

Assessment of Postoperative Outcomes Using Half and Full Vacuum Drainage Systems in Modified Radical Mastectomy

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Abstract

Background: Modified radical mastectomy is commonly associated with postoperative complications such as seroma formation, prolonged drainage, and wound-related morbidity. Closed suction drainage plays an important role in reducing dead space and preventing fluid accumulation following surgery. However, the optimal level of vacuum pressure remains controversial. Half vacuum drainage may reduce tissue trauma and discomfort while maintaining adequate drainage, whereas full vacuum drainage may facilitate faster fluid evacuation but can increase postoperative pain and tissue adherence. The aim is to compare the postoperative outcomes of half vacuum and full vacuum drainage systems following modified radical mastectomy. **Material and Methods:** This prospective comparative study was conducted over a period of 10 months in the Department of General Surgery at Sree Mookambika Institute of Medical Sciences. A total of 55 female patients undergoing modified radical mastectomy for carcinoma breast were included in the study. Patients were divided into two groups, Group A included 28 patients managed with half vacuum suction drainage, while Group B included 27 patients managed with full vacuum suction drainage. Postoperative parameters assessed included total drain output, duration of drain placement, postoperative pain, seroma formation, wound infection, flap necrosis, duration of hospital stay, and need for seroma aspiration. Statistical analysis was performed using chi-square test and independent t-test. **Results:** The mean total drain output was significantly lower in the half vacuum group (468.2 ± 102.4 mL) compared to the full vacuum group (612.5 ± 128.6 mL) ($p < 0.01$). The duration of drain placement was shorter in Group A than in Group B ($p < 0.01$). Seroma formation was observed in 4 (14.3%) patients in the half vacuum group and 10 (37.0%) patients in the full vacuum group ($p = 0.04$). Postoperative pain scores were significantly lower in Group A. Surgical site infection occurred in 2 (7.1%) patients in Group A and 4 (14.8%) patients in Group B. The mean hospital stay was significantly shorter in Group A compared to Group B ($p < 0.01$). **Conclusion:** Half vacuum suction drainage following modified radical mastectomy was associated with reduced postoperative drainage, lower pain scores, decreased seroma formation, and shorter hospital stay compared to full vacuum drainage.

Keywords: Breast carcinoma; Drainage system; Full vacuum drainage; Modified radical mastectomy; Postoperative complications; Seroma formation; Suction drainage.

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INTRODUCTION

Although surgical techniques and treatment of peri-operative fluid and electrolyte balance have improved, wound problems after modified radical mastectomy are still a problem and can largely account for the burden of morbidity and disability, extended hospital stays, delayed healing and the cost of care.^[1-4]

The occurrence of seroma has been reported to range from 15% to 80% of the modified radical mastectomy patient population depending on surgical technique, extent of dissection, use of electrocautery, patient related factors and postoperative management strategies.^[5] Seroma may lead to the development of wound infection, flap necrosis, delayed wound healing, repeated aspirations, patient anxiety, and delays in initiating adjuvant therapy. Thus, ensuring the reduction of postoperative fluid collection is an important goal in breast surgery.^[6]

To minimize dead space, remove collected fluid, and minimize incidence of seroma, closed suction drainage is routinely used post modified radical mastectomy. Different drainage methods and different suction pressures have been

used in clinical practice, some with better results than others, the most frequently used of which is the full vacuum suction drainage which drains any fluid collection quickly and keeps the flaps in place. But, too much negative pressure can lead to more tissue trauma, more pain, longer lymphatic leakage, and increased drain output.^[7,8] On the flip side, half vacuum drainage uses less negative pressure and might be enough to keep the tissues drained without causing as much trauma and pain in the postoperative period.^[9]

While the use of half vacuum or full vacuum drainage systems is still debatable, with little evidence to decide between them.

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Some surgeons advocate full suction drainage for greater fluid removal, while others propose a lower suction pressure to avoid the disruption of the lymphatics and irritation of tissues. It is very important to maintain this balance of good drainage and avoiding excessive tissue trauma in maximizing postmastectomy recovery after a modified radical mastectomy procedure.^[10,11]

Wound healing and seroma formation after surgery is dependent on a number of factors, including age, obesity, diabetes mellitus, hypertension, and the extent of axillary dissection and tumor stage. It is also to be noted that the prolonged use of drains may further aggravate the risk of infection and patient discomfort.^[12] Therefore, finding an appropriate drainage strategy that can minimize the postoperative morbidity and hasten recovery is important clinically.

In the present study we wanted to compare the results after half a vacuum and full vacuum suction drainage after the modified radical mastectomy surgery. The results could be used to form a standard drainage protocol to enhance the patient's comfort and surgical outcomes after breast cancer surgery.

Aims and Objectives: To compare the postoperative outcomes of half vacuum and full vacuum drainage systems following modified radical mastectomy.

MATERIALS AND METHODS

The study was designed as a prospective comparative study carried out for 10 months period from April 2025 to January 2026 in the Department of General Surgery of Sree Mookambika Institute of Medical Sciences. In a study, 55 female patients with carcinoma breast were included for who were planned for modified radical mastectomy. Informed consent was obtained from the patient for this study, which all patients signed a written informed consent form after explained.

Patients were from over 18 years of age with histologically proven operable carcinoma breast and having modified radical mastectomy as their surgery were included in the study. Pre and postmenopausal women were included. Patients with Stage I, II and III (operable) carcinoma breast were eligible. Patients who were undergoing surgery with axillary clearance and had to be drained after surgery were selected as a control group to compare the results of the drainage.

The subjects were excluded if they had undergone prior breast carcinoma surgery, metastatic breast carcinoma, inflammatory carcinoma breast, bleeding disorder disorder, severe uncontrolled systemic disease, chronic liver disease, renal failure, or a current local infection. Also excluded were patients receiving any type of anticoagulant therapy, patients who had undergone breast-conserving surgery as well as those who had either gone through a simple mastectomy or underwent immediate breast reconstruction. Those with previous axillary surgery or who refused to participate in the study were omitted.

There were 28 patients in Group A, who were treated with ½ VSD, and 27 patients in Group B, who were treated with

full vacuum suction drainage. For the half vacuum group, the suction reservoir was slightly compressed in order to achieve moderate negative pressure and in the full vacuum group, the suction reservoir was completely compressed to achieve maximum negative suction pressure.

In all patients, a complete clinical history and physical examination were undertaken. Demographic data (age, menopausal status, BMI, presence of diabetes mellitus and hypertension) and tumor characteristics were registered along with clinical stage. All patients had routine pre-operative blood tests, blood sugar tests, renal function tests, liver function tests, coagulation profile, electrocardiogram, chest radiograph, ultrasonography and confirmation by biopsy. All anesthetics requirements for fitness and physician evaluation were acquired before surgery.

All the surgeries were carried out under general anaesthetic with the same operative technique for modified radical mastectomy with clearance of the axilla. Care has been taken during surgery to achieve hemostasis without excessive bleeding after surgery. Patients were divided into two groups after the surgery, according to the type of suction drainage used after surgery.

All patients were treated for a standard duration with an antibiotic regimen, analgesics and wound care per institutional protocol postoperatively. The output of the drains was recorded each 24 h until the drains were removed. Drainage was stopped when output was < 30 mL in 24 hours. Post-operative complications such as seroma, surgical site infection, flap necrosis, hematoma and wound dehiscence were monitored in patients. The Visual Analogue Scale (VAS) was used to measure postoperative pain. The following factors were recorded: length of time for which the drains were to be placed, the total output of the drains, whether the drains would need aspiration, and the hospital stay. Wound healing and wound complications were assessed during a follow-up period of the patients every day.

All the collected data were then recorded on a structured proforma and processed with the relevant statistical methods. Data for continuous variables were presented as mean $\pm$ standard deviation, and data for categorical variables were presented as frequencies and percentages. Where applicable, statistical analysis was carried out with chi square test and independent t test. A p-value of < 0.05 was chosen as statistically significant.

RESULTS

Based on the postoperative drainage method used, 28 (50.9%) patients were assigned to Group A (half vacuum drainage) and 27 (49.1%) patients to Group B (full vacuum drainage). The majority of patients in both groups belonged to the 41–60 years age category, and Stage II carcinoma breast constituted the predominant clinical stage at presentation. The demographic characteristics and associated comorbidities were similarly distributed between both groups, indicating adequate comparability of the study population. Most patients presented with Stage II disease, suggesting that the majority underwent surgery during the operable stage of breast carcinoma. [Table1]

Table 1: Baseline Demographic and Clinical Profile of Patients

Variable	Category	Group A n (%)	Group B n (%)	p-value
Age (years)	≤40	5 (17.9%)	4 (14.8%)	0.88
	41–50	10 (35.7%)	11 (40.7%)	
	51–60	9 (32.1%)	8 (29.6%)	
	>60	4 (14.3%)	4 (14.8%)	
Diabetes Mellitus	Present	9 (32.1%)	10 (37.0%)	0.70
	Absent	19 (67.9%)	17 (63.0%)	
Hypertension	Present	8 (28.6%)	7 (25.9%)	0.82
	Absent	20 (71.4%)	20 (74.1%)	
Tumor Stage	Stage I	4 (14.3%)	3 (11.1%)	0.91
	Stage II	16 (57.1%)	17 (63.0%)	
	Stage III	8 (28.6%)	7 (25.9%)	

Half vacuum drainage was associated with significantly lower postoperative drain output and earlier drain removal compared to full vacuum drainage. Patients in Group A also

experienced less postoperative pain and shorter hospitalization, indicating better postoperative recovery and improved patient tolerance. [Table 2]

Table 2: Comparison of Postoperative Recovery Outcomes

Parameter	Group A (Half Vacuum) Mean ± SD	Group B (Full Vacuum) Mean ± SD	p-value
Total drain output (mL)	468.2 ± 102.4	612.5 ± 128.6	<0.01
Drain duration (days)	5.6 ± 1.3	7.2 ± 1.6	<0.01
Postoperative pain score (VAS)	3.1 ± 1.0	4.8 ± 1.2	<0.01
Hospital stay (days)	6.1 ± 1.4	8.0 ± 1.8	<0.01

Patients managed with half vacuum drainage developed fewer postoperative wound complications, particularly seroma formation and need for repeated aspiration.

Although infection and flap necrosis rates were lower in Group A, the differences did not reach statistical significance. [Table 3]

Table 3: Postoperative Complications in Study Groups

Complication	Category	Group A n (%)	Group B n (%)	p-value
Seroma formation	Present	4 (14.3%)	10 (37.0%)	0.04*
	Absent	24 (85.7%)	17 (63.0%)	
Seroma aspiration	Required	3 (10.7%)	8 (29.6%)	0.05*
	Not required	25 (89.3%)	19 (70.4%)	
Surgical site infection	Present	2 (7.1%)	4 (14.8%)	0.35
	Absent	26 (92.9%)	23 (85.2%)	
Flap necrosis	Present	1 (3.6%)	3 (11.1%)	0.29
	Absent	27 (96.4%)	24 (88.9%)	

Seroma formation was significantly more common in diabetic patients, patients with prolonged drainage, and those with higher drain output. Use of full vacuum drainage

demonstrated a higher association with postoperative seroma formation, whereas half vacuum drainage showed comparatively favorable wound healing outcomes. [Table 4]

Table 4: Association of Clinical Factors with Seroma Formation (n = 55)

Variable	Category	Seroma Present n (%)	Seroma Absent n (%)	p-value
Age	≤50 years	5 (16.1%)	26 (83.9%)	0.19
	>50 years	9 (37.5%)	15 (62.5%)	
Diabetes Mellitus	Present	8 (42.1%)	11 (57.9%)	0.02*
	Absent	6 (16.7%)	30 (83.3%)	
Drain duration	≤6 days	4 (13.3%)	26 (86.7%)	0.01*
	>6 days	10 (40.0%)	15 (60.0%)	
Total drain output	≤500 mL	3 (11.1%)	24 (88.9%)	<0.01*
	>500 mL	11 (39.3%)	17 (60.7%)	
Drainage type	Half vacuum	4 (14.3%)	24 (85.7%)	0.04*
	Full vacuum	10 (37.0%)	17 (63.0%)	

DISCUSSION

The present study evaluated postoperative outcomes following modified radical mastectomy using half vacuum and full vacuum suction drainage systems in 55 female patients. Among them, 28 (50.9%) patients were managed

with half vacuum drainage and 27 (49.1%) patients with full vacuum drainage. The majority of patients belonged to the 41–60 years age group, and baseline demographic characteristics, comorbidities, and tumour stage were comparable between both groups. Stage II carcinoma breast was the most common clinical presentation, observed in 16 (57.1%) patients in Group

A and 17 (63.0%) patients in Group B. Similar demographic findings were reported by Mohan TJ et al,^[13] who observed that most patients undergoing modified radical mastectomy were above 45 years of age with comparable baseline characteristics between study groups.

The study demonstrated that patients managed with half vacuum drainage experienced significantly improved postoperative recovery compared to those receiving full vacuum drainage. The mean postoperative drain output was lower in the half vacuum group (468.2 ± 102.4 mL) compared to the full vacuum group (612.5 ± 128.6 mL). Likewise, the duration of drain placement was shorter in Group A (5.6 ± 1.3 days) than in Group B (7.2 ± 1.6 days). Similar observations were made by Oyewale S et al,^[14] who reported significantly reduced total drain effluent and shorter hospital stay with half vacuum drains compared to full vacuum drainage systems. Comparable findings were also reported by Bari ML et al,^[15] who demonstrated significantly lower drainage volume and earlier drain removal in the half vacuum suction group.

Reduced drain output and earlier drain removal contributed to decreased patient discomfort and facilitated faster postoperative recovery. Patients in the half vacuum group also had lower postoperative pain scores, indicating better tolerance to reduced suction pressure. The mean duration of hospital stay was shorter in Group A (6.1 ± 1.4 days) compared to Group B (8.0 ± 1.8 days), suggesting earlier mobilization and improved postoperative rehabilitation. Similar reductions in hospital stay were reported by Kakde MM et al,^[16] and Lal M et al,^[17] both of whom concluded that half vacuum suction drainage effectively reduces postoperative morbidity and shortens hospitalization following modified radical mastectomy.

Postoperative wound complications were less frequent in patients managed with half vacuum drainage. Seroma formation occurred in 4 (14.3%) patients in Group A compared to 10 (37.0%) patients in Group B, demonstrating reduced postoperative fluid accumulation with lower suction pressure. Requirement for seroma aspiration was also lower in the half vacuum group, observed in only 3 (10.7%) patients compared to 8 (29.6%) patients in the full vacuum group. Similar findings were reported by Kakde MM et al,^[16] who observed significantly lower seroma formation in the half suction group compared to the full suction group. Lal M et al,^[17] also reported reduced seroma incidence and shorter drain duration with half vacuum suction drainage.

Surgical site infection occurred in 2 (7.1%) patients in Group A and 4 (14.8%) patients in Group B, while flap necrosis was noted in 1 (3.6%) and 3 (11.1%) patients respectively. Although these complications were numerically lower in the half vacuum group, statistical significance was not observed. Similar observations were made by Mohan TJ et al,^[13] and Kakde MM et al,^[16] who reported lower wound infection and flap necrosis rates with half vacuum drainage, although differences were not statistically significant.

Correlation analysis in the present study demonstrated that seroma formation was significantly associated with diabetes

mellitus, prolonged drain duration, increased drain output, and use of full vacuum drainage. Seroma developed in 8 (42.1%) diabetic patients compared to 6 (16.7%) non-diabetic patients. Patients with drain duration greater than 6 days and drain output exceeding 500 mL showed significantly higher rates of postoperative seroma formation. Similar associations between postoperative drainage and seroma formation were reported by Karwasra RK et al,^[18] who observed that higher early postoperative axillary drainage correlated positively with subsequent seroma development.

CONCLUSION

Half vacuum suction drainage following modified radical mastectomy demonstrated superior postoperative outcomes compared to full vacuum drainage. It was associated with reduced drain output, shorter duration of drain placement, lower postoperative pain, decreased seroma formation, and reduced hospital stay. Patients managed with half vacuum drainage also showed lower rates of wound-related complications and improved postoperative recovery. Factors such as diabetes mellitus, prolonged drainage duration, and increased drain output were significantly associated with seroma formation. Half vacuum drainage appears to be a safe, effective, and patient-friendly alternative that may help reduce postoperative morbidity and improve surgical outcomes after modified radical mastectomy.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Huang J, Chan PS, Lok V, Chen X, Ding H, Jin Y et al. Global incidence and mortality of breast cancer: a trend analysis. *Aging* (Albany NY). 2021 Feb 11;13(4):5748.
2. Cuthrell KM, Tzenios N. Breast cancer: updated and deep insights. *International Research Journal of Oncology*. 2023 May 26;6(1):104-18.
3. Valente SA, Liu Y, Upadhyaya S, Tu C, Pratt DA. The effect of wound complications following mastectomy with immediate reconstruction on breast cancer recurrence. *The American Journal of Surgery*. 2019 Mar 1;217(3):514-8.
4. Hashemi E, Kaviani A, Najafi M, Ebrahimi M, Hooshmand H, Montazeri A. Seroma formation after surgery for breast cancer. *World journal of surgical oncology*. 2004 Dec 9;2(1):44.
5. Melwani R, Malik SJ, Shakeel S, Zafar S, Khoso MY, Ali SN. Frequency of early postoperative complications of modified radical mastectomy within the period of four weeks. *Int J Res Med Sci*. 2020 Apr 27;8(5):1838-42.
6. Peng JM, Ansingkar KK, Landavazo BN, Shaikh AF, Rahimi M. A comprehensive review of seroma formation, prevention, and treatment approaches. *Journal of Vascular Surgery Cases, Innovations and Techniques*. 2025 Oct 1;11(5):101879.
7. Stehbins WE. Postmastectomy serous drainage and seroma: probable pathogenesis and prevention. *ANZ journal of surgery*. 2003 Nov;73(11):877-80.
8. Durai R, Ng PC. Surgical vacuum drains: types, uses, and complications. *AORN journal*. 2010 Feb 1;91(2):266-74.

9. Durai R, Mownah A, Philip CN. Use of drains in surgery: a review. *Journal of perioperative practice*. 2009 Jun;19(6):180-6.
10. Loon MM, Mohamed EH, Lima SR, Hassan BD, Abbas T, Lima Sr SR. Comparative effectiveness of surgical drainage techniques and postoperative interventions for reducing complications: a systematic review of randomized controlled trials. *Cureus*. 2024 Nov 10;16(11).
11. Stoyanov GS, Tsocheva D, Marinova K, Dobrev E, Nenkov R. Drainage after modified radical mastectomy-a methodological mini-review. *Cureus*. 2017 Jul 10;9(7):e1454.
12. Pan XF, Huan JL, Qin XJ. Potential risk factors for the development of seroma following mastectomy with axillary dissection. *Molecular and clinical oncology*. 2015 Jan 1;3(1):222-6.
13. Mohan TJ, Kennedy JJ, Sujitha T. A comparative study between half vacuum suction and full vacuum suction drainage in patients undergoing modified radical mastectomy. *Int J Acad Med Pharm*. 2023;5(2):449-52.
14. Oyewale S, Ariwoola A. Comparing the effectiveness of full-vacuum and half-vacuum drainage in reducing seroma after modified radical mastectomy: a meta-analysis. *The Annals of The Royal College of Surgeons of England*. 2025 Mar 9;107(3):167-73.
15. Bari ML, Choudhury CT, Ahmed S, Mubin S. Modified Radical Mastectomy in Female Breast Cancer-A Relative Clinical Outcomes of Half Versus Full Vacuum Suction Drainage. *Public Health*. 2023;3:01-9.
16. Kakde MM, Gore RW, Atram GP, Rathod V. Full versus half suction drainage after modified radical mastectomy for breast cancer: a longitudinal study. *International Journal of Health Sciences*. 2022;6(S6):4998-5005.
17. Lal M, Jakhar D, Kajla RK. Half versus full vacuum suction drainage after modified radical mastectomy for breast cancer—a prospective randomized control study. *Scholars J Appl Med Sci*. 2017;5:1649-51.
18. Karwasra RK, Srivastava S, Parshad S, Tripathi M, Arora B. A prospective randomized study on management of suction drains in patients undergoing modified radical mastectomy. *IJERMDC*. 2015;2(11):9-19.