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TOTAL INTRAVENOUS ANAESTHESIA: COMPARISON OF PROPOFOL- KETAMINE AND PROPOFOL- DEXMEDETOMIDINE COMBINATIONS

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ABSTRACT

Rising cost of medical treatment and the reimbursement of medical expenses by medical insurance provider companies' emphasis on day care surgery are on rise. Previously day care surgeries were being performed under General Anaesthesia which is costlier than TIVA. GA require specific vaporizers for inhalational volatile anaesthetics requiring frequent calibrations and maintenance and produces pollution of working area.

TIVA has advantages of smooth induction and maintenance of anaesthesia, fewer incidences of side post operative nausea and vomiting, smooth recovery and minimal side effects, has predictable action of drugs, the oxygen demand is minimal or nil. TIVA can be practised easily in less equipped hospitals and, convenient to use. The search for newer and more convenient as well as safer combinations of drugs in TIVA is being done to achieve the goals.

The main aim of study was to compare two combinations of drugs 1) Propofol and Ketamine and 2) Propofol and Dexmedetomidine in TIVA for short surgical procedures.

Material and Method: Total 100 patients of between the age group of 20 years to 65 years belonging to ASA Group I and II of either sex undergoing short surgical procedures were included in the study.

The patients were divided in two groups, one group of 50 patients each. Group 1) PK group received Propofol and Ketamine, while group 2) PD group received Propofol and dexmedetomidine combination. In group I (PK) the induction was done with Propofol 1.0 mg/kg body wt. and Ketamine 1.0 mg/kg body wt and in group II (PD group) induction was done with Propofol 1.0 mg/kg body wt. plus Dexmedetomidine 1.0 mcg /kg body wt. Vital parameters were continuously monitored. All the patients of both groups were monitored and followed up in post operative period for any symptoms.

Conclusion: Present study suggest that both the combinations of Propofol and Ketamine as well as Propofol and Dexmedetomedine are equally effective in TIVA, the less hemodynamic effects, minimal side effects and are safe. The recovery features are identical in post operative period. Both the combinations produce rapid, pleasant, smooth and swift recovery with minimal residual impairment of mental functions with stable hemodynamic status.

KEYWORDS : TIVA, Propofol, Ketamine, Dexmedetomidine.

INTRODUCTION

With the rising cost of medical treatment, and increase in the reimbursement of medical expenses by medical insurance provider companies emphasis on day care surgery is on rise. The patients are admitted in the hospital in the morning of operation day and return back home on the same day. Sometimes patients are discharged after few hours of completion of surgery. Previously day care surgeries were being performed under General Anaesthesia. The induction and maintenance of G.A. was being done with the help of volatile anaesthetic agents.

The main disadvantages of G.A. are: -

- Increased cost
- Use of specific vaporizers for various inhalational volatile anaesthetic agents. These vaporizers also require frequent calibrations and maintenance to deliver desired delivery of these agents.
- Expulsion and scavenging system of anaesthetic gases is needed in OT to avoid pollution of area of work.

While TIVA has advantages of smooth induction and maintenance of adequate depth of anaesthesia for surgery, it has fewer incidences of post operative nausea and vomiting, smooth recovery from anaesthesia and minimal side effects. The newer better and safe drugs with predictable outcome have become available for use in TIVA. There is no pollution of operation theatre. Majority of drugs used have minimum cardiac side effects, the oxygen demand is minimal or nil, they produce less diffusion hypoxia. TIVA can be practised easily in less equipped hospitals having Oxygen and airway maintenance facilities. It is very convenient to use TIVA. These advantages have made the TIVA method of choice in present day care surgery procedures. The search for newer and more convenient as well as safer combinations of drugs in TIVA is being done to achieve the goals.

Material and Methods

The main aim of study was to compare two combinations of drugs 1) Propofol and Ketamine and 2) Propofol and Dexmedetomidine in TIVA for short surgical procedures.

The study was done also to evaluate the induction characteristics, maintenance of anaesthesia and recovery characteristics following anaesthesia with these combinations. Side effects, if any, of such medications were also studied.

Total 100 patients of between the age group of 20 years to 65 years belonging to ASA Group I and II of either sex undergoing short surgical procedures were included in the study.

The patients were divided in two groups, one group of 50 patients each. Group 1) PK group received Propofol and Ketamine, while group 2) PD group received Propofol and dexmedetomidine combination.

Exclusion criteria: Patients with history of allergy to any particular drug, allergy to egg or fat, patients on MAO inhibitors, patients with history of liver disease like Jaundice etc. and pregnant patients were excluded. Patient with long duration surgery were also excluded.

All the patients were given one capsule of Omeprazole 20 mg and

one tablet Alprazolam 0.25 mg at 10.00 PM in previous night of surgerical procedure After patients were received in OT the monitoring equipments like SpO2 probe, ECG leads, NIBP monitor were connected. All the patients were started I.V. line and Ringer Lactate solution infusion 15 ml/Kg Body weight was infused as preloading solution.

Intra-operative fluid was infused according to calculated formula with following criteria:

For first 10 kg of body weight 4ml/Kg body weight, for second 10 Kg 2 ml/Kg body weight, and for remaining 1 ml/Kg body weight were calculated. 50% of this total fluid was given in first hour and remaining in second hour.

Induction of Anaesthesia:
In group I (PK) the induction was done with Propofol 1.0 mg/kg body wt. and Ketamine 1.0 mg/kg body wt and in group II (PD group) induction was done with Propofol 1.0 mg/kg body wt. plus Dexmedetomidine 1.0 mcg /kg body wt. The drugs were loaded by the separate person not involved in study and observations were noted by separate person to eliminate the bias.

Maintenance of anaesthesia:
Propofol 2.0 mg/kg/hr plus Ketamine 2.0 mg/kg/hr through infusion was given in group I (PK). Propofol 2.0 mg/kg/hr plus Dexmedetomedine 0.7mcg/kg/hr was started through infusion in group II (PD) for maintenance of anaesthesia.

Vital parameters like SpO2, NIBP, ECG and heart rate were continuously monitored at interval of 5 min for initial 15 min and there after every 10 min interval till end of surgery. All patients in both groups were ventilated with 100% Oxygen through circuit attached to circle absorber.

All the patients of both groups were monitored and followed up in post operative period for any symptoms. The vitals were recorded at 15 min interval in recovery room. They were requested to report for any symptom arising out in post operative phase.

RESULTS

The demographic distribution in both the groups was similar in relation to age, sex ratio, weight, duration of surgery, and duration of anaesthesia as shown in table I

TABLE 1 Demographic distribution

Demographic distribution	Group PK (n=50)	Group PD (n=50)
Age (in years)	35 ± 13	38±15
Weight (Kgs)	53± 11	53± 13
Sex (M/F)	24/26	21/29
Duration of Surgery (in min)	49 ± 6	51 ± 4
Duration of Anaesthesia (in min)	58± 7	59 ± 5

Pulse rate: There was slight increase in pulse rate in the both groups. The increase in rate persisted for initial period of 35 min approximately, and came down after this but didnot reach initial rate in rest period of observation.(Table 2)

Table 2 Changes in pulse rate

Time	Group PK (n=50)	Group PD (n=50)
Pre operative	75 ± 4	77± 8
After induction	82 ± 4	84 ± 5
05 Min	80 ± 5	83± 7
10 Min	80 ± 6	80 ± 7
15 Min	80 ± 6	77± 6
25 Min	81± 7	79± 6
35 Min	81± 5	79 ± 5
45 Min	79 ± 5	77 ± 6
55 Min	79 ±6	78±5
65 Min	78 ± 6	76± 5
75 Min	79 ± 5	78± 4
85 Min	78 ± 5	76± 4

Changes in Systolic Blood Pressure: There was insignificant change in systolic blood pressure readings in comparison to readings at the time of taking the patient for surgery. We presume that administration of Propofol which has property of lowering Blood pressure may have prevented the property of Ketamine to raise the B.P. (in group 1) while Dexmedetomedine by cutting the anxiety has prevented the B.P. to rise.

TABLE 3 Changes in Systolic Blood pressure (mm of Hg)

Time	Group PK (n=50)	Group PD (n=50)
Pre operative	108±6	110±6
After induction	114±8	110+6
05 Min	117±8	114±6
10 Min	117±7	114±5
15 Min	116±7	112±6
25 Min	116±6	114±7
35 Min	117±7	114±6
45 Min	117±6	114±6
55 Min	116±7	112±10
65 Min	116±6	114±12
75 Min	117±7	113±10
85 Min	116±6	110±8

Diastolic Blood Pressure: -Similarly there was no change in Diastolic B.P. as compared to base level in both the groups. (Table 4)

TABLE 4 Changes in diastolic blood pressure (mmHg)

Time	Group PK (n=50)	Group PD (n=50)
Pre operative	77± 7	75 ± 6
After induction	74 ±5	73 ± 6
05 Min	77 ± 4	77± 6
10 Min	77 ± 7	75 ± 5
15 Min	77± 6	74 ± 6
25 Min	78± 6	76 ± 7
35 Min	77± 6	75± 7
45 Min	77± 6	76 ± 7
55 Min	76± 7	75 ± 7
65 Min	77±6	75 ± 6
75 Min	76 ±5	74 ± 6
85 Min	76 ± 7	75 ± 7

The spontaneous eye opening was 7.0 min in PK group and it was 8.0 min in PD group. The drowsiness i.e. time required to response to verbal commands was more in the PK group. (Table 5)

TABLE 5 Mean duration of spontaneous eye opening & drowsiness

	Group PK (n=50)	Group PD (n=50)
Time of spontaneous eye opening	7.0 min	8.0 min
Duration of drowsiness	13.0 min	4.0 min

SpO2: The SpO2 was monitored throughout the procedure. We found insignificant variation in both the groups.

TABLE 6 Incidence of Nausea and Vomiting in two groups

Nausea & Vomiting	Group PK	Group PD
Present	5/50	6/50
Absent	45/50	44/50

The incidence of complains of nausea and vomiting were comparable in the groups

DISCUSSION

Nielsen PF, Ahlburg P, Sosted EE, Christensen JH. have found the decrease in the dose requirement of Propofol and fetanyl in elderly patients. [1]We did not find any difference in response to the dose requirement in different age group patients in our study.

The study carried out by Hernandez et al with Propofol –Ketamine, midazolam-Ketamine, Propofol- Fentanyl found higher readings in patients receiving Midazolam- Ketamine than patients in other two groups [2]. In present study the difference in both the groups was not observed. The anxiety was less in present study possibly due to alprozolam given to the patients.

Canpolat DG et al in their study for sedation in children for tooth extraction found that no statically significant change in NIBP and heart rate any time during procedure and did not alter during number of repeat doses of Ketamine –Propofol combination. They used two combinations 1) Ketamine- Propofol and 2)Ketamine-Dexmedetomidine combinations in children for sedation during tooth extraction. They concluded that Ketamine- Propofol combination was option of choice due to lower incidence of nausea and vomiting. They found higher level of satisfaction in surgeons with this combination. In our study also there was no statistical difference in NIBP and heart rate.[3]

BP remained almost near pre-induction readings mainly due to the antagonistic properties of Propofol (decrease in BP) and Ketamine (increase in BP) in group 1and in group 2 due Dexmedetomedine sedation combating the anxiety factor.

The induction features like loss of consciousness (onset of sleep) [4] and apnoea [4,5] had similarity as in other studies.There was early recovery from anaesthesia with these drug combinations in TIVA in both the groups and were comparable.

We used Steward Scoring System [6] for evaluation of recovery, which evaluates physical signs like ventilation pattern, movements, response to loud voice.

Second method of evaluation of recovery was used by observing the *return of protective airway reflexes* like cough and gagging and *response to verbal commands* like spontaneous opening of eyes, protrusion of tongue and lifting of head.

It was observed that there was slight increase in oral secretions in PK group compared to PD group. This was probably due to Ketamine's salivary effect. [7]

The incidence of nausea and vomiting was equal in both the groups. The Propofol has the anti-emetic property and has been used successfully for treatment of PONV.

The incidence of awareness, mood fluctuation, and agitation was not seen in both groups. The pain at injection site, cough, involuntary movements were also not seen. [8, 9]

Side effects during recovery period:
There was increased incidence of oral secretions in PK group, and nausea and vomiting was observed in low incidence in both the groups

CONCLUSION

In conclusion, results derived from present study suggest that both the combinations of Propofol and Ketamine as well as Propofol and Dexmedetomedine are equally effective in TIVA anaesthesia procedures. Both the combinations have stable hemodynamic effects, minimal side effects and are safe. The recovery features like response to verbal commands and level of drowsiness are identical in post operative recovery phase. Both the combinations produce rapid, pleasant, smooth and swift recovery with minimal residual impairment of mental functions with stable hemodynamic status. This is possibly because of significant metabolism, short elimination time and very high total clearance of drugs from body.

Therefore both the combinations of drugs can be recommended for TIVA in both routine as well as day care surgical procedures.

However further studies are recommended to find out optimum doses of both combinations in day care surgery anaesthesia techniques.

Foot notes:
Source of support: Nil
Conflict of Interest: None

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