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The Role of local Anesthesia Instillation in Pain Alleviation Post Laparoscopy

Christien Magdy Fouad Zaki, Mohammad Abd El Hameed Nasr Al Deen, Ahmed Mohamed Mamdouh

Department of Obstetrics and Gynecology, Faculty of Medicine, Ain Shams University

ABSTRACT

Background: Gynecological laparoscopy is now becoming a more popular technique for diagnosis and treatment of infertility cases; however gynecological laparoscopy is usually followed by Post-operative pain which may be attributed to small incision in abdominal wall or as a result of diaphragmatic irritation by inflating gases.

Aim of the Study: was to assess the role of local anesthesia instillation in pain relief after laparoscopy.

Patients and methods: the present study was a randomized trial study performed on 146 women aged 20-35 years, admitted to Ain Shams University hospitals. Patients were split into 2 equal groups, Group(A): further subdivided into A1 and A2 whom undergone diagnostic and operative laparoscopy respectively- patients administrated 20ml of 0.25% of Bupivacaine instilled intraperitoneal-and Group (B): further subdivided into B1 and B2 -whom undergone diagnostic and operative laparoscopy respectively-Patients administrated 20ml of 0.75% of Ropivacaine instilled intra-peritoneal. Vital signs and Pain scores were measured preoperatively, immediate postoperative, 1 hours, 2 hours, 4 hours, 8 hours, 12 hours postoperatively. Data was collected, tabulated, then analyzed using IBM© SPSS© Statistics version 22 (IBM© Corp., Armonk, NY).

Results: administration of 20mL of Ropivacaine 0.75% at the end of technique gave pain relief for four hours in group B1 and pain relief for three hours in group B2, associated with an increase in heart rate and blood pressure for two hours in group B1 and B2 for three hours.

Conclusion: instillation of local anesthetic after laparoscopy promotes pain relief post operatively and further minimizes the postoperative hospital stay.

Keywords: laparoscopy, ropivacaine, bupivacaine, local Anesthesia, postoperative pain, intraperitoneal instillation

INTRODUCTION

Effective postoperative analgesia is important from the patient's perspective and can also improve clinical outcomes. Recent surveys report only modest success in providing suitable analgesia, as 30% to 86% of surgical patients report moderate to severe pain after a surgical procedure. Although "advanced" analgesic techniques such as epidural analgesia or perineural catheters, can provide superior analgesia, many of these analgesia modalities are labour-intensive and expensive[(1)].

The management of postoperative pain has received much interest in recent years. The degree of postoperative pain, as ultimately perceived by the patient, is mulfactorial and depends on variables such as type and duration of the operation, type of anesthesia and analgesia used, and the patient's mental and emotional status [(2)].

There are many methods of postoperative pain treatment. The traditional and most widely used is parenteral opioid. Parenteral narcotics in general are associated with nausea, vomiting, constipation, respiratory depression, and sedation. Newer techniques, such as continuous epidural analgesia/patient controlled analgesia, have adverse effects, are expensive, and require trained personnel and special equipment [(3)].

Preoperative analgesia is an analgesic regimen initiated before the onset of tissue trauma and could have effects that outlast the pharmacokinetic. It is based on the theory of prevention of prevention of central pain sensitization. Different techniques of preoperative analgesia have been reported, including intramuscular, intramuscular, intravenous, epidural and local anesthetics used in peripheral never block, intraperiotenal instillation, or wound infiltration [(4)].

Laparoscopy in infertility is one of the infertility procedure for diagnosis and treatment of infertility. Pain after laparoscopic gynecology may occur in lower abdomen, back and shoulder. It may be transient or persistent for at least 3 days [(5)].

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Pain after laparoscopy may be moderate or even severe, some of the patients require more than one opioid treatment [(6)].

Nonstreroidal anti-inflammatory drugs (NSAIDs) for post operative pain management have been previously shown to reduce opioid requirements of patients after these operations. Achieving optimal pain relief after laparoscopy is an important tissue. Postoperative local anesthetics instilled at end of laparoscopic procedures were suggested to be able to prevent postoperative pain at wake up and during the first 24hours [(7)].

A previous study was done by Refaie and Khatab[(8)]entitled reduction of early postoperative pain after diagnostic laparoscopy with local bupivacaine: a randomized placebo controlled study, aimed to evaluate the effects of preincisional infiltration and intraperitoneal instillation of bupivacaine on early relief of pain after diagnostic laparoscopy, and concluded that Bupivacaine infiltration into the trocar sited and instillation into the peritoneal cavity is beneficial for patients undergoing diagnostic laparoscopy. The effect of these drugs is temporary, but they can significantly decrease early postoperative pain and reduce the need for additional analgesics. Most important, the rate at which patients can be discharged from the hospital only 2hours after surgery is increased significantly.

Also another study done by Cruz *et al.*[(9)], entitled combination of pre-emptive port-site and intraoperative intraperitoneal repivacaine for reduction of postoperative pain: a prospective cohort study, aim to evaluate the effectiveness of intraoperatively applied local ropivacaine added to standard analgesic therapy in reducing postoperative pain intensity and opioid requirement under routine hospital conditions; and concluded that addition of pre-emptive port-site plus intraperitoneal ropivacaine to standard postoperative analgesic therapy reduced postoperative pain intensity and opioid consumption in gynaecological laparoscopy.

PATIENTS AND METHODS

This is a randomized study conducted between Jan 2015 and Jan 2017 and performed on 146 women aged 20-35 years. They were admitted to Ain Shams University Hospitals, Obstetrics and Gynecology Department for management of infertility by gynecological laparoscopy.

An informed consent was obtained from all patients enrolled in the present study, Patients were divided into two main groups each group included 73 patients

Group A: test group;

- A1: 37 patients for diagnostic laparoscopy.
- A2: 36 Patients for operative laparoscopy.

At the end of surgery before awaking the patients, they were given 20 ml of 0.25% of bupivacaine instilled intra-peritoneal (6 ml. in each sub-diaphragmatic area and 8 ml at the site of trocar entry).

Group B: test group;

- B1: 37 patients for diagnostic laparoscopy.
- B2: 36 patients for operative laparoscopy.

At the end of surgery before awaking the patients, they were given 20 ml of 0.75% of ropivacaine instilled intra-peritoneal (6 ml. in each sub-diaphragmatic area and 8 ml at the site of trocar entry).

Exclusion Criteria: Patients with:

- Uncontrolled diabetes.
- Major cardiac pulmonary diseases.
- Renal diseases.
- Hepatic diseases.

All operations were performed in the morning after an approximate preoperative fasting of 8 hours.

Aneshtetic techniques

A standard technique of anesthesia was conducted for all patients.

Premedication:

5 mg midazolam was given IV 15 minutes before induction of anesthesia.

Induction

Anesthesia was induced with fentanyl 100 mg, thiopentone 4-7 mg/kg and endotracheal intubation with an oral cuffed tube facilitated by suxamethonium 1mg/kg.

Maintenance

Anesthesia was maintained with 50% nitrous oxide in oxygen and halothane 1% muscle relaxation using pancuronium bromide 0.1 mg/kg.

Laparoscopic procedure

The patients was placed in a 15-20 degrees head down position. The operative technique involved the intra-peritoneal insufflation of carbon dioxide through a needle inserted into a small infra umbilical incision into the peritoneal cavity and connected to carbon dioxide source for insufflation. The electronic variable flow insufflator terminated the flow when an intra-abdominal pressure of 12-14

mmHg was reached. The surgical site was assessed by trocars and cannula inserted through the puncture wounds in the anterior abdominal wall. An endovideo camera was attached to the primary cannula to display the surgical site on video monitors. The patients position were then changes to steep reverse trendelenburg with left lateral tilt to minimize the diaphragmatic dysfunction associated with the induced pneumo-peritoneum operative procedures.

Measurements

The following parameters were measured preoperatively, immediate postoperative, 1 hours, 2 hours, 4 hours, 8 hours, 12 hours postoperatively.

1. Vital signs
- Heart rate (beats per minute).
- Arterial blood pressure (systolic and diastolic).

2. Pain assessment

The verbal Rating Scale (VRS) - Prince Henry pain Scales:

Verbal rating scale (VRS) is a list of verbal descriptors for pain where the patient chooses the best description.

Table (1): Pain score

Definition	Score
No pain on coughing	0
Pain on coughing but not on deep breathing	1
Pain on deep breathing but not at rest	2
Pain at rest, slight	3
Pain at rest, severe	4

3. Estimation of any side effect:

Nausea of vomiting (present, or absent)

4. Need to analgesia

NSAID's was given on demand and opioid also if NSAID's alone aren't enough to relive pain. The does of NSAID's and opioid was compared with two groups.

Sample size justification

The required sample size has been calculated using the IBM (© Sample Power© software (IBM © Corp., Armonk, Ny, USA).

The primary outcome measure is the postoperative pain score in either study group as measured on an 11 point numerical rating scale (NRS, o [no pain] to 10 [unbearable paint]). A previous study by Somaini*et al.*[9] reported that the mean ± SD pain score in patients receiving intrapertioneal ropivacaine after laparoscopic gynecologic procedures was 3.4 ±2 at 4 hours after surgery. Another trial [10]reported that the mean ± SD pain score in patients receiving intraperitoneal bupivacaine was 4.1 ± 0.7 at 4 hours after surgery.

So, it is estimated that a sample size of 73 patients in either study group (total, 146 patients) would achieve a power of 80% (type II error, 0.2) to detect a statistically significant difference of 0.7 (corresponding to means of 3.4 versus 4.1) in the pain score at 4 hours after surgery using a two-sided unpaired t test with a confidence level of 95% (type I error, 0.05) and assuming a common-within group SD of 1.498 (based on SD estimates of 2.0 and 0.7) [9,10]. This difference is equivalent to an effect size (Cohen d) of 0.47. The effect size (Cohen d) is calculated as follows:

d = (ml-32)/sd

Where ml and m2 are the means of group 1 and group 2, respectively, and sd is the common standard deviation.

Statistical Methods

Data was collected, tabulated, then analyzed using IBM© SPSS© Statistics version 22 (IBM© Corp., Armonk, NY).

Normally distributed numerical data was presented as mean and SD, and skewed data as median and interquartile range. Qualitative data was presented as number and percentage. Comparison of normally distributed numerical data was done using the unpaired student t test. Skewed data was compared using the Mann-Whitney U test. Categorical data was compared using the chi-squared test or Fisher's exact test, when appropriate. A two-sided p-value <0.05 was considered statistically significant.

The study was approved by the Ethics Board of Ain Shams University.

RESULTS

This study was performed on 146 women cases of average age 20 – 35 years patients undergoing laparoscopy for diagnosis and treatment of Infertility cases. Patients were divided into two main groups

Group A Bupivacaine (73 Patients):
- **A1:** 37 patients for diagnostic laparoscopy.
- **A2**: 36 Patients for operative laparoscopy.

Group B Ropivacaine (73 Patients):
- **B1:** 37 patients for diagnostic laparoscopy.
- **B2:** 36 patients for operative laparoscopy.

As regard demographic data including age and BMI of different study groups are shown. There was no statistically significant difference between different study groups regarding age and BMI.

Table (2): Comparison between group A and group B as regarding Demographic data

		Bupivacaine Group	Ropivacaine Group	Independent t-test	
		No.= 73	No.= 73	t	P-value
Age (year)	Mean ± SD Range	25.86 ± 1.99 22 – 30	25.60 ± 2.24 23 – 34	0.520	0.605
BMI	Mean±SD Range	33.51 ± 4.48 30.48 – 41.15	33.78 ± 1.53 32.44 – 35.99	0.487	0.626

Non sig. >0.05 Sig. <0.05 High sig. <0.001**

This table show non statistically significant between group A and group B as regarding age when p-value >0.05 This table show non statistically significant between group A and group B as regarding parity when p-value >0.05.

I. DIAGNOSTIC GROUPS

1. Hemodynamics Data

a) Systolic Blood pressure in diagnostic groups at different time intervals showed the following data

1-2 hours post operative: There was significant increase in SBP in group A1 for 1hour and in group B1 for 2 hours. There was a significantly higher difference in group A1 than in group B1 in SBP during the first two hours post operative.

4-6 hourspost operative: There was high significant decrease in SBP to preoperative level in group A1 and B1.

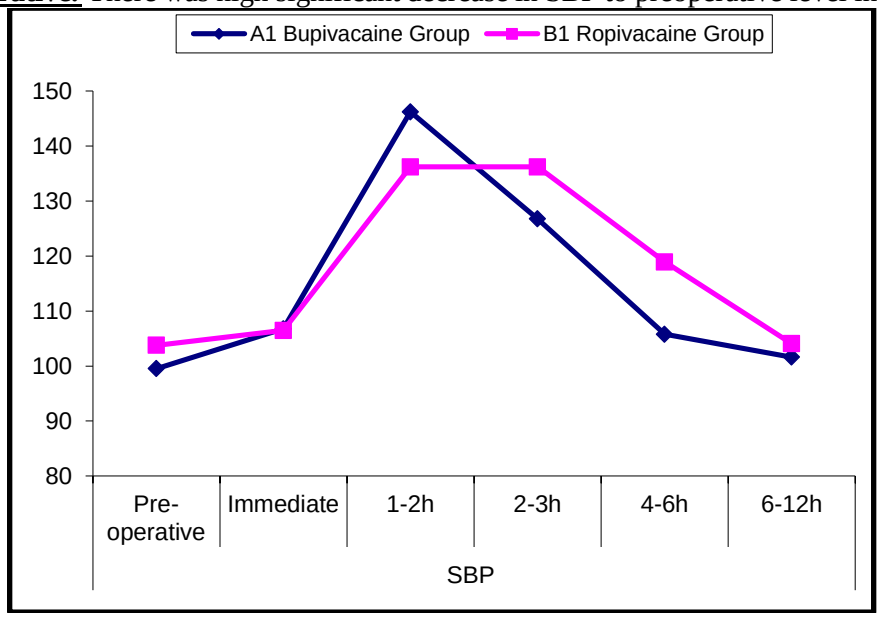

Fig. (1): Comparison between SBP in cases of diagnostic laparoscopy in different studied groups at variable times preoperative, immediate postoperative, 1 hour, 2 hours 4 hours, 6 hours, and 12 hours.

B) Diastolic blood pressure in diagnostic groups at different time intervals showed the following data:

1-2 hours postoperative: There was significant increase in DBP in group A1 for 1 hour and in group B1 at 2 hours. There was a significantly higher difference in group A1 than in group B1 in DBP during the first two hours post-operative.

4-6 hours postoperative: There was high significant decrease in DBP in group (A1-B1) to the preoperative level.

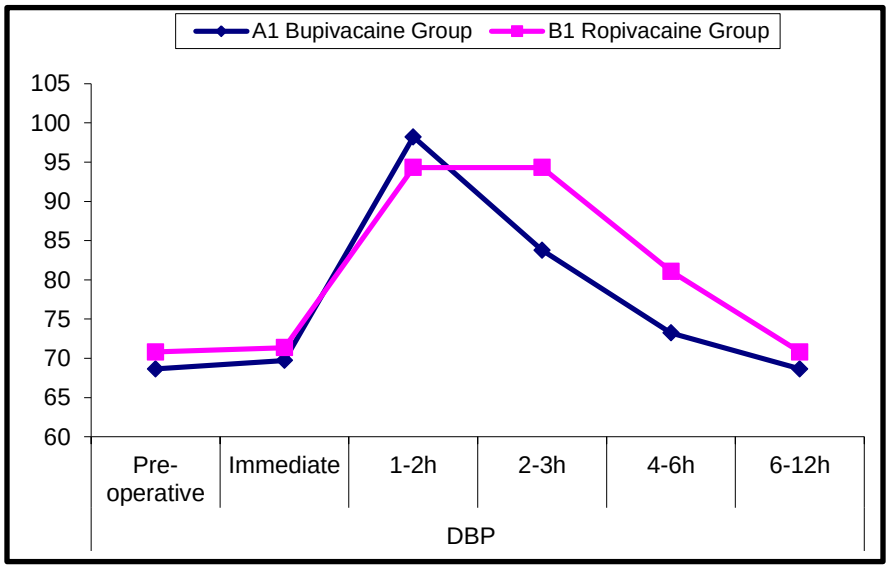

Fig. (2): Comparison between DBP in cases of diagnostic laparoscopy in different studied groups at variable times preoperative, immediate postoperative, 1 hour, 2 hours 4 hours, 6 hours, and 12 hours.

C) Heart rate in diagnostic groups at different time intervals showed the following data

1-2 hours postoperative: There was significant increase in heart rate values in group A1 at 1 hour and group B1 at 2 hours. Bupivacaine group shows a significantly higher HR than the Ropivacaine group during the first 3 hrs post-operative.

4-6 hours postoperative: There was significant decrease in heart rate values in two studied groups.

As regard to pain score in diagnostic groups. The results at different time intervals showed the following data (Fig 3)

1-4 hours postoperative: There was no pain for 3 hours in group A1 and no pain for 4 hours in group B1.

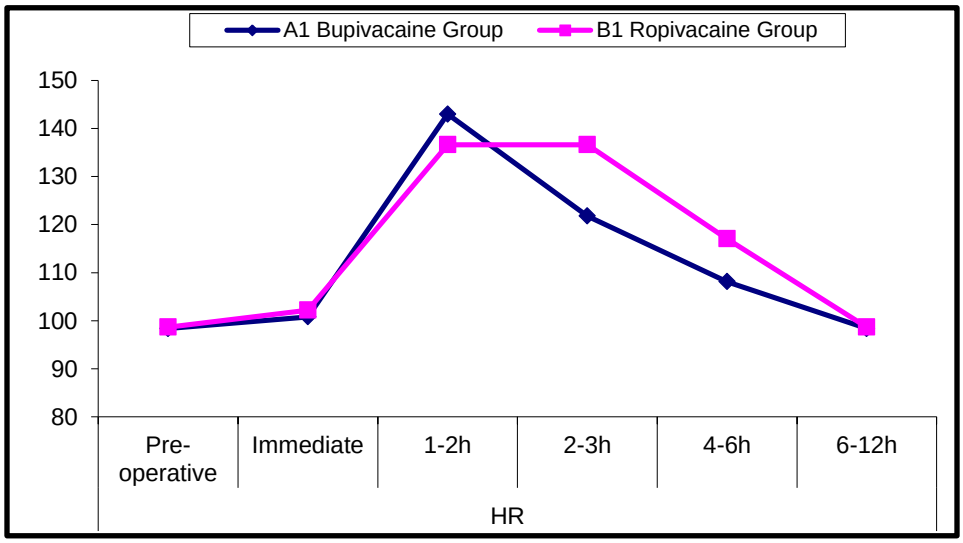

Fig. (3): Comparison between heart rate in cases of diagnostic laparoscopy in different studied groups at variable times preoperative, immediate postoperative, 1 hour, 2 hours 4 hours, 6 hours, and 12 hours.

2. Pain score (Verbal rating scale):

The results at different time intervals showed the following data (Table 3)

Table (3): Comparison between Pain score in the two studied groups of diagnostic laparoscopy.

		A1 Bupivacaine Group	B1 Ropivacaine Group	Independent t-test	
		No.= 37	No.= 37	t	P-value
Pian score (Pre-operative)	Median (IQR) Range	0 (0 – 0) 0 – 0	0 (0 – 0) 0 – 0	0.000	1.000
Pian score (Immediate)	Median (IQR) Range	0 (0 – 0) 0 – 0	0 (0 – 0) 0 – 0	0.000	1.000
Pain Score (1-2h)	Median (IQR) Range	0 (0 – 0) 0 – 0	0 (0 – 0) 0 – 0	0.000	1.000
Pain Score (2-3h)	Median (IQR) Range	0 (0 – 0) 0 – 0	0 (0 – 0) 0 – 0	0.000	1.000
Pain Score (4-6h)	Median (IQR) Range	1 (1 – 1) 1 – 2	0 (0 – 0) 0 – 1	-7.135	0.01
Pain Score (6-12h)	Median (IQR) Range	2 (2 – 2) 2 – 3	2 (2 – 2) 1 – 3	-2.947	0.003

1-4 hours postoperative: There was no pain for 3 hours in group A1 and no pain for 4 hours in group B1.

Incidence of complications in diagnostic groups:

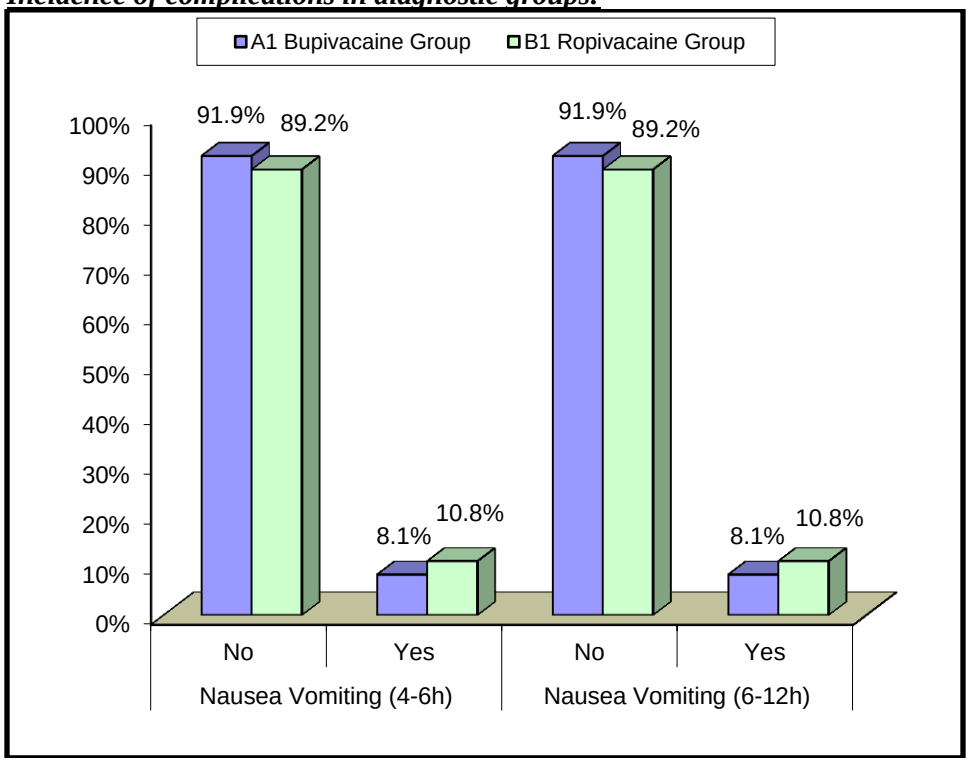

Fig. (4): Percentages of cases with nausea and vomiting in two diagnostic groups.

- GA1: Three patients experienced nausea and vomiting.
- GB1: Four patients experienced nausea and vomiting.

Table (4): Comparison between Need for analgesia in the two studied groups of diagnostic laparoscopy

		A1 Bupivacaine Group	B1 Ropivacaine Group	Independent t-test	
		No.= 37	No.= 37	t	P-value
Need for analgesia	Mean ± SD Range	6.3 ± 0.7 6 – 7	7.2 ± 0.95 7 – 8	4.639	<0.001

II. OPERATIVE GROUPS

1. Hemodynamics Data

a) Systolic Blood pressure in operative groups at different time intervals showed the fallowing data (Fig.5)

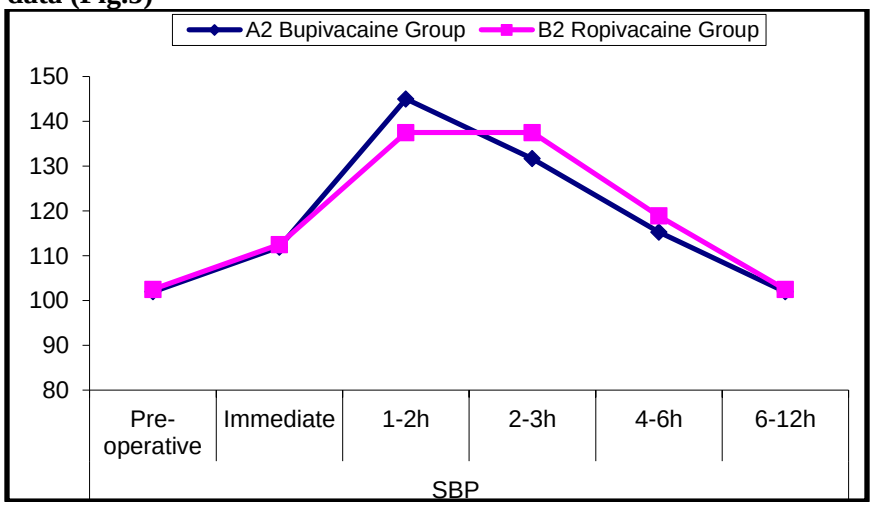

Fig. (5): Comparison between SBP in cases operated for oprative laparoscopy in different studied groups at variable times preoperative, immediate postoperative, 1 hour, 2 hours 4 hours, 6 hours, and 12 hour.

1-4 hours postoperative: There was significant increase in SBP in group A2 at 2 hours and in group B2 at 3 hours. Bupivacaine group shows a significantly higher SBP than the Ropivacaine group during the first 3 hrs post-operative.

4-6 hours postoperative: There was high significant decrease in SBP in group A2 and B2 to the preoperative level.

b) Diastolic blood pressure in operative groups at different time intervals showed the following data (Fig. 6):

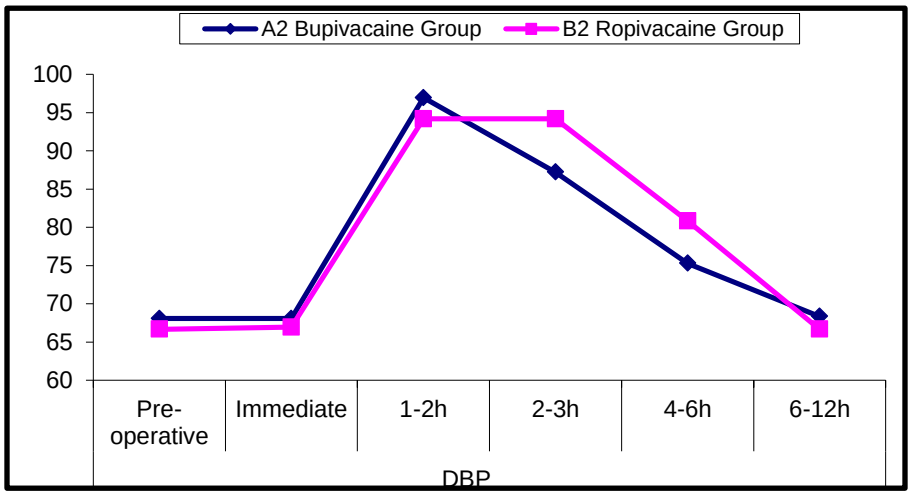

Fig. (61): Comparison between DBP in cases operated for operative laparoscopy in different studied groups at variable times preoperative, immediate postoperative, 1 hour, 2 hours 4 hours, 6 hours, and 12 hours.

1-4 hours postoperative: There was significant increase in DBP in group A2 at 2 hours but in group B2 at three hours.
Bupivacaine group shows a significantly higher DBP than the Ropivacaine group immediately post-operative and for 2 hr.
4-6 hours postoperative: There was high significant decrease in DBP in group A2 and B2 to the preoperative level.

c) Heart Rate in operative groups at different time intervals showed the following data (Fig. 7)

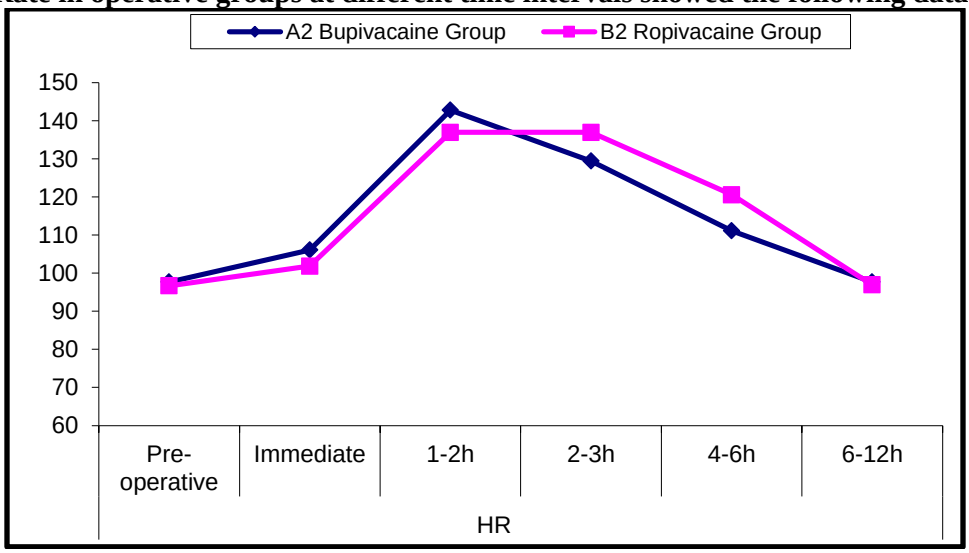

Fig. (7): Comparison between heart rate in cases operated for operative laparoscopy in different studied groups at variable times preoperative, immediate postoperative, 1 hour, 2 hours 4 hours, 6 hours, and 12 hours.

1-4 hours postoperative: There was significant increase in heart rate values in group A2 at 2 hours and in group B2 at 3 hours postoperative for 2 hours. Bupivacaine group shows a significantly higher HR than the Ropivacaine group after injection and for two hours post-operative.
4-6 hours postoperative: There was high significant decrease in heart rate values in two studied groups.

2. Pain score (Verbal rating scale)

Pain score in operative groups at different time intervals showed the following data (Table 5):

Table (5): Comparison of pain score in the two studied groups operated for operative laparoscopy.

		A2 Bupivacaine Group	B2 Ropivacaine Group	Independent t-test	
		No.= 36	No.= 36	t	P-value
Pian score (Pre-operative)	Median (IQR) Range	0 (0 – 0) 0 – 0	0 (0 – 0) 0 – 0	0.00	1.000
Pian score (Immediate)	Median (IQR) Range	0 (0 – 0) 0 – 0	0 (0 – 0) 0 – 0	0.00	1.000
Pain Score (1-2h)	Median (IQR) Range	0 (0 – 0) 0 – 0	0 (0 – 0) 0 – 0	0.00	1.000
Pain Score (2-3h)	Median (IQR) Range	1 (1 – 1) 1 – 1	0 (0 – 0) 0 – 0	8.42	0.001
Pain Score (4-6h)	Median (IQR) Range	1 (1 – 1) 1 – 1	0 (0 – 0) 0 - 0	2.10	0.035
Pain Score (6-12h)	Median (IQR) nge	2 (1 – 2) 1 – 2	2 (2 – 3) 2 – 3	1.255	0.209

1-4 hours post operative: There was no pain after 2 hours in group A2 and after 3 hours in group B2. Pain appeared in the two studied groups after 3 hours.

Incidence of complications in operative groups (Table 12).

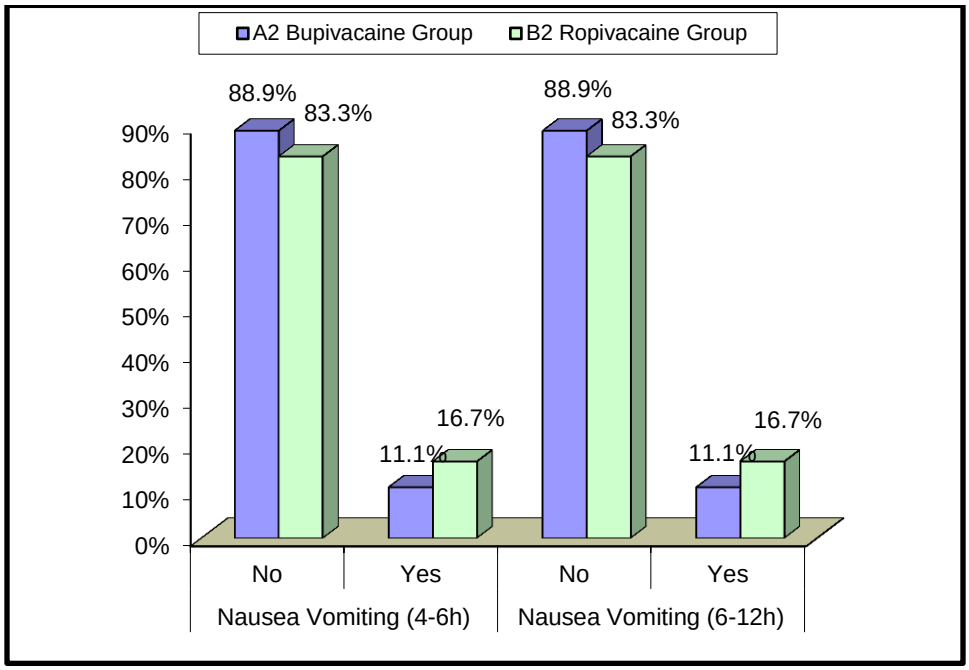

Fig. (8): Percentages of cases with nausea and vomiting in two operative groups.

- Group A2: Five patients experienced nausea and vomiting.
- Group B2: Six patients experienced nausea and vomiting.

Table (6): Comparison of Need for analgesia in the two studied groups

		A2 Bupivacaine Group	B2 Ropivacaine Group	Independent t-test	
		No.= 37	No.= 37	t	P-value
Need for analgesia	Mean ± SD Range	5.5 ± 0.8 5 – 6	6.8 ± 0.5 6 – 7.5	8.382	<0.001

DISCUSSION

This study was carried on 146 cases aged (20-35 years) scheduled for laparoscopy in management of infertility cases Patients were divided into two main groups (A, B,) then each group was subdivided into two groups (A1,A2 and B1,B2).

In the current study as regarding age and BMI, we have found that no significant difference between both groups (A, B).

Pain was relieved for three hours in group A1 and for two hours in group A2. After intra-peritoneal instillation of 20mL of bupivacaine 0.25%, VRS showed significant increase by that time.

This study is consistent with that done by Alavi*et al.*[12] who used smaller volume of Bupivacaine 15 mL of the same concentration (0.25%), and recorded pain control for eight hours. This can be attributed to higher concentration of bupivacaine 0.5% used by Gupta *et al.*[13] also the result obtained by Chundriga*et al.* (2013) is consistent with the present study. They demonstrated effective pain relief for four hours with the same volume and concentration of Bupivacaine.

On the other hand, results of this study are not consistent with that obtained by Chundriga*et al.*[14] who did not report any effective pain relief in spite of higher volume but low concentration.

The result of the present study also does not consistent with that obtained by Joris *et al.*[15]who didn't report any effective pain relief inspite of

higher volume with low concentration (80 mL of bupivacaine 0.125%.(

Some patients need analgesics in group A1 after 7 hours and A2 after 6 hours.

Pain was relieved for four hours in group B1 and for 3 hours in group B2 after intra-peritoneal instillation of 20 ml of ropivacaine 0.75%. VRS showed significant increase by that time. This study is consistent with that done by Rademaker*et al.*[16]and used the same volume and concentration of ropivacaine.

Some patients need analgesics in group B1 after 8 hours and B2 after 7 hours.

The present study showed that the analgesic effect was more pronounced with ropivacaine in the 7th hr. The difference in VRS score increased from 7th hr similarly, VRS scores in Group A and in Group B were significantly reduced in the immediate postoperative period and at first hr .

This study is consistent with that done by Kucuk*et al.*[17] who determined the effect of local anesthetic instillation and compared bupivacaine and ropivacaine in patients undergoing gynecological laparoscopy. The study showed that intraperitoneal instillation of 100 mg bupivacaine, 100 mg ropivacaine, or 150 mg ropivacaine at the end of a LC significantly reduced the analgesic consumption during the first 24 h. For preventing postoperative pain; 150mg ropivacaine proved to be significantly more effective than either 100 mg.

In the present study, heart rate increased only for one hour in group A1, two hours in group A2, two hours in group B1 and increased for 3 hours in group B2.

The results of the present study also don't match with that obtained by Gupta *et al.*[18]who did the same study but the incidence of tachycardia was not increased. The reason for this difference in incidence between the two studies could not be ascertain.

In the present study, blood pressure increased only for one hour in group A1, two hours in group A2, two hours in group B1 and increased for 3 hours in group B2.

This study is consistent with Gupta *et al.*[18], who revealed the same findings, moreover none of the agents used intraperitoneally were described as causing rise in the blood pressure .

As regard to complications

The incidence of nausea and vomiting showed marked decrease in group B and was even lower in group A. This study is consistent with that carried out by Fleisher *et al.*[19] who used the same volumes and concentrations.

CONCLUSION

It could be concluded that instillation of local anesthetic after laparoscopy gave better pain relief post operatively and minimized the patient staying time in the hospital. Administration of 20 mL of 0.25% of bupivacaine by intra-peritoneal Instillation gave pain relief for three hours in group A1, and for two hours in group A2. Administration of 20 mL of 0.75% of ropivacaine by intra-peritoneal instillation gave pain relief for four hours in group B1, and for three hours in group B2.

Nevertheless, studies on large scales with use of larger volumes and higher concentrations of Bupivacaine and ropivacaine are recommended.

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