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STUDY ON THE EFFECT OF COMBINED SPINAL AND EPIDURAL MAGNESIUM ON ANALGESIC REQUIREMENTS OF PATIENTS UNDERGOING INFRAUMBILICAL SURGERIES

Anaesthesiology

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ABSTRACT

Background- Regional anaesthesia is safe inexpensive technique with the advantage of prolonged postoperative pain relief. Effective treatment of postoperative pains blunts the somatic, autonomic and endocrine responses. The use of additives during regional techniques provides adequate pain relief prolonging the duration and sometimes minimise the side effects too.
Aims And Objectives- To assess the effectiveness of intrathecal and epidural magnesium in reducing intra and post-operative analgesic requirements. To compare the quality of analgesia of intrathecal bupivacaine- fentanyl-magnesium mixture with intrathecal bupivacaine-fentanyl mixtures.
Results-This study demonstrates that addition of magnesium to bupivacaine fentanyl mixture definitely improves the quality of analgesia by reducing the overall pain score, prolonging the duration of the time of first rescue analgesia and causing reduction of total analgesic consumption in the postoperative period without any hemodynamic instability
Conclusion-1. Single dose administration of intrathecal and epidural magnesium to intrathecal bupivacaine-fentanyl mixture provides effective postoperative analgesia in patients undergoing elective infra-umbilical surgeries, without any hemodynamic instability. 2. Epidural magnesium significantly reduces the postoperative analgesic requirements.

KEYWORDS

magnesium, infra umbilical surgeries, combined spinal and epidural anesthesia

INTRODUCTION

Regional anesthesia is a safe, inexpensive technique with the advantage of prolonged postoperative pain relief. Effective treatment of postoperative pain blunts autonomic, somatic, and endocrine responses. It has become a common practice to use a poly pharmacological approach for the treatment of postoperative pain, because no drug has yet been identified that specifically inhibits nociception without associated side effects. Magnesium is the fourth most plentiful cation in the body. It has anti-nociceptive effects in animal and 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 NMDA receptor. It has been reported that intrathecal magnesium enhances opioid anti-nociception in an acute incisional model. These effects have prompted the investigation of magnesium as an adjuvant for postoperative analgesia. There are studies concerning different routes of magnesium administration such as i.v or intrathecally or epidurally that improve anesthetic and analgesic quality.

This study is designed to assess the effectiveness of using intrathecal and epidural magnesium (Mg) in reducing intra and post-operative analgesic requirements and to compare the quality of analgesia of intrathecal bupivacaine fentanyl-magnesium mixture with intrathecal bupivacaine-fentanyl mixture.

AIMS AND OBJECTIVES

1.To assess the effectiveness of using intrathecal and epidural magnesium (Mg) in reducing intra and post-operative analgesic requirements.
2.To compare the quality of analgesia of intrathecal bupivacaine-fentanyl-magnesium mixture with intrathecal bupivacaine-fentanyl mixture.
3.To evaluate the hemodynamic response of intrathecal and epidural magnesium.

POSTOPERATIVE ANALGESIA IN INFRAUMBILICAL SURGERIES

Postoperative pain is of major concern after orthopaedic lower limb surgeries. Pain is moderate to severe at rest and exacerbated on movement and particularly after hip and knee surgery and by severe reflex muscular spasm. This not only causes patient discomfort but also compromise the early physical therapy, the most influential factor on rapid postoperative rehabilitation and ambulation.

Postoperative pain relief can be achieved by a number of techniques such as intravenous patient-controlled analgesia (PCA) or epidural analgesia. Effective analgesia with epidural or peripheral block reduces narcotic requirements, provides better analgesia, reduces catabolism and results in improved rates of rehabilitation after orthopedic lower limb surgeries.

The benefits of effective postoperative analgesia in orthopedic surgeries was made evident by the fact that it facilitates early ambulation which is beneficial in the prophylaxis of deep vein thrombosis, which is a common problem encountered in orthopedics. Postoperative modalities like pneumatic compression boots, foot pumps, foot exercises, aspirin and low dose warfarin (started the day after surgery) can be safely used in conjunction with epidural anesthesia to reduce the incidence of deep vein thrombosis.

MATERIALS AND METHODS

Patient selection: The study population consist of 40 ASA I & ASA II patients in the age group of 18 years to 65 years admitted to undergoing infra-umbilical surgeries at Santhiram Medical college & general hospital, Nandyal during the period of December 2014 to November 2016. After getting approval from the institutional ethical committee and after obtaining written informed consent from each patient, the study was conducted.

Inclusion Criteria:

1.Age Group 18 – 65 years
2.ASA I and ASA II Groups
3.Elective Infra-umbilical surgeries
4.Duration of Surgery between 1:00 to 2:30 hours.

Exclusion Criteria:

1.Patient refusal
2.Patients with preexisting renal problems
3.Allergy to any of the study medications
4.Preoperative hypotension
5.Local infection at lumbar area
6.Pre-existing neurological disorders
7.Coagulation defects and patient on anticoagulants

Preoperative Assessment:

-Routine clinical examination
-Biochemical investigations
-Electrocardiogram and chest x-ray were examined thoroughly for the conduct of anesthesia.

Conduct Of Anesthesia

Patients were allocated randomly into two equal groups (20 in each group). Group P (placebo) received intrathecal 12.5 mg of hyperbaric bupivacaine 0.5% (2.5ml) plus 25 µg of fentanyl (0.5 ml) plus 0.9%

NaCl solution (1 ml). Total intrathecally injected volume is 4 ml. Epidural infusion of 0.9% NaCl solution is given in first hour of surgery at the rate of 5ml/hr.

Group M (Magnesium) received intrathecal 12.5 mg of hyperbaric bupivacaine 0.5% (2.5 ml) plus 25 µg of fentanyl (0.5 ml) plus 50 mg of 5% magnesium sulphate (1 ml). Total intrathecally injected volume is4ml. Epidural infusion of 2 % magnesium sulphate is given at the rate of 100 mg/hr (5 ml/hr) during first hour of surgery.

5 % magnesium sulphate solution is prepared by mixing 1 ml of 50% magnesium sulphate with 9 ml of preservative free sterile water. 2% magnesium sulphate is prepared by mixing 1 ml of 50% magnesium sulphate with 24 ml sterile water.

No premedication was given. On arrival in the operating room, baseline cardiorespiratory parameters viz., Heart Rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP), Respiratory rate (RR), Spo2 were recorded.

A good intravenous access was established using 18G IV cannula.

Preloading was done with crystalloids (10 ml/kg).

A standard anesthetic technique was followed in all patients.

With the patient in sitting posture, after informing the procedure to the patient & under strict aseptic precautions, epidural space was identified at L2-L3 interspace using 18G Tuohy needle by loss of resistance technique. 20G epidural catheter was threaded in a cephalad direction & 3 cm catheter length was kept inside the epidural space. A test dose of 3 cc of 1.5 % lignocaine with adrenaline (5 µg/ml) was given. Spinal anesthesia is performed at L3-L4 interspace. Epidural catheter was fixed and secured with tapes. The epidural catheter is then connected to infusion pump that is disconnected after first hour of surgery. Patients with duration of surgery between 1-2:30 hours were only included in the study. Unanticipated prolonged duration of surgery was excluded from the study.

Time of incision is noted.

Intra-operatively the patient was monitored with ECG, BP and SpO2.

The following parameters were monitored every 10 mins:
Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP), Respiratory rate (RR), Oxygen saturation (SpO2). Urine output was monitored hourly all patients were given oxygen supplementation (4-5 L/min) through Hudson's face mask. No intravenous opioid analgesics were supplemented during the study. Intravenous fluid management was done based on mean arterial blood pressure and surgical blood loss.

RAMSAY SEDATION SCALE:
1.Patient is anxious and agitated or restless, or both
2.Patient is co-operative, oriented and tranquil
3.Patient responds to commands only
4.Patient exhibits brisk response to glabellar tap or loud auditory stimulus
5.Patient exhibits sluggish response to glabellar tap or loud auditory stimulus.
6.Patient exhibits no response

POST- OPERATIVE MONITORING:
-The epidural catheter was retained in position. Postoperatively the patient was transferred to the Post Anesthetic Care Unit (PACU) where PR, SBP, DBP, SPO2 & RR monitored continuously and recorded every hour.
-The intensity of pain was measured by using the verbal rating pain scale.

Pain Score (Verbal Rating Score):
Grade0 - No complaint of pain
Grade1 - Patient complaints of pain but tolerable (mild pain)
Grade2 -Patient complaining of severe pain and demands relief (Moderate pain)
Grade3-Patient restless and screaming with pain (Severe pain)

When the patient complaints of pain, the pain intensity was assessed based on verbal rating scale & if pain score reaches 1, epidural top up of 6ml of 0.125% bupivacaine was given to the patient. The time of first rescue analgesia (TFA) was calculated from the time of injection of study drug in the central neuraxial block to the time when the verbal rating pain score reached 1 in the postop period.

S.NO	DIAGNOSIS AND SURGICAL PROCEDURES	NO. OF CASES	
		GROUP P	GROUP M
1.	Fracture shaft of femur- ORIF with interlocking nailing / plating	6	7
2.	Fracture both bones leg- ORIF with intramedullary nailing / plating	6	5
3.	Hernia repair surgeries	5	5
4.	Supracondylar fracture femur – ORIF with Dynamic Condylar Screw (DCS)	2	3
5.	OPEN APPENDICECTOMY	1	-
	TOTAL CASES	20	20

Number of epidural top-ups (6 ml of 0.125% bupivacaine) required by each patient for a period of 48 hours was noted in both the groups.

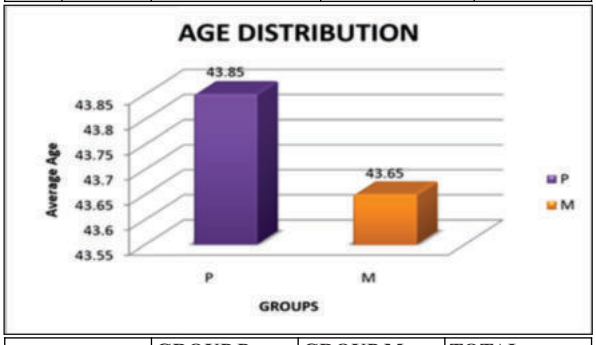
OBSERVATION & RESULTS
LIST OF ELECTIVE INFRAUBILICAL SURGERIES

STATISTICS AND ANALYSIS
40 Patients were allocated randomly into two equal groups (20 in each group). Group P (placebo) received intrathecal 12.5 mg of hyperbaric bupivacaine 0.5% (2.5 ml) plus 25 µg of fentanyl (0.5 ml) plus 0.9% NaCl solution (1 ml). Total intrathecally injected volume is 4 ml. Epidural infusion of 0.9% NaCl solution is given in first hour of surgery at the rate of 5ml/hr.

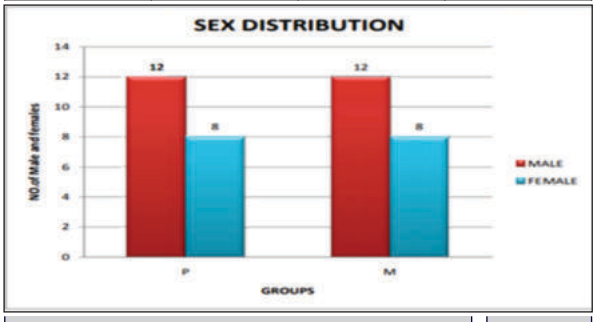
Group M (Magnesium) received intrathecal 12.5 mg of hyperbaric bupivacaine 0.5% (2.5 ml) plus 25 µg of fentanyl (0.5 ml) plus 50 mg of 5% magnesium sulphate (1 ml). Total intrathecally injected volume is 4 ml. Epidural infusion of 2 % magnesium sulphate is given at the rate of 100 mg/hr (5 ml/hr) during first hour of surgery.

Demographic Profile
Table- 1 Comparison Of Age Distribution

S.NO	PARAMETERS	GROUP		P VALUE
		GROUP P	GROUP M	
		MEAN ± SD	MEAN ± SD	
1.	Age (yrs)	40.60 ± 7.40	36.85 ± 9.59	P-0.961

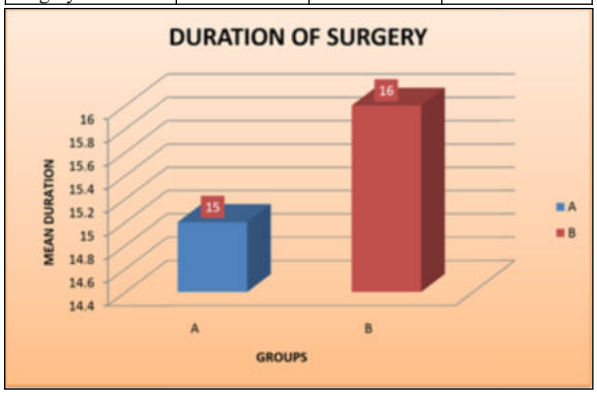


	GROUP P	GROUP M	TOTAL
MALE	12(60%)	12(60%)	24 (60%)
FEMALE	8 (40%)	8(40%)	16(40%)
TOTAL	20	20	40



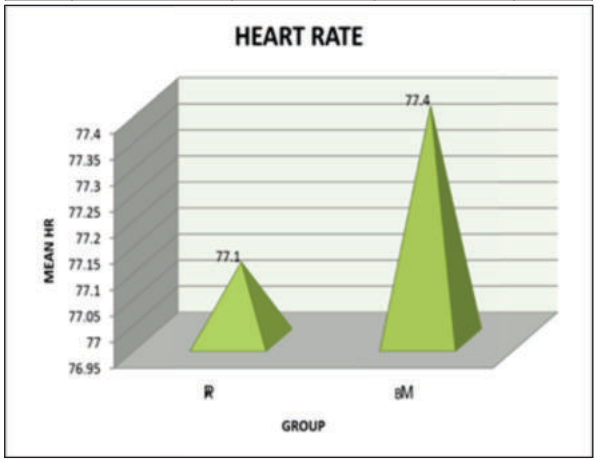
Duration Of Surgery

	GROUP P	GROUP M	P VALUE
Duration Of Surgery	2.14 ± 0.07	2.12 ± 0.07	P – 0.359



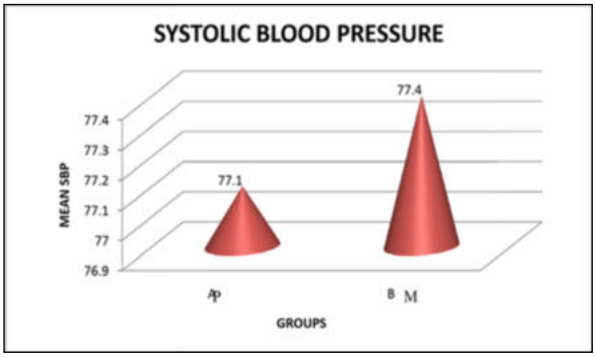
HEART RATE

S NO.	PARAMETER in (MINUTES)	GROUP		P VALUE
		GROUP P	GROUP M	
		MEAN ± SD	MEAN ± SD	
1.	HR PRE-OP	77.10 ± 12.165	77.40±12.072	0.938
2.	HR10	76.0 ± 13.673	75.30 ± 10.668	0.858
3.	HR20	73.15 ± 12.554	73.60 ± 14.192	0.916
4.	HR30	72.55 ± 10.797	72.65± 12.449	0.978
5.	HR40	72.05± 11.436	71.95 ± 12.089	0.979
6.	HR50	71.35 ± 10.908	71.05± 11.274	0.932
7.	HR60	71.55 ± 9.139	71.30 ± 9.336	0.932
8.	HR70	71.40 ± 9.561	70.80 ± 9.567	0.844
9.	HR80	71.85 ± 8.054	71.00 ± 8.541	0.748
10.	HR90	72.35 ± 8.087	71.90± 8.422	0.864
11.	HR100	69.25 ± 16.767	71.85 ± 8.273	0.538
12.	HR110	72.20 ± 7.971	72.25 ± 8.130	0.984
13.	HR120	72.10 ± 7.986	73.00 ± 8.348	0.729



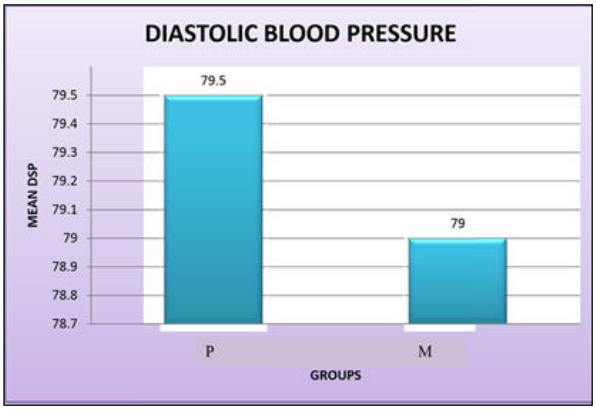
Systolic Blood Pressure

S NO.	PARAMETERS (MINUTES)	GROUP		P VALUE
		GROUP P	GROUP M	
		MEAN ± SD	MEAN ± SD	
1.	SBP PRE-OP	131.70 ± 13.079	131.20 ± 12.935	0.904
2.	SBP 10	116.20 ± 16.795	117.40± 16.430	0.821
3.	SBP 20	109.90 ± 16.124	111.60 ± 16.436	0.743
4.	SBP 30	109.20 ± 13.664	110.80 ± 12.387	0.700
5.	SBP 40	108.75± 9.585	109.85 ± 9.959	0.724
6.	SBP 50	108.10 ± 9.765	108.40 ± 10.107	0.924
7.	SBP 60	107.05 ± 6.117	108.85± 8.689	0.453
8.	SBP 70	107.80 ± 8.703	107.20± 10.165	0.842
9.	SBP 80	110.20± 12.597	108.70± 8.832	0.665
10.	SBP 90	108.65 ± 7.513	110.95± 10.380	0.427
11.	SBP 100	110.40 ± 9.052	111.20 ± 9.140	0.782
12.	SBP 110	107.05± 8.036	111.45± 8.457	0.100
13.	SBP 120	107.40 ± 12.193	109.90± 10.906	0.498



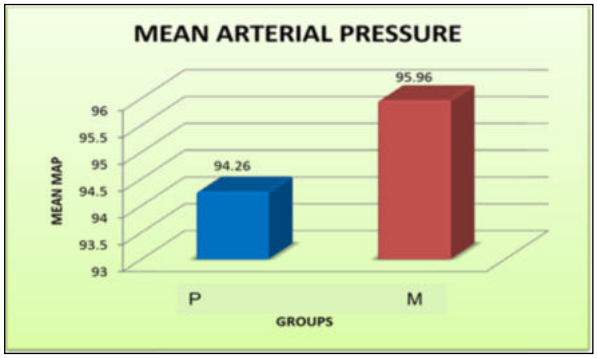
Diastolic Blood Pressure

S NO.	PARAMETERS (MINUTES)	GROUP		P VALUE
		GROUP P	GROUP M	
		MEAN ± SD	MEAN ± SD	
1.	DBP PRE OP	79.50 ± 11.311	79.00± 10.964	0.888
2.	DBP 10	67.25 ± 12.494	67.70± 12.368	0.909
3.	DBP 20	61.40± 11.718	60.40 ± 11.798	0.789
4.	DBP 30	62.20 ± 8.557	63.80 ± 7.757	0.539
5.	DBP 40	62.50± 8.307	63.00 ± 8.448	0.851
6.	DBP 50	63.20 ± 7.824	63.20 ± 8.715	1.000
7.	DBP 60	62.85 ± 10.017	63.75 ± 9.176	0.769
8.	DBP 70	63.75± 8.410	62.60 ± 8.611	0.671
9.	DBP 80	66.90 ± 9.026	68.30± 8.517	0.617
10	DBP 90	65.70 ± 8.417	67.70± 5.992	0.392
11.	DBP 100	63.50± 8.127	65.50 ± 8.325	0.425
12.	DBP 110	64.20± 8.154	65.20 ± 9.024	0.715
13.	DBP 120	65.10±10.062	65.10 ± 9.525	1.000



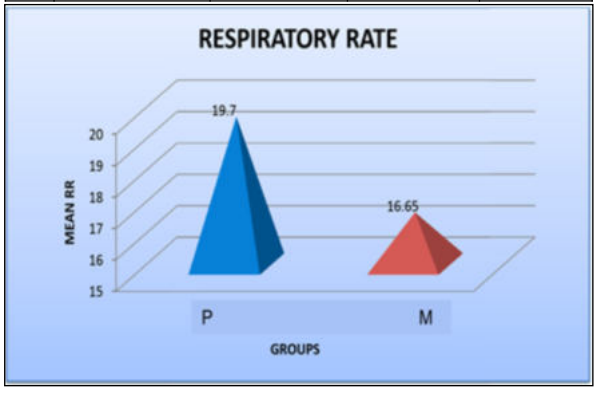
Meanarterial Pressure

S. NO.	PARAMETERS (MINUTES)	GROUP		P VALUE
		GROUP P	GROUP M	
		MEAN ± SD	MEAN ± SD	
1.	MAP PRE-OP	94.2665 ± 13.53558	95.9665 ± 10.87998	0.664
2.	MAP 10	84.05 ± 14.262	83.85± 13.228	0.964
3.	MAP 20	78.70 ± 13.215	78.00± 13.310	0.868
4.	MAP 30	77.05 ± 9.534	78.70± 8.921	0.575
5.	MAP 40	77.2165 ± 8.32811	78.0165 ± 8.42322	0.764
6.	MAP 50	77.5330 ± 7.39585	78.2330 ± 7.88920	0.774
7.	MAP 60	78.30 ± 7.895	78.30 ± 8.535	1.000
8.	MAP 70	76.8330 ± 8.66450	76.9830 ± 8.62051	0.957
9.	MAP 80	79.2500 ± 8.69891	81.1165± 8.88860	0.506
10.	MAP 90	82.1665 ± 8.50967	81.3500± 8.00181	0.756
11.	MAP 100	77.7000 ± 7.86799	80.5165± 9.22643	0.305
12.	MAP 110	76.3830 ± 7.69053	79.0830 ± 0.13223	0.348
13.	MAP 120	76.95 ± 10.733	77.60± 10.382	0.314



Respiratory Rate

S NO.	PARAMETERS (MINUTES)	GROUP		P VALUE
		GROUP P	GROUP M	
		MEAN ± SD	MEAN ± SD	
1.	RR PRE OP	19.70 ± 13.534	16.65 ± 2.777	0.330
2.	RR 10	18.00 ± 3.195	17.95± 3.316	0.962
3.	RR 20	17.70 ± 2.993	17.90 ± 2.789	0.828
4.	RR 30	17.85 ± 2.834	17.65 ± 2.815	0.824
5.	RR 40	17.50± 3.426	17.20 ± 3.334	0.780
6.	RR 50	16.70± 2.867	16.50 ± 2.911	0.828
7.	RR 60	17.10 ± 2.789	17.00±2.636	0.908
8.	RR 70	17.35 ± 2.434	17.05 ± 2.460	0.700
9.	RR 80	17.10 ± 2.469	17.20± 2.546	0.900
10	RR 90	17.30± 2.774	16.70 ± 3.511	0.552
11.	RR 100	16.50± 2.819	16.60 ± 3.050	0.915
12.	RR 110	16.70± 2.922	16.80 ± 2.858	0.913
13.	RR 120	16.30 ± 2.922	17.10±3.144	0.410



Ramsay Sedation Scale

TIME	RSS	GROUP P	GROUP M	TOTAL
30 Mts	1.Count % within Group	20 (100%)	12 (60%)	32 (80%)
	2.Count % within Group	0 (0%)	8 (40%)	8 (20%)
60 Mts	1.Count % within Group	20 (100%)	0 (0%)	20 (50%)
	2.Count % within Group	0 (0%)	20 (100%)	20 (50%)
90 Mts	1.Count % within Group	20 (100%)	6 (30%)	26 (65%)
	2.Count % within Group	0 (0%)	14 (70%)	14 (35%)
120 Mts	1.Count % within Group	0 (0%)	14 (70%)	14 (35%)
	2.Count % within Group	0 (0%)	1 (5%)	1 (2.5%)

According to Chi- square test, RSS was significant at 30 min (P-0.003), 60 min (P<0.001) and 90 min (P<0.001). RSS was not significant at120min.

Verbal Rating Scale

Time in Hours	Verbal Rating Scale	Group P	Group M	Total	Chi-square Test
2	1.Count % within Group	18 (90%)	20 (100%)	38 (95%)	P-0.487 NOT SIG
	2 Count % within Group	2 (10%)	0 (0%)	2 (5%)	
4	1.Count % within Group	0 (0%)	19 (95%)	19 (47.5%)	P < 0.001 SIG
	1 Count % within Group	16 (80%)	1 (5%)	17 (42%)	
	2 Count % within Group	4 (20%)	0(0%)	4 (10%)	
6	1.Count % within Group	6 (30%)	8 (40%)	14 (35%)	P-0.741 NOT SIG
	2 Count % within Group	14 (70%)	12 (60%)	26 (65%)	
8	1.Count % within Group	0 (0%)	4 (20%)	4 (10%)	P-0.072 NOT SIG
	2 Count % within Group	19 (95%)	16 (80%)	35 (87.5%)	
	3 Count % within Group	1(5%)	0(0%)	1 (2.5%)	
12	1.Count % within Group	0 (0%)	2 (10%)	2 (5%)	P<0.001 SIG
	2 Count % within Group	7 (35%)	18 (90%)	25 (62.5%)	
	3 Count % within Group	13(65%)	0(0%)	13 (32.5%)	
18	1.Count % within Group	5 (25%)	11 (55%)	12 (30%)	P-0.004 SIG
	3 Count % within Group	15 (75%)	5(25%)	20(50%)	
24	1.Count % within Group	1 (5%)	11 (55%)	12 (30%)	P-0.001 SIG
	2 Count % within Group	19 (95%)	9(45%)	28(70%)	
36	2 Count % within Group	18 (90%)	20 (100%)	38 (95%)	P-0.487 Not SIG
	3 Count % within Group	2 (10%)	0 (0%)	2 (5%)	
48	1.Count % within Group	0 (0%)	2 (10%)	2 (5%)	P-0.487 Not SIG
	2 Count % within Group	20 (100%)	18 (90%)	38(95%)	

Time Of First Rescue Analgesia

	GROUP		P VALUE
	GROUP P	GROUP M	
	MEAN ± SD	MEAN ± SD	
Time of first rescue analgesia(hrs)	3.27 ±0.53	6.05 ± 0.65	0.001 SIGNIFICANT

No. Of Post Operative EPIDURALTOP-UPS

GROUPS	NO. OF EPIDURAL TOP UPS				AVERAGE NO OF EPIDURAL
	4	5	6	7	TOP UPS
GROUP P	-	-	15	5	6.25
GROUP M	19	1	-	-	4.05

DISCUSSION

Our knowledge of acute pain mechanisms has advanced sufficiently over the past decade so that rational rather than empirically derived therapy can be used by aiming specifically at interrupting the mechanisms responsible for the generation of clinical pain. Breakthrough pain after surgical procedures is now beginning to be recognized as constituting suboptimal management. This is an active research area. A number of clinical trials have been conducted to prove the efficacy of anti- nociceptive effect of magnesium using different techniques and different types of drugs with conflicting results. The use of epidural techniques also offers the advantage of effective prolonged postoperative analgesia as compared to nerve blocks and local infiltrations.

Noxious stimulation leads to the release of neurotransmitters which bind to various sub classes of excitatory amino acid receptors, including NMDA receptors. So NMDA receptor antagonists may play a role in the prevention and treatment of post injury pain.

Magnesium blocks calcium influx and non-competitively antagonizes NMDA receptor channels. Non-competitive NMDA receptor antagonists can have an effect on pain when used alone, but it has also been shown that they can reveal the analgesic properties of opioids.

The safety of intrathecal and epidural magnesium administration has been evaluated in animal and human studies that concluded that magnesium has a good safety profile with no serious side effects.

Since the amount of magnesium used in this is study is only 150 mg (50 mg intrathecally and 100 mg through epidural infusion), serum magnesium levels was not monitored during the study. In this study we found that magnesium administered intrathecally and epidurally reduced the amount of analgesic that patients required postoperatively suggesting that magnesium may enhance the analgesic effect of bupivacaine and fentanyl.

In this randomized control study, we have evaluated the analgesic efficacy of bupivacaine with fentanyl and magnesium mixture given through spinal route and epidural magnesium in patient undergoing elective.

Infra Umbilical Surgeries.

The level of sedation intraoperatively was monitored using Ramsay Sedation Scale. The patients in group M were well sedated and comfortable than in group P.

Pain intensity was assessed using the verbal rating scale (VRS) postoperatively. Significant lower VRS scores after 2, 4, 6, 8, 12, 18, 24, 26, 48 hours has in group M demonstrated the clinical advantage of administering mixture of bupivacaine, fentanyl and magnesium through spinal route for effective postoperative analgesia.

Duration of analgesia was significantly more in group M patients receiving bupivacaine, fentanyl and magnesium mixture as compared to group P. The demand for supplementary epidural top-ups over 48 hours postoperatively was significantly low in group M than group P.

Hala El-Kerdawyet al in 2008 conducted a similar study but they had a little different results. Duration of spinal anaesthesia was prolonged in magnesium group (182.8±19.1 mins) when compared to placebo group (164.4±16.9 mins). In our study the duration of spinal anaesthesia in magnesium group is 363±38 mins when compared to placebo group (195±32 mins). The difference in the results may be explained by the fact that El Kerdawy et al performed spinal at L3-L4 interspace or L4-L5 interspace whereas we did it in L2-L3 space and L3- L4 interspace. Total intrathecally injected volume of drug is also different. They used 3 ml whereas in our study it is 4ml.

Time for first rescue analgesia is also different in both studies. In our study, time for first rescue analgesia (TFA) in magnesium group is 363±38 mins. But in my parent study, time for first rescue analgesia (TFA) in magnesium group is 79 mins. This gross difference can be explained by difference in the definition of TFA in both studies.

El-Kerdawy et al defined time for first rescue analgesia as the time from the completion of surgery till the time of first use of rescue medication by PCEA. Since each surgery may have different durations, in our study, we defined time for first rescue analgesia as the time from the injection of the study drug in spinal anaesthesia to the time when verbal rating pain score reaches 1 in the postoperative period.

Two patients of placebo group (10% of group P) and two patients of magnesium group (10% of group M) had episodes of hypotension with a MAP< 70 mm Hg during intraoperative period who were managed with a single dose of ephedrine 6 mg iv and crystalloids, and this may be as a result of epidural bupivacaine as such.

Postoperatively none of the patients had episode of hypotension. No incidence of any bradycardia was noted in both the group during intraoperative and postoperative period.

The significant decrease in postoperative analgesic use obtained in this study is comparable with other studies that proved that intrathecal and epidural magnesium prolongs opioid analgesia and reduce postoperative analgesic requirements.

This finding is different from some studies which suggests that magnesium is not effective in anaesthesia. Their finding can be explained by the different route of magnesium administration (intravenous) they used, which may lead us to the fact that the true site of action of magnesium is spinal cord NMDA receptors.

SUMMARY

This randomized control study was designed to assess the effectiveness of using intrathecal and epidural magnesium (Mg) in reducing intra and post-operative analgesic requirements and to compare the quality of analgesia of intrathecal bupivacaine-fentanyl-magnesium mixture with intrathecal bupivacaine-fentanyl mixture.

Forty ASA I & II patients undergoing elective infra umbilical surgical procedures under epidural anaesthesia were randomly allocated into one of the two groups. Group P (placebo) received intrathecal 12.5mg of hyperbaric bupivacaine 0.5% (2.5 ml) plus 25 µg of fentanyl (0.5 ml) plus 0.9% NaCl solution (1 ml). Total intrathecally injected volume is 4 ml. Epidural infusion of 0.9% NaCl solution is given in first hour of surgery at the rate of 5 ml/hr.

Group M (Magnesium) received intrathecal 12.5 mg of hyperbaric bupivacaine 0.5% (2.5 ml) plus 25 µg of fentanyl (0.5 ml) plus 50 mg of 5% magnesium sulphate (1 ml). Total intrathecally injected volume is 4 ml. Epidural infusion of 2 % magnesium sulphate is given at the rate of 100 mg/hr (5 ml/hr) during first hour of surgery.

Pain in the post-operative period was assessed using a verbal rating scale (VRS). Time of first rescue analgesic (TFA) and the supplementary analgesic doses required for 24 hours were noted for the two groups. Pain score were significantly less in Group M at 2, 4, 6, 8, 12, 24, 48 hours ($P<0.05$) than in group P. Overall pain score over 48 hours period also revealed better pain relief in group M ($P<0.05$) as compared to Group P.

Time of first rescue analgesic (TFA) in group M was significantly prolonged compared with group P. The postoperative analgesic consumption was also significantly less in group M than in group P. The incidence of hypotension did not differ significantly between the two groups & there was no bradycardia in both the groups. So, this study demonstrates that addition of magnesium to bupivacaine-fentanyl mixture definitely improves the quality of analgesia by reducing the overall pain score, prolonging the duration of the time of first rescue analgesia and causing reduction of total analgesic consumption in the postoperative period without any hemodynamic instability.

CONCLUSION

Single dose administration of intrathecal and epidural magnesium to intrathecalbupivacaine-fentanyl mixture provides effective postoperative analgesia in patients undergoing elective infra-umbilical surgeries, without any hemodynamic instability.

Epidural magnesium significantly reduces the postoperative analgesic requirements.

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