ORIGINAL RESEARCH ARTICLE

Midazolam/ Dexmedetomidine with Ketamine base Total Intravenous Anaesthesia for Minor Surgerical Procedures In Paediatric Patients

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DOI: http://dx.doi.org/10.21276/ijcmsr.2020.5.4.25

How to cite this article: Manisha Kapdi, Shweta Patel, Palak Panchani, Khushbu sagparia, Karan Batavia, Charmi Bhimbha. Midazolam/dexmedetomidine with ketamine base total intravenous anaesthesia for minor surgerical procedures in paediatric patients. International Journal of Contemporary Medicine Surgery and Radiology. 2020;5(4):D112-D115.

A B S T R A C T

Introduction: Ketamine is ramponedly used induction agent for minor surgical procedures in paediatric patients. But, its utility has been restricted because of its unwanted sympathomimetic activity even though it has an excellent analgesic property with minimal respiratory depression. Added to this, it is also associated with undesirable postoperative delirium several drugs like Midazolam, Dexmedetomidine, Propofol were added to counteract the side effects of Ketamine. Study aimed to compare efficacy of Midazolam/ Dexmedetomidine as adjuvant to ketamine base general anaesthesia in form of hemodynamic stability, recovery & adverse reactions.

Maerial and methods: The study was done to evaluate the efficacy of dexmedetomidine-Ketamine combination in minor surgeries in paediatric patients.

Results: Dexmedetomidine & ketamine provide stable perioperative cardiovascular parameters with good postoperative sedation and smooth recovery than Midazolam & ketamine group. There were no undesirable incidences like respiratory depression or hypoventilation and PONV during postoperative period.

Conclusion: Dexmedetomidine & Ketamine combination provides good haemodynamic stability during intraoperative period. Dexmedetomidine has addition property of sedation, antiemesis and analgesia, which makes better choice of drug for combining with Ketamine.

Keywords: Ketamine, Dexmedetomidine, Midazolam, MinorSurgeries, Paediatric Patients

INTRODUCTION

In recent years, there has been an increased amount of minor surgeries in paediatric age group.[1] Children make excellent candidates for day care surgeries as they are usually healthy, free from systemic diseases and they typically require minor and short surgical procedures.1Induction of anaesthesia either by I.V. or inhalation is suitable in paediatric minor care surgeries. The choice depends on the needs of individual child with main goal being smooth atraumatic induction. IV induction has become increasingly popular since the introduction of local anaesthetic skin preparations.[1] There is some evidence that IV induction is less psychologically disturbing than inhalation methods.1 In ambulatory practice, Total Intravenous Anaesthesia (TIVA) provides advantages for all short surgical procedures. TIVA is found to have advantages of shorter recovery and no agitation or other behavioural disorder even after prolonged infusion.2 Commonly used IV agents for TIVA in day care surgeries are Propofol, Fentanyl, Ketamine, Midazolam and Dexmedetomidine. They produce rapid induction and recovery of anaesthesia.[2]

Ketamine is a phencyclidine derivative. It provides excellent amnesia and analgesia, preserves muscle tone with maintaining air reflexes and spontaneous respiration. But, its drawbacks are frightening emergent reactions, sympathomimetic effects, vomiting and excessive salivation. Ketamine is often combined with midazolam or propofol to alleviate these adverse effects.[2]

Midazolam is ultra short acting benzodiazepine which directly effect onGABA receptors.It counteract the side effects of ketamine like hallucinations.[1,3]

Dexmedetomidine is a highly selective α2-agonist. It has sedative and anxiolytic properties similar to benzodiazepines. It also produces perioperative analgesia and reduces the

narcotic dose requirement. Dexmedetomidine has antiemetic properties and does not possess respiratory depression like benzodiazepines. However, co-administration of dexmedetomidine with other anaesthetic agents, sedatives, hypnotics or opioids is likely to cause additive effects. It attenuates stress-induced sympathoadrenal responses protecting the patients from noxious sympathetic stimulation and haemodynamic changes.[3]

The purpose of the study was to compare & evaluate the haemodynamic stability and recovery profile using midazolam/ Dexmedetomidine with ketamy in day care surgeries in paediatric age group.

MATERIAL AND METHODS

The study was conducted in tertiary care hospital. All the cases which were maintained by spontaneous mask ventilation were taken for study. Standerded starvation protocol was followed. The study cases had fasting period of 6 hrs. for solid food and 4 hrs. for clear fluids. All study cases were in the age group between 2 yrs. to 12 yrs. and Children with anaemia, Congenital Heart Disease (CHD) and any other associated medical abnormalities were excluded.

All the study cases were premedicated with I.V. atropine10 mcg/kg body weight.

Group M: inj. Midazolam 0.02 mg/ kg in 20 ml NS over 10 min was infused through syringe pump.

Group D, Dexmedetomidine 0.5 mcg/kg body weight in 20 mL of Normal Saline was started and infused for 10 mins. Induction was done with Inj. Ketamine 2 mg/ kg body weight I.V. Patients were maintained with O2 on spontaneous ventilation by mask. Intraoperatively, HR, BP, SPO2 was monitored. Supplemental Ketamine was given for further maintenance of anaesthesia. Postoperative recovery is monitored by Aldrete score, Sedation score (modified Ramsay scale) and Wong Baker FACES Pain Rating Score along with cardiovascular monitoring.

Sedation Score (Modified Ramsay Scale)

1. Fully Awake and Anxious.
2. Calm adequate cooperation.
3. Arousable to verbal comments.
4. Arousable to mild stimulation/vigorous reaction painful stimulation.
5. Slow/incomplete reaction to painful stimulation
6. No reaction to painful stimulations

Aldrete score

I) Respiratory stability
- Able to take deep breath and cough 2
- Dyspnea/shallow breathing 1
- Apnea 0

II) Oxygen saturation
- Maintain value >92% on room air 2
- Needs o2 inhalation to maintain oxygen saturation >90% 1
- o2saturation <90% even with supplemental oxygen 0

III) Coniousiousness

-Fully awake 2

-arousable on calling 1

- Not responding 0

IV) Circulation
- BP±20 mm Hg preop 2
- BP±20-50 mm Hg preop 1
- BP±50 mm Hg preop 0

V) Activity
- Able to move 4 extremities 2
- Able to move 2 extremities 1
- Able to move 0 extremities 0

Total score 10

Alderte Score of >7 was considered satisfactory.

Postoperative PR, BP, SpO2, Sedation score, Aldrete scores and Pain score of each patients were noted for 2 hrs. All the patients were kept in Postoperative ward till they attain Aldrete score of 8-10.

All patients were looked for PONV. Ondansetron 0.2 mg/kg is given IV if child has PONV.

Analgesia was given by 20 mg/kg of paracetamol suppository at the end of surgery. IV Fentanyl 0.5 mcg/kg bolus was considered as rescue analgesic in case if it is required. Bradycardia if occurred treated with a bolus dose of atropine 0.01 mg/kg. If Hypotension (>20 mmHg of preoperative level) is detected IV fluid ½ DNS 10 mL/kg was given bolus.

RESULTS

Table-1 shows demographic profile of the subjects. Table 2 shows that Dexmedetomidine group had better haemodynamics. Table-3 shows various scores of both groups.

One case had bradycardia with HR of 48/mins. during intraoperative period, in dexmedetomidine group which was treated with 0.1 mg/kg of atropine I.V. bolus.

Postoperative sedation score during first 30 mins. in group Dexmedetomidine was 6 [no reaction to painful stimulus] & At 120 mins. of postoperative period, sedation scores came to 2 (calm adequate cooperative).In midazolam group no bradycardia or hypotension.postoperative sedation score was 4 at 30 min & 1 at 2 hrs.

Postoperative pain scores were 0 in first 30 mins to all cases and were 2 after 2 hrs. In both groups as ketamine is good

Parameters	Group M	Group D	P value	Inference
Age (years)	7.42+/-2.8	6.81+/-5.0	>0.05	NS
Male/ female	17/13	16/14	-	-
Weight (kg)	17.24+/-5.2	16.52+/-6.2	>0.05	NS

Table-1: Demographics

ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2019: 98.48 |

Parameters	Group M	Group D	P value	Inference
HR(/ min)	120+/-10	108+/-10	>0.05	ME
SBP (mm ofHg)	100+/-24	90+/-14	<0.05	S
DBP (mm of Hg)	74+/-8	60+/-4	<0.05	S
MAP (mm of Hg)	66+/-5	60+/-4	<0.05	S
Duration of surgery (mins)	15+/-5	14+/-6	>0.05	NS

Table-2: Haemodynamic parameters

Score	Group M	Group D	P value	Inference
Sedation (RSS)	3+/-0.5	4.5+/-0.2	<0.001	HS
Alderte score	7.8+/-0.5	8+/-0.6	>0.05	NS
Pain score	4/+-0.2	2.8+/-0.5	<0.05	S

Table-3: various scores

analgesic.

Recovery scores showed patient had Aldrete score of 8 after 20 mins. All cases of Dexmedetomidine group had sedation score of 5 for 2 hrs., which is advantageous to the paediatric age group. All patients had satisfactory analgesia during postoperative period.

Adverse effects

None of them required any bolus rescue doses of Fentanyl during postoperative period. None of the cases had postoperative agitation in Dexmedetomidine group. Whereas 3 patients with Midazolam group has hallucinations. (10%)

None of the patients in any groups had PONV, Respiratory depression during perioperative period.

DISCUSSION

Ahmad Ramzi Sahban, Sahar Kamal et al[4] has compared Dexmedetomidine-Ketamine with Propofol-Ketamine combination for invasive procedures in oncology patients. They found recovery-related agitation was more common in Ketamine-Propofol combination whereas Dexmedetomidine-Ketamine combination resulted smooth recovery pattern. They concluded that Dexmedetomidine and Ketamine combination provided stable cardiovascular parameters.

Our study also showed Dexmedetomidine and Ketamine combination provided stable cardiovascular parameters and smooth recovery. Recovery scores and Pain scores are comparable to their studies. Only 1 case in our study had bradycardia, which was treated successfully with a bolus dose of injection Atropine.

Tarek Tammam[5] in a comparative study of efficacyof dexmedetomidine-ketamine combination for MRI sedation. He found better sedation and better cardiovascular stability when compared to dexmedetomidine alone**.** In our study, we found satisfactory sedation and pain scores in 2 hrs. of postoperative period.

All the studies done were for invasive procedure and diagnostic procedures. Our study is to evaluate haemodynamic stability & recovery in both groups.

Koruk et al[6] prospectively compared sedation using Dexmedetomidine and Ketamine to a regimen using midazolam and ketamine during extracorporeal shock wave lithotripsy in a Cohort of 50 paediatric patients who ranged in the age 2-15 yrs. They found the recovery sedation scores were similar in both the regimen. Incidence of nausea and vomiting was significantly lower in dexmedetomidine-ketamine combination. In our study, none of the patients had nausea and vomiting.

Joseph D Tobias[7] in an article "Dexmedetomidine and Ketamine" in Paediatric Critical Care Medicine reported the potential utility of the combination of ketamine and dexmedetomidine for procedural sedation even in patients with compromised respiratory or cardiac function. When compared with other agents used for procedural sedation, these two agents have limited effects on respiratory function. Bloor, Ward et al[8] used respiratory inductance plethysmography in their study to evaluate respiratory depression while using dexmedetomidine or propofol with ketamine. They found respiratory depression with these combination was rare and it was due to obstructive cause and not central cause. In our study, we did not detect any hypoventilation or desaturation in our patients.

Rakhee Goyal[9] in an article in correspondence column in Paediatric Anaesthesia reported that Ketamine-Dexmedetomidine is a useful and practical alternative to standard drugs used in TIVA. Adverse effects are less during perioperative period and recovery time is more with this combination when compared to other drugs like propofol and midazolam. In our study, all cases had sedation scores were 6/5 for 1 hr. Sedation score of 2 (Arousable Sedation) after 2 hrs. of postoperative period.

Goyal R, Shivinder Singh et al[10] used Dexmedetomidine-Ketamine combination in non-cardiac surgeries in patients with CHD. They found patients were haemodynamically stable with smooth recovery with this combination.

CONCLUSION

In nutshell we conclude that Midazolam or Dexmedetomidine both are good adjuvants to ketamine based general anaesthesia for minor surgical procedures in children.

Dexmedetomidine-Ketamine combination produces stable haemodynamics with out adverse reactions & good recovery in comparison to Midazolam-ketamine combination.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 27-11-2020; **Accepted:** 20-12-2020; **Published online**: 31-12-2020