CLINICAL STUDY

A Single-Incision Technique for Placement of Implantable Venous Access Ports via the Axillary Vein

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ABSTRACT

Purpose: To evaluate the technical feasibility and safety of a single-incision technique for placement of implantable venous access ports via the axillary vein.

Materials and Methods: Ports were placed in 216 patients between May and October 2012 using a single-incision technique via the axillary vein. Patients included 112 men and 104 women with a mean age of 58.2 years. After making a single vertical incision without subcutaneous tunneling, ports were placed via the left axillary vein in 172 patients and via the right axillary vein in 44 patients. Axillary vein punctures were directed medially at the incision site under ultrasound guidance. We retrospectively reviewed success rates, technical difficulties, procedure times, and immediate and delayed complications of the procedure.

Results: All single-incision port placements were technically successful. Technical difficulties occurring during the procedure included advancement of the wire or catheter into an unintended vein (n = 33), kinking at the cuff-catheter junction (n = 13), bleeding via the puncture tract (n = 5), bending of the peel-away sheath (n = 3), and puncture of the axillary artery (n = 3). All technical problems were overcome with additional manipulation. The only immediate complication was puncture site hematoma in two patients. The mean follow-up period was 165.7 days, and there were no reports of port malfunction. Axillary vein thrombosis was observed in one patient.

Conclusions: The single-incision technique for placing ports via the axillary vein was a feasible and safe procedure with high technical success and low risk of complications.

ABBREVIATIONS

IJV = internal jugular vein, SCV = subclavian vein, SVC = superior vena cava

Since first reported by Niederhuber et al (1), implantable venous access ports have been widely used, and many studies have demonstrated their safety and reliability (2–4). The first port implantation was performed using a surgical approach via the cephalic vein. Radiologically guided implantation has been increasing in popularity since Morris et al (5) described a percutaneous technique in which puncture of the internal jugular vein (IJV) or subclavian vein (SCV) was performed in the interventional suite (1,6,7). Although these techniques used many different veins, the IJV is the ideal vessel for placement of tunneled catheters (7–10). The most popular technique for placing ports under radiologic guidance is creation of a tunnel between the venipuncture site and port pocket in the infraclavicular area after IJV puncture.

Use of conventional IJV interventional radiologic techniques during port placement and follow-up presents several potential disadvantages. Immediate problems that may occur during the procedure include pain at the tunneling site secondary to tissue traction, ecchymosis of the skin overlying the subcutaneous tunnel especially in older patients, and incorrect measurement of catheter length. Problems that may arise during the follow-up period include discomfort with neck

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movement or swallowing and cosmetic issues caused by palpation of the catheter over the clavicle in patients with little subcutaneous fat. A single-incision technique was designed for placing ports by puncturing the axillary vein without the subcutaneous tunneling used in conventional techniques. In this article, we describe this new technique and evaluate the feasibility, technical success, and complications of the procedure.

MATERIALS AND METHODS

The institutional review board of our institution approved this retrospective study, and the requirement for written informed consent was waived. Between May and October 2012, ports were placed in 216 of 241 patients using a single-incision technique via the axillary vein in an interventional radiology suite. Patients included 112 men and 104 women with a mean age of 58.2 years (range, 17–84 y). All patients had malignancies, as shown in Table 1, and a treatment plan including chemotherapy using ports. Ports were placed in 25 patients with high body mass index or pendulous breasts using a conventional technique via the IJV.

Before the procedure, written informed consent including advantages and expected complications was obtained from all patients. All ports were placed by one interventional radiologist. If not contraindicated, the left axillary vein was preferred because its course to the superior vena cava (SVC) is more obtuse. Access routes were selected by ultrasound (US) examination of the axillary vein before the procedure. Ports were placed via the left axillary vein in 172 patients and via the right axillary vein in 44 patients. The most common reason for accessing the right axillary vein was port placement in the contralateral chest for patients with left-sided breast cancer (n = 25) (Table 2). The ports placed included the 6.5-F Celsite Discreet STR or STL type (B. Braun Medical, Boulogne Cedex, France), 6.5-F Celsite ST type (B. Braun Medical), and 8-F Healthport (Baxter Healthcare SA, Zurich, Switzerland) (Table 3).

Before disinfecting the skin and sterile draping, the direction of the axillary vein was identified using US guidance, and an incision line was drawn on the skin (Fig 1). The incision line was typically 3 cm lateral to the junction of the axillary vein and clavicle to reduce the risk of pinch-off syndrome and disturbance of shoulder motion. Local anesthesia was injected into the incision line, puncture tract, and port pocket, and a 2-cm vertical incision was made. The axillary vein was punctured under US guidance using a micropuncture needle from a Micronitinol rapid access kit (Access Point Technologies, Rogers, Minnesota). Puncture was initiated at the cephalic end of the incision line for the medial pocket and the midportion for the lateral pocket (Fig 2). A 0.018-inch microwire was advanced, and a micro-introducer was inserted. Vein puncture was confirmed by visualization of the microwire in the right atrium on fluoroscopic imaging (Fig 3). Port pockets were created medial or lateral to the incision line by blunt dissection of the subcutaneous tissue. Early on in using this technique, the pocket was created lateral to the incision line for placement of a Celsite ST type or Healthport, and later the pocket was placed medially when the Celsite Discreet port became available. The catheter was introduced through a peel-away sheath.

Table 1. Underlying Malignancies

Malignancies	N (216 Patients)
Breast cancer (left 25, right 31)	56
Stomach cancer	29
Colon cancer	28
Lung cancer	23
Rectal cancer	12
Lymphoma	11
Esophageal cancer	7
Cholangiocellular carcinoma	5
Ovarian cancer	5
Pancreatic cancer	5
Other malignancies	35

Table 2. Reasons for Access via the Right Axillary Vein

Reasons	N (44 Patients)
Left-sided breast cancer	25
Lymph node enlargement around left axillary vein	7
Mass in left side of the neck	5
Problems with left axillary vein	4
Dilated vascular structures in infraclavicular area	2
Left shoulder pain	1

Table 3. Types of Ports and Pockets

		Left Axillary Vein	Right Axillary Vein	Total
Medial pocket (n = 123)	Celsite Discreet STR	88	0	88
	Celsite Discreet STL	0	35	35
Lateral pocket (n = 93)	Celsite ST	42	2	44
	Healthport	42	7	49
Total		172	44	216

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