

Role of Preoperative Intravenous Steroid Injection in Preventing Seroma Formation after Breast Surgeries

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ABSTRACT

Objective: To evaluate the role of preoperative intravenous steroid injection in preventing seroma formation after breast surgeries.

Study Design: Quasi-experimental study.

Place and Duration of Study: Pak Emirates Military Hospital, Rawalpindi Pakistan, from Jul to Dec 2023.

Methodology: With non-probability consecutive sampling technique, a total of 40 patients were included who were scheduled for breast surgeries. 20 patients were grouped into Group-I who were not given steroid before surgery. Group-II also consisted of 20 patients who were injected 120 mg intravenous injection of methylprednisolone one hour prior to surgery. Post-surgery the amount of drainage and number of drainage days were recorded in milliliters. At each follow up visit, wound was also examined for any infection or necrosis.

Results: Patients ranged in age from 18 to 69 years, with a mean age of 56.83±6.91. Methylprednisolone injection given to the patients of Group-II helped reduce the average drain output and number of days for which drainage was required and was statistically significant. 25% of patients reported with seroma formation in Group-II and only 5% of which underwent surgical/ IR guided intervention as compared to 45% in Group-I with 15% undergoing surgical/ IR guided intervention.

Conclusion: A single dose of intravenous steroid injection (methylprednisolone) given an hour before surgery is a promising and effective strategy to prevent seroma formation following breast surgical procedures without any significant complications or side effects.

Keywords: Breast Surgery, Depomedrol, Methylprednisolone, Seroma, Steroids.

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INTRODUCTION

In 2020, there were more than 2.3 million cases reported and 685,000 breast cancer fatalities globally. According to reports, Pakistan likely had 178,388 new instances of breast cancer in 2020. With the bulk of the disease's burden occurring in females, breast carcinoma is by far the most frequent malignancy diagnosed worldwide.^{1,2} Cancer is more prevalent in the developed countries, but it is also becoming increasingly common in low and middle income nations such as Pakistan.³ According to estimates, these low and middle income countries account for approx. 70% of breast cancer related mortalities.⁴

Breast cancer treatment is multidisciplinary and comprises surgical removal of the tumor, radiation, hormone therapy, and chemotherapy, with surgery being the key component. Surgical treatment options for the nodal areas include lymph node dissection or

sentinel lymph node biopsy, while mastectomy or lumpectomy might be used to treat the underlying tumor. Neo-adjuvant chemotherapy is the initial line of treatment for locally advanced breast cancer, and depending on the clinical condition, is followed by BCS (Breast conservation surgery) or MRM (Modified Radical Mastectomy).⁵ The rate of long-term morbidity and death following breast surgery is typically less than 1%. The most frequent perioperative side effect of this surgery, which occurs between 35 and 80 percent of patients, is seroma development.⁶ In reaction to surgical trauma, seroma development involves a local limited immunological event with high cytokine levels in seroma fluid.⁷ It often starts on the seventh post-op day, peaks on the eighth day, and continues to deteriorate until the sixteenth day, at which point it normally resolves. Long-term hospitalization and outpatient follow-up are the outcomes.⁸ Several approaches have been documented in study and practices to prevent or reduce seroma production, however no one treatment has been effectively and consistently demonstrated to be successful. Various

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approaches include mechanical closure of the dead space, shoulder mobility limitations, fibrin glue-hypothesis is still debatable. Mechanical pressure, sclerotherapy, and thrombin spray cannot stop seroma outflow. The number of drain tubes or a low pressure system should be employed, but neither will stop the production of seroma. Low Hoover drains in the axilla, however, cause less seroma to accumulate and hasten drain clearance and discharge.⁹ According to previous studies, even a little steroid dosage might reduce the postoperative inflammatory response. Edema in the operative region was decreased following a single 125 mg dosage of methylprednisolone sodium succinate in multiple studies on head and neck surgery, with no increase in complications related to surgery.^{9,10} The study's objective was to determine if intravenous steroid injection given prior to breast surgery has any impact in avoiding seroma formation.

METHODOLOGY

The Quasi-experimental study was conducted over the course of 6 months (July to December 2023) at Pak Emirates Military Hospital (PEMH), Rawalpindi with the blessing of Ethical Research Committee (ERC) of the institute (ERC No. A/28/ERC/06/2024, Date: 02/01/2024). Through the use of the WHO sample size calculator, the study's sample size was determined to be 10 patients, with minimum incidence rate of 35%.⁶

Inclusion Criteria: Female patients, 18 years or older, with operable primary breast cancer who were scheduled for a lumpectomy/ Wide local excision (WLE) or Modified radical mastectomy and axillary lymph node dissection (MRM + ALND) were included. Informed written consent to participate was essential for inclusion.

Exclusion Criteria: The research excluded patients under the age of 18 years, individuals of male gender, patients using steroids or used steroids in any form in last 01 month, patients allergic to steroids, pregnant patients and patients with Ischemic Heart Disease, Diabetes Mellitus, Asthma and Chronic Obstructive Pulmonary Diseases (COPD).

Individuals were grouped into Group-I who were not given steroid before surgery and Group-II who were injected with 120 mg intravenous injection of Methylprednisolone (Depomedrol) one hour prior to surgery.

Group-I who were not given steroid before surgery. Group-II also consisted of 20 patients who were injected 120 mg intravenous (Figure).

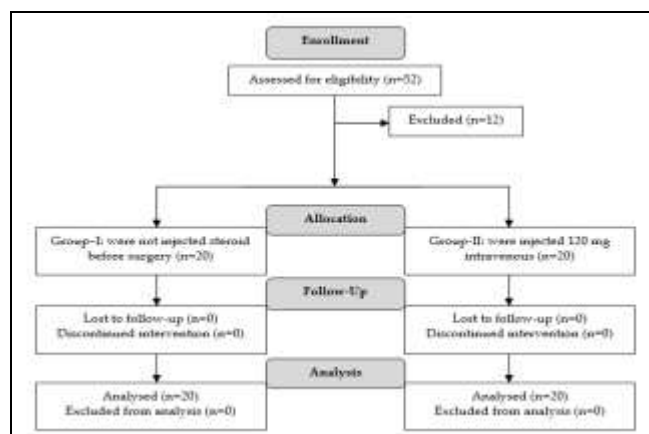


Figure: Patient Flow Diagram (n=40)

Both groups received a closed suction drain, which was removed after it drained less than 30 ml per day or five days whichever occurred first. The amount of drainage overall and the number of drainage days were both reported in milliliters. While some patients were discharged without a drain, some were discharged with drain and were followed in outpatient department. No drains were kept for more than five days. On the seventh postoperative day, an ultrasound revealed a seroma, which was described as a clinically palpable accumulation of serous fluid that had been verified by needle aspiration and confirmed as an anechoic collection. Seroma was aspirated with, until the volume was clinically below 50 ml. At each follow up visit, the wound's infection and necrosis (if any) were examined and managed. The seroma was graded according to version 3.0 of the Common Terminology Criteria for Adverse Events that stated Grade 1: No symptoms; Grade 2: Symptoms that necessitate for simple aspiration or medical treatment; Grade 3: Symptoms that necessitate for interventional radiology or surgical intervention.¹²

Statistical Package for the Social Sciences (SPSS) version 26.0 was used for the statistical analysis. Qualitative data were reported as counts and percentages (%), including the frequency of seroma development, the severity of seroma, and wound consequences. Using the chi-square test, proportions between Group-I and Group-II were compared. Age, total drainage, and drainage duration were all numerical variables that were reported as Mean with SD (Mean Standard Deviation). An independent t-test was used to compare the means of the two groups. For all comparisons, a *p*-value of 0.05 or less was regarded as statistically significant.

RESULTS

In our study, 40 female patients presenting to surgery department were enrolled according to inclusion criteria and were grouped into two groups of 20 patients each. Patients ranged in age from 18 to 69 years, with a mean age of 56.83+6.91 years. As seen in Table-I, patients were categorized according to surgical options employed. Modified Radical Mastectomy (MRM) with axillary dissection was the most common breast surgery performed in the patients accounting for 57.5% of the patients.

Table-I: Classification of Patients (n=40)

Variables	Total	Groups	
		Group-I n-20	Group-II n-20
Age (Mean+SD) (years)	56.83+6.91	55.95+7.39	57.70+6.45
Wide Local Excision	9(22.5%)	4(20.0%)	5(25.0%)
Modified Radical Mastectomy	8(20.0%)	4(20.0%)	4(20.0%)
Modified Radical Mastectomy + Axillary Dissection	23(57.5%)	12(60.0%)	11(55.0%)

Table-II: Drainage volume for Six days showing the Difference the Groups (n=40)

Difference the Groups (n=20)				
Days	Total (mL)	Groups		p-value
		Group- I (n-20)	Group-II (n- 20)	
Drainage Volume (mL)				
Day 01	151.12+36.01	148.25+32.5	154.0+39.78	<0.001
Day 02	97.62+25.36	96.25+21.99	99.00+28.86	<0.001
Day 03	60.87+22.64	63.00+23.80	58.75+21.81	<0.001
Day 04	36.25+22.92	40.25+24.46	32.25+21.11	<0.001
Day 05	13.87+17.99	15.00+19.73	12.75+16.50	<0.001
Day 06	3.75+9.18	5.00+10.38	2.50+7.86	0.013

Table-III: Outcome of Steroid Usage in Group-II as compared to Group-I (n=40)

Variables	Total	Groups		p-value
		Group-I n-20	Group-II n- 20	
Duration of Drainage Days (Mean+SD)	4.22+5.91	5.4+6.26	3.05+5.43	<0.001
Seroma Formation				
Grade-1	5(12.5%)	4(20.0%)	1(5.0%)	0.151
Grade-2	5(12.5%)	2(10.0%)	3(15.0%)	0.632
Grade-3	4(10.0%)	3(15.0%)	1(5.0%)	0.291
Total	14(35.0%)	9(45.0%)	5(25.0%)	
Wound Status				
Healed	34 (85.0%)	17(85.0%)	17(85.0%)	1.000
Necrosis	3 (7.5%)	2(10.0%)	1(5.0%)	0.548
Infected	3 (7.5%)	1(5.0%)	2(10.0%)	0.548

120 mg of methylprednisolone intravenously (I/V) given one hour before surgery to the patients of Group II, as convenient method of administration, helped reduce the average drain output and the

number of days for which drainage was required and it was statistically significant. 25% of patients reported with seroma formation in Group II and only 5% of which underwent surgical/ IR guided intervention as compared to 45% in Group-I with 15% undergoing surgical/ IR guided intervention.

DISCUSSION

It is important to minimize seroma formation as it delays wound healing, leads to surgical site infection and skin flap necrosis, and is a cause of persistent pain and patient morbidity.¹² According to studies, even a little steroid dosage might reduce the postoperative inflammatory response and seroma formation. Edema in the operative region was decreased following a single 125 mg dosage of methylprednisolone sodium succinate in multiple studies on head and neck surgery, with no increase in complications related to surgery. Even a higher single glucocorticoid dosage (30 mg/kg) administered to lessen postoperative difficulties after an abdominal procedure did not lead to an increase in the incidence of surgical complications.^{10,11} According to a prior study,¹¹ a large preoperative single dosage of glucocorticoids (30 mg/kg methylprednisolone sodium succinate) decreased the immune system's ability to fight infection and the inflammatory response, but had no detrimental effect on wound healing. In another study, in patients having complete mastectomy with axillary lymph node dissection, a single dose of intracavitary Methylprednisolone dramatically decreased seroma development and allowed for the early removal of drains.¹³ Various other studies concluded that prophylactic steroid injection in Modified Radical Mastectomy (MRM) patients was linked to a substantial decrease in mean drainage volume when compared to normal saline.^{14,15} A study by Khan *et al.*, found seroma formation to be the most frequent complication after breast surgeries, and among the treatments employed to lessen its occurrence, preoperative steroid injection appears to be the most practical and successful option.¹⁶ Various studies concluded that preoperative injection of methylprednisolone acetate was successful in terms of outcomes of breast surgery.¹⁷⁻¹⁹ This literature review supports our research work.

In our research, we found that injecting 120 mg of methylprednisolone intravenously (I/V) an hour before surgery was a practical method of administration, helping to decrease the average drainage output and number of drainage days.

Additionally, by taking this measure, fewer seromas formed on average and majority of them were treated with conservative measures rather than resorting to surgical and IR guided drainage methods. Our study also demonstrated that patients in Group-II had a slight increase in the frequency of wound infection, but it was not statistically significant. The finding is in line with previous research and adds significantly to the body of data demonstrating the benefits of using methylprednisolone before breast surgeries in selected patients without any major side effects or complications. Small sample size was the main limitation of the study. Therefore, more robust evidence is needed before making firm recommendations, and while contemplating this strategy, specific patient variables should always be taken into account.

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CONCLUSION

Our research concludes that a single dose of intravenous steroid injection (methylprednisolone) given an hour before surgery is a promising and effective strategy to prevent seroma formation following breast surgical procedures without any significant complications or side effects.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SB & SMH: Data acquisition, data analysis, critical review, approval of the final version to be published.

WAK & MA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AM & FA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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