

Journal Club Synopsis
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September 8th, 2009

Is Ketamine Safe for Procedural Sedation in the Emergency Department?

Clinical Scenarios:

Case #1

CC/HPI: 45 y.o. F presents to the ED with pain and drainage from abscess in L axilla for 3 days. Hx of R axilla abscess drained in ED 3 years ago. No fevers and chills. No Chest pain, shoulder pain, breast tenderness, SOB. Pt. states she had a recent colonoscopy and was awake for the procedure even though she was given medications. Last was meal 3 hours ago.

Vitals: Temp- 99.1F HR 98 BP 127/82 RR 16

Weight: 130kg

PMH/ PSH: HTN, C-section

Meds: lisinopril

Allergy: None

PE: Left axilla – 6x6 cm large raised abscess, flocculent, 2 small draining areas, surrounding cellulitis. Pain with left shoulder abduction

US – superficial, 1.5cm depth, multi – loculated, ~5x5cm

What are you going to do for your patient?

Case #2

CC/HPI: 2.5 yr old male brought into ED with history of running into the corner of an open door, sustaining a head laceration. The child's bleeding had been controlled with a pressure dressing in triage and per his parents there was no LOS. His behavior is reported as normal and there has been no n/v or depressed mental status since the event approximately one hour ago.

Vitals: T 98.4 HR 96 BP 114/75 RR 16

Weight: 18 kg

PMH/PSH: Recurrent Ear infections with tubes placed at age one. Small lacerations to chin and eyebrow requiring repair.

Meds: None

Allergies: NKDA

Last Meal: Four hours prior

PE: There is a deep semi-circular left sided forehead laceration which crosses into the scalp approximately 11 cm in length with deep tissue violation. Bleeding controlled with pressure. No other injuries noted, and neurological and physical is unremarkable. It is 2 am and your staff has had hard time keeping the patient contained in his exam station.

He is currently running around your department hiding from the staff and his parents and has the nick names, BAM BAM and CHOPPER, per his Father. The last time you patient had sutures placed it took three people to hold him down even with a papoose.

How would you best treat this patient?

Introduction:

Emergency physicians are often required to sedate patients for procedures in the emergency department. There are a range of procedures performed in the ED covering a wide range of subspecialties. Among the number of pharmaceutical options for procedural sedation is ketamine. Ketamine has been widely established for use in children and adults in other countries. There has been some controversy over its safety profile and its use in the US is often questioned in certain regions. The purpose of this journal club is to evaluate the pros and cons of ketamine use for procedural sedation in the US for adults and children as well as establish an overall familiarity with this drug for multiple potential uses in the ED.

Articles for Review and Summaries:

Article #1:

Sacchetti, Alfred et. al. Procedural Sedation in the Community Emergency Department: initial Results of the ProSCED Registry. *Academic Emergency Medicine* 2007; 14:41-46.

The ProSCED study is a prospective observational database composed of consecutive emergency physician-directed procedural sedation cases in community hospitals. This report describes community hospital practices with all types of medications and outcomes in a multicenter registry. A total of 1,028 procedural sedations were performed on 980 patients at 14 study sites. Complications of any description occurred in 42 cases (4.1%), with no patient's disposition changed secondary to a complication. Patients' ages ranged from 1 month to 95 years, with a median age of 31 years. Medication use included midazolam in 423 cases (41.1%), propofol in 253 (24.6%), fentanyl in 253 (24.6%), etomidate in 241 (23.4%), and ketamine in 145 (14.1%). Cases using either ketamine or propofol exhibited the fewest complications, while those using fentanyl, hydromorphone, or midazolam demonstrated the highest complication rates. No patients disposition was compromised by complications.

There was no direct comparison of different types of medication for conscious sedation. The study was done in a larger age group including children and adults. Complications as the study defined it are agitation, airway obstruction, apnea, hypoxia, hypotension, seizure and death. This study only showed suggestive evidence of ketamine having less complications. Overall this study showed that conscious sedation as done in community emergency department is done safely with all ages of patients. From this study you should take away 1) procedural sedation is safe in the emergency department 2) there is suggestive evidence that ketamine has less complications than other forms of of procedural sedation but this was not a head to head study and does not show definitive evidence.

Article #2:

Newton, A., Fitton, L., Intravenous ketamine for adult procedural sedation in the emergency department: a prospective cohort study. *Emergency Medicine journal* 2008; 25:498-501

This was a prospective observational study done over two years in the UK on all patients who received IV ketamine. Exclusion criteria included hypertension (SBP>180), abnormal airway, cardiac disease, and psychotic illness. The age range is from 16-89 years old. All patients received 0.5-1.0 mg/kg ketamine intravenously for the procedure. Adequate sedation was

obtained in 91 of the 92 patients (98.9%) and successful completion of the procedure was achieved in 91 patients (98.9%). Adverse events occurred in 20 patients (21.7%). Four patients (7%) developed clonic movements, none of which required treatment. Twelve patients (13.0%) developed recovery agitation. In five cases the agitation was transient and required no treatment; the other seven patients were treated with intravenous midazolam.

This study showed that ketamine is safe to use in adults that don't have the baseline conditions that excluded at the beginning of the study. At the journal club discussion Dr. Tan Eyck brought up the point that the mean %increase in BP was 25mmHg or 18% with a range of 0% up to 68%. There is a potentially worrisome increase in BP with ketamine. That is why HTN was an exclusion criteria for this study was cardiac disease and hypertension. Another known side effect of ketamine is agitation (emergence reaction). This was seen in 13% of the patients in the study. This is a known side effect of the medication and can be expected and you should be prepared to treat. There was a 98.9% successful completion rate of all procedures done in patients ranging from 1 to 89. It is important to note that there were no episodes of laryngospasm, no hypotension, no air way compromise. From this study you should take away 1) ketamine is safe to use in adults for procedural sedation 2) Hypertension, tachycardia, and emergence reaction are common side effects of ketamine use.

Article #3

Green, S., Krauss, B., Clinical Practice Guideline for Emergency Department Ketamine Dissociative Sedation in Children. *Annals of Emergency Medicine* 2004; 44:460 – 471.

First off Michelle did a great job of summarizing what was the longest article in the bunch. This product of the ACEP provided guidelines for general procedural sedation in children using ketamine by first reviewing the dissociative and analgesic nature of drug. The fundamental difference that ketamine does not cause appreciable respiratory depression makes it distinctively different and separate from general anesthetics. The next part of the article examines the contraindications; age under 3 months (absolute), age under 12 months, laryngeal stimulation, URIs, asthma, laryngospasm, cardiac disease, increased ICP, increased intraocular pressure, fasting status, (all relative), and examined the slim data to support many of these assertions. Administration was reviewed, noting the IM (4-5mg/kg) and IV (1.5mg/kg) routes and paying attention to the fact that rapid IV administration < 1 minute of ketamine can induce apnea. The use of coadministered medications such as atropine/midazolam were examined with a consensus that prophylactic treatment appeared unnecessary and could even cause complications due to respiratory depression, rather the recommendation is to use benzodiazapines only to treat emergence reactions. Monitoring was discussed and reflects normal measures promoted for all types of sedation/procedures. Further discussion regarding specific adverse reactions and treatment such as emesis/laryngospasm/emergence reactions were revisited. Recovery procedures recommend avoiding excessive noise or stimulation as the patient emerges from their dissociation, and the recommendation that patients be observed at least 30 minutes post procedure was given. Discharge information should inform parents that ataxia can occur post ketamine exposure and they should be observed for fall risks and it seems appropriate to hold oral intake for a couple of hours if any nausea was reported. Overall the article provided a concise review with many pearls tucked away inside.

Article #4

Vardy, J.M., et. al., Audit of the safety and effectiveness of ketamine for procedural sedation in the emergency department. *Emergency Medicine Journal* 2008; 25:579-582.

This was a prospective study by our English friends with the goal of examining the safety of ketamine in procedural sedation after its use was introduced into an ED environment. Over 2 years 210 patients were studied, 40% treated with ketamine, 51% midazolam and 9% propofol. Depth of sedation, adverse affects, and time taken to regain full orientation were reported. Overall, ketamines return to orientation was 25 minutes, complications occurred in 15.9% of all sedations with a 14.6% rate using ketamine. Hypertension and hypertonicity were the most common side affects with ketamine and 19.5% experienced a reemergence phenomenon, with no psychological sequela noted. Overall the study found ketamine to compare well against midazolam and propofol and should be considered as a first line agent in any group considered high risk of adverse effects with other agents; respiratory compromise or hypotension.

Summary:

The bottom line after discussion and review of the four articles is that ketamine has a good margin of safety in both pediatrics and adults. The drug has predictable side effect that we can plan for and treat. You should know that when you use this drug you will see hypertension and tachycardia, emergence reactions, and possibly nausea and vomiting. Knowing these side effects you should select your patient population accordingly. It is a dissociative anesthetic and it does not cause hypotension or respiratory suppression like other medications used for procedural sedation. Our discussion hit upon many topics beyond what was covered in the articles including ketamine for sepsis, chemical restraint, trauma, RSI and others, and overall the group felt ketamine would be an appropriate choice for the clinical scenarios that had been proposed.

In the words of one reviewer journal club was “A gripping account . . . fascinating to its core, and all the more compelling for being true.” It does not get any better than that.