

Effect of pre-emptive epidural Mg sulphate versus Dexmedetomidine on postoperative analgesia requirement after open abdominal surgeries

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Abstract

Background: epidural approach is used to provide anaesthesia and analgesia (pain relief) in abdominal surgeries.

Objectives: To estimate total cumulative dose of post-operative rescue analgesia & to estimate time to 1st post-operative analgesic request.

Patients and methods: A prospective randomized double blind observational study. Conducted in Qena university hospital, South Valley University, Qena, Egypt. The study was conducted on sixty patients (ASA I or II) scheduled for major abdominal surgeries with general anesthesia combined with epidural anesthesia were included. Their ages ranged between 25 and 60 years old.

Results: Regarding assessment of post-operative pain by visual analogue scale (VAS) we find that there was statistically significant difference between the three groups 24hour post-operative. there were significant difference (P<0.05) about the time to reach VAS 4 , that the time to reach VAS 4 in dexmedetomidine group is longer than the time to reach VAS 4 in Mg sulphate group than the time to reach VAS 4 in control group.

Conclusion: Epidural Dexmedetomidine and Epidural Magnesium sulphate are safe in open abdominal surgeries and effectively reducing postoperative pain with longer duration of analgesia in Dexmedetomidine group

Keywords: Epidural approach; Magnesium sulfate; Dexmedetomidine

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Introduction

Epidural approach is used to provide anesthesia and analgesia (pain relief) in abdominal surgeries (Liu et al., 1995). It is very reliable, safe and has a low failure rate. Production of anesthesia is done by injection of a local anesthetic agent into the epidural space which is a space inside bony spinal canal outside the dura mater). It may be the sole anesthetic or combined with spinal or general anesthesia (Sharma et al., 2019).

Some adjuvants like opioids are used to lengthen the effectiveness of the regional anesthetic agent. But, there were some disadvantages when adding opioids to local anesthetic solution has, such as respiratory depression and pruritus (Gupta et al., 2011).

Dexmedetomidine is one of the selective α_2 -agonists. It is used to be a neuroaxial adjuvant because it can offer stable hemodynamic circumstances, perfect level of intraoperative state and less side effects and increase the time of postoperative analgesia at the same time (Magdy et al., 2015). Intrathecal α_2 -adrenoceptor agonists can lengthen the motor and sensory block of local anesthetics through binding to both presynaptic C-fibers and postsynaptic dorsal horn neurons. So decrease the release of transmitters(C-fiber) and over stimulation of postsynaptic dorsal horn neurons (Mohamed et al., 2012).

Magnesium is considered the 4th most abundant cation inside the human body and the in the second stage as strongest intracellular cation (Afsani, 2010).It can stop Ca^{++} influx also can noncompetitively antagonize NMDA receptor channels.

All these actions have encouraged the use of magnesium as an

adjuvant agent for intra operative and postoperative analgesia of severe pain (Soave et al., 2009). We aimed to estimate total cumulative dose of post-operative rescue analgesia (1st outcome).Additionally, to estimate time to 1st post-operative analgesic request (2nd outcome)

Patients and methods

Our study is a prospective double-blind randomized controlled study that carried out in Hospital of south Valley University. After obtaining written consent from all patients.

Patients

Sixty patients listed for prolonged abdominal surgeries with general anesthesia combined with epidural anesthesia were included. Their ages ranged between 25 and 60 years old. Patients were randomly divided into 3groups (20 patients each):

Group M: was given Bupivacaine 0.25 % (10ml) + magnesium sulfate 50 mg (in 1 ml 0.9% saline).

Group D: Bupivacaine 0.25 % (10ml) + dexmedetomidine 0.5 μ g/kg (in 1 ml 0.9% saline).

Group C: Bupivacaine 0.25% (10ml) + 1 ml 0.9% saline (controlled group).

Methods

1. Preoperative preparation

We assessed the pain by using visual analogue scale (VAS) but first all patients were taught how to answer the scale.

2. Placement of epidural needle

At first, we placed the epidural catheter for all patients in sitting position. A 20-gauge multi-orifice epidural catheter was chosen to be inserted 5 cm into the epidural space in a cephalic direction and aspirated for detection of cerebrospinal fluid or blood.

3. Induction and maintenance of general anesthesia

Induction of anesthesia was made by giving all participants 2mg/kg propofol, Fentanyl 1.5µg/kg, atracurium 0.5mg/kg is given to help intubation by inducing muscular relaxation. All epidural study medications will be injected after induction of general anesthesia.

Patients were monitored during surgery with pulse oximetry ECG and non-invasive blood pressure.

4. Recovery

visual analog scale (VAS) is used to measure the intensity of pain after operation (a 10-mm scale with '0' indicating no pain and '10' indicating worst pain ever). The duration of analgesia or pain-free duration is defined as the time elapsed since the epidural injection until the first request of rescue analgesia. Rescue analgesia given when the patient had a VAS score of 4 or more during 24 h postoperative. Rescue analgesia was 50mg of pethidine per dose.

Statistical analysis

Our data were analyzed by the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continues data were expressed as mean± standard deviation (SD). Qualitative data

were expressed as frequency and percentage. Test of significances: chi-square test was used to compare the difference in distribution of frequencies among different groups. For continuous variables; ANOVA test was carried out.

Results

There were no significant differences between dexmedetomidine group, Mg sulphate group and control group as regards age, sex, height as shown in (Table 1).

Regarding assessment of post-operative pain by visual analogue scale (VAS) we find that there was statistically significant difference between the three groups 24 hour (Table 2).

In comparison between D group, M group and control group, there were significant difference ($P < 0.05$) about the cumulative dose of pethidine, that cumulative dose of pethidine in dexmedetomidine group is less than the cumulative dose of pethidine in Mg sulphate group than the cumulative dose of pethidine in control group (Table 3). There were no complications observed as regard to heart rate and systolic blood pressure in dexmedetomidine group and Mg sulphate group (Fig.1).

Table 1. Demographic Data of the study groups

Variables	Control group	Group M	Group D	P value
Age	39.8±9.5	39.2±9.1	41.1±9.2	.7
Male/ Female	10/10	10/10	10/10	1
Weight	70±7.9	75±7.3	75±6.5	.05*
Height	165.5±7.1	165.3±7.9	167.5±6.9	0.5

*ANOVA test

Table 2. Post-operative pain assessment using visual analogue scale (VAS)

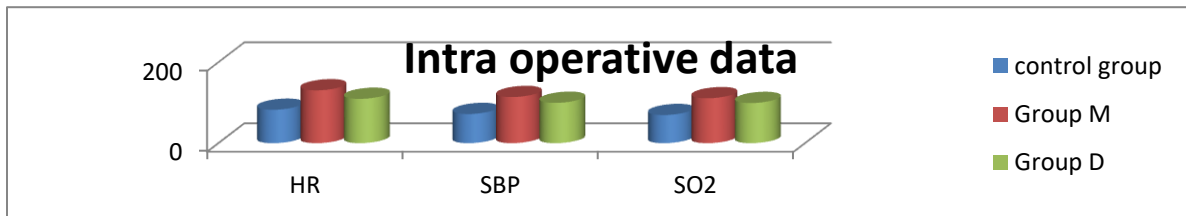
Variables	Control group	Group M	Group D	P value
30 minutes	4.1±1.8	.8±1	.7±1	.000*
60 minutes	2.2±1.8	1.4±1.2	1±1.1	.03*
90 minutes	1.8±1.3	1.6±1	1.4±1.4	.6
2 hours	2.2±1.3	2.1±.9	1.1±.7	.002*
4 hours	2.4±1.3	2.7±.8	2±.8	.09
8 hours	3.5±1.6	2.1±1.1	1±.8	.000*
10 hours	2.8±1.2	1.8±.9	.8±1.3	.000*
12 hours	2.3±1.5	2.2±.6	1.1±.9	.001*
16 hours	3±1.3	3.6±.7	1.7±1	.000*
20 hours	2.5±1.5	2.8±1.9	2.1±.9	.2
24 hours	2.7±.9	2.5±.5	1.5±.7	.000*

*ANOVA test
 *means (p < 0.05).

Table 3. Duration of analgesia and cumulative dose of pethidine

Variables	Control group	Group M	Group D	P value
Duration of analgesia	.4±.4	3.2±1.4	4.9±1.9	.000*
Cumulative dose of pethidine	165±32.8	115±23.5	65±23.5	.000*

*ANOVA test



*means (p < 0.05).

Fig.1. Comparison of heart rate, systolic blood pressure and oxygen saturation among study groups

Discussion

As regard intraoperative and postoperative heart rate according to our results there were significance difference between three groups, there were a significant reduction in heart rate as were less group D than group M than control group.

As regard intraoperative and postoperative systolic blood pressure according to our results there were significance difference between three groups, there were a significant decrease systolic blood pressure as were less group D than group M than control group.

Regarding assessment of post-operative pain by visual analogue scale

(VAS) we find that there was statistically significant difference between the three groups 24hour.

There is a statistical significant difference between the three groups (p value < 0.05), as (VAS) was higher in control group than in M group than D groups. In comparison between D group, M group and control group, there were significant difference (P<0.05) about the time to reach VAS 4, that the time to reach VAS 4 in dexmedetomidine group is longer than the time to reach VAS 4 in Mg sulphate group than the time to reach VAS 4 in control group. These results in accordance with **Shahi, et al. (2014)** studied One hundred and twenty 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. AS The time from epidural medication to first epidural top up was longest (587.8 ± 64.3 min) in dexmedetomidine group followed by magnesium group (266.3 ± 60.9 min) and with a shortest (157.3 ± 23.8 min) in control group of patients. The differences among groups were highly significant (P < 0.001).

There was statistically significant difference (P < 0.001) in the mean pulse rate of the three groups. there were a significant reduction in heart rate as were less group D than group M than C group.

BUT this study not agree with our results, as There was no statistically significant difference (P > 0.05) in the MAP of the three groups

Also in accordance with **Karhade et al. (2015)** studied 60 American Society of Anesthesiologists I and II patients

requiring vaginal hysterectomy were enrolled. Patients were randomly divided into two groups : group I: Control group receiving epidural bupivacaine 0.5% 15–20 ml only, group II: Group receiving of epidural bupivacaine 0.5% 15–20 ml with dexmedetomidine 05 mcg/kg. AS, the time for rescue analgesia was shorter with group I (150.24 ± 24.42) as compared to group II (320.62 ± 23.86). The group II experienced the prolonged pain free period as compared to group I. Our result also agree with **Yehia et al. (2019)** studied 60 patients undergoing surgery who were randomized into three groups for postoperative epidural analgesia: group B bupivacaine, group BM bupivacaine plus MgSO₄, and group BD bupivacaine plus dexmedetomidine. Group BD showed statistically significantly early onset at 8.25 ± 1.1 min versus 9.8 ± 1.5 min in group BM and 10.075 ± 1.3 min.

Conclusion

Epidural Dexmedetomedine and Epidural Magnesium sulphate are safe in open abdominal surgeries and effectively reducing postoperative pain with longer duration of analgesia in Dexmedetomedine group than Magnesium sulphate group with no obvious side effects in both groups.

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