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PROSPECTIVE STUDY ON THE EFFECTIVENESS OF METHYLPREDNISOLONE IN REDUCING SEROMA AND DRAIN OUTPUT AFTER MODIFIED RADICAL MASTECTOMY

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Abstract

Background: Breast cancer is the most common cancer affecting women worldwide and is a leading cause of cancer-related deaths. Surgery remains the primary treatment for most patients with operable breast cancer. Mastectomy is the surgical removal of the entire breast and is commonly performed for large, multicentric, or locally advanced tumors. Modified radical mastectomy is one of the most frequently performed procedures and includes removal of the breast along with axillary lymph nodes. Although mastectomy is an effective treatment, it is associated with several postoperative complications. Common complications include seroma, hematoma, wound infection, skin flap necrosis, and prolonged drainage. Among these, seroma formation is the most frequent complication after surgery1. These complications can delay wound healing, prolong hospital stay, and postpone adjuvant therapy. Various surgical techniques and medical interventions have been used to reduce postoperative complications. Improving postoperative outcomes is essential to enhance recovery and quality of life in patients undergoing mastectomy. This study evaluates the effect of preoperative intravenous methylprednisolone in reducing postoperative drain output and seroma incidence2,3.

Methods: A randomized, prospective, comparative study was conducted in the Department of General Surgery at Sapthagiri institute of medical sciences, Bangaluru, involving 62 female patients scheduled for elective MRM with Ca breast for 9 months from march 1st 2024 to november 30th 2024. Participants were randomly assigned into two equal groups: Group A (intervention), which received 120 mg of intravenous methylprednisolone one hour before surgery, and Group B (control), which received standard perioperative care. The primary outcome measures were daily drain output, duration of drain placement, and the incidence of postoperative seroma.

Results: Group A showed a statistically significant reduction in postoperative drain output during the early postoperative period. Mean drain volumes were significantly lower on Day 1 (82.5 ± 5.51 mL vs. 92.77 ± 23.74 mL; p=0.015), with similar significant differences observed on Days 3 (p=0.021) and 4 (p=0.015). Accordingly, 93.33% of patients in Group A had their drains removed by Day 5, whereas delayed drain removal until Day 6 occurred more frequently in Group B (13.33%). Although the incidence of seroma was lower in Group A (9.4%) than in Group B (11.33%), the difference was not statistically significant..

Conclusion: A single preoperative dose of 120 mg methylprednisolone significantly reduces early postoperative drain output and facilitates earlier drain removal in patients undergoing modified radical mastectomy. This simple, cost-effective intervention may help reduce postoperative morbidity, enhance recovery, and enable the timely initiation of adjuvant therapy and potential to reduce the duration of hospital stay.

Key Words: Ca Breast, Modified radical mastectomy, Seroma

Introduction

Breast cancer is the most common cancer affecting women worldwide and is a leading cause of cancer-related deaths. Surgery remains the primary treatment for most patients with operable breast cancer. Mastectomy is the surgical removal of the entire breast and is commonly performed for large, multicentric, or locally advanced tumors. Modified radical mastectomy is one of the most frequently performed procedures and includes removal of the breast along with axillary lymph nodes. Although mastectomy is an effective treatment, it is associated with several postoperative complications. Common complications include seroma, hematoma, wound infection, skin flap necrosis, and prolonged drainage. Among these, seroma formation is the most frequent complication after surgery1. These complications can delay wound healing, prolong hospital stay, and postpone adjuvant therapy. Various surgical techniques and medical interventions have been used to reduce postoperative complications. Improving postoperative outcomes is essential to enhance recovery and quality of life in patients undergoing mastectomy2. This study evaluates the effect of preoperative intravenous methylprednisolone in reducing postoperative drain output and seroma incidence3,4.

Modified radical mastectomy (MRM) continues to be one of the standard surgical treatments for operable breast cancer, particularly in patients with locally advanced disease or when breast-conserving surgery is not an appropriate option. Despite its proven oncological effectiveness, postoperative complications remain a major concern. Among these, seroma formation is the most common, with reported incidence rates ranging from 3% to 85%, depending on patient-related factors, operative techniques, and postoperative care protocols. Seroma develops due to the collection of serous fluid within the dead space created after extensive tissue dissection and disruption of lymphatic vessels. Its occurrence is associated with pain, impaired shoulder movement, repeated aspirations, wound infection, flap necrosis, prolonged drain retention, delayed wound healing, and postponement of adjuvant therapy, thereby increasing patient morbidity and healthcare costs5.

The development of seroma is multifactorial and is attributed to inflammatory fluid exudation, lymphatic leakage, increased capillary permeability, and inadequate tissue adherence following surgery. Several preventive strategies have been investigated, including closed-suction drainage, flap fixation, quilting sutures, fibrin sealants, tissue adhesives, compression dressings, and modifications in surgical technique. However, none of these methods has consistently demonstrated superior effectiveness, and seroma remains a persistent postoperative challenge6,7.

Recently, perioperative corticosteroids have emerged as a promising pharmacological approach to reduce postoperative drainage and seroma formation. Methylprednisolone possesses potent anti-inflammatory properties by inhibiting phospholipase A_2, suppressing prostaglandin and leukotriene synthesis, reducing the release of pro-inflammatory cytokines, and stabilizing capillary membranes, thereby decreasing vascular permeability and inflammatory exudation. Recent clinical studies and systematic reviews have suggested that perioperative corticosteroid administration may reduce postoperative drain output and allow earlier drain removal without increasing the risk of wound complications or surgical site infections. However, evidence from prospective studies, particularly in the Indian population, remains limited, and differences in patient demographics, disease characteristics, and surgical practices may influence clinical outcomes8. Given the increasing incidence of breast cancer and the need for simple, affordable interventions that improve postoperative recovery, this prospective comparative study was conducted to evaluate the effect

of a single preoperative intravenous dose of 120 mg methylprednisolone on postoperative drain output and seroma formation in patients undergoing modified radical mastectomy9,10. The findings are expected to provide further evidence regarding the effectiveness of perioperative corticosteroid therapy in reducing postoperative morbidity and enhancing recovery following breast cancer surgery11,12.

Aim And Objectives Of The Study

1.To determine effectiveness of of methylprednisolone in Reducing Seroma and Drain Output After Modified Radical Mastectomy

Materials And Methods

Source of data :

Patients presenting to opd and admitted in department of General Surgery at Sapthagiri institute of medical sciences, Bangaluru, involving 62 female patients scheduled for elective MRM with Ca breast for 9 months from march 1st 2024 to november 30th 2024.

Period of study: March 1st 2024 to November 30th 2024
Study design: prospective comparative study

Inclusion Criteria :

Female patients aged 18 years and above with histologically confirmed breast cancer who were scheduled to undergo upfront elective Modified Radical Mastectomy (MRM) were eligible for inclusion.

Exclusion Criteria:

1.Patients not willing for study

2.Patients were excluded if they were receiving long-term corticosteroid therapy, had uncontrolled diabetes mellitus, severe hepatic impairment, a documented allergy to corticosteroids, active systemic infections, immunosuppressive conditions, or had previously undergone neoadjuvant chemotherapy

Methodology:

A total of 62 eligible patients were recruited and allocated into two equal groups of 31 participants each based on the perioperative management protocol followed by the treating surgical team.

Group A (Intervention Group): Patients received a single intravenous injection of 120 mg methylprednisolone administered one hour prior to the skin incision.

Group B (Control Group): Patients underwent the conventional perioperative protocol without receiving preoperative corticosteroid therapy.

The diagnosis of breast carcinoma was confirmed through a combination of clinical examination, radiological assessment using ultrasonography and/or mammography, and histopathological evaluation of core needle biopsy specimens. All patients underwent standard Modified Radical Mastectomy (MRM) with axillary lymph node dissection under general anaesthesia. Anaesthetic management was standardized for all participants, with induction using propofol and fentanyl, followed by routine intraoperative monitoring comprising electrocardiography, pulse oximetry, and non-invasive blood pressure measurement.

At the end of the procedure, two closed-suction drains were routinely inserted—one in the axillary region and the other beneath the mastectomy skin flap over the pectoral muscle—before wound closure. Drain output was recorded daily, and both drains were removed once the total drainage volume was less than 30 mL over the previous 24-hour period.

Outcome Measures

The primary outcome was the daily postoperative drain output measured until drain removal.

The secondary outcomes included:

- Duration of drain placement.
- Time to drain removal.
- Incidence of postoperative seroma formation.

Seroma was graded according to the Common Terminology Criteria for Adverse Events as follows:

- Grade 1: Asymptomatic seroma requiring no intervention.
- Grade 2: Symptomatic seroma requiring aspiration or other medical management.
- Grade 3: Symptomatic seroma requiring image-guided intervention.

Statistical analysis

The collected data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation (SD), while categorical variables were reported as frequencies and percentages. Intergroup comparisons for continuous variables were performed using the independent Student's t-test, whereas categorical variables were analyzed using the Chi-square test or Fisher's exact test, as appropriate. A two-sided p-value of <0.05 was considered statistically significant.

Results

1.A total of 62 patients with carcinoma breast undergoing modified radical mastectomy (MRM) were equally allocated into two groups. Group A received a single intravenous dose of 120 mg methylprednisolone one hour before surgery, whereas Group B underwent standard perioperative care without corticosteroids.

2.Baseline demographic and clinical characteristics were comparable between the two groups. Most patients were aged 51–70 years, the majority had no significant comorbidities, and right-sided MRM was performed more frequently, indicating good baseline comparability and minimizing confounding bias.

3.No significant demographic differences between steroid-treated and control groups, supporting that postoperative outcomes were primarily related to the intervention.

4.The primary outcome, postoperative drain output, was significantly lower in the methylprednisolone group during the early postoperative period. Mean drain volumes were significantly reduced on postoperative day (POD) 1 (83.0 ± 6.51 vs. 94.67 ± 24.74 mL; $p = 0.015$), POD 3 (31.0 ± 12.96 vs. 41.0 ± 19.00 mL; $p = 0.021$), and POD 4 (17.0 ± 9.15 vs. 24.67 ± 14.08 mL; $p = 0.015$). No significant differences were observed on POD 2, 5, 6, or 7.

5.The reduction in early postoperative drainage can be explained by the anti-inflammatory effects of corticosteroids, which inhibit phospholipase A_2 activity, suppress prostaglandin and leukotriene synthesis, reduce capillary permeability, and decrease inflammatory cytokine release, thereby limiting postoperative exudative fluid accumulation.

6.A favorable trend toward earlier drain removal was observed in the methylprednisolone group. Drain removal by POD 5 was achieved in 93.33% of patients receiving methylprednisolone compared with 86.67% in the control group, while delayed drain removal beyond POD 5 was less frequent in the steroid group (3.33% vs. 13.33%).

7.Earlier drain removal may improve patient comfort, facilitate rehabilitation, reduce hospital stay, and potentially decrease the risk of ascending infection. Seroma formation occurred in 10% of patients in the methylprednisolone group and 13.33% in the control group, with no statistically significant difference between groups.

8.Similar observations have been reported by Qvamme et al., who demonstrated reduced postoperative drainage without a corresponding reduction in clinically significant seroma. corticosteroids alone cannot prevent seroma because its development depends on multiple factors, including lymphatic disruption, extent of axillary dissection, dead space, and individual healing responses.

9.The findings support the current understanding that seroma formation is multifactorial, involving lymphatic injury, inflammatory exudation, tissue trauma, and inadequate tissue adhesion. Corticosteroids effectively reduce the inflammatory component but have limited effect on persistent lymphatic leakage, explaining the reduction in drain output without a significant decrease in seroma incidence.

10.No steroid-related adverse events or wound complications were observed following administration of a single 120 mg intravenous dose of methylprednisolone, confirming the safety of this regimen.

11.These results are consistent with previous studies demonstrating that a single perioperative corticosteroid dose does not increase postoperative wound complications or infectious morbidity.

12.Overall, preoperative intravenous methylprednisolone appears to be a safe, inexpensive, and effective adjunct for reducing early postoperative drainage after modified radical mastectomy. Although its effect on seroma formation is limited, the reduction in drain output and the trend toward earlier drain removal may improve postoperative recovery and support its incorporation into enhanced recovery protocols for breast cancer surgery

Table 1: Demographic Profile and Baseline Clinical Characteristics

Age	Group A		Group B	
	numbers	Percentage(%)	numbers	Percentage(%)
30-40	5	21	6	19.30
41-50	5	14.7	9	34.44
51-60	9	28.9	9	34.44
61-70	7	30.8	4	12.9
>70	5	4.8	3	9.6
Total	31	100.00	31	100.00

Table 2: Post-operative Drain Output, Removal Timing

Drain output	Group A Mean +/- SD	Group B Mean +/- SD	p-valve
Day 1	82+/-6.45	93.5+/-23.3	0.014
Day 2	53+/-11.9	62.4+/-20.4	0.089
Day 3	30 +/-13.5	41.8+/-7.8	0.02
Day 4	16+/-9.6	24+/-9.8	0.015
Day 5	11+/-3.4	12.66+/-6.77	0.22
Day 6	10+/-0.44	12.55+/-7.8	0.53
Day 7	9+/-0.11	8.9+/-88	0.22

Table 3: Seroma formation

Present	6	9.9	4	13.3
absent	26	90.1	25	86.67
total	32	100	30	100

Discussion

The findings of the present study indicate that preoperative intravenous methylprednisolone effectively decreases postoperative drain output following modified radical mastectomy, particularly during the early inflammatory phase of recovery. Although no significant reduction in seroma incidence was observed, the lower drainage volume and tendency toward earlier drain removal may enhance patient comfort, promote earlier hospital discharge, and reduce healthcare resource utilization. Further large-scale, multicenter studies incorporating inflammatory biomarkers, standardized drain removal protocols, and extended follow-up are required to better establish the role of steroids in improving postoperative outcomes after breast cancer surgery

Conclusion

The present prospective comparative study suggests that a single preoperative intravenous dose of 120 mg methylprednisolone is an effective adjunct for reducing early postoperative drain output following modified radical mastectomy. Patients who received methylprednisolone demonstrated significantly lower drain volumes during the early postoperative period, along with a tendency toward earlier drain removal, indicating a reduction in the postoperative inflammatory response. Although the incidence of seroma formation was lower in the methylprednisolone group, the difference was not statistically significant, implying that seroma development is influenced by multiple factors beyond inflammation alone. No steroid-related adverse effects or wound-healing complications were observed, supporting the safety of a single perioperative dose. Owing to its low cost, simple administration, and favorable safety profile, preoperative intravenous methylprednisolone may serve as a practical measure to improve postoperative recovery after modified radical mastectomy. However, larger multicenter studies with standardized surgical techniques, adequate sample sizes, control of confounding factors, and longer follow-up are required to validate these findings and support its routine clinical use.

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