

## Questionnaire-based evaluation of satisfaction levels in patients receiving chemotherapy through implanted venous access ports

Nilgün Yıldırım<sup>1\*</sup>, Mahir Cengiz<sup>2</sup>, Erhan Önalın<sup>3</sup>, Sibel Özcan<sup>4</sup>, Azmi Lale<sup>5</sup>

### Abstract

**Objective:** This study aimed to evaluate the effect of totally implanted venous access ports on the quality of life and patient satisfaction of cancer patients.

**Materials and Methods:** The study was comprised of patients who underwent implantation of a central venous port catheter (CVPC) for chemotherapy treatment at our hospital's oncology department and continued with follow-up and treatment. The researchers conducted face-to-face interviews with the participants in which the latter responded to 15 questions concerning the effects of the port catheter on daily quality of life and satisfaction with the implantation procedure.

**Results:** A total of 260 patients participated in the study. Port-related complications were observed in 54 patients (20.7%), the most common being catheter occlusion. Participants expressed high levels of satisfaction and stated that the CVPC had a positive effect on their quality of life. Overall satisfaction and quality of life were significantly different for patients who experienced complications compared to those without, however, with the former reporting decreased satisfaction and increased stress and anxiety levels. Nevertheless, there was no significant difference between the patients who developed complications and those who did not concern their response to the statement: "Faced with a similar situation requiring a port catheter, I would make the same decision" (54.5% versus 52%,  $p = .188$ ).

**Conclusion:** Most patients reported overall satisfaction with the CVPC system while noting a minor negative impact on daily life. Complications related to the implantation procedure have statistically been shown to be a predictor of satisfaction and quality of life.

**Keywords:** Cancer, central venous, port, catheter, patient satisfaction

### Introduction

Cancer is one of the leading causes of mortality on a global scale, with the number of new cases increasing every year. Patients frequently experience negative psychological as well as physical outcomes resulting from the disease and its treatment (1). This has led to an increase in studies not only on cancer response rates and survival times but also on patients' quality of life. In addition to cancer itself, the methods used to treat it, such as surgery, chemotherapy, feeding tubes used for enteral nutrition, and central venous catheters, have a significant impact on the quality of life (2, 3).

Central venous catheters are attached to patients with malignant or chronic diseases to provide easier vascular access during treatment. The use of such catheters is generally preferred for patients requiring long-term treatment and/or multiple treatments at intervals (4).

While port catheters constitute a major convenience for cancer patients, nonetheless complications may develop during their placement or use. In the early period, pneumothorax, hemothorax, malposition, malfunction, arrhythmia, cardiac perforation, port pocket hematoma, embolism, arteriovenous fistula, left thoracic ductus lesion, and/or phrenic or brachial plexus lesions may occur. During the late period, skin necrosis, catheter breakage, embolism, infection, catheter occlusion and disconnection, extravasation of fluids, difficulty in detecting the port, and aspiration of blood have been encountered (5).

Studies on venous port systems generally focus on risks and complications, with patient perception considered of secondary importance. However, in recent years, there has been an increased emphasis on the patient's point of view regarding medical procedures (6), and different tools have

Received 24-05-2019 Accepted 17-06-2020 Available Online 23-06-2020 Published 30-06-2020

1 Firat University Faculty of Medicine, Department of Medical Oncology, Elazığ, TR

2 Biruni University Faculty of Medicine, Department of Internal Medicine, Istanbul, TR

3 Firat University Faculty of Medicine, Department of Internal Medicine, Elazığ, TR

4 Firat University Faculty of Medicine, Department of Anesthesiology and Reanimation, Elazığ, TR

5 Firat University Faculty of Medicine, Department of General Surgery, Elazığ, TR

\* Corresponding Author: Nilgün Yıldırım E-mail: [dmilgunsari23@gmail.com](mailto:dmilgunsari23@gmail.com)



been developed to evaluate patients' quality of life. Thus, physical health no longer remains the sole meaningful outcome when assessing the success of a medical procedure (7). Psychosocial factors, for example, can positively affect perceived cancer pain (8). For this reason, greater importance is now placed on the quality of life for patients with extended life expectancy, as well as on their experiences with the medical procedures they undergo.

This study aimed to evaluate the effect of a single type of totally implantable venous catheter on the daily life and patient satisfaction of cancer patients

## Material and Methods

### Patients

Patients who received a central venous port catheter (CVPC) at our hospital's oncology department and continued with follow-up and treatment were included in the study. The criteria for inclusion were as follows: minimum age of 18, a diagnosis of malignant disease, chemotherapy treatment with a CVPC, conscientious response to the researchers' questions, and a life expectancy of 6 months or longer. Data concerning patients' age, gender, performance status, educational status, diagnosis, treatments received, the total number of central venous port catheters applied, port insertion and removal dates, and types of complications (thrombosis, infection, and mechanical) were recorded. Port insertion and removal dates were obtained by interviewing the patients and referencing hospital records. The study protocol was approved by the local Ethics Committee. The study was conducted in accordance with the principles of the Declaration of Helsinki.

### Implantation procedure

Coagulation parameters of the patients including prothrombin time, INR, activated partial thromboplastin time, and platelet counts were examined before the procedure. During the procedure, all patients were non-invasively monitored. As the first choice, the right subclavian vein was preferred due to the convenience of access and satisfactory cosmetic outcomes. For patients who had a history of right mastectomy, receiving radiotherapy on the right thoracic side, or in the presence of unavailability of right subclavian vein for vascular access due to the several causes, the left subclavian or internal jugular venous route was used. All procedures were performed under local anesthesia with sterile conditions in the operating room. The subclavian vein was percutaneously punctured using the Seldinger needle through landmark technique. The needle was placed under the inferior margin of the one-third lateral of the clavicle in a horizontal plane and gingerly directed with a negative aspiration toward the anterior margin of the trachea at the level of the suprasternal notch. Following the aspiration of venous blood, a 0.035-inch guidewire was inserted through the needle, until an arrhythmia trace was seen on the monitor. If an arrhythmia trace was not seen or there was a suspicion on guidewire location, a fluoroscopic examination was performed to detect the location of the wire. A subcutaneous pocket was created above the second

costa for the placement of the port reservoir through making a transverse incision with a size of approximately 2-3 cm. A tunnel was formed between the puncture site and subcutaneous pocket. A silicone catheter with a diameter of 7 or 8 F was inserted through the tunnel, and a tip of the catheter was connected to the reservoir placed into the subcutaneous pocket. A peel-away sheath combined with a vascular dilator was passed over the guidewire. Following the dilator and guidewire removal, the catheter was inserted through the sheath. After the catheter was advanced, it was confirmed by c-arm scope that the catheter tip was in the vena cava superior or cava-atrial junction. The reservoir and catheter were washed with a 20-mL isotonic sodium chloride solution and, then, the reservoir was filled with a 5-mL isotonic sodium chloride solution containing 100 U/mL of unfractionated heparin. The base of the reservoir was fixed to the fascia of the pectoralis major muscle with the absorbable sutures, and the skin was sutured using the polypropylene threads. At the end of the procedure, the port catheter localization was checked with posteroanterior chest radiography. Experienced nurses were responsible for the maintenance and use of these devices during treatment. Patients were evaluated after undergoing at least 4 weeks of treatment, and those who had received a port catheter for chemotherapy were recorded.

### Questionnaire and survey design

A 15-item questionnaire was designed to evaluate patient satisfaction with the implantation procedure, the effects of the port catheter on the overall quality of life, and psychosocial issues. The organization of the questionnaire followed that used in a previous similar study (7). While one objective was to consider everyday situations in which a port can be inconvenient or unpleasant, focus was also directed at the positive aspects of having a port, especially with regard to receiving treatment. The questions in the survey were evaluated by the means of face-to-face interviews with the patients. Patients were requested to choose the most suitable of five possible responses to each statement, these being "strongly disagree", "somewhat disagree", "neither agree nor disagree", "somewhat agree", and "strongly agree".

### Statistical analysis

Continuous variables are presented as mean  $\pm$  standard deviation. Categorical variables are presented as counts. Categorical variables were compared using the Chi-square test or Fisher exact test for small samples. Values of  $p < 0.05$  were considered statistically significant. The statistical analyses were performed using SPSS 20.0 software (SPSS, Chicago, IL, USA) for Windows

## Results

A total of 260 patients agreed to participate in the study. The most common diagnosis was colon cancer, followed by stomach cancer and head and neck cancer. The mean age was 56 years and men comprised 52% of the participants. Half of the patient population consisted of primary school graduates. Of those included in the study, 60% were patients with Stage 4 disease, and the most frequently used treatment protocol was the FOLFOX regimen. Patient

characteristics, including demographic data as well as disease type, severity, and treatment, are shown in Table 1.

The average number of catheter days of the patients was 431. Port-related complications were observed in 54 patients (20.7%), the most frequent complication being catheter occlusion. Port-specific information is presented in Table 2.

A total of 157 patients (59.6%) stated that they experience little or no pain during the insertion of their ports. Only six patients reported experiencing a lot of pain while receiving treatment during port use, while 229 (87.1%) patients stated that they did not feel any significant discomfort or pain during treatment.

Stress and anxiety levels following port insertion were scattered across the entire spectrum of possible responses. Of the participants, 87% reported little or no cosmetic discomfort resulting from the port. Ten patients (3.8%) stated that answering questions regarding the effect of the port on daily life was quite disturbing.

Twenty-one patients (8%) reported the perception of carrying foreign bodies in the body of the port catheter to be quite high. In response to the statement "Faced with a similar situation requiring a port catheter, I would make the same decision", 142 (54%) patients replied in the affirmative ("strongly agree" or "somewhat agree"), with the remaining responding negatively. One hundred and ninety-two patients (73%) strongly or somewhat agreed that their port catheters facilitated the treatment process and positively affected their quality of life. A total of 220 patients (83.6%) reported being able to enjoy their leisure time and were happy that their hospital stays were short, either strongly or somewhat agreeing with the relevant statement. Detailed survey results are shown in Table 3.

The effects of CVPC on general satisfaction levels and quality of life differed significantly according to whether or not patients experienced complications. In patients with complications, satisfaction decreased and stress and anxiety levels increased compared to those without complications.

The rate of positive responses to the question "Would you recommend attaching port to other patients?" was also lower for patients who developed complications. Nevertheless, there was no significant difference between patients with complications and those without in response to the statement "Faced with a similar situation requiring a port catheter, I would make the same decision" (54.5% versus 52%,  $p = .188$ ) (see Table 4 for more details)

**Table 1:** Patient characteristics

|                                   | n (%)           |
|-----------------------------------|-----------------|
| <b>Gender</b>                     |                 |
| Male                              | 137 (52.1)      |
| Female                            | 126 (47.9)      |
| <b>Age, years</b>                 |                 |
| Mean $\pm$ SD                     | 56.3 $\pm$ 11.1 |
| <b>Education</b>                  |                 |
| College education                 | 30 (11.4)       |
| High school education             | 32 (12.2)       |
| Lower than high school            | 20 (7.6)        |
| Primary school                    | 131 (49.8)      |
| Illiterate                        | 50 (19)         |
| <b>Malignant neoplasms</b>        |                 |
| Colorectal cancer                 | 148 (56.3)      |
| Gastric cancer                    | 66 (25.1)       |
| Hepatobiliary cancer              | 5 (1.9)         |
| Breast cancer                     | 10 (3.8)        |
| Head and neck cancer              | 20 (7.6)        |
| Others                            | 14 (5.3)        |
| <b>Access site</b>                |                 |
| Right subclavian vein             | 241 (91.6)      |
| Left subclavian vein              | 22 (8.4)        |
| <b>Primary Indication</b>         |                 |
| Chemotherapy                      | 245 (92)        |
| Parenteral nutrition              | 0               |
| Reliable venous access            | 18 (8)          |
| <b>Stage</b>                      |                 |
| I (adjuvant treatment)            | 2 (0.8)         |
| II (adjuvant treatment)           | 12 (4.6)        |
| III (adjuvant treatment)          | 91 (34.6)       |
| IV (palliative treatment)         | 158 (60.1)      |
| <b>Chemotherapy</b>               |                 |
| FOLFOX                            | 104 (39.5)      |
| FOLFOX + Bevacizumab              | 34 (12.9)       |
| FOLFOX + anti-EGFR                | 8 (3)           |
| FOLFIRI + Bevacizumab             | 12 (4.6)        |
| FOLFIRI + anti-EGFR               | 18 (6.8)        |
| FLOT                              | 26 (9.9)        |
| CF                                | 14 (5.3)        |
| CF + anti-EGFR                    | 4 (1.5)         |
| TCF                               | 18 (6.8)        |
| Others                            | 25 (9.5)        |
| <b>Previous IV Chemotherapy</b>   |                 |
| Yes                               | 104 (39.5)      |
| No                                | 159 (60.5)      |
| <b>Number of treatment rounds</b> |                 |
| 1 <sup>st</sup> round             | 185 (70.3)      |
| 2 <sup>nd</sup> round             | 72 (27.4)       |
| 3 <sup>rd</sup> round             | 6 (2.3)         |

**Table 2:** Port-specific information

|  | n (%)                        |
|--|------------------------------|
| <b>Patients with complications</b>                                 | 54 (20.5)                    |
| <b>Total observation time</b>                                      | 112.164 days                 |
| <b>Catheter days (mean <math>\pm</math> SD, range)</b>             | 431.4 $\pm$ 537.3 (30- 2033) |
| <b>Complications</b>   |                              |
| Infection  | 16 (6.1)                     |
| Occlusion  | 22 (8.4)                     |
| Pneumothorax   | 2 (0.8)                      |
| Subcutaneous hemorrhage  | 2 (0.8)                      |
| Displacement   | 8 (3)                        |
| Skin ulceration  | 2 (0.8)                      |
| Analgesia requiring pain   | 2 (0.8)                      |
| <b>Patients whose ports were removed port due to complications</b> | 40 (15.2)                    |

**Table 3:** Patient evaluations of their ports

| Statment  | Strongly disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Strongly agree |
|---|-------------------|-------------------|----------------------------|----------------|----------------|
|   | n (%)             | n (%)             | n (%)                      | n (%)          | n (%)          |
| I felt pain during the initial insertion of the port  | 38 (14.4)         | 119 (45.2)        | 68 (25.9)                  | 18 (6.8)       | 20 (7.6)       |
| I felt pain while receiving treatment using the port  | 139 (52.9)        | 90 (34.2)         | 28 (10.6)                  | 6 (2.3)        | 0              |
| The port restricts my arm movements   | 97 (36.9)         | 114 (43.3)        | 38 (14.4)                  | 12 (4.6)       | 2 (0.8)        |
| The port prevents (engel) me from performing daily tasks  | 98 (37.3)         | 119 (45.2)        | 36 (13.7)                  | 10 (3.8)       | 0              |
| When treatment is finished the port causes me discomfort  | 80 (30.4)         | 92 (35)           | 63 (24)                    | 28 (10.6)      | 0              |
| I avoid bathing as much as possible because of the port   | 124 (47.1)        | 101 (38.4)        | 28 (10.6)                  | 10 (3.8)       | 0              |
| Having the port in my body creates the sensation of carrying a foreign object                           | 114 (43.3)        | 62 (23.6)         | 66 (25.1)                  | 19 (7.2)       | 2 (0.8)        |
| My stress and anxiety increased after the port was inserted   | 88 (33.5)         | 77 (29.3)         | 68 (25.9)                  | 28 (10.6)      | 2 (0.8)        |
| I feel uncomfortable with my appearance due to the port   | 179 (68.1)        | 50 (19)           | 22 (8.4)                   | 10 (3.8)       | 2 (0.8)        |
| Criticism of the port by those close to me has affected me  | 177 (67.3)        | 42 (16)           | 20 (7.6)                   | 22 (8.4)       | 2 (0.8)        |
| I would recommend having a port to other patients   | 10 (3.8)          | 22 (8.4)          | 59 (22.4)                  | 114 (43.3)     | 58 (22.1)      |
| Faced with a similar situation requiring a port catheter, I would make the same decision                | 28 (10.6)         | 41 (15.6)         | 52 (19.8)                  | 106 (40.3)     | 36 (13.7)      |
| I am happy that I can shorten my hospital stays and enjoy my leisure time                               | 2 (0.8)           | 12 (4.6)          | 29 (11)                    | 160 (60.8)     | 60 (22.8)      |
| Having a port has had a positive effect on my quality of life   | 2 (0.8)           | 10 (3.8)          | 59 (22.4)                  | 116 (44.1)     | 76 (28.9)      |
| I have access to adequate support for the use and maintenance of my port from other health institutions | 73 (27.8)         | 90 (34.2)         | 42 (16)                    | 48 (18.3)      | 10 (3.8)       |

**Table 4:** Association of main objectives with complications

|   |      | Answer n (%)      |                   |                            |                |                | p      |
|---|------|-------------------|-------------------|----------------------------|----------------|----------------|--------|
|   |      | Strongly disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Strongly agree |        |
| Having a port has had a positive effect on my quality of life                 | NC   | 0 (0)             | 4 (1.9)           | 45 (21.1)                  | 98 (46)        | 66 (31)        | < .001 |
|   | C(s) | 2 (4)             | 6 (12)            | 14 (28)                    | 18 (36)        | 10 (20)        |        |
| Faced with a similar situation, I would make the same decision                | NC   | 18 (8.5)          | 35 (16.4)         | 44 (20.7)                  | 86 (40.4)      | 30 (14.1)      | .188   |
|   | C(s) | 10 (20)           | 6 (12)            | 8 (16)                     | 20 (40)        | 6 (12)         |        |
| I would recommend having a port to other patients                             | NC   | 8 (3.8)           | 10 (4.7)          | 49 (23)                    | 98 (46)        | 48 (22.5)      | < .001 |
|   | C(s) | 2 (4)             | 12 (24)           | 10 (20)                    | 16 (32)        | 10 (20)        |        |
| When treatment is finished the port causes me discomfort                      | NC   | 70 (32.9)         | 80 (37.6)         | 49 (23)                    | 14 (6.6)       | 0 (0)          | < .001 |
|   | C(s) | 10 (20)           | 12 (24)           | 14 (28)                    | 14 (28)        | 0 (0)          |        |
| My stress and anxiety increased after the port was inserted                   | NC   | 78 (36.6)         | 65 (30.5)         | 50 (23.5)                  | 18 (8.5)       | 2 (0.9)        | .018   |
|   | C(s) | 10 (20)           | 12 (24)           | 18 (36)                    | 10 (20)        | 0 (0)          |        |
| The port restricts my arm movements   | NC   | 85 (39.9)         | 96 (45.1)         | 24 (11.3)                  | 8 (3.8)        | 0 (0)          | < .001 |
|   | C(s) | 12 (24)           | 18 (36)           | 14 (28)                    | 4 (8)          | 2 (4)          |        |
| I avoid bathing as much as possible because of the port                       | NC   | 110 (51.6)        | 77 (36.2)         | 22 (10.3)                  | 4 (1.9)        | 0 (0)          | .001   |
|   | C(s) | 14 (28)           | 24 (48)           | 6 (12)                     | 6 (12)         | 0 (0)          |        |
| Having the port in my body creates the sensation of carrying a foreign object | NC   | 96 (45.1)         | 50 (23.5)         | 52 (24.4)                  | 15 (7)         | 0 (0)          | .049   |
|   | C(s) | 18 (36)           | 12 (24)           | 14 (28)                    | 4 (8)          | 2 (4)          |        |

NC; No Complication(s), C(s); Complication(s)

## Discussion

Central venous port catheters are employed to deliver chemotherapy treatment for many cancer patients. Chemotherapy by infusion is an important tool for the safe and effective delivery of anti-cancer drugs (9,10). The objective of the present study was to analyze the effects of CVPC on daily life and patient satisfaction in cancer patients treated following standard clinical practices. Our survey results confirmed the generally positive perception of CVPC on the part of cancer patients, similar to findings previously reported in the literature (6, 7, 11-13). A majority of the participants reported that CVPC had a positive effect on their overall quality of life and that they were better able to enjoy their leisure time thanks to shortened hospital stays enabled by the use of CVPC.

The majority of patients did not experience any significant discomfort or pain during the implantation procedure. In some studies, participants reported that the insertion of a port catheter was not a painful procedure (7, 12). In one study similar to our own, 62% of the patients stated that the attachment of their ports caused them little or no pain (14). An overwhelming majority (90%) of the patients in that study found the use of the port to be neither painful nor uncomfortable. In the present study, this rate was 87%. Most of our patients expressed that they were not disturbed during normal activities and that they were able to carry out their daily tasks. In 80% of our cases, arm mobility was affected only slightly or not all. Although most patients did not experience the sensation of having a foreign object in



the body due to the CVPC, some patients did report increased stress and anxiety levels following port insertion.

Feelings about one's physical appearance vary according to the patient's perspective, and individual perception is of critical importance for satisfaction. Much as the cosmetic result of a medical procedure may have a significant effect on overall life satisfaction, an individual's feelings regarding his/her appearance are similarly important, even when battling the disease. Changes in appearance have been found to play a critical role in patient compliance during treatment (15, 16). In some studies (7, 12), the percentage of patients complaining about the cosmetic results of the port catheter was higher than in our study, which had a greater percentage of patients reporting overall satisfaction. Only two young female patients diagnosed with breast cancer in the present study expressed cosmetic dissatisfaction. The high satisfaction rates observed in our study may also be due to regional and cultural differences.

When our patients were asked whether others' opinions had influenced them in any way before the insertion of the port catheter, the majority replied that they had merely followed their doctors' advice and had not discussed their decision with anyone. Although this response may simply have resulted from a high level of trust in physicians, it may also have been due to the doctors not discussing intravenous chemotherapy with their patients. More than half of our patients were not able to receive port catheter care from health institutions other than our hospital, possibly because family practitioners lack experience using a port catheter, which requires special needles. This situation constituted an extra inconvenience for our patients, thus negatively affecting the quality of life.

The overall safety of CVPC systems has been demonstrated by their low complication rates (12,17-19). The high complication rate of our study was consistent with the results of some studies in the literature (7,13,20). The most common complications that we encountered were port occlusion and infection. Satisfaction with the port catheter was evaluated on a comparative basis between patients with and without complications; there were significant differences between the two groups regarding its effects on daily tasks and quality of life. Patients who developed complications reported lower satisfaction rates and experienced higher levels of stress and anxiety following port implantation. While 28% of the patients with complications responded negatively to the question "Would you recommend inserting a port to other patients?", only 8% of the patients without complications responded negatively, a statistically significant difference. A previous study found no significant difference between these two groups (12). In response to the question of whether, in similar circumstances, they would again choose to have a port inserted, there was no significant difference between the responses of patients with and without complications. More than half of the patients in both groups answered this question in the affirmative, either as somewhat agree or strongly agree. In a questionnaire-based study conducted by Nagel et al., no statistically significant difference was observed between these groups concerning this issue (7). Although our results indicate that low complication rates

may have led to higher levels of satisfaction, the general outlook of patients concerning the use of CPVC is positive.

There are limitations to this study that should be noted. First, no analysis was performed according to the disease stage of our patients. Advanced stage disease is an important risk factor for upper limb venous thrombosis associated with CVPC use (21). In addition to disease stage, patient performance status and even sociocultural factors affect life expectancy, yet these patient groups were not analyzed separately.

## Conclusion

With the increasing use of continuous infusion chemotherapy regimens and the need to improve patient quality of life, the future will likely see a significant increase in demand for CVPC. Although most of the patients surveyed reported overall satisfaction with the CVPC system and experienced only a low negative impact on daily life as a result, in some respects the feedback was less positive. For example, an increase in complications stemming from the implantation procedure was found to statistically be a predictor of satisfaction. Therefore, actions taken to reduce the frequency and severity of complications will not only improve patients' experiences using CVPC but also increase the satisfaction and well-being of patients undergoing treatment over long periods.

**Acknowledgement, Funding:** None.

**Author's contributions:** NY, MC, EÖ, SÖ, AL; Project design, Patient examination, Patient survey questionnaire, NY; Article preparation and revisions

**Conflict of interest:** The authors declare that they have no conflict of interest.

## References

1. Kontodimopoulos N. The potential for a generally applicable mapping model between QLQ-C30 and SF-6D in patients with different cancers: a comparison of regression-based methods. *Qual Life Res.* 2015;24(6):1535-1544.
2. Ringash J, Au HJ, Siu LL, et al. Quality of life in patients with K-RAS wild-type colorectal cancer: The CO.20 phase 3 randomized trial. *Cancer.* 2014;120(2):181-189.
3. Stevens CS, Lemon B, Lockwood GA, Waldron JN, Bezjak A, Ringash J. The development and validation of a quality-of-life questionnaire for head and neck cancer patients with enteral feeding tubes: the QOL-EF. *Support Care Cancer.* 2011;19(8):1175-1182.
4. Biffi R, Pozzi S, Agazzi A, et al. Use of totally implantable central venous access ports for high-dose chemotherapy and peripheral blood stem cell transplantation: results of a monocentre series of 376 patients. *Annals of Oncology.* 2004; 15: 296-300.
5. Burns KEA, McLaren A. Catheter-related right atrial thrombus and pulmonary embolism: A case report and systematic review of the literature. *Can Respir J.* 2009; 16: 163-165.
6. Maurer MH, Beck A, Hamm B, Gebauer B. Central venous portcatheters: evaluation of patients' satisfaction with implantation under local anesthesia. *The Journal of Vascular Access.* 2009; 10: 27-32.

7. Nagel SN, Teichgräber UKM, Kausche S, Lehmann A. Satisfaction and quality of life: a survey-based assessment in patients with a totally implantable venous port system. *Eur J Cancer Care (Engl)*. 2012;21(2):197-204.
8. Zaza C, Baine N. Cancer pain and psychosocial factors: a critical review of the literature. *Journal of Pain and Symptom Management*. 2002; 24: 526-542.
9. Bow EJ, Kilpatrick MG, Clinch JJ. Totally implantable venous access ports systems for patients receiving chemotherapy for solid tissue malignancies: a randomized controlled clinical trial examining the safety, efficacy, costs, and impact on quality of life. *J Clin Oncol*. 1999;17(4):1267.
10. Biffi R, Toro A, Pozzi S, Di Carlo I. Totally implantable vascular access devices 30 years after the first procedure. What has changed and what is still unsolved? *Support Care Cancer*. 2014; 22(6): 1705-1714.
11. Paleczny J, Banyś-Jaferník B, Gazurek K, Kierpiec K, Szczerba H, Zipser P. Long-term totally implantable venous access port systems—one center experience. *Anaesthesiol Intensive Ther*. 2013; 45(4): 215-222.
12. Kreis H, Loehberg CR, Lux MP, et al. Patients' attitudes to totally implantable venous access port systems for gynecological or breast malignancies. *Eur J Surg Oncol*. 2007; 33(1): 39-43.
13. Ignatov A, Hoffman O, Smith B, et al. An 11-year retrospective study of totally implanted central venous access ports: complications and patient satisfaction. *Eur J Surg Oncol*. 2009; 35(3): 241-246.
14. Vermeulin T, Lahbib H, Lottin M, et al. Patients' perception and attitude to totally implantable venous access for urologic or digestive cancer: A cross-sectional study. *Bull Cancer*. 2019; 106(11): 959-968.
15. Moreira H, Canavarro MC. A longitudinal study about the body image and psychosocial adjustment of breast cancer patients during the course of the disease. *European Journal of Oncology Nursing*. 2010; 14: 263-270.
16. DeFrank JT, Mehta CC, Stein KD, Baker F. Body image dissatisfaction in cancer survivors. *Oncology Nursing Forum*. 2007; 34: 36-41.
17. Yanık F, Karamustafaoğlu YA, Karataş A, Yörük Y. Experience in totally implantable venous port catheter: Analysis of 3,000 patients in 12 years. *Turkish Journal of Thoracic and Cardiovascular Surgery*. 2018; 26(3): 422-428.
18. Ma L, Liu Y, Wang J, Chang Y, Yu L, Geng C. Totally implantable venous access port systems and associated complications: A single-institution retrospective analysis of 2,996 breast cancer patients. *Molecular and Clinical Oncology*. 2016; 4: 456-460.
19. Bertoglio S, Cafiero F, Meszaros P, et al. PICC-PORT totally implantable vascular access device in breast cancer patients undergoing chemotherapy. *J Vasc Access*. 2019 Nov 1:1129729819884482. doi: 10.1177/1129729819884482
20. Araujo C, Silva JP, Antunes P, et al. A comparative study between two central veins for the introduction of totally implantable venous access devices in 1201 cancer patients. *Eur J Surg Oncol*. 2008; 34: 222-226.
21. Kang JR, Long LH, Yan SW, Wei WW, Jun HZ, Chen W. Peripherally inserted central catheter-related vein thrombosis in patients with lung cancer. *Clin Appl Thromb Hemost*. 2017; 23(2): 181-186.