

Peripherally inserted central catheters with distal versus proximal valves: prospective randomized trial.

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PURPOSE: To evaluate whether peripherally inserted central catheters (PICCs) with a proximal valve have any advantage compared to those with a distal valve in regard to the incidence of occlusion, infection, or malfunction. **MATERIALS AND METHODS:** One hundred patients (mean age, 46 y) were randomized to receive either a distal-valved Bard Groshong catheter (n = 48) or a proximal-valved Catheter Innovations Pressure Activated Safety Valve catheter (n = 52). All catheters were 4-F, single-lumen PICCs. Catheters were placed under fluoroscopic (n = 82) or sonographic (n = 18) guidance. Most (91%) were placed for the administration of antibiotics. The placement procedure, maintenance, and weekly follow-up were the same for both catheters.

RESULTS: Percutaneous placement with the catheter tip in the central veins was successful in all patients. Mean dwell time was 36 days. There were 12 (25%) occlusive or infectious complications in the distal valve catheter group and six (11.5%) in the proximal valve group (P = .08). There were 25 fractures in 17 distal valve catheters (35.4%) and three (5.8%) proximal valve catheter fractures (P < .01).

CONCLUSION: *There was a marked difference in durability between the valved catheters, in favor of the catheter with a proximal valve. There was also a trend for fewer occlusive and infectious complications with the proximal valve catheter..*

SOURCE: Journal of Vascular and Interventional Radiology. 2001 Oct; 12 (10): 1173-7

KEY TAKEAWAY: *This is the only study to date offering a head-to-head comparison between the PASV PICC and Groshong PICC.*

Evaluating new technology to improve patient outcomes: a quality improvement approach.

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SUMMARY: The nurses in the peripherally inserted central catheter (PICC) program at the University of Washington Medical Center perform ongoing data tracking to measure team and patient outcomes. Quality improvement initiatives have included the transition to microintroducer technology and ultrasound-guided placement. Used together, this technology has allowed the PICC team to increase their bedside insertion success rate to 91%. The group has also changed PICC securement methods, and use of the Statlock anchoring device has reduced the incidence of catheter migration from 6% to 1.5% of all catheter lines placed. *Catheter durability also was assessed. The Pressure Activated Safety Valve PICC was compared to the Groshong PICC and the rate of catheter repair and exchange due to breakage has been reduced from 11% to 1%.*

SOURCE: Journal of Infusion Nursing. 2002 Jul-Aug; 25(4): 250-5

KEY TAKEAWAY: *Catheter fracture is commonly associated with the Groshong PICC. In this case, the PASV PICC was able to virtually eliminate the instance of catheter fracture.*

The timing and sequence of multiple device-related complications in patients with long-term indwelling Groshong catheters

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BACKGROUND: The function of long term indwelling venous access devices is commonly perturbed by post-insertion catheter-related complications (CRC). In an effort to assess the patterns of CRC in our community accurately, a prospective analysis of Groshong catheters in adult cancer patients was undertaken.

METHODS: Three hundred and twenty-four consecutive adult oncology patients in whom a Groshong catheter was utilized for long-term central venous access were observed for the development of a CRC. A subset analysis was undertaken of those catheters that developed one or more complications.

RESULTS: Among the 221 catheters with a primary complication (68%), 176 additional complications (54%) were subsequently identified (109 2nd, 50 3rd, and 17 4th complicating events). Ball-valve effect (BVE), the most frequent complication, was found to occur disproportionately as a primary event (85 of 119 catheters, 71%, $P < 0.01$), whereas catheter-related venous thrombosis (CR-VT) was more likely to occur as a later, subsequent complication (46 of 66 catheters, 70%, $P < 0.01$). Although risk analysis affirmed a paucity of clinical predictors for developing a primary complication, patients with BVE as a first complication were at increased risk for developing a later episode of CR-VT.

CONCLUSIONS: Multiple sequential complications are common in patients with Groshong catheters, occurring in a rather predictable sequence. The increased risk of CR-VT in patients with catheters with an early complication suggests a cause-effect relationship. An awareness of this sequencing may lead to improved strategies for the prevention of primary and subsequent complications.

SOURCE: Cancer. 1996, Sep 15; 78(6): 1308-13.

KEY TAKEAWAY: *This study outlines multiple complications associated with Groshong technology. An overall catheter complication rate of 68% was noted. Of the complications, "Ball-valve effect" and catheter occlusion were the two most common forms of catheter related complication.*

Nurse and patient satisfaction with three types of venous access devices

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PURPOSE/OBJECTIVES: To examine patient and nurse satisfaction with three types of venous access devices (VADs)--port, Groshong (Bard Access Systems, Salt Lake City, UT), and Hickman (Bard Access Systems)--and to identify the problems and benefits experienced with each type of device.

DESIGN: A descriptive, correlational quality-assurance study.

SETTING: Outpatient oncology/hematology clinic in a midwestern United States academic hospital with a comprehensive cancer center.

SAMPLE: A convenience sample of 85 patients who had a port, Groshong catheter, or Hickman catheter and the clinic nurses who provided their care.

METHOD: Consecutive patients meeting study criteria were invited to complete self-report questionnaires at the time of their clinic visits. Clinic nurses who cared for these patients also completed questionnaires.

FINDINGS: Patients' reports of benefits did not differ by device, but they reported fewer blood-drawing problems with ports than with Groshong or Hickman catheters. *Patients and nurses reported infections and clots more often with Groshong catheters than with the other two devices*, Patients indicated that healthcare workers seemed most knowledgeable about Hickman catheters. Patients with ports reported more problems with access to the device, development of hematomas, and anxiety. *Nurses reported more flow rate problems with Groshong catheters than with Hickman catheters*. Patients and nurses reported no flow rate problems with ports.

CONCLUSIONS: Each device was associated with a specific problem, yet in the global satisfaction ratings, patients expressed the greatest satisfaction with Hickman catheters and ports. *Nurses tended to be least satisfied with Groshong catheters*.

IMPLICATIONS FOR NURSING PRACTICE: Nurses need to ensure that other care providers have appropriate information on the care of VADs. This could be accomplished via written instructions on VAD care and followup telephone calls to care providers. A need exists for continued patient education on VAD care to minimize complications. The selection of an appropriate VAD should be based on the patient's best interests rather than on nurses' preferences.

SOURCE: Oncology Nurse Forum. 1997 Jan-Feb; 24 (1 Supplement): 34-40

KEY TAKEAWAY: *This study compares port performance to Hickman and Groshong TCCs. Each device had specific performance related issues, but in global satisfaction ratings, RNs were less satisfied with the Groshong technology.*

A randomized, prospective trial of standard Hickman compared with Groshong central venous catheters in pediatric oncology patients

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BACKGROUND: Safe and reliable central venous access is critical in the management of children with cancer. A recently described valved catheter (Groshong) requires less frequent flushing to preserve catheter patency, theoretically reducing daily care costs for the catheter as well as lessening the risk of mechanical or infectious complications. This study compared standard Hickman to Groshong catheters in a group of pediatric oncology patients.

STUDY DESIGN: From December 1992 to May 5, 1994, 20 consecutive pediatric oncology patients were randomized by medical record number to receive either a standard dual lumen Hickman (7F) or Groshong (9.5F) catheter. All patients were prospectively followed on a weekly basis and a log was maintained regarding complications and cost of maintenance of the catheter until it was removed.

RESULTS: Ten patients received Groshong catheters and ten received Hickman catheters. Total catheter days for each group were similar (Hickman, 2,599 compared with Groshong, 2,389 days). *Five Groshong catheters required removal because of mechanical complications and several required daily flushes because of blood backing up into the catheter lumen. When taking into account the cost of associated complications, no differences were noted in daily cost for maintenance between the two catheters.*

CONCLUSIONS: *When considering the cost of complications, Groshong catheters were no less expensive to maintain compared with standard Hickman catheters. Furthermore, Groshong catheters malfunctioned more frequently and required a greater number of urokinase instillations for withdrawal occlusion.* The use of the Groshong catheter in pediatric oncology patients cannot be supported by the present study.

SOURCE: Journal of the American College of Surgery. 1996 Aug; 183(2): 140-4.

KEY TAKEAWAY: *This study compares cost associated with a non-valved Hickman catheter to a valved Groshong catheter in a pediatric oncology setting. It was concluded that due to a higher incidence of catheter related complications with the Groshong catheter compared to the Hickman, any potential cost savings associated with a non-Hepairn flush was negated.*

The effects of Heparin flush on patency of the Groshong catheter: a pilot study

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PURPOSE/OBJECTIVES: To determine whether the addition of a heparinized saline flush would decrease clot formation and persistent withdrawal occlusion (PWO) in Groshong (Bard Access Systems, Salt Lake City, UT) catheters.

DESIGN: A prospective, nonrandomized study using a historical control group of patients with Groshong catheters that had been flushed weekly with 5 ml normal saline compared to data from patients with Groshong catheters flushed weekly with 2.5 ml heparinized saline (100 U/ml). A retrospective chart review was performed to determine the incidence of PWO. In both groups, the presence of liquid blood and adherent or nonadherent clot in explanted catheters was recorded.

SETTING: Oncology inpatient and outpatient units of a cancer research center located in a mid-Atlantic city in the United States.

SAMPLE: Control group: Twenty-eight 9.5 Fr. double-lumen Groshong catheters maintained with a saline flush. Experimental group: Twenty-three double-lumen Groshong catheters maintained with a heparin flush. At the time of this report, 12 of these 23 catheters had been explanted and 11 remained in place.

METHODS: The frequency of PWO was measured in a retrospective chart review and determined by the number of urokinase instillations required for each catheter. All 28 catheters in the saline flush group and 8 catheters in the heparin flush group were examined immediately after removal for intraluminal liquid blood and adherent or nonadherent clot.

MAIN RESEARCH VARIABLES: Urokinase usage, intra-luminal blood or clot, and PWO.

FINDINGS: *PWO occurred less frequently in the heparin flush group ($p = 0.006$) than in the saline flush group. All 28 of the saline flush catheters developed an adherent clot in one or both lumens, whereas no adherent clots were found in the heparin flush catheters ($p < 0.0001$).*

CONCLUSIONS: The addition of a heparinized saline weekly flush to maintain Groshong catheters decreased the presence of intraluminal adherent clots and improved the catheter function.

IMPLICATIONS FOR NURSING PRACTICE: The safe delivery of medication and the ability to obtain blood specimens are vital for patients who depend on functioning venous access catheters. Flushing Groshong catheters with heparinized saline decreases the likelihood of intraluminal clot formation and catheter malfunction.

SOURCE: Oncology Nurse Forum. 1996 Oct; 23(9): 1401-5

KEY TAKEAWAY: *This study compares two sets of Groshong catheters, those that received a Heparin flush and those that did not. The study notes that there was a significant difference in PWO when Heparin was not used as part of the flushing protocol.*

Intraperitoneal therapy administered through a Groshong catheter

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SUMMARY: This report describes a new device for delivery of intraperitoneal therapy. From October 1989 through March 1991, 27 externally accessed Groshong (Bard Access Systems, UT) catheters were placed transabdominally into 24 patients with presumed epithelial ovarian cancer at the conclusion of primary or second-look laparotomy. Total duration of catheter use was 81 months (range, 1-62 weeks). Fifty-seven cycles of intraperitoneal therapy were administered through 18 catheters (range, 1-11). Nine catheters were removed without being used after patients randomized off intraperitoneal treatment arms or were ineligible for intraperitoneal protocols. There were no complications associated with catheter placement or removal. None of the catheters became obstructed or dislodged while in place. There were no cases of infectious peritonitis, although one patient developed an exit-site skin infection. Surgery is not required to remove the Groshong catheter which fosters empiric placement of the device at the time of laparotomy in all patients potentially eligible for intraperitoneal therapy. ***The device-related infection rate of 4.2 per 100 patients is similar to that described using other implanted devices.*** Catheter maintenance is easy and patient acceptance is good. The Groshong catheter is a safe, reliable, and acceptable means of delivering intraperitoneal therapy.

SOURCE: Gynecological Oncology. 1994 Jun; 53(3): 320-5.

KEY TAKEAWAY: *This article notes that the Groshong catheter is a safe and effective means to deliver intraperitoneal therapy, but references a 4.2% infection rate associated with the device.*

Externalized Groshong catheters and Hickman ports for central venous access in gynecologic oncology patients

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SUMMARY: There is a demand on gynecologic oncology services for semipermanent cannulization of central veins to improve the quality of life in cancer patients by circumventing the need for frequent peripheral venous punctures. Central venous thrombosis and sepsis are the major complications with these lines. We reviewed our experience with the externalized Groshong catheters and subcutaneously implanted Hickman ports in 104 gynecologic oncology patients requiring either chemotherapy (56), hyperalimentation (5), or supportive care (43). All devices were inserted under the supervision of one primary gynecologic oncologist. Groshong catheters and Hickman ports remained in place for a median of 68.5 and 210 days, respectively ($P < 0.001$). ***Thrombosis occurred in association with 4.8% of catheters and was exclusive to the Groshong catheters. Line sepsis occurred in 32% of Groshong catheters and 16.2% of Hickman ports ($P = 0.04$).*** Infection rates were not higher in dual-lumen compared to single-lumen Groshong catheters. Staphylococcus epidermidis was the common isolate in line infections. The majority of lines were salvaged despite infectious complications. Malfunction of the catheter was equally common in both groups (10.5-13.5%), but was complete, necessitating replacement of only 2.9% of lines. The Groshong catheters took less time to insert ($P < 0.003$). The externalized Groshong catheter remains a useful alternative to the subcutaneously implanted ports, especially when relatively short-term use is anticipated, but gynecologic oncologists should be aware that there is an increased frequency of complications with the externalized catheter.

SOURCE: Gynecologic Oncology. 1993 Dec; 51 (3): 372-6.

KEY TAKEAWAY: *This article references line sepsis in 32% of Groshong catheters. Sepsis is a potentially life-threatening inflammatory response that occurs due to infection. The infection activates a person's entire immune system, which then sets off a chain reaction of events that can lead to uncontrolled inflammation of the body. This whole body response to infection produces changes in temperature, blood pressure, heart rate, white blood cell count, and lung function.*
