **Placement of central venous catheters by cut-down with electrocardiogram positioning.** *Surg Gynecol Obstet* 1993, **177:**49-53.
9. Povoski SP, Zaman SA: **Selective utilization of preoperative venous duplex ultrasound and intraoperative venography for central venous access device placement in cancer patients.** *Ann Surg Oncol* 2002, **9:**493-499.
10. Kock HJ, Pietsch M, Krause U, Wilke H, Eigler FW: **Implantable vascular access systems: Experience in 1500 patients with totally implanted central venous port systems.** *World J Surg* 1998, **22:**12-16.
11. Eastridge BJ, Lefor AT: **Complications of indwelling venous access devices in cancer patients.** *J Clin Oncol* 1995, **13:**233-238.
12. Poorter RL, Lauw FN, Bemelman WA, Bakker PJM, Taat CW, Veenhof CHN: **Complications of an inplantable venous access device (port-a-cath) during intermittent continuous infusion of chemotherapy.** *Eur J Cancer* 1996, **32A:**2262-2266.
13. Nightingale CE, Norman A, Cunningham D, Young J, Webb A, Filshie J: **A prospective analysis of 949 long-tern central venous access catheters for ambulatory chemotherapy in patients with gastrointestinal malignancy.** *Eur J Cancer* 1997, **33:**398-403.
14. Damascelli B, Patelli G, Frigerio LF, Lanocita R, Garbagnati F, Marchiano A, Spreafico C, Di Tolla G, Monfardini L, Porcelli G: **Placement of long-term central venous catheters in outpatients: study of 134 patients over 24,596 catheter days.** *Am J Roentgenol* 1997, **168:**1235-1239.
15. Di Carlo I, Cordio S, La Greca G, Privitera G, Russello D, Puleo S, Latteri F: **Totally implantable venous access devices implanted surgically. A retrospective study on early and late complications.** *Arch Surg* 2001, **136:**1050-1053.
16. Shukla NK, Das DK, Deo SVS, Raina V: **An analysis of long-term venous access catheters in cancer patients: Experience from a tertiary care center in India.** *J Postgrad Med* 2002, **48:**21-24.
17. D'Angelo FA, Ramacciato G, Aurello P, De Angelis R, Amodio P, Magri M, Barillari P: **Prospective randomised study of cephalic vein cut-down versus subclavian vein puncture technique in the implantation of subcutaneous venous access devices.** *Chir Ital* 2002, **54:**495-500.
18. Kamat A, Kramer P, Soisson AP: **Cephalic vein cutdown for inserting indwelling subclavian vein catheters in gynecologic oncology patients.** *W V Med J* 2002, **98:**15-17.