ORIGINAL ARTICLE

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Complications and Management of Chemotherapy Port: Analysis of 322 Cases

Kemoterapi Port Uygulamasında Komplikasyonlar ve Yönetimi: 322 Olgunun Analizi

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ABSTRACT

Aim: Implantable central venous catheters are frequently preferred in malignancy patients in cases where drugs in the chemotherapy group that cause extravasation, drug group requiring continuous infusion and a single extremity as in breast carcinomas are used. In this study, it was aimed to present the complications that occur during chemotherapy port in the acute and chronic periods and the intervention method in malignancy patients.

Materials and Methods: Patients who underwent chemotherapy port application between January 2021 and June 2023 were examined retrospectively. They were evaluated by age, gender, malignancy types, acute and chronic complications, and surgical interventions for complications.

Results: A total of 322 patients were performed venous port catheter for chemotherapy. There were 201 (62.4%) males. The mean age was 58.9±11.4 (range: 20-82) years. The most common malignancy types were colorectal carcinoma in 116 patients (36%), gastric carcinoma in 70 patients (21.7%) and pancreatic carcinoma in 53 patients (16.5%). The most common port catheter application sites were the right jugular (n=267, 82.9%), left jugular (n=27, 8.4%) and right subclavian (n=22, 6.8%). Complications were observed in 19 (5.9%) cases in the series, including 8 (2.5%) venous thrombus, 7 (2.2%) wound infection, 2 (0.6%) pneumothorax, and 2 (0.6%) port dislocation.

Conclusion: In the patient group receiving chemotherapy, the use of chemotherapy ports has increased significantly in recent years due to its convenience. Although it is performed under local anesthesia, serious complications can be seen and the way to intervene in complications is important. I aimed to present complication and intervention methods with clinical experience.

Keywords: Chemotherapy, venous port catheter, ultrasonography

ÖZ

Amaç: İmplante edilebilen santral venöz kateterler; malignite hastalarında ekstravazasyona yol açan kemoterapi grubunda ilaç kullanılması, sürekli infüzyon gerektiren ilaç grubunun kullanılması ve meme karsinomlarında olduğu gibi tek ekstremite kullanımı gerektiren durumlarda sıklıkla tercih edilmektedir. Bu çalışmada, malignite hastalarında kemoterapi port uygulaması sırasında akut ve kronik dönemde gerçekleşen komplikasyonlar ve müdahale şeklinin sunulması amaçlandı.

Gereç ve Yöntem: Ocak 2021 ve Haziran 2023 tarihleri arasında kemoterapi port uygulaması yapılan hastalar restrospektif olarak incelendi. Hastalar yaş, cinsiyet, malignite tipleri, akut ve kronik komplikasyonları ve komplikasyonlara yönelik cerrahi müdahaleleri ile değerlendirildi.

Bulgular: Toplam 322 hastaya kemoterapi uygulanması amacı ile venöz port kateter takıldı. Olguların 201'i (%62,4) erkek idi. Yaş ortalaması 58,9±11,4 (aralık: 20-82) yıl idi. En sık görülen malignite tipinin kolorektal karsinom (n=116, %36), mide karsinomu (n=70, %21,7) ve pankreas karsinomu (53, %16,5) olduğu tespit edildi. En sık kullanılan port kateter uygulama yeri sırasıyla sağ juguler (n=267, %82,9), sol juguler (27, %8,4) ve sağ subklaviyen (22, %6,8) olarak bulundu. Seride 19 (%5,9) olguda komplikasyon görülmüş olup, sırasıyla 8 (%2,5) venöz trombüs, 7 (%2,2) yara yeri enfeksiyonu, 2 (%0,6) pnömotoraks ve 2 (%0,6) port dislokasyonu gözlendi.

Sonuç: Kemoterapi alan hasta grubunda, sağladığı kolaylıklardan dolayı kemoterapi port kullanımı son yıllarda ciddi olarak artmıştır. Lokal anestezi altında yapılmasına rağmen ciddi komplikasyonlar görülebilmekte ve komplikasyonlara müdahale etme şekli önem arz etmektedir. Klinik tecrübemle, komplikasyon ve müdahale şekillerini sunmayı hedefledim.

Anahtar Kelimeler: Kemoterapi, venöz port kateter, ultrasonografi

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INTRODUCTION

Vascular access is important in patients planned for long-term chemotherapy. Implantable central venous port catheters are frequently used to avoid potential problems of the peripheral venous access, especially in cancer patients receiving long-term chemotherapy[1].

Partially implantable catheters were described by Broviac et al.[2] and Hickman et al.[3] in 1970 and the first vascular port catheter was realized in 1982 by Niederhuber et al.[4]. In malignancy patients receiving chemotherapy, the use of port catheters has increased in recent years due to frequent venous procedures, long duration of treatment, use of sclerosing agents in this treatment and excessive fluid replacement. They provide advantages over other central catheters due to their low infection rates, long duration of use and the fact that they do not restrict the daily activities of the patient[5].

Complications may occur during or after the insertion of port catheters. In the early period, pneumo-hemothorax, malposition, arrhythmia, cardiac perforation, hematoma in the port area, embolism, arteriovenous fistula, left thoracic duct lesion, phrenic or brachial plexus lesion may be observed. In the late period, skin necrosis, catheter breakage and embolism, infection, catheter occlusion and disconnection, extravasation of fluids and difficulty in blood aspiration may be observed[6,7].

In this study, it is aimed to present the complications that occur in the acute and chronic periods during the insertion of chemotherapy port in malignancy patients and the approach to these complications.

MATERIALS AND METHODS

Patients who underwent chemotherapy port insertion between January 2021 and June 2023 at Dr. İsmail Fehmi Cumalıoğlu City Hospital were examined retrospectively. The study permission was obtained from the Dr. İsmail Fehmi Cumalıoğlu City Hospital Clinical Research Ethics Committee (decision no.: 2022/10, date: 28.11.2022).

Patients were evaluated for complete blood count and bleeding time values before the insertion. The procedure was monitored and started under operating room conditions. The vascular area was determined by ultrasonography in the foreground, and ultrasonography was used again, if necessary, after the sterile field was provided. The relevant area was cleaned with povidone iodine and local anesthesia was performed with 20 cc prilocaine. With a 10 cc syringe, the vascular structure to be used was found and marked with a guidewire. A port area was created with a 3 cm incision on the midclavicular line above the pectoral muscle and the reservoir part was implanted with 2/0 vicryl. The reservoir and catheter were combined and passed under the skin to the vascular area entrance of the catheter. The tip of the catheter was advanced to the vena cava-right atrium junction with the help of a guidewire. The catheter length was determined by external visualization according to the patient's size (Figure 1).

The right jugular vein and then the right subclavian vein were used as the intervention site. Subclavian vein was preferred in the cachectic patient group. Patients who underwent unilateral mastectomy for breast cancer were treated from the opposite side. A chemotherapy port was inserted using the right femoral vein in a patient with a history of vena cava superior thrombus. All patients underwent chest radiography in the postoperative period (Figure 2). The localization of the catheter tip according to the cava-atrium junction was evaluated. The patients without complications were discharged at the 4th hour after the procedure.

Statistical Analysis

For statistical analysis, IBM SPSS Statistics version 26 was used. The descriptive results of the study are presented as frequencies with the corresponding percentages in the case of nominal or ordinal variables. Continuous variables are also presented as mean and standard deviation.

RESULTS

A total of 322 patients received venous port catheter for chemotherapy. There were 201 (62.4 %) males and 121 (37.6 %) females. The mean age was 58.9±11.4 (range: 20-82) years. The disease status of the patients at the time of the procedure was as follows: 201 (62.4%) had metastatic disease, 89 (27.6%) had undergone surgery for primary disease, and 32 (9.9%) had locally advanced disease. The malignancy types of the patients who underwent the procedure were as follows: 116 (36%) colorectal carcinoma, 70 (21.7%) gastric carcinoma, 53 (16.5%) pancreatic carcinoma, 27 (8.4%) breast carcinoma, and the others are shown in Table 1.

As side of port catheter insertion, 267 (82.9%) right jugular vein, 27 (8.4%) left jugular vein, 22 (6.8%) right subclavian vein, 5 (1.6%) left subclavian vein and 1 (0.3%) right femoral vein were used (Table 2).

Complications were observed in 19 (5.9%) cases in the series (Table 3). Pneumothorax developed in two cases (0.6%) during the procedure and was treated with tube thoracostomy. In two cases, the site of application was the subclavian vein. In the long term, eight (2.5%) venous thrombus cases were proven by ultrasonography and the port catheter was removed. After consultation with the oncology physician, a new port catheter from the opposite side was inserted in the same session in the patient group who continued to need a port. Local infection developed in seven cases (2.2%) where the subcutaneous port reservoir was present, and the port catheter was removed and the tissue was debrided if necessary (Figure 3).

In two cases (0.6%), the port catheter was detached from the reservoir and was found to be in the right ventricular area. The first case was a 52-year-old female patient who underwent surgery with a diagnosis of pancreatic carcinoma. Oncological treatment was planned and chemotherapy port was applied by us. Ten days after the procedure, a subcutaneous swelling was detected in the area of the port reservoir during chemotherapy treatment and the treatment was stopped. Intracardiac foreign body was removed from the femoral vein by angiography, which was found to be dislocated on radiographs (Figure 4A).

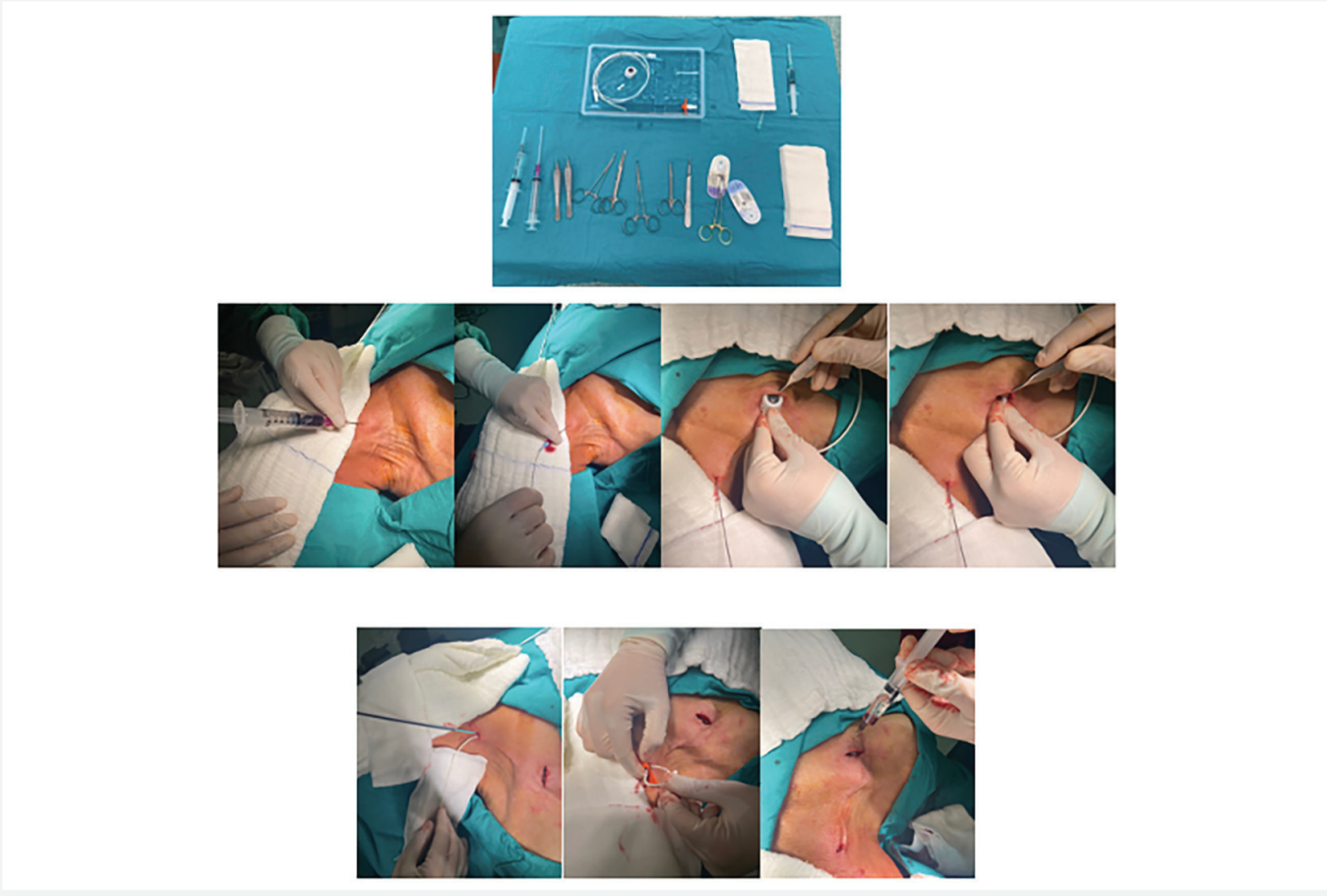


Figure 1. Surgical equipment to be used for port catheter insertion and images of the procedure



Figure 2. Chest radiography in the postoperative period; right jugular vein, right subclavien vein and left jugular vein, respectively

Table 1. Malignancy types of patients receiving chemotherapy port catheter

Types of malignancy	n	%
Colorectal	116	36
Gastric	70	21.7
Pancreas	53	16.5
Breast	27	8.4
Lung	14	4.3
Liver	10	3.1
Head-neck	10	3.1
Esophagus	9	2.8
Others*	13	4.1

*Cholangiocarcinoma, endometrial carcinoma, ovarian carcinoma, renal cell carcinoma, bladder carcinoma

Table 2. Location of chemotherapy ports

Anatomical location	n	%
Right jugular vein	267	82.9
Left jugular vein	27	8.4
Right subclavien vein	22	6.8
Left subclavien vein	5	1.6
Right femoral vein	1	0.3

Table 3. Complications and management

Complications	n	%	Management
Venous thrombus	8	2.5	Port catheter removal
Wound infection	7	2.2	Port catheter removal
Pneumothorax	2	0.6	Tube thoracostomy
Dislocated port catheter	2	0.6	Intracardiac foreign body removal with angiography



Figure 3. Images of wound infection

The other case was a 61-year-old female patient with a diagnosis of metastatic gastric carcinoma, who underwent chemotherapy port by us. She received the first chemotherapy treatment and there were no problems. During the second chemotherapy treatment, subcutaneous swelling was detected in the area of the port reservoir and the treatment was stopped. It was found that the catheter part was dislocated in the chest radiograph. An intracardiac foreign body was removed from the right femoral vein by angiography. Angiography images are shown in Figure 4B.

The procedure was performed in the angiography room. The femoral vein and artery were visualized with an incision applied to the femoral region and the vascular structure was taken under control with nylon tape due to hemorrhage that might develop during the procedure. The angiocatheter sent from the femoral vein was passed from the inferior vena cava to the intracardiac area. The angiocatheter was extended towards the superior vena cava and its lasso-shaped tip was extended from the superior-inferior line and the intracardiac dislocated catheter was held. After being fixed with the angiocatheter, it was removed from the femoral vein. No vascular injury was observed during the procedure.

DISCUSSION

Port catheters can be inserted through central veins such as subclavian and jugular veins. In practice, the subclavian vein may be preferred because of its proximity to the vena cava and right atrium. However, the possibility of development of pneumothorax is high (1-3.2%) in subclavian vein puncture with the Seldinger method[8,9]. In our study, jugular vein was used primarily and no pneumothorax was detected in this intervention line due to the routine use of ultrasonography. In the series, 2 (0.6%) pneumothorax complications were detected and occurred at the site of subclavian venous intervention in two cases.

Catheter lengths were calculated as 16-18 cm in right interventions and 20-22 cm in left interventions according to the Czepizak formula and according to the patient's height[10]. No arrhythmia was observed in any patient. After the insertion, the catheter was washed with heparin diluted with saline and found to be active. In some patients, when blood could not be punctured, stenosis was detected at the site of catheter entry into the vascular area, and the malfunctioning condition improved when the soft tissue area was freed. In the literature, the frequency of catheter malfunction has been reported as 0.8-5%. The most common cause of catheter malfunction is difficulty in blood puncture although there is no difficulty in infusion[11,12]. In our study, the catheter length was determined by external visualization according to the patient's size and no postoperative malfunction was observed.

Pain, erythema, tenderness at the port site indicates infection in this area. In cases of port infection, the port, which is the source of infection, should be removed immediately, the local wound site should be debrided, and oral antibiotics should be started. The incidence of port site infection has been reported to be 0.3-4.4%[13]. In our study, port infection was observed in 7

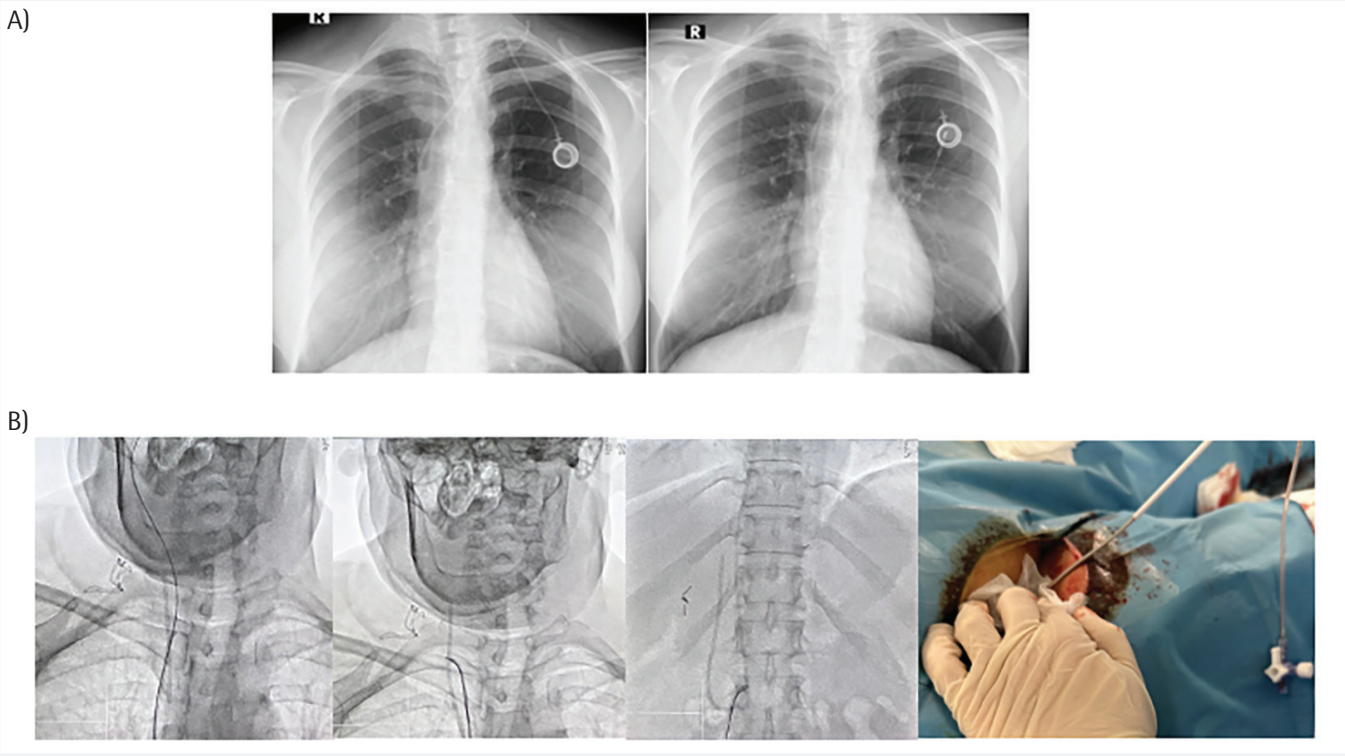


Figure 4. A) Dislocated port catheter at left jugular vein, **B)** Intracardiac foreign body removal with angiography

(2.2%) cases. It was observed that there were no port infections when the chemotherapy port reservoir was implanted as far away from the incision line as possible, by deepening from the incision line to create a port area towards the area where the soft tissue is thicker. We recommend the use of this technique.

The risk of pulmonary embolism due to venous thrombosis in patients with port insertion is between 5% and 40%. Although thrombosis may develop between 2 weeks and 2 years, 70% is observed in the first weeks[14]. Although pulmonary embolism was not observed in our study, catheter-induced venous thrombus was detected on Doppler ultrasonography performed in 8 (2.5%) patients due to catheter malfunction and the port catheter was removed and anticoagulant treatment was started.

The "pink off" complication, defined as a syndrome, occurs when the port catheter gets stuck between the clavicula and the first rib, resulting in rupture or fracture. In this case, infusion becomes difficult and pain or paresthesia may develop in the arm. The detached fragment should be removed as it may cause complications such as pulmonary embolism or cardiac arrhythmia. Lin et al.[15] reported that this syndrome developed in 73 cases in a study in which 3358 catheters were used. No "pink off" complication was observed in our study. In only two cases, dislocation of the catheter part into the right ventricle due to separation of the port catheter and the reservoir part was detected after the port catheter insertion. In the coronary angiography unit, the femoral vein was visualized through an incision made in the femoral region and the angiography catheter was inserted into the right ventricle and the catheter was removed from the femoral vein under radiographic visualization. These complications and treatments have not been reported in the literature and is recommended in early dislocated cases.

Study Limitations

Since the patients received treatment in different chemotherapy clinics, it could not be evaluated how long the patients could actively use the chemotherapy ports and whether there was a difference in usage according to the vascular structures.

CONCLUSION

Although port catheters inserted in the patient group using long-term chemotherapy increase the comfort of the patient and the physician, it should be kept in mind that the procedure is invasive and complications that may cause morbidity or mortality may develop. Experienced team, appropriate port determination, caution in the follow-up process and appropriate catheter care reduce the risks that may occur. In the clinical experience, using ultrasound during the procedure provides convenience for the physician.

Ethics

Ethics Committee Approval: The study permission was obtained from the Dr. İsmail Fehmi Cumalıoğlu City Hospital Clinical Research Ethics Committee (decision no.: 2022/10, date: 28.11.2022).

Informed Consent: Retrospective study.

Footnotes

Financial Disclosure: The author declared that this study received no financial support.

Conflict of Interest: No conflict of interest was declared by the author.

REFERENCES

1. Stanislav GV, Fitzgibbons RJ Jr, Bailey RT Jr, Mailliard JA, Johnson PS, Feole JB. Reliability of implantable central venous access devices in patients with cancer. Arch Surg. 1987;122:1280-3.
2. Broviac JW, Cole JJ, Scribner BH. A silicone rubber atrial catheter for prolonged parenteral alimentation. Surg Gynecol Obstet. 1973;136:602-6.
3. Hickman RO, Buckner CD, Clift RA, Sanders JE, Stewart P, Thomas ED. A modified right atrial catheter for access to the venous system in marrow transplant recipients. Surg Gynecol Obstet. 1979;148:871-5.
4. Niederhuber JE, Ensminger W, Gyves JW, Liepman M, Doan K, Cozzi E. Totally implanted venous and arterial access system to replace external catheters in cancer treatment. Surgery. 1982;92:706-12.
5. Carlo JT, Lamont JP, McCarty TM, Livingston S, Kuhn JA. A prospective randomized trial demonstrating valved implantable ports have fewer complications and lower overall cost than nonvalved implantable ports. Am J Surg. 2004;188:722-7.
6. Ballarini C, Intra M, Pisani Ceretti A, Cordovana A, Pagani M, Farina G, et al. Complications of subcutaneous infusion port in the general oncology population. Oncology. 1999;56:97-102.
7. Collier PE, Blocker SH, Graff DM, Doyle P. Cardiac tamponade from central venous catheters. Am J Surg. 1998;176:212-4.
8. Turcotte S, Dubé S, Beauchamp G. Peripherally inserted central venous catheters are not superior to central venous catheters in the acute care of surgical patients on the ward. World J Surg. 2006;30:1605-19.
9. Cowl CT, Weinstock JV, Al-Jurf A, Ephgrave K, Murray JA, Dillon K. Complications and cost associated with parenteral nutrition delivered to hospitalized patients through either subclavian or peripherally-inserted central catheters. Clin Nutr. 2000;19:237-43.
10. Czepizak CA, O'Callaghan JM, Venus B. Evaluation of formulas for optimal positioning of central venous catheters. Chest. 1995;107:1662-4.
11. Di Carlo I, Cordio S, La Greca G, Privitera G, Russello D, Puleo S, et al. Totally implantable venous access devices implanted surgically: a retrospective study on early and late complications. Arch Surg. 2001;136:1050-3.
12. Kurul S, Saip P, Aydin T. Totally implantable venous-access ports: local problems and extravasation injury. Lancet Oncol. 2002;3:684-93.
13. Gowda MR, Gowda RM, Khan IA, Punukollu G, Chand SP, Bixon R, et al. Positional ventricular tachycardia from a fractured mediport catheter with right ventricular migration--a case report. Angiology. 2004;55:557-60.
14. Gullo SM. Implanted ports. Technologic advances and nursing care issues. Nurs Clin North Am. 1993;28:859-71.
15. Lin CH, Wu HS, Chan DC, Hsieh CB, Huang MH, Yu JC. The mechanisms of failure of totally implantable central venous access system: analysis of 73 cases with fracture of catheter. Eur J Surg Oncol. 2010:36;100-3.