



Correlation between the Properties of Excised Axillary Lymph Nodes and the Drain Output after a Modified Radical Mastectomy: a Retrospective Study

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Abstract

Introduction: Adjuvant chemotherapy and radiotherapy can only commence at the end of post-operative drainage. We evaluated whether the extent of lymph node excision or tumor infiltration is predictive of the postoperative drain output and duration.

Methods: We reviewed the records of patients diagnosed with breast carcinoma over a period of 3 years and identified 342 cases for possible inclusion in our analysis. We finally included 151 cases in the study and assessed this population for demographic parameters, postoperative drain amount, number of drains in situ, number of lymph nodes dissected, and the extent of tumor infiltration.

Results: The Pearson correlation coefficient was 0.16 for lymph nodes dissected (regardless of cancer involvement) and total drain output, 0.05 for drain duration; 0.02 for lymph nodes infiltrated by tumor cells and the total drain amount, and -0.05 for the number of days of drain.

Conclusion: Although postoperative drain is a result of lymph node dissection during surgery, there is no correlation between the number of lymph nodes involved or dissected and the drain duration or output.

Keywords: Drain output; Breast cancer; Mastectomy

Introduction

Breast cancer arises from the epithelium of the breast duct system and can develop anywhere between the nipple and the terminal duct unit. This disease is the most common cause of death in middle-aged women in Western countries [1]. Breast cancer is also associated with geographical location, an age above 20 years, female sex, low levels of phyto-estrogens in the diet, and high alcohol intake. The risk of developing breast cancer increases with increased exposure to estrogen, such as through early menarche, nulliparity, late age at first childbirth, not breastfeeding, use of oral contraceptive pills, late menopause, or hormone replacement therapy initiated after menopause [1]. The most common variant of breast cancer is ductal carcinoma, followed by lobular carcinoma, with mixed variants less frequently seen. The mechanisms of spread differ between histological types. Cells can spread locally to involve the skin superficially or the pectoralis major and chest wall more deeply. Lymphatic spread primarily occurs to the axillary lymph nodes. The posterior one-third of the breast drains to the internal mammary nodes. Supraclavicular and contralateral lymph node spread occurs in advanced cases. Surgery is advocated for the treatment of breast cancer other than cases of locally advanced or metastatic cancer. In cases amenable to surgery, local control is initially achieved by either neo-adjuvant therapy or surgery. Mastectomy is performed in patients with large tumors, central tumors, tumors involving the nipple, multifocal disease, or local recurrence. Patey mastectomy, which includes removal of level 1 and 2 lymph nodes, is currently preferred [2]. In cases of lymph nodal involvement, systemic chemotherapy, hormonal therapy, and sometimes radiotherapy are provided in addition to surgery. The lymph system allows drainage of unused, unwanted, and waste material, and also excess fluid from the tissues that the venous system has failed to remove. Its essential function is therefore to return protein, colloids, and particulate matter that is too large to reenter blood compartment directly [3]. Lymphatic vessels flow into the lymph nodes and can be of two types [4]. The smaller of these includes lymphatic capillaries and precollector vessels and the larger includes collecting lymphatic vessels. These vessels also contain a spontaneous intrinsic contractility which propels the lymph towards the nodes [5]. The mechanism of flow differs in the smaller lymphatic vessels where it occurs due to intermittent changes in the

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hydrostatic and oncotic pressures locally [6]. Intermittent changes in pressure over the lymphatic vessels caused by surface pressure, muscle contractions, and arterioles cause alternative compression and expansion which helps to propel the lymph. This occurs in one direction only due to a competent valve system [4]. Dissecting the lymph nodes during the MRM procedure eliminates the lymphatic drainage system for the breast and arm. Prior to regeneration of lymphatic vessels, continuously produced lymph will collect below the skin flap. To prevent complications like seroma, which can occur with localized collection of lymph, synthetic drains are placed postoperatively, usually one in the axilla and one below the skin flap. Drains are left in situ until new lymphatic collaterals develop and drain output clinically ceases. Hence, the more the lymphatic system is disrupted, the higher the drain output should be either in amount or duration. The present study was conducted to confirm this. The aim of our analysis was to verify the underlying pathophysiological process and predict the amount and duration of the drain in accordance with the number of lymph nodes dissected during surgery and their histopathology.

Methods

Study population

Our present study was conducted as a retrospective review of medical records for patients diagnosed with breast carcinoma in the previous 3 years (1st January 2012 to 1st January 2015) at our tertiary teaching hospital, Kasturba Medical College and Hospital, Manipal, India. Patients who underwent surgery other than modified radical mastectomy, who visited the hospital only for adjuvant therapy, on whom surgery was not performed due to advanced disease, who were discharged with drain in-situ, and/or who had bilateral disease were excluded. Approval for this study was obtained from the Institutional Ethical Committee of Kasturba Medical College and Hospital, Manipal University.

Data extraction

The age and sex of all patients was collected. Information regarding the drain duration and amount drained was also gathered. Histopathological reports on the dissected specimens were analyzed to determine the number of lymph nodes excised during surgery and the fraction of these shown to have tumor deposits.

Statistical analysis

Study subjects were analyzed based on their demographic profile. A Pearson product-moment correlation coefficient was computed to assess the relationship between the number of lymph nodes excised and the number of days the drain was placed, the number of lymph nodes excised and the amount drained, the number of lymph nodes positive for tumor deposits and the number of days the drain was placed, and the number of lymph nodes positive for tumor deposits and the amount drained.

Results

This study was a retrospective review of the medical records of patients diagnosed with breast carcinoma at our hospital over a 3-year period (1st January 2012 to 1st January 2015). Of the 342 patients in this category, 68 were excluded as they were treated outside of our hospital or were referred for adjuvant therapy, and 107 were excluded as they received forms of treatment other than MRM, such as breast conservative surgery, wide local excision, neo-adjuvant chemotherapy, and palliative treatment due to advanced disease.

Two cases were excluded as they had bilateral disease, and 14 were excluded as they were discharged with a drain in-situ. The remaining 151 cases were therefore analyzed. All 151 included patients were women aged between 30 and 83 years (median, 52 years; mode, 47 years). Of these cases, 5 suffered from diabetes, 12 from hypertension, and 15 from both of these conditions. One patient had a history of epilepsy, one was retropositive, and two had hypothyroidism. The number of lymph nodes removed ranged from 2 to 29 (median, 10; mode, 9). Upon pathology review, tumor metastasis to the lymph nodes was not detected in most cases (range, 0-24 lymph nodes positive for metastasis, median 1). The drain output ranged from 105-3650 mL (median, 662 mL; mode, 400 mL). The length of time that the drain remained ranged from 2-30 days (median and mode of 8 days). A Pearson product-moment correlation coefficient was calculated and indicated no relationship between the number of lymph nodes excised and the number of days the drain was placed ($r = 0.05$), between the number of lymph nodes excised and the amount drained ($r = 0.16$), between the number of lymph nodes positive for tumor deposits and the number of days the drain was placed ($r = -0.05$), or between the number of lymph nodes positive for tumor deposits and the amount drained ($r=0.02$). Overall, there were no significant correlations between any two variables.

Discussion

The dissection of lymph nodes during MRM is known to disrupt the lymphatic drainage system of the arm and breast [4,7]. This is due to rupture of the collecting vessels that drain into the dissected lymph nodes, dermal backflow, and rerouting of lymph flow via the collateral vessels to higher lymph nodes [7]. Following a lymphadenectomy, the lymphatic vessel regenerates, the contralateral vessels are co-opted and the contractile functions of the lymphatic vessels are restored within 13 days. The regenerated vessels then redirect to higher lymph nodes, which will be the probable sites of metastasis if it occurs in the future [8]. Symptoms of cancers of the breast and arm have large individual variations [9], just like the drain output. After surgery and prior to regeneration of the lymphatic system, the lymph collects in the closed space created by the surgery, forming a seroma [10]. This occurs mainly due to low fibrinogen levels and net fibrinolytic activity within lymphatic fluid collections. This needs to be cleared with the help of synthetic drains [11,12]. Drain output ceases when the skin flaps adhere to the chest wall [10]. Many sclerosing agents have been tested in the prevention of seroma formation, including tetracycline, [13] bovine thrombin [14], fibrin glues, patches, and/or sealants. However, none have shown to be effective [10]. Lymphatic fluid build-up at the surgical site post-operation should be prevented as this can act as a reservoir for infection. The chance of wound infection after modified radical mastectomy ranges from 1% to nearly 20%, usually by Staphylococcal organisms from skin flora [15-24]. There is also an increased risk of hematoma formation, which has decreased in recent years due to the widespread use of electrocautery, but this complication continues to occur in 2% to 10% of cases [10]. There is also a risk of lymphedema formation, or delay wound healing of the surgical incision. Drains are placed to prevent these complications. The lymphatic disruption caused by dissection of the lymph nodes is maintained throughout the remainder of the patient's life although the lymphatic system undergoes regeneration to compensate for damaged lymphatic vessels and lymph nodes. A known complication due to post-mastectomy lymphatic damage is lymphedema of the arm. Even though lymphedema of arm and post-operative drains share the same pathophysiology, lymphedema has a

positive association with the level of tumor infiltration of a node as compared to the number of nodes infiltrated by tumor cells, whereas the amount of post-operative drain had no correlation [25]. Drains placed in-situ prevent acute collection of lymph and blood in the surgical plane. These drains are placed until the fluid collection drops to levels below 30 mL in a 24 hr period. The time to fluid decrease can vary greatly between patients. In our current study, we observed a range of 2 to 30 days. Adjuvant therapy, which is commonly instituted in patients who undergo MRM, can only be administered after the drains clear. The unpredictability of this timeline prevents physicians from providing patients with an approximate time for adjuvant therapy. In our current study series, we tried to predict the drain amount and duration based on the number of lymph nodes dissected during surgery or the proportion of nodes positive for tumor metastasis. Our results indicated no correlations between any two variables, despite the correlation between the pathophysiology of lymphatic drainage and lymph node dissection. Our literature review identified a similar study of 63 participants that evaluated the same parameters as our current analysis. The authors of that report also found that the extent of lymphatic resection did not correlate with the drain duration or amount [26]. Hence, further studies are needed on the pathophysiology of lymphatic drainage to identify predictive factors for drain output duration and amount.

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