

# Evaluation of Subclavian Central Venous Port Catheters Placed by Anesthesiologists: Single-Center Experience

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## ABSTRACT

**Introduction:** A Central Venous Port Catheter (CVPC) is a key part of the chemotherapy and palliative care of cancer patients. CVPC is placed by surgical clinics, oncologists, and anesthesia and reanimation specialists. In our study, we aimed to examine the complications related to subclavian CVPCs inserted by anesthesiology and reanimation specialists and to share the experiences obtained.

**Methods:** The study included 1,805 cancer patients who underwent CVPC in the anesthesiology and reanimation clinic of the University of Health Sciences Turkey, İstanbul Training and Research Hospital. The medical records of the patients were reviewed retrospectively. The data obtained were analyzed and the mean age, gender distribution, and distribution of patients according to diagnoses, count, and percentages of early and late complications were calculated.

**Results:** The records of 1,805 patients who underwent subclavian CVPC placement with the percutaneous method were reviewed retrospectively. Early complications occurred in 6 of our patients. Of these six, 3 patients had pneumothorax, (acute atrial fibrillation attack due to intervention in 1 patient, air embolism in 1, and cerebrovascular event complications in 1), whereas vessel perforation and hematoma were not seen in any patient. Considering the late complications, local port infection, port thrombosis, and skin necrosis were observed in 28, 50, and 26 patients, respectively. However, neither port dislocation or rupture, or catheter-related blood vessel infection, or pinch-off syndrome and nor reservoir access wounds were detected in the patients.

**Conclusion:** Our data analysis showed that the complication rate in our study was similar or better than many other studies compared with the data of other clinics in the literature.

**Keywords:** Subclavian central venous port catheter, oncology patients, anesthesiologists

## Introduction

Central venous port catheters (CVPC) are used during the treatment of cancer patients, for taking samples for blood tests, surgical interventions, administering chemotherapeutic agents, and meeting other intravenous needs. CVPC are in high demand due to being the most comfortable method for long-term and intermittent chemotherapy for people receiving cancer treatment, being more comfortable for self-care of the patient, not causing cosmetic and mental problems as it is not visible from the outside, the occurrence of less thrombosis and infection, no need for dressing, not disrupting the daily needs of the person, and the low maintenance requirements (1,2). Pneumothorax, hematoma, vessel perforation, acute atrial fibrillation attack, air embolism, and

cerebrovascular event (CVE) can arise as early complications, while late complications include local port infection, port thrombosis, skin necrosis, port dislocation or rupture, catheter-related blood vessel infection, pinch-off syndrome, and reservoir access wound (3).

Although the right internal jugular vein is mostly preferred in the intravenous ports, the right subclavian vein, left subclavian, femoral vein, and axillary vein can also be used. As can be seen in the literature, CVPC are inserted by anesthesiologists, oncologists, radiologists, and surgeons (4,5). In this study, we aimed to retrospectively analyze the CVPC placed with the subclavian technique by experienced anesthesia and reanimation team and to share our five-year results.



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## Methods

After obtaining approval from the hospital ethics committee (approval number: 231, date: 22.07.2022), 1,805 cancer patients who underwent subclavian CVPC by University of Health Sciences Turkey, Istanbul Training and Research Hospital anesthesiology and reanimation specialists were included in the study. The medical records of the patients were analyzed retrospectively, and the data obtained were analyzed and the average age, gender distribution, the distribution of patients by age groups, the distribution of patients according to diagnoses, count, and percentages of early and late complications were calculated.

The patients were evaluated before the procedure using coagulation tests, PA chest radiography, and hemogram tests. Patients signed consent was obtained after informing the patients and/or their relatives about the procedure. All our port catheter interventions were performed in the operating room under local anesthesia, and with ultrasound (USG) monitoring of the patients. Antibiotics for prophylactic purposes were not routinely administered. All procedures were performed in the operating room by performing electrocardiography, peripheral oxygen saturation (SpO<sub>2</sub>), and noninvasive blood pressure measurements. While the venous port catheter was being placed, the subclavian area was cleaned with povidone iodine and covered with sterile drapes. Local anesthesia was applied to the puncture site and reservoir pocket in all patients. After the subclavian vein puncture, a guide wire was sent through the needle. The port pocket was made - after an incision of approximately 2.5-3 cm subcutaneously in accordance with a reservoir by blunt dissection. It is tunneled from the puncture site in the subclavian area to the port pocket direction. The catheter was connected and irrigation was performed with heparinized fluid. After the port reservoir was identified, the skin was closed. Verification of the port catheter location and the presence of hemothorax or pneumothorax were checked by taking the PA chest X-ray in all patients. Age, gender, diagnosis of primary disease, early complications (hematoma, air embolism, pneumothorax, vessel perforation, acute atrial fibrillation, CVE) and late complications

(local port infection, port thrombosis, skin necrosis, port dislocation or rupture, catheter-related blood vessel infection, port entrapment (pinch-off syndrome, and reservoir access wound) were recorded. Average age, gender distribution, the distribution of patients according to age groups, the distribution of patients according to cancer diagnosis, and number, and percentage of early and late complications were calculated.

## Statistical Analysis

Mean, standard deviation, median lowest, highest, frequency, and ratio values were used in the descriptive statistics of the data. SPSS 28.0 program was used in the analysis.

## Results

Out of the 1,805 patients who underwent subclavian CVPC by University of Health Sciences Turkey, Istanbul Training and Research Hospital anesthesiology and reanimation physicians, 51.5% were female and 48.5% were male. The mean age of the patients was 57.7. The highest number of patients, 590, was in the 55-64 age group. The youngest patient was 19 and the oldest patient was 95 years old (Table 1).

Among the early complications, pneumothorax, acute atrial fibrillation, air embolism and CVE were observed in 3, 1, 1, and 1 patient, respectively, whereas vascular perforation and hematoma were not observed. In our study, venous ports were most frequently inserted in colorectal cancers with a rate of 29%. Among the late complications, 28 patients had local port infection, 50 patients had port thrombosis, and 26 patients had skin necrosis while, port dislocation or rupture, catheter-related blood vessel infection, pinch-off syndrome, and reservoir access wound were not detected in the patients (Table 2).

## Discussions

CVPCs, which have been in use since the first half of the 1980s, have been frequently used for chemotherapy, blood transfusion, nutritional purposes, antibiotic therapies and all kinds of intravenous treatments

**Table 1. The demographic features and age distribution of the patients**

		Min.-max.	Median		Average ± SD/(n,%)	
Gender	Women	-	-		929 (51.5%)	
	Man	-	-		876 (48.5%)	
Age	-	19.0-95.0	59.2		57.7±12.1	
Man-age	-	19.0-87.0	61.4		60.2±10.9	
Women age	-	21.0-95.0	56.0		55.1±12.7	
	<b>Total</b>		<b>Man</b>		<b>Women</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
19-24 age	21	1.2%	7	0.8%	14	1.6%
25-34 age	58	3.2%	16	1.8%	42	4.8%
35-44 age	195	10.8%	57	6.5%	138	15.8%
45-54 age	401	22.2%	181	20.7%	220	25.1%
55-64 age	590	32.7%	336	38.4%	254	29.0%
65-74 age	448	24.8%	279	31.8%	169	19.3%
≥75 age	92	5.1%	53	6.1%	39	4.5%

Min.: Minimum, max.: Maximum, SD: Standard deviation

**Table 2. The distribution of cancer types and early/late complications**

	n	%
<b>Early complications</b>		
Not-observed	1799	99.7%
Observed	6	0.3%
Pneumothorax	3	0.16%
Acute atrial fibrillation	1	0.05%
Air embolism	1	0.05%
Cerebrovascular event	1	0.05%
Vascular perforation	0	0.0%
Hematoma	0	0.0%
<b>Late complications</b>		
Not-observed	1701	94.2%
Observed	104	5.8%
Local port infection	28	1.6%
Port thrombosis	50	2.8%
Skin necrosis	26	1.4%
Port dislocation/rupture	0	0.0%
Catheter related blood vessel infection	0	0.0%
Pinch-off syndrome	0	0.0%
Reservoir access wound	0	0.0%
<b>Distribution of cancer types</b>		
Breast cancer	411	22.8%
Colorectal cancer	523	29.0%
GIS (oral, nasopharynx, esophagus, stomach) cancer	325	18.0%
Liver, biliary tracts, pancreas cancer	194	10.7%
Liver cancer	172	9.5%
Urogenital cancer (uterus, cervix, prostate, bladder)	47	2.6%
Hematological cancer	32	1.8%
Other cancers	101	5.6%
GIS: Geographic Information System		

and blood tests, and hence their complications have been a subject of research.

In Di Carlo et al.'s (6) study, while the cephalic vein was preferred in the open surgery method, it was seen that the subclavian vein was used more in the percutaneous method. The rate of early complications was found to be higher in those who were implanted by the percutaneous method compared with those implanted by the surgical method (4.5% in the surgical method, while 0.9% in the percutaneous method) (6). In our study, the subclavian vein was similarly used, and early complications were found at a lower rate of 0.3%.

While the frequency of pneumothorax was 0.5-6% in the literature (7,8), the frequency of pneumothorax was 0.16% in our study, less frequent than in the literature. We believe that this is due to the use of USG while implanting the CVPC.

The rate of acute AF caused by CVPC in the literature was between 0.1 and 0.9% (9), and similarly it was seen in 1 patient in our study, yielding a rate of 0.05, consistent with the literature.

Additionally, among other early complications, air embolism was detected in 1 patient and CVE was detected in 1 patient.

With regards to the late complications, local port pocket infection in our study was 1.6%, which is consistent with the literature (0.3-4.4%) (10).

Cancer patients have a higher risk of venous thrombosis, and catheterization further increases this risk. While the rate of catheter-related thrombosis was 12-64% (11,12) in the literature, this rate was much lower (2.8%) in our study than in the literature. The reason for the low rate of thrombosis in our clinic may be the catheter controls performed at regular intervals.

Skin necrosis may occur if there is a technical error while applying the port or if the appropriate port is not used in patients with low subcutaneous fat tissue. While skin necrosis was detected at a rate of approximately 0-1 (13) in the literature, this rate was found to be 1.4% in our study.

In our study, port dislocation/rupture, catheter-related blood vessel infection, Pinch-off syndrome, and reservoir access wounds were not observed. We believe that this is due the fact that all procedures are performed under sterile conditions in the operating room environment and regular checks were performed.

#### Study Limitations

The limitation of this study is to investigate the only subclavian venous port catheterization complications.

#### Conclusion

CVPC is a very comfortable and safe method preferred for long-term venous access due to their ease of use and cosmetically non-disturbance to the patients. CVPC, applied by surgical clinics, radiologists, and oncologists, is a method that is safely applied with a USG also by anesthesiologists with experience in interventional procedures.

**Ethics Committee Approval:** The study was approved by the University of Health Sciences Turkey, Istanbul Training and Research Hospital Ethics Committee (approval number: 231, date: 22.07.2022).

**Informed Consent:** Patients signed consent was obtained after informing the patients and/or their relatives about the procedure.

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