

Our central venous port catheter system practice — a retrospective study

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Abstract

Objective: To evaluate indications for insertion, complications and indications of central venous port catheters, and to identify indications for their removal.

Methods: The retrospective study was conducted at Okmeydani Training and Research Hospital, Istanbul, Turkey, and comprised data from January 2006 to June 2014 of patients who had central venous port catheters. The indications for removal of the catheters were also evaluated.

Results: Of the 1198 patients whose records were reviewed, 605(50.5%) were women and 593(49.5%) were men. The overall mean age was 52.3±12.78 years. Of the total, 1142(95.33%) cases related to chemotherapy treatment. There were 127(10.6%) complications; the most common being catheter occlusion 46(36.2%). The catheters were removed in 182(15.2%) patients. Among them, 83(45.6%) catheters were removed because they were no more needed.

Conclusion: In the light of the findings, there is a need for standardised guidelines for evaluation before central venous port catheter insertion and follow-up after insertion to detect and to avoid possible complications.

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Introduction

Central venous port catheters (CVPCs) are used as an alternative to temporary intravenous (IV) catheters when long-term usage is required. More complex and effective treatment regimens can be administered, outpatient treatment is offered, duration of stay in the hospital decreases, mobilisation of the patient and comfortable survival is possible with CVPCs.^{1,2}

Difference of CVPC from a temporary catheter is that it is a closed system and is placed under the skin. Port catheters consist of two systems; reservoir and catheter. Reservoir is the compartment that has silicone system for needle insertion and that is felt with the hand. But the catheter, the other part, is inserted in the central vein. It starts from the reservoir and extends to the heart.

Ports inserted under the skin have a considerably low risk of infection development, and may be used for a long period of time. These catheters do not affect the body image, and do not restrict any activity.

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While there are many advantages associated with CVPCs, there are many early and late complications associated with it. Early complications are pneumothorax, haemothorax, malposition, malfunction, arrhythmia, cardiac perforation, haematoma, emboli, arteriovenous fistula, left thoracic ductus lesion, and phrenic or brachial plexus lesion.²⁻⁵ Late complications are infection, skin necrosis, occlusion of catheter, breakage and emboli.^{1,2,4-7}

The current study was planned to evaluate the indications of insertion and removal of CVPCs, preferred venous access and complications at a research hospital.

Materials and Methods

The retrospective study was conducted at Okmeydani Training and Research Hospital, Istanbul, Turkey, and comprised data from January 2006 to June 2014 of patients who had CVPCs.

Data was retrieved after approval from the institutional ethics review committee. Demographic characteristics, primary diseases, indications of port insertion, venous access used for catheterisation, complications detected and the reasons for removal of CPVC were documented. Also noted were general status of the patients, coagulation profile, and existence of infection at the intervention site. Patients and their relatives had been informed about the intervention and informed consent had been obtained before the intervention.

All port catheter interventions had been performed with open method in the operating room, under local

anaesthesia with sedation. Patients were also monitored during the procedures. Antibiotic prophylaxis was not given routinely, 1g of cefazolin sodium was administered intravenously 30 minutes before the intervention to the patients who were at high risk for infection and those who were neutropenic with white blood cell count $1000/\text{mm}^3$. The procedure was not performed in patients with deranged coagulation profile.

Usually the right subclavian vein was preferred and CVPC was placed via a small surgical intervention to the upper region of the chest. Internal jugular or femoral vein was preferred for venous access. After the insertion site of the catheter was determined, the site was cleaned with appropriate antiseptic solution and a small incision was given over the skin and a subcutaneous pocket was formed and the reservoir of the port was placed. The end of the catheter was forwarded to the joint of superior vena cava and right atrium with a special needle and a guidewire. The reservoir was joined to the catheter and was placed in the subcutaneous pocket and the incision site was closed with subcutaneous and cutaneous layers. Bleeding in the port was controlled by entering the port with a Huber needle and the CVPC system was checked with physiological saline solution containing 100U/mL heparin.

Patients who underwent the procedure in day-care setting were sent home after 2 hours of observation and were called for follow-up after one week when they were observed for erythema, swelling, hyperthermia, haematoma in the port insertion site and whether stitches were opened and needed to be controlled. For port maintenance, each port lumen was injected with 10ml of heparinised isotonic solution monthly or after every usage (1000 IU heparin/10ml isotonic). Cleaning of the skin was done with antiseptic solution and the port needle was covered after it was inserted. Specially-designed port needles were used in all the cases. The patients were advised to visit when they had any complaint. If there was pain or swelling at the port site, shoulder or arm, the possibility of thrombosis was considered. Venous doppler ultrasonography (USG) of the port inserted into arm and neck was done. When there was fever of unknown origin, port infection was suspected and if any other source could not be found and if the fever did not come down despite antibiotic treatment, the port was removed and culture was analysed for potential infection.

Results

Of the 1198 patients whose records were reviewed, 605(50.5%) were women and 593(49.5%) were men. The overall mean age was 52.3 ± 12.78 years. Of the total,

Table-1: Indications of central venous port catheter (CVPC) insertion.

Indications Of Central Venous Port Catheters Insertion	Number	Percentage(%)
Chemotherapy	1142	95.33
Nutrition	5	0.42
Intravenous intervention	50	4.17
HIV	1	0.08
Total	1198	100

HIV: Human immunodeficiency virus.

Table-2: Central venous port catheter (CVPC) complications.

Complications	Number	Percentage(%)
Thrombosis	4	0.33
Occlusion in catheter	46	3.83
Pneumothorax	25	2.08
Breakage of catheter	4	0.33
Infection suspicion	40	3.34
Wound site infection	5	0.42
Port migration	2	0.17
Brachial plexus injury	1	0.08
Total	127	10.60

Table-3: Indications of removal of central venous port catheters (CVPCs).

	Number	Percentage(%)
Thrombosis	4	2.20
Infection	40	21.98
Not needed	83	45.60
Occlusion in catheter	46	25.27
Port migration	3	1.65
Breakage of catheter	4	2.20
Cannot be removed	1	0.55
Radiotherapy treatment	1	0.55
Total	182	100

1142(95.33%) cases related to chemotherapy treatment (Table-1).

Right subclavian vein was done in 1160(96.8%) cases, followed by left subclavian vein 30(2.5%), right internal jugular vein 5(0.42%) and the right femoral vein 3(0.25%).

There were 127(10.6%) complications; the most common being catheter occlusion 46(36.2%) (Table-2).

The catheters were removed in 182(15.2%) patients; 87(47.8%) women and 95(52.2%) men, with an overall mean age of 51.7 ± 13.07 years. Among these 182(15.2%) cases, 83(45.6%) catheters were removed because they were no more needed (Table-3).

The catheters of 4(2.2%) patients were broken and were

removed with the help of invasive radiological procedure. A decision not to remove 1(0.55%) port placed on the right ventricular base was made after consultation with the Cardiovascular Surgery Department.

Discussion

During placement, the catheter end is planned to be at the lower 1/3rd of vena cava superior or at the joint of vena cava superior and atrium.⁸ If the port catheter end is not at these locations, it is called catheter malposition, while placement of the catheter end at the small veins such as jugular, brachiocephalic or subclavian vein increases the risk of venous thrombosis. Placement at right atrium or ventricle may cause cardiac arrhythmia, thrombosis, perforation or tamponade.⁹⁻¹⁴ In literature, malposition is reported as 0.8-3.3%.¹⁵⁻¹⁷ In our study, malposition was determined in 2(0.17%) patients.

Occlusion in catheter in the current study was determined in 3.83% cases and thrombosis in 0.33% cases after which CPVC was removed. In literature, clinically apparent venous thrombosis has been reported 1.6-2%.^{16,18} Our thrombosis rates are lower as we encourage patients to come for a monthly check-up and wash the catheter as needed.

In literature, pneumothorax is reported to be 1-1.7%.^{1,2} In our study, pneumothorax was detected in 2.1% cases. The higher rate is possibly because USG was not used, and USG-guided insertion, we believe, reduces pneumothorax rate.

Diagnosis of catheter-related bloodstream infection (CRBSI) is established in cases where no other focus of infection can be determined and fever >38°C, shivering or hypotension is observed. Sterility requirements must be observed during CPVC insertion and also during preparation of solutions and application of the needle for CRBSI to be prevented. For the fever of unknown origin, port infection must be considered and if any other source cannot be determined and fever cannot be controlled despite antibiotic treatment, the port must be removed and culture must be sampled. CRBSI was suspected in 45 patients in the current study, and 5 responded positively to antibiotic treatment, while 40(3.34%) ports were removed due to infection.

Cancer patients are prone to infections because their immune system is usually suppressed during the treatment period. In literature, it is reported that port catheters, especially in immune system-suppressed patients, have a lower infection risk compared to peripheral venous and central tunnelled catheters.

Port infection percentage in oncological patient group has been reported as 0.6-2.2%.^{15,16,19,20}

In the current study, catheters of 4(0.33%) patients broke off and were removed by means of invasive radiological procedure and decision not to remove 1 (0.08%) port placed on right ventricular base was taken after consultation with cardiovascular specialist. Removal of CPVC may be difficult after long-term use due to adhesion of catheter to the wall of the central vein.

A study argued that catheters firmly adhered to the vein wall could be left there because they could not migrate to heart and lung.²¹

However, the components broken and in-circulation must be removed because they can cause complications, such as sepsis, endocarditis, thrombosis, emboli, vascular occlusion and dysrhythmia.^{10,22}

Nowadays, it is known that central venous catheter interventions with many usage areas may cause some complications. We believe that follow-up and control of CPVC is as important as its insertion with regards to complication rates and reliability.

Complication rates vary between 7.3% and 18.5% in different studies.^{23,24}

Sterile performance of procedures and maintenance and training of patients and their relatives about the system may significantly decrease the occurrence of complications.

Conclusion

In order to detect and avoid possible complications, standard guidelines are needed for the evaluation of CPVC before, during and after insertion. The complication rates are expected to go down with the help of such guidelines.

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