Original Article

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Factors that Affect Drain Indwelling Time after Breast Cancer Surgery

Ömer Uslukaya[1], Ahmet Türkoğlu[1], Metehan Gümüş[1], Zübeyir Bozdağ[1], Ahmet Yılmaz[2], Hatice Gümüş[3], Şeyhmus Kaya[4], Mesut Gül[1]

[1]Department of General Surgery, Dicle University School of Medicine, Diyarbakır, Turkey
[2]Department of Family Medicine,, Dicle University School of Medicine, Diyarbakır, Turkey
[3]Department of Radiology, Dicle University School of Medicine, Diyarbakır, Turkey
[4]Department of Pathology, Dicle University School of Medicine, Diyarbakır, Turkey

ABSTRACT

Objective: The most common procedure to prevent seroma formation, a common complication after breast and axillary surgery, is to use prophylactic surgical drains. Ongoing discussions continue regarding the ideal time for removing drains after surgical procedures. In this study, we aimed to investigate factors that affect drain indwelling time (DIT).

Materials and Methods: From 2014 to 2015, a total of 91 consecutive patients with breast cancer were included in the study. The demographic characteristics of the patients, treatment methods, histopathologic features of the tumor, size of removed breast tissue (BS), tumor size (TS), number of totally removed lymph nodes (TLN), and metastatic lymph nodes (MLN), whether they had neoadjuvant chemotherapy, and the DIT were retrospectively recorded from the hospital database.

Results: The mean age of the patients was 48.9 years, and the mean DIT was 4.8 days. The mean size of breast removed was 17.3 cm and tumor size was 4.7 cm, and the mean number of metastatic lymph nodes was 3.3, and mean total number of lymph nodes was 14.1. Patients who had neoadjuvant chemoterahpy had longer DIT. There was a positive correlation between the BS, TS, TLN, MLN, length of hospital stay, and DIT. Linear regresion analysis revealed that the BS, TLN, and history of neoadjuvant chemoterahpy were independent risk factors for DIT.

Conclusion: DIT primarily depends on BS, TLN, and history of neoadjuvant chemoterahpy. A policy for the management of removing drains to prevent seroma formation should thus be individualized.

Keywords: Breast cancer, mastectomies, drainage, suction

Introduction

Drains offer a significant advantage for seroma after breast cancer surgery (1). Surgical drains are used in the immediate postoperative period because the dead space in the operation area is one of the most important factors for seroma-associated complications (1, 2). Although there are different ways to prevent seroma, including external compression, flap fixation, dead space obliteration (3) or tissue glues (1, 4), closed suction wound drainage has been accepted as the most effective technique in reducing morbidity (5-7). However, there are several disadvantages of drain insertion such as discomfort and retrograde migration of bacteria (2). According to a meta-analysis, there was no widely accepted consensus for an ideal time for drain removal following breast cancer surgery (8). Drain removal protocols vary enormously from hospital to hospital, even from department to department in the same hospital. Prolonged drainage may prolong hospital stay (9). Some patients refuse to be discharged with drains, because there are difficulties in managing them at home, which may result in wound infection. Early removal of drains has been linked with shorter length of hospital stay (LOS) (9-11). However, indiscriminate withdrawal of drains, regardless of the fluid volume of fluid drained, may be accompanied by increased seroma formation (9, 11-17). Therefore, repeated aspirations and even surgical draining may be required. Furthermore, the risk of infection, skin flap necrosis, prolonged hospital stay, and delay in the commencement of chemotherapy or radiotherapy, or both in some cases, are often increased if drains are not used (9, 11).

Drain indwelling time (DIT) has not been an issue in many centers for patients who are admitted in the early stages of cancer. However, 40% of the patients at our center are admitted with stage 3 disease and as such a common solution for this problem is still pending. There are many benefits to short-duration drains; however, early withdrawal complications and DIT are very important to know. We believe the knowledge of the factors that affect DIT is the most important step in determining the optimal time. Therefore, the need to investigate the ideal time for drain removal is warranted. The first step is to investigate factor(s) that affect DIT. Accordingly, we aimed to determine these factors in this study.

Address for Correspondence :
Ömer Uslukaya, e-mail: druslukaya@gmail.com

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Materials and Methods

The study was conducted from 2013 to 2014. Ninety-one consecutive patients with breast cancer were admitted to Faculty of Medicine, Department of General Surgery, and were included in the study. All procedures adhered to the ethical principles of the Helsinki Declaration. In order to identify factors that affect DIT, the demographic and tumor features of the patients management strategy, pathologic results of the tumor, the size of removed breast tissue (BS), tumor size (TS), the number of totally-removed lymph nodes (TLN) and metastatic lymph nodes (MLN), whether they had neoadjuvant chemotherapy, LOS, and DIT were retrospectively recorded from the hospital database. The greatest dimension was used for breast size and tumor size. The number of TLN and MLN was assessed using the final histopathologic report.

According to our unit protocols, all drains were removed after fifteen days regardless of the drainage volume, or when the drainage volume was less than 50 mL on two sequential days. If patients were discharged with the drain, they were seen every two days. If fluid collected after drain removal it was removed through percutaneous aspiration.

Statistical analysis

Statistical Package for the Social Sciences package program 18 (SPSS Inc.; Chicago, IL, USA) was used for statistical analysis. After preliminary analysis for factors affecting DIT, multivariate linear regression analysis was used to identify independent risk factors. $p<0.05$ was accepted as statistically significant.

Results

The study consisted of 91 women with a mean age of 48.9 years (range, 26-81 years); the mean DIT was 4.8 days (range, 0-13 days). The mean BS was 17.3±8.5 cm and TS was 4.73±2.948 cm, and the mean MLN was 3.3 (range, 0-19). The mean TLN was 14.1 (range, 2-32) and LOS was 5.93 days (range, 1-20 days). The rate of patients treated with neoadjuvant chemotherapy was 22/91 (24.18%). The mean DIT was 3.72±2.36 in the patients who had neoadjuvant chemotherapy and 8.18±2.86 in the others. The patients who had neoadjuvant chemotherapy had longer DIT ($p<0.001$).

There was a positive correlation between the BS, TS, TLN, and MLN, LOS, and DIT (Table 1). Linear regression analysis was performed for the statistically significant variable in the univariate analysis. Linear regression analysis revealed that the BS, TLN, and neoadjuvant chemotherapy used were independent risk factors for DIT (Table 2).

The effects of age, histopathologic type, hormone receptor status, concomitant disease on DIT were not statistically significant.

Discussion and Conclusion

The most common complication following breast cancer surgery is seroma, with an incidence of up to 90%. Seroma can lead to several problems including pain, delayed wound healing, skin necrosis, and infections if it remains untreated. It has been suggested that suction drainage markedly decreased the development of postsurgical seroma (10). Furthermore, it has been reported that nearly all of the total seroma formation was drained within the 48 hours of the post-operative period (1, 9). Interestingly, the levels of seroma showed wide variation between the trials. The rates were reported as 21% to 49% for early drain removal regimens, whereas 4% to 28% for late drain removal (8). Andeweg et al. (14) showed that short-term axillary drainage was related to a higher incidence of seroma. However, a similar number of aspirations were needed in the short- and long-term drainage groups with a similar volume per patient requiring aspiration.

The timing of drain removal was reported to have no influence on seroma formation (1, 11, 14, 18, 19). Moreover, no significant difference was demonstrated in the rates of infection between early and late drain removal (8, 18, 20-23). All these studies show that DIT is a very controversial issue. One reason for planning this study was that there is no consensus about DIT. We think that the consensus should begin by finding factors that affect DIT. Age, remains a controversial factor because some studies revealed apparent seroma formation, whereas others did not show a significant link, like in our study (10, 11, 24-29).

Table 1. Correlation coefficients between drain indwelling time and studied variables

		Total lymph node	Metastatic lymph node	Size of breast	Age	Tumor size	Hospital stay
Metastatic lymph node	R	0.539**	1				
	p	0.000					
Size of breast	R	0.341**	0.360**	1			
	p	0.001	0.000				
Age	R	0.102	0.064	0.064	1		
	p	0.334	0.544	0.549			
Tumor size	R	0.416**	0.359**	0.543**	-0.039	1	
	p	0.000	0.000	0.000	0.716		
Hospital stay	R	0.490**	0.280**	0.252*	0.053	0.220*	1
	p	0.000	0.007	0.016	0.615	0.036	
Drain remaining time	R	0.560**	0.244*	0.485**	0.152	0.362**	0.444**
	p	0.000	0.020	0.000	0.149	0.000	0.000

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Table 2. Linear regression analysis of independent risk factors of drain indwelling time

	Unstandardized coefficients		Standardized coefficients			95% Confidence interval for B	
Model	**B**	**Std. error**	**Beta**	**T**	**Sig.**	**Lower bound**	**Upper bound**
(Constant)	-3.476	0.740		-4.700	0.000	-4.947	-2.006
Tumor size	-0.010	0.089	-0.010	-0.116	0.908	-0.186	0.166
Total lymph node	0.184	0.038	0.405	4.782	0.000	0.107	0.260
Metastatic lymph node	-0.040	0.060	-0.056	-0.669	0.505	-0.159	0.079
Size of breast	0.097	0.031	0.262	3.158	0.002	0.036	0.157
Neoadjuvant Chemotherapy	3.378	0.517	0.464	6.532	0.000	2.350	4.407

A. Dependent Variable: Drain Indwelling Time

In our clinical practice, we used closed suction drainage systems that are removed from skin flaps following from axilla. Dead space forming after excision is eliminated by the negative pressure applied by the drain. Thus, apposition of skin flaps is promoted and wound healing is strengthened. Negative pressure may decrease wound dehiscence, necrosis, infection and seroma formation as well (4, 10, 30, 31). Closed suction drainage systems seem to be more successful than open drainage systems (32).

First, the drain of the mastectomy skin flaps was removed. The axillary drain remained and continued to drain (1).

Various factors might affect seroma formation. Axillary dissection is related to the formation of postoperative seroma (33). The development of a seroma has been reported in 10% to 52% of cases (9, 34). If a great number of lymph nodes were dissected from the axilla, much more seromas were observed. The higher lymph node yield might be considered as an indirect measure of a more extensive axillary dissection in patients with seroma (1). The amount of drainage may project the extent of injury to the lymph vessels (13). As such, tissue ligation around the axillary vessels during dissection may decrease the amount of postoperative discharge compared with transection with a knife or diathermy (23). The number of lymph nodes remains a controversial factor because some authors declared obvious seroma formation, whereas others did not observe a significant relation (10, 11, 24-29). However, the number of lymph nodes removed during axillary dissection was found to be an independent risk factor for the duration of draining in the present study.

Sentinel lymph node biopsy (SLNB) is a minimally-invasive alternative technique to axillary dissection. SLNB has significantly lower seroma formation rates compared with axillary dissection (10, 35-37). It also prevents the damage to blood and lymphatic vessels by reducing the need for larger dissection (10). In this study, DIT was lower in patients who were SLNB negative, some of them even had no drainage performed. However, these benefits were reached only if SLNB results were benign; our patients were admitted in the later stages and benefit was limited.

Another factor is the presence of metastatic lymph nodes (9, 32, 38, 39). The number of metastatic lymph nodes remains controversial because some studies found significant seroma formation, and others showed an insignificant association, similar to our study (10, 11, 24-29).

Breast size is another important factor (9, 32, 38, 39). Wide chest wall dissection influences seroma formation (14). Breast size was not found to have a significant influence on seroma formation in some studies (40, 41). Extensive dissection causes damage to more blood and lymphatic vessels and subsequently results in larger seroma formation. More seroma is seen in modified radical mastectomy than in simple mastectomy or wide local excision plus axillary lumpectomy (7, 10, 25-27). When MRM was compared with breast-conserving surgery (BCS), although the results were mixed, MRM had an overall higher seroma formation (10, 42-45). There were correlations between removed breast size and DIT in the present study. Therefore, we found that smaller surgery corresponded with lower DIT. Studies showed that patients who underwent MRM had higher risk of developing seroma than patients who underwent BCS or completed axillary clearance (11, 19, 29). Some studies showed that tumor size had no significant influence on seroma formation (10, 40, 41). In the present study, there was a correlation between tumor size and DIT, but it was not found as an independent risk factor.

Diabetes mellitus was not found as a significant influence on seroma formation (10, 40, 41) and hypertension was significant in influencing factors for seroma formation (10, 36). In our study, neither disease had a significant effect on DIT.

Neoadjuvant chemotherapy used was an independent risk factor for DIT in our study, but other studies determined that this form of chemotherapy had no significant influence on seroma formation (10, 40, 41).

The limitations of our study include: 1. Surgical factors, including technique (surgeon A versus surgeon B), extent of dissection (total mastectomy vs. modified radical mastectomy), surgical devices used for dissection (electrocautery vs. scalpel), these were not investigated; 2. The study would have benefitted if it included patient characteristics such as body mass index and body weight.

Drain indwelling time should be individualized to prevent seroma formation. DIT primarily depends on BS, TLN, and which neoadjuvant chemotherapy is used.

Ethics Committee Approval: Ethics committee approval was received due to the retrospective nature of this study.

Informed Consent: Verbal informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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