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A clinical study On Changes in oxygen saturation, haemodynamics and ECG in patients during postoperative period undergoing abdominal surgery using different analgesic regimens

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ABSTRACT

Patient generally faces some degree of cardio-pulmonary complication, in post operative period, measuring O_2 saturation, ECG changes and haemodynamics changes despites pulmonary and circulatory complication in post operative patient receiving Morphine, Tramadol and Pathedine. Patients were divided into 3 groups. Group A: Morphine Group -: Subgroup I: morphine IM, Subgroup II: morphine IV, Subgroup III: Morphine epidurally, Group B: Tramadol Group -: Subgroup I: tramadol IM, Subgroup II: tramadol IV, Subgroup III: Tramadol epidurally., Group C: Control Group-: Patients receiving Pethidine IM on demand, which is the standard practice. In each .sub group we 10 patient included (n=10).In our study we found Variables like pulse rate, systolic or diastolic or mean blood pressure, respiratory rate, changes in ECG and arterial oxygen saturation showed no statistically significant difference between study and control groups. Keeping in view all the factors considered in the present study, epidural morphine was found to be the best analgesic with very good analgesia, less sedation and hemodynamic stability with fewer side effects. Epidural Tramadol was found to be the next best. IM Tramadol was last in rating as it was a poor analgesic for intense postoperative pain, although hemodynamic and respiratory stability was good without any side effects. So we recommend epidural morphine 3mg in 10ml saline for control of postoperative pain relief.

Keywords: tramadol, hemodynamic, patient

Introduction

Despite advances over the past 50 years in anaesthetic and surgical technique of upper abdominal and thoracic surgery, the incidence of pulmonary and circulatory complication has not decreased to the expectations, varying from 19 to 27%, being highest after upper abdominal and thoracic surgery. The factors responsible for pulmonary complications are residual inhalational anaesthetic, intra-operative narcotics, upper abdominal and thoracic incision sites, residual paralysis following muscle relaxant use, restrictive bandage, post operative pain and narcotics used for its relief[1,2]

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Post operative pain is one of the most important factor. Pulmonary gas exchange abnormalities may be due to decreased functional residual capacity, increased intrapulmonary shunt and ventilation perfusion mismatch. Decrease in functional residual capacity is due to depressed rib cage expansion, cephalad movement of diaphragm and blood redistribution between thorax and abdomen. Oxygenation is affected when functional residual capacity falls below closing volume, causing early postoperative hypoxemia. Functional residual capacity may take upto two weeks to recover. The role of pain in genesis of these complications is also well known.

Postoperative Opioids may cause impaired respiratory functions and cardiovascular collapse or even coma due to cephalad movement of opioid in cerebrospinal fluid. These can be detected by hypoxemia assessment, but cyanosis is hard to detect and impossible to

quantify. Respiratory rate and depth and tachycardia are also not reliable[3].

Pain also causes sympathetic stimulation and subsequent tachycardia, increased stroke volume, cardiac work load and myocardial oxygen consumption. These are further aggravated by hypoxemia leading to increased risk of myocardial infarction[4].

Postoperative pain is treated most effectively with a combination of peripheral and central agents and drugs modifying the inflammatory (wound) response. Opium is the oldest and the most effective remedy for severe pain[5].

As postoperative pain itself, is a very potent factor for pulmonary and cardiac complications and when treated by narcotics, it impairs respiratory control; so it is important to find out the safe and potent narcotics without much respiratory depressant action[6,7].

Materials and Methods

The present study was conducted in the Department of Anesthesiology, LLR Hospital, GSVM Medical College, Kanpur from July 2016 to November 2017. The study was performed on 70 patients undergoing different types of elective abdominal surgeries under general anesthesia. Selected patients for study were assessed as per guide line of American Society of Anaesthesiologists (ASA) Grade I and Grade II. A thorough clinical assessment and routine investigations like Hb%, TLC, DLC, urine examination, chest X-ray, ECG were done to establish their physical status. Patients having any systemic diseases were excluded from the study.

The total number of participants was divided into three groups as follows by following double blind principle. Patient were allocated in each group according to chit in box method

Group A: Morphine Group
- Subgroup I: morphine IM (n=10)
- Subgroup II: morphine IV (n=10)
- Subgroup III: morphine epidurally (n=10)

Group B: Tramadol Group
- Subgroup I: tramadol IM (n=10)
- Subgroup II: tramadol IV (n=10)
- Subgroup III: tramadol epidurally (n=10)

Group C: Control Group
- Patients receiving pethidine IM on demand.

Preoperatively pulse, blood pressure, respiratory rate, arterial oxygen saturation and ECG of all patients were recorded. All subjects were then premedicated with pethidine 25mg and glycopyrrolate 0.2mg IM 45 minutes prior to induction of anaesthesia. In all epidural subgroup patients, portex epidural catheter was passed preoperatively in right lateral position, under all aseptic precautions, via L3-L4 space using 16G Touhy's needle with loss of resistance technique and advanced 4-5cm according to surgery.

Balanced general anaesthesia was used. Induction was done by pentothal sodium and suxamethonium and maintenance by nitrous oxide and oxygen and neuromuscular blocking agent supplemented by inhalational agent. Reversal was done by neostigmine and glycopyrrolate.

Postoperative analgesia was given on demand. First dose of morphine: 10mg IM or 5mg IV or 3mg epidural; tramadol: 100mg IM or 50-100mg IV or 50mg epidural; or pethidine 50mg IM were given as per group of study. The same was repeated on demand.

Postoperatively recording of pulse rate, blood pressure, ECG, oxygen saturation, respiratory rate, grading of pain and degree of sedation was done on hourly basis for eight hours and side effects noted.

Grading of pain- done by verbal rating scale:
- 0 – No pain at rest or movement
- 1 – No pain at rest, slight pain on movement
- 2 – Intermittent pain at rest, moderate pain on movement
- 3 – Continuous pain at rest, severe pain on movement

Degree of sedation recorded as:
- 0 – Alert
- 1 – Drowsy
- 2 – Very drowsy
- 3 – Unarousable
- 4 – Asleep

SpO_2 was monitored using a pulse oxymeter while patients were breathing normal air. Grading of hypoxemia was defined as:
- Mild - $SpO_2 < 94\%$ for >12 minutes/ hour
- Moderate - $SpO_2 < 90\%$ for >12 minutes/ hour
- Severe - $SpO_2 < 85\%$ for >12 minutes/ hour

After thorough assessment, statistical calculations were done to evaluate the acceptability of drugs with their relative merits and demerits using student 't' test.

The 'p' value is obtained by 't' test at 18 df which shows that if the 't' value is ≥2.1 then p is ≤0.05, i.e., it is significant. If the 't' value is ≥2.88, then p value is ≤0.01 (highly significant).

Observations

Table 1: Types of operations

Surgery	Group A			Group B			Group C	Total	%
	I	II	III	I	II	III			
Cholecystectomy	1	0	1	4	5	1	3	15	21.4
Prostatectomy	1	2	1	0	2	2	3	11	15.7
Appendicectomy	1	3	1	2	0	1	0	8	11.4
Incisional hernia repair	1	0	1	1	0	1	0	4	5.7
Colostomy closure	1	2	0	1	1	0	0	5	7.1
Exploratory laparotomy	3	0	0	2	2	0	0	7	10
Abdominal hysterectomy	1	1	2	0	0	2	3	9	12.8
Others	1	2	4	0	0	3	1	11	15.7

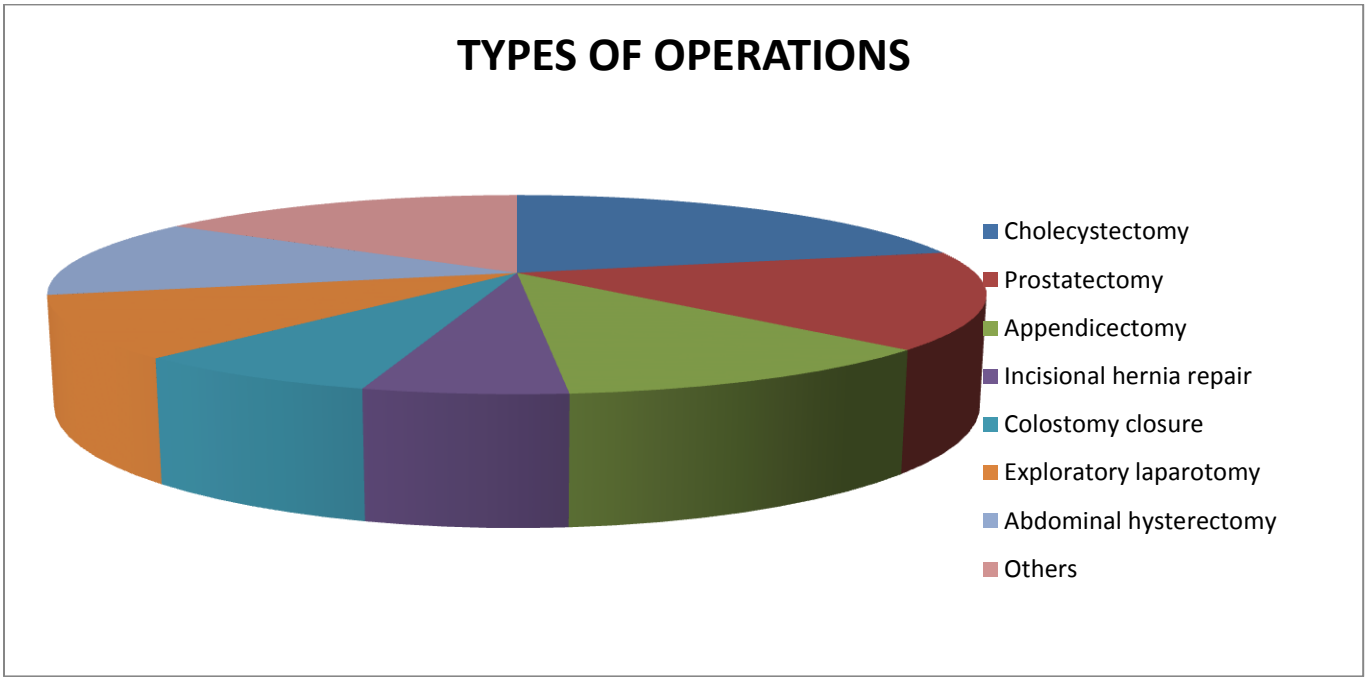

Table 2: Mean pulse rate changes

Group	Preop	Immediate Postop	1 hr Postop	2 hrs Postop	5 hrs Postop	8 hrs Postop
A I	95.4	90.8	86.8	87.0	83.0	80.4
A II	88.6	84.6	80.4	84.4	82.0	82.4
A III	93.4	95.6	90.0	85.6	85.8	81.6
B I	90.8	96.0	93.2	92.4	88.6	86.6
B II	89.0	98.6 (significant)	83.6	84.2	84.2	83.4
B III	93.4	93.6	94.8	89.0	86.4	85.6
C	85.6	89.2	87.0	87.8	83.2	85.0

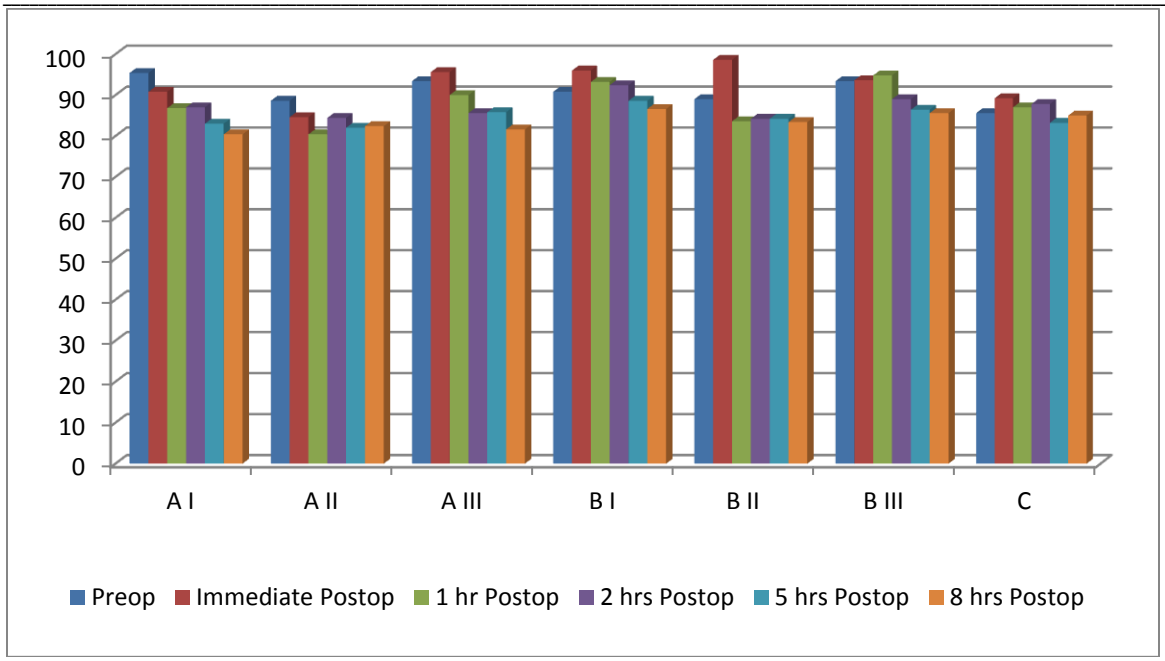

Table 3: Mean systolic BP changes

Group	Preop	Immediate Postop	1 hr Postop	2 hrs Postop	5 hrs Postop	8 hrs Postop
A I	127.0	134.0	127.6	125.0	121.0	120.6
A II	127.0	135.2	131.4	128.0	119.0	121.0
A III	123.4	139.4	129.2	127.6	121.8	126.8
B I	125.0	129.8	130.0	123.6	127.2	123.6
B II	127.4	137.6	131.0	126.4	123.6	121.2
B III	125.6	130.0	131.4	126.6	120.8	119.2
C	131.2	141.0	131.6	130.0	123.6	127.4

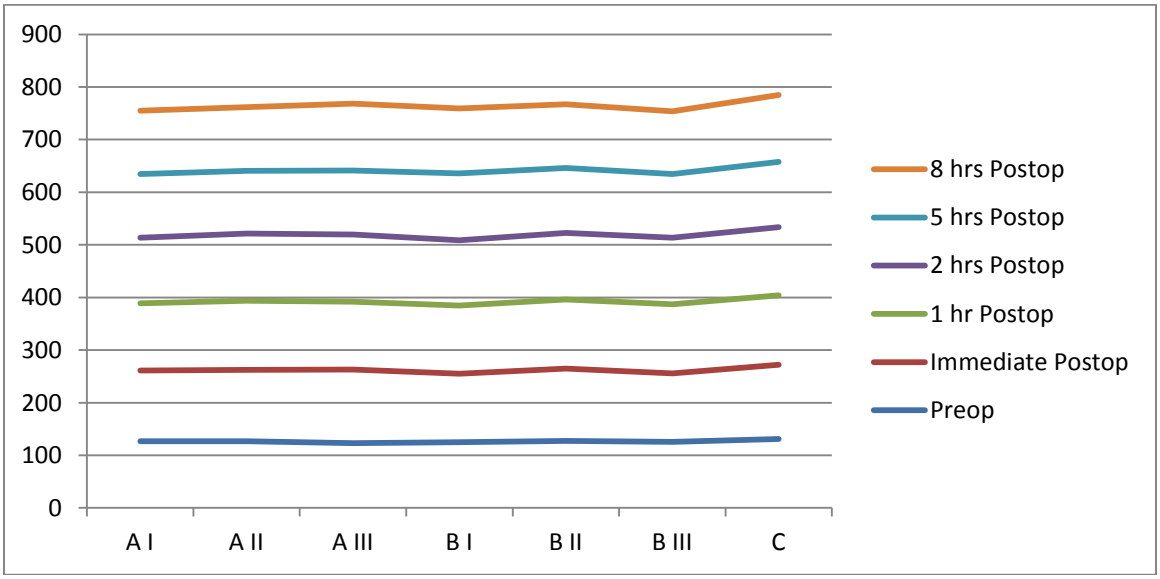

Table 4: Mean diastolic BP changes

Group	Preop	Immediate Postop	1 hr Postop	2 hrs Postop	5 hrs Postop	8 hrs Postop
A I	82.4	86.4	81.4	78.6	77.4	76.8 (significant)
A II	78.2	87.0	85.0	79.2	77.4	77.0 (significant)
A III	79.8	90.8	83.8	80.4	81.0	79.2
B I	77.2	86.0	82.8	78.2	79.0	77.8
B II	79.6	89.8	83.0	80.2	76.8	77.4
B III	80.8	82.4	81.6	78.0	78.4	76.0
C	79.8	88.6	83.2	81.6	78.2	82.2

Table 5: Mean respiratory rate changes

Group	Preop	Immediate Postop	1 hr Postop	2 hrs Postop	5 hrs Postop	8 hrs Postop
A I	20.2	18.1	26.2	24.4 (significant)	23.8 (significant)	23.8
A II	22.0	19.2	26.6	24.4	23.0 (significant)	23.0 (significant)
A III	22.0	19.4	27.8	25.2	23.2 (highly significant)	22.0 (significant)
B I	21.4	20.0	26.6	27.8	26.0	25.0
B II	20.6	17.9	26.6	25.8	25.0	24.8
B III	22.4	18.6	27.2	25.2 (significant)	25.0 (significant)	25.0
C	20.8	18.1	28.0	26.8	26.4	25.6

Table 6: Mean arterial oxygen saturation (SpO_2) changes

Group	Preop	Immediate Postop	1 hr Postop	2 hrs Postop	5 hrs Postop	8 hrs Postop
A I	97.7	95.6	97.0	97.1	97.1	97.1
A II	97.7	94.9	96.4	96.8	97.2	97.1
A III	97.7	95.5	96.0	96.9	95.8	95.2
B I	98.0	95.8	97.2	97.6	97.4	97.4
B II	97.8	95.1	95.1	96.4	96.4	96.4
B III	97.5	94.8	95.3	97.7	97.1	97.4
C	97.6	95.3	97.5	97.0	96.9	97.1

Table 7: Number of patients having hypoxaemia

Group	Immediate Postop				1 hr Postop				2 hrs Postop				5 hrs Postop				8 hrs Postop			
	Normal	Mild	Mod	Severe	Normal	Mild	Mod	Severe	Normal	Mild	Mod	Severe	Normal	Mild	Mod	Severe	Normal	Mild	Mod	Severe
A I	9	1	-	-	10	-	-	-	9	-	1	-	9	-	1	-	9	-	1	-
A II	9	1	-	-	9	1	-	-	9	1	-	-	9	1	-	-	9	1	-	-
A III	8	1	1	-	9	1	-	-	8	1	1	-	8	1	1	-	7	1	1	1
B I	9	-	1	-	10	-	-	-	10	-	-	-	10	-	-	-	10	-	-	-
B II	8	2	-	-	9	1	-	-	10	-	-	-	10	-	-	-	10	-	-	-
B III	8	1	1	-	9	1	-	-	9	1	-	-	9	1	-	-	9	1	-	-
C	9	-	1	-	9	1	-	-	9	1	-	-	9	1	-	-	9	1	-	-

Table 8: Side effects in different groups

Side effect	Group A			Group B			Group C	Total
	I	II	III	I	II	III		
Nausea	-	-	1	1	2	2	2	8
Vomiting	-	1	1	-	2	1	-	5
Respiratory Depression	1	1	2	-	-	-	1	5
Urinary Retension	-	1	1	-	-	1	-	3
Pruritus	-	-	1	-	-	-	-	1
Dryness of mouth	-	-	-	-	-	1	-	1
Hypotension	-	-	-	1	1	-	1	3

Discussion

No study quoted in introduction. One needs to compare with previous study.

A haemodynamically stable analgesic for postoperative pain relief without respiratory depression and side effects has been long awaited. In this study, observations were made about the haemodynamics, respiratory rate, arterial oxygen saturation, ECG, pain score, sedation score changes and side effects (if any) and were recorded in all the patients after giving analgesics in each group at one hour interval upto eight hours.

1. All the techniques, i.e., IV, IM or epidural along with the two drugs used were found to be haemodynamically stable.
2. Longer duration of decreased respiratory rate was among IV and epidural morphine. Short duration of decreased respiratory rate was found with IM morphine and epidural tramadol. Statistically significant decreased respiratory rate was not found in IV and IM tramadol group.
3. No statistically significant hypoxaemia was found with any technique- IM, IV or epidural, with either drugs. Severe hypoxaemia was found in one patient with epidural morphine.
4. In general, patients who received analgesia epidurally were found to have less pain score and higher duration of analgesia.
5. Nausea, vomiting and respiratory depression were common side effects. Pruritus and dryness of mouth were rare.

Conclusion

1. Variables like pulse rate, systolic or diastolic or mean blood pressure, respiratory rate, changes in ECG and arterial oxygen saturation showed no statistically significant difference between study and control groups.
2. Decrease in respiratory rate was found in IV and epidural morphine group but not to the extent which caused hypoxemia. Statistically insignificant decrease in respiratory rate was found with IM morphine and epidural tramadol.
3. Epidural morphine showed better pain relief for longer duration as compared to IM or IV morphine, IM or IV tramadol and IM pethidine.
4. IM and IV morphine had same pain scores but less than IM tramadol or pethidine and IV tramadol. IM tramadol was found to be of highest pain score and shorter analgesia duration.
5. Highest sedation score was of epidural morphine and lowest of IM tramadol initially, but at 8^{th} hour it was almost equal in all the groups.
6. There was not much variation in ECG but tachycardia was found with tramadol and bradycardia with morphine.
7. Nausea and vomiting was found maximumally with IV tramadol.
8. Mild respiratory depression was found in morphine and pethidine groups but not to the extent of hypoxaemia.

Keeping in view all the factors considered in the present study, epidural morphine was found to be the best analgesic with very good analgesia, sedation and hemodynamic, cardiac and respiratory stability with fewer side effects.

Epidural tramadol was found to be the next best. IM tramadol was last in rating as it was a poor analgesic for intense postoperative pain, although hemodynamic and respiratory stability was good without any side effects.

So we recommend epidural morphine 3mg in 10ml saline for control of postoperative pain relief.

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