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To evaluate effectiveness of intraperitoneal instillation of 0.5% ropivacaine in reduction of postoperative pain and rescue analgesia.

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Abstract:

Background and Aim

Postoperative pain management remains a major challenge after laparoscopic procedures. Pain after laparoscopic surgery has a visceral component as a result of diaphragm irritation by carbon dioxide. The aim of the study is to evaluate effectiveness of intraperitoneal instillation of 0.5% ropivacaine in reduction of postoperative pain and rescue analgesia.

Material and Method

After receiving ethical committee approval in NSCB Medical College Jabalpur and consent of parents ,60 ASA I and ASA II patients of both sex of age group 6-14 years were randomly allocated to two groups. In group R, 0.5% Ropivacaine was instilled intraperitoneally under the surface of diaphragm after the creation of pneumoperitoneum. In group C Normal Saline was instilled instead of ropivacaine. Both the groups were subjected to pre-incisional periportal infiltration with 1%lignocaine.Heart rate(HR) and Mean Arterial Pressure(MAP) were recorded after extubation and at 1,2 and 6 hrs.Time to rescue analgesia was noted in both the groups.

Results

Heart rate after extubation was significantly lower ($p<0.0001$) in the study group(Mean 81.77±2.75) than the control group(Mean 99.27±1.36).Post-operatively Heart Rate of the study group at 1hr(Mean 81±2.6),at 2hr(Mean 82.03±2.72) and at 6hr(Mean 82.23±2) was also significantly lower than the control group(Mean 99.7±1.3).Mean Blood Pressure after extubation was significantly lower in Group R(Mean 82.23±2.92) than in Group C(89.07±4).Blood pressure noted postoperatively in Group R at 1hr(Mean 82.17±3),at 2hr(82.30±2) and 6hr(Mean 81.8±2.2) was also significantly lower than Group C(Mean 90.20±2.6).The mean VAS at 6hrs were lower in Group R(<4) in comparison to Group C(>4) and was statistically significant at 0,1, 2 and 6hrs.

Conclusion

Intraperitoneal instillation of ropivacaine is a safe and effective modality of providing analgesia that improves postoperative haemodynamics and increases time to rescue analgesia.

Keywords: effectiveness, intraperitoneal, ropivacaine, perioperative & haemodynamics**.**

Study Designed: Randomized Prospective Controlled Study.

1. Introduction

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Intraperitoneal local anaesthetics acts by blocking the visceral nociceptors, thereby, decreasing the visceral pain in laparoscopic surgeries. It also has anti-inflammatory action and prevents peritonitis and bowel adhesion[1]. Visceral nociceptors will be stimulated by handling of the viscera and the peritoneum causing inflammation and pain.
Insufflation of gas into the peritoneal cavity causes decrease in pulmonary compliance, basal atelectasis due to elevation of diaphragm, decrease in functional residual capacity leading to ventilation perfusion mismatch[2]. Other problems that may occur include endobronchial intubation, pneumothorax, subcutaneous emphysema, embolism and bronchospasm. PaCO2 will increase progressively and will reach a plateau in 15 to 30 minutes after CO2 pneumoperitoneum[3&4].
Increase in intra-abdominal pressure also increases intrathoracic pressure, which increases the peripheral vascular resistance. Postoperative pain management is a major challenge after laparoscopic procedures. Effective pain control promotes early ambulation, which reduces the risk of deep vein thrombosis[5&6].

2. Materials & Method

The study was carried out in Department of Anaesthesiology, NSCB Medical College and Hospital, Jabalpur, M.P. After careful pre-anaesthetic check-up of the patients, written informed consent was obtained from legal guardians. 60 ASA I and ASA II patients of both sex of age group 6-14 years Patients were allocated randomly into two groups according to (study) drug received:
Group R: In this group of patients 0.5% Ropivacaine was instilled intraperitoneally under the surface of diaphragm after the creation of pneumoperitoneum.
Group C (Control group): Normal Saline was instilled instead of ropivacaine. Both the groups were subjected to pre-incisional periportal infiltration with 1%lignocaine.Patients were sedated with intramuscular (IM) midazolam at a dose of 0.1mg/kg, 20 minutes before the procedure. On arrival of patient to the operating room, routine monitoring devices such as Electrocardiography(ECG), non-invasive blood pressure, pulse oximetry (SpO 2) and End tidal CO 2 (EtCO 2) probe were applied to the patient. An intravenous access (IV) with intravenous catheter was secured. General anaesthesia was maintained with 100% oxygen, sevoflurane and atracurium 0.1mg/kg every 20 to 30 minutes to ensure proper muscle relaxation.Pneumoperitoneum was created during laparoscopy. In Group R: 0.5% Ropivacaine was instilled under the diaphragm by the surgeon after the insufflations of CO 2
Group C: laparoscopic surgery was performed with instillation of normal saline under the diaphragm after insufflation. Patients in both groups received paracetamol at a dose of 15mg/kg by the end of surgery .At the end of operation, reversal of muscle relaxation was carried out using Neostigmine at a dose of 0.06mg/kg and glycopyrrolate at a dose of 0.01 mg/kg.Heart rate (HR) and Mean Arterial BP(BP) were noted at extubation and at 1,2 and 6 hrs Assessment of pain was performed after extubation and in recovery at 0,1,2 and 6 hrs postoperatively using VAS score 10 cm scale. Time to rescue analgesia was recorded in both groups.

INCLUSION CRITERIA:

- Sixty paediatric patients, ASA I and ASA II of both sex of age group 6-14 years posted for elective laparoscopic surgery were included in the study.

EXCLUSION CRITERIA:

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- Parental refusal
- Patients allergic to Ropivacaine or any other local anaesthetic.
- Patient receiving anti-epileptic therapy.
- Patients with severe cardiopulmonary, hepatic or renal problems.
- Patients with congenital anomalies.
- Duration of surgery > 60 minutes.

3. Results

TABLE NO. – 1: COMPARISON OF POSTOERATIVE HEART RATE BETWEEN STUDY AND CONTROL GROUP

Variable	ROPIVACAINE				CONTROL				t test	p value
	Mean	SD	Min	Max	Mean	SD	Min	Max		
hr after extubation	81.77	2.75	79	90	99.27	1.36	96	101	-31.227	<0.0001
hr 1hour	81.97	2.67	79	91	99.93	1.11	97	102	-34.007	<0.0001
hr 2hour	82.03	2.72	79	90	101.20	1.83	97	105	-32.018	<0.0001
hr 6hour	82.23	2.92	80	90	101.97	1.30	100	104	-33.812	<0.0001

TABLE NO. – 2: COMPARISON OF POSTOPERATIVE BLOOD PRESSURE BETWEEN STUDY AND CONTROL GROUP

Variable	ROPIVACAINE				CONTROL				t test	p value
	Mean	SD	Min	Max	Mean	SD	Min	Max		
bp after extubation	82.23	2.64	80	91	89.07	4.39	84	103	-7.315	<0.0001
bp 1hour	82.17	3.05	80	90	89.23	2.97	85	101	-9.092	<0.0001
bp 2hour	82.30	2.38	80	90	89.73	3.10	85	102	-10.427	<0.0001
bp 6hour	81.80	2.23	80	91	90.20	2.62	86	101	-13.366	<0.0001

TABLE NO. – 3: COMPARISON OF VAS SCORE BETWEEN STUDY AND CONTROL GROUP

Variable	ROPIVACAINE				CONTROL				t test	p value
	Mean	SD	Min	Max	Mean	SD	Min	Max		
VAS Score 0Hr	3.20	0.61	2	4	5.03	0.85	4	7	-9.594	<0.0001
VAS Score 1Hr	2.53	0.51	2	3	4.53	0.68	3	6	-12.893	<0.0002
VAS Score 2Hr	2.50	0.73	1	4	6.03	0.76	5	8	-18.29	<0.0003
VAS Score 6Hr	2.57	0.68	1	4	6.97	0.85	6	8	-22.149	<0.0004

TABLE NO. – 4: COMPARISON OF TIME TO RESCUE ANALGESIA BETWEEN CONTROL AND STUDY GROUP

Variable	ROPIVACAINE				CONTROL				t test	p value
	Mean	SD	Min	Max	Mean	SD	Min	Max		
time of rescue analgesia	2.42	0.42	2	3	1.34	0.28	1	1.75	11.694	<0.0001

4. Discussion

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Ropivacaine was used for intraperitoneal instillation because of its low toxicity and long duration of action. Ropivacaine is a long-acting amide type local anaesthetic used as regional anaesthetic[7]. It is a pure S(−) enantiomer, developed for the purpose of reducing potential cardiac toxicity and improving relative sensory and motor block profiles[8]. When ropivacaine is given intraperitoneally it starts acting within 10–20 min, and duration of action lasts for 4–6 h. Kucuk et al. in 2007 found that intraperitoneal instillation of 150 mg of ropivacaine was significantly more effective than either 100 mg bupivacaine or 100 mg ropivacaine for preventing postoperative pain. Another important aspect is the appropriate volume of the medium used for instillation[9]. It should be large enough to reach the entire subdiaphragmatic region. Some studies have shown that better abdominal and shoulder tip pain control was observed when larger volume of local anaesthetic solution was used for instillation rather than smaller volume. Timing of intraperitoneal instillation of local anaesthetic is also very important[10].

In our study, we infiltrated the trocar site with lignocaine 1% before skin incision, and instilled ropivacaine 0.5% at the dosages of 2 mg/kg intraperitoneally immediately after creating pneumoperitoneum in paediatric patients undergoing laparoscopic surgeries and we found that instillation exerted beneficial effects on intraoperative and postoperative haemodynamics and postoperative pain relief especially in the early postoperative period when evaluated 0, 1, 2h and 6h postoperatively[11]. There was also less demand for rescue analgesia postoperatively. No cases of local anaesthetic toxicity were reported during our study[12].

5. Conclusion

There was no significant difference between age, sex and duration of surgery between the two groups. There was also no significant difference between SPO_2 between the two groups intraoperatively. Heart rate after extubation and postoperatively at 1,2 and 6hrs was significantly lower ($p<0.0001$) in the study group(Mean 81.77±2.75) than the control group(Mean 99.27±1.36). Mean blood pressure was lower in Group R(Mean 82.23±2.92) than in Group C(89.07±4) after extubation and postoperatively at 1,2 and 6hrs

The mean VAS at 6hrs were lower in Group R(<4) in comparison to Group C(>4) and was statistically significant at 0,1, 2 and 6hrs.Time to rescue analgesia was longer in Group R than in Group C.

Intraperitoneal instillation of ropivacaine is a safe and effective modality of providing analgesia that improves postoperative haemodynamics and reduces the need of rescue analgesia.

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