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Research Paper

Is there any correlation between venipuncture sites and complications of central venous port placement in the chest wall?

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ABSTRACT

Background: Central venous (CV) port is an integral part of chemotherapy and parenteral treatment, for long-term venous access. It is still unclear whether there is a correlation between venipuncture sites, and complications and patency of the CV port placed in the chest wall.

Methods: Two-hundred and sixty-nine patients, who underwent CV port placement in their chest wall, were reviewed retrospectively in this study. They were divided into two groups, the S (subclavian vein) group and I (internal jugular vein) group, according to the venipuncture site. We analyzed the data from the medical records and examined the differences in complications between the two groups.

Results: The median event free period among all patients was 228 days (range: 5–1877), the cumulative follow-up period was 97,176 catheter days. There were no significant differences between the two groups in terms of sex, age, body mass index (BMI), primary disease, reason for implant, past history of diabetes mellitus and occurrence of procedural complications. The median event free days were 200.0 (6–1846) in the S group and 246.0 (5–1877) days in the I group. The rate of event-free port availability after one, two and three years was 84.6, 74.0 and 66.5% in the S group, and 84.4, 80.3 and 80.3% in the I group respectively, which were not significantly different between the two groups.

Conclusions: Complications of CV port placement have no correlation with the subclavian or jugular vein puncture sites.

1. Introduction

Central venous (CV) ports are used for long-term and secure access of the vein, among patients who receive chemotherapy and parenteral nutrition. There are different sites for venipuncture and placement e.g. chest, neck, upper arm, forearm, and femur. Several complications related to the placement of CV ports have been reported. They can be classified as procedural and late complications. Procedural complications include pneumothorax, vascular injury, accidental arterial puncture, and dislocation of the catheter. Late complications often necessitate removal of the CV port due to infection, fracture, kinking, and obstruction. Although prospective, randomized controlled trials are necessary to determine the best procedure for CV port placement, it is difficult due to the differences in site selection. The most common site for CV port placement is the chest wall, with puncture of the subclavian vein; however, puncture of the subclavian vein can induce pneumothorax or arterial punctures [1–4]. On the other hand, cannulation into the internal jugular vein has been reported to have lower procedural complications [5–7]. However, there are few reports comparing complications between the internal jugular vein and subclavian vein cannulation, for CV port placement in the chest wall.

We examine here, the correlation between venipuncture sites, and complications as well as long-term patency of CV port placement in the chest wall.

2. Patients and methods

2.1. Patients

Two hundred and seventy-two patients underwent CV port placement between October 2012 and December 2017 in our institute. Of these, 269 patients (133 men and 136 women), with a CV port implanted in their chest wall, were enrolled in this retrospective cohort analysis (Fig. 1). The median age was 71 years (range: 25–93). The primary diseases of the patients are summarized in Table 1.

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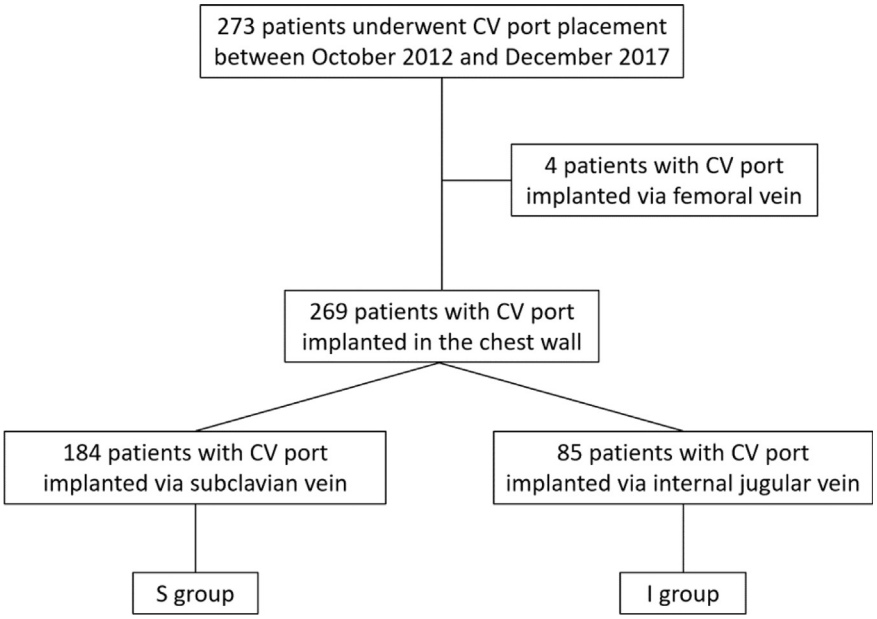

Fig. 1. Study population, surgical procedures and the reason of withdrawal.

2.2. Devices

We used three types of CV port kits: (1) 8-Fr. Groshong® catheter and BARD MRI Port (Bard Access Systems Inc., Salt Lake City, UT, USA) in 169 cases; (2) 8-Fr. Groshong® catheter and PowerPort MRI isp (Bard Access Systems Inc., Salt Lake City, UT, USA) in 88 cases; (3) 8-Fr. Groshong® catheter and MicroNeedle Port (COVIDIEN, Dublin, Ireland) in 7 cases.

In five cases, the kits used could not be confirmed.

2.3. Procedure

CV ports were implanted under ultrasound and fluoroscopic guidance by skilled surgeons, with maximum sterile precautions in all patients. The surgeons selected the venipuncture site and its side according to their preference, the patient's request and the skin condition such as dermatitis, postoperative scar or others. We inserted the catheter into the subclavian or internal jugular vein, on the left or right side. The catheter was then passed under the skin, and the port was implanted in a subcutaneous pocket of the chest wall, on the same side as venipuncture.

Table 1
Patient characteristics.

Characteristic	
Sex	
Male (%)	133 (49.4)
Female (%)	136 (50.6)
Age (year)	71 (25–93)
CV port patent period (days)	228 (5–1877)
Cumulative follow-up period (catheter days)	97,176
Primary disease	
Malignancy (%)	249 (92.6)
Esophagus/Stomach/Colon/Rectum (%)	88 (32.7)
Liver/Biliary tract/Pancreas (%)	49 (18.2)
Lung (%)	13 (4.8)
Breast (%)	27 (10.0)
Blood (%)	62 (23.0)
Other (%)	10 (3.7)
Benign (%)	20 (7.4)
Venipuncture sites	
Subclavian vein	
Right (%)	142 (52.8)
Left (%)	42 (15.6)
Internal jugular vein	
Right (%)	76 (28.3)
Left (%)	9 (3.3)
Purpose of implant	
Chemotherapy (%)	200 (74.3)
Parenteral nutrition (%)	69 (25.7)

Continuous variables are presented as median (range).

2.4. Definitions of complications

Procedural complications included pneumothorax, vascular injury, accidental arterial puncture, and dislocation of the catheter. Late complications included removal of the CV port due to catheter-related bloodstream infection (CRBSI), fracture of the catheter, kinking, and obstruction of the catheter. The definition of CRBSI was based on the guidelines for the prevention of intravascular catheter-related infections [8]. Specifically, CRBSI was diagnosed when some clinical signs of bacteremia with systemic inflammatory response syndrome (SIRS) such as high fever, fatigue, or hypotension were positive without any other source of infection, and when the same organisms were isolated in the culture of the specimen collected from both, peripheral veins and the withdrawn catheter. We defined clinical conditions strongly indicative of CRBSI as “suspected CRBSI” even if they did not satisfy all criteria for the diagnosis of CRBSI. CRBSI was suspected when there was only one positive bacterial culture from either peripheral vein blood or the withdrawn catheter, or negative cultures of specimens collected after administration of antibiotics.

2.5. Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS; Chicago, IL, USA). Continuous variables were expressed as median and range. Continuous variables were compared using Mann-Whitney test. Comparisons between qualitative variables were performed using the Chi-square test. The time to development of CV port-related late complications was evaluated using the Kaplan-Meier product limit method. All tests were two-tailed and differences with a p value of <0.05 were considered as statistically significant.

Our study is fully compliant with the STROCSS criteria [9].