



Effect of modified surgical method on subcutaneous hydrops of patients with breast cancer after modified radical mastectomy

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ABSTRACT

Objective: Through prospective randomized clinical study, to observe the preventive effect of improved surgical method to subcutaneous hydrops after modified radical mastectomy. **Method:** A total of 80 cases of patients who have done modified radical mastectomy were selected, and randomly divided them into study group (40 cases) and control group (40 cases), then adopted different surgical methods as followed respectively, to observe the daily drainage volume at the first 3 d after surgery; when the drainage volume ≤ 20 mL, 24 h after surgery, removed the drainage tubes, to record the drainage days, total cases who occurred subcutaneous hydrops and all adverse events after surgery.

Results: Study group: the first 3 d of daily drainage volume declined quickly, and were accordingly less than that in control group; and ≤ 50 mL/24 h on the third day. Drainage total days median (4 d) were less than that in control group (7 d); subcutaneous hydrops occurrence rate was only 2%, which was greatly lower than that in control group (14%), statistics difference had significance. Through the comparison between study group and control group, this surgical method improvement will not bring any surgical safety problems, such as hematoma, wound infection, skin flap necrosis and upper limb LOM etc. Only extended the surgical time slightly. While in control group, drainage tubes fell into the dead space or were blocked frequently, then induced hydrops; but in study group, due to the suture of latissimus dorsi leading edge and chestwall, dead space disappeared at this spot, drainage tube were not blocked any more. **Conclusion:** In mastectomy and axillary lymph dissection, due to axillary dissection, ligation might lead to open lymphatic tissue, added that suture fixed latissimus dorsi leading edge and skin flap leading to disappeared dead space, compared with traditional surgical method, this improved surgical method could obviously reduce the occurrence rate of hydrops. Daily drainage volume obviously reduced at the first 3 d after surgery; total drainage days reduced, and surgery was safe and reliable, no postoperative complications.

1. Introduction

In recent decades, breast cancer attack stayed at a high level in the world, showed a trend of rapid growth in China. Surgical comprehensive treatment was still the basic model of breast cancer. Subcutaneous hydrops was one of the most common early wound complications in breast cancer surgery. Although in most cases, subcutaneous hydrops could only cause some less serious consequences[1], such as wound healing delay occurred,

hospitalization days and treatment cost increased etc., but meanwhile could obviously increase the psychological burden of patients, in a few cases, also could lead to wound infection, which might be associated with upper extremity edema. Once subcutaneous hydrops occurred, recovery within 1-2 months was impossible, which required repeated needle aspiration for a few days to disappear. A few patients might need months. Even some reports showed that extensive fiber cyst induced by subcutaneous hydrops needed surgical debridement for radical elimination[2]. Although hydrops prevention methods were more, no one was durable and reliable. Therefore, we supposed that hydrops occurrence was related with axillary lymph-vessel open, through improved surgery, to close the open lymph vessels, meanwhile to eliminate the dead space, then to play a role of prevention to the occurrence of subcutaneous hydrops.

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On this basis, prospective randomized clinical study was designed as followed:

2. Materials and methods

2.1. Research subjects

From January 2012 to December 2014, selected 80 cases confirmed to above inclusion and exclusion criteria, according to admission time sequence, were programmed as No.1-80, Odd Numbers as study group (40 cases), and Even Numbers as control group (40 cases). Test Criteria: This experiment was approved by Ethics committee in our hospital, all cases signed the consent for operation. Inclusion Criteria: operable breast cancer patients, and prepared to be operated the breast cancer modified radical mastectomy. Exclusion Criteria: (1) patients who had important organ complications and needed to finish surgery in short time; (2) patients who needed breast reconstruction surgery at the same period; (3) patients who have been operated the non-standard surgery except for the local biopsy in other hospital.

2.2. Methods

2.2.1. Surgical method

All patients were given mammectomy by electrotome, conventionally, to axillary started doing different processing respectively. Basic surgical procedure was as followed: surgery was finished under trachea cannula general anesthesia. According to the tumor location in the breast, transverse incision or vertical incision was alternative. Next to the primary lesion (2-3 cm), dong fusiform transverse(vertical) incision, cut open the cuticle, subcutaneous tissue; free skin flap to the anatomy edge of breast by scalpel, that was: Up to the subclavian 2 cm, Inside to sternum sideline, Down to the costal arch about 2 cm, Outside to the anterioraxillary line. Afterwards, at the edge, vertically down direction, cut to its muscle layer by electrotome. Excised off the mammary gland by electrotome between the pectoralis major muscle and its superficial fascia. Excision Sequence: Up - Inside - Down, ended at axilla.

Excised the adipose tissue to the anterior latissimus dorsi edge by electrotome at the outside. Then according to different groups, dong axillary lymph node dissection through different technical methods. Study group: after the axillary vein was exposed, cut off it sharply, then dissected its perihilar tissues, and ligation for every cutting-off tissue, in order to avoid the lymphatic vessels open; the outside was bounded by anterior latissimus dorsi edge and subscapular neurovascular bundle, doing the same dissection processing. Before the surgical incision suture, sutured the anterior latissimus dorsi edge fixing on chest wall, in order to eliminate the dead space, then placed the drainage tube. Dong subcutaneous fixation suture for the whole

flap and its subcutaneous muscle tissue at every certain distance, not leaving obvious "dimple" traces in the skin as far as possible, if failed, indicated that the flap suture was over deep, demolition and suture fixation once more was necessary at this time. Control group: around the axillary vein and subscapular blood vessels, only ligation for branch vessels, while other tissues were given blunt dissection or direct cutting, and suture treatment was not available for latissimus dorsi and flaps. Single tube was placed in axilla for negative pressure drainage and pectoral girdle bandage for both groups.

2.2.2. Experimental index observation

Both groups were given the above different technical methods for surgery respectively, and then recorded the total time needed from skin incision to skin suturing. To observe the drainage flow every 24 h the first 3 d after surgery; when the drainage flow ≤ 20 mL at 24 h, removed the drainage tube, to record the drainage days and the total cases of followed subcutaneous hydrops occurrence, besides, to record the postoperative adverse events related to wound healing, like inadequate drainage, wound bleeding, infection, skin flap necrosis and upper limb dysfunction etc.

2.3. Statistical method

Inputting the general conditions and above observations into EXCEL data base, and using SPSS (version 11.5, SPSS Inc, Chicago, IL) read-in data for statistical treatment. According to the statistical, all the observation indexes in both groups were in abnormal distribution, therefore, its difference significance using nonparametric Mann-Whitney *U* test. Classified variable difference significance using Fisher accurate *chi*-square test, continuous variable expressed by median (interquartile range), classified variable expressed by percentage, $P < 0.05$ had statistical significance.

3. Results

3.1. General data for cases

A total of 80 cases of female patients with breast cancer, admitted in our hospital were selected from January 2012 to December 2014; age 22-76 years old, median age 50 years old; body mass index, BMI 19-31, median 22; primary lesion diameter 2.0 cm (29 cases), 2.1-5.0 cm (41 cases), > 5.0 cm (10 cases); among them, 26 cases of patients attacked by axillary lymph lymphadenectasis before treatment, 33 cases of patients have been given the breast mass excision biopsy surgery before treatment, and 27 cases of patients have been given 1-2 cycle neoadjuvant chemotherapy before treatment. All patients were given modified radical mastectomy, among them, Auchincloss operation: 73 cases, Patey operation: 7

cases. All patients were diagnosed with breast cancer by pathology, among them, non-special type invasive ductal carcinoma (71 cases), invasive lobular carcinoma (3 cases), special type invasiveductal carcinoma (6 cases), axillary lymph nodes (50 cases-negative; 30 cases-positive). See chart 1. As a result, compared the basic characteristics of two groups, various indexes had no statistical difference, which indicated that basic characteristics of both groups had no deviation, comparability available. Random group was successful.

Table 1.

Comparison of basic characteristics in both groups.

| Variables | Study | Control | P value |
|--|------------|------------|---------|
| Average age (year) | 49.83±9.47 | 50.63±9.16 | >0.05 |
| Average weight (kg) | 58.25±9.19 | 59.19±9.07 | >0.05 |
| BMI | 21.70±2.97 | 22.08±3.03 | >0.05 |
| Lymph node excision cases | 15.45±5.72 | 14.06±3.44 | >0.05 |
| Pectoralis minor muscle excision cases | 4 | 3 | >0.05 |
| Lymph node positive cases | 17 | 13 | >0.05 |

3.2. Drainage and hydrops occurrence rate comparison

Within the first 3 d, daily drainage volume in study group decreased quickly, and was accordingly lower than that in control group, and was no more than 50 mL/24 h on the third day. Drainage total days median (4 d) in study group was less than that in control group (7 d), ($P<0.01$), had obvious statistical difference. Subcutaneous hydrops occurrence rate in study group was only 2%, which was obviously lower than that (14%) in control group ($P<0.01$).

Table 2.

Operation time, drainage volume, drainage total days comparison in both groups.

| Variables | Study (n=40) | Control (n=40) |
|-------------------------------------|-----------------|----------------|
| Operation Time (min) | 115.00 (29.00)* | 95.00 (12.25) |
| The first day drainage volume (mL) | 62.50 (45.00)* | 80.00 (58.75) |
| The second day drainage volume (mL) | 40.00 (20.00)* | 60.00 (62.50) |
| The third day drainage volume (mL) | 30.00 (10.00)* | 60.00 (77.50) |
| Drainage total days (d) | 4.00 (2.00)* | 7.00 (7.00) |

* $P<0.01$.

3.3. Surgical safety comparison

Through comparison of above both groups, we found that this surgical method improvement did not bring any surgical safety problems, such as hematoma, wound infection, skin flap necrosis or upper limb LOM etc., but extended the surgical time slightly. In control group, drainage tube dropping into dead space frequently appeared, which led to the blocking, then hydrops; while in study group, due to the suture of latissimus dorsi leading edge and chest wall, dead space disappeared at this spot, drainage tube were not blocked any more.

4. Discussion

Production mechanism of subcutaneous hydrops was not clear yet at present[3]. Traditionally, lymphatic fluid backflow from the upper limb to axillary fossa, axillary lymph dissection cut off the channels of lymph backflow, which led to the whole or partial lymphatic vessels open, and the lymphatic fluid leakage was the important sources of subcutaneous hydrops[4]. During the process of radical mastectomy, in spite of low occurrence rate of ductus thoracicus damages, but which was easily associated with the possibility of lymphatic leakag[5]. Some researches showed that[6] hydrops was related with lymphatic fluid leakage in some degree. Extracting hydrops for laboratory analysis from 2 patients with long-playing hydrops, we confirmed that it had speciality of lymphatic fluid, that was low protein concentration, cell component also only meaned lymphocyte. Some scholars also researched the relationship between the drainage fluid total volume after modified radical mastectomy and the postoperative upper limb lymphedema occurrence of patients, the results showed that among patients with drainage fluid total volume > 900 mL, 75% of patients appeared postoperative upper limb lymphedema; while among patients with drainage fluid total volume < 500 mL, no case showed. Therefore, postoperative drainage fluid total volume was a reflection of the closure volume of upper limb lymphatic fluid. However, other researchers held different points: relationship between hydrops and inflammatory exudation was more necessary. In addition, some scholars[8] have operated laboratory biochemical analysis for drainage fluid at the 3-4 d after breast cancer surgery, results showed that it was more similar to the inflammatory exudation, lymphatic and plasma component accounted for only a few of them. Author' opinion that liquid was accumulated by exudation process, and the dead space left from surgery created a good environment for constant inflammatory exudation and liquid accumulation. Therefore, we thought that due to the improper operation by operators, too many dead space left was the leading cause of hydrops occurrence. Wide difference of hydrops occurrence rate reported in literatures reflected the surgery-operation differences of operators.

In recent years, after skin flap fixation, subcutaneous hydrops occurrence rate reduced after mammectomy, postoperative infusion frequency also reduced accordingly. Some reports[9] that during the breast cancer radical resection, suture fixation for the skin flap and its sub-muscle, aiming to close the dead space, pulled out the drainage tube in the early stage, finally, postoperative subcutaneous hydrops occurrence rate obviously reduced. In a prospective randomized study, scholars[10] operated a suture fixation for the skin flap and chest wall muscle, compared with the regular direct wound closure method, postoperative drainage volume obviously reduced. In a latest prospective randomized study, scholars[11] compared the suture fixation for the skin flap and the non-suture fixation for

the skin flap after breast cancer breast-conserving surgery axillary dissection, confirmed that adopting suture fixation for the skin flap could reduce the occurrence rate of hydrops. Some researches confirmed that using local muscle tissue around axilla to filled the dead space, forming into the axilla pad, which could instead of vacuum closed drainage and obtain better curative effect after axillary lymph dissection[12].

All the above researches showed that subcutaneous suture fixation for skin flap could reduce the occurrence rate of hydrops. However, only by this method, occurrence rate of hydrops was still a little higher[13]. In this study, we adopted comprehensive preventive health measures, like ligation for all the cut off tissues, which may cause lymphatic vessels open, around axillary vein and thoracic dorsal neurovascular bundle, which was also the source leading to lymphatic enrichment and lymphatic leakage. In addition, suture fixation for the latissimus dorsi leading edge to the chest walls, in order to fill the dead space. According to past experience in this paper, drainage tube was easy to drop into the dead space, which led to the drainage tube blocks, inadequate drainage, at this moment, hydrops occurred. Suture fixation for the latissimus dorsi to the chest wall, coordinated with negative pressure drainage, which effectively eliminated the dead space here. Suture fixation for the skin flap to the chest wall reduced the skin flap movement caused by breathing or upper limb activity, and effectively eliminated the subcutaneous dead space, made for the skin flap and chest wall adhesion. Through the above comprehensive technical improvement, hydrops could reach to a low level. In this study, study group was only 2%. By observation, daily drainage volume obviously reduced within 3 d after surgery, drainage days reduced accordingly, although the surgical time extended slightly compared with conventional surgical method, along with the increased operation experience for operators, the time could be shortened in some degree.

Finally, it would be specially mentioned that this improved surgical method including 2 parts: (1) ligation method for closing lymphatic vessel around axillary vein; (2) suture method for killing the axilla and skin flap subcutaneous dead space, which played a good preventive effect of hydrops occurrence. But this effect was brought by closing lymph-vessel or killing dead space, or it was a bit of both, which needed further discussion.

Although the improved surgical method was given to study group in this study, which also played a good effect of hydrops prevention, but complete elimination of hydrops occurrence was impossible. In study group, there still existed 2 cases with hydrops occurrence, and this kind of hydrops was stubborn, and needed a long-playing needle aspiration for recovery. From the basic features of these 2 cases, we could not find the common risk factors of hydrops often mentioned in the literature[14], like obesity, accompanied by metabolic disease, like diabetes etc., but they had a common characteristic: daily drainage volume decreased, but not obvious within the first 3 days

after surgery, the total drainage volume of 3 d was relatively high, but whether or not it were the decisive factors for the hydrops occurrence rate in the future could not be proved yet[15], which may involve occurrence mechanism problems of hydrops, not clear, needed further discussion.

In conclusion, through clinical randomized study, preliminarily proved that during the process of mastectomy and axillary lymph node dissection, ligation may lead to open lymphatic tissues due to axilla dissection, added the improved surgical method that suture fixation for latissimus dorsi leading edge and skin flaps, in order to kill the dead space, compared with traditional surgical method, which could reduce the occurrence rate of hydrops. Daily drainage volume obviously reduced at the first 3 d after surgery, total drainage days reduced, and surgery was safe and reliable, no postoperative complications. Therefore, the surgical method was worth popularizing in clinical application.

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