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Surgery

To Compare the Efficacy of Dexmedetomidine, Granisetron and Tramadol in Prevention of Post-Operative Shivering In Patients Undergoing Surgeries under General Anesthesia

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Abstract: Shivering is one of the major causes of distress to the patient recovering from the effects of anesthesia, both psychologically and physiologically and occurs in up to 60 % of patients recovering from general anaesthesia. Excessive shivering creates an imbalance between body's oxygen demand and supply ratio. The resultant increased demand, sometimes up to six times than normal. This study was intended to compare the efficacy of relatively newer drugs, dexmedetomidine and granisetron in reducing the incidence of postoperative shivering as compared to tramadol, which is known to be a potent antishivering agent. 90 ASA I and II patients of either sex were taken. The patients were randomly allocated into three groups, Group D Group G and Group T, comprising of 30 patients each. The patient were educated about the visual analogue scale (VAS) scale and about the drug. Any episode of shivering, fever, pain, hallucination, dry mouth, postoperative nausea and vomiting (PONV) and other complications will be recorded by a Senior Resident Anesthesia and then the data was analysed. When the patients were received in PACU in group D no patient showed shivering. Incidence of shivering in group T is 2(6.6%). Incidence of shivering in group G is 16(53.3%). The incidence of shivering in group D and group T were statistically comparable. Whereas the incidence of shivering in both group D and well as group T was statistically significantly lower than that in group G with a p value of <0.00. Dexmedetomidine 1 μg/kg is less effective than tramadol 1 mg/kg in reducing the incidence of post-operative shivering which is statistically insignificant, and granisetron is not as effective as tramadol or dexmedetomidine in reducing shivering but having an added advantage that it prevents PONV.

Keywords: post-operative shivering, dexmedetomidine,tramadol, granisetron.

INTRODUCTION

Shivering is one of the major causes of distress to the patient recovering from the effects of anesthesia, both psychologically and physiologically and occurs in up to 60 % of patients recovering from general anaesthesia[1]. The maintenance of body temperature under anaesthesia is complicated by a variety of factors including heat loss to atmosphere (cool operating room), infusion of fluid at room temperature, disruption of normally coordinated thermoregulatory mechanism by epidural/ spinal anesthesia and redistribution hypothermia [2].

Excessive shivering creates an imbalance between body's oxygen demand and supply ratio. The resultant increased demand, sometimes up to six times than normal; and relative deficit of oxygen supply can lead to various metabolic derangements such as hypoxemia, lactic acidosis, and hypercarbia, thereby hampering a smooth recovery from anesthesia [3, 4].

Various drugs, techniques, and measures have been used in the past to prevent incidence of shivering but the search for an ideal drug or drug combination is still on [5, 6]. Dexmedetomidine seems to have great potential for its usage in anesthesia and intensive care practice. It is also postulated that Dexmedetomidine exhibits antishivering effects through its centrally mediated actions [11]. Recently, 5-hydroxytryptamine 3 (5-HT3) receptor antagonists like granisetron and ondansetron have been reported to prevent post anesthetic shivering [7, 8].

This study was intended to compare the efficacy of relatively newer drugs, dexmedetomidine and granisetron in reducing the incidence of postoperative shivering as compared to tramadol, which is known to be a potent antishivering agent.

MATERIALS AND METHODS

After obtaining approval from hospital ethical committee and written informed consent 90 ASA I and II patients of either sex were taken. The patients were randomly allocated into three groups, Group D Group G and Group T, comprising of 30 patients each. Type of surgeries included were general surgeries duration >2hrs under general anesthesia. Along with pre anesthetic checkup, patients were educated about drug to be used and Visual analogue scale (VAS).

All the patients were premedicated with alprazolam 0.25 mg and ranitidine 150 mg orally with a sip of water a night before surgery and 2 hours before the proposed surgical procedure. The patients were randomly allocated into three groups comprising of 30 patients each. Drugs were administered as a diluted solution of 10 ml normal saline containing 1μg/kg of Dexmedetomidine in group D, 40 μg/kg Granisetron in group G, 1mg/kg Tramadol in group T 30 minutes before the anticipated completion of surgery over 10 minutes.

In the preoperative room, all the vitals including axillary temperature were observed and recorded into the proforma by a staff nurse. In the operation theatre, all the baseline parameters such as heart rate (HR), electrocardiography (ECG), noninvasive blood pressure (NIBP), pulse oximetry (SpO2), and end tidal carbon dioxide (EtCO2) were recorded and an intravenous (IV) access was secured with a 20G cannula. Intravenous fluids in form of NS /RL warmed to 37°C was infused as maintenance fluid. Anesthetic management was standardized. Anesthesia was induced with propofol (2 mg/kg), fentanyl (1.5 mcg/kg), midazolam (1 mg), and vecuronium (0.1 mg/kg). Endotracheal intubation done followed by mechanical ventilation. Axillary temperature and nasopharyngeal [core] temperature were measured again after induction of anesthesia and thereafter every 30 minutes and also just before the administration of study drugs.

All the patients were provided adequate covering of the body and operation room temperature was maintained at 24-25°C. Anesthesia was maintained with 60% nitrous oxide in oxygen, isoflurane 1- 1.5% and vecuronium bromide 0.03-0.05mg/kg as and when required. Palonosetron was also administered in a dose of 75 μg IV to all patients of all the three groups 20-25 minutes before the anticipated completion of the surgical procedure. Neostigmine 2.5 mg i.v and glycopyrrolate 0.5 mg i.v was given to antagonize any residual neuromuscular blockade. Tracheal extubation done uneventful. All the vital parameters were duly observed and recorded into the proforma. In the recovery room, all the patients will be covered with warm blankets and their axillary temperature was recorded on arrival. They were administered oxygen @ 3 L/min in a slightly propped-up position. Any episode of shivering, fever, pain, hallucination, dry mouth, postoperative nausea and vomiting (PONV) and other complications will be recorded by a Senior Resident Anesthesia. Vital parameters HR, NIBP, ECG, and SpO2will are recorded at intervals of 5, 10, 20, 30, 45, and 60 minutes and half hourly thereafter for next 2 hours. Patients with any episode of PONV will be treated with palanosetron 75 mcg IV.

Shivering is defined as readily detectable fasciculation of the face, jaw, head, trunk or extremities lasting longer than 15 seconds and occurs in up to 65% of patients recovering from general anesthesiap[9,10].

STATISTICS

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables were presented as mean ± SD, and categorical variables are presented as frequency and percentage. The comparison of normally distributed continuous variables between the groups was performed using Student's t test. Nominal categorical data between the groups were compared using Chi-squared test or Fisher's exact test as appropriate. $P<0.05$ was considered statistically significant.

RESULTS

The three groups were statistically comparable with regard to age with p-value 0.996 ($p >0.05$), weight with p-value 0.367 ($p >0.05$), sex distribution with p-value 0.837 ($p >0.05$) which was statistically insignificant. All three groups comprised of comparable number of ASA 1 and 2 patients with a p value of=0.853 which is >0.05, duration of surgery with p value > 0.05 (p=0.990) which is statistically not significant.

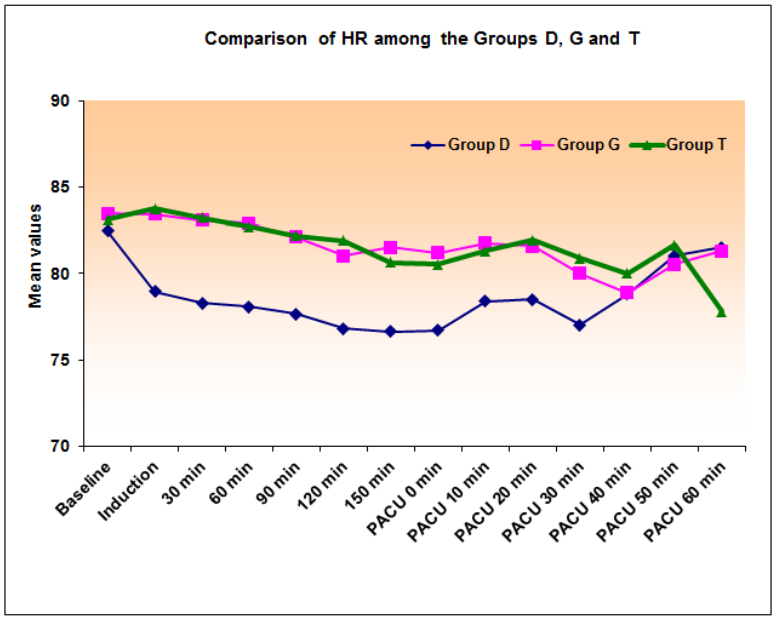

Fig-1

At 150 min and early in PACU, reduction in heart rate was statistically significant in group D when compared to group both group G and group T. Although the reduction in heart rate was never clinically significant in group D and no incidence of clinically significant bradycardia was observed in any group (FIGURE 1).

At 150 min and early in PACU, reduction in mean arterial pressure was statistically significant in group D (P 0.002) when compared to group both group G and group T. Although the reduction in MAP was never clinically significant in group D and no incidence of hypotension was observed in any group. There was no event of desaturation, that is SpO_2<95%, in any of the groups at any time in PACU.

Table-1: Temperature

	Group D (N=30)	Group G (N=30)	Group T (N=30)	P value	Group D vs Group G	Group D vs Group T	Group G vs Group T
T0	36.71 ± 0.05	36.72 ± 0.08	36.74 ± 0.09	0.380	0.862	0.354	0.664
Ti	36.28 ± 0.14	36.31 ± 0.13	36.34 ± 0.12	0.175	0.470	0.156	0.772
Td	35.98 ± 0.18	35.90 ± 0.14	35.87 ± 0.22	0.078	0.215	0.080	0.875
Te	35.88 ± 0.22	35.87 ± 0.23	35.78 ± 0.35	0.262	0.995	0.309	0.357

There is a decrease in temperature from preoperative to at induction and at the end of surgery in all three groups. Mean temperature in Group D decreased from 36.71 ± 0.05 preoperatively to 35.88 ± 0.22 by the end of the surgery. Mean temperature in Group G decreased from 36.72 ± 0.08 preoperatively to 35.87 ± 0.23 by the end of the surgery. Mean temperature in Group T decreased from 36.74 ± 0.09 preoperatively to 35.78 ± 0.35 by the end of the surgery. This decrease is statistically insignificant and similar in all groups.

Also, all the three groups were statistically comparable as regard to the core body temperature at all times (p>0.05).

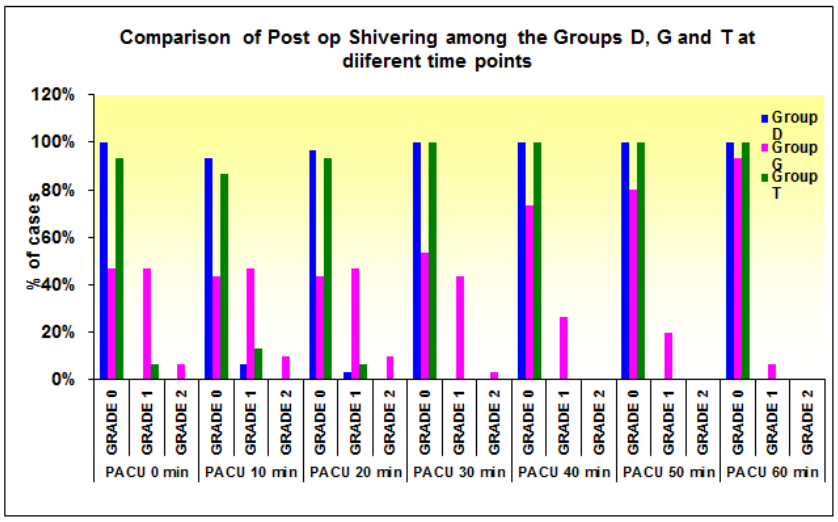

Fig-2: Shivering in PACU in various groups

When the patients were received in PACU in group D no patient showed shivering. Incidence of shivering in group T is 2(6.6%). Incidence of shivering in group G is 16(53.3%). The incidence of shivering in group D and group T were statistically comparable. Whereas the incidence of shivering in both group D and well as group T was statistically significantly lower than that in group G with a p value of <0.00.

At 10 minutes in PACU, the incidence of shivering in group G, D and T were 2(6.6%), 17(56.6%), and 4(13.3%) respectively. Group D and group T showed significant reduction in the incidence of shivering as compared to group G.

Assesment of sedation at 0 minute in PACU, all 30 patients in group D were sedated out of which 19 patients were arousable to tactile stimulation and 11 were arousable to voice, whereas in group T, 11 patients were arousable to tactile stimulation and 19 were arousable to voice. Sedation in group D was more than that in group T but it was statistically comparable with p value of 0.549.

At 10 minute in PACU, all 30 patients in group D were sedated out of which 11 patient were arousable to tactile stimulation and 19 were arousable to voice, whereas in group T, 4 patients were arousable to tactile stimulation and 26 were arousable to voice. Sedation in group D was more than that in group T but it was statistically comparable with p value of 0.072.

DISCUSSION

Electrophysiologic, neurophysiologic and neuropharmcologic experiments in animals have established the role of Noradrenaline and 5HT3 in the control of body temperature. Activation of nucleus Raphe Magnus, where 5-HT3 acts as a neurotransmitter has inhibitory effect on shivering. It is thus possible that antishivering effect of Tramadol is mediated by its effect on these receptors. Dexmedetomidine is also being studied as antishivering agent it exhibits this effect through its centrally mediated action. Granisetron 5 HT3 receptor antagonist is a known antiemetic agent has also been studied for having antishivering property. After going through the literatures we did not find any study, which compared dexmedetomidine, tramadol and granisetron in single study.

With the effect size of 0.50 at two tailed alpha value (0.05) and a beta value (0.2), 90 observations (30 per group) would be sufficient to detect a significant difference in post operative shivering in patients undergoing surgeries under General Anaesthesia between any two Groups Dexmedetomidine, Granisetron and Tramadol respectively.

The comparability of the demographic factors such as age, weight, gender distribution, duration of anesthesia and surgery in the present study has ruled out any visible or confounding bias which could have affect the result of the study. Physical factors such as operating room temperature (24-25 degree C), temperature of recovery room and temperature of infused fluid are considered potential risk factor of shivering but these factors were very well controlled in the present study. Temperature was noted preoperatively (To), at the time of induction (T_i), at the time of drug administration(T_d) and at the end of anesthesia (T_e) and these were also found to be comparable in all three groups at all times though there is a decrease in temperature from preoperative to at induction and then at the end of surgery.

This was supported by previous studies by Mohta *et al.* [11], Piper *et al.* [5] observed that the mean temperatures before and after induction of anaesthesia were comparable in all the groups. Above results of post operative shivering and sedation in our study suggest that tramadol is statistically superior to granisetron in

reducing the incidence of shivering, although at the cost of increased post operative sedation. These results are in contrast to that of that of Sajedi *et al*. who concluded that prophylactic use of granisetron 40 μg/kg is as effective as meperidine (0.4 mg/kg) and tramadol (0.1 mg/kg) in preventing postanesthetic shivering without prolonging the emergence time from anesthesia[8].

We found that dexmedetomidine was also effective in reducing the incidence of shivering and was statistically comparable to tramadol. Incidence of hypotension, bradycardia and sedation was significantly higher with dexmedetomidine when compared to granisetron. The incidence of these side-effects was more than that with tramadol but the difference was statistically insignificant.

This is supported by Bajwa *et al*. who concluded that dexmedetomidine was found to reduce the occurrence of shivering in patients undergoing general anesthesia but was associated with high incidence of sedation and dry mouth [12].

CONCLUSION

Dexmedetomidine 1 μg/kg is less effective than tramadol 1 mg/kg in reducing the incidence of post-operative shivering which is statistically insignificant, and granisetron is not as effective as tramadol or dexmedetomidine in reducing shivering but having an added advantage that it prevents PONV.

Another Inference drawn from the present study was that dexmedetomidine significantly produces sedation and also decreases heart rate as well mean blood pressure than tramadol, while granisetron has no effect on hemodynamic.

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