Original Article

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A Comparison between Etomidate and Propofol for Sedation in Colonoscopy

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Abstract

Background: Propofol has been the widely used sedative agent for colonoscopy.However, in elderly population, propofol causes an exaggerated cardiorespiratory depression. Etomidate causes sedation with minimal effect on cardiovascular and respiratory system. *Objective:* The primary objective was to compare the hemodynamic, respiratory and recovery profiles of Etomidate versus Propofol for sedation in colonoscopy. Secondary objective was to evaluate the effect on pain post colonoscopy with these drugs. *Materials and Methods:* Sixty patients aged 60 years and above, for colonoscopy were randomly divided into two groups.All patients received fentanyl 1mcg/kg. Group E received etomidate 0.1mg/kg over one minute, followed by 5-10 mcg/kg/minute. Group P received propofol 0.5mg/kg over one minute, followed by 0.05mg/kg/minute. Colonoscope was inserted when Ramsay sedation score was 4. The time required for induction, vitals every 5 minutes, and the time for modified aldrette score to reach 9 were noted. Visual analog pain score was assessed in all patients. *Results:* During the procedure the fall in heart rate, mean arterial pressure was significantly more in group P than in group E ($p < 0.001$). The fall in oxygen saturation was greater in group P but was not significant. The time taken to induce the patients was the same in the two groups.The recovery time was significantly longer in group E($p<0.001$). There was no difference in the visual analog score of pain. Bradycardia, hypotension and hypoxia were encountered in group P. *Conclusion:* Etomidate fentanyl sedation is safer than propofol fentanyl combination in elderly patients undergoing colonoscopy.

Keywords: Etomidate; Propofol; Fentanyl; Colonoscopy.

Introduction

Colonoscopy is the diagnostic tool for detection and screening of colorectal cancer, which is more common in the elderly population [1]. Colonoscopy is a short invasive procedure causing pain, discomfort and vasovagal effects. Most patients need sedation and analgesia during the procedure. Sedation implies drug induced lowering of level of consciousness [2]. The objective is to allay patient anxiety, discomfort, pain, ease the procedure and to keep the patient free of unpleasant memories.

Most endoscopic procedures require patient to be under moderate sedation, a technique termed conscious sedation. Here the patient can maintain the ventilatory and cardiovascular function and respond purposefully to verbal and tactile stimuli. A deeply sedated patient is not easily arousable but may be responsive to repeatedpainful stimuli and airway protection becomes mandatory. At the level of general anaesthesia, the patient is not arousable to painful stimuli and has impaired cardiovascular function.

Propofol has been widely used for conscious sedation due to its rapid onset, easy titratibility and rapid recovery profile [3,4]. But it may lead to bradycardia, hypotension, loss of protective reflexes and respiratory depression [5,6]. These adverse effects are more pronounced in elderly patients >60 years [7]. Other drugs like midazolam and dexmedetomidine too have the risk of respiratory and cardiac depression respectively.

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Hence the quest for a sedative agent having rapid onset, short duration and least hemodynamic and respiratory adverse effects. Etomidate is a good sedating agent that fulfils these criteria [8]. Etomidate fentanyl combination has not been evaluated in patients above 60 years for outpatient procedures.

In this study, etomidate fentanyl versus propofol fentanyl combination was evaluated in patients above 60 years undergoing colonoscopy in terms of respiratory, hemodynamic, pain and recovery profiles.

Materials and Methods

This randomised, double blind study included 60 ASA 1-3 patients, aged 60-80 years, undergoing elective colonoscopy after approval of the institutional ethical committee and on obtaining written informed consent from the patients. This study was conducted in our institute from September 2014 to November 2016.

Exclusion criteria were drug allergy,patient refusal, difficulty in communication, neurological or psychiatric disability and patients on opioid medication or substance abuse.The patients were randomised into two groups of 30 each – Group E and group P using a computer generated programme.

All patients underwent a thorough preanaesthetic examination. A complete medical history was noted and examination was conducted. Clinical investigations included complete blood picture, fasting and post prandial blood sugars, serum electrolytes, liver and renal function tests, chest x ray and 12 lead electrocardiography. They were familiarized with the visual analog pain scale (0=no pain, 10=maximum pain). All patients were kept nil by mouth for six hours .On arrival to the endoscopy room, patients heart rate, electrocardiography, blood pressure, room air saturation were noted and monitored during and after the procedure. Premedication was done with glycopyrrolate 0.005mg/kg and fentanyl 1microgram/kilogram intravenously. They were put in left lateral position and oxygen was given with face mask @4L/minute. Intravenous ringer lactate solution was started @10 ml/kg/hour. 2% lidocaine 3 ml was administered intravenously to all patients. Group E patients received etomidate 0.1 mg/kg over 60 seconds followed by 5-10 mcg/kg/minute. Group P patients received propofol 0.5 mg/kg over 60 seconds followed by0.05mg/kg/minute. These drugs were loaded by our assistant. As both propofol and etomidate are white coloured solution, the anaesthesiologist who was noting down the readings was unaware as to what group the patient belonged. The time of induction was noted. The colonoscope was allowed to be inserted when the Ramsay Sedation Score reached 4 [Ramsay Sedation Score- 1=awake, 2=drowsy,3=arousable toverbal commands, 4=arousable to tactile stimuli, 5=not arouable]. The vitals were noted every 5 minutes. The time were recorded as :

Tin– time for induction,i.e time from injection of drugs to RSS=4, when colonoscopy was started

Tco – duration of colonoscopy(time elapsed between the introduction to the removal of colonoscope)

Drugs were stopped immediately once the endoscopist confirmed the end of procedure. Post procedure, the patients were monitored.

Trec – time taken to recovery; i.e. time to reach Modified aldrette score 9.

On recovery, the visual analog scale was assessed in the two groups.

Results

Table 1: Demographic profile

	Group E Mean ± SD	Group P Mean ± SD	P-Value
Age	63.6 ± 3.14	62.9 ± 2.51	0.344
Gender (M:F)	18:12	15:15	0.436
Height	163.0 ± 4.76	159.80 ± 4.58	0.010
Weight	65.50 ± 2.81	63.13 ± 3.95	0.009
ASA			
I	0	1 (3%)	
I	15 (50%)	15 (50%)	0.596
II	15 (50%)	14 (47%)	

Table 2: Procedure characteristics

	Group E Mean ± SD	Group P Mean ± SD	P-Value
Induction time (Min)	2.65 ± 0.82	2.78 ± 0.94	0.578
Duration (Min)	10.19 ± 1.52	11.30 ± 1.84	0.014
Receovery time (Minutes)	4.51 ± 1.60	2.85 ± 1.06	<0.001
Visual Analogue Score	2.13 ± 0.51	2.17 ± 0.46	0.791

Table 3: Heart rate

	Group E Mean ± SD	Group P Mean ± SD	P-Value
T0	75.10 ± 7.62	76.27 ± 8.59	0.580
T1	78.73 ± 7.17	79.67 ± 8.31	0.643
T5	72.30 ± 5.63	62.83 ± 7.21	<0.001
T10	67.77 ± 5.16	58.83 ± 7.74	<0.001
T15	66.53 ± 4.61	56.30 ± 5.79	<0.001
T20	69.77 ± 4.33	59.50 ± 3.98	<0.001

Table 4: Mean arterial blood pressure

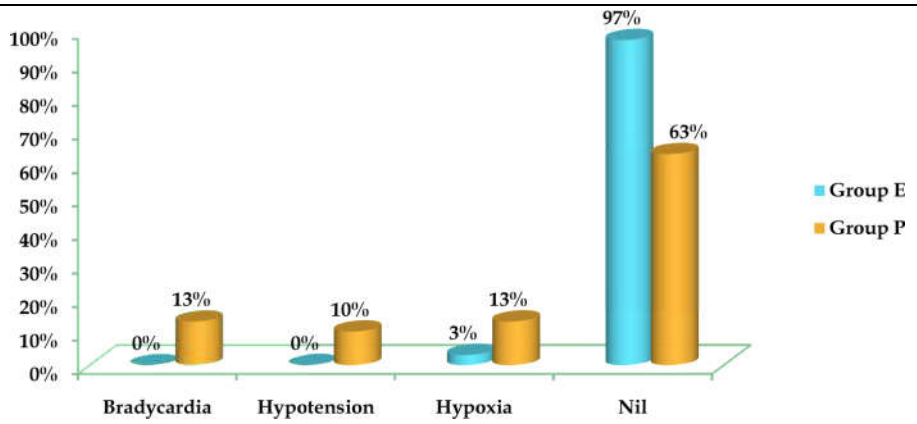
	Group E Mean ± SD	Group P Mean ± SD	P-Value
T0	89.57 ± 3.97	90.20 ± 3.97	0.539
T1	87.13 ± 3.91	85.03 ± 4.80	0.068
T5	84.20 ± 3.65	80.03 ± 5.47	0.001
T10	83.70 ± 3.60	77.63 ± 5.71	<0.001
T15	85.43 ± 2.18	77.87 ± 5.63	<0.001
T20	86.40 ± 2.79	81.23 ± 4.88	<0.001

Table 5: SpO2

	Group E Mean ± SD	Group P Mean ± SD	P-Value
T0	97.7 ± 1.44	98.07 ± 1.27	0.298
T1	96.97 ± 1.57	96.57 ± 1.96	0.280
T5	95.03 ± 2.12	94.27 ± 2.41	0.196
T10	94.83 ± 2.39	92.80 ± 3.29	0.008
T15	96.13 ± 2.22	93.97 ± 2.47	0.001
T20	97.07 ± 1.48	96.47 ± 1.77	0.158

Table 6: Adverse effects

	Group E	Group P	Total	P-Value
Bradycardia	0	4 (13%)	4	
Hypotension	0	3 (10%)	3	0.012
Hypoxia	1 (3%)	4 (13%)	5	
Nil	29 (97%)	19 (63%)	48	
Total	30	30	60	



Graph 1: Adverse effects

The study got over without any major complications. There was no significant difference between the two groups in terms of patient demographics, i.e, age, gender, height, weight and ASA status (Table1). The baseline heart rate, mean arterial pressure was similar in the two groups. However during the procedure the fall in heart rate, mean arterial pressure (Table 3,4) was significantly more in group P than in group E ($p < 0.001$). The fall in oxygen saturation was also greater in group P than in group E but was not significant (Table 5). The time taken to induce the patients was the same in the two groups. The duration of colonoscopy was the same in the two groups (Table 2). But the recovery time i.e, the time for modified aldrette score to be 9, in group E was 4.57±1.60 minutes, while in group P it was 2.85±1.06 minutes. It was significantly longer in group E ($p<0.001$). There was no difference in the visual analog score of pain between the two groups upon recovery (Table 2). There were more adverse effects encountered in group P than Group E. in Group P, 4 patients developed bradycardia, 3 developed hypotension, 4 developed hypoxia, while in group E, hypotension was encountered in one patient only (Table 6, Graph 1).

Discussion

In this study, we have compared the suitability of etomidate and propofol for sedation in the elderly population in terms of cardiorespiratory, recovery parametres, post operative analgesia and adverse effects. The results showed that etomidate provided more stable hemodynamic and respiratory parameters than propofol.

An ideal sedative agent in gastrointestinal endoscopy should be one with rapid onset , short duration and with good analgesic properties. Moreover there should be good hemodynamic stability and be devoid of unpleasant emergence reactions [9]. Propofol has generally been a popular hypnotic amongst gastroenterologists owing to its rapid onset and fast recovery [10,11,12]. But in a guideline of sedation and anaesthesia in gastrointestinal endoscopy, it was stated that transient hypotension occurred in 4-7% and hypoxia in 3-7% cases with propofol [13]. Propofol has excellent depressant action on laryngeal reflexes [14]. We encountered a fall in heart rate, mean arterial pressure and oxygen saturation after sedation with propofol, suggesting its cardiorespiratory inhibitory action. This effect is attributable to peripheral vasodilator and inhibitory action of propofol on the cardiomyocytes [15].

Etomidate is a non barbiturate hypnotic anaesthetic agent acting on the GABA receptors in the central nervous system [16]. It is rapidly acting(<1 minute) with a short duration(3-5 minute) of action. Its advantages include hemodynamic stability, less ventilator depression, cerebroprotective and pharmacokinetics leading to rapid recovery after a single dose [17]. It has no effect on the sympathetic system and baroreceptor function explaining its hemodynamicstability [18]. The cerebroprotective effect is due to reduction in the cerebral blood flow, intracranial pressure and hence cerebral oxygen metabolism. This protects from hypoxia. All these reasons make etomidate a better option than propofol for sedation especially in geriatric population.

The time taken for induction and the duration of colonoscopy were similar in both the study groups. The recovery time was longer in the etomidate group however. This may be due to higher sedation with etomidate. The visual analog pain scale upon recovery was similar in the two groups. Fentanyl administered prior to sedation could be the reason for the good analgesia.

Myoclonus is a significant adverse effect of etomidate [19] especially if used without premedication with an incidence of 50-80% [14]. Our premedication with fentanyl has suppressed myoclonus.

Our studyhas two limitations. One, we have not measured plasma cortisol and adrenocorticotropic hormone levels in our patients. Etomidate is known to cause adrenocortical suppression [20]. However a single dose of etomidate is unlikely to cause adrenocorticalsuppression. Secondly, we have not investigated pain caused by injection of propofol and etomidate during induction. We have injected intravenous lidocaine prior to induction in all cases which has interfered with pain if caused. Thus, we conclude that etomidate fentanyl sedation is safer than propofol fentanyl combination in elderly patients undergoing colonoscopy.

Conflicts of Interest: None.

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