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ORIGINAL ARTICLE

Preemptive Versus Post Op Local Anesthetic Infiltration at Port Site in Gynae Surgery A Quasi-Experimental Study

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ABSTRACT

Introduction: Port-site pain is widely believed to cause postoperative pain in cases of gynecological laparoscopic surgery. cuts and leads to slow recovery and opioid overuse. Local anesthetic infiltration is an easy method to manage somatic pain in the areas of incision. The timing of infiltration, preemptive, or postoperative may affect analgesic efficacy. This study compared efficacy of preemptive and postoperative port-site local anesthetic. infiltration of postoperative pain reduction.

Methodology: This is a quasi experimental study that was carried out at Lahore General Hospital, Lahore, between the months of November 2022 to October 2023. One hundred women who were having elective gynecological laparoscopic. surgery were recruited and separated into two groups of 50 patients. Group A received preemptive before skin incision, local anesthetic infiltration was given to Group B whereas infiltration occurred at the end of Group B. surgery. The pain measured after the operation with the help of the Visual Analog Scale (VAS) was 2, 6, 12, and. 24 hours. Total opioid consumption and time to first rescue analgesia were also recorded. Data were analyzed using independent samples t-test, repeated measures ANOVA, and chi-square test.

Results: In the group that took preventative measures, pain scores were considerably lower at all postoperative intervals ($p < 0.001$). Repeated measures ANOVA showed a significant overall difference in pain trends between groups ($p < 0.001$). Mean opioid consumption was lower in the preemptive group (82.0 ± 24.5 mg vs 121.0 ± 30.2 mg; $p < 0.001$), and there was a greater delay in the onset of rescue analgesia (5.8 ± 1.9 hours versus 3.6 ± 1.5 hours; $p < 0.001$).

Conclusion: Preemptive port-site local anesthetic infiltration provided superior postoperative analgesia and reduced opioid requirement compared to postoperative infiltration in gynecological laparoscopy.

Keywords: Preemptive analgesia, Postoperative pain, Laparoscopy, Gynecological surgery, Local anesthetic infiltration, Port-site pain

INTRODUCTION

Minimally invasive gynecological surgeries, including laparoscopic hysterectomy, cystectomy, and diagnostic laparoscopy, have become standard practice due to reduced hospital stay, faster recovery, and lower postoperative morbidity in contrast to open procedures[1]. Postoperative pain is still a major clinical problem in spite of these benefits. Pain following laparoscopy is multifactorial in origin, arising from port-site incisions, pneumoperitoneum-induced peritoneal stretching, and visceral manipulation. Among them somatic pain of the trocar insertion sites is. the most local and immediate source of discomfort in the first days after the operation[2].

Pain management is good not only to make the patients comfortable but also to ensure early discharge. ambulation, less opioid use, low chances of postoperative complication, and enhanced general surgical performance[3]. Although effective, opioid analgesics have been linked with. Side effects that include nausea, vomiting, sedation, ileus and possible respiratory depression, that can slow down recovery and discharge. Therefore, the multimodal analgesia plans have. acquired additional significance, with the use of non- opioid systemic drugs and regional or local anesthetic methods[4].

The technique is a cost-effective, safe, and simple method of infiltration of the port sites with local anesthesia. strikes directly at the incision on the somatic pain. It is known to be common in laparoscopies. and may be given either preemptively (preincisional infiltration) before skin incision or post-incisional. of surgery (infiltration postoperative)[5]. The idea of preemptive analgesia is founded on the premise. prevention of central sensitization through prevention of nociceptive input prior to surgical trauma. By blocking the conduction of pain impulses at the initial levels, prophylactic local anesthetic. administration can decrease the severity and the length of postoperative pain[6].

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On the contrary, the infiltration of local anesthesia during the postoperative period is conventionally done at the end. of surgery and the purpose of which is to offer immediate postoperative pain relief. While both techniques they are applied in clinical practice, it is still discussed which time is better. analgesic benefit. According to some studies, preemptive infiltration can result in reduced scores on pain. and decreased analgesic demands, others describe similar results in the comparison of the, two approaches[7].

In laparoscopic surgeries involving gynecology as the field of practice and the procedure is mainly elective, and when the patient is. characteristically, young to middle-aged women, it is especially vital to maximize the pain management. to mobilize early, spend less time on a hospital bed, and improve the process of recovery. However, differences in rate of surgery, nature of anesthesia, dose and schedule of infiltration. and lead to variable results in the literature[8].

Whereas a number of studies have assessed local anesthetic infiltration during laparoscopic surgery, most of them have used general surgical or mixed populations. The specific evidence on gynaecological laparoscopic procedures is minimal and the outcomes are not standardized. The divergent study design, and pain evaluation instruments and time of the results execution prevents the formulation of clear conclusions about the effectiveness of preemptive and postoperative infiltration.

Objective: The objective of the research is to compare the efficacy of preemptive and postoperative local anesthetic infiltration of the port sites in patients who undergo laparoscopic gynecological surgery on the basis of postoperative pain scores and analgesic use.

METHODOLOGY

Study Design: In this study, the researcher carried out a quasi-experimental comparative research to test the efficacy of preemptive versus postoperative local anesthetic infiltration at port locations in patients undergoing laparoscopic surgery in the gynaecology centre.

Study Setting and Duration: The research was conducted in the Department of Gynecology and obstetrics of Lahore General Hospital (LGH), Lahore. Data collection was done within one year November 2022 to October 2023.

Study Population: The sample population was comprised of women who underwent elective gynecological laparoscopic surgeries under the influence of general anesthesia. These operations were diagnostic laparoscopy, ovarian cystectomy, laparoscopic hysterectomy and other non cancerous gynecological laparoscopic surgeries.

Sample Size and Sampling Technique: The formula used to compare two independent mean was used in calculating the sample size. Past experiments recorded an average difference of about 1.5 units on the Visual Analog Scale (VAS) postoperative pain scores in the preemptive and postoperative local anesthetic infiltration groups with a standard deviation of about 2.5. The power was calculated at 80% with a confidence level of 95 and a two-sided significance of 0.05 and this yielded a minimum of 45 patients in each group [9]. The sample size was expanded by ten percent to cover the potential dropout and incomplete data, thus consisting of 100 participants consisting of 50 patients per group. The non probability consecutive sampling method has been employed. All the eligible patients eligible in the study period were recruited and divided into two groups according to the time of the local anesthetic infiltration.

Inclusion and Exclusion Criteria: The women included in the study were aged between 18 and 60 years and those subjected to elective laparoscopic gynecological surgery under general anesthesia. The study eliminated patients with known allergy to local anesthetics, chronic pain disorders, frequent opioid use, psychiatric disease and conversion to open surgery and severe intraoperative complications.

Group Allocation and Intervention: The subjects were separated into two groups. In Group A, patients were given preemptive local anesthesia infiltration at every port location prior to incision of the skin. Group B patients were provided with local anesthetic infiltrated at the same port sites during the time of skin closure at the end of surgery. The local anesthetic type and concentration were similar in both the groups (i.e. 0.25% bupivacaine). Distribution of the total volume of anesthetic was the same to all port sites whereby the anesthetic permeated the skin, subcutaneous tissue, and fascial layers under aseptic technique. Procedures were conducted according to the standardized guidelines of general anesthesia and intraoperative analgesia was maintained to reduce confounding

Postoperative Pain Management: Every patient was provided with standard postoperative analgesia according to hospital protocol which consisted of intravenous paracetamol and rescue analgesia with opioids in case of necessity. The time and dose of rescue analgesics were documented.

Outcome Measures: Postoperative pain intensity measured with the Visual Analog Scale (VAS) with 0 indicating no pain and 10 the worst conceivable pain was the primary outcome measure. Nursing staff who were not aware of group assignment were used to record pain scores at 2, 6, 12 and 24 hours post-surgery.

The secondary outcome measures were total opioid use during the first 24 hours of postoperative time and time to request rescue analgesia.

Data Collection Procedure: The demographic data such as age, body mass index, type and length of surgery were noted. The pain scores and analgesic needs were recorded on a structured proforma. All the data were prospectively gathered throughout the hospitalization.

Statistical Analysis: The analysis and entry of data were done in Statistical Package of social sciences (SPSS) version 26. Age, duration of surgery, pain scores, and opioid consumption were discussed in terms of mean and standard deviation as the quantitative variables. Such variables as type of surgery are qualitative and were represented as frequencies and percentages.

Independent samples t-test was applied to test the mean pain scores and the mean opioid consumption in the two groups. Experiments The analysis of variance (ANOVA) repeated measure was used to evaluate the difference in the level of pain over time between and within groups. The chi-square test was employed to remove the nominal variables. P value [?]0.05 was found to be statistically significant.

Ethical Considerations: The ethical approval was received by the Institutional Review Board of Lahore General Hospital, Lahore before the study was conducted. Informed consent was made written and all the participants were informed. The research ensured patient confidentiality and the participants could withdraw during the research process without compromising on their medical care.

RESULTS

The study involved 100 patients who attended the study and provided follow-up, 50 of them belonging to group A (preemptive infiltration) and 50 to group B (postoperative infiltration). The selected participants had no dropouts or open surgery conversions. Group A had a mean age of patients of 34.8 ± 8.6 years, and Group B had 35.6 ±9.1 years. Mean age in the two groups did not significantly differ on independent samples t-test (p = 0.68). Body mass index mean was 26.1 ± 3.9 kg/m2 in Group A and 26.5 ±4.2 kg/m2 in Group B, and this is also not significantly different (p = 0.59). The two groups showed similarity in the distribution of various forms of laparoscopic gynecological procedures such as diagnostic laparoscopy, ovarian cystectomy and laparoscopic hysterectomy with no statistically significant relatedness on chi-square test (p = 0.74).The mean duration of surgery was also similar in both groups (p = 0.64).

Table I: Baseline Demographic and Clinical Characteristics

Variable	Group A (Preemptive) Mean ± SD / n (%)	Group B (Postoperative) Mean ± SD / n (%)	p-value
Age (years)	34.8 ± 8.6	35.6 ± 9.1	0.68
BMI (kg/m²)	26.1 ± 3.9	26.5 ± 4.2	0.59
Duration of surgery (min)	72.4 ± 18.7	74.1 ± 19.3	0.64
Diagnostic laparoscopy	18 (36%)	16 (32%)	0.74
Ovarian cystectomy	20 (40%)	22 (44%)	
Laparoscopic hysterectomy	12 (24%)	12 (24%)	

Table II: Comparison of Mean Postoperative VAS Pain Scores

Time After Surgery	Group A (Preemptive) Mean ± SD	Group B (Postoperative) Mean ± SD	p-value
2 hours	3.1 ± 1.2	4.6 ± 1.4	<0.001
6 hours	2.8 ± 1.1	4.1 ± 1.3	<0.001
12 hours	2.3 ± 1.0	3.5 ± 1.2	<0.001
24 hours	1.6 ± 0.8	2.5 ± 1.0	<0.001

Table III: Postoperative Analgesic Outcomes

Outcome	Group A (Preemptive) Mean ± SD	Group B (Postoperative) Mean ± SD	p-value
Total opioid consumption (mg)	82.0 ± 24.5	121.0 ± 30.2	<0.001
Time to first rescue analgesia (hours)	5.8 ± 1.9	3.6 ± 1.5	<0.001

Postoperative pain scores assessed using the Visual Analog Scale (VAS) showed consistently lower values in the preemptive group at all measured time points. At 2 hours postoperatively, the mean VAS score in Group A was 3.1 ± 1.2, whereas in Group B it was 4.6 ± 1.4 (p < 0.001). At 6 hours, the mean VAS score was 2.8 ± 1.1 in Group A and 4.1 ± 1.3 in Group B (p < 0.001). At 12 hours, the scores were 2.3 ± 1.0 and 3.5 ± 1.2, respectively (p < 0.001). At 24 hours, pain scores further decreased in both groups but

remained significantly lower in Group A (1.6 ± 0.8) compared to Group B (2.5 ± 1.0), with $p < 0.001$.

Repeated measures ANOVA demonstrated a significant reduction in pain scores over time in both groups (within-subject effect, $p < 0.001$) as well as a significant difference between the two groups across all time points (between-subject effect, $p < 0.001$). This was a pointer that, despite a gradual reduction in pain levels in the two groups, the general direction of the pain levels in both groups was much lower in the preemptive infiltration group.

With respect to the total opioid requirement (intravenous tramadol equivalent dose), the mean result of Group A (82.0 ± 24.5 mg) was less than that of Group B (121.0 ± 30.2 mg) during the first 24 hours following the surgery. This was statistically significant on independent samples t-test ($p < 0.001$). The time required to request rescue analgesia was also significantly longer in the preemptive group (5.8 ± 1.9 hours) than in the postoperative group (3.6 ± 1.5 hours), which is also statistically significant ($p < 0.001$).

Both groups showed no noteworthy negative outcomes with regard to local anesthetic infiltration, including wound hematoma, infection, or local anesthetic toxicity. Group B had slightly more postoperative nausea and vomiting that were associated with increased opioid use, but these differences were not statistically different on chi-square analysis ($p = 0.27$).

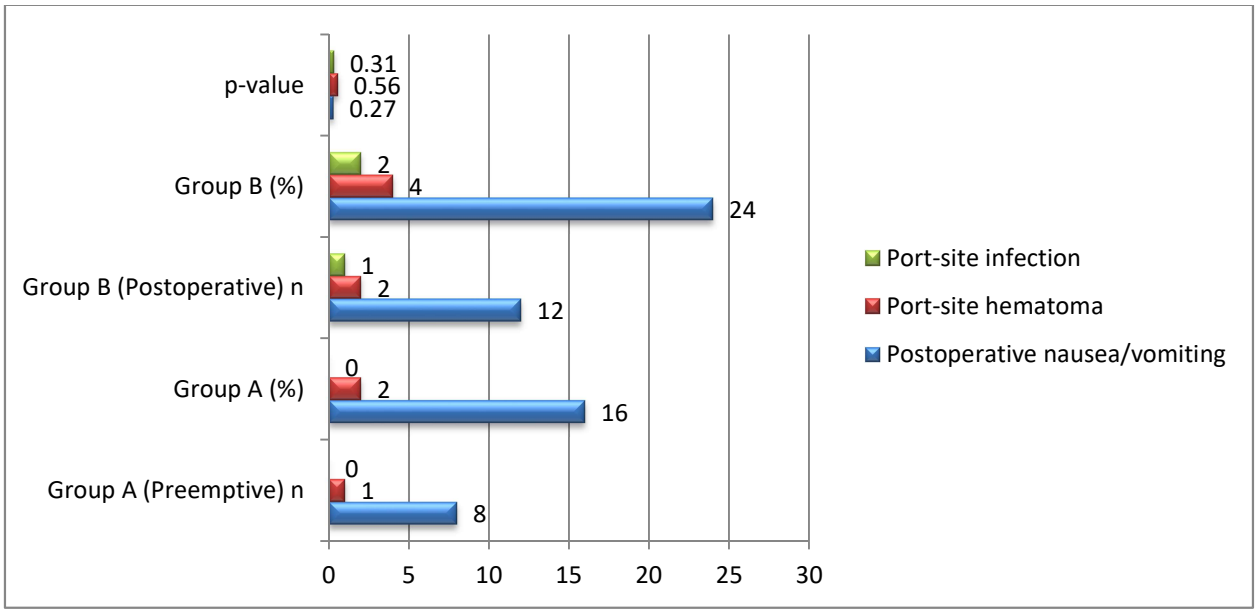

Figure 1: Comparison of Postoperative Complications and Side Effects

DISCUSSION

This research revealed that laparoscopic port preemptive local anesthetic infiltration was found to be better in providing postoperative analgesia than postoperative infiltration in patients who had undergone laparoscopic gynecological surgery. The preemptive patients had much lower pain levels at all evaluated postoperative time, less opioid analgesia use in the first 24 hours, and took a longer time to request rescue analgesics. These results are consistent with the idea that preoperative prevention of nociceptive input prior to surgical incision decreases central sensitization and results in enhanced management of postoperative pain..

In both groups, the pain scores declined gradually after 24 hours, which is a manifestation of the natural process of postoperative recovery as well as the influence of systemic analgesia. Nevertheless, the pain curve occurs at a significantly lower level in the preemptive group, as the repeated measures analysis shows, suggesting that the timing of the administration of local anesthesia has a clinically significant contribution. Reduced opioid consumption in the preemptive group further highlights the benefit of this approach, as minimizing opioid use is associated having lesser negative impacts and enhanced recovery.

In contrast to existing literature, the results of this study are in agreement with many previous trials that have shown improved early postoperative pain control with preemptive local anesthetic techniques in laparoscopic procedures[10]. Several studies in minimally invasive abdominal and pelvic surgeries have reported lower visual analog pain scores and decreased analgesic requirements when local anesthetic infiltration was administered before incision rather than at the end of surgery[9,10]. The present findings are also consistent with evidence suggesting that preemptive analgesia reduces peripheral and central sensitization, thereby diminishing the intensity of postoperative pain[11].

However, some published studies have reported minimal or no difference between preemptive and postoperative infiltration[12,13]. Such variations may be explained by differences in surgical procedures, number and size of ports, type and dose of local anesthetic used, and variations in multimodal analgesic regimens. Differences in pain assessment timing and study design may also contribute to inconsistent findings. The current study adds procedure-specific data for gynecological laparoscopy, where evidence has previously been relatively limited and heterogeneous.

The reduction in opioid consumption observed in this study is also supported by literature emphasizing the opioid-sparing effect of effective local anesthetic techniques[14,15]. Although the difference in postoperative nausea and vomiting was not statistically significant, the lower incidence in the preemptive group may be clinically relevant and related to reduced opioid use.

Limitations and Future Recommendations: This research was limited in a number of ways. As a quasi-experimental design as opposed to a randomized controlled trial, there was possible allocation bias. The research was undertaken in one tertiary care hospital and might not be generalizable to other settings. Pain perception is subjective and may be affected by psychological and cultural senses which had not been controlled particularly. Moreover, short-term postoperative outcomes were only used and long-term pain outcomes were not conducted.

Future studies ought to involve multicenter randomized controlled trials with more participants to bring in greater weight to

the evidence on the ideal time to inject port-site local anesthetic. Research evaluating the various forms, dosages, and dosing volumes of local anesthetics could be used to find out the most effective regimen. The purpose of preemptive infiltration ingynecological laparoscopic surgery would be better illustrated by assessment of long-term results, patient satisfaction and cost-effectiveness.

CONCLUSION

The preemptive local anesthetic infiltration of laparoscopic port sites was more effective than postoperative infiltration in the reduction of postoperative pain, decrease in opioid use, and the time to first rescue analgesia in gynecological laparoscopic surgery. This low cost and simple method can be integrated into normal surgical care to increase postoperative recovery and help in opioid avoidance methods of pain management.

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