



## Resident Journal Review: May-June 2010

Trushar Naik, MD MBA; Michael Yee, MD; Christopher Doty, MD; Michael C. Bond, MD

*This is a continuing column providing synopses of high-impact journal articles pertinent to EM residents. It is not meant to be an extensive review of the articles, nor is it wholly comprehensive of all the literature published. Rather, it is a short list of potentially useful literature important to the busy EM resident. Residents should read the articles themselves to draw their own conclusions. These papers were selected after a review of twenty-two of the most pertinent journals for emergency medicine. This edition will include articles published over a two month period, between January and February of 2010.*

### **A prospective case series of pediatric procedural sedation and analgesia in the emergency department using single-syringe ketamine-propofol combination (ketofol). Andolfatto G, Willman E. *Acad Emerg Med.* Feb;17(2):194-201.**

The use of propofol for procedural sedation has become more popular in recent years. The rapid onset and short recovery time makes this sedative hypnotic an appealing option in the busy emergency department. Procedural sedation in the pediatrics population is often accomplished with IV or IM ketamine. This medication is associated with nausea, bronchorrhea and an adverse emergence phenomenon. Ketofol is used as a single-syringe with a 1:1 mixture of 10mg/ml ketamine and 10mg/ml propofol. The use of ketofol has been shown to be effective in providing adequate sedation while using lower doses of each drug. The lower dose helps to reduce the adverse effects typically seen with the individual drugs. Clinical studies on ketofol have mainly involved adults. The authors of this article sought to evaluate the effectiveness of ketofol in pediatric patients in a large prospective observational study conducted over three and a half years in a trauma-receiving community teaching hospital.

This was a single center study of patients under the age of 21 years, who underwent procedural sedation in the emergency department. The only exclusion criterion was known allergy to either medication. The sedative agents used were up to the discretion of the ED physician. Outcome measures included percentage of successful sedation, physician and nursing satisfaction scores, recovery time and total sedation time.

Of the 298 patients for which complete data was obtained, 219 patients (73%) received ketofol, 57% of whom were under 13 years old, and 20% were less than eight years. All patients who received ketofol had successful sedation. This was defined as a completed procedure without the need of adjuvant medications. The median dose of ketofol used was 0.8mg/kg, with 96% of patients using <1.5mg/kg and 68% of patients using <1mg/kg. Median recovery time for ketofol was 14 minutes, with 90% of patients recovering within 20 minutes. Median total sedation time was 18 minutes. Median physician and nursing satisfaction scores, based on a scale of 1(low) - 10(high), were 10 and 10.

Limitations to this study include the lack of patient randomization, potential selection bias, lack of a standardized dosing protocol, and a lack of a control group for comparison. Adverse effects included emergence reactions (two patients), temporary apnea (two patients), laryngospasm (one patient), and need for airway intervention (three patients). No patients required endotracheal intubation or admission to the hospital. Despite these issues, this is the largest observation study to date on the use of ketofol in pediatric patients, and it provides compelling evidence that ketofol can be used safely and

effectively for procedural sedation in this group. Due to the limited numbers of patients under age two, no conclusions about the use of ketofol in this age group can be made.

### **Sensitivity of bedside ultrasound and supine anteroposterior chest radiographs for the identification of pneumothorax after blunt trauma. Wilkerson RG, Stone MB. *Acad Emerg Med.* Jan;17(1):11-17.**

Supine chest radiographs are the routine study in the evaluation of thoracic injury for blunt chest and severe trauma. In many cases, supine positioning is a necessary requisite for spinal immobilization. However, supine chest radiographs have been reported to have poor sensitivity for the detection of pneumothorax. Chest ultrasonography is an emerging modality for the evaluation of pneumothoraxes. This study sought to compare the sensitivity of chest ultrasonography to supine radiographs for the detection of pneumothorax in blunt trauma.

The authors of this review conducted a structured search of the literature, including a search of bibliographies to identify additional articles. Prospective, observational studies of adult patients in whom pneumothorax was suspected after blunt trauma were included. Pneumothorax detection was compared between chest radiographs and ED physician-performed chest ultrasonography. The criterion "gold" standard was either computed tomography (CT) of the chest demonstrating a pneumothorax or the presence of a "rush of air" on chest tube insertion in patients unstable for CT. Four studies met inclusion criteria, comprising 606 patients. The sensitivity and specificity of ultrasound ranged from 86-98% and 97-100%, respectively, as compared to a sensitivity of 28-75% and specificity of 100% for chest radiographs.

In this review, chest ultrasonography demonstrated a superior sensitivity and similar specificity for the detection of pneumothorax after blunt trauma when compared to a standard supine chest radiograph. However, several important limitations must be considered. First, the ED physicians performing the chest ultrasounds were generally experienced ultrasonographers, potentially limiting the applicability of the results to the general ED physician. Second, clinical outcomes were not examined. Thus, the resultant benefit of increased sensitivity can only be assumed. Other limitations included a nonrandom study design and a relatively small sample size. Despite these limitations, the review demonstrates the higher sensitivity of ultrasound compared to a supine chest radiograph. While chest radiographs will remain a mainstay in the evaluation of blunt trauma due to the additional clinical information provided, chest ultrasonography is emerging as a more sensitive alternative to aid in the diagnosis of pneumothoraxes.

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**Diagnostic accuracy of noncontrast computed tomography for appendicitis in adults: a systematic review. Hlibczuk V, Dattaro JA, Jin Z. *Ann Emerg Med.* Jan;55(1): 51-59.**

Acute appendicitis is a diagnosis that is frequently considered in the emergency department in patients presenting with right lower quadrant abdominal pain. Classic symptoms and signs are frequently absent. The use of computed tomography (CT) to aid in the diagnosis of acute appendicitis has decreased negative laparotomy rates significantly. There is still debate on whether or not intravenous contrast is necessary to make the diagnosis. The authors of this study performed a systematic review to evaluate the accuracy of non-contrast CT scan for acute appendicitis.

This review included studies of adult patients with suspected acute appendicitis that used a multi-slice helical scanner and had a pathologic diagnosis or patient follow-up at a minimum of two weeks. Exclusion criteria included articles that involved mixed adult and pediatric populations. Seven studies were included with a combined total of 1,060 patients. The prevalence of acute appendicitis in these studies ranged from 20.1 to 84.5%, with a median of 39.3%. The pooled estimates of sensitivity and specificity were 92.7% and 96.1%, respectively.

There were a number of limitations in this review. The number of CTs that were inconclusive in each study was omitted from the final analysis. In one study, acute appendicitis was ultimately diagnosed in 41% of the patients with a non-conclusive CT. It is unknown how this would have affected the results. Also, despite follow up, the number of false negative scans is not truly known as patients may have had subclinical disease. In addition, the prevalence of appendicitis in some of the studies, as high as 84.5%, likely reflected some selection bias by the enrolling physicians. The use of oral and rectal contrast was also not fully disclosed.

Non-contrast CT of the abdomen has good sensitivity and specificity for acute appendicitis, but it also has a false negative rate of 7.3%. With this in mind, non-contrast CT is a viable option in the ED setting, but those patients with a strong suspicion for appendicitis might need an admission for serial examinations or an additional study to confirm the diagnosis. The lack of contrast can also affect the ability to diagnosis an alternative condition as the cause of the patient's pain. Overall, the option of doing a CT without contrast can help decrease the time to diagnosis in the majority of patients with appendicitis and help improve patient flow through the ED.

**Does the early administration of beta-blockers improve the in-hospital mortality rate of patients admitted with acute coronary syndrome? Brandler E, Paladino L, Sinert R. *Acad Emerg Med.* Jan 2010;17(1):1-10.**

For decades, beta-blocker therapy has been a mainstay in the treatment of acute coronary syndrome (ACS). Beta-blockers decrease the workload of the heart by reducing chronotropy and inotropy, lowering the oxygen demands of the ischemic myocardium. Early studies from the 1960s showed mortality benefits when beta-blockers were given in the early and chronic setting, leading to its frequent use in the ED. More recent studies, however, have gone against this old paradigm, and beta-blockers may in fact cause harm

due to the risk of reduced cardiac output and cardiogenic shock. The authors of this study sought to determine if in-hospital mortality improved when beta-blockers were given early in suspected acute coronary syndrome.

This systematic review included studies of adult patients who presented within 24 hours of chest pain onset and who were given beta-blocker therapy within eight hours of presentation. Studies of patients with chronic stable angina were excluded. There were no exclusions based on the type of beta-blocker therapy or other therapies given to the patient (i.e. thrombolysis, angioplasty). The primary outcome measure was in-hospital mortality. Eighteen articles from 1965 to 2005 were included that showed a pooled relative risk ratio of 0.9 (CI 0.9-1.01), demonstrating that there is no benefit of early administration of beta-blockers on in-hospital mortality.

Limitations to the review included the large heterogeneity of the trials in regards to sample sizes, type and dosing of beta-blockers, placebo use and adjuvant therapies. The largest study included was the 2005 COMMIT trial (n=45,852), which showed no benefit and an increased incidence of cardiogenic shock with early beta-blocker administration. By comparison, the next largest studies were the ISIS-1 study of 1986 (n=15,997) and the MIAMI trial of 1985 (n=5,779). If the COMMIT trial was excluded from the analysis, the pooled relative risk ratio would be 0.86 (CI 0.7-0.96), weakly favoring early beta-blocker therapy. In addition to the differences of sample sizes, there were large differences in the control mortality rates amongst the studies. For all trials prior to 1984, the control mortality rates were all >12%. After 1984, the highest control mortality rate was 7.8%, while most others ranged from 1.2 to 5.7%. This was likely due to the adjuvant therapies such as thrombolysis and percutaneous interventions that were not available prior to that time. The data from older studies may show larger benefits of beta-blockers on survival because more current therapies were not available, which may have skewed the overall results.

Based on this review and largely due to the findings of the COMMIT trial, there is no evidence that beta-blocker therapy started in the ED decreases the in-hospital mortality of ACS patients and, in fact, may actually increase mortality rates.

**Nasogastric aspiration and lavage in emergency department patients with hemochezia or melena without hematemesis. Palamidessi N, Sinert R, Falzon L, Zehtabchi S. *Acad Emerg Med.* Feb 2010;17(2):126-132.**

Nasogastric aspiration and lavage are common practices in the management of melena and hemochezia. The benefits of these procedures have recently been questioned. Proponents argue nasogastric tube (NGT) aspiration helps localize bleeding (upper versus lower) thereby guiding subsequent endoscopic management, while clearance or lack of clearance of the aspirate assists in determining the urgency of endoscopy. Opponents argue that nasogastric aspiration results rarely change management yet subject patient to the risks of complications and the discomfort of NGT placement (noted by patients to be among the most painful procedures performed in the ED). The authors of this study sought

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to examine if nasogastric aspiration and lavage differentiates upper and lower gastrointestinal (GI) bleeding in patients with melena or hematochezia without hematemesis.

In this systematic review, a structured search of the literature was performed including a review of bibliographies of relevant articles. Adult patients presenting with melena and hematochezia without hematemesis were included. Patients with hematemesis were excluded (presumed to have upper GI bleeding). Esophagogastroduodenoscopy (EGD) was used as the reference standard. In total, three studies met inclusion criteria, comprising 533 patients. Primary endpoints included sensitivity and specificity of finding an upper GI bleed as the source of the melena or hematochezia.

The sensitivity and specificity varied among the studies, from 42-84% and 54-91%, respectively. The positive predictive value and negative predictive value ranged from 41-93% and 61-78%, respectively. The positive likelihood and negative likelihood ratios varied from 1.44-4.74 and 0.2-0.65, respectively. Several important limitations to these results were noted. All the studies included were retrospective and carry the biases inherent to these types of analyses. There was significant heterogeneity among the definitions of positive NG

aspirate results as well as the reference standard (various criteria for a positive EGD or positive diagnosis for upper GI bleed). One study only included patients with GI bleed after having myocardial infarction, thereby introducing bias into the study population and limiting the universal application of its results.

These important limitations prevent definitive recommendations for the use of nasogastric aspiration for hematochezia or melena. However, all the included studies showed poor sensitivity for nasogastric aspiration or lavage questioning its role as a useful test to rule out upper GI bleed. Specificity was also low. The authors note that a positive result may still provide useful information if the consulting gastroenterologist would consider emergent (versus delayed) endoscopy based on these findings. However, such a decision would likely be based on a multitude of additional factors, such as hemodynamic stability and hematocrit, time of day, and availability of support staff. This review suggests that the common practice of nasogastric aspiration or lavage in the setting of hematochezia or melena has limited value. However, more rigorous studies are needed for definitive conclusions.

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