

## Comparison of Clinical Follow-up and Complications according to Cancer Types in Patients with Permanent Port Catheter Insertion due to Malignancy

Malignite Sebebiyle Kalıcı Port Kateter Takılan Hastalarda Kanser Tiplerine göre Klinik Takip ve Komplikasyonların Karşılaştırılması

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### ABSTRACT

**Aim:** In patients diagnosed with cancer, port catheter insertion is of critical importance for the appropriate delivery of the treatment and patient comfort. Aim of this study is to compare the patients placed subcutaneous port catheter in terms of the complications and the port remaining open based on cancer types.

**Material and Methods:** A total of 530 patients who had port catheter insertion in our clinic for chemotherapy between January 2011 and December 2017 were included into the study. Of the cases, 234 (44.1%) were female and 296 (55.9%) were male; and the mean age was 57.90±10.18 years. The port catheters were placed subcutaneously under vascular ultrasonography and the position of the catheter was checked using fluoroscopy. Patients underwent physical examination to check for hemorrhage or hematoma, and underwent chest x-ray to check for pneumothorax or hemothorax. Patients were called in for checkup for wound-site infection and port thrombosis on the postoperative 10th and 30th days.

**Results:** The majority of the patients who had port insertion were being followed up for gastrointestinal malignancies. Of the patients, 224 (42.2%) had port catheter insertion due to colon cancer, 68 (12.8%) due to breast cancer, and 111 (20.9%) due to gastric cancer. Frequency of catheter thrombosis was statistically higher in cases with colon and breast cancer. Wound site infection was observed more frequently in hematological malignancies.

**Conclusion:** We suggest that, after port insertion, these complications can be reduced by using prophylactic anticoagulants for long-term port use in cases with breast and colon cancer, and by continuing empirical antibiotic treatment against endemic pathogens in cases with hematological cancers.

**Keywords:** Cancer; complications; permanent port insertion.

### ÖZ

**Amaç:** Kanser tanısı alan hastalarda port kateter takılması hasta konforu ve tedavinin uygun verilmesi açısından çok önemlidir. Bu çalışmanın amacı subkutan kalıcı port kateteri takılan hastaların kanser tiplerine göre port açık kalma ve gelişen komplikasyon açısından karşılaştırılmasıdır.

**Gereç ve Yöntemler:** Kliniğimizde Ocak 2011 ve Aralık 2017 arasında kemoterapi amacıyla port kateter takılan 530 hasta çalışmaya alındı. Olguların 234 (%44,1)'ü kadın ve 296 (%55,9)'sı erkek, ortalama yaş 57,90±10,18 idi. Port kateterler vasküler ultrasonografi altında subkutan olarak takıldı ve perioperatif skopi ile kateter yeri ve kateter kırılması açısından kontrol edildi. Hastalara fizik muayene yapılarak kanama ve hematoma açısından, akciğer grafi çekilerek pnömotoraks ve hemotoraks açısından kontrol edildi. Hastalar postoperatif 10. ve 30. günde yara yeri enfeksiyonu ve port trombozu açısından kontrole çağrıldı.

**Bulgular:** Port takılan hastaların büyük çoğunluğu gastrointestinal kanser tipleri sebebiyle takip ediliyordu. Olguların 224 (%42,2)'üne kolon ca, 68 (%12,8)'ine meme ca ve 111 (%20,9) hastaya rektum ca sebebiyle port kateter takıldı. Kateter trombozu sıklığı kolon ve meme kanseri olan olgularda istatistiksel olarak daha yüksekti. Yara yeri enfeksiyonu ise hematolojik malignansilerde daha sık gözlemlendi.

**Sonuç:** Port takılmasından sonra meme ve kolon kanseri olgularında uzun süreli port kullanımı için profilaktik antikoagülan kullanımının, hematolojik kanser olgularında ise sık görülen patojenlere etkili ampirik antibiyotik tedavisinin devam edilmesi ile bu komplikasyonların azaltılabileceği kanaatindeyiz.

**Anahtar kelimeler:** Kanser; komplikasyon; kalıcı port takılması.

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## INTRODUCTION

Port catheter insertion provides cancer patients comfort and ease of deliverability of chemotherapy without the obligation of staying in the hospital. Its subcutaneous location also provides low infection rates (1). It can be performed painlessly, safely and with low complication rates using local anesthesia and ultrasonography. There are many studies in the literature on the complications that can be encountered during the insertion of port catheter and the relevant treatments. There are limited number of studies on the complications during port catheter insertion and the recommended prophylaxis according to the cancer types. In our clinic, by stratifying the patients according to their cancer types, we aimed to retrospectively analyze the outcomes of patients who had port catheter insertion for chemotherapy.

## MATERIAL AND METHODS

Following the approval of the local Ethics Committee of Namık Kemal University Medical Faculty (2018/29/03/03), patients who had port catheter insertion for chemotherapy in Cardiovascular Surgery clinic in Namık Kemal University Hospital between January 2011 and December 2017 were included in the study. The prospectively collected data of a total of 530 patients were retrospectively analyzed. Patient data were collected via retrospective file review and using the records for the outpatient clinic and the operating room. Of the cases, 234 (44.1%) were female and 296 (55.9%) were male, the mean age was  $57.90 \pm 10.18$  years.

### Routine Procedure of Port-Catheter Insertion

The preferred site of port placement was right subclavian vein in majority of patients; while left subclavian or jugular veins were used in case of failed puncture due to anatomical causes. Vascular puncture was made under Doppler ultrasonography (Sonosite, M turbo, Milano, Italia) following the local anesthesia in all cases. The position of the guide wire was checked by fluoroscopy (Ziehm Vision RFD, Nürnberg, Germany) in all patients. After observing that the blood flows easily along the port line, port reservoir was inserted in a way that there would be no kinks along the line. 0.5 cc heparin was injected into the reservoir as a prophylaxis for thrombosis.

### Routine Follow-up

The patients were routinely checked for hemothorax and pneumothorax by chest x-ray immediately after the operation. On the first, 10th and 30th days after the operation, the patients were checked for hemorrhage, wound site infection, thrombosis and function of the port catheter in the outpatient clinic. The primary outcome of the study was all postoperative complications including hematoma, hemorrhage, pneumothorax, hemothorax, infection, thrombosis and malfunction.

### Statistical Analysis

Statistical analysis was performed using the IBM SPSS for Mac version 20.0 software (IBM Corp., Armonk, NY, USA). Continuous variables were expressed in mean  $\pm$  standard deviation. The categorical variables were expressed in numbers and percentage. Pearson chi-square or Fisher-Freeman-Halton tests were used for the categorical variables.

## RESULTS

A total of 530 patients were included in the study. In Table 1, the numbers and percentiles of the patients according to their cancer types are given and the demographical data of the patients are given in Table 2. In terms of the port catheter insertion site, there were 436 (82.2%) patients with right subclavian vein insertion, 53 (10%) with left subclavian vein insertion, 34 (6.4%) with right jugular vein insertion, and 7 (1.3%) with left jugular vein insertion. These patients were followed-up post-operatively for hemorrhage, hemothorax, pneumothorax, malfunction, infection, and thrombosis. Complications that developed depending on the cancer types are shown in Table 3. Of these patients, 42 (7.9%) had thrombosis, 25 (4.7%) had infection, 4 (0.8%) had malfunction, 3 (0.6%) had pneumothorax, and 1 (0.2%) had hemothorax. Patients who had hemothorax and pneumothorax were treated with thorax tube and under water sealed drain. In patients who had malposition, the port line was re-inserted appropriately. Of 224 patients with colon cancer, 29 (12.9%) had thrombosis ( $p < 0.001$ ). Of 68 patients with breast cancer, 9 (13.2%) had thrombosis ( $p < 0.001$ ). The frequency of thrombosis in cases with breast and colon cancer, was statistically significantly higher compared to other cancer groups ( $p = 0.005$ ). In patients whose port catheter was not operating appropriately due to thrombosis, the port catheter was re-inserted.

**Table 1.** Distribution of patients according to cancer types

Cancer Type	n (%)
Colon Cancer	224 (42.2)
Gastric Cancer	111 (20.9)
Breast Cancer	68 (12.8)
Rectal Cancer	35 (6.6)
Pancreas Cancer	27 (5.1)
Larynx Cancer	18 (3.4)
Hematological Malignancies	16 (3.0)
Lung Cancer	13 (2.5)
Liver Cancer	8 (1.5)
Over Cancer	4 (0.8)
Esophagus Cancer	3 (0.6)
Bladder Cancer	2 (0.4)
Renal Cancer	1 (0.2)

**Table 2.** Demographic characteristics of the patients

Demographic Characteristics	n (%)
Sex	
Male	296 (55.8)
Female	234 (44.2)
Smoke	205 (38.7)
Diabetes Mellitus	123 (23.2)
Hypertension	109 (20.6)
Coronary Artery Disease	196 (37.0)
Chronic Kidney Disease	20 (3.8)

**Table 3.** The complications encountered by cancer types of patients with permanent port insertion, n (%)

Complications	Colon Cancer (n=224)	Gastric Cancer (n=111)	Breast Cancer (n=68)	Rectal Cancer (n=35)	Pancreas Cancer (n=27)	Larynx Cancer (n=18)	Hematological Malignancies (n=16)	p
Infection	8 (3.6)	2 (1.8)	1 (1.5)	3 (8.6)	2 (7.4)	1 (5.6)	6 (37.5)	<0.001
Thrombosis	29 (12.9)	1 (0.9)	9 (13.2)	1 (2.9)	1 (3.7)	0 (0.0)	1 (6.3)	0.005
Malfunction	2 (0.9)	0 (0.0)	2 (2.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.521
Hemothorax	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	---
Pneumothorax	1 (0.4)	1 (0.9)	1 (1.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.693
p	<0.001	0.801	<0.001	0.128	0.509	0.999	0.001	

There were no complications in patients with lung, liver and esophagus cancer. Over, bladder and renal cell cancers with one complication cannot be compared because of the small number of patients in groups. There were one infection in patients with over cancer and renal cell cancer, while there was one hemothorax in patients with bladder cancer. Moreover, of 16 patients diagnosed with hematological malignancy (12 patients with leukemia, 4 patients with Non-Hodgkin's Lymphoma), 6 (37.5%) had their ports removed due to infection at the port site and the port was re-inserted into the subclavian artery at the opposite site ( $p=0.001$ , Figure 1).



**Figure 1.** Port catheter infection in a 65-year-old male patient diagnosed with hematologic cancer

## DISCUSSION

Insertion of permanent port catheter provides great comfort to the patient as it allows the delivery of the treatment directly via central vein in chemotherapy patients and eliminates the requirement to perform intervention every time vascular access is needed. Since the port catheter is subcutaneously localized, skin integrity is not disrupted and the incidence of foreign object-induced infection is reduced. Moreover, it does not limit the daily activities of the patient which is a serious advantage compared to other central catheters (1,2). In addition to the complications specific to port catheter that occur during the operation such as hemorrhage, hemothorax, pneumothorax, hematoma, malposition (3); there are late-complications such as thrombosis, wound site infection, deep vein thrombosis observed after the operation that depends on patient comorbidities (4).

In cancer patients, permanent port catheter applications for chemotherapy carry a higher risk for thrombosis than the venous interventions in other patient groups. Increased risk for thrombosis in cancer patients is results from endothelial damage due to chemotherapy and direct thrombogenicity of some chemotherapeutic agents. The cancer type also influence the post-operative complications of the patient. Incidence of thromboembolic events in cancer patients is given as 5% in the literature, although this is around 20% in active cancer patients (5,6). In our study, the incidence of thrombosis in colon and breast cancer patients was found to be statistically higher than the patients with other cancer types. The literature reports the presence of a 'cancer procoagulant' in some tumor cells which has the structure of cysteine protease and requires vitamin K for its synthesis. Cancer procoagulant activates factor X initiating the common coagulation pathway (7). It contributes to the thrombosis by activating thrombin, thrombocytes and leukocytes (8). Blood levels of the cancer procoagulant was found to be especially elevated in colon, lung, breast, renal cancer and melanomas (9). In addition, there are studies that report

decreased protein C and S and increased thrombin levels in patients with breast cancer on chemotherapy (10). While this seems concordant with the results of our study, the chemotherapeutic agent also increases the tendency to thrombosis. In the literature, it was shown that cyclophosphamide, 5-FU or methotrexate used in the treatment for breast cancer increases the risk for thrombosis (11). Tamoxifen, a fundamental element of breast cancer therapy which provides a 49% reduction in the breast cancer recurrence, also increases the frequency for pulmonary embolism and thrombosis by 3-fold (12). Due to high rates of thrombosis observed in breast and colon cancers, prophylaxis to be administered for thromboembolism in this patient group has critical importance. Although the requirement of administration of thromboprophylaxis to these patients during their hospital stay was proven (13), administration of prophylaxis after discharge is controversial. There are studies reporting increased hemorrhage when prophylaxis in home care is applied (13,14). The need for prophylaxis must be tailored individually depending on the cancer type. We think that in cases with colon and breast cancers, administration of thromboembolism prophylaxis after discharge may enhance the patency of the port catheter and reduce the risk of having venous thromboembolic events. While the prophylaxis to be administered during hospitalization can be low molecular weight heparins (LMWH), standard heparin or fondaparinux (15), the use of LMWH in the post-discharge period will be efficient and easy.

Infections are frequently observed in cancer patients, with immunosuppression being the most important cause of infection (16). However, infection epidemiology is affected by many factors. Presence and severity of neutropenia, antineoplastic agent administered, empirical antibiotic treatment, presence of central venous lines, duration of hospital stay and some cancer types are risk factors for infection. Infection is frequently observed especially due to neutropenia that develops as a result of the chemotherapeutic agents administered to leukemia and lymphoma patients. In these cases, the most frequently isolated pathogens are gram negative rods such as pseudomonas, klebsiella, Escherichia coli and proteus species (17). In our study, wound site infection after insertion of permanent port catheter was more frequent in cases with hematological malignancy. While the average infection rate in patients who had insertion of port catheter was 4.7%, this was 37.5% in cases with hematological malignancy. We suggest that, initiation of empirical antibiotic treatment against endemic pathogens in neutropenic patients and in patients with hematological malignancy during the follow-up visits may decrease the infection rates.

In conclusion, insertion of port catheter in cancer patients for chemotherapy is of critical importance for the patient's comfort and the quality of the chemotherapy. We think that, in colon cancer and breast cancer patients who have tendency for thrombosis, application of thromboprophylaxis throughout the period the port catheter is used in the patient may be beneficial. This study also suggests that, in neutropenic cases on in those with hematological malignancies, timely initiation of empirical antibiotic treatment against endemic pathogens, may the rate of infectious complications and patency of port catheters.

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