International Surgery Journal
Bari ML et al. Int Surg J. 2024 Jan;11(1):21-25
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20233917

Original Research Article

Differences in vacuum suction drainage pressure following mastectomy and its impact on the clinical outcome of breast cancer patients

M. Latiful Bari[1]*, Riaz Mahmud[2], M. Amjad Hossain[3], Iffat Sharmin[4], Tasnim Nusrat[5], Saif U. Ahmed[6]

[1]Department of Surgery, Upazila Health Complex, Gabtali, Bogura, Bangladesh
[2]Department of Surgery, Kurmitola General Hospital, Dhaka, Bangladesh
[3]Department of Surgery, Rangpur Medical College Hospital, Rangpur, Bangladesh
[4]Department of Surgery, Khulna Medical College Hospital, Khulna, Bangladesh
[5]Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[6]Department of General Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh

Received: 03 October 2023
Revised: 08 November 2023
Accepted: 21 November 2023

***Correspondence:**
Dr. M. Latiful Bari,
E-mail: surgeon.bari85@gmail.com

ABSTRACT

Background: Vacuum suction drainage is an obligatory practice for long past following mastectomy for breast cancer. But recent studies are showing that the pressure of the vacuum suction drain is of value in determining the volume of seroma formation and thereby the drain indwelling time, duration of hospital stays and patient morbidity. Half vacuum suction may be of greater value in this regard comparing full vacuum suction drainage. Objectives were to assess and compare the clinical outcome of half versus full vacuum suction drainage following modified radical mastectomy for breast cancer.
Methods: Forty patients of histologically proven breast cancer had been chosen purposively and systematically randomized in two equal groups. Group A with half vacuum suction (device was squeezed up to half of its vertical length) and group B with full vacuum suction (device was squeezed to its maximum). The outcome measured were postoperative drainage, drain indwelling time and post-surgery length of hospital stay.
Results: Patients having half vacuum suction had a significantly reduced mean total drainage volume (364.25±128.52 ml versus 822.00±251.30 ml), drain indwelling time (5.50±1.32 days versus 9.05±1.90 days) and post-surgery hospital stay (7.15±2.58 days versus 10.25±2.55 days) in comparison to the full vacuum suction group. No significant difference found in regards to postoperative pain and other wound related complications.
Conclusions: We concluded that half vacuum suction drain ensures a lower drain collection and were removed earlier and hence reduced the hospital stay significantly than full vacuum suction drains.

Keywords: Breast cancer, Modified radical mastectomy, Vacuum suction drainage, Seroma, Drain indwelling time, Length of hospital stay

INTRODUCTION

The surgical treatment of choice for breast cancer patients is either modified radical mastectomy (MRM) or breast conservation depending upon stage of the disease and various patient factors. Historically, a modified radical mastectomy was the primary method of treatment of breast cancer. As the treatment of breast cancer evolved, breast conservation has become more widely used.[1] However, mastectomy still remains a viable option for women with breast cancer. Like most other South Asian countries, MRM is the more widely used treatment modality in

Bangladesh because of delayed presentation of patients; indistinct and individualized surgical practices and unreliable patient follow up.[2] Post-operative fluid collections under skin flaps or seromas are the commonest complication of breast cancer surgery, whether it be MRM, SNB or breast conservation therapy (BCT).[1] The amount of postoperative drainage is influenced by various factors like the clinical profile of the patient including the body mass index, extent of axillary lymph node dissection, number of lymph nodes dissected, and use of elctrocautery, co-morbid conditions and also the negative pressure on the suction drain.[3] Use of drains has been a common surgical practice to obliterate the dead space created during surgery and frequently used in post MRM. Drains are used both prophylactically and therapeutically. Commonly used as prophylaxis in post-surgery to prevent accumulation of fluid. The use of vacuum suction drainage postoperatively has been shown to reduce, but not prevent seromas. No suction or high suction drainage both may contribute to higher incidence of seroma formation and longer hospital stay.[4] While a high negative suction pressure is expected to drain the collection and reduce the dead space promptly, it may also prevent the leaking lymphatics from closing and lead to increased drainage from the wound.[3] To reduce these complications half vacuum suction drainage is proposed and comparison of half and full vacuum suction drainage was done in this study. As post mastectomy drainage or seroma collection is one of the most notable points of drain removal time, prolonged drainage will eventually prolong hospital stay. Early removal of drains has been linked with shorter length of hospital stay (LOS). However, indiscriminate withdrawal of drains, regardless of the fluid volume of fluid drained, may be accompanied by increased seroma formation. So if we can minimize the seroma formation by applying proper means of vacuum suction drainage it can eventually reduce the drain indwelling time (DIT) and LOS.[5] Discharging patient with the drain in situ is somehow not feasible in most of the cases, especially in a public hospital setting. It may be feasible with patients of higher cultural and social standing, but not all the patients have the required background.[6] In a low resource country like ours, where the patients are poor, uneducated, coming from far and remote areas with limited medical facilities, there is an added difficulty in management of the drains away from the hospital. So, most of them are managed in indoors until the drains were removed. However, we do not have any recommended guidelines for this as no such studies were conducted before in Bangladesh in this regard. With the aim of making a balance between not having suction at all and having a full negative suction, half negative suction drainage was used in the present study to achieve a shorter hospital stay without any increase in the rate of postoperative seroma formation. This was found to effectively reduce the hospital stay and also did not increase the postoperative morbidity as compared to high (full) negative suction group. In this study, we primarily aimed to assess and compare the clinical outcome of half versus full vacuum suction drainage in terms of drain collection and its impact on drain indwelling time, duration of hospital stays and other patient morbidities, notably- pain control and wound infections. We hope, this overall knowledge will result in a positive impact on the breast cancer patient management and also help the economy of our country which is really in a challenge to combat prevailing and upcoming breast cancer patient burden.

METHODS

This is a single centered, observational, comparative study. The study was conducted in the surgical oncology unit of department of general surgery, BSMMU over a period of one year. 40 cases of diagnosed breast cancer (as proved by trucut needle biopsy) patients were included in the study. The 40 patients were systematically divided into 20 patients in the half vacuum suction group (group A) and 20 cases in the full vacuum suction group (group B) based on the negative suction pressure differences. The two groups were comparable in respect of age, weight (body mass index) and type of operation- MRM. Surgeries were performed by the same surgical team comprising two senior surgeons and three residents using a standardized technique of mixed diathermy and scissor dissection. Axillary dissection was done for level I and II in all the cases. Ideally, the pressure should be measured by applying a manometer at the exit drain. But, by measuring the height/length of the collection device we can also set the pressure range grossly. From clinical practice point of view this is more feasible means of doing so. For this study, the length, after complete squeezing of the device is termed as full suction and if it is squeezed up to its half of the neutral length- termed as half suction. The pressure was measured grossly in each group by measuring the length of the suction device. Inclusion criteria were included in the study age >18 years, unilateral growth, not received neo-adjuvant chemotherapy, not underwent other form of breast/axilla surgery previously, and giving informed written consent to participate. Exclusion criteria were excluded from the study patients who may withdraw from the active participation during any step of study, inflammatory carcinoma of breast, patients having clinically fixed axillary lymph node, patients on drugs (anticoagulants, corticosteroids) or alcohol abuse, and patients with any acute illness or coagulopathy. Approval was taken from institutional review board (IRB), BSMMU, Dhaka to carry out this study.

Two silicone tube drains of 14 Fr (one axillary and one pectoral) were inserted in all the patients. Each drain was connected to a single 800 ml suction bottle (of the same commercial type).

The device was kept in full vacuum pressure for first 24 hours in all the cases. But then, one group got half vacuum pressure and another group got full vacuum pressure suction. Normal postoperative care including wound care was ensured as required. The drain was emptied every 24 hours and was measured and recorded for drain output comparison in each group. Padding of the axilla was

applied immediately postoperatively and the patients were encouraged to do active and passive shoulder exercises after 2 days. The drains were removed once the output reaches less than 25 ml in previous 24 hours and the patients were discharged on the same day considering other discharge criteria. The mean hospital stay in both the groups were calculated and compared. The postoperative morbidity including fever, wound infection, wound pain and discharge were also recorded and compared in both groups. Patients were advised to attend outpatient clinics for removal of stitches. All of them were advised for follow up as per standard follow up schedule. If any patient gets readmission after discharge with any complication within 30 days of surgery, was included for observation in this study. Statistical analysis of the results was done by using computer based statistical software statistical package for the social sciences (SPSS) version 23. The statistical terms were included in this study are mean, standard deviation. Statistical analysis was done by student t-test and Mann-Whitney U test for quantitative variable and Chi square (χ^2) test and Fisher's exact test for qualitative variable. Statistical significance was set at $p<0.05$ and confidence interval at 95% level.

Figure 1: Assessment of negative pressure by measuring the length of the device.

Figure 2: The commercial pack of the vacuum suction drain used in the study.

RESULTS

In the 40 patients we studied, the mean age of the patients in half suction group (n=20) was 48.20±11.88 years and in full suction group (n=20) was 45.85±9.46 years. The BMI of half vacuum suction and full vacuum suction group were 21.46±1.63 and 21.18±1.19 respectively.

Table 1 showed mean of the total drainage volume of the two comparison groups. In the half vacuum suction group, it was 364.25±128.52 (mean±SD) ml. where in the full vacuum suction group it was 822.00±251.30 ml. This result was statistically significant (p value <0.001).

Table 1: Average total drain collection in the two different vacuum suction pressure groups (n=20).

Total drain collection (ml)	Groups		P value
	Half	Full	
Mean±SD	364.25±128.52	822.00±251.30	<0.001

Table 2 showed the mean drain indwelling time in the two groups. The half suction group had an average DIT of 5.50±1.32 days. In contrast, the full suction group had an average of 9.05±1.90 days. The p value is <0.001 which denotes statistical significance.

Table 2: Distribution of the patients according to drain indwelling time by groups (N=40).

Drain indwelling time (day)	Groups		P value
	Half	Full	
2-5	10 (50.0)	0 (0.0)	<0.001
6-10	10 (50.0)	16 (80.0)	
11-14	0 (0.0)	4 (20.0)	
Mean±SD	5.50±1.32	9.05±1.90	

Table 3 showed 17 out of 20 patients (85%) in the half suction group had an average post-surgery hospital stay ≤10 days. Where in the comparative groups this number was 12(60%). 8 out of 20 patients in that group had to stay more than 10 days. The average post-surgery hospital stay in half suction and full suction were 7.15±2.58 and 10.25±2.55 days respectively.

Table 3: Distribution of the patients according to length of hospital stay by groups (N=40).

Drain indwelling time (day)	Groups		P value
	Half	Full	
Normal (≤10)	17 (85.0)	12 (60.0)	<0.001
Prolonged (>10)	3 (15.0)	8 (40.0)	
Mean±SD	7.15±2.58	10.25±2.55	

Table 4 showed a comprehensive look on the presence of local wound pain and fever following MRM. In all the follow up not the differences are statistically insignificant.

Table 4: Distribution of the patients according to local wound pain and fever by groups (N=40).

Complications	Groups (n=20)		P value
	Half	Full	
1stPOD			
Local pain	16 (80.0)	15 (75.0)	0.999
Fever	-	-	-
3rdPOD			
Local pain	11 (55.0)	17 (85.0)	0.038
Fever	-	-	-
5thPOD			
Local pain	5 (25.0)	10 (50.0)	0.102
Fever	1 (5.0)	1 (5.0)	0.999
8thPOD			
Local pain	2 (10.0)	4 (20.0)	0.661
Fever	0 (0.0)	1 (5.0)	0.999

Table 5: Distribution of the patients according to wound complications by groups (N=40).

Wound conditions	Groups (n=20)		P value
	Half	Full	
1stPOD			
Swelling	-	-	-
Hematoma	-	-	-
Discharge	-	-	-
Wound dehiscence	-	-	-
3rdPOD			
Swelling	-	-	-
Hematoma	-	-	-
Discharge	-	-	-
Wound dehiscence	-	-	-
5thPOD			
Swelling	-	-	-
Hematoma	-	-	-
Discharge	3 (15.0)	3 (15.0)	0.999
Wound dehiscence	3 (15.0)	2 (10.0)	0.999
8thPOD			
Swelling	-	-	-
Hematoma	-	-	-
Discharge	3 (15.0)	3 (15.0)	0.999
Wound dehiscence	3 (15.0)	2 (10.0)	0.999

Table 5 showed wound conditions were assessed clinically in terms of local wound swelling, hematoma, discharge and presence of wound dehiscence. 3 patients in each group had discharge on 5th and 8th POD follow up.

3 out of 20 patients had wound dehiscence in half suction group with 2 out of 20 in the comparative group. These data were statistically not significant.

DISCUSSION

It is an accepted fact that negative suction prevents seroma collection and helps in the adherence of the walls of the axilla thus reducing the dead space and allowing the lymphatics to close. High negative suction pressure generated by the drain can maintain lymph drainage by a negative pressure gradient.[7] It is also reported that the high negative suction pressure does not allow the lymphatic channels to close leading to continuous drainage and a higher incidence of seroma formation.[8] There are studies to suggest that high negative suction may be beneficial in the sense that the amount of drainage would be more thus allowing an early adherence of walls of the axilla to the chest wall and reduction in the seroma formation.[7] However, in the present study it was observed that high suction caused prolonged drainage, which can possibly be explained by the hypothesis that high negative suction may not allow, leaking lymphatics to close. Therefore, no suction or high suction drainage both may contribute to the same result; that is higher incidence of seroma formation and longer hospital stay. In the 40 patients we studied, we got there are no significant differences in the demographic variables of the two groups. The mean age of the patients in half suction group (n=20) was 48.20±11.88 years and in full suction group (n=20) was 45.85±9.46 years. The mean weight of the sample in half suction group was 51.95± 5.53 and that for full suction group was 51.50±3.90. The BMI of half vacuum suction and full vacuum suction group were 21.46±1.63 and 21.18±1.19 respectively. All the above data were statistically insignificant. No statistically significant differences were found between the drainage volume among low vacuum group and the high vacuum group by Bonnema.[6] In contrast, the mean volume of seroma evacuated with a low vacuum system was 386±26 ml (n=38) compared with 537±43 ml with a high vacuum system (n=40) ($p<0.005$) in the study by van Heurn.[7] Chintamani et al reported similarly significantly reduced drain volumes in low vacuum suction groups (325±39.6 ml versus 525±66.28 ml; $p<0.00125$).[3] Our study shows that the mean of the total drainage volume of the two comparison groups was statistically significant (p value <0.001). In the half vacuum suction group, it was 364.25±128.52 ml. where in the full vacuum suction group it was 822.00±251.30 ml. Van Heurn reported a significant early removal of low-pressure suction drains as compared to high pressure suction drains (p=0.02).[7] Chintamani et al demonstrated significant early removal of low vacuum suction drains (350 g/m^2) at 6±1.414 days as compared to high vacuum suction (700 g/m^2) at 10.8±1.603.[3] We found the half suction group had an average DIT of 5.50±1.32 days. In contrast, the full suction group had an average of 9.05±1.90 days. The p value is <0.001 which denotes statistical significance. Study by Bonnema found no significant difference in hospital stay between low and high vacuum group (9.5 versus 10 days).[6] Kopelmen et al found no significant difference in hospital stay (p=0.7) between low and high pressure suction drainage following axillary clearance.[9] Mansoor et al found mean hospital stay in low vacuum suction group was 4.96±0.898 days which

was 32.9% shorter than 7.39±1.397 days for high pressure suction group ($p<0.005$).[10] In our study, 17 out of 20 patients (85%) in the half suction group had an average post-surgery hospital stay ≤10 days, where in the comparative groups this number was 12 (60%). 8 out of 20 patients in that group had to stay more than 10 days. The average post-surgery hospital stay in half suction and full suction were 7.15±2.58 and 10.25±2.55 days respectively. Here, the p value was <0.001.

Limitations

So, this finding is statistically significant. Regarding the postoperative pain and wound related morbidities like local wound swelling, hematoma, discharge and presence of wound dehiscence, we found no significant changes in the half and full vacuum suction groups.

CONCLUSION

We conclude that half vacuum suction drain ensures a lower drain collection than full vacuum suction drains and were removed earlier and hence reduced the hospital stay significantly. But in regards to postoperative pain and other wound related complications, the differences in vacuum pressure did not have any significant impact in our study. However, prolong hospital stay due to the continuous drainage for high vacuum suction drainage may have an adverse wound effect, assessment of which demands a longer and meticulous follow-up. On the other hand, the impact of earlier removal of low vacuum suction drains on incidence of further seroma formation and lymphedema also needs further follow up for evaluation.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Srivastava V, Basu S, Shukla V. Seroma Formation after Breast Cancer Surgery: What We Have Learned in the Last Two Decades. J Breast Cancer. 2012;15(4):373.
2. Hossain M, Ferdous S, Karim-Kos H. Breast cancer in South Asia: A Bangladeshi perspective. Cancer Epidemiol. 2014;38(5):465-70.
3. Chintamani, Singhal V, Singh J, Bansal A, Saxena S. Half versus full vacuum suction drainage after modified radical mastectomy for breast cancer- a prospective randomized clinical trial [ISRCTN24484328]. BMC Cancer. 2005;5(1).
4. Gumus M, Satici O, Ulger B, Oguz A, Taskesen F, Girgin S. Factors Affecting the Postsurgical Length of Hospital Stay in Patients with Breast Cancer. J Breast Health. 2015;11(3):128-31.
5. Uslukaya O, Turkoglu A, Gumus M, Bozdag Z, Yilmaz A, Gumus H, et al. Factors that Affect Drain Indwelling Time after Breast Cancer Surgery. J Breast Health. 2016;12(3):102-6.
6. Bonnema J, van Geel A, Ligtenstein D, Schmitz P, Wiggers T. A prospective randomized trial of high versus low vacuum drainage after axillary dissection for breast cancer. Am J Surg. 1997;173(2):76-9.
7. Van Heurn L, Brink P. Prospective randomized trial of high versus low vacuum drainage after axillary lymphadenectomy. Br J Surg. 1995;82(7):931-2.
8. Morris A. A controlled trial of closed wound suction drainage in radical mastectomy. Br J Surg. 1973;60(5):357-9.
9. Kopelman, O. Klemm, H. Bahous, R. K D. Postoperative Suction Drainage of the Axilla: for How Long? Prospective Randomised Trial. Eur J Surg. 1999;165(2):117-20.
10. Mansoor J, Ahmed M, Junaid Z, Umair M, Meshwani A. Impact of low versus high vacuum suction drainage on duration of hospital stay after modified radical mastectomy. PAFMJ. 2015;65(5):604-9.

Cite this article as: Bari ML, Mahmud R, Hossain MA, Sharmin I, Nusrat T, Ahmed SU. Differences in vacuum suction drainage pressure following mastectomy and its impact on the clinical outcome of breast cancer patients. Int Surg J 2024;11:21-5.