Original Article

ISSN (O): 2456-7388; ISSN (P): 2617-5479

Evaluation of Ketamine-midazolam as Procedural Sedative Agent for Ease of Induction of Spinal Anesthesia in Patients Undergoing Abdominal Surgeries

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Abstract

Background: Most of the patients are anxious during induction of spinal anesthesia may lead to poor positioning, autonomic fluctuations. Providing procedural sedation may alleviate those undesired difficulties. In this study, we evaluated intravenous ketamine-midazolam combination as procedural sedative agent for ease of induction of spinal anaesthesia. **Subjects and Methods:** This prospective study was conducted among 60 patients who were randomly divided into 2 groups. Group K received Inj Ketamine 0.5mg/kg with Inj Midazolam 0.02mg/kg as procedural sedative agent prior to spinal anaesthesia, Group C did not receive any procedural sedative drugs. Ease of identification of space, time to induce spinal anaesthesia, number of attempts, patient comfort score, patient satisfaction score was recorded and analyzed. **Results:** Demographic data were comparable between the groups, there was no statistically significant difference between the groups in terms of ease of identification of space, number of attempts, time to induce spinal anaesthesia. Patient comfort score was significantly higher in group K compared to group C (9.17 ± 0.59 and 7.13 ± 1.20 respectively). Patient satisfaction score was higher in group K than group C (95.33 ± 7.30 and 71.67 ± 12.27 respectively). **Conclusion:** Intravenous Ketamine-midazolam as procedural sedative agent may not significantly ease the induction of spinal anesthesia compared to patients without sedation. However, it resulted in better satisfaction and comfort to the patient than without sedation.

Keywords: Procedural Sedation, Spinal Anaesthesia, Ketamine-Midazolam, Patient Satisfaction.

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Received: 09 May 2021 **Revised: 13 July 2021** **Accepted: 24 July 2021** **Published: 31 December 2021**

Introduction

Despite best pre-anaesthetic briefing and anxiolytic premedications, some patients may not co-operate completely during administration of regional or neuraxial blockade. Inadequate positioning may make the procedure difficult and also increases the chances of repeated attempts, traumatic punctures, causes excruciating pain and discomfort to the patient. This may even cause autonomic fluctuations.[1] Adequate sedation and analgesia during procedures alleviates anxiety, relieves pain and increases success and also timely completion of any procedure.[2] Now a days, a great emphasis is put towards judicious usage of procedural sedation during regional anaesthesia for the same reason.[3]

Procedural sedation may help in reducing these difficulties during induction of spinal anaesthesia. Ketamine has shown promising results as procedural sedative agent so far in different procedures. Addition of midazolam has enhanced its efficacy. Midazolam helps in reducing chances of post-operative recall and ketamine induced emergence.[4] There are limited studies in evaluating them as procedural agent for ease of induction of spinal anaesthesia.

In our study, we are evaluating ketamine-midazolam as procedural sedative agent before administration of spinal anesthesia in patients undergoing lower abdominal surgeries.

Subjects and Methods

This randomized controlled study was carried out in tertiary hospital, after obtaining approval from the Institutional Ethics Committee and written informed consent from the patients. Sixty patients of the American Society of Anaesthesiologists

Classes either sex and of age 18–60 years of age posted for abdominal surgery were randomly divided into two groups (n = 30) using computer-generated table.

Inclusion Criteria

All American Society of Anaesthesiologists Physical Status-1 patients aged between 18 years to 60 years, undergoing elective surgeries under spinal anaesthesia, who can understand and willing to give consent were included.

Exclusion Criteria

Obese patients BMI≥ 30

Patients having any spinal deformity

Patients having history of allergy to the study drugs and local anaesthetics

Patients with history suggestive of GERD

Patients having coagulation abnormalities, Bleeding diathesis.

Patients with hemodynamic instability/fixed output cardiac disorder

Patients who are having features suggestive of raised ICP

Detailed pre-anaesthesia check-up and appropriate investigations were carried out day prior to the surgery. The anaesthesia technique was explained to the patient and written informed consent was taken.

Patients were kept nil per oral overnight prior to surgery and were premeditated with Tab Ranitidine 150mg on the night prior to surgery.

In operation theatre, after performing standard pre-use checks of anaesthesia workstation and ancillary equipment, patients were shifted to OT, basal vital parameters were noted (Heart rate, BP spo2, Respiratory rate).

In Group K, the patients received Inj.ketamine 0.5mg/kg and Inj midazolam 0.02mg/kg IV along with increments of Inj. Ketamine 10mg till they achieved Ramsay sedation score of 4 along with oxygen via venti mask at 6-8ltr/min.

In Group C, the patients did not receive any sedative medications

Time to achieve Ramsay score 4 was be noted and considered as onset of sedation in group B. All patients were maintained on spontaneous Respiration.[5]

Standard airway management equipments were kept ready as a rescue measure if any signs of respiratory depression was observed.

Patients were placed with their back parallel to edge of the operating table, thighs flexed into the abdomen with neck flexed to allow the forehead to be as close as possible to knees with the help of an assistant in OT.

Under all aseptic precautions, using landmark technique, desired space for insertion of spinal needle was identified. Ease of identification of space was assessed using ordinal scale as: easy, difficult, or impossible to palpate the lumbar spinous processes.[1]

Later, spinal anaesthesia was performed by introducing the 25G Quinke spinal needle into preferred interspinous space until tactile sensation was felt. Correct placement of spinal needle into the subarachnoid space was judged by appearance of cerebrospinal fluid (CSF) in the hub of the needle.[6]

When there was no CSF in the needle hub or there was only a small amount of CSF with poor flow, the needle was rotated clockwise 90° and wait for 5 seconds. The sequence of rotation continued for another 3- quadrant rotation of 90° and would wait 5 seconds after each rotation. Despite this manoeuvre, if there was absence of CSF or its free flow, the needle was further advanced approximately by 2 mm. The number of times for needle re-directions and bony contacts were documented.

Thus, considering all the above-mentioned manipulations, each attempt was considered as a failed attempt if there was no CSF in the hub, despite advancement, three redirections coupled with 360 manoeuvre of the needle.[6]

Appearance of free flow of CSF confirmed a successful needle insertion and the study was complete whenever the subarachnoid space was confirmed by observation of free flow of CSF. Thus the time duration from the time of insertion of needle in first attempt till appearance of CSF was noted as time to induce spinal anaesthesia,[7] the number of attempts were noted.

Patient's comfort score during the procedure was analysed by an independent observer using 10cm VAS scale (10cm denotes maximal comfort while 0cm denotes minimal comfort).[8]

Patient satisfaction score was also recorded in a subjective scale of 0-100.Additional data including any adverse or notable events were documented.

Statistical Analysis

All the data obtained were analysed using SPSS software version 16

Results

All 60 patients enrolled have completed the study with nil dropouts. Demographic data were comparable in both the groups with respect to Age, Gender and BMI. [Table 1]. All patients belonged to ASA Physical status 1. Ease of identification of space was comparable among the two groups [Table 2]. There was no significant difference in Time to induce spinal in both the groups [Table 2]. Number of spinal attempts among the groups were comparable and was not statistically significant. However, only 6.7% of the cases in group K had attempts more than 1 while in group C it was

Table 1: Demographic data (Chi squared test)

Parameters	Group		P- value
	B (n = 30)	C (n = 30)	
Age (Years)	39.43 ± 12.85	40.03 ± 12.21	0.854[1]
Gender			0.438[2]
Male	14 (46.7%)	17 (56.7%)	
Female	16 (53.3%)	13 (43.3%)	
BMI (Kg/m^2)	25.80 ± 2.69	25.70 ± 2.72	0.887[1]

20%. [Table 2]

Patient comfort score in group K (9.17 ± 0.59) was significantly higher than group C (7.13 ± 1.20) (p <0.001). Patient satisfaction score was also significantly higher in group K (95.33 ± 7.30) than group C (71.67 ± 12.27) (P<0.001). The onset of sedation, i.e. the time taken to achieve Ramsay sedation score of 4 in group K was 67.20 ± 11.27seconds. There was no significant difference between the two groups in terms of Heart rate, Mean arterial pressure and Saturation. No adverse events noted.

Discussion

Ketamine is a noncompetitive N-Methyl-D-aspartate (NMDA) receptor antagonist, and it blocks HCN1 receptors. However, at higher doses it may also bind to the opioid mu and sigma receptors. It disrupts the neurotransmitter glutamate. It can exhibit sympathomimetic activity which can lead to rapid heart rate and elevated blood pressure.[9]

Ketamine is the potent sedative, analgesic, hypnotic which also maintains upper airway tone used as a sedative agent for multiple procedures. However it can increase secretions and induce delirium. Adding midazolam and glycopyrrolate alleviates these unwanted side effects.[4,10]

Most of the patients are anxious regarding the surgical procedure and anaesthetic technique. This may result in poor positioning, hemodynamic variations and may also hinder the ease of induction of anesthesia or anaesthetic technique.

Sedation has been shown to increase patient satisfaction during Regional anaesthesia and it is a valuable tool to make it more convenient for patient, anaesthesiologist and the surgeon. It also reduces postoperative recall.[11]

There are studies to compare the ease of induction of spinal in different positions but till date,[1,6,12] there are limited studies in adults done to know the usefulness of procedural sedation for the ease of spinal induction.

C R Chudnofsky et al conducted study on 77patients in emergency department and concluded that The combination of midazolam and ketamine provides effective procedural sedation and analgesia in adult ED patients, and appears to be safe.[13]

In our study we evaluated ketamine-midazolam as procedural sedative agent for ease of spinal anaesthesia.

There were no significant differences in identification of appropriate intervertebral space among sedated and non-sedated patients in our study. The time taken to induce spinal anaesthesia was also comparable. Number of spinal attempts among the groups were comparable and was not statistically significant. However, only 6.7% of the cases in group B had attempts more than 1 while in group C it was 20%. This can be attributed to the analgesic property of ketamine along with sedation which results in better acceptance of needle prick compared to non-sedated patients.

Subarachnoid block procedure, though well-explained to the well-premeditated patients preoperatively, exposure to the new operation room environment and its people, positioning for spinal procedure and the fear of pain during spinal needle insertion result in procedural discomfort. VR Hemanth Kumar et al conducted a study on 90 patients and found that Ketamine in the dose of 0.3 mg/kg provided sufficient sedation for allaying procedural discomfort due to sedation, less positional difficulty, early verbal response, no hallucinations, no recall of performance of procedure, and good patient satisfaction.[14]

Similar results were obtained in our study as well. Patient comfort was significantly better in sedated patients with ketamine-midazolam compared to non-sedated patients and this enhanced the convenience of the anesthesiologist in providing successful subarachnoid block.

Patient satisfaction score was similarly better in patients who received ketamine-midazolam as procedural sedative agent than those who did not receive any procedural sedation.

Many anaesthesthesiologists hesitate to administer procedural sedation due to possible adverse events like hemodynamic fluctuations, respiratory depression, hallucination, behavioral changes, violent emergence etc. But none of the adverse events were noted in our study.

Our results were similar to the study conducted by Oznur uludag et al. In their study, The midazolam-ketamine com-

Table 2: Evaluating parameters, patient comfort and satisfaction score

Parameters	Group A	Group B	P- value	Statisctical test used
Ease To Identify Space			0.488[2]	**Chi-Squared Test**
Easy	26 (86.7%)	24 (80.0%)		
Difficult	4 (13.3%)	6 (20.0%)		
Time to Induce Spinal (Seconds)	16.17 ± 8.69	18.17 ± 13.62	0.654[3]	Wilcoxon-Mann-Whitney U Test
Number of Spinal Attempts	1.07 ± 0.25	1.27 ± 0.58	0.123[3]	Wilcoxon-Mann-Whitney U Test
More Than 1 Attempt (Yes)	2 (6.7%)	6 (20.0%)	0.254[4]	
Patient Comfort Score***	9.17 ± 0.59	7.13 ± 1.20	<0.001[3]	Wilcoxon-Mann-Whitney U Test
Patient Satisfaction Score***	95.33 ± 7.30	71.67 ± 12.27	<0.001[3]	Wilcoxon-Mann-Whitney U Test
Onset of Sedation (Seconds)	67.20 ± 11.27	-	-	

bination provided better hemodynamic stability than the midazolam-propofol combination, although the two combinations were similar with regard to patient comfort and post-anesthesia recovery.[15]

In our study, there was no significant variation in hemodynamics (Heart rate,MAP,SPO2).This may be due to the sympathomimetic property of ketamine.[9] None of the patients had any respiratory depression, hallucinations, delirium or behavioral changes as we have used lower doses of sedative agents and addition of midazolam as supported by the study conducted by Serkan Sener et al who Coad ministered midazolam with ketamine and found that midazolam significantly reduces the incidence of recovery agitation after ketamine procedural sedation and analgesia in ED adults.[16]

Conclusion

Co-administration of intravenous Ketamine-midazolam as procedural sedative agent before induction of spinal anesthesia provides better satisfaction and comfort to the patient. Use of this combination as pre-procedural sedation, resulted in statistically insignificant decrease in number of spinal attempts.

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How to cite this article: S M, M K Y, Hosagoudar P. Evaluation of Ketamine-midazolam as Procedural Sedative Agent for Ease of Induction of Spinal Anesthesia in Patients Undergoing Abdominal Surgeries. Acad. Anesthesiol. Int. 2021;6(2):6-10.

DOI: dx.doi.org/10.21276/aan.2021.6.2.2

Source of Support: Nil, **Conflict of Interest:** None declared.