—Report on Experiments and Clinical Cases—

An Analysis of Factors That Influence the Duration of Suction Drainage in Breast Cancer Surgery

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Abstract

Background: The duration of suction drainage in patients undergoing breast cancer surgery is difficult to predict. The uncertainty this poses may complicate the development of a clinical pathway for patients with breast cancer. In this study we attempted to identify factors that may influence the duration of suction drainage in patients undergoing breast cancer surgery.

Methods: We examined the relationships between the duration of suction drainage and several clinical factors including type of drainage tube in 60 patients with primary breast cancer who underwent surgical resection at the Nippon Medical School Hospital in 2004 and 2005. The drainage tubes were removed 1 day after the daily drainage volume had decreased to less than 50 mL or on the seventh postoperative day in patients in whom such a decrease did not occur. All patients were discharged from the hospital 1 or 2 days after the drains were removed.

Results: Seroma was observed in all patients. No complications associated with the drainage were observed. The median duration of drainage was 4.5 days, and the range was 2 to 7 days. Univariate analyses revealed significant relationships between the duration of drainage and the following 5 factors: patient age at surgery, body mass index, intraoperative blood loss, operation time, and type of surgery (total breast resection or partial breast resection). Univariate and multivariate analyses showed no significant statistical associations between the duration of drainage and the other factors, including the type of drainage tube.

Conclusion: None of the factors examined was strongly associated with the duration of drainage. This study has shown that any type of drainage tube can be used in breast cancer surgery, in regards to the duration of drainage, and that patient discharge 1 or 2 days after drainage tube removal is appropriate.

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Key words: breast cancer, drainage, seroma

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Introduction

Clinical pathways are now commonly devised as a tool for standardizing perioperative management for patients who undergo breast cancer surgery[1]. Yet the difficulty in predicting the duration of suction drainage in these patients poses an uncertainty that may complicate the development of a suitable clinical pathway. Through this study, we hope to facilitate the development of a clinical pathway by identifying the factors that may influence the duration of wound drainage after breast cancer surgery.

Subjects and Methods

Subjects

The study subjects were 60 patients with primary breast cancer who underwent resection operations at the Nippon Medical School Hospital in 2004 and 2005. Thirty of the patients underwent total breast resection (Bt) and the other 30 underwent partial breast resection (Bp)[2]. All 60 patients underwent axillary lymph node dissection, because the omission of this procedure after the sentinel lymph node biopsies had yet to be introduced during the year of the study. The exclusion criteria were: male sex, concurrent treatment with skin graft surgery, simultaneous breast construction surgery, bilateral breast cancer, postoperative bruising of the skin and subcutaneous tissue, and treatment with anticoagulants, antiplatelet agents, heparin, or low-molecular-weight heparin.

Drainage Procedure

Axillary drainage tubes were placed in all 60 patients. The patients undergoing Bt received 1 tube in the axillary space and 1 tube in front of the major pectoral muscle, and patients undergoing Bp received 1 tube in the axillary space. The drainage tubes were removed 1 day after the daily drainage volume had decreased to less than 50 mL, or on the seventh postoperative day in patients in whom such a decrease did not occur. All patients were discharged from the hospital 1 or 2 days after the drainage tubes were removed.

Clinical Factors Examined

Analyses were performed to examine how the duration of drainage related to the following factors: patient age at surgery, height, body weight, body mass index, intraoperative blood loss, operation time, results of preoperative and postoperative blood tests, and biochemical marker data (preoperative data included total protein [TP], albumin, hemoglobin, hematocrit, platelet count, prothrombin time [PT], and activated partial thromboplastin time [APTT]; postoperative data included TP, albumin, hemoglobin, hematocrit, platelet count, and fibrinogen degradation products [FDPs]), type of surgery (Bt or Bp), number of drainage tubes used (1 or 2, depending on the type of surgery), extent of axillary lymph node dissection (greater or less than the level I field[2]), the type of drainage tube (ReliaVac® silicon round drainage tube [4.7 mm; Davol Inc., subsidiary of C. R. Bard Inc., Cranston, RI, USA], Hemaduct® silicon round drainage tube [15 French; Allegiance Healthcare Corp., McGraw Park, IL, USA], or J-VAC® silicon round drainage tube [15 French; Ethicon Inc., Somerville, NJ, USA]), which was selected for the patients in a nonrandomized manner).

Statistical Analysis

Univariate analysis was performed using Spearman's rank correlation analysis, the Mann-Whitney U test, and the Kruskal-Wallis rank test. $P < 0.05$ was considered to be statistically significant. Statistical analysis was performed using the Statistical Package for Social Science (SPSS) software (SPSS Inc., Chicago, IL, USA).

Results

Seroma was observed in all patients. The median duration of drainage after surgery was 4.5 days, and the range was 2 to 7 days. No complications associated with drainage were noted. Spearman's rank correlation analysis revealed that the duration of drainage was significantly associated with the age at surgery, body mass index, intraoperative blood

Table 1 Correlation between clinical data and duration of drainage

	Median	Range	P*
Drainage period (days)	5	2－7	—
Patient age (y.o.)	59	28－90	0.021
Height (cm)	154.1	134.7－169.0	0.20
Body weight (kg)	54.5	39.0－78.5	0.11
Body mass index	22.7	14.3－38.2	0.0070
Intraoperative blood loss (g)	70	10－460	0.0010
Operation time (minutes)	154	83－255	0.040

*Spearman's rank correlation test.

Table 2 Correlation between components of TNM staging and duration of drainage

T, N, Stage	N	Duration of drainage #	P*
T: 1/2/3/4	30/23/4/3	4/5/5.5/4	0.75
N: 0/1/2/3	45/13/2/0	4/6/7/—	0.0051
Stage: 0/1/2/3/4	0/28/26/6/0	—/3.5/5/5.5/—	0.34

#Values were median.
*Kruskal-Wallis rank test.

Table 3 Correlation between type of surgery, extent of axillary dissection, and duration of drainage

		N	Duration of drainage#	P*
Neoadjuvant chemotherapy	−	51	4 (2－7)	0.20
	+	9	5 (3－7)	
Sentinel lymph node biopsy	+	40	4 (2－7)	0.075
	−	20	5 (2－7)	
Surgery method	Bt	30	6 (3－7)	<0.0001
	Bp	30	3 (2－7)	
Extent of axillary dissection	over level I	33	5 (2－7)	0.12
	under level I	27	3 (2－7)	

values were median (range).
* Mann-Whitney's U test.

loss, and operation time but not with height or body weight (**Table 1**). Among the components of TNM staging[2], only the N factor correlated significantly with the duration of drainage, as determined with the Kruskal-Wallis rank test (**Table 2**). The duration of drainage showed no statistically significant association with the results of preoperative or postoperative blood test or with any biochemical markers (preoperative data included TP, albumin, hemoglobin, hematocrit, platelet count, PT, and APTT; postoperative data included TP, albumin, hemoglobin, hematocrit, platelet count, and FDP), as assessed with Spearman's rank correlation analysis. The Mann-Whitney U test revealed that the duration of drainage was significantly associated with the type of surgery (Bt or Bp) and, as a consequence, with the number of drainage tubes (1 or 2) but not with neoadjuvant chemotherapy (administered or not administered), sentinel lymph node biopsy (performed or not performed), or extent of axillary lymph node dissection (greater or less than the level I field) (**Table 3**). The type of drainage tube used was not significantly related to the duration of drainage, as assessed with the Kruskal-Wallis rank test (**Table 4**). Multivariate analysis revealed no relationships between the duration of

Table 4 Correlation between type of drainage tube used and duration of drainage

Drainage tube	N	Duration of drainage#	P*
ReliaVac silicon round tube (15 French)	20	3.5 (2－7)	
Hemaduct silicon round tube (15 French)	20	4.5 (2－7)	0.59
J-VAC silicon round tube (15 French)	20	5 (2－7)	

#Values were median (range)
*Kruskal-Wallis rank test

drainage and any of the factors tested.

Discussion

Seroma formation is a problem commonly associated with breast cancer surgery. Seroma is defined as an accumulation of serous fluid that develops following the formation of skin flaps during mastectomy in either the skin or the axillary dead space in the immediate or acute postoperative period[3]. Although previous reports have suggested that a large dead space increases the likelihood of seroma, the contents of the lymph-like fluid or exudates making up the seroma remain unknown[4]. A systematic review to analyze the risk factors for seroma formation in patients undergoing breast cancer surgery has suggested that the following factors are associated with an increased risk of seroma formation: higher body weight, extended radical mastectomy (as compared to simple mastectomy), greater drainage volume during the first 3 postoperative days, and the performance of a sentinel lymph node biopsy[5]. In contrast, none of the other factors in this review were found to have significant influences on the risk of seroma formation: duration of drainage, hormone receptor status, immobilization of the shoulder, intensity of negative suction pressure, lymph node status or positivity of lymph nodes, number of drains, number of lymph nodes removed, previous biopsy, removal of drains on the fifth postoperative day (versus removal after the daily drainage volume decreased to a minimum), stage, type of drainage (closed suction versus static drainage), or use of fibrinolysis inhibitors.

Seroma formation causes discomfort and sometimes prolongs the hospital stay[6]. Axillary drainage or axillary and pectoral drainage after a breast cancer operation is widely employed to prevent the postoperative development of seromas[7]. Yet difficulty in predicting the duration of the suction drainage seems to complicate the development of a suitable clinical pathway for patients undergoing breast cancer surgery.

In the present study we attempted to identify factors that may influence the duration of wound drainage in patients undergoing breast cancer surgery. Univariate analyses showed that 5 factors influenced the duration of drainage in patients undergoing breast cancer surgery: patient age at surgery, body mass index, intraoperative blood loss, operation time, and type of surgery performed (Bt or Bp). Of these 5 factors, only the intraoperative blood loss and operation time are under the surgeon's control. Efforts by the surgeon to decrease the intraoperative blood loss or operation time might shorten the duration of drainage and, as a consequence, the length of the hospital stay.

Multivariate analysis revealed no associations between the duration of drainage and any of the factors listed above. This result is consistent with the data previously reported, in that it suggests that none of the factors examined are strongly associated with the duration of drainage[5]. Therefore, it is difficult to predict the duration of drainage and the length of hospital stay on the basis of an analysis of these factors. We can at least conclude that any type of drainage tube can be used in breast cancer surgery in regards to the duration of drainage.

No complications associated with drainage were

found in any of the patients in this study. Thus, our procedure that patients are discharged 1 or 2 days after drainage tube removal is appropriate.

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