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TRANSVERSUS ABDOMINAL PLANE BLOCK;

EFFICACY OF MAGNESIUM SULPHATE AS AN ADJUVANT TO BUPIVACAINE IN TRANSVERSUS ABDOMINAL PLANE BLOCK IN ABDOMINAL HYSTERECTOMY PATIENTS.

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ABSTRACT… Objectives: To determine the efficacy of co-administration of magnesium sulphate ($MgSO_4$) with bupivacaine in enhancing the analgesic efficacy of Transversus abdominus plane block (TAP block) in patients undergoing total abdominal hysterectomy. **Study Design:** Randomized clinical single blinded trial. **Setting:** Department of Anesthesia, Nishtar Medical University/Hospital Multan. **Period:** 07 months from March 2017 to October 2018. **Methods:** We included female patients who presented with uterine or ovarian cancer and planned for total abdominal hysterectomy. In group B patients (n=30) TAP block was given using 0.25% bupivacaine (20 ml). In group M patients (n=30), 19.4 ml 0.25% bupivacaine plus 0.60 ml Mg sulphate. Mean arterial blood pressure, heart rate, VAS pain score and time of 1st rescue analgesia and total dose of rescue analgesia was noted in all patients. For data analysis we used independent sample t-test (Mann-Whitney U test for skewed data) to compare quantitative variables. Chi-square test we used for comparison of ASA status. P-value $\leq$ 0.05 was taken as significant difference. **Results:** Mean VAS pain score after 1 hour was 3.27$\pm$1.70 in group B and 2.23$\pm$1.35 in group M (p-value 0.012), after 2 hours mean VAS pain score was 4.03$\pm$2.10 in group B and 2.47$\pm$1.25 in group M (p-value 0.001), after 6 hours mean VAS score was 4.53$\pm$2.62 in group B and 3.27$\pm$1.36 in group M (p-value 0.02). Mean VAS pain score after 12 and 24 hour of shifting the patient in recovery room was no significantly different between the groups (p-value 0.55 & 0.08 resp.). Mean time of 1st rescue analgesia was 7.53$\pm$4.92 hours in group B versus 13.96$\pm$2.25 hours in group M. **Conclusion:** Administration of 200 mg of $MGSO_4$ with bupivacaine for TAP block significantly improves the duration of analgesia and reduces the requirement of rescue analgesics in patients undergoing total abdominal hysterectomy.

Key words: Transversus Abdominus Plane Block, Abdominal Hysterectomy, Magnesium Sulphate.

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INTRODUCTION

Abdominal hysterectomy is one of the commonly performed gynecological procedures.[1] Abdominal hysterectomy has excellent success rate with very low morbidity but the pain and discomfort associated with abdominal hysterectomy are always a matter of concern for the anesthetists as well as the surgeons.[2] Opioids are the mainstay of treatment of pain after surgery but their use is associated with increased risk of nausea, vomiting and changes in blood pressure and heart rate of patients.[3,4] After the introduction of transversus abdominal plane block by Rafi et al.[5] in 2001, TAP block has remained a most widely used technique for the management of pain after abdominal hysterectomy. TAP block basically instillation of local anesthetic agents into the deep fascia between the transversus abdominus and internal oblique muscles to block the nerve supply of the anterior abdomen (T7 to L1 thoraco-abdominal nerves).[5-7]

Studies have found that TAP anesthesia is effective in reducing the need of opioid based analgesics.[8-10] Bupivacaine is a commonly used drug for TAP block and have a good safety and efficacy. Studies have proven that magnesium sulfate also has a role in pain modulation, by acting on Ca channels and N-methyl-D-aspartate (NMDA) receptors it reduce central sensitization of peripheral pain receptors.[11] Efficacy of magnesium in prolonging the duration of neuro-

axial anesthesia has been well proven. Efficacy of magnesium as an adjuvants in local analgesic blocks have been established by many studies. Nevertheless the efficacy of magnesium sulphate in TAP block has not been well established yet. So we conducted this study to determine the efficacy of co-administration of $MgSO_4$ with bupivacaine in enhancing the analgesic efficacy of TAP block in patients undergoing total abdominal hysterectomy.

METHODS

This randomized clinical single blinded trial was conducted in department of anesthesia, Nishtar medical university/hospital Multan within a duration of 7 months from March 2017 to October 2018. We included 60 female patients who presented with uterine or ovarian cancer and planned for total abdominal hysterectomy. This sample size calculation was done by taking mean time of 1st analgesia 15.67±6.04 hours in patients receiving bupivacaine plus magnesium and 6.33±0.96 hours in patients receiving bupivacaine alone with power of test (1-β) 0.80 and α 0.05 the sample size for each group was only 4 we took 30 patients in each group to make results of this study more accurate.[12] Patients allergic to the studied drugs, having co-agulation abnormalities, sepsis and severely obese patients (BMI>35 Kg/m^2) were excluded from study. Approval from IRB of university was taken. A written informed consent was also signed by all study patients before including them in this study.

Patients were allocated into two equal groups using random number tables. In group B patients TAP block was given using 0.25% bupivacaine (20 ml). In group M patients, 19.4 ml 0.25% bupivacaine plus 0.60 ml Mg sulphate. Before surgery all patients were taught to recognize their pain-score after surgery ranging from 0-10. TAP block was given using the technique described by McDonnell *et al.* The lumbar triangle of petit on both sides was located. Using 18 gauge Tuohy needle in mid axillary line, needle was introduced perpendicular to the skin until it crossed skin , subcutaneous tissue, external oblique & between the internal oblique & transverse abdominis muscle 20 ml solution was given on each side i.e. bupivacaine in group B and bupivacaine plus magnesium sulphate in group M. After completion of surgery & before reversal was given TAP block performed.

Non-invasive monitoring of blood pressure and heart rate was done. After surgery and reverting the patient from anesthesia, post-operative pain score was noted in all patients, time of requirement of 1st analgesia and total dose of analgesia within 24 hours was also noted. Nalbuphine 20 mg IV was given as a single bolus as rescue analgesic. Anesthetist who was unaware of study protocols recorded the post-operative study parameters. Mean post-op pain score and time of requirement of 1st analgesia were primary study endpoints.

For data analysis we used independent sample t-test (Mann-Whitney U test for skewed data) to compare quantitative variables. Chi-square test we used for comparison of ASA status. P-value $\leq$ 0.05 was taken as significant difference. All tests was performed using SPSS v23 software.

RESULTS

Baseline variables of study patients are depicted in Table-I. There was no significant difference in age and BMI of study patients. Duration of surgery and anesthesia duration were also no significantly different between the group B & M (p-value 0.36 & 0.39 resp.).

	Group B	Group M	P-value
Age	40.8±7.2	43.33±6.45	0.89
BMI	24.9±4.9	26.2±4.4	0.28
ASA I/II	23/7	24/6	0.75
Duration of Surgery	65.3±8.7	67.2±7.5	0.36
Duration of Anesthesia	82.5±5.8	84.1±8.3	0.39

Table-I. Data of baseline study variables.

Mean arterial blood pressures (BP) after induction of anesthesia were significantly less after 1 and 2 hours of induction of anesthesia in group M as compared to group B. Mean arterial BP after 1 hour of anesthesia induction was 97.80±4.83 mmHg in group B and 93.93±5.86 mmHg in group M (p-value 0.007). Mean arterial BP after 2 hour of anesthesia induction was 101.20±5.85 mmHg in group B and 96.37±7.54 mmHg in group M (p-value 0.008). however after 6 hours, 12 hours and 24 hours of anesthesia there was no statistically proved significant difference in mean arterial BP between the groups (p-value (0.33, 0.78 & 0.17 respectively). Figure-1

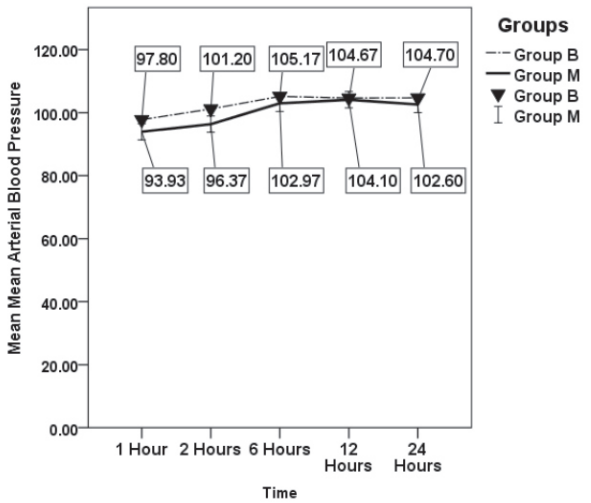

Figure 1. Mean Arterial blood Pressure of Study Patients.
(P-value after 1 hour of induction of anesthesia=0.007, after 2 hours=0.008, after 6 hours=0.33, after 12 hours=0.78, after 24 hours = 0.17).

Mean heart rate of study patients in group M was little low after 1, 2, 6, 12 and 24 hours of induction of anesthesia in group M as compared to group B but with insignificant difference (Figure-2).

Mean VAS pain score after 1, 2 and 6 hours after shifting the patient in recovery room was significantly less group M as compared to group B. Mean VAS pain score after 1 hour was 3.27±1.70 in group B and 2.23±1.35 in group M (p-value 0.012), after 2 hours mean VAS pain score was 4.03±2.10 in group B and 2.47±1.25 in group M (p-value 0.001), after 6 hours mean VAS score was 4.53±2.62 in group B and 3.27±1.36 in group M (p-value 0.02). Mean VAS pain score after 12 and 24 hour of shifting the patient in recovery room was no significantly different between the groups (p-value 0.55 & 0.08 resp.) [Figure-3].

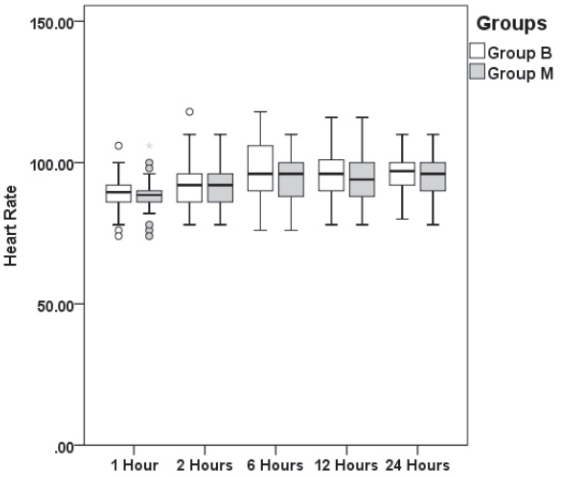

Figure-2. Mean Heart rate of Study Patients.
(P-value after 1 hour of induction of anesthesia=0.48, after 2 hours=0.55, after 6 hours=0.19, after 12 hours=0.51 and after 12 hours=0.47).

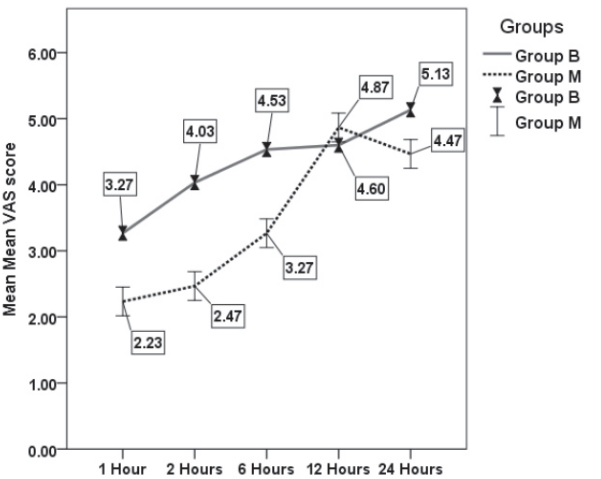

Figure-3. Mean VAS pain score of Study Patients.
(P-value after 1 hour of shifting the patients to recovery room=0.012, after 2 hours=0.001, after 6 hours=0.02, after 12 hours=0.55, after 24 hours=0.08).

Mean time of 1st rescue analgesia was significantly prolonged in group M while total dose of rescue analgesia was significantly less in group M as compared to group P (p-value <0.0001 & 0.002 respectively) [Table-II].

	Group B	Group M	P-value
Time of 1st analgesia requirements	7.53±4.92	13.96±2.25	<0.0001
Total doses of Nalbuphine	36.66±19.71	20.66±17.00	0.002

Table-II. Data regarding analgesia requirement of study patients.

DISCUSSION

In this study we determined the analgesic effects of addition of 200 mg of magnesium sulphate in bupivacaine solution for TAP anesthesia. We found that co-administration of magnesium significantly improves the analgesic efficacy of TAP block when compared with bupivacaine block alone. It also reduces the total requirements of Nalbuphine used as a rescue analgesics.

TAP block has gained a great popularity in past few years. Its use in enhancing the quality of analgesia in abdominal surgeries has been well established. Many advancements are being made in the native TAP block technique and blocking agents to further enhance the effect of TAP block. Several studies have concluded that addition of magnesium sulphate in local anesthetists during local blocks such as intra-thecal and para-bulbar block approves the efficacy and duration of analgesia.[13-15]

A study conducted by Roy et al.[16] concluded that co-administration of $MgSO_4$ to 0.50% bupivacaine enhances the efficacy of epi-dural analgesia in patients undergoing sub-umbilical surgeries as compared to bupivacaine plus normal saline and bupivacaine plus clonidine.

Asker et al.[17] evaluated the effects of co-administration of 50 mg MgSO4 with 0.25% bupivacaine on hemodynamic parameters and pain score of study patients undergoing caudal block for lower abdominal surgeries concluded that addition of magnesium enhances the analgesic efficacy of caudal block and reduces the need of rescue analgesia and has minimum effects on hemodynamics. In our study, we also did not found any significant adverse effect of co-administration of magnesium on hemodynamic parameters. There was reduction in mean arterial BP after 1 and 2 hours of surgery, however this decrease was in acceptable limits and there was no significant difference in mean arterial BP after 6, 12 and 24 hours. While there was no difference in heart rate of patients between the groups.

Abd-Elsalam et al.[12] concluded that co-administration of MgSO4 with 0.25% bupivacaine increases the analgesic efficacy of TAP block, it increases the duration and reduces the rescue analgesia requirements in patients after total abdominal hysterectomy. Mean time of 1st rescue analgesia in that study was 15.67±6.04 in MgSO4 plus bupivacaine group versus 6.33±0.96 in bupivacaine group. In our study, mean time of 1st rescue analgesia was 7.53±4.92 hours in bupivacaine group versus 13.96±2.25 hours in $MgSO_4$ plus bupivacaine group. The difference in our study and the study of Abd-Elsalam et al. was we used simple blind technique for administration of TAP block and Abd-Elsalam et al. used ultrasound for TAP block in their study patients.

CONCLUSION

Administration of 200 mg of $MGSO_4$ with bupivacaine for TAP block significantly improves the duration of analgesia and reduces the requirement of rescue analgesics in patients undergoing total abdominal hysterectomy.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Syed Aftab Haider	Conceived, designed the methodology.	
2	Atqua Sultan	Did data collection and helped in statistical analysis.	
3	Zaira Salman	Did data collection and manuscript writing.	
4	Salman Waris	Supervised the research project and gave final approval for publication.	