



Resident Journal Review: March-April 2009

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This is a continuing column providing 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 that the busy EM resident may have missed. Residents should read the articles themselves to draw their own conclusions. This edition will include articles published over a two month period. These selections are from papers published in November and December 2008.

Appelboam A, Reuben AD, Bengner JR, et al. Elbow extension test to rule out elbow fracture: multicentre, prospective validation and observational study of diagnostic accuracy in adults and children. *BMJ* 2008;337:a2428

This prospective study evaluated the performance of the elbow extension clinical decision rule. The elbow extension rule predicts a low likelihood of elbow fracture in patients who can fully extend their arm. The investigators performed an interventional validation study in patients 15 years of age and older and an observational study in pediatric patients. 958 adults and 778 children were enrolled. For adults, if the patient was able to flex the shoulder to 90 degrees and then fully extend and lock their elbows, no further imaging was performed. Management of pediatric patients was left to the treating attending physician; documentation of elbow extension was recorded contemporaneously.

Overall, this clinical decision rule performed well. Of 958 adults, 313 (33%) were able to fully extend their elbow; five (1.6%) fractures were identified in this group of patients, with two requiring operative intervention. 647 adults could not fully extend their elbow – 311 (48%) had fractures, and 84 (13%) had joint effusions. This yields a negative predictive value of 98.4% and a negative likelihood ratio of 0.03. Among the 778 children, 289 (37%) could fully extend their elbow – 12 (4.1%) had fractures, and 6 (2.1%) had effusions. None required operative intervention. The negative predictive value in pediatric patients is 95.8%, and the negative likelihood ratio is 0.11.

Elbow injuries are a common orthopedic complaint in the emergency department. This clinical decision rule can reduce the number of plain films performed in the evaluation of these patients. While this rule performed well, it is important to give clear instructions for return to patients who leave the emergency department without having radiographic imaging performed.

Bottiger BW, Arntz HR, Chamberlain DA, et al. Thrombolysis during resuscitation for out-of-hospital cardiac arrest. *The New England Journal of Medicine* 2008;359:2651-62

Morbidity and mortality after cardiac arrest are extremely high. As pulmonary embolism and myocardial infarction are believed to precipitate this final common pathway in many patients, there has been speculation that thrombolysis may confer a clinical benefit.

The Thrombolysis in Cardiac Arrest (TROICA) trial was a double-blind multicenter investigation of tenecteplase compared to placebo during cardiopulmonary resuscitation for adult patients with witnessed out-of-hospital cardiac arrest. The investigators had a primary outcome of 30 day survival; secondary end points were hospital admission, return of spontaneous circulation, 24 hour survival, survival to hospital discharge and neurologic outcome. It was calculated that 1,000 patients would be needed to detect a differ-

ence of 7% between groups, with a power of 90%. The trial protocol was modified after enrollment of 443 patients (excluding asystolic patients) and was terminated early for futility by the data and safety monitoring board after enrollment of 1,050 patients. There were no statistically significant differences in the primary or secondary outcome measures.

The findings of this study differ from prior reports of clinical benefit; however, a randomized double-blind methodology had not been used in prior investigations. While it may be true that certain subgroups of patients with cardiac arrest will benefit from thrombolytic therapy, these results do not support routine administration of these agents to an unselected cardiac arrest population.

Sillberg VA, Perry JJ, Stiell IG, Wells GA. Is the combination of vasopressin and epinephrine superior to repeated doses of epinephrine alone in the treatment of cardiac arrest – a systematic review. *Resuscitation* 2008;79:380-6

While animal studies of combined epinephrine and vasopressin in cardiac arrest have shown improved outcomes, human studies have been less convincing. The investigators conducted a systematic review of human trials that compared epinephrine to the combination of epinephrine and vasopressin in cardiac arrest. The primary outcome was survival to hospital discharge, and the secondary outcome was return of spontaneous circulation.

Three double-blinded randomized controlled trials were identified, including 1,226 patients. Differences in methodologies precluded a pooled analysis of the patient outcome data. For these three studies, there was a trend towards better return of spontaneous circulation, but an unclear impact on survival.

The combination of vasopressin and epinephrine in cardiac arrest is not supported by high quality evidence. The authors identified three additional ongoing trials that will likely inform the ACLS protocol in this regard; until the publication of these studies, this combination cannot be regarded as having a rigorously proven benefit.

Singh A, Alter HJ, Zaia B. Does the addition of dexamethasone to standard therapy for acute migraine headache decrease the incidence of recurrent headache for patients treated in the emergency department? A meta-analysis and systematic review of the literature. *Acad Emerg Med*. 2008; 15:1223–33

Dexamethasone has been proposed as an adjunct therapy for patients presenting with migraine headaches, particularly to prevent recurrence or severity of headache following ED discharge. While there have been a number of studies examining the efficacy of this treatment, none have clearly indicated a benefit to this therapy. The authors of this systematic review and meta-analysis conducted an exhaustive search of published studies, clinical trials and abstracts

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in order to find the highest quality randomized, double-blinded, placebo controlled trials to find their answer.

The pooled analysis of the seven trials they included examined 742 patients, looking at severity of migraine symptoms at 24 to 72 hours after disposition. It should be noted that six of the seven included trials showed only a trend toward benefit and no statistically significant treatment differences, but that the pooled results suggested a modest benefit to treatment with prevention of moderate or severe headache relapse in about one in nine treated patients.

As with any meta-analysis, there is concern for a single conclusion drawn from heterogeneous studies, which the authors consider in their analysis. The included trials varied in their dosing and route of dexamethasone given, their headache severity scoring and duration of follow-up times. In addition, there was variability within and between studies for "standard therapy" for migraine headaches. Despite these inherent difficulties in analysis, the generally safe side-effect profile and the potential benefit seems to indicate that the addition of dexamethasone to standard migraine therapies is an acceptable strategy to prevent headache relapse.

Strayer RJ, Nelson LS. Adverse events associated with ketamine for procedural sedation in adults. Am J Emerg Med. 2008 Nov;26(9):985-1028

Ketamine is a drug widely used for procedural sedation in pediatrics, with a number of studies in the emergency medicine literature supporting its safety and efficacy. What is less well-studied is the use of ketamine as a sedative agent for adult emergency patients. The authors of this narrative review conducted an exhaustive study of the available literature on the use of ketamine for sedation in adult patients. A number of databases were searched, and foreign language abstracts were included. Of 5,512 citations, 87 met their criteria for analysis and inclusion. A majority of the included studies came from anesthesia literature and was published in the 1970s. Due to the heterogeneity in study design and quality, the authors did not attempt statistical analysis, but rather presented the results qualitatively.

What is apparent is that ketamine is a dependable medication at dissociative doses for sedation and analgesia in adults. Ketamine demonstrates very high safety, as the authors report coming across one serious adverse cardiopulmonary complication in over 70,000 patients described. A few patients became transiently apneic, but were successfully ventilated with a bag-valve mask. Most of these cases involved patients who received concomitant therapy with other respiratory depressants such as opiates or benzodiazepines. Likely, the most common adverse effect, and probably the most concerning to most emergency physicians, seems to be the presence of emergence reactions. The incidence of this phenomenon seems to be about 10-20%; however, this decreases with the use of other

anxiolytic/sedating agents or with pre-induction counseling. Other less frequent adverse events include vomiting, hypertonus, rash and hypersalivation.

While no large randomized trial exists that compares ketamine to other sedation strategies, these results seem to indicate that this drug is safe and effective, with few respiratory adverse events. The risk of emergence reactions seems to decrease with a number of strategies that may employ predissociative, pre-emergence or PRN medication use.

Kelly AM, Kerr D, Clooney M. Outcomes of emergency department patients treated for primary spontaneous pneumothorax. Chest. 2008 Nov;134(5):1033-6

The treatment of spontaneous pneumothorax varies in different international guidelines. While most physicians agree that small pneumothoraces can be managed with observation, the existing literature does not indicate that the management of a pneumothorax should be based on its size. In this retrospective study from two community hospitals, the authors examined the outcomes of 154 patients with 203 primary spontaneous pneumothoraces treated with a variety of strategies – observation, aspiration and tube thoracostomy. Ninety-one patients were treated with observation, 48 with aspiration and 64 with tube thoracostomy. No patient enrolled had signs or symptoms of tension pneumothorax. The treatment groups were not matched for size of pneumothorax; however, there were a higher proportion of large pneumothoraces treated with aspiration or tube thoracostomy. Patients in the observation arm had resolution without further intervention 79% of the time, the remainder requiring non-emergent intervention to achieve resolution. Aspiration alone was successful 50% of the time and tube thoracostomy 73%.

The retrospective nature of this study limits what conclusions can be drawn from these results, as does the fact that treatment groups were not matched for initial pneumothorax size, meaning that comparisons can not be made between groups. What it does set up, however, is the groundwork for future prospective trials that may include an observation arm for patients with primary spontaneous pneumothorax.

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