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Original research article

Comparison of analgesic efficacy of plain bupivacaine versus bupivacaine and magnesium sulfate in ultrasound guided transversus abdominis plane block in lower abdominal surgeries

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Abstract

Aim and Objectives: To compare post-operative analgesic efficacy using Bupivacaine Vs Bupivacaine with Magnesium Sulfate in ultra sound guided transversus abdominis plane block in patients undergoing abdominal surgeries. To evaluate the duration of post-operative analgesic efficacy of these drugs; To assess postoperative haemodynamics; Post-operative pain score at 30min, 1hr, 2hr, 3hr, 4hr, 5hr, 6hr, 8hr, 12hr and 24hr; Immediate post-operative complications.

Methods: Prospective, randomized, double blinded, comparitive study. The study was conducted in the Department of Anaesthesiology in tertiary care hospital, Vijayawada from May 2022 to Nov 2022, on patients undergoing lower abdominal surgeries.

Results: All data were analysed and the demographic profile, duration of surgery and hemodynamic parameters were comparable in both group without any significant difference. The average duration of analgesia was 516 minutes in bupivacaine and Magnesium sulfate group compared to 277 minutes in plain bupivacaine group. Hence duration of analgesia was statistically significant in bupivacaine with Magnesium sulfate group when compared to bupivacaine group. The incidence of complications like post operative nausea, vomiting hypotension and bradycardia was similar in both groups, and it was not statistically significant. Thus the addition of Magnesium sulfate to bupivacine extended the duration of analgesia without any significant side effects in ultrasound guided Transversus abdominis Plane Block.

Conclusion: Ultrasound guided Transversus abdominis plane (TAP) block as a technique for providing postoperative analgesia is highly effective for lower abdominal surgeries. The addition of magnesium sulfate to bupivacaine in TAP block extended the duration of analgesia with minimal sedation when compared to plain bupivacaine without significant changes in hemodynamic parameters or complications.

Keywords: Postoperative, haemodynamics, Ultrasound guided, Transversus abdominis plane

Introduction

The pain associated with abdominal surgeries may be somatic and visceral. The major component is from the abdominal wall incision (i.e somatic). A technique called the transversus abdominis plane (TAP) block, blocks the afferents from the nerves supplying anterior abdominal wall (T6-L1) and can relieve this incisional pain. The Transversus abdominis plane is situated in between the internal oblique and transversus abdominis muscle [1, 3]. It contains the nerve fibres supplying anterior abdominal wall and can be blocked by local anaesthetics. Ultrasound guided transversus abdominis plane (TAP) block has been employed for pain relief in lower abdominal surgeries, With ultrasound, plane can be exactly located for delivery of drug, guide the block needle to target nerves or plane,thus prompting fewer attempts with higher success rate of block, helps in reducing the volume of local anaesthetic drugs used and lowers the side effects [4, 6].

The adjuvant drugs used with local anesthetics reduced the dose requirement of each agent with enhanced analgesic efficacy and decreased incidence of adverse reactions. Injection of Magnesium Sulfate has been suggested for enhancing the quality of nerve block. Magnesium ions have an inhibitory effect on postjunctional potentials and decrease in muscle fibre membrane excitability [7]. It also has an action on presynaptic potentials by competitively blocking the entry of calcium ions.

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Materials and Methods

Prospective, randomized, double blinded, comparitive study. The study was conducted in the Department of Anaesthesiology in tertiary care hospital, Vijayawada from May 2022 to Nov 2022, on patients undergoing lower abdominal surgeries.

Study population

60 patients of either sex between 18 - 45 years, ASA Grade I and II those posted for lower abdominal surgeries under spinal anesthesia were taken for the study.Institutional ethical committee approval was obtained. Permission from the collaborating department was also obtained. Written informed consent was obtained after the procedure was explained to the patient in their own mother tongue.

Detailed pre- aneaesthetic evaluation including history of previous medical illnesses, previous surgeries, general examination and routine investigations like Complete blood count, Blood glucose, renal function tests, liver function tests, BT, CT, ECG, Chest X ray were done as per institutional protocol. Patients fulfilling the inclusion criteria were randomly allocated to one of the groups.

Groups

GROUP B: Contains 30 patients: TAP BLOCK with 0.25%bupivacaine 20ml (each side) GROUP BM: Contains 30 patients: TAP BLOCK with 0.25% bupivacaine 20ml + Magnesium sulphate 200mg

Inclusion Criteria

- ASA class I &II patients
- 18 to 45 years of age
- Patients undergoing spinal anaesthesia for lower abdominal surgeries

Exclusion Criteria

- Patient refusal
- Patient with known allergic reaction to local anaesthetics
- History of bleeding diathesis
- Known psychiatric illness,
- Patients on chronic analgesics.
- BMI >40kg/m²
- Liver failure and Renal failure

Materials

- Ultrasound machine, with high frequency transducer probe,
- Sterile gel, antiseptics
- 23 G Quincke spinal needle, 0.5% heavy bupivacaine
- 18 G Tuohy needle, 0.5% Bupivacaine, sterile normal saline
- 10 ml and 20 ml syringes
- Swabs, swab holding forceps and sterile towel
- Magnesium sulfate vial
- Multi parameter monitoring of ECG, PR, SpO2, NIBP, RR
- Emergency drugs Inj. Atropine, Inj. Adrenaline, Inj. Ephedrine, Inj. Dopamine

Methodology

In the preoperative room, patient details were noted. Baseline data like (pulse rate, blood pressure, respiratory rate), and basic investigations were collected.

History regarding significant past medical illness, previous surgery, drug intake and allergy were recorded. General and systemic examination was done, airway assessment was done. An informed and written consent was taken after explaining the anaesthetic procedure and study in detail.

Both groups were explained about the procedures (Both SAB and TAP Block) and postoperative follow up pattern. The VAS was explained as 0-10 cm scale reading and patient was asked to tell the number.

Patients were divided randomly by envelope method to receive TAP block either with 0.25% bupivacaine 20ml per side (n=30) or TAP block with 0.25% bupivacaine + Magnesium sulfate 200mg (n=30). The investigator, patients and postoperative care physicians were blinded to group assigned.

Common to both groups are 18G IV Cannula was secured and preloading done with 1000ml of crystalloid. Under asepsis, SAB given with 0.5% Bupivacaine 10 mg using 23G Quincke's spinal needle to all the patients in both groups. Patient monitored intra- operatively and after the surgical procedure was over patients sensory level was assessed, once when the sensory level reached to T10, TAP was performed.

Under asepsis ultrasound guided posterior TAP block technique was used to locate the TAP. Local anaesthetic either bupivacaine 0.25% 40ml or bupivacaine 0.25% with Magnesium sulfate 40ml were prepared. Investigator was blinded to the injected solution. Ultrasound probe was placed in mid-way

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between costal margin and iliac crest along the
mid axillary line after visualizing, 18G tuohy needle inserted anterior to the ultrasound probe. in the fascial plane between TA and IOM, a small volume of drug is injected to confirm the correct plane and needle tip, then 20 ml of prepared solution was injected in both left and right side. After observing closely for signs of toxicity patients were shifted to post operative ward.
The presence and severity of pain assessment was done with visual analogue scale (VAS score 0 : no pain and 10 : worst pain) in 30min,1, 2,3, 4,5, 6,7,8,10, 12 and 24 hours by an investigator blinded to group assigned.
Vitals parameters pulse rate, Blood pressure changes, respiratory rate changes, SpO2, symptoms and signs of local anaesthetic toxicity and complications were recorded up to VAS score reached to ≥ 4 in immediate postoperative period after TAP block.
The primary end point of study is when the VAS score reached ≥ 4. Rescue analgesia: Inj. Tramadol 100mg i.m. was used as first rescue analgesia either on demand or when the VAS score was ≥ 4.

Observations and Results
The following observations were recorded during the study
1. The mean onset,pain relief, duration of action of TAP block was noted for both the groups
2. The heart rate, systolic blood pressure, diastolic blood pressure and SpO2, VAS score were noted for 30min,1hr,2hr,3hr,4hr,5hr,6hr7hr,8hr,10hr,12hr and 24hr
3. Rescue analgesia dose, time and any side effects were noted and compared between both the groups

Statistical Evaluation
To determine the statistical significance, all recorded data was input into MS Excel and analysed using SPSS version 21 software. Analysis of variance (ANOVA) was used to study the significance of mean. On the mean values of various parameters, an independent 't' test was employed to compare the two groups. P-values less than 0.05 were considered statistically significant. The study was conducted on 60 patients who were randomly allocated to 2 groups.
In this study the analgesic efficacy of bupivacaine and adjuvant magnesium sulfate in ultrasound guided TAP block in lower abdominal surgeries for postoperative pain relief is evaluated. The observation and results were analyzed.
In order to ascertain the significance of demographic features, Kruskul Wallis chi- square test was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables. A 'p' value less than 0.05 is taken to denote significant relationship.

Group	Number of cases	Drug &dosage
B	30	0.25% Bupivacaine(40ml)
BM	30	Bupivacaine(40 ml) + Magnesium sulfate 200mg

Age distribution

Table 1: Age comparison

Variable	Group	N	Mean	SD	P- value
Age (years)	Group BM	30	28.33	7.19	0.92
	Group B	30	28.50	7.31	

The two groups were similar with respect to age distribution and difference was statistically insignificant (p>0.05).

Sex

Table 2: Sex comparison

Sex	Group BM		Group B		P- value
	Number	%	Number	%	
Female	16	53.33%	16	53.33%	0.6
Male	14	46.67%	14	46.67%	
Total	30	100.00%	30	100.00%	

The count of male and female in both groups is same. The sex distribution did not have any statistical significance.

ASA Status Comparison

Table 3: ASA Status comparison

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GROUP	ASA Grade		Total	P value
	I	II		
Group BM	22	8	30	0.79
Group B	22	8	30	

The two groups are comparable with respect to ASA status and difference is statistically insignificant (p>0.05).

BMI

Table 4: BMI comparison

Variable	Group	N	Mean	SD	P- value
BMI	Group BM	30	28.27	5.60	0.42
	Group B	30	27.03	6.28	

The two groups are comparable with respect to BMI status and difference is

Statistically insignificant.

Preoperative hemodynamic parameters

Table 5: Preoperative hemodynamic parameters comparison

Variables	Group BM		Group B		P Value	Significance
	Mean	SD	Mean	SD		
Pulse rate	82	9.6	81.7	9.4	0.89	Not Significant
Systolic BP	117.2	13.4	119.2	12.5	0.54	Not Significant
Diastolic BP	71.9	8.3	73	8.7	0.61	Not Significant
SPO2	98.5	0.59	98.5	0.7	0.3	Not Significant

The two groups are comparable with respect to pre-operative vital parameters and difference is statistically insignificant.

Duration of surgery
The two groups are comparable with respect to duration of surgery and difference is statistically insignificant.

Time to regress T10 level of sensory block
The two groups are comparable with respect to regression of sensory level to T10 and difference is statistically insignificant.

VAS score

Table 6: Mean VAS score at various intervals

VAS at	VAS in				'p'	Significance
	Group BM		Group B			
	Mean	SD	Mean	SD		
30 minutes	0	-	0	-	-	-
1 hour	0	-	0	-	-	-
2 hours	0	-	0	-	-	-
3 hours	0	-	0	-	-	-
4 hours	0	-	0.33	0.8	0.0207	Significant
5 hours	0	-	3.33	0.76	0.0001	Significant
6 hours	0.7	1.29	4.6	0.56	0.0001	Significant
7 hours	3.27	0.69	-	-	-	-
8 hours	4.4	0.56	-	-	-	-
10 hours	4.5	0.51	-	-	-	-

Postoperative VAS pain scores were significantly reduced in Bupivacaine and magnesium sulfate group in all the time intervals when compared to Plain bupivacaine group. Even after 8hrs the mean VAS score was between 4 to 5 in Group BM. And the rescue analgesia was given when the VAS score reached ≥4.
Duration of Analgesia.

Table 7: Duration of Analgesia comparison

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Variable	Group	N	Range	Mean	SD	P-value
Duration of Analgesia (mins)	Group ED	30	375-570	516.67	39.42	<0.0001
	Group ID	30	240-330	277.33	24.52	

The duration of analgesia was significantly increased in bupivacaine magnesium sulphate (BM) group and the "p" value is 0.0001.

Complications

Table 8: Complications comparison

Complications	No of complications in		P Value
	Group BM	Group B	
Nausea	3	3	1.0
Hypotension	-	-	-
Bradycardia	1	-	0.5

The complication rate was similar in both groups and statistically not significant.

Pulse Rate

Table 9: Mean pulse rate at various intervals

Pulse Rate at	Pulse Rate				P Value	Significance
	Group BM		Group B			
	Mean	SD	Mean	SD		
0 minute	83.93	7.95	84.30	9.23	0.86967	Not significant
30 minutes	86.73	8.54	83.60	9.17	0.17607	Not significant
1 hour	86.90	8.05	85.97	8.95	0.67255	Not significant
2 hours	84.70	8.36	86.57	8.32	0.38956	Not significant
3 hours	87.47	6.85	87.40	8.29	0.97302	Not significant
4 hours	86.57	8.01	87.30	8.96	0.73945	Not significant
5 hours	87.50	8.53	85.27	8.46	0.3128	Not significant
6 hours	85.77	8.61	89.70	7.05	0.05776	Not significant
7 hours	85.63	8.46	-	-	-	-
8 hours	82.00	8.77	-	-	-	-

Both groups had comparable normal heart rate and the difference is statistically not significant.

Systolic Blood Pressure

Table 10: Mean systolic blood pressure (mmHg) at various intervals

SBP at	SBP mmHg				P Value	Significance
	Group BM		Group B			
	Mean	SD	Mean	SD		
0 minute	112.53	10.21	115.27	9.71	0.29	Not significant
30 minutes	111.87	9.84	113.80	10.30	0.46	Not significant
1 hour	112.33	8.93	114.27	8.92	0.41	Not significant
2 hours	110.13	9.38	113.67	9.73	0.16	Not significant
3 hours	113.27	8.97	114.53	10.14	0.61	Not significant
4 hours	110.80	20.30	114.73	10.50	0.35	Not significant
5 hours	113.47	8.66	116.80	8.67	0.14	Not significant
6 hours	112.67	9.07	114.67	10.55	0.43	Not significant
7 hours	115.87	9.04	-	-	-	-
8 hours	113.47	8.82	-	-	-	-

The mean systolic BP of both groups were with in normal limits and the difference is statistically not significant.

Diastolic Blood Pressure

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Table 11: Mean diastolic blood pressure (mmHg) at various intervals

DBP at	DBP mmHg				P Value	Significance
	Group BM		Group B			
	Mean	SD	Mean	SD		
0 minute	73.77	8.62	70.47	6.98	0.10866	Not significant
30 minutes	75.20	9.01	73.87	8.24	0.55213	Not significant
1 hour	71.07	8.01	72.20	7.42	0.57184	Not significant
2 hours	74.73	8.70	74.27	8.42	0.83351	Not significant
3 hours	72.00	6.99	72.80	8.62	0.69446	Not significant
4 hours	72.67	8.59	72.60	7.86	0.97509	Not significant
5 hours	71.80	6.53	74.87	8.67	0.12717	Not significant
6 hours	74.13	10.07	71.00	7.18	0.17063	Not significant
7 hours	74.67	10.83	-	-	-	-
8 hours	70.60	8.49	-	-	-	-

The mean diastolic BP of both groups were with in normal limits, and the difference is statistically not significant.

Respiratory Rate

Table 12: Mean respiratory rate at various intervals

RR at	RR				P Value	Significance
	Group BM		Group B			
	Mean	SD	Mean	SD		
0 minute	13.73	0.64	13.97	0.85	0.23	Not significant
30 minutes	13.90	1.03	13.70	0.65	0.37	Not significant
1 hour	14.33	1.27	14.00	1.02	0.27	Not significant
2 hours	13.70	0.65	13.83	1.02	0.55	Not significant
3 hours	13.67	0.96	13.67	0.92	1.00	Not significant
4 hours	14.10	0.80	13.90	0.80	0.34	Not significant
5 hours	13.70	0.65	13.87	0.68	0.34	Not significant
6 hours	13.93	1.08	14.37	1.19	0.14	Not significant
7 hours	14.83	1.09	-	-	-	-
8 hours	13.67	0.76	-	-	-	-

The respiratory rate of both groups were with in normal limits,and the difference is statistically not significant.

SPO_2

Table 13: Mean SPO_2 at various intervals

SPO_2 at	SPO_2				P Value	Significance
	Group BM		Group B			
	Mean	SD	Mean	SD		
0 minute	95.47	17.86	98.67	0.71	0.33	Not significant
30 minutes	95.40	17.84	98.67	0.61	0.32	Not significant
1 hour	95.23	17.81	98.77	0.68	0.28	Not significant
2 hours	95.40	17.84	98.47	0.63	0.35	Not significant
3 hours	95.50	17.86	98.53	0.57	0.36	Not significant
4 hours	95.43	17.85	98.57	0.63	0.34	Not significant
5 hours	95.23	17.81	98.50	0.51	0.32	Not significant
6 hours	95.40	17.84	98.90	0.66	0.29	Not significant
7 hours	95.20	17.80	-	-	-	-
8 hours	95.40	17.84	-	-	-	-

The saturation in both groups were with in normal limits, and the difference is statistically not significant.

Discussion

Thorough familiarity with anatomy, safe monitoring and injection technique, knowledge of local anaesthetic pharmacology and toxicity would prevent the possibility of complications and the technique TAP block is simplified by proper knowledge and correct technique of ultrasound usage. These precautions will prevent major complications with TAP block. By using the ultrasonography real time,

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needle position can be confirmed and is a promising approach that should further decrease the risk of visceral injury complication.

Truncal blocks are commonly used for postoperative pain management in various anterior and posterior abdominal surgeries. With the introduction of ultrasonogram in anesthetic practice, the truncal blocks have gained more popularity with the advantage of real view imaging and lesser failure and toxicity rates. Good postoperative analgesia is an important component of adequate perioperative care. Pain after abdominal surgeries is often severe. Effective pain relief reduces stress postoperatively and fasten recovery, helps in early mobilisation, improve infant nursing care and reduces morbidity post operatively in parturients, improves patient satisfaction, coupled with reduction in opioid consumption,has fewer adverse effects and lesser requirement of rescue analgesia following abdominal surgeries.

It is well known that, local anaesthetics used in various techniques reduces pain and requirements of post operative analgesic, which can improve the quality of postoperative recovery. The efficacy of TAP block by using local anaesthetics are proved in many studies.

A study was conducted by McDonnell JG [2], Curley GCJ, Carney J, *et al* (2008) to compare the analgesic efficacy of TAP block after caesarean delivery using ropivacaine 0.75% in one group and placebo in another group along with standard postoperative analgesia (using IV morphine analgesia and regular diclofenac and acetaminophen) was made. The results of this study showed that TAP block has significant efficacy as compared with placebo and also reduces the standard analgesic drug requirement postoperatively ($p<$ o.oo1). The visual analogue scale pain scores was used for pain measurement in the participants

The safety of adding magnesium sulphate in epidural route has been witnessed in previously done studies in humans by TANMOY [3] *et al* (2010), A.BILIR [8] *et al* (2007), Fawcet VY (1999) in the studies done by the above authors the dosage of magnesium sulphate used was 50 mg.

In order to increase the duration of block, Magnesium sulfate has been used as an adjuvant to local anaesthetics in different regional techniques. It has been proved that Magnesium in doses up to 200mg improves the quality and duration of local anaesthetic nerve blocks with minimal side effects.

The dose of magnesium used in this study was based on the data from a study Gunduz A, Bilir A, Gulec S [9]. Magnesium added to prilocaine prolongs the duration of axillary plexus block, Reg Anesth Pain Med. 2006; 31:233-6 Their study concluded that the addition of MgSO4 in a dose of 150 mg provided a pronounced prolongation of the duration of sensory and motor blocks compared to magnesium 100 mg, without systemic or neurotoxicity. In another study of Goel *et al* [10] (2008), MgSO4 was used in 200 mg and 100 mg dose as sole agent for post-operative analgesia in axillary block and the duration of pain relief in MgSO4 groups were better than control group, whereas the duration of pain relief with 200 mg MgSO4 was better than 100 mg MgSO4 and also morphine consumption was less in both study drugs than control group. None of the patients showed any neurological deficits in the form of sensory or motor blockade with perineural MgSO4.

So this prospective, randomized, double-blinded, comparitive study was done to evaluate the post-operative analgesic efficacy of bupivacaine alone or in combination with Magnesium sulfate in ultrasound guided TAP block in patients undergoing lower abdominal surgeries.

The patients selected in our study were patients undergoing lower abdominal surgeries and these patients, they want to be more alert and mobile in the immediate postoperative period. Immediate pain relief in the post operative period has several implications in recovery of these patients. In our study the demographic profiles like age, height, weight and BMI were comparable and there was no statistically significant difference between Group BM and Group B. There were no significant differences between the two groups regarding the ASA Physical status, surgery duration, surgeon and history of any previous abdominal surgery.

The effect of the USG-TAP block is more when the block is carried out in patients who are responsive and alert rather than in a sedated patient. In alert patient we were able to elicit the VAS pain score, the time of onset of analgesia and the intensity of pain relief can be very well studied.

Belavy *et al* [11] (2009) observed that TAP block reduced opioid consumption in the first 6 hrs after Cesarean section.

A study done by Mc Donnell JG [12] *et al* (2007) showed that the pain scores at all post-operative times were reduced after TAP block with levobupivacaine in large bowel surgeries via a midline abdominal incision compared to patient controlled analgesia standard regimen, even at 24 hrs (1.7 +/- 1.7 vs 3.1 +/ - 1.5, $p< 0.005$).

Lower abdominal surgeries such as LSCS, Hernioplasty, Appendicitis under regional anaesthesia provides an excellent opportunity to perform TAP block. Injection in the postoperative period avoids operating room time delays. So at the end of surgery TAP block was perfomed. The best thing while performing the procedure is patients do not feel pain, because the TAP block was performed in the area already anaesthetised by subarachnoid block.

In our study the local anaesthetics were deposited in the correct plane with ultrasound guidance. In this study 20 ml of 0.25% bupivacaine or 0.25% bupivacaine with magnesium sulfate 200mg on each side for ultrasound guided TAP block was used which is comparable to study conducted by Jumana M Baaj *et al*

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[13] (2010), where the duration of analgesia and efficacy of TAP block was studied for lower segment caesarean section.

We selected Tramadol [14] for rescue analgesia, as several studies have confirmed the analgesic effects of single-dose intramuscular tramadol 50– 100mg can provide effective postoperative analgesia comparable to that obtained with morphine, pentazocine, and ketorolac.

Uma Srivastava,*et al* [15] (Sep 2015) conducted a double-blind, randomized trial to evaluate the Efficacy of transverse abdominis plane block for post cesarean delivery analgesia. 62 parturients undergoing caesarean section were randomized in a double-blind manner to receive either bilateral TAP block at the end of surgery with 20 ml of 0.25% bupivacaine or no TAP block, in addition to standard analgesic comprising 75 mg diclofenac 8 hourly and intravenous patient controlled analgesia (PCA) tramadol. Each patient was assessed at 0, 4, 8, 12, 24, 36, and 48 hr after surgery by an independent observer for pain time of 1st demand for Diclofenac, total consumption of PCA tramadol, satisfaction with pain management and side effects. The results were use of tramadol was reduced in patients given TAP block by 50% compared to patients given no block during 48 hr after surgery ($P< 0.001$). Pain scores were lower both on rest and activity at each time point for 24 hr in study group ($P< 0.001$), time of first analgesia was significantly longer, satisfaction was higher, and side effects were less in study group compared to control group.

Ultrasound guided bilateral TAP block has been shown to provide adequate analgesia to the skin and anterior abdominal wall musculature in patients undergoing lower abdominal surgeries. All patients in both groups breathed deeply, coughed freely, moved without limitation and showed good satisfaction. The bupivacaine with Magnesium sulfate group showed increased duration of analgesia.

Patel SA, *et al* [16] (2010) evaluated the role of Transversus abdominis plane block for postoperative analgesia after caesarean delivery. They compared the postoperative adjunctive oral narcotic use in women who underwent caesarean section and received the TAP block vs those who received neuraxial narcotics. After adjusting for confounders and the presence of antecedent labor, there remained a significant reduction in the total oral narcotic doses given to women who underwent a TAP block compared to other forms of analgesia. The TAP block is thus associated with decreased oral narcotic usage 24-48 h following caesarean delivery.

There are studies done in evaluating the effect of magnesium sulphate in spinal anesthesia by M. OZALEVLI *et al* [17] (2005, 2015, 2018), S Katiyar *et al* (2015), Binesh kathuria *et al* (2014) and CJ Pandya *et al* (2014). The dosage of magnesium sulphate used in these studies was 50 mg magnesium sulphate which showed no deleterious effect in humans.

Duration of Post-operative Analgesia

In this study results had demonstrated that post operative ultrasound guided TAP block reduced VAS score in the both groups. In group B (0.25%bupivacaine alone) the VAS score was almost zero in the first 4 hours while in Group BM the VAS score was zero for about 6 hours, which itself explains the effectiveness of TAP block. In this study the mean time to reach VAS score of ≥ 4 was 516 minutes in bupivacaine with Magnesium sulfate (BM) group, when compared with 277 minutes in the 0.25% bupivacaine (B) the difference of 239 minutes with p value less than
0.05 was very significant statistically.

This is in accordance to study conducted by Ae Ryoung *et al* (2012), where the addition of Magnesium with bupivacaine in peripheral nerve block extended the duration of post operative analgesia.

Similar to our study, Taneja P [5] *et al*, also showed a minimal difference in the onset of sensory block where they used magnesium sulphate as an adjuvant to ropivacaine, but there was no statistical significance between the two groups($p>0.005$). Khezri *et al*, Malleeswaran *et al*, and Ekmecki *et al*, also observed similar results while performing a comparative study between levobupivacaine with magnesium sulphate and plain levobupivacaine in femoral nerve block though it was statistically insignificant.

The reason for extended analgesic duration after TAP blockade may be due to the relatively poor vascularisation and slowed drug clearance from transversus abdominis plane, and may be due to avoidance of central sensitization by giving TAP block post operatively. The prolonged action of magnesium is because of inhibitory effect on post junctional potentials, and preponderant action on presynaptic potentials by competitive blockade of Calcium channels. When added to local anaesthetic it enhance the quality and reduces the time of onset of block.

Hemodynamic Stability

Hemodynamic stability in terms of changes in pulse rate, oxygen saturation and blood pressure were compared in both groups and there were no significant difference between them. This is in accordance to study conducted by Popping DM *et al* and Cucchiaro G *et al* (2007) where the hemodynamic stability was comparable in both groups after peripheral nerve blockade in children.

The Usage of Rescue Analgesic and Vas Score

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The rescue analgesic requirement in group BM, was after 530 min. and the rescue analgesic requirement in group B, was after 280 min and was statistically significant. The usage of rescue analgesic was lesser in the magnesium group which is attributed to the prolonged duration of sensory block by magnesium. Kasthuri *et al* (2014), showed similar results, where the magnesium group required lesser number of rescue analgesic injections in first 24 hours of postoperative period than in the other group.

BEENA *et al* in 2013, demonstrated that rescue analgesic (tramadol) requirement was lower in ultrasound guided transversus abdominis plane block group (103.8±32mg) when compared to placebo group (235.8±47.5 mg) at 24 hours post operatively which correlates with the findings of our study.

Reduced requirement of analgesic in the magnesium group is certainly due to prolonged duration of sensory block. The VAS score at 6 hours in group BM, was 0.0± 0.0 and the VAS score at 6 hours in group B was 2.0 +0.0, and was statistically significant, though clinically not significant. The VAS score at 9 hours in group BM, was 2.0+ 0.0 and the VAS score at 9 hours in group B was 4.0+ 0.0, and was statistically and clinically significant. Rescue analgesia Tramadol was given.

This study very well correlates with the study of Siddiqui [46] *et al*. who in his analysis of Seven randomized, double-blinded studies of both blind and ultrasound guided TAP technique for postoperative analgesia in infra umbilical surgeries demonstrated average and significant reduction in IV PCA requirement as a part of multimodal analgesic regimen. He also demonstrated reduced VAS score both at rest and movement in the early postoperative period. He also found out there was reduced incidence of postoperative nausea, vomiting and sedation. Dileep Gupta also observed similar results in the VAS score and rescue analgesic was administered at VAS score >4.

Conclusion

Ultrasound guided Transversus abdominis plane (TAP) block as a technique for providing postoperative analgesia is highly effective for lower abdominal surgeries. The addition of magnesium sulfate to bupivacaine in TAP block extended the duration of analgesia with minimal sedation when compared to plain bupivacaine without significant changes in hemodynamic parameters or complications.

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Nil

Conflict of Interest

None

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