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Intraoperative Bupivacaine Intra-Abdominal Infiltration for Laparoscopic Gynaecological Procedures

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Abstract

Introduction: Laparoscopy in gynaecology is now widely practiced along with multimodal analgesia for postoperative pain. Intra-peritoneal infiltration of Bupivacaine is a novel method to enhance postoperative pain relief. This study was designed to explore the feasibility and effectiveness of intra-peritoneal Bupivacaine in laparoscopic gynaecological surgical procedures. **Objectives:** To compare pain scores, analgesic requirements, postoperative mobilisation, and patient satisfaction after intra-peritoneal infiltration of Bupivacaine and placebo in Laparoscopic gynaecology surgeries. **Methodology:** A double-blinded RCT was conducted at Teaching Hospital Peradeniya, Sri Lanka. Two groups were used. One was "therapeutic laparoscopic procedures," and the other was "diagnostic laparoscopic procedures". Cases were subjected to intra-peritoneal infiltration of Bupivacaine after the procedures. Distilled water was used as the placebo. Recruitment of subjects was voluntary with informed written consent. Randomization was accomplished using the sealed envelopes technique. Postoperative pain scores, analgesic requirement, mobilization, and overall patient satisfaction were assessed, and SPSS®VER.21 was used for data analysis. **Results:** 49 & 46 patients were included in cases and control groups, respectively. Significantly lower pain score on postoperative day 2 ($p = 0.004$) and less amount of per-rectal Diclofenac ($p = 0.014$) requirement was noted with IP-Bupivacaine in the diagnostic laparoscopy arm. Similar to that, 6-hour post-op pain ($p = 0.033$), IM Pethidine usage ($p = 0.036$), oral Paracetamol ($p = 0.007$), and duration for full mobility ($p = 0.01$) was significantly improved in therapeutic laparoscopy arm with IP Bupivacaine. No Bupivacaine-related major or minor toxicity was reported. **Conclusion:** IP Bupivacaine reduces postoperative pain and non-opioid analgesic requirements in diagnostic laparoscopy procedures. Immediate postoperative pain, both opioid/non-opioid

requirements were less in therapeutic laparoscopic surgeries, along with enhanced postoperative mobilization with IP Bupivacaine.

Keywords

Laparoscopy, Intraperitoneal Bupivacaine, Postoperative Pain, Postoperative Mobilization, Postoperative Satisfaction

1. Introduction

With modern technologies, laparoscopy has evolved into an essential aspect of minimal access gynaecological surgeries [1]. Novel venues are being explored to improve postoperative analgesic requirements, reduce healthcare costs, prevent adverse drug reactions in adverse analgesics, and promote early postoperative mobilisation [2].

When it comes to the pathophysiology of postoperative pain, during the creation and maintenance of the pneumo-peritoneum in laparoscopy, parietal and visceral peritonea get stretched, leading to slight injuries followed by local inflammation. Furthermore, CO_2 is a neurotransmitter that can irritate the phrenic nerve and visceral nerve endings. Ultimately, this results in overall postoperative pain, which hinders the mobilisation and overall recovery.

There are various other techniques for pain relief used in laparoscopy, including pharmacological and non-pharmacological methods. Mainly, the pharmacological methods include local analgesics, oral agents, systemic analgesics, per rectal preparations, etc. Timely use of multimodal analgesia further enhances the patient's preference for laparoscopy over open surgical techniques [3] [4].

Bupivacaine is a local anaesthetic agent, where intra-operative infiltration of diluted Bupivacaine with normal saline or distilled water is absorbed from the peritoneum, where nerve endings are blocked to reduce the pain. It is an accepted method of postoperative pain relief that is mainly employed in general surgical laparoscopic procedures such as laparoscopic cholecystectomies and nephrectomies. The possibility of this method being used in gynaecology will help in improving postoperative complications and patient satisfaction [4]-[6]. Cost-effectiveness, good safety profile, and higher availability in the Sri Lankan health care system are the rationale for using Bupivacaine over other local anaesthetics in the current study.

Our study suggested intra-peritoneal Bupivacaine has better analgesic coverage while being a patient-friendly route of administration, inflicting less pain during administration. Thus, it is expected to see a reduced oral and systemic analgesic requirement, early mobilisation, and higher patient satisfaction. Previously done similar studies have also recommended the usage of intraperitoneal local anaesthetics in gynaecology practice. However, in those previous studies, the overall sample sizes were inadequate. No assessment has been performed on patient satisfaction and postoperative mobilisation. This study was designed to fill these re-

search gaps and set new therapeutic standards while modifying existing knowledge and practices regarding the rational usage of local anaesthetics in laparoscopic gynaecological surgeries.

2. Materials and Methods

2.1. Objective

The main objective was to compare postoperative pain, analgesic requirement, time for postoperative mobilisation, and patient satisfaction with and without postoperative Bupivacaine intra-abdominal infiltration in both diagnostic and therapeutic laparoscopic procedures. Postoperative pain was assessed using a 0 - 10 numeric pain scale in the immediate postoperative period, post-op days 1 and 2, along with the mean duration for total mobilisation after the procedure.

2.2. Ethical Clearance

Ethical clearance was taken from the ethical review committee of the Faculty of Medicine, University of Peradeniya.

2.3. Study Design & Setting

The study design was a double-blinded, randomised controlled trial carried out at the Main operation theatre and Ward 3, Teaching Hospital Peradeniya, Sri Lanka, over 24 months (01/10/2016 - 30/09/2018).

2.4. Sample Size

The total sample was 80, which was calculated using the formula in Figure 1. The significant level and the statistical power were assumed to be 5% and 80%, respectively [7]. In a previous study, patients who received only normal saline as a placebo showed a visual analogue score of 44 (SD = 19.16) during the immediate postoperative period, and those who received intra-peritoneal Ropivacaine showed a VAS of 22.2 (SD = 5.06) [5]. Therefore, d was taken as 21.8 (44 - 22.2) with SD of 19.16. Hence, the calculated sample size was 12. However, for better statistical power and adjusting for dropouts, 20 patients were chosen for each case and control group in each of the diagnostic and therapeutic laparoscopic procedures, respectively.

$$\text{Sample Size} = 2SD^2(1.96 + 0.84)^2 / d^2$$

SD – Standard deviation
D – Effect size (different betdifferent between mean sizes)

Figure 1. The equation for sample calculation at a 5% significant level with 80% of statistical power; adapted from sample size determination in health studies: a practical manual (S. K. Lwanga and S. Lemeshow).

2.5. Sampling, Inclusion Criteria, and Recruitment of the Patients

Stratified sampling was done, as shown in Figure 2. Patient recruitment was voluntary. Those who were undergoing laparoscopic Dye tests without ovarian drill-

ing, diagnostic laparoscopic procedures for a suspected ectopic pregnancy without salpingectomy, and missing IUCDs were allocated into the diagnostic group. On the other hand, patients undergoing laparoscopic cystectomy, sterilisation, and adhesiolysis were allocated into the therapeutic group.

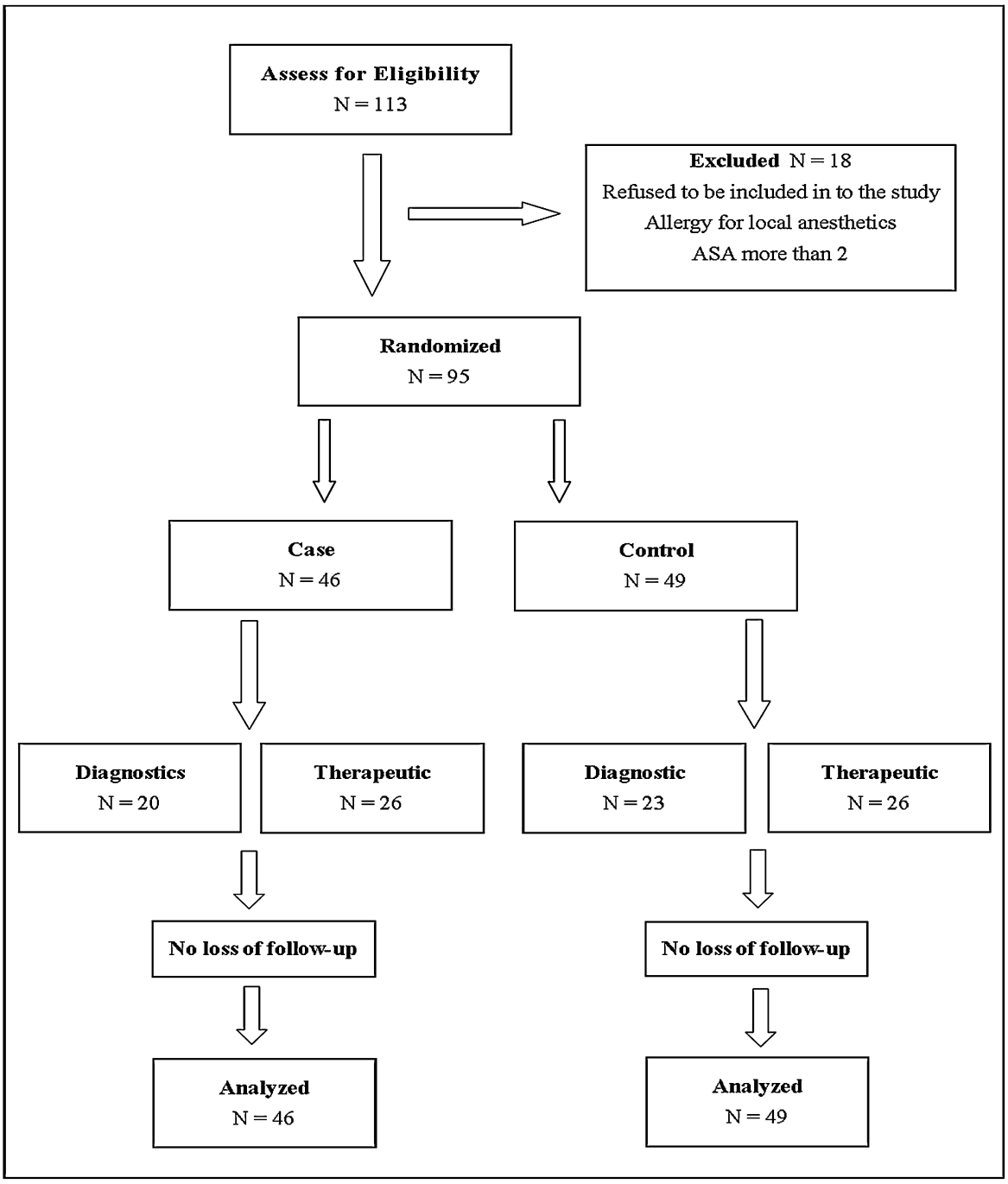

Figure 2. CONSORT diagram for recruitment of subjects and study procedure.

2.6. Exclusion Criteria

Patients who were at high risk for bleeding, allergy to local anaesthetic agents or

product ingredients, patients with an ASA of iii/iv/v [8], casualty admissions, patients with chronic pelvic pain of more than 6 months, a diagnostic procedure that took more than 20 minutes from the point of achieving the pneumo-peritoneum, and therapeutic procedure which took more than 60 minutes were excluded from the study to eliminate the procedural bias.

2.7. Consent

Informed written consent was taken from all subjects.

2.8. Randomization

Randomization was done before sending the patient to the operation theatre by using a sealed envelope [9] for the allocation.

2.9. Surgical Procedure & Intervention

Pneumo-peritoneum was achieved with a Veress needle. Then, the initial pressure and working pressure were kept at 20 mmHg and 15 mmHg, respectively. For the diagnostic procedures, a single extra port and for therapeutic procedures, up to two extra ports were introduced, apart from the primary camera port. The duration of the procedure, from the insertion of Veress to deflation of the abdomen, was documented. At the end of the laparoscopic procedure, just immediately before removing the ports, the sealed envelope was opened, and according to that, either 10 ml (50 mg/10ml) of plain Bupivacaine with 20 ml of distilled water or an equal volume of distilled water was instilled into the peritoneal cavity, by the surgeon. Then, the internal CO_2 was allowed to flow out through the camera port. Both cases and controls were induced with weight-appropriate general anesthetic agents. The post-op analgesic requirement was documented, and routine analgesics were given on demand. (**Figure 3**)

2.10. Assessment, Data Collection & Analysis

Pain was assessed according to the 0 - 10 numeric pain rating scale [10] on post-operative 6 hours, day 1, and day 2. Time taken for post-op mobilization onto a chair and to achieve total post-op mobilization was documented. Any reactions, adverse effects, and alterations of biochemical parameters were documented on post-op day 1/2 [11]. Patient satisfaction was rated on a 0 - 10 numeric scale on post-op day 2, prior to discharge from the ward. Data were entered and analyzed using SPSS® VER21 statistical software. Data entry was a single-entry process, and a standard data cleaning procedure was followed. Qualitative data were analyzed with simple numbers and frequencies. In contrast to analgesic requirements, postoperative pain scores, mobilization, and patient satisfaction were statistically compared with an independent sample t-test. Statistically, the significance level (p) was taken as 0.05, and the confidence interval (CI) was assigned as 95%. Results were interpreted as numbers, frequency, and means with standard deviation.

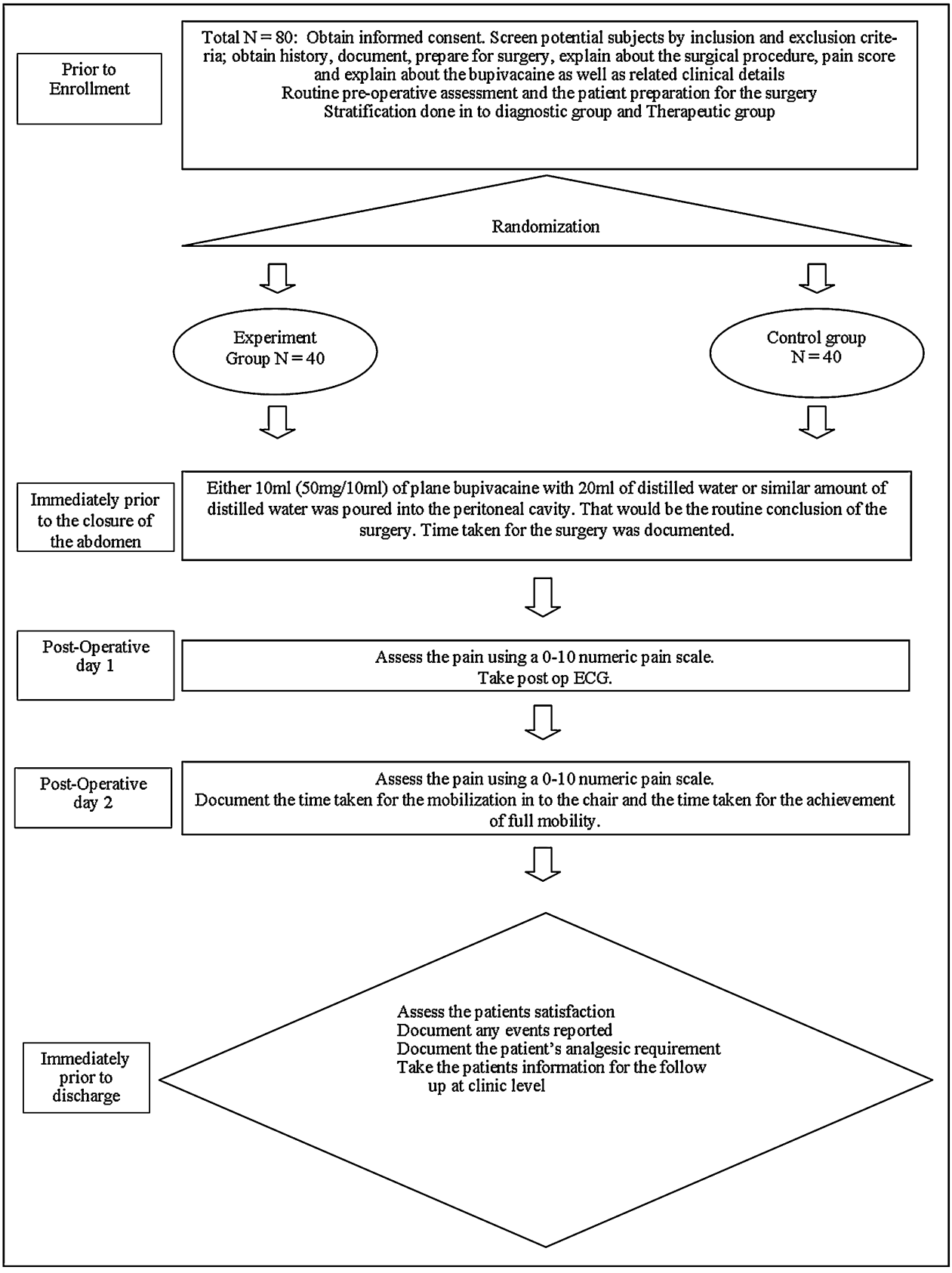

Figure 3. Flow chart for study procedure from patient recruitment, randomization, stratification, and postoperative assessment.

3. Results

3.1. Demographic Data

Out of 113 patients who were assessed for the study, 18 subjects were excluded based on the exclusion criteria at the beginning. Reasons being; refusal to participate, allergy to local anaesthetics, and having an ASA of more than ii. Among them, 43 subjects had undergone laparoscopic diagnostic procedures, and 52 had undergone laparoscopic therapeutic procedures, as shown in Figure 2.

Cases and controls of the diagnostic arm were equally balanced concerning age, weight, and the duration of surgery. No statistically significant difference was identified in age (t_{41} = 0.513, p = 0.922), body weight (t_{41} = 0.253, p = 0.26), and duration for surgery (t_{41} = 0.486, p = 0.613). Similarly, in the therapeutic arm, parameters were equally balanced without statistically significant difference in their age (t_{50} = 0.267, p = 0.913), body weight (t_{50} = 0.018, p = 0.307), and duration of surgery (t_{50} = 1.132, p = 0.104). (Table 1)

Table 1. Basic demographic data, including age, weight, and duration of surgery.

	Case		Control	
	Diagnostic Group	Therapeutic Group	Diagnostic Group	Therapeutic Group
Age (years)	33 ± 4.7	36.9 ± 7.3	33.8 ± 4.6	36.3 ± 8.2
Weight (kg)	60.7 ± 12.03	59.8 ± 10.9	61.8 ± 15.04	59.9 ± 12.5
Duration for surgery (min)	14.2 ± 1.6	46.5 ± 7.4	14.5 ± 2.4	43.7 ± 10.5

3.2. Postoperative Pain

Regarding the postoperative pain scores, statistically significantly less pain was identified at postoperative day 2 ($t_{28.044}$ = 4.886, p = 0.004) in the diagnostic arm among the patients who had IP Bupivacaine compared with the control group. Moreover, there was significantly less postoperative pain among patients who had IP Bupivacaine, which was identified at 6 hours following the surgery in the therapeutic arm ($t_{37.529}$ = 9.587, p = 0.033) as in Figure 4 and Figure 5.

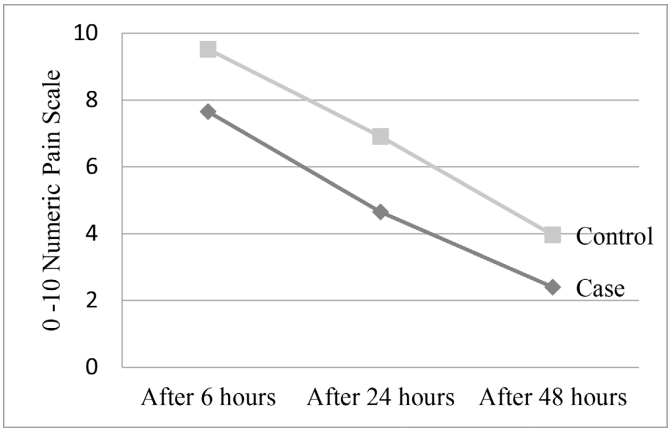

Figure 4. Variation in 1 - 10 numerical pain score against time in the diagnostic arm.

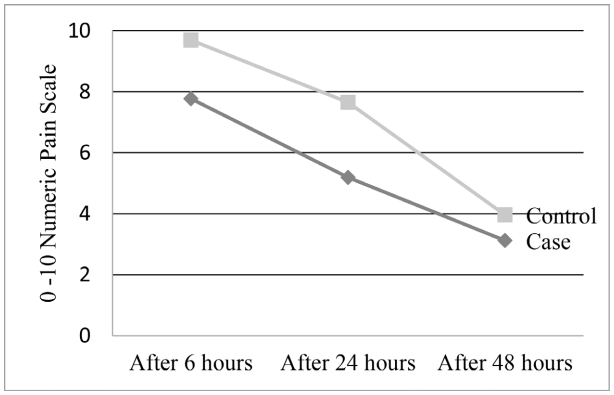

Figure 5. Variation in 1 - 10 numerical pain score against time in the therapeutic arm.

3.3. Analgesia Requirement

Non-opioid drug requirement among the patients who had IP Bupivacaine following the procedure was lower in the diagnostic arm, such as usage of per rectal Diclofenac Sodium ($t_{22.933} = 1.11$, $p = 0.014$). On the other hand, overall usage of opioids for laparoscopic diagnostic procedures was very minimal with IP Bupivacaine (Table 2). However, opioid and non-opioid requirements have been reduced following IP Bupivacaine in the therapeutic arm. Usage of IM Pethidine ($t_{18.971} = 2.291$, $p = 0.036$) and PO Paracetamol ($t_{17.314} = 1.467$, $p = 0.007$) has been significantly reduced in the case group compared to the controls.

Table 2. Intra-operative and post-operative analgesic usage (IV: Intravenous, IM: Intramuscular, Na^+: Sodium, μg: microgram, mg: milligram, g: gram).

	Case		Control	
	Diagnostic Group	Therapeutic Group	Diagnostic Group	Therapeutic Group
Fentanyl IV (μg)	83.82 ± 17.55 n = 17	95.83 ± 9.51 n = 24	86.67 ± 20.84 n = 15	95.31 ± 13.6 n = 16
Morphine IV (mg)	6 ± 1.5 n = 3	4.93 ± 1.43 n = 7	5.32 ± 1.55 n = 11	6 ± 1.73 n = 22
Pethidine IM (mg)	75 n = 1	71.43 ± 39.34 n = 7	50 ± 15.8 n = 6	130.36 ± 78.56 n = 14
Diclofenac Na^+ Per-rectal (mg)	115 ± 33.75 n = 10	159.38 ± 68.69 n = 24	133.33 ± 48.8 n = 15	213.04 ± 143.2 n = 23
Paracetamol Per-oral (g)	1.8 ± 0.76 n = 15	2 ± 0.76 n = 20	2.57 ± 0.51 n = 14	2.73 ± 1.83 n = 15

3.4. Postoperative Mobilisation

Mobilisation to a chair and full mobilisation were assessed following the procedures. However, there was no significant difference in the time taken for mobilisation in the diagnostic arm. In contrast, there was a statistically significant re-

duction in time taken for total mobilisation following IP Bupivacaine observed in the therapeutic arm ($t_{40.805} = 2.542$, $p = 0.01$).

3.5. Patient Satisfaction

Patient satisfaction was assessed on a self-rated 1 to 10 numeric scale. However, no statistically significant improvement was identified in diagnostic or therapeutic arms. Even though it was not statistically significant, higher satisfaction levels were observed in patients who had intra-peritoneal Bupivacaine administrations, as shown in Figure 6.

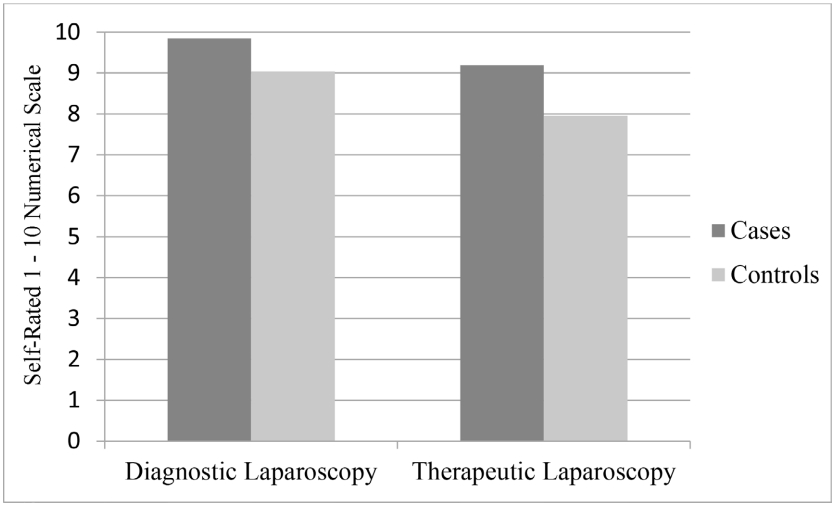

Figure 6. Level of satisfaction in both arms before and after the intervention.

3.6. Adverse Drug Reactions

No Bupivacaine-related side effects were observed. The considered adverse drug reactions were postoperative convulsion, hypotension, ventricular arrhythmia, bradycardia, allergic reaction, blurred vision, and unprovoked fever. Both pre-operative and postoperative ECGs were used to evaluate the incidents of ventricular arrhythmias and bradycardia, but none were reported.

Minor side effects such as nausea, vomiting, chills, and headaches were not evaluated since these are very common for any minor or major procedure. In the current research, 10ml of 50 mg/10ml Bupivacaine has been used at 50 mg per candidate. The maximum Bupivacaine dose used for an individual was 1.43 mg/kg, and the mean Bupivacaine usage was (0.87 ± 0.2) mg/kg per subject. According to the available literature, Bupivacaine can be used up to 2mg/kg. Hence, the mean dosage was less minimal than the maximum therapeutic dose. (Table 3)

4. Discussion

4.1. Comparison of the Method

There were several available studies that looked at the peritoneal infiltration of anaesthetic agents, as in Table 4. Rasooli *et al.*, 2015, a RCT, compared intravenous

Table 3. Summary of the results.

	Diagnostic Arm	Therapeutic Arm
Sample Size	43	52
Distribution of age, weight, and duration of the procedure	Equally balanced in both case and control group	Equally balanced in both case and control group
Post-op pain at 6 hours	No significant difference	Significantly reduced (p = 0.033)
Post-op pain at 24 hours	No significant difference	No significant difference
Post-op pain at 48 hours	Significantly reduced (p = 0.004)	No significant difference
Post-op non-opioid requirement	Significantly reduced (p = 0.014)	Significantly reduced (p = 0.007)
Post-op opioid requirement	No significant difference	Significantly reduced (p = 0.036)
Mobilization from bed to chair	No significant difference	No significant difference
Complete mobilization	No significant difference	Significantly enhanced (p = 0.004)
Overall patient satisfaction	No significant difference	No significant difference
Major adverse drug reaction	Not reported	Not reported

Table 4. Methodology: comparison between previous research and current research (B + M: Bupivacaine and Meperidine, NS: Normal Saline, VAS: Visual Analogue Score, VRS: Verbal Rating Scale).

Study	Sample Size	Study Method	Sample Groups	Technique	Primary Outcome	Secondary Outcomes	Tool for Pain Score
Current Study	N = 95 Case = 46 Control = 49	Randomized double-blinded controlled trial	Sample was subdivided into therapeutic and diagnostic groups. Each received Bupivacaine or 0.9% NS intraperitoneal instillation	Sealed envelope method	Postoperative pain, Analgesic Requirement, mobilization and patient satisfaction	Bupivacaine Related side effects and immediate complications	0 - 10 numeric pain scale
Rasooli *et al.*, 2015	N = 90 Group P = 43 Group B + M = 42	Randomised double-blinded controlled trial	Group P: Intravenous Paracetamol; Group B + M: intraperitoneal instillation of Bupivacaine and Meperidine	According to the tables of random numbers	Analgesic effect on pain	Postoperative complications	VAS
Sing *et al.*, 2013	N = 150 50 per group	Randomized controlled trial	Group 1: Placebo 0.9% NS Group 2: Ropivacaine Group 3: Ropivacaine and Fentanyl intraperitoneal instillation	Computer generated numbers	Postoperative pain	Total analgesic requirement	VAS and VRS
Dreher *et al.*, 2000	N = 19 Control = 9 Case = 10	Randomized double-blinded trial	Case and control, each received either Ropivacaine (N = 10) or 0.9% NS intraperitoneal instillation (N = 9)	Picking a coded vial from a brown paper bag	Pain score, usage of analgesics, antiemetics, level of satisfaction	Occurrence of nausea, local anaesthetic toxicity	VAS

Paracetamol against intra-peritoneal Bupivacaine to achieve postoperative analgesia in gynaecological diagnostic laparoscopic procedures. The samples were randomised into two groups, and the pain was assessed with a 0 to 10 Visual Analogue Score. Dreher *et al.* (2000) and Sing *et al.* (2013) found that similar pain was subjectively and objectively assessed with a Visual Analogue Score and total analgesic requirement. Moreover, Parsanezhad *et al.* (2003) recommended irrigation of Bupivacaine to both the hemidiaphragm and the pelvis, following the procedures to optimise postoperative pain [12]. (**Table 4**)

4.2. Advantages of IP Bupivacaine

The current study showed that intra-peritoneal Bupivacaine administration significantly reduces the intermediate postoperative pain (at 48 hours) and the requirement for analgesic drugs in diagnostic laparoscopy procedures. However, the usual postoperative pain management following diagnostic laparoscopy is via non-opioids, such as PR Diclofenac Sodium and PO Paracetamol. However, following IP Bupivacaine, the requirement for non-opioids was also significantly reduced. Similarly, IP Bupivacaine reduced immediate postoperative pain and postoperative opioid requirements in therapeutic procedures such as laparoscopic adhesiolysis/ cystectomies/ oophorectomies and ventri-suspensions. Thus, IP Bupivacaine is a suitable option for postoperative pain management in laparoscopic procedures for managing benign diseases.

This would reduce the cost of analgesic drugs and the consumption of health sector human resources and instruments. On the other hand, it reduces opioid-related adverse drug reactions such as constipation, postoperative nausea, and vomiting.

Administration of IP Bupivacaine is a time-saving and operator-friendly method. However, the limiting factor is that it can only be administered once, which can be eliminated using the peritoneal catheter with top-up doses. Furthermore, it could be used as a modality of Patient Controlled Analgesia (PCA). The administration of local anaesthetics through a peritoneal catheter for postoperative pain management has been well-established in cancer palliation.

Enhanced postoperative mobilisation helps reduce postoperative complications such as deep vein thrombosis, the requirement for thrombo-prophylaxis, and lung atelectasis. One of the main advantages of laparoscopic surgery is early mobilisation compared to an open procedure which is further enhanced by IP Bupivacaine. Even though postoperative pain and time taken for mobilisation were reduced following IP Bupivacaine, the overall level of satisfaction has not significantly improved. This could be due to various other confounding factors such as a long waiting list, poor infrastructure facilities at the ward setting, poor communication, etc.

4.3. Bupivacaine-Related Adverse Drug Reactions and Complications

Even though Bupivacaine is considered a safe drug, various types of adverse drug reactions have been reported in the literature. Severe systemic toxicity might oc-

cur with higher doses. The current study did not assess incident rates of minor adverse reactions, including nausea, vomiting, chills, and headaches. This is because of other confounding factors. However, in Dreher *et al.*, 2000, the Occurrence of nausea, vomiting, and local anaesthetic toxicity was measured as a secondary outcome. The requirement of antiemetics was measured as a primary outcome. However, the incident rate for minor and nonspecific adverse drug reactions needs to be established with an adequately powered study with a larger sample size.

The maximum dosage of Bupivacaine is 2 mg/kg. Usage above this dose would lead to systemic toxicity. The IP Bupivacaine dosage used in the current study was far smaller than the toxic dose. Hence, associated significant adverse effects were minimal. On the other hand, incident rates of significant adverse reactions are also very minimal with the intra-peritoneal route of Bupivacaine.

4.4. Comparison of Previous Research against the Current Study

Compared with other studies, the results of the current study are summarised in Table 5. First of all, immediate postoperative pain (up to 6 hours) was statistically reduced in each arm. Therefore, the IP route is better suited for managing immediate,

Table 5. Results: comparison between previous research and current research (D: Day, B + M: Bupivacaine and Meperidine, h: hour, IM: Intramuscular, NS: Normal Saline, P: Paracetamol, PO: Per Oral, PR: Per Rectal, VAS: Visual Analogue Score, VRS: Verbal Rating Scale).

Study	Pain Score ($p < 0.05$)	Analgesic Requirement ($p < 0.05$)	Time Taken for Mobilization ($p < 0.05$)	Satisfaction ($p < 0.05$)	Major Side Effects	Minor Side Effects
Present Study	Diagnostic arm: Reduced in post-op D2 ($p = 0.004$) Therapeutic arm: Reduced in post-op 6 h ($p = 0.033$)	Therapeutic arm: Reduced usage of PR Diclofenac ($p = 0.014$), IM Pethidine ($p = 0.036$), PO Paracetamol ($p = 0.007$)	Therapeutic arm: time taken for full mobilization is significantly reduced ($p = 0.01$)	No statistically significant improvement	Not reported	Not assessed
Rasooli *et al.*, 2015	VAS is significantly less in group B + M at 2 ($p = 0.002$), 4 ($p = 0.001$) and 8 ($p = 0.034$) hours	Additional Diclofenac requirement is higher in group P ($p < 0.0001$)	Not assessed	Not assessed	Not assessed	Sedation is high in group P
Sing *et al.*, 2013	Group 3: Significantly reduced pain in the immediate postoperative period and at the 6th hour	Group 3: Significantly reduced total analgesic requirement ($p < 0.001$)	Not assessed	Not assessed	Not assessed	Not assessed
Dreher *et al.*, 2000	The mean pain score for the case group was significantly lower than the control, only at 2 hours ($p < 0.05$)	Mean Fentanyl requirement was significantly reduced in the cases	Not assessed	80% of the ropivacaine group were either very or totally satisfied	No toxicity reported	Some degree of nausea with additional antiemetics only in 33% of the cases

rather than long-term postoperative pain. This suits the fundamental objective of these types of research, which is to evaluate and establish low-cost, patient-friendly pharmacological methods for reducing pain and reducing the requirement of opioid analgesics in laparoscopic procedures.

Some previous studies suggested the usefulness of IP local anaesthetics such as Ropivacaine and Meperidine. However, patient satisfaction and mobilisation have not been analyzed. Thus, the current study was supposed to fill this research gap. New therapeutic standards have been established to reduce postoperative opioid requirements, enhance postoperative mobilisation, and patient and operator-friendly novel routes of analgesia.

Another RCT, carried out by Colbert *et al.*, 2000, compared IP Bupivacaine-Meperidine against IP Bupivacaine-IM Meperidine, with a sample size of hundred [13] showed postoperative pain scores were significantly lower in the group receiving IP Meperidine. Hence, it has been concluded that combining IP drugs with conventional analgesics brought out a better effect in patients undergoing laparoscopic interventions. (**Table 5**)

5. Conclusions and Recommendations

Intra-peritoneal Bupivacaine reduces intermediate postoperative pain and the total postoperative analgesic requirement when used for laparoscopic diagnostic procedures. However, when it comes to therapeutic laparoscopic procedures, it reduces immediate postoperative pain and the requirement of opioids for analgesia. Moreover, it reduces the time taken for postoperative mobilization, especially for those who underwent therapeutic laparoscopic procedures.

Therefore, IP Bupivacaine can be used as a postoperative analgesic in standard clinical practice. The possibility of intraperitoneal catheter usage for top-ups and patient-controlled analgesia needs to be explored. However, therapeutic doses of Bupivacaine for maximum therapeutic effects with minimum side effects need to be established with studies with a higher power and a larger sample size.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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