Original Article

Comparison of Quality of Anaesthesia with Propofol Fentanyl and Propofol Ketamine as Total Intravenous Anaesthesia Technique for Short Surgical Procedures

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ABSTRACT

Aim: The present study was conducted to evaluate the efficacy of combination of propofol-fentanyl and propofol-ketamine as total intravenous anesthesia to assess haemodynamics, recovery profile of either groups, Postoperative nausea and vomiting and any other side effects.

Materials and Methods: A total of 50 patients undergoing elective surgeries of shorter duration were randomly allocated into two groups of twenty five each. Group A received Propofol 2mg/kg and Fentanyl 2µg/kg for induction and propofol 4mg/kg/hr and fentanyl 1µg/kg/hr for maintenance of anesthesia, Group B received propofol 2mg/kg and ketamine 1mg/kg for induction and Propofol 4mg/kg/hr and ketamine 1mg/kg/hr for maintenance of anesthesia. Hemodynamic variables were recorded at regular intervals. At the end of drug infusion, recovery was assessed by time to spontaneous eye opening and Modified Aldrete scoring system.

Results: Group A combination produced a significantly greater fall in pulse rate and in mean arterial pressure as compared to Group B after induction of anaesthesia.Time to spontaneous eye opening was comparable in both the groups. There was a slight respiratory depression in Group A but not in Group B. Modified Aldrete score was better in Group B than in Group A. Incidence of postoperative nausea and vomiting was seen in 3 patients in Group A and none in Group B.

Conclusion: Both Propofol–Ketamine and Propofol–Fentanyl combinations produce a rapid, pleasant and safe anesthesia with minimal untoward side effects and slight hemodynamic changes. Out of the two, Propofol–Ketamine group is more effective without respiratory depression, better haemodynamic stability and no postoperative nausea and vomiting.

Keywords: Ketamine, propofol, total intravenous anaesthesia, recovery, analgesia, amnesia

INTRODUCTION

Keeping in consideration the merits of total intravenous anesthesia (TIVA), a clinical investigation was made to find a ideal drug combination that can be used in general anesthesia. Various drugs have been tried from time to time in TIVA. Since no single drug can provide all the characteristics of an ideal intravenous agent, several drugs were used in different combinations to provide balanced anesthesia in TIVA, to produce amnesia, hypnosis and analgesia. The goals of outpatient ambulatory anaesthesia includes a rapid and smooth induction, effective intraoperative anaesthesia, a smooth and prompt recovery with minimal, postoperative side effects to facilitate an early discharge.[1,2]

Propofol has emerged as a gold-standard for TIVA [4,5] for short surgical interventions and day care surgery but it's main shortcoming is lack of analgesia, therefore it has to be combined with an analgesic. [3] Pain relief forms an important constituent of balanced anaesthesia. Ketamine and Fentanyl are the popular analgesics in this context. Ketamine is a potent analgesic, functionally "dissociates" the thalamus (which relays sensory impulses from the reticular activating system to the cerebral cortex) from the limbic cortex mainly involved in the awareness of

sensation. Its anaesthetic and analgesic effects have been suggested to be mediated by different mechanisms. It has very high margin of safety, no irritation of the veins and no negative influence on ventilation or circulation. Its main disadvantages are hypertension and psychomimetic emergence phenomena. [6]

Fentanyl is the most popular opioid in clinical anaesthesia today. Its disadvantage is respiratory depression and postoperative nausea and vomiting. Ketamine produces emergence delirium, which Propofol seems to be effective in eliminating. [7] In the present study, haemodynamic variables and recovery of the combination propofol-ketamine was compared to the combination propofol-fentanyl in patients undergoing elective surgeries of shorter duration.

MATERIALS AND METHODS

A prospective study was conducted from June to September 2013, after obtaining the permission from the ethical committee. A total of 50 patients undergoing short elective surgeries between the age group of 15-65 years, ASA physical status I and II and with no significant systemic disease were included in the study while patients of other age groups, patient's refusal, ASA physical status III or more, known hypersensitivity to drugs used, difficult intubation and pregnant and/or lactating mothers were excluded.

All patients were premedicated with injection Glycopyrrolate 20µg/kg intravenous (IV) 30 minutes before shifting to operation theatre. On arrival at operation theatre, baseline measurement of pulse rate, blood pressure, respiratory rate and SpO2 were recorded. An intravenous cannula was placed for administration of fluids and medicines. All patients were given injection Midazolam (0.03 mg/kg) IV before induction of anesthesia. Patients were preoxygenated with 100% oxygen for 3 minutes and then induced.

The patients were randomly allocated into two groups of 25 each with drug regimens as follows:-

Group A: Propofol 2mg/kg + Fentanyl 2µg/kg for induction and Propofol 4mg/kg/hr + Fentanyl 1µg/kg/hour for maintenance of anesthesia.

Group B: Propofol 2mg/kg + Ketamine 1mg/kg for induction and Propofol 4mg/kg/hr + Ketamine 1 mg/kg/hour for maintenance of anesthesia.

Blood pressure and heart rate were monitored at basal level, after induction and in perioperative period after initiation of infusion, every 5 minutes till 30 minutes and then every 10 minutes till the end of the procedure. Incidence of hypotension / hypertension, changes in Electrocardiogram and other complications during procedure were noted and appropriate corrective measures were taken. The infusion of drugs was stopped at the end of surgery. Recovery was assessed by time to spontaneous eye opening and Modified Aldrete scoring criteria (parameters- activity, consciousness, circulation, respiration, saturation) are scored 0, 1, 2 based on the assessment and added to get the maximum score. 10 is the maximum and 1 the lowest score.

Statistical analysis: All the statistics compiled in charts and analyzed for mean ± standard deviation. Statistical analysis was done using a computer software package for student unpaired t-test.

RESULTS

Demographic data of the groups were similar for mean age, weight, and sex ratio. There was no significant difference in duration of surgery and anaesthesia.

Table 1: Demographic profile

Variable	GROUP A	GROUP B	P VALUE
Age(years)	32±10	30±8	0.78
Weight(kg)	45±13	46±13	0.40
Sex(m/f)	12/13	11/14	0.097
Duration of surgery(min)	19±6	21±7	0.54
Duration of anaesthesia (min)	20±5	22±7	0.07

Pulse Rate

Preoperative pulse rate is 85.04±14.24 (Group A) and 85.48±14.11 (Group B). After Few minutes of induction, patients in Group A showed a variable degree of bradycardia whereas tachycardia is shown in Group B.

Table 2: Changes in pulse rate

TIME	GROUP A	GROUP B	P VALUE
1 MIN	69.52± 12.386	105 .88±12.735	0.0092
5 MIN	68.88±11.602	103.4±11.394	0.0088
10 MIN	69.88±11.162	102.56±11.604	0.0076
15 MIN	72.36± 11.434	97.28± 10.269	0.0067
20 MIN	73.894±11.135	91.95 ±10.816	0.078

Mean arterial pressure(MAP)

Patients in Group A showed decrease in MAP in the first 15 minutes of the surgery, whereas Group B showed slight raise in MAP and stable haemodynamics. Preoperative MAP is 89.16±13.34 (Group A) and 83.88±11.89 (Group B).

Table 3: Changes in MAP

TIME	GROUP A	GROUP B	P VALUE
1 MIN	72.44 ±11.060	99.24 ±9.265	0.0023
5 MIN	72.2 ±10.177	98.64 ±9.141	0.0065
10 MIN	73 ±10.144	95.72 ±8.502	0.0076
15 MIN	75.76 ± 9.988	94.0 8 ±7.809	0.0098
20 MIN	75.84 ± 8.532	91.6 ±7.199	0.0059

Recovery

Spontaneous eye opening after the cessation of infusion was early in Group B than in Group A, but the groups did not differ significantly in relation to the time to opening the eyes spontaneously.

Table 4: Duration of spontaneous eye opening

	GROUP A (MIN)	GROUP B (MIN)	P VALUE
TIME	6.72 ± 1.208	4.56 ±1.260	0.0090

Modified aldrete scoring

Recovery after the stoppage of infusion was slightly delayed in Group A than Group B, while Group B had good Modified Aldrete Score than Group A. There was slight respiratory depression postoperatively in patients of Group A whereas it was not seen in Group B.

Table 5: Modified Aldrete Score

TIME	GROUP A	GROUP B	P VALUE
0 MIN	7.24 ± 1.362	9.92 ±0.276	<0.0034
10 MIN	7.92 ± 1.382	9.92 ± 0.276	<0.0056
20 MIN	9.52 ± 0.822	10	<0.076
30 MIN	10	10	

Post operative nausea and vomitting (PONV)

PONV was noted in 3 patients of Group A and none in Group B.

DISCUSSION

Total intravenous anaesthesia has been subject of interest for all anaesthesiologists as this is a convenient and patient friendly procedure in cases of day care surgeries and it avoids operation theatre pollution. [8,9] Total intravenous anaesthesia was started with single drug (Thiopentone, Propofol, Ketamine) but combinations were much useful and had good effects on patients, because no single drug is available which has all the best anaesthetic characteristics. The advent of continuous infusion systems have made administering TIVA more popular and convenient. Propofol, a modern intravenous hypnotic agent causes both reduction in mean arterial pressure and cardiac index.[10] In contrast, a potent analgesic, Ketamine increases mean arterial pressure and cardiac index.[11] Fentanyl being an opioid is a best analgesic but causes respiratory depression and bradycardia.[12]

In the present study two groups were studied i.e Propofol–Fentanyl (Group A) and Propofol- Ketamine (Group B). There was decrease in mean arterial pressure and heart rate in Group A during post induction and maintenance for first 15 minutes, when compared with Group B. [13] The results are similar to study done by Saha et al (2001), Mayer et al (1990) where they found decrease in blood pressure and heart rate after induction and during maintenance in Propofol–Fentanyl group. [20, 25] Fentanyl causes dose dependent decrease in heart rate. Carotid sinus baroreceptor reflex control of heart rate is markedly depressed by Fentanyl.[14, 15]

There was a gradual increase in mean pulse rate in Propofol-Ketamine group (Group B). Mean heart rate increased by 24% after induction in Propofol-Ketamine group. Hui TW et al (1991) also concluded that heart rate and peripheral vascular resistance are increased when Ketamine was used.[16] Ketamine stimulates cardiovascular system by 0-40% and 0-42% associated with increase in blood pressure, cardiac output respectively.[17] The hemodynamic effects of Ketamine are not dose dependent.[28] The effect is due to increase in central sympathetic tone [18,19] In a study by Croizer et al (1996) compared Propofol–Ketamine and Propofol–Alfentanil, they found that Propofol–Ketamine group was more haemodynamically stable.[26] A similar study done by Dunnihoo et al (1994) also showed Propofol– Ketamine group had better haemodynamic stability with slight changes in heart rate and mean arterial pressure.[17,27]

Recovery

Recovery was assessed by time to spontaneous eye opening and Modified Aldrete scoring system. Groups did not differ significantly in relation to the time to spontaneous eye opening which is same as in the study done by Mahajan R et al (2010).[24] There was slight respiratory depression postoperatively in patients who received propofol–fentanyl as compared to patients who received propofol-ketamine.[20,21] The slightly lower ventilation score with propofol–fentanyl combination was due to central respiratory depressant effect of fentanyl.[22] Whereas patients in propofol–ketamine combination had good recovery, the result is similar to study conducted by Sheppard et al 2001 where they concluded that propofol-ketamine combination has a better recovery in terms of respiration, mood, perception and cognition.[23]

Post operative nausea and vomitting

Nausea and vomiting in Propofol – Fentanyl group was

noted in 3 patients which may be due to the central emetic effects of Fentanyl. There was none in patients in Propofol–Ketamine group. The lower incidence of nausea and no incidence of vomiting are attributed to the antiemetic effect of propofol. [13,24]

CONCLUSION

Both propofol–ketamine and propofol–fentanyl combinations produce a rapid, pleasant and safe anesthesia with minimal untoward side effects and slight hemodynamic effects. Out of the two, propofol–ketamine group is more effective without respiratory depression, better haemodynamic stability and no postoperative nausea and vomiting.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

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