

A Comparison Study of Total Intravenous Anaesthesia (TIVA) to Inhalational Anaesthesia for Day Care Surgery

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The aim of the study was to determine propofol based TIVA as a technique for day care surgery and to compare TIVA with inhalation anaesthesia in terms of intra and post operative haemodynamic profile, post operative recovery and undesirable sequelae like post operative nausea and vomiting. Eighty (80) ASA grade I and II adult patients in the age group of 20-40 years undergoing D&C, Ovum collection, Bartholin cyst as elective and emergency day care surgeries were divided randomly into two groups of 40 patients in each. Results: Regarding post operative nausea vomiting (PONV) that propofol was associated with less post operative nausea vomiting (PONV) significantly as compared to inhalational technique with halothane. The overall post operative side effects considered as minor sequelae were also found in much more number of patients in inhalational anaesthesia group as compared to TIVA (Propofol) group. Propofol compares favorably to thiopentone halothane-Nitrous oxide for maintenance of anaesthesia during day care procedure with remarkable early and rapid recovery with propofol and less PONV.

[Dinajpur Med Col J 2017 Jan; 10 (1):37-42]

Key words: inhalational, anaesthesia, surgery, day care, TIVA

Introduction

Day care surgery may be defined as a patient recovers from surgery and fit to return home within a day (24 hours).¹ Day surgery represents high-quality patient care with excellent patient satisfaction. Shorter hospital stays and early mobilization reduce rates of hospital-acquired infection and venous thromboembolism.² The intravenous anesthesia is the latest concept of balanced anesthesia, which obviates in need for inhalational agents like halothane.³ Since its

introduction into clinical practice, propofol has acquired an important place in the anaesthesiologists armamentarium and the interest in the total intravenous anaesthesia has been revived by propofol.⁴ For day case surgery to be effective, morbidity must be minimized.⁵ An ideal intravenous anaesthetic regime used in day care surgery should provide rapid recovery and early discharge with minimal side effects and should be cost effective. Propofol is the drug of choice when a rapid and smooth recovery is required.

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Recovery from propofol anaesthesia is characterized by the absence of “hangover effect” and a low incidence of nausea and vomiting. In addition the use of TIVA avoids operation theater pollution seen with inhalational anaesthetic agents especially Halothane with Nitrous Oxide.⁴ This randomized controlled study was designed to evaluate total intravenous anaesthesia (TIVA), as an anaesthetic technique for day care in different short period of surgical procedures and to compare TIVA with inhalational anaesthesia technique in terms of intra and post operative hemodynamic profile, post operative recovery and undesirable sequelae like post operative nausea vomiting (PONV).

Methods

Eighty ASA grade I and II adult patients in the age group of 20-40 yrs undergoing D&C, Ovum collection, Bartholin cyst as elective and emergency day care surgeries were divided randomly into two groups of 40 patients in each. Exclusion criteria were a history of allergic or other serious adverse experience with anaesthesia; severe respiratory, metabolic and central nervous system disease, hepatic disease, significant cardiac disease or anticipated airway management problems.

Inhalational anaesthesia group included 40 patients and acted as control group. This was the inhalational anaesthesia group.

TIVA (Propofol) group included 40 patients and was study group, the total intravenous anaesthesia group (TIVA). No premedication was given in both groups. In the control group, induction of anaesthesia was achieved with thiopentone Na 4-5 mg/kg and maintenance with O₂/ N₂O/ halothane (0.5-3%) as judged clinically. Halothane was tapered at the end of surgery and stopped at

skin closure. N₂O was stopped at skin closure and continued with O₂ for 5 minutes.

In the study (TIVA) group patients were induced with propofol 2 mg/kg and maintained by 20-30 mg intermittent dose of propofol with 3 liter oxygen by through nasal canula/ face mask. Intermittent dose was adjusted according to need of anaesthesia depth. Propofol was tapered towards the end of case and stopped at skin closure. Analgesia in both was provided with 1-2µgm of fentanyl at induction. Recovery time was recorded from cessation of the intermittent dose or inhalational agent to eye opening on vocal command, limb lift on command and achievement of Aldrete score >9.

Results

The patients in both the groups were comparable with respect to age and weight. Mean heart rate and hemodynamic variables preoperatively was comparable. The mean age was found 27.61±4.47 years in Inhalational anaesthesia group and 28.53±4.06 years in TIVA (Propofol) group. Mean weight was found 52.42±6.91 kg in control group and 53.24±7.11 kg in study group. The mean age and weight were not statistically significant (p>0.05) (Table I). In the intraoperative period there was a slight decrease in the heart rate from preoperative baseline levels in Inhalational anaesthesia group patients in first 10 min while no such decrease in the heart rate was observed in TIVA (Propofol) group patients. The relationship was statistically insignificant. Similarly although mean heart rate in Inhalational anaesthesia group at various instances intra operatively was lower than in TIVA (Propofol) group, the comparison was statistically insignificant (Table II). TIVA (Propofol) group patients showed an initial fall in mean arterial blood pressure when compared to baseline values as well as Inhalational anaesthesia, the difference was statistically insignificant. During the rest of

intraoperative period the blood pressure remained lower than the preoperative levels in both the groups with a statistically non-significant difference (Table III). In the post operative period, the return of activity i.e time achieved to eye opening on command occurred at 09.8 ± 6.3 min after termination of halothane in group I while in group II (propofol group) eye opening occurred at 05.2 ± 4.3 minutes after termination of propofol infusion. The return of limb movement on command occurred earlier in TIVA (Propofol) group than in Inhalational anaesthesia group which were 10.1 ± 7.6 and 15.1 ± 8.6 respectively. The relationship of recovery characteristic was statistically significant when the two groups were compared (p- value <0.001) (Table IV). The ability to breathe and to cough freely on vocal command developed earlier in TIVA (Propofol) group as compared to Inhalational anaesthesia group and the difference was statistically significant p <0.05 (Table V). Regarding post operative nausea vomiting

that propofol-fentanyl was associated with less post operative nausea vomiting (PONV) significantly as compared to inhalational technique with halothane-fentanyl. The overall post operative side effects considered as minor sequelae were also found in much more number of patients in Inhalational anaesthesia group as compared to TIVA (Propofol) group (Table VI) .

Table I: Demographic data

Demographic data	Inhalational anaesthesia (n=40)	TIVA (Propofol) (n=40)	p value
Age in years			
20-25 yrs	09(22.5)	10(25)	
26-30 yrs	13(32.5)	12(30)	
31-35 yrs	11(27.5)	10(25)	
>35 yrs	07(17.5)	08(20)	
Mean age (years)	27.61 ± 4.47	28.53 ± 4.06	0.33 ^{ns}
Mean weight (kg)	52.42 ± 6.91	53.24 ± 7.11	0.60 ^{ns}

Table II: Mean heart rate at pre operative, Intra operative and post operative periods in the two groups

Group	Mean heart rate						
	Preoperative	5 min	10 min	20 min	30 min	Termination	Post operative
Inhalational anaesthesia	78	70	65	67	73	80	85
TIVA (Propofol)	80	82	77	78	80	84	88

Table III: Mean arterial pressure (mean \pm SD) during preoperative, intraoperative and post operative period in two groups

Group	Mean Heart Rate							
	Pre induction	Immediate after induction	5 min	10 min	20 min	30 min	Termination	Post operative
Inhalational anaesthesia	88 ± 15	86 ± 11	85 ± 10	88 ± 11	87 ± 13	87 ± 15	88 ± 14	90 ± 12
TIVA (Propofol)	89 ± 17	80 ± 15	77 ± 13	80 ± 10	84 ± 11	86 ± 13	87 ± 13	88 ± 10

Table IV: Mean time in achieving eye opening and limb movement on vocal command in two groups

Group	Inhalational anaesthesia (n=40)	TIVA (Propofol)	p
Eye opening	09.8±6.3	05.2±4.3	0.001 ^s
Limb	15.1±8.6	10.1±7.6	0.001 ^s

Table V: Mean time in the two groups to breath and cough freely

Group	Inhalational anaesthesia (n=40)	TIVA (Propofol)	p
Breathing (minutes)	5.8±2.5	3.1±2.1	0.045 ^s
Cough freely (minutes)	8.9±4.6	5.2±3.9	0.014 ^s

Table VI: Post operative nausea vomiting

Group	Inhalational anaesthesia (n=40)	TIVA (Propofol) (n=40)	p
Nausea	36	18	<0.001
Vomiting	18	10	<0.05

Discussion

Intravenous anaesthetics have evolved from being used primarily for induction of anaesthesia to provide unconsciousness and amnesia for surgical procedures performed under anaesthesia. Propofol is commonly used for induction of anaesthesia for day care surgery and is widely used as a component of TIVA.⁶ Propofol has pharmacokinetic profile that favours its use as a intermittent dose for maintenance of anaesthesia. TIVA with propofol has been shown to be superior to inhalational anaesthesia in operations of short durations in terms of rapid awakening and return to street fitness.⁷ Many studies have demonstrated the advantages of TIVA with propofol for day care procedures.^{8,9} This randomized prospective study was designed to compare the haemodynamic and recovery

benefits if TIVA using propofol and fentanyl with inhalational anaesthesia in patients undergoing short many surgical procedures.

In presents study showed the mean age was found 27.61±4.47 years in Inhalational anaesthesia group and 28.53±4.06 years in TIVA (Propofol) group. Mean weight was found 52.42±6.91 kg in control group and 53.24±7.11 kg in study group. Similar observation was found Kewalramani et al¹⁰ study, they showed the **mean Age** 26.1±4.66 were Inhalational anaesthesia and 26.78±5.06 were in TIVA (Propofol) group and in weight in kg also approximately similar to our study which was 49.40±10.33 and 48.74±9.36 respectively. Induction of anaesthesia with propofol was found to be associated with a slight drop in systolic blood pressure and increased heart rate and as compared to inhalational anaesthesia, although it was statistically non significant. In the intraoperative priod TIVA (propofol) was associated with better hemodynamic stability than inhalation anaesthesia. Similar results were observed by R M Grounds et al 1985¹¹ and Michael M Todd et al 1993.¹² These studies confirm the safety of of propofol during the intraoperative period for maintenance of anaesthesia inspite of hypotensive effects. The hypotensive effects of propofol appear to be transient in nature and are not of sufficient nature so as to compromise coronary circulation.¹³ The arterial oxygen saturation was monitered throughout the surgery using pulse oximetry. No evidence of desaturation was evident in any patient of either group. In the inhalational anaesthetic group, 3 patients developed drop of oxygen saturation to 85% and required oxygen supplementation in recovery room which was attributed to diffusion hypoxia due to use of nitrous oxide in the gas mixture during the maintenance of anaesthesia and also delayed recovery. These findings confirm that maintenance of anaesthesia during propofol with oxygen mixture is

adequate for maintenance of SpO₂ within normal limits. Furthermore TIVA reduces the risk of development of diffusion hypoxia that can occur in patients maintained on O₂/Halothane/ N₂O mixture. An assessment of post operative recovery by Aldrete scoring found that there was early recovery in patients who received TIVA as compared to inhalation anaesthesia although not statistically significant.

The findings of other studies confirm our findings.^{7,12} Similar findings have been seen by other investigators who have used other scoring systems like Steward score by Marshall et al 1992.¹⁴ The time to eye opening, limb lift was earlier in the patients receiving TIVA as compared to inhalation anaesthesia technique. Our findings supported by other authors demonstrate that TIVA was associated with improved early postoperative well being with better recovery.

In our study fewer patients (15%) in the propofol group experienced postoperative nausea and vomiting in the recovery ward as compared to inhalation Anaesthesia group (40%). Klazima Vissa et al, 2002¹⁵ reported an incidence of postoperative nausea and vomiting of 47% after Halothane and 29% after TIVA . Similar results were seen in studies of Sneyd J R et al 1998 and C K Hofer et al , 2003¹⁶ . These findings conclusively prove superior emetic profile of TIVA despite the use of opioids over inhalation anaesthetic technique and hence the better suitability of TIVA for use in outpatient surgical procedures. In study of Kewalramani¹⁰ showed the overall post operative side effects considered as minor sequelae were also found in much more number of patients in inhalation anaesthetic group as compared to TIVA group. In study of Rao et al⁵ study also observed TIVA (Propofol) was less postoperative nausea and vomiting than other inhalation anaesthesia.

Conclusion

Propofol compares favorably to thiopentone halothane-Nitrous oxide for maintenance of anaesthesia during short or day care procedure with remarkable early and rapid recovery with propofol and less PONV.

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