ARTICLE

Circulatory Responses to Propofol-Ketamine Combination Compared to Propofol Alone for Sedation During Spinal Anaesthesia

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Abstract

The present study was undertaken to establish the efficacy of low dose ketamine infusion in combination with propofol in maintaining hemodynamic stability when used for sedation during spinal anaesthesia compared to propofol alone. Sixty adult with ASA physical status I and II patients undergoing urological procedures were studied after giving informed consent. Patients receiving spinal anaesthesia with 0.5% bupivacaine were randomly assigned to sedation with propofol - ketamine [Group I (n=30)] or propofol only [Group II (n=30)]. Group I patients received a loading dose of propofol (0.4 mg/kg) and ketamine (0.1 mg/kg) followed by a continuous infusion of low dose propofol (1.2 mg/kg/hr) and ketamine (9.3 mg/kg/hr) whereas group II patients received a bolus dose of propofol (0.5 mg/kg?) only followed by a continuous infusion of propofol (1.5 mg/kg/hr). Monitored parameters included: heart rate, systolic blood pressure, diastolic blood pressure and sedation scores rated on a five point scale. Parameters were recorded at baseline and at predetermined intervals of 5, 10, 15, 20, 25, 30, 45, 60, 75 and 90 minutes after spinal anaesthesia. Heart rate, systolic and diastolic blood pressure were all significantly higher in group I patients at various intervals as compared to group II patients. Sedation scores revealed no significant difference at the predetermined time intervals between the two groups. In conclusion, the propofol-ketamine combination confers hemodynamic stability during spinal anaesthesia as compared to Propofol alone.

Key words: Spinal anaesthesia; sedation; propofol; ketamine; circulatory responses

Introduction

Regional anaesthesia is becoming an increasingly important aspect of anaesthesia practice. The main advantage of regional over general anaesthesia is reduction of certain risks inherent in general anaesthesia; particularly those

of airway obstruction and pulmonary aspiration (1). A clinically important impediment to successful use of regional blocks is the idea that the "blocks should do it all. Spinal and epidural anaesthetics are more likely to fail due to inadequate sedation and anxiolysis than due to technical flaws (2). Most patients undergoing surgery under regional anaesthesia prefer being asleep during the procedure (3). Various methods have been tried in an effort to provide sedation and stable hemodynamics during spinal anaesthesia ranging from use of intravenous or inhalational sedation to full general anaesthesia. Light sedation with an intravenous agent is simple and convenient, but should not have adverse consequences, particularly for the cardiovascular system.

Propofol, a phenol derivative with hypnotic properties, is increasingly being used as a sedative during regional anaesthesia (2). Propofol by continuous infusion provides a readily titratable level of sedation and rapid recovery (3). However, propofol causes a dose-related cardiovascular depression that is likely to worsen the hypotension commonly seen after spinal anaesthesia. Ketamine, a phencyclidine derivative, increases heart rate and arterial blood pressure by activation of the sympathetic nervous system and reduces the incidence of spinal anaesthesia induced hypotension (1). With this background we decided to compare the effect of propofol-ketamine combination to propofol alone on hemodynamics when used as a sedative adjuvant to spinal anaesthesia.

Patients and Methods

After approval from the hospital ethical committee and informed written consent, adult male and female patients of ASA physical status I and II, undergoing spinal anaesthesia for urological procedures were enrolled for the study. Patients with a history of allergic reaction to propofol and/or ketamine, obesity or significant central nervous system, cardiac, pulmonary, hepatic, or renal disease were excluded from the study. Patients were randomly allocated to one of the two study groups. Group I (propofol-ketamine combination) or group II (propofol alone). The patients were pre-medicated with Alprazolam 0.25 mg on the morning of surgery.

On arrival to the operating room patients were monitored, including ECG, non-invasive blood pressure (NIBP), and pulse oximetry. Baseline measurements of heart rate, SpO_2, systolic and diastolic blood pressures were recorded prior to administration of spinal anaesthesia, and then at five minute intervals for the first 30 minutes of surgery, and every 15 minutes thereafter for a total duration of 90 minutes. Patients were preloaded with 6mL/kg of Ringer's lactate, then spinal anaesthesia was administered with hyperbaric Bupivacaine 0.5% in sitting position using a 24 G spinal needle, in doses sufficient to provide a satisfactory sensory block for the procedure to be done. The sensory block was evaluated every three minutes using a cold swab until the level was sufficient for the surgery to begin.

Immediately after spinal anaesthesia, patients assigned to group I received a loading dose of Propofol and Ketamine (0.4mg/kg of Propofol and 0.1mg/ kg of Ketamine) followed by a continuous infusion of both with an initial rate of 1.2mg/kg/hr Propofol and 0.3 mg/kg/hr of Ketamine. Group II patients received a bolus of 0.5mg/kg of Propofol only followed by a continuous infusion of 1.5 mg/kg/hr. The level of sedation was recorded every five minutes and subsequent infusion rates titrated to maintain the sedation score at or around level 3 on a five point sedation score as shown in table 1. The observer assessing the level of sedation was blinded to the sedative infusion being administered. The sedative infusion was stopped during the surgical procedure if the respiratory rate fell to less than eight breaths per minute, the infusion otherwise was discontinued at the end of the surgical procedure. Total sedative and vasopressor requirements were noted. Oxygen was administered by face mask to those patients who exhibited a Spo2 of 95% or less. Observations were continued in the recovery room for a total of 90 minutes from start of surgery. Patients remained in the recovery room until sensory functions returned to normal.

The data were analyzed using the students's t-test. Values were expressed as mean±SD and $p < 0.05$ was taken as significant, and $p < 0.001$ as highly significant.

Results

The patient data was comparable between the two groups on basis of age, weight, and gender distribution as shown in Table 2. Duration of surgery was shorter in group II as compared to group I. The total dose of Propofol administered was similar in both the groups (95±35mg and 100±40mg in groups I and II respectively), while as Group I received 22±11mg as combination with Propofol.

The sedation scores showed no significant difference between the two groups with a constant degree of sedation being maintained throughout the procedure. Four patients in group II experienced a hypotensive episode and needed ephedrine supplementation for treatment of hypotension.

Changes in heart rate and arterial blood pressure after the spinal anaesthesia and sedative administration are shown in Figure 1. It was observed that the changes in the heart rate between the two groups did not differ significantly during the procedure. On the other hand, both systolic and diastolic blood pressures remained significantly higher in group I patients, when compared to group II patients at similar time intervals. There were no differences between the two groups in respiratory rate, SpO_2 or the need for oxygen supplementation.

Table 1: Sedation score

Score	Degree of sedation
1.	Fully awake and oriented
2.	Drowsy
3.	Eyes closed but arousable to command
4.	Eyes closed but arousable to mild physical stimulation
5.	Eyes closed but unarousable to mild physical stimulation

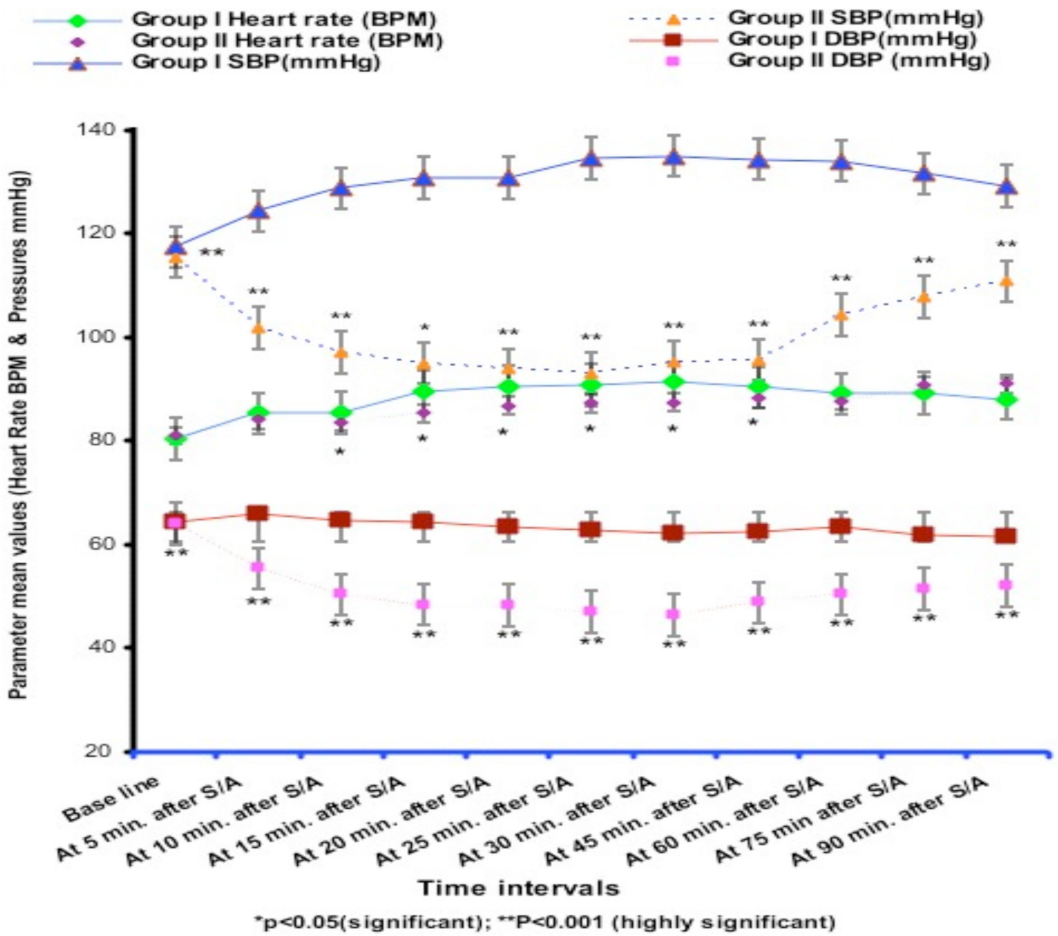

Figure 1: Circulatory variables during peri-operative period in the two groups at different time intervals

Table 2: Demographic variables of the patients in the two groups Values are expressed as number or mean±SD.

Characteristics	Group I	Group II
Number	30	30
Age (years)	57.6±8.0	57.9±6.7
Weight (kgs)	56.9±6.6	57.5±5.9
Sex (M/F)	27/3	27/3
Surgical Time (Min.)	59±13	42±27
Total Propofol (mg)	95±35	100±40
Sedation Score	2.93±0.82	2.82±0.72
Ephedrine Required (No.)	None	4

Discussion

Spinal anaesthesia is one of the most common techniques of regional anaesthesia (1). The impediments to the effective use of spinal anaesthesia are the predictable decreases in arterial blood pressure and heart rate through the accompanying sympathectomy with its attendant vasodilatation and blockade of cardio accelerator fibres. Another clinically important impediment to successful blocks is inadequate sedation.

Propofol infusion provides excellent sedation during spinal block. The advantages of Propofol sedation are that the technique is safe, simple, depth of sedation can be easily altered, and recovery occurs within five minutes after stopping the infusion (3). However Propofol causes a reduction in myocardial contractility and in peripheral vascular resistance, leading to reduction of mean arterial pressure that will worsen hypotension after spinal anaesthesia. Ketamine has a stimulant effect on intact sympathetic nervous system which may offset the depressant effect of Propofol.

The hypothesis of this study was thus that a Propofol-Ketamine combination for sedation after spinal anaesthesia would result in more stable hemodynamics than an infusion of Propofol alone. The Propofol-Ketamine combination provided similar sedation to propofol alone and the haemodynamics remained more stable during spinal anaesthesia with Propofol-Ketamine infusion as compared to patients receiving Propofol only.

Our results are in agreement with those of Frizelle, et al (1), who demonstrated that propofol-ketamine combination, given as infusion during spinal anaesthesia, provided hemodynamic stability. Similar results were also obtained by Guit, et al (4), who recommended a propofol-ketamine combination infusion when stable hemodynamics are required (4). Hemmingsen, et al (5) observed that during spinal anaesthesia patients could be kept hemodynamically stable by intravenous administration of Ketamine.

We conclude that although propofol infusion in sub-anaesthetic doses is an effective sedative adjuvant during spinal anaesthesia, the propofol-ketamine combination has definite advantages over propofol alone for providing hemodynamic stability during spinal anaesthesia.

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