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Comparative administration of ketamine-dexmedetomidine & Ketamine: Propofol for sedation during upper gastrointestinal endoscopy in children

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Abstract
In children, dexmedetomidine is currently used in many studies in intra-operative sedation, post-operative analgesia, prevention delirium, and shivering with different dose regimens. In various invasive procedures of children, ketamine and propofol have been popular anaesthetic agents to use, either alone or in combination. Hence present study was planned with the aim to evaluate Ketamine-Dexmedetomidine versus Ketamine-Propofol for Sedation in Children during Upper Gastrointestinal Endoscopy.
The patients were divided in two groups as Group A& Group B. The group A having 15 cases were administered ketamine-dexmedetomidine and group B patients having 15 cases were administered ketamine-propofol. All patients administered ketamine 1 mg/kg intravenous. Patients in group A received dexmedetomidine 1 µg/kg bolus dose slowly IV over 10 min and patients in Group B received propofol 1 mg/kg as initial doses.
From the above study results it can be concluded that combination of ketamine dexmedetomidine for sedation in children undergoing upper gastrointestinal endoscopy is an effective, reliable and safe alternative to ketamine-propofol without any major side effects.

Keywords: ketamine, dexmedetomidine, Propofol, sedation, children, endoscopy

Introduction
Upper GI endoscopy is a procedure in which a doctor uses an endoscope-a flexible tube with a camera-to see the lining of your upper GI tract. A gastroenterologist, surgeon, or other trained health care professional performs the procedure, most often while you receive light sedation to help you relax.
Esophagogastroduodenoscopy (EGD) also called by various other names, is a diagnostic endoscopic procedure that visualizes the upper part of the gastrointestinal tract down to the duodenum. It is considered a minimally invasive procedure since it does not require an incision into one of the major body cavities and does not require any significant recovery after the procedure (unless sedation or anesthesia has been used). However, a sore throat is common [1, 2].
The tip of the endoscope should be lubricated and checked for critical functions including: tip angulations, air and water suction, and image quality.
The patient is kept NPO (Nil per os) or NBM (Nothing by Mouth) that is, told not to eat, for at least 4 hours before the procedure. Most patients tolerate the procedure with only topical anesthesia of the oropharynx using lidocaine spray. However, some patients may need sedation and the very anxious/agitated patient may even need a general anesthetic. Informed consent is obtained before the procedure. The main risks are bleeding and perforation. The risk is increased when a biopsy or other intervention is performed.
The patient lies on his/her left side with the head resting comfortably on a pillow. A mouth-guard is placed between the teeth to prevent the patient from biting on the endoscope. The endoscope is then passed over the tongue and into the oropharynx. This is the most uncomfortable stage for the patient. Quick and gentle manipulation under vision guides the endoscope into the esophagus. The endoscope is gradually advanced down the esophagus making note of any pathology. Excessive insufflation of the stomach is avoided at this stage. The endoscope is quickly passed through the stomach and through the pylorus to examine the first and second parts of the duodenum. Once this has been completed, the endoscope is withdrawn into the stomach and a more thorough examination is performed including a J-maneuver. This involves retro flexing the tip of the scope so it resembles a 'J' shape in order to examine the fundus and gastroesophageal junction. Any additional procedures are performed at this stage. The air in the stomach is aspirated before removing the endoscope. Still photographs can be made during the procedure and later shown to the patient to help explain any findings.
In its most basic use, the endoscope is used to inspect the internal anatomy of the digestive tract. Often inspection alone is sufficient, but biopsy is a valuable adjunct to endoscopy. Small biopsies can be made with a pincer (biopsy forceps) which is passed through the scope and allows sampling of 1 to 3 mm pieces of tissue under direct vision. The intestinal mucosa heals quickly from such biopsies.
Dexmedetomidine, is an anxiety reducing, sedative, and pain medication. Dexmedetomidine is notable for its ability to provide sedation without risk of respiratory depression (unlike other commonly used sedatives such as propofol, fentanyl,

and midazolam) and can provide cooperative or semi-arousable sedation.

Similar to clonidine, it is an agonist of α2-adrenergic receptors in certain parts of the brain. Dexmedetomidine hydrochloride is also used in veterinary medicine for dogs and cats. It was developed by Orion Pharma [1].

Ketamine, is a medication mainly used for starting and maintaining anesthesia. It induces a trance-like state while providing pain relief, sedation, and memory loss. Other uses include for chronic pain and for sedation in intensive care. Heart function, breathing, and airway reflexes generally remain functional during its effects. Effects typically begin within five minutes when given by injection with the main effects lasting up to 25 minutes. Common side effects include psychological reactions as the medication wears off. These reactions may include agitation, confusion, or hallucinations. Elevated blood pressure and muscle tremors are relatively common, while low blood pressure and a decrease in breathing are less so. Spasms of the larynx may rarely occur. Ketamine is an NMDA receptor antagonist but it may also have other activity [3].

Propofol, is a short-acting medication that results in a decreased level of consciousness and lack of memory for events. Its uses include the starting and maintenance of general anesthesia, sedation for mechanically ventilated adults, and procedural sedation. It is also used for status epilepticus if other medications have not worked. It is given by injection into a vein. Maximum effect takes about two minutes to occur and it typically lasts five to ten minutes. Common side effects include an irregular heart rate, low blood pressure, burning sensation at the site of injection, and the stopping of breathing. Other serious side effects may include seizures, infections with improper use, addiction, and propofol infusion syndrome with long-term use. It appears to be safe for using during pregnancy but has not been well studied in this group. However, it is not recommended during caesarean section. Propofol is not a pain medication, so opioids such as morphine may also be used. Whether or not they are always needed is unclear. Propofol is believed to work at least partly via a receptor for GABA [4].

In children, dexmedetomidine is currently used in many studies in intra-operative sedation, post-operative analgesia, prevention delirium, and shivering with different dose regimens. In various invasive procedures of children, ketamine and propofol have been popular anaesthetic agents to use, either alone or in combination. Hence present study was planned with the aim to evaluate Ketamine-Dexmedetomidine versus Ketamine-Propofol for Sedation in Children during Upper Gastrointestinal Endoscopy.

Methodology

The study was planned in the Department of Anaesthesia Anugrah Narayan Magadh Medical College and Hospital in Children during Upper Gastrointestinal Endoscopy. After obtaining approval from the institutional ethics committee, and written informed consent from the subjects' parents, children aged 2-14 years and classified as American Society of Anaesthesiologists (ASA) I-II were enrolled. Following were the inclusion and the exclusion criteria of the patients.

Inclusion Criteria: Childrens of the age 2 -14 years undergoing the Upper Gastrointestinal Endoscopy.

Exclusion Criteria: Patients with upper respiratory tract infections, psychosis, increased intracranial tension, neurologic diseases, an abnormal anatomy of the jaw and face, glaucoma, hypertension, porphyria or history of hypersensitivity to any of the study drugs were excluded from the study.

The patients were divided in two groups as Group A& Group B. The group A having 15 cases were administered ketamine-dexmedetomidine and group B patients having 15 cases were administered ketamine-propofol. All patients administered ketamine 1 mg/kg intravenous. Patients in group a received dexmedetomidine 1 µg/kg bolus dose slowly IV over 10 min and patients in Group B received propofol 1mg/kg as initial doses.

Sedation level was assessed by checking patients' response to verbal and tactile stimulation Dier two min of the initial dose using Ramsay Sedation Scale (RSS) ranging from 1-6; 1=anxious, agitated or restless, 2=co-operative, oriented, and tranquil, 3=responds to commands only, 4=brisk response to light glabellar tap or loud auditory stimulus, 5=sluggish response to light glabellar tap or loud auditory stimulus and 6=no response. Our target is RSS ≥ 5 and if the target was not achieved, top-up doses of 2-4 ml of the prepared solutions were given till achievement of RSS ≥ 5 and time to RSS of ≥ 5was recorded.

Results & discussion

The data from the two study group were collected and presented as below. The group A having 15 cases were administered ketamine-dexmedetomidine and group B patients having 15 cases were administered ketamine-propofol. All patients administered ketamine 1 mg/kg intravenous. Patients in group A received dexmedetomidine 1 µg/kg bolus dose slowly IV over 10 min and patients in Group B received propofol 1 mg/kg as initial doses.

Table 1: Comparative Data in Both Study group

	Group A	**Group B**
Demographic Data		
Age	4-11 years	3-14 years
Gender:		
Male	11	10
Female	4	5
Weight	19-25 kg	12-26
Procedure & Observation		
Duration of procedure	7-11 min	7.5-10.6 min
Time to RSS ≥ 5	3.5- 5.7 min	4.2 – 6.3 min
Total ketamine dose	32-38 mg	27-31 mg
Complications	**No. of Cases**	**No. of Cases**
Nausea and vomiting	4	3
Apnea	0	2
Endoscopists' satisfaction	13	12

RSS: Ramsay Sedation Scale

Koruk *et al*. [5] reported that KD combination led to lower recovery time than KP combination in paediatric cardiac catheterisation. Similarly, in our previous study [6] we observed a lower recovery time in the KD group than the KP group in paediatric burn dressing changes. On the other hand, Tosun *et al*. [7] concluded that KD combination led to a longer

recovery time in paediatric cardiac catheterisation. In the current study, the sedation scores (evaluated using RSS) were similar in both groups. The recovery time was longer in the KD group in clinical evaluation, but the difference was not statistically significant. The similar recovery time of the groups may be due to the type or duration of the procedure, or patient population.

Upper gastrointestinal endoscopy procedures in paediatric patients for diagnostic and therapeutic purposes have increased and become more frequent [8]. Choosing a sedative should be on the basis of its onset time, associated adverse effects and time to restore cognitive function Dier stopping it [9]. In our study, we compared two pharmaceutical combinations (ketamine-propofol and ketamine dexmedetomidine) for sedation in 30 children during upper gastrointestinal endoscopy. Ketamine was described as safe, effective and simple and was firstly hoped to be used as a sole anesthetic medication causing loss of consciousness, amnesia, and analgesia. However, its use rapidly decreased because of its associated psychological effects and the presence of other alternative anesthetic agents [10]. Combination of ketamine with either propofol dexmedetomidine allows usage of lower doses adds synergism and decreases side effects.

Conclusion

From the above study results it can be concluded that combination of ketamine dexmedetomidine for sedation in children undergoing upper gastrointestinal endoscopy is an effective, reliable and safe alternative to ketamine-propofol without any major side effects.

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