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Magnesium Sulfate versus Fentanyl as Adjuvant to Epidural Levobupivacaine in Surgeries below Umbilicus

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ABSTRACT

Background: Epidural anesthesia is performed to provide anesthesia for surgical procedures carried on lower abdomen, pelvis, and lower limbs. It offers superior pain relief and early mobilization especially when local anesthetic is combined with an adjuvant. Noxious impulses from damaged tissue evoke long lasting alterations in the central nervous system.

Objective: The aim of the current study was to evaluate and compare between the effectiveness of adding magnesium sulphate versus addition of fentanyl to epidural levobupivacaine in onset of sensory and motor block, duration of analgesia , quality of block , intraoperative hemodynamics, post-operative pain control and post-operative side effects.

Patients and Methods: The present study is a prospective randomized double blind controlled comparative study conducted for patients scheduled to undergo elective surgeries below umbilicus in Al-Azhar University Hospital in Assiut. After obtaining Institutional Ethics Committee approval and written informed consent, 90 patients ASA I/II were enrolled into the study.

Results: this study demonstrated that magnesium, and fentanyl are effective as useful adjuvants to local anesthetic for epidural anesthesia. Magnesium sulphate is associated with a shorter onset of action of the epidural block with less nausea, vomiting and pruritis incidence, fentanyl have a prolonged duration but more incidence for those side effects.

Conclusion: It could be concluded that magnesium sulfate and fentanyl are good adjuvants to local anesthetics when given epidurally, fentanyl provides more duration of analgesia but with more incidence of nausea vomiting and pruritis when compared to magnesium sulfate, but magnesium sulfate show more incidence of pain with injection.

Keywords: Magnesium Sulfate, Fentanyl, Epidural Levobupivacaine, Surgeries Below Umbilicus.

INTRODUCTION

Epidural anesthesia is a safe, inexpensive technique, with the advantage of prolonged postoperative pain relief. It has become common practice to use a polypharmacological approach for the treatment of postoperative pain, because no drug has yet been identified that specifically inhibits nociception without associated side effects [(1)].

There are a lot of adjuvants that can be added to local anesthetic drugs when given epidurally. A variety of adjuvants are used for epidural infusion to enhance analgesia while minimizing side effects, like opioids, Clonidine, Epinephrine, Ketamine, Sodium bicarbonate, Anticholinesterases, Magnesium etc. [(2)].

Opioids have both presynaptic and postsynaptic effects in the dorsal horn and affect the modulation of nociceptive input but do not cause motor or sympathetic blockade. Magnesium is the fourth most plentiful cation in the body. It has antinociceptive effects in human models of pain. These effects are primarily based on the regulation of calcium influx into the cell that is natural physiological calcium antagonism and antagonism of N-methyl-d-aspartate (NMDA) receptor. It has been reported that epidural magnesium is proved to prolong the duration of spinal opioid analgesia in humans. Co-administration of epidural magnesium for postoperative epidural analgesia has provided a pronounced reduction in patient-controlled epidural consumption without any side-effects [(3)].

On the basis of these evidences, this study was undertaken to compare the effects of epidural fentanyl to that of epidural magnesium when administrated as an adjuvant to levobupivacaine in patients' surgeries below umbilicus [(4)].

The aim of the current study was to evaluate and compare between the effectiveness of adding magnesium sulphate versus addition of fentanyl to epidural levobupivacaine in onset of sensory and motor block, duration of analgesia , quality of block , intraoperative hemodynamics, post-operative pain control and post-operative side effects.

PATIENTS AND METHODS

This prospective randomized double blind controlled comparative study included a total of 90 patients ASA I/II scheduled to undergo elective surgeries below umbilicus, attending at Al-Azhar University Hospital, Assiut. Written informed consent from all the subjects were obtained.

Ethical consideration and Written informed consent: An approval of the study was obtained from Al-Azhar University Academic and Ethical Committee.

Types of surgeries included within the study: 60 patients orthopedic surgery, 12 patients general surgery, 12 patients urological surgery and 6 patients plastic surgery

Preoperative assessment:

All patients were prepared preoperatively. The whole procedure was explained to the patients. Full

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history was taken including diseases, bleeding tendency, drug intake, history of allergy or sensitivity to any drug and previous anesthetic experience. Full general examination was done including airway assessment, chest and cardiac auscultation. All patients fasted for a suitable period of time (6 hours for food and 4 hours for water).

Laboratory evaluation: Complete Blood Count (CBC), liver and kidney function tests, coagulation profile including partial thromboplastin time (PTT), prothrombin time and concentration (PT, PC and INR) and INR bleeding time (BT) and clotting time (CT).

Equipments:

Resuscitation Equipments

- Anesthesia machine.
- Oxygen supply, face masks .
- A selection of different sizes endotracheal tubes.
- A selection of different sizes laryngeal masks.
- Laryngoscope (MacIntosh).
- 18 G venous cannula.

Epidural Equipments

- Sterile skin preparation solution of povidine iodine.
- Sponges/gauze.
- Selection of different sizes of syringes.
- Epidural needle.

Drugs:

Resuscitation Drugs

1. Atropine
2. Epinephrine
3. Ephedrine.

Drugs included within epidural anesthesia

- Lidocaine 2%.
- Levobupivacaine 0.5%. (Abbvie pharmaceutical company)
- Magnesium sulfate. (Ampoule of one gm diluted in 20 ml syringe and 1 ml was withdrawn) (Egyptian. INT. pharmaceutical industries CO) (E.I.P.I.CO.)
- Fentanyl. (Ampoule of 100 micrograms fentanyl diluted in 10 ml syringe so that each ml contains 10 micrograms fentanyl)

Monitoring

- Electrocardiogram
- Noninvasive blood pressure
- Pulse oximetry
- Capnography.

Anesthetic Procedure:

Upon arrival to the operating theatre, venous access was secured using an 18G venous cannula and all patients were premedicated with midazolam 2 mg IV. Measurements of baseline hemodynamic parameters were recorded.

All patients were monitored intra-operatively using: A Pulse oximetry, non-invasive blood pressure and ECG. An infusion of Ringer's lactate 15ML\Kg comprised preloading. All patients had an epidural anesthesia; Patients were assumed lateral or sitting position. Under strict aseptic precautions, the back was sterilized using povidone iodine at the site of insertion, tips of lumbar spine were palpated and L2-3 or L3-4 space was selected. The epidural space was identified through a midline approach, using loss-of-resistance technique , an epidural catheter was then inserted into the epidural space, the catheter was advanced 3-5 cm beyond the previously-noted distance between the skin and epidural space and a test dose of 3 ml Lidocaine 2% was injected.

The included subjects were randomly allocated into three groups and activation of epidural anesthesia was done as follows; **Group C (control group):** (30 patients): received in epidural catheter 14 ml of levobupivacaine 0.5% as a bolus dose initially, **Group M (magnesium group):** (30 patients): received in epidural catheter 14 ml of levobupivacaine 0.5% plus magnesium sulphate50 mg as a bolus dose initially., **Group F (Fentanyl group):** (30 patients) received in epidural catheter 14 ml levobupivacaine 0.5% plus 1 mic\Kg fentanyl.

Data Collected:

The following data were collected from the study patients:

- Onset of sensory block: detected by time needed to achieve sensory block level up to T10.
- Onset of motor block: detected by time needed to achieve grade 3 modified Bromage score that it will be measured in all groups also to asses quality of motor block. Bromage score is a range from 0 to 3.
- Number of patients with sensory level above T10 after 20 minutes from the epidural injection
- Number of patients with sensory level above L1 after 120 minutes from the epidural injection
- Duration of the block by measuring time to two segment regression.
- Potency of the block: at the end of the operation, assessed by visual analogue scale 'VAS': value range from 0 (no pain) to 10 (worst pain imaginable).
- Rescue analgesia plane will be given for VAS >3 using non-steroidal anti-inflammatory analgesic (ketorolac 1amp) and VAS>6 using opioid (3mg morphine). Time of the first rescue analgesia will be recorded.
- Vital signs: blood pressure & heart rate

  Hypotension (defined as a decrease of more than 20% from the baseline mean arterial blood pressure (MAP), severe hypotension (defined as a decrease in MAP more than 30% of baseline value) & bradycardia (defined as a heart rate < 55 bpm).

  Hypotension was managed with an IV bolus of 250 ml of crystalloids & if severe, 9-12 mg of ephedrine will be given. Bradycardia will be managed with atropine 0.5 mg IV.

- Patients were also evaluated for the side-effects related to epidural drugs:
- Total spinal block.
- Failure of anesthesia.
- Nausea and vomiting : Was evaluated on a 3- point ordinal scale
  (0 = none , 1 = nausea , 2 = vomiting).
- Pruritus.
- Urine retention.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- Independent-samples t-test of significance was used when comparing between two means.
- Chi-square (x^2) test of significance was used in order to compare proportions between two qualitative parameters.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. The p-value was considered significant as the following:
- Probability (P-value)

- P-value <0.05 was considered significant.
- P-value <0.001 was considered as highly significant.
- P-value >0.05 was considered insignificant.

RESULTS

Ninety patients were recruited for this study and randomly allocated into 3 groups: C group (control group) , M group (magnesium group) and F group (fentanyl group)

They showed no significant differences regarding age, gender ,duration of surgery (1).

Table (1): Demographic data of patients included in the study (age, sex and duration of the surgery).

	Group C	Group M	Group F
Age (years)	**33.6±3.3**	**34.7 ±3.5**	**33.8±4.7**
Gender **Male** **Female**	 **15** **15**	 **17** **13**	 **16** **14**
Duration of surgery	**110±15.17**	**112±19.2**	**115 ± 12.6**

Onset of sensory block: Mean time (minutes) to achieve complete sensory block there was statistically significant differences between the three groups ($p < 0.001$), was faster in group **M** in comparison to groups **F** and **C.**

Table (2): Onset of sensory block

Groups	Sensory block (min)
Group C	**17.32 ± 1.39**
Group M	**11.09 ± 0.92**
Group F	**17.32 ± 1.36**

Data expressed as mean ± (SD)

Mean time (minutes) to achieve motor block ,there was statistically significant differences between the three groups ($p < 0.001$), was faster in group **M** in comparison to groups **F** and **C.**

Table (3): Onset of motor block

Groups	Motor block (min)
Group C	**19.27 ± 1.67**
Group M	**13.18 ± 1.33**
Group F	**19.32 ± 1.70**

Data expressed as mean ± (SD)

There was no statistically significant difference in quality of motor blockade between three groups (P value > 0.05).

Table (4): Quality of motor block

Bromage score	Group C	Group M	Group F
(0)	**0**	**0**	**0**
(1)	**0**	**0**	**0**
(2)	**5(16.7%)**	**3(10%)**	**1(3.3%)**
(3)	**25(83.3%)**	**27(90%)**	**29(96.7%)**

Pain assessment using VAS showed no statistically significant difference between the three groups in the first and second hour postoperative. starting from the third hour statistical significant differences were observed between the three groups (p value < 0.05), VAS was higher in group C than in groups M and F though none of the patients required analgesia In the fifth and sixth postoperative hours VAS was significantly higher in groups C than in groups M and F.

Table (5): Potency of the block assessed by VAS

VAS	Group C	Group M	Group F
first hour	**1.0±0.0**	**1.0±0.0**	**1.0±0.0**
Second hour	**1.0±0.0**	**1.0±0.0**	**1.0±0.0**
Third hour	**2.20±0.78**	**1.85±1.14**	**1.47±0.5**
Forth hour	**3.0±0.61**	**2.47±0.54**	**1.60±1.19**
Fifth hour	**4.00± 0.81**	**3.37± 0.50**	**2.00±0.11**
Sixth hour	**4.88± 0.88**	**3.85± 0.33**	**3.00±0.61**

Data expressed as mean ± (SD)

Time for first analgesic dose was longer in Group F and Group M compared to Group C ($P = 0.001$).

Table (6): First time needed for rescue analgesia

Group	First time needed for rescue analgesia (min)
Group C	**153.96±10.04**
Group M	**294.98 ±21.67**
Group F	**466.2±49.09**

Data expressed as mean ± (SD)

By monitoring the MAP over 140 minutes, we found no significant difference between the 3 groups.

Table (7): Mean arterial blood pressure trend.

MAP	Group C	Group M	Group F
Baseline	94±3.3	95±4.4	94.3±4.1
10 min.	83± 4.1	85±4.2	83.5±4.4
20 min.	82±3.3	83±5.1	82.9±4.3
30 min.	85.8 ± 5.1	82.2±3.4	68.17±9.7
40 min.	85.8 ± 4.9	85.8 ± 4.9	66.47±7.4
50 min.	86.5 ± 6.3	88.8 ± 7.3	69.4±7.7
60 min.	87.8 ± 7.52	90.0±9.5	84.9±9.5
70 min.	89.5 ± 7.54	92.3±7.3	90.7±10.4
80 min.	89.8 ± 7.67	94.3±7.9	94.4±10.8
90 min.	89.8 ± 7.34	94.5± 7.6	96.0±12.4
100 min.	90.5±6.4	94.3 ± 6.5	95.1±10.9
110 min.	90.8 ± 8.8	93.3 ± 9.72	91.6±9.8
120 min.	92.5 ± 5.96	95.1±10.9	96.5±8.3
130 min.	92.5 ± 7.42	96.5±8.3	97.7±11.5
140 min.	93.3 ± 9.72	96.3±12.1	96.3±12.1

Data expressed as mean ± (SD)

By monitoring the HR over 140 minutes, we found no significant difference between the 3 groups.

Table (8): Heart rate trend.

	Group C	Group M	Group F
HR baseline	80.8±9.7	80.3±7.5	71.44±8.65
10 min.	83.2±9.6	81.3±6.8	74.50±10.46
20 min.	82.5±10.4	79.5±8.9	85.80±13.65
30 min.	85.8±8.6	82.3±7.8	67.73±8.76
40 min.	85.4±12.3	77.7±8.1	62.63±5.47
50 min.	84.3±12.4	78±7.9	80.27±12.15
60 min.	83.5±8.6	80.3±5.4	77.73±8.08
70 min.	84.8±13.4	78.8±6.9	77.43±7.88
80 min.	82.2±7.65	81.4±7.1	77.07±11.10
90 min.	83.2±11.4	82.5±5.5	75.73±7.36
100 min.	82.5±10.3	82.74±5.8	79.55±8.96
110 min.	84.03±14.1	82.63±12.5	76.12±10.85
120 min.	84.8±13.9	83.3±6.8	75.85±11.96
130 min.	85.2±11.3	83.1±7.1	77.98±12.33
140 min.	86.8±11.6	83.4±7.9	78.12±10.74

Data expressed as mean ± (SD)

Regarding the incidence of complications, number of patients who experienced:

- Nausea was significantly higher in group F when compared to group M.
- Vomiting was significantly higher in group F when compared to group M.
- Pruritus was significantly higher in group F when compared to group M.
- Pain with injection was significantly higher in group M when compared to group F.
- Urine retention was higher in group F when compared to group M but it was not statistically significant.

Table (9): Incidence of complications**.**

	Group M	Group F
Nausea	3* (10%)	10(33.3%)
Vomiting	1(3.3%)*	5(16.7%)
Pruritus	0*	5(16.7%)
Painwith injection	4(13%)	0*
Urineretention	4(13%)	7(23%)

DISCUSSION

In the present study, we compared the effect of magnesium (50 mg) versus fentanyl (1µg\kg) as an additive to epidural levobupivacaine (14cc, 0.5%) to prolong the postoperative analgesia in patients undergoing surgeries below umbilicus.

The demographic data in the present study were comparable to similar other studies and did not show any significant difference on statistical comparison.

Hemodynamic variables including mean arterial blood pressure and heart rate were stable althrough the operative period , by monitoring the MAP over 140 minutes and there were no clinically significant differences between the three study groups, with the exception of a decrease in the mean blood pressure in all groups at the 10 minutes readings (from 94±3.3 mm Hg to 83± 4.1 mm Hg in the group C. From 95±4.4 to 85±4.2 mm Hg in the group M. From 94.3±4.1 to 83.5±4.4 mm Hg in the group F). This can be explained by the vasodilatation of resistance and capacitance vessels, resulting from the block of the sympathetic outflow by the epidural local anesthetic, causing relative hypovolemia with a consequent drop in blood pressure.

These results are in accordance to those found by **Jiehao *et al.*** [(5)] who compared the epidural magnesium and/or morphine with bupivacaine for postoperative analgesia after cesarean section. No significant differences were found in hemodynamic variables of BP and heart rate ($p > 0.05$). Also, there were no significant differences in these variables in the study conducted by **Arcioni *et al.*** [(3)] in which they combined intrathecal and epidural magnesium sulfate supplementation to reduce post-operative analgesic requirements. They concluded that adding magnesium sulfate has no effect on MAP.

In contrast to the present study, **Bajwa *et al.*** [(6)] found that the mean arterial pressure (MAP) decreased from the baseline with a maximum decline at 30-50 minutes after the epidural injection of fentanyl to epidural ropivacaine, but it never went below 65 mmHg. They reported that a negative chronotropic effect was exhibited approximately 30–35 minutes after the epidural injection of these drugs. Postoperatively, HR and MAP remained stable. The decrease in HR caused by α-2 agonist can be explained on the basis of their central action whereby they decrease sympathetic outflow and nor-epinephrine release.

This study showed fast onset of sensory block in Magnesium group (11.09 ± 0.92) in comparison to Fentanyl group (17.32 ± 1.36) and

Control group (17.32 ± 1.39) there was statistically significant differences between the three groups ($p < 0.001$), and showed fast onset of motor block in Magnesium group **(**13.18 ± 1.33) in comparison to Fentanyl group (19.32 ± 1.70) and Control group (19.27 ± 1.67) there was statistically significant differences between the three groups ($p < 0.001$).

Ghatak *et al.*[1] studied effect of magnesium sulphate vs. clonidine as adjunct to epidural bupivacaine by prospective randomised double-blind study was undertaken to establish the effect of addition of magnesium or clonidine, as adjuvant, to epidural bupivacaine in lower abdominal and lower limb surgeries. A total of 90 American Society of Anesthesiology (ASA) grade I and II patients undergoing lower abdominal and lower limb surgeries were enrolled to receive either magnesium sulphate (Group B) or clonidine (Group C) along with epidural bupivacaine for surgical anesthesia. All patients received 19 ml of epidural bupivacaine 0.5% along with 50 mg magnesium in group B, 150 mcg clonidine in Group C, whereas in control group (Group A), patients received same volume of normal saline. Onset time, heart rate, blood pressure, duration of analgesia, pain assessment by visual analogue score (VAS) and adverse effects were recorded. The onset of sensory and motor blocks was faster in the magnesium group, while the duration of anesthesia was longer in the clonidine group followed by the magnesium group and then the control group

In this study, the percentage of patients who developed sensory block level above T10 in fentanyl group, after 20 minutes of epidural levobupivacaine administration was about 80%, while it was 93.3% in the magnesium group and it was 76.6% in control group but the differences between the three groups was statistically insignificant. Also the sensory block level again after 120 minutes and the percentage of patients who had sensory block level above L1 in fentanyl group was 90 %, but only 66.6% of patients who had sensory block level above L1 in magnesium group and only 40% in control group which means the higher effect of fentanyl in prolongation the sensory block level.

Rashpal *et al.*[7] conducted a prospective, randomized study for comparative evaluation of addition of fentanyl and dexmedetomidine to ropivacaine for epidural anesthesia and analgesia in lower abdominal and lower limb orthopedic surgeries. In this study,group RD received 0.75 % Ropivacaine 15 ml with 1 μg/kg of dexmedetomidine epidurally and group RF received Inj. 0.75 % Ropivacaine 15 ml with 1 μg/kg of fentanyl epidurally. They had found that onset of sensory level at T10 was faster in fentanyl group also time to two segment regression was higher in fentanyl group and differences were statistically significant.

This study showed longer duration of postoperative analgesia in fentanyl group (136.5±3.5) minutes compared to magnesium group (133.4±4.1) minutes but the difference was not statistically significant, although these 2 groups showed longer duration of action than the control group (120.4±5.3) minutes and this was statistically significant.

Gupta *et al.*[8] studied the effect of levobupivacaine with dexmedetomidine and fentanyl for epidural analgesia in vaginal hysterectomy. 60 female patients of American Society of Anaesthesiologist (ASA) physical status I and II, were randomized into two groups of 30 patients each. Group LD patients received epidural study solution of 15 ml of levobupivacaine 0.5% with 25 μg dexmedetomidine and Group LF patients received epidural study solution of 15 ml of levobupivacaine 0.5% with fentanyl 50 μg keeping the total volume of 16 ml in both groups. They concluded that Co-administration of epidural fentanyl can provides better intraoperative analgesia and also increases duration of post operative analgesia as well.

Regarding time for recovery of motor block, according to this study this time was (130±4.1) minutes group M and (132±3.5) minutes in group F and this difference was not statistically significant, but the time was much more lower in group C (115±5.3) minutes and this difference was statistically significant.

In agreement with the present study , **Vaibhav *et al.* [9]** studied 121 ASA (American Society of Anesthesiologists) class I and II patients undergoing lower limb surgeries were enrolled to receive either magnesium sulfate (Group M) or dexmedetomidine (Group D) along with epidural bupivacaine for surgical anesthesia. All the study subjects received an epidural anesthesia with 14 ml of 0.5% bupivacaine along with either $MgSO_4$ 50 mg (Group M) or dexmedetomidine 0.5 μg/kg (Group D) or saline (Group C). They concluded that duration of motor block was higher in patients in magnesium sulphate group and the difference from the other group was statistically significant.

Ropivacaine, 15 ml of 0.75%, was administered epidurally in both groups with addition of 1 μg/kg of dexmedetomidine in RD group and 1 μg/kg of fentanyl in RF group.It was concluded that adding epidural fentanyl to Rovabupivacaine 0.75% increases time to motor power to recover.

As regards first time needed for rescue analgesia, in the present study, we found that the first time needed for rescue analgesia was significantly longer in group F (466.2±49.09) minutes and group M (294.98 ±21.67) minutes than the time was more shorter in group C (153.96±10.04) minutes.

Omar [10] studied Magnesium Sulfate as Preemptive Adjuvant to Levobupivacaine for Postoperative Analgesia in Lower Abdominal and Pelvic Surgeries under Epidural Anesthesia(Randomized Controlled Trial) Two groups, each with fifty patients undergoing lower abdominal and pelvic surgeries with epidural anesthesia. Group M received 15 ml of a mixture of 14 ml levobupivacaine 0.5%, 0.5 ml magnesium sulfate 10% (50 mg), and 0.5 ml 0.9 NaCl at induction. Group L received 15 ml of 14 ml levobupivacaine 0.5% and 1 ml 0.9 NaCl at induction. Then, continuous infusion was used as 5 ml/h

of the specific mixture of each group till the end of the surgery. The time for first dose rescue analgesic was significantly longer in the M group compared to the L group , associated with shortening of the time to reach motor and sensory block, prolongation of postoperative analgesia without hemodynamic implications or complications.

According to present study, none of the patients was noticed to have respiratory depression or deterioration in conscious level. There was no significant difference in hemodynamics between three groups. No severe bradycardia or hypotension occurred with any of the two groups.

In this study, we tried to detect incidence of side effects associated with fentanyl and magnesium as an additives to epidural levobupivacaine. The patients of the fentanyl group who developed nausea were 33% of the total number of the group but only 10% of the patients of the magnesium group did and this difference was statistically significant. Also, in fentanyl group, 16.7% of patients experienced vomiting while in magnesium group was 3.3%. Itching presented only in fentanyl group and about 16.7% of the patients were complaining of pruritus. Pain with injection occurred with magnesium group, about 13% of patients reported mild pain with epidural magnesium administration. All these side effects percentages differences was statistically significant.

In consistence with the present study, the study of **Yu and Gambling** [(11)] which studied the effect of dexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedic surgeries. They found that there was statistical significance as regards the side effect itching and vomiting with epidural administration of fentanyl.

Also **Tanmoy *et al.*** [(12)] in a comparison study between magnesium sulphate and clonidine as adjuvants epidurally, studied 90 patients undergoing elective lower abdominal and lower limb surgeries aged 18 to 60 years of either gender, belonging to American Society of Anesthesiology physical status I and II, with ±20% of ideal body weight.

Patients were classified into 3 groups: Group A: (control group): bupivacaine 0.5% (19 ml) + saline 0.9% (1ml). Group B: bupivacaine 0.5% (19 ml) + magnesium sulphate 50 mg (in 1 ml 0.9% saline) Group C**:** bupivacaine 0.5% (19 ml)+clonidine 150 mcg (1 ml).

They found that no patients in the magnesium sulfate group experienced itching or vomitting, while 15% experienced pain with injection.

CONCLUSION

It could be concluded that magnesium sulfate and fentanyl are good adjuvants to local anaesthetics when given epidurally, fentanyl provides more duration of analgesia but with more incidence of nausea vomiting and pruritis when compared to magnesium sulfate, but magnesium sulfate show more incidence of pain with injection.

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