The Trauma Professional's Blog

Trauma MedEd

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The Eastern Associate for the Surgery of Trauma (EAST) holds its annual scientific assembly every year in January, typically in a nice, warm location. This year is no exception, as it will be taking place in the JW Marriott in San Antonio.

The program is usually quite varied, and there are always two special sessions that are devoted to prevention and presentations from young researchers. This organization caters to young trauma professionals, and strives to get them involved in its various committees early in their careers. And it provides invaluable networking opportunities in a very informal setting.

In recent years, the scientific program has been a bit ho-hum. However, I've been reviewing this year's abstract selection and have found quite a few exciting papers. So I decided to devote not one, but two months of this newsletter to them. I wanted to give you a sample of what will be presented before January 12.

But remember, these analyses are based on reading the abstracts alone. Sometimes the actual work presented varies substantially so I urge you to attend and listen to the talks yourself.

And I've included one example (the last article) on how not to write your abstract.

So let's get started!

Inside This Issue

Trauma Calendar of Events

Eastern Association For The Surgery Of Trauma
Location: JW Marriott, San Antonio, Texas
Date: January 12-16, 2016

Pediatric Trauma Conference – Children's Hospital of the King's Daughters
Location: Norfolk Waterside Marriott, Norfolk, Virginia
Date: March 11-12, 2016

Brain Hypoxia In TBI With Aeromedical Evacuation

I'm sure that most of you have noticed that I very rarely write about animal studies. The problem I have is that the effects generally found are not dramatic, and results seldom carry over to humans the way we think they should.

But for this paper, I've made an exception. It uses a swine model to study the effect of air transport at altitude on TBI. As you may know, most aeromedical transport in the US is via helicopter.

However, some patients in more rural areas must travel longer distances to get high level trauma care, and may need to fly in fixed wing aircraft. U.S. military transports overseas use fixed wing almost exclusively.

Medical helicopters typically fly at only 1000-3000 feet above the ground, and the change in air pressure (and hence PaO2) is small. However, fixed wing aircraft fly at much higher altitudes, and the effective cabin altitude may rise to about 8000 feet. This is why your ears "pop" so many times as you ascend. **You've essentially just climbed Mt. St. Helens in Washing state.** The amount of oxygen in cabin air also decreases with altitude.

So what happens to a patient with severe TBI

when exposed to these fluctuations in pressure and oxygen levels? A group at the Naval Research Center looked at this issue in anesthetized swine that received a TBI from a percussion device. They received standard TBI and injury-specific care (for pigs?) for two hours, then underwent flight simulation using a **hypobaric** chamber set to a cabin altitude of 8000 feet for four hours.

Here are the factoids:

- Six study pigs underwent the 2 hours at sea level followed by 4 hours at altitude. Six control pigs stayed at sea level after their injury.
- **Mean arterial pressure in the pigs at altitude decreased somewhat**, but not significantly.
- **Intracranial pressure (ICP) increased significantly in the TBI group(!)**
- As a result, **cerebral perfusion pressure (CPP) dropped in the study group** (highly significant result).

Bottom line: Aeromedical transport at typical cabin altitudes significantly increases ICP and decreases CPP in an injured pig model. Although the groups are small, this information is startling and deserves rapid confirmation. This information may have a significant impact on the way we fly patients with head injuries. In particular, this is important for military aeromedical evacuation.

Reference: Brain hypoxia is exacerbated in hypobaria during aeromedical evacuation in swine with TBI. EAST 2016 Oral abstract #2, resident research competition.

Acetylcysteine (Mucomyst) And Pulmonary Infection

Okay, there's only one thing I dislike writing about more than an animal study. And that's writing about a bench research study. First, I don't even pretend to know enough about most of it to make any real sense of it. But even more importantly, the actual translation into clinical practice is far in the future and frequently never happens. So many times it's just an academic exercise to get a paper published.

But this is another paper with a startling result that begs rapid follow-up and animal or human study. The use of nebulizers and inhaled aerosols is commonplace in ventilated patients in the typical ICU setting. **A recent trial of an inhaled cocktail** containing heparin, albuterol, and n-acetylcysteine (mucomyst) unexpectedly resulted in a **higher incidence of pneumonia. So which one is the offending ingredient?**

Since mucomyst is therapeutically used to change the properties of mucus, a group at Wayne State in Detroit looked at its effect on mucus, cytokine response, and bacterial transcytosis in an in vitro model.

Here are the factoids:

- Three groups of monolayers of human bronchial epithelial cells were grown and **each was treated with either mucomyst, albuterol, or nothing (control).** A mucin analysis was carried out.
- Separately, Klebsiella was added to three groups of monolayers grown as above. Cytokine response and bacterial transcytosis was measured.
- **Mucin and its oligosaccharide content decreased significantly only in the mucomyst group**, within 15 minutes of administration.
- **Cytokine response was decreased in the mucomyst group after exposure to Klebsiella.** This did not achieve statistical significance but was impressive.
- Bacterial transcytosis was increased only in the mucomyst + Klebsiella group.

Bottom line: This is startling news that involves a medication we tend to take for granted. Again, animal and/or human studies need to be quickly designed so we can determine whether the use of N-acetylcysteine should be avoided in ventilated patients.

N-acetylcysteine renders airway barrier at risk for bacterial passage and subsequent infection. EAST 2016 Oral abstract #4, resident research competition.

(F)utility Of Transfusion In Flight

Air transport of trauma patients has resulted in the creating a mobile intensive care unit in the passenger compartment of the aircraft. Since trauma patients frequently need blood, it was logical to begin stocking blood products on board. Once again, though, it sounds like a good idea. **But does it make a difference?**

Vanderbilt University carried out a retrospective review of aeromedical transports to its Level I trauma center.

The authors chose overall mortality and 24-hour mortality as their endpoints.

Here are the factoids:

- 5581 patients were entered into the study. This represented all trauma scene transports to this trauma center over 7 years.
- Only 4% of these patients (231) received blood in the aircraft.
- Multivariate regression analyses were performed with and without propensity score matching. (Sorry, just had to throw that in there to make your head spin!)
- **There was no significant improvement in 24-hour or overall mortality when blood was given.** This was true using all of their statistical methods.

Bottom line: This abstract seems to corroborate a few other studies that show no benefit to prehospital blood administration. So why do we still do it? Because we don't know the full answer yet. Using mortality alone is a very crude outcome measure. What about early complications, ventilator times, time in the ICU, and other soft measures? More work is needed to slice and dice this appropriately enough to answer the question.

Reference: Blood transfusion: in the air tonight? EAST 2016 Oral abstract #5, resident research competition.

(F)utility of CPR In Hemorrhagic Shock

Ahh, another (f)utility study. Does it work, or doesn't it? And yes, I know. It's another animal study. But it may give us a glimpse of where we are really going with this.

A team at the University of Tennessee – Knoxville devised a dog experiment to study how well performing CPR works in critically hypovolemic animals. They used three groups of dogs that received a severe shock insult: hemorrhage until loss of pulse, then waiting for 30 minutes in that pulseless state. At that point, one of **three interventions** was performed for 20 minutes.

One group received **CPR only**, another group underwent **CPR plus fluid administration**, and the last group got **fluids only**.

Here are the factoids:

- The insult to all three groups was similar.
- Vital signs and lab studies were similar in the CPR+fluid and fluid only groups.
- The **CPR only group had significantly lower mean arterial pressures and higher pulse rates** than the other CPR+fluid and fluid only groups.
- **Ejection fraction was lower in the CPR only group**, and it also had a higher incidence of end organ damage.
- Two of the six dogs in the CPR only group died before the end of the study.

Bottom line: Tread with caution here. It makes sense that pounding on an empty tank won't do much. But this study doesn't exactly prove this. Only the vital signs measurements were significantly different. All other results are just trends in this very small study. And finally, dogs are (obviously) different than people, in their physiology and their chest wall shape. This can certainly make a difference, and *does not* mean that we should abandon CPR in *humans* in hemorrhagic shock.

Reference: Utility of CPR in hemorrhagic shock, a dog model. EAST 2016 Oral abstract #8, resident research competition.

Scene Time And Mortality

The old "scoop and run" vs "stay and play" debate has gone on for years. It would seem to be intuitive that trauma patients, who should be assumed to be bleeding to death, would do better with shorter prehospital times and quicker transport to definitive care.

However, several studies have not shown worse outcomes in these patients. Once again, mortality is a very crude indicator of "worse" outcomes, and may not be a good enough measure. Nonetheless, the debate continues to rage. A group at the University of Pittsburgh used the Pennsylvania Trauma Registry to review a huge number of EMS transports, looking at mortality as the measure of interest.

Recognizing that total prehospital time can be influenced by delays in specific phases (response, scene, or transport), they analyzed the impact of

problems in each. If one particular phase represented more that 50% of the total prehospital time, it was considered a delay. Logistical regression was used to match patients to try to control for any confounding issues.

Here are the factoids:

- Over 164,000 records with prehospital times were reviewed over a 14 year period.
- There was a statistically significant increase in mortality if the scene time phase was prolonged.
- No differences in mortality were noted with longer response or transport times.
- Prolonged extrication and intubation had a tendency to prolong scene time, and were independently associated with higher mortality.
- Lengthy scene time **without extrication or intubation** was not associated with higher mortality.

Bottom line: This registry-based study has helped us to slice and dice the prehospital time issue a little bit better. As with other studies, the times themselves may not necessarily be the problem. It's what is causing the delay that matters. Extrication and intubation tend to indicate sicker trauma patients, but they are also somewhat unavoidable. Prehospital trauma professionals will need to focus on tools and exercises that save time during these critical interventions.

Reference: Not all prehospital time is equal: influence of scene time on mortality. EAST 2016 Oral abstract #9, resident research competition.

Lower Mortality In Patients Taking Newer Oral Anticoagulants vs Warfarin

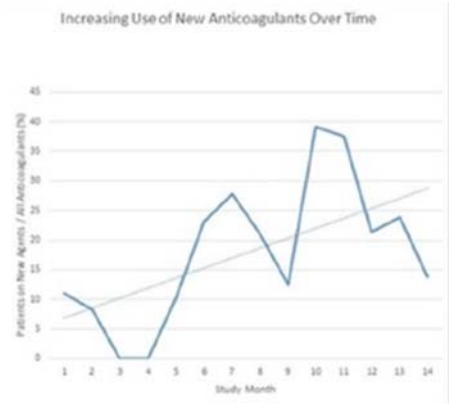
How not to write your abstract. The full title is this:

Trauma Patients on New Oral Anticoagulation Agents Have Lower Mortality Than Warfarin

Now let's look at what it really says. This was a **retrospective** trauma registry review from a **single Level I trauma center**. Over a 14 month period, 275 of 1994 admitted patients were on anticoagulants.

Here are the (misleading) factoids and my comments:

- Patients on warfarin had a higher mortality (13%) than those on new oral agents (NOA) (6%). ***(I can't duplicate the statistical significance calculation)***
- Patients taking any anticoagulant were admitted to an ICU more often (44-50% vs 36%). ***(Duh! This just shows their usual practice, nothing new)***
- Patients on warfarin were more statistically likely to receive prothrombin complex concentrate. ***(Double duh! Because it doesn't work for NOAs?)***
- The authors pointed out a trend toward more NOA use in this graph. ***(Really? It goes from 11 to 14 with wide monthly variations!)***



Bottom line: This is why it's so important to read the entire abstract and think about the stats. And ultimately, it's even more important to read the whole paper! They don't always say what you think they say!

Reference: Trauma patients on new oral anti-coagulation agents have lower mortality than those on warfarin. EAST 2016 Oral abstract #24.

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