October 2020 | Volume 20 Issue 10

EM:RAP
Emergency Medicine: Reviews and Perspectives

www.emrap.org

October Introduction

Anand Swaminathan, MD and Jan Shoenberger, MD

Take Home Points

- **While lipase elevation is not specific for pancreatitis, a level elevated more than 3 times above the upper limit of normal is more specific.**
- **Hypertriglyceridemia is a fairly common cause of pancreatitis.**
- **Patients with pancreatitis due to hypertriglyceridemia may be treated with plasmapheresis or insulin drip.**

- A 44-year-old male presented with 3 days of constant sharp epigastric pain radiating to his back. He had nausea and vomiting, but denied fevers. There was no history of similar symptoms in the past. He had no past medical history and was not on medications. He didn't smoke or drink. He was uncomfortable. He was tachycardic with a heart rate of 115 bpm and was tachypneic with a respiratory rate of 22 breaths per minute. His blood pressure was 118/65 mmHg. Oxygen saturation was 97% and he was afebrile. He had epigastric tenderness with guarding.
- **What is your differential diagnosis?** This presentation has a broad differential diagnosis. Perforated ulcer or viscus. Gallbladder pathology such as cholecystitis, choledocholithiasis, or gallstone pancreatitis. Pancreatitis. Myocardial infarction (although these patients are not usually tender to palpation).
- **They got an ECG.** They sent labs. His white blood cell count was elevated at 13. Platelets were elevated. LFTs were normal. The lipase was 1083.
- **Lipase elevation is not specific for pancreatitis.** However, when the lipase is elevated more than 3 times above the upper limit of normal, it is very specific for pancreatitis.
- **Should you get a CT?** Shoenberger doesn't get a CT on all patients with pancreatitis. She is more likely to get imaging if the patient is sicker.
- **Why does the patient have pancreatitis?** It can change the management and disposition. Patients with gallstone pancreatitis and necrotizing pancreatitis may be admitted to the surgical service.
- **The patient swore he didn't drink alcohol.** His wife confirmed he was not a drinker.
- **There were no gallstones on ultrasound.** He was not on medications. There was no report of scorpion bite. Hypercalcemia and hypertriglyceridemia can be an etiology.
- **Hypertriglyceridemia leading to pancreatitis is fairly common.** You can make this diagnosis at the bedside by looking at the separation of lipids in the tube. The triglyceride level was 2500 mg/dL (28.2 mmol/L).
- **What are you going to do about it?** There is increasing evidence that judicious fluid hydration is better than drowning the patient. Pain control.
- **There are two options for hypertriglyceridemia.** Plasmapheresis and insulin infusion. The insulin infusion is easier to arrange in the ED. Insulin infusions reduce the triglyceride levels and the synthesis of the triglycerides by accelerating their metabolism. This can rapidly lower the triglycerides. The insulin is usually given at a fixed rate of 0.25 units/kg/hr. You may have to infuse dextrose as well. The patient was transferred to the ICU and did well.
- **It is important to get the insulin drip started early to stop the process.**

Critical Care Mailbag: Acute Liver Failure

Anand Swaminathan, MD and Scott Weingart, MD

Take Home Points

- **Although patients with liver failure may have an elevated INR, it doesn't mean they are coagulopathic. Thromboelastography (TEG) or rotational thromboelastometry (ROTEM) might provide a more accurate assessment of coagulopathy.**
- **The role of prophylactic antibiotics in acute liver failure patients is unclear.**
- **Consider vasopressin when giving vasopressors.**
- **Contact your transplant center for transfer if you do not have these resources in-house.**

CASE

A 24-year-old woman presented with fever, nausea, vomiting, and abdominal pain. She had an extensive work-up and her liver function testing was markedly elevated. ALT was approximately 30000. AST approximately 20000. Bilirubin was 9. The INR was 2.1. The acetaminophen level was undetectable. The patient likely had acute liver failure from a viral hepatitis.

- **Is there a role for N-acetylcysteine (NAC) in the absence of acetaminophen overdose?** Yes. It is a free-radical scavenger and replenishes the stores of glutathione. Although literature is limited, it does seem to be effective for any cause of acute liver failure. There is little downside aside from cost.
  - **Is the regimen the same as acetaminophen overdose?** Yes, although you can continue the infusion beyond 23 hours.
  - **What are the indications for NAC?** It depends on the chronicity. If the patient has chronic liver failure with a bump in the LFTs, it is your usual cirrhotic patient and you do not have to give NAC. However, if the patient had normal liver function and is now in acute liver failure, give it empirically.
- **Do you treat the coagulopathy if they have bleeding from their puncture sites?**
  - Puncture site bleeding is arbitrary. INR elevation does not necessarily mean the patient will have increased bleeding.
  - INR measures Factor VII and is only supposed to be used for warfarin monitoring. Warfarin affects all of the vitamin K dependent clotting factors (II, VII, IX and X) and measuring just one of these factors is sufficient to determine the medication effect. However, in liver failure, the coagulopathy is not distributed evenly. Factor VII tends to be affected more than the other factors, which may be okay.
  - TEG or ROTEM may provide a better idea of the coagulation status.
  - If the patient has overt bleeding, you may treat potential coagulopathy with FFP or PCC.
- **Patients with cirrhotic liver failure have high risk of infection and there is benefit to prophylactic antibiotics in patients with GI bleeds. Is there any role for antibiotics in acute liver failure?** Antibiotics have a role in patients who could be infected or are infected. Weingart would not give antibiotics just for liver failure alone. You should give antibiotics to cirrhotic patients with GI bleeds.
- **What else should you consider in the management of acute liver failure?**
  - **Are you a liver transplant center?** If you are not, you should consider transferring the patient. Make sure you are speaking to the GI attending or transplant attending if the transfer is refused.
  - **The degree of encephalopathy may be worse in acute fulminant hepatic failure patients than in cirrhotics.** The relationship of ammonia levels to hepatic encephalopathy in cirrhotic patients is not well-defined. Encephalopathy in acute hepatic failure patients may be caused by acute increased intracranial pressure. Obtain a head CT. Evaluate the optic nerve sheath on ultrasound or CT.
    - If they have evidence of increased intracranial pressure, they may need hypertonic saline or mannitol. Avoid mannitol in a hypotensive patient. Mannitol itself has minimal effect on blood pressure but it can be difficult to keep up with fluid losses. If you give mannitol, you need to monitor urinary output and match any losses. You can give hypertonic saline to hypotensive or hypotonic patients.
    - You are likely going to intubate these patients. The patients may need ICP monitoring.
    - How do you monitor response to these agents if you don't have ICP monitoring? Most of these patients will be transferred to a facility with capabilities for ICP monitoring. You can use ultrasound to track changes in intracranial pressure with the optic nerve sheath diameter. Your goal is optic nerve sheath diameter less than 5-6 mm.
  - **Do they need additional fluids or keep them dry?** There isn't much evidence available. If Weingart is going to give more fluid than a little bit of crystalloid, he is quick to reach for albumin. Albumin has multiple benefits for liver failure patients. Cirrhotics do better with albumin with spontaneous bacterial peritonitis. Albumin has less potential for edema formation. Weingart may give 50-100g of the higher percentage albumin.
  - **These patients may develop renal failure.** They may need continuous renal replacement therapies.
  - **There is some enthusiasm for liver dialysis although not much supporting data.**
  - **If you need vasopressor support, you can use standard pressors.** Weingart likes vasopressin in liver failure patients. Chronic liver failure patients are vasopressin-deficient in general. It is unclear if acute liver failure patients are vasopressin-deficient. In general, these patients don't need much inotropic support, although they do tend to have low blood pressures. You don't need to go crazy to reach high normal in these patients.

Rural Medicine: Lateral Canthotomy

Vanessa Cardy, MD and Julie Vieth, MD

Take Home Points

- **Lateral canthotomy is a fairly easy procedure and you have the necessary equipment in your ED.**
- **Review the video before you do it.**
- **Consider reversing coagulopathy.**

- **It was the weekend in rural upstate New York.** The PA walked out of a room and approached Vieth. "I think this lady needs a lateral canthotomy."
- **A 40-year-old female had tripped and fallen at home, hitting her left eye on a table.** There was no loss of consciousness. She was on anticoagulation due to a history of a mechanical valve. She had a history of surgery on both of her eyes and the affected eye was her good one.
- **She was neurologically intact with stable vital signs.** She was holding her hand over her injured eye. When she removed her hand, the eye was completely swollen shut with significant periorbital ecchymosis. The lids were nearly everted due to the swelling. There appeared to be proptosis. Vieth examined the globe. There was significant conjunctival hemorrhage. The pupil was round but not reactive. The patient was able to see Vieth and count fingers. The exam was difficult, the patient was in pain and pushing Vieth away.
- **Do you image now or later?** Cardy does not have the option to image in her setting. The patient would require procedural sedation if she needed a lateral canthotomy as she barely tolerated the exam. This would add time so Vieth decided to send her for head CT to rule out hemorrhage. She didn't want to sedate the patient with a potentially undiagnosed intracranial process.
- **By the time the patient returned to the ED, Vieth had reviewed the EMRAP video on lateral canthotomy and Quickcards.** The last time she had done a lateral canthotomy was nearly 9 years before in a simulation lab with a pig head.
- **The CT was negative for intracranial injury but it was obvious she had a large retrobulbar hematoma**.
- **What resources does Vieth have at her hospital?** She has a CT scanner. She has an awesome ophthalmologist Monday through Friday but this was the weekend. She has anesthesia available. She called anesthesia to help with the sedation because she needed to focus on the procedure.
- **They used ketamine which the patient tolerated well.** When the patient was sedated, they obtained an intraocular pressure which was 65 mmHg. She injected 1% lidocaine with epinephrine along the lateral canthus and used the hemostats to clamp along the lateral canthus to devascularize the area for about a minute. The patient was on warfarin and Vieth wasn't sure how much the patient was going to bleed.
- **Vieth felt for the ligament with the scissors.** She went for the inferior crus first and the pressure decreased to 35 mmHg. However, the patient had an estimated 90 minute transport time to specialist care and Vieth was worried the pressure might increase during transport. Vieth cut the superior crus as well and the intraocular pressure dropped to 20 mmHg. The bleeding was minimal.
- **Vieth had given the patient 4-factor PCC.** Should she have reversed the warfarin? She looked it up later and the consensus seemed to be that you should probably reverse these. After the patient left the facility, the INR returned at 1.7.
- **The patient did have an emergence reaction after the ketamine but the flight team was able to give sedation with ketamine and benzodiazepines.** It kept the patient calm.
- **What dressing did she use?** Vieth placed moist gauze with saline around the area and gently protected the eye. She didn't put anything on top of the eye or lid. She used a Styrofoam cup to create an elevated dressing.
- https://www.emrap.org/episode/lateral/lateral

EMA September Ultra Summary

Mel Herbert, MD

Take Home Points

- **Loop incision drainage is non-inferior compared to incision and drainage for small abscesses.**
- **Patients with SARS-CoV-2 infections are at high risk for mortality and pulmonary complications with surgery and non-essential surgeries should be delayed or non-operative management attempted.**
- **High-flow oxygen reduced dyspnea in palliative care patients in the ED and was better tolerated than BiPAP.**
- **Phenobarbital was superior to levetiracetam in the treatment of neonatal seizures.**

- **Abstract 1:** Schechter-Perkins, E et al. **Loop drainage is non-inferior to traditional incision and drainage of cutaneous abscesses in the emergency department.** Acad Emerg Med. 2020 May 14.

- This is the first prospective trial comparing loop drainage to traditional incision and drainage of abscesses. The article was well done but a large number of patients did not return for follow-up. Loop drainage appeared to be non-inferior and had fewer complications.
- The abscesses in this study were small.

- **Abstract 2:** COVIDSurg Collaborative. **Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study.** Lancet. 2020 Jul 4;396(10243):27-38.
  - Surgery at baseline can be dangerous especially in the old and frail. Even elective surgery has significant morbidity and mortality. This study looked at surgery in patients who were positive for COVID a week before and up to 30 days after.
  - The primary outcome was 30-day postoperative mortality and the main secondary outcome was pulmonary complications.
  - Post-operative pulmonary complications occurred in half of patients with SARS-CoV-2 infection and were associated with high mortality. They recommended postponing non-urgent procedures and considering non-operative treatment to avoid or delay surgery.
- **Abstract 3:** Ong, J et al. **Headaches associated with personal protective equipment – a cross-sectional study among frontline healthcare workers during COVID-19. Headache.** 2020 May;60(5):864-877.
  - This study looked at headaches associated with the use of N95 masks. They had a sample size of 158 healthcare workers. These healthcare workers were wearing masks for over 6 hours a day and 18 hours a month.
  - Did it produce headaches? Yes. Approximately 70% of patients in the study had headaches. These were mostly mild but 30% were sufficiently severe to require medications.
  - Our new normal is different than putting an N95 mask on for a few minutes to go see a tuberculosis patient. We need to look at making these masks more user friendly for prolonged use.
- **Abstract 4:** Ruangsomboon, O et al. **High-flow nasal cannula versus conventional oxygen therapy in relieving dyspnea in emergency palliative patients with do-not-intubate status: a randomized crossover study.** Ann Emerg Med. 2020 May;75(5):615-626.
  - This study compared high-flow nasal cannula versus conventional therapy for dyspnea in patients receiving palliative care and no intubation. Often we use BiPAP or CPAP which can be unpleasant.
  - They found that high-flow oxygen significantly reduced dyspnea and made them feel better. This something to try in the emergency department.
- **Abstract 5:** Sharpe, C et al. **Levetiracetam versus phenobarbital for neonatal seizures: a randomized controlled trial.** Pediatrics. 2020 Jun;145(6):e20193182.
  - This study compared phenobarbital to levetiracetam as first-line treatment for neonatal seizures. They found phenobarbital was much better (80% of patients remained seizure free with phenobarbital compared to 28% with levetiracetam).
  - There were increased side effects with phenobarbital such as hypotension and apnea.
- **Abstract 6:** Coutinho, J et al. **Effect of endovascular treatment with medical management vs standard care on severe cerebral venous thrombosis: the TO-ACT randomized clinical trial.** JAMA Neurol. 2020 May 18;77(8):966-973.
  - This was a big study over 5 years looking at endovascular treatment of cerebral venous thrombosis compared to standard medical care with heparin. The study only included 67 patients as it is a rare disease.
  - There was no difference in outcomes. If you have a patient with cerebral venous thrombosis, heparin is sufficient for now.
- **Abstract 9:** Alowais, S et al. **Heart rate outcomes with concomitant parenteral calcium channel blockers and beta blockers in rapid atrial fibrillation or flutter.** Am J Emerg Med. 2020 May8;S0735-6757(20)30324-7.
  - Can you give calcium channel blockers along with beta-blockers in patients with atrial fibrillation? We have been told not to do this. This was a retrospective study.
  - They found that the vast majority of patients who received a calcium channel blocker after the beta-blocker didn't work did fine. Unfortunately, one patient out of the 136 patients ended up in the ICU due to symptomatic bradycardia and required vasopressors.
  - If you are going to add a second agent, most people will do fine but be careful because it can go bad.
- **Abstract 10:** Alper, B et al. **Thrombolysis with alteplase 3-4.5 hours after acute ischaemic stroke: trial reanalysis adjusted for baseline imbalances.** BMJ Evid Based Med. 2020 May 19;bmjebm-2020-111386.
  - This article re-examined the data of ECASS. When ECASS was published, many methodologists questioned the data. The data has been released and re-analyzed. The randomization was terrible and we probably can't believe the results. Administration of alteplase 3-4.5 hours after acute ischaemic stroke probably does not provide benefit and may cause harm.
    - Hacke, W et al. **Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke.** N Engl J Med. 2008 Sep 25;359(13):1317-29.

- We should be demanding research with independent groups recommending methodology and statistics rather than having industry lead the way.

- **Abstract 15:** Goyal, M et al. **Racial and ethnic differences in emergency department pain management of children with fractures.** Pediatrics. 2020 May;145(5):e20193370.
  - This study looked at children with long bone fractures and the administration of pain medication and pain control in minority children. The results were mixed. They found minority children were more likely to receive analgesics but less likely to receive opioids and optimal pain reduction.

Perfection and Admitting Errors

Anand Swaminathan, MD and Peter Smulowitz, MD

Take Home Points

- **We have the power to change the system from within and we can push for transparency and support programs.**
- **Perfection in medicine is an illusion. You will make mistakes and you are not alone. They do not define you as a clinician.**

- Smulowitz, P. **The illusion of perfection.** BMJ Qual Saf. 2020 Apr;29(4):345-347.
- Smulowitz has always been interested in variation in physician decision making and the intersection with risk tolerance. Early in his career, he had a bad case which influenced his view on this issue. Three months after finishing residency, he worked a night shift and cared for a 24-year-old male who presented with a complaint of right sided back pain. He had recently moved and been lifting boxes. His presentation seemed typical for musculoskeletal back pain. However, there were some atypical components and the patient had recently used cocaine and may have had a history of IV drug use. Smulowitz ordered labs and an MRI looking for epidural abscess. Hours later, the MRI report was normal. The patient was receiving pain medications.
  - **Around 4 am, Smulowitz heard a thud.** He ran over and found the patient lying on the floor. The patient had just come from the bathroom. They gave him naloxone based on the previous history of substance abuse which had no effect.
  - **The patient was placed back on the stretcher.** He was in PEA arrest. During his resuscitation, the senior resident needle decompressed the right chest and blood came spurting out. They contacted the radiologist to look at what they could see of the aorta on the MRI and they identified a problem. The patient had a Type A dissection which had ruptured in the right hemothorax.
  - **They tried to resuscitate him and contacted surgery to take him to the OR.** Unfortunately, the patient died.
  - **Smulowitz was in complete despair.** He reached out to his colleagues for advice. They recommended that he keep on working and things would be fine. The first person he reached out to was the representative for the malpractice carrier who told him not to speak to anyone. He was totally alone. He felt like an absolute failure. He considered quitting medicine completely. That lasted for several months. He didn't find a good outlet and continued to work. He felt anger. He felt like patients were waiting to file a lawsuit for any mistake. It wasn't a good place to be. You can't practice medicine when you are angry and have an adversarial relationship with patients.
  - **Over time it subsided but he can still recall the feelings of fragility and inadequacy.** He didn't want other physicians to go through what he did. We are not perfect. We will all make mistakes. We need to change the system so we have some forgiveness when this happens.
- **What did he learn from this experience?** Perfection in medicine is an illusion. Rationally, we know we aren't perfect but we are so hard on ourselves. We often blame ourselves when things go wrong. We need to stop doing that. We will never be perfect. We need to get better at supporting each other when bad things happen. We don't have to accept this broken malpractice system. We have the power to change things.
- **In the aftermath of an adverse event, we should do better at communicating with families, supporting families and providers and being transparent and admitting when we make a mistake.**
- **What can we do as physicians?** We are handicapped to some degree by the basic premise of the malpractice system. CARE programs have been developed (Communication, Apology and Resolution). We should establish early, ongoing and iterative communication with patients and families when bad things happen. We should be able to apologize when bad things happen. An apology is not an admission of fault. It may just be an empathic response. Resolution can mean many things including financial remuneration. Some families aren't interested in financial remuneration but just want the truth about what happened.
- **Apologies are a good thing.** When these programs were established in Massachusetts, the plaintiff's bar was involved. They advised that if the case reaches a court of law and there has been an apology, the jury looks at it as a positive thing. When you appear human and empathic, it can be protective. Apologies can help stop some lawsuits. Some lawsuits happen because patients and families feel angry, abandoned and are searching for facts. When we take responsibility, there is evidence that it can reduce lawsuits.

- **Smulowitz's hospital has created a support system for physicians and families.** They had the assistance of the University of Michigan and other programs. It is complicated and there is room for improvement.
  - There needs to be a robust system for recognizing and reporting when adverse events occur.
  - There needs to be a dedicated team of individuals that are involved early on in determining what should be communicated to patients and families and how. This is complicated and it is important to have training. This depends on the hospital setting. Communication may take place during hospitalization as well as afterwards.
  - There needs to be a close working relationship between the hospital and the insurer. Some malpractice insurers are within the hospital system but more often they are external to it. There needs to be close coordination between the hospital and the insurer. Sometimes the insurer will want external review of the case and they will need to be involved before any decisions are made on financial compensation.
- **How do you offer an apology?** This is difficult and many hospitals have decided not to train everyone. There may be dedicated and trained individuals that physicians can reach out to when something bad happens and get assistance in what to say and how to say it. Apology can be simple and upfront. "I am so sorry that this happened to you or your family. I can't imagine how you possibly feel." This is empathic and not dismissive. "This was something that we are going to look into. We don't know what happened or the facts. Someone will get back to you about it."
- **Where do you go next after the apology?** We need to take care of ourselves. The second victim phenomenon involves clinicians. Formal peer support programs can be helpful. If these aren't available, know people in your department that you can reach out to and who will be helpful. We need to make sure we take care of ourselves and each other when bad things happen. Even if you can't discuss the case, you can discuss how you feel. There is a lot that we can talk about.

Stroke in Pregnancy

Gita Pensa, MD and Julie Roth, MD

Take Home Points

- **The incidence of stroke is increasing in pregnancy.**
- **Migraines with aura are a risk factor for stroke in pregnancy.**
- **Pregnant women with stroke should receive emergent imaging such as CT/CT angiography. Although MRI is an option, it is not available or timely in most centers.**
- **tPA does not cross the placenta but may result in a higher risk of uterine bleeding and rupture.**

- **There is evidence that the incidence of stroke in younger patients has been increasing over the last decade.** There are differences in risk factors and presentations between men and women.
- **Strokes in pregnant women.** Stroke in pregnancy has an incidence of 10-30 per 100,000 patients. There is an increase in stroke incidence in pregnancy and it is unclear why. It does correlate with the increasing incidence of hypertensive disorders in pregnancy.
- **In older patients with stroke**, we consider hypertension, atrial fibrillation, cervical vessel stenosis, smoking, hyperlipidemia, and diabetes.
- **In younger patients**, aside from hypertension, we need to consider more unusual causes. Strokes may occur from cervical vessel dissection, venous obstruction, and hypercoagulable states.
- Risk factors in pregnancy include preeclampsia/eclampsia, C-section, pregnancy related hematologic problems, congenital heart defects, gestational diabetes, and migraines.
- Migraines with aura are a risk factor for stroke in pregnant and non-pregnant women. Migraine with aura can also be a stroke mimic. Many strokes in the young present with headache as well as focal neurologic features and it can be difficult to differentiate between strokes and stroke mimics.
- **How do we work up stroke in a pregnant patient?** CT and CT angiogram (CTA) of the head and neck. Dissection is in the differential. If you have fast access to MRI, you can do MRI/MRA but most of us don't have rapid access to MRI. MRA does not need contrast. Gadolinium should be avoided in pregnant patients as its risks are not as well defined.
  - **CT of the head has low risk of radiation exposure to the fetus.** It is less than 0.01 rads.

- **For CTA, you need to give iodinated contrast.** Our knowledge of the safety of a single dose of IV contrast comes from the pulmonary embolism literature.
  - Bourjeily, G et al. **Neonatal thyroid function: effect of a single exposure to iodinated contrast medium in utero.** Radiology. 2010 Sep;256(3):744-50.
  - Among several hundred infants exposed to a single dose of contrast in utero, there was only one infant that had transiently abnormal thyroid function tests and normalized within a week.

CASE

A woman who is 6 months pregnant presents with new onset hemiparesis. CT and CTA does not show abnormalities such as bleed, dissection, large vessel occlusion, or visible stroke. It has been two hours since symptom onset. What do you do? Do you give tPA?

- **There are no guidelines.** There is some data available. We need to counsel patients on theoretical risks.
- **Does tPA cross the placenta?** No. tPA is a large molecule that does not cross the placenta.
- Depending on the stage of pregnancy, there is a lot of blood going to the placenta. There are case reports of uterine bleeding or rupture with thrombolytics. This data includes tPA for all indications not just stroke. The major bleeding risk is a little lower for stroke than these other disorders.
- We need to consider the risks and severity of symptoms. tPA will be out of the system in 24 hours but hemiparesis has high morbidity. Shared decision making should occur.

- **What if there was a large vessel occlusion on CT?** Should you proceed straight to IR? There is less data than thrombolytics. There are a handful of case reports. Interventionalists often have to give heparin or IIb/IIIa inhibitors to prevent peri-procedural thrombosis. There is a risk of vessel perforation or rupture. We need to consider all of these factors.

CASE

A pregnant patient with stroke was taken for mechanical thrombectomy that was unsuccessful so they placed a stent. The patient did well and had full neurologic recovery. She had to take clopidogrel subsequently but developed an allergy. She then had to start a IIb/IIIa inhibitor. What do you do for delivery?

- The OB/GYN, maternal fetal medicine, anesthesia, and neurology services all worked together to develop a plan. They used a short-acting blood thinner at the time of delivery. Although you are focused on the patient at the time of treatment, you need to consider the future course as well.

CASE

A patient who is 6 months pregnant presents with non-dominant hand clumsiness. CT and CTA are negative. Everyone decides not to proceed with tPA after an assessment of risks and benefits. How is the patient treated?

- **Full dose aspirin is contraindicated in pregnancy but 81 mg of aspirin is often used.** 81 mg is often used as prevention in patients who are at high risk for preeclampsia.
- **Anticoagulation.** Outside of pregnancy, anticoagulation is usually only used as secondary stroke prevention in patients with atrial fibrillation, mechanical valves or venous stroke. Anticoagulation is used for both arterial and venous thromboembolic disease in pregnancy. Dr. Roth and her neurology colleagues are more likely to anticoagulate a pregnant patient, but most patients are given baby aspirin for secondary stroke prevention, and this is what is supported by most practice guidelines.

Related Material

EM:RAP 2015 January: The LIN Session: tPA in Pregnancy

No Spleen, Big Problems

Anand Swaminathan, MD and Isaac Bogoch, MD

Take Home Points

- **Asplenic patients are at higher risk of bacterial infections with encapsulated organisms.**
- **Ask about vaccination status in asplenic patients.**
- **Have a low threshold to admit febrile asplenic patients and make sure they have very close follow-up if discharged.**

- **In the March 2018 introduction, we discussed a patient who was diagnosed with pneumonia and discharged home on appropriate antibiotics.** The patient returned a day later and was much sicker. The patient had a history of surgical splenectomy.
- **Asplenic patients are at a higher risk of certain bacterial infections such as encapsulated organisms like *Pneumococcus*, *Meningococcus* and *Hemophilus influenzae* type B. Thus they can decompensate quickly.** This is because the spleen contains macrophages which remove bacteria.
- **Recommendations for vaccinations differ for asplenic patients.** Patients should receive the 13-valent conjugated pneumococcal vaccine followed by the 23-valent polysaccharide pneumococcal vaccine approximately 8 weeks later. Patients

should receive the quadrivalent meningococcal vaccine covering strains A, C, W and Y. They should also receive the meningococcal serogroup B vaccine, as well as the Hemophilus influenzae type B vaccine.

  - **How often do asplenic patients need to update their vaccines?** They should receive the 23-valent polysaccharide vaccine and the quadrivalent vaccine for meningococcus every 5 years. There may be some variation in these recommendations depending on the country.
  - **Ask the patient if they have had the appropriate vaccinations within the last 5 years.**

- **Prophylactic antibiotics.** There is a wide range of practice regarding prophylactic antibiotics. It depends on risk to the individual for infection, practice patterns, and comfort level of the practitioner. Some patients may have a pill-in-pocket approach with recommendations to take the antibiotic if they have a fever or feel unwell.
- **The patient in the case was non-toxic and febrile with a right lower lobe infiltrate. They were discharged on levofloxacin.** The patient decompensated rapidly and returned with severe sepsis. What was missed?
  - They had the right diagnosis, the right antibiotic was given, and the right tests were performed. The case just highlights the significance of asplenia. Even if the patient appears fine, they have the ability to deteriorate rapidly.
- Rubin, Lorry et al. **Clinical practice. Care of the asplenic patient.** N Engl J Med. 2014 Jul 24;371(4):349-56.
  - The article recommended obtaining cultures and starting broad-spectrum antibiotics. This recommendation generated a lot of listener feedback. Have a low threshold to admit these patients. Respect asplenia.
- **What should you do if you cannot find a source?** You will still get cultures and start broad-spectrum antibiotics and keep them until there is a clear indication that they aren't deteriorating.
- **We see patients with surgical splenectomy such as after trauma. Patients with sickle cell disease may have auto-splenectomy. Does the management of these patients differ?** No. They still have the same risk of developing severe infection due to encapsulated organisms.
- **Education of asplenic patients is important.** Remind them that the need for vaccination is lifelong and find out when their last vaccinations were. They should have a medic-alert bracelet or card in their wallet in case of emergency.

Related Material

EM:RAP 2018 April: Pediatric Pearls: Sickle Cell in Kids: An Update

EM:RAP 2016 November: Paper Chase 3: Respecting the Spleen

Rick's Rants: Crisis Standards of Care

Rick Bukata, MD

Take Home Points

- **An overwhelmed healthcare system may lead to rationing care and crisis standards of care.**
- **We need an evidence-based and consistent federal and state-based approach to future pandemics.**

- **An article entitled "Arizona's plan to ration care was avoidable" was published in the July 1 issue of the Los Angeles Times.** Wasn't flattening the curve supposed to eliminate rationing of care? It appeared that flattening the curve only delayed the inevitable. The majority of the citizenry has determined that we have been on lockdown long enough despite cases of COVID skyrocketing. Lines stretch around the block for Disneyland, restaurants are packed in some areas, and cars are filling the streets.
- **In July, hospitals were close to maximum capacity and numbers continue increasing.**
- **The article reported that the state of Arizona had activated a rule book for rationing care.** It indicated that hospitals could deny critical healthcare resources such as ventilators to patients based on medical judgment about likelihood of survival. Under the rules, doctors making triage decisions that deprive patients of necessary care will be immune from legal liability.
- **Crisis standards of care are not isolated to Arizona.** Many states allowed premature opening of bars and restaurants or half-heartedly supported mask wearing. This is a respiratory virus. Aren't masks reasonable? What is the big deal about wearing a mask when in proximity to others in public?
- **The push to re-open the economy prevailed and resulted in a flare of new viral cases.** Bukata's SOFA score isn't likely to be great by the time he hits the ED. The richest country on the planet that spends the most on healthcare is at a point where we can't care for some patients. Most likely, it will be the oldest, most vulnerable patients.
- **What about the frontline workers?** Being in the ED day after day, shuffling around in stifling masks and clothing. It wears you down. How did this happen?
- **This crisis called for enlightened leadership and plenty of resources.** Instead, state governors are calling the shots on closures. Some were assiduous and cautious in mandates, others were clueless. Some had strict stay-at-home orders and others opened non-essential businesses. Our response was inconsistent and often half-hearted.

- **This could have been done a lot better.** We can't ever let this happen again. Hopefully this will lead the American people to demand a consistent and evidence-based federal and state response to future pandemics.

Pediatric Pearls: PALS 2019

Ilene Claudius, MD and Sol Behar, MD

Take Home Points

- **Bag-valve-mask ventilation is reasonable compared to endotracheal intubation or supraglottic airway for out-of-hospital pediatric cardiac arrest.**
- **ECMO-assisted CPR should be considered for in-hospital cardiac arrest in pediatric patients with known cardiac conditions.**
- **Targeted temperature management in pediatric patients who are comatose after cardiac arrest did not have benefit over normothermia.**

- **In 2019, the American Heart Association upheld most of their recommendations regarding PALS but made a few updates.** They focused on three areas: pediatric advanced airway management during cardiac arrest, ECMO during pediatric CPR, and pediatric targeted temperature management during post-arrest care.
- **Advanced airway.** Most arrests in pediatric patients are caused by respiratory compromise. These recommendations apply only to out-of-hospital management of pediatric cardiac arrest. They advise that bag-valve-mask ventilation is reasonable compared to advanced airway interventions including endotracheal intubation and supraglottic airways. They discussed trials showing that supraglottic airways were relatively equivalent to endotracheal intubation and bag-valve-mask ventilation. Intubation may be inferior to bag-valve-mask ventilation in the out-of-hospital setting. The studies were conducted in areas with very short transport times and it is unclear if it applies when transport times are longer. **Bag-valve-mask ventilation is an acceptable alternative.**
    - These recommendations were geared towards the out-of-hospital arrest, but there is some relevance to the emergency department. These three modalities are relatively equivalent. If you are single coverage and a 15-day-old newborn arrives in cardiac arrest, you can hold off on intubation for a bit and have your respiratory therapist bag the baby while you start resuscitation.
- **Can you use ECMO with CPR in pediatric patients with known cardiac diagnosis and in-hospital cardiac arrest events?** You should consider ECMO CPR in children with cardiac diagnosis who arrest in the hospital. There is no literature on out-of-hospital cardiac arrest. This recommendation is less relevant to us in the emergency department. However, if you have a child with myocarditis or cardiac disease who arrests in front of you and you have access to ECMO, you can consider it.
    - The rates of survival to hospital discharge in pediatric patients with in-hospital cardiac arrest and conventional CPR are between 29-44%. ECMO-assisted CPR can increase the rates to 48%. For specific patients with surgical cardiac disease, some studies have shown rates as high as 73%.
    - Only about 30% of patients who receive ECMO-assisted CPR have a good neurologic outcome at 12 months.
- **Targeted temperature management.** If you are trying to control the temperature, you should continuously monitor it. There have been two large studies looking at targeted temperature management between 32-34 degrees. One study examined in-hospital arrest and the other evaluated out-of-hospital arrest. One study was terminated due to futility and was unable to find a discernible difference between targeted temperature management and forced normothermia.
- **There are no significant changes to BLS.** Bystanders should initiate CPR for out-of-hospital cardiac arrest.
- **If you are giving positive pressure ventilation to a neonate born in your department or immediately prior to transport, start the positive pressure ventilation with room air FiO_2 21%, if full term.** If the neonate is premature, start with a FiO_2 of 21-30%.

Related Material

CorePendium: Pediatric Resuscitation Chapter

EM:RAP 2019 December: The ILCOR Files: Oxygen for Neonates and Presyncope

EM:RAP 2017 March: Paper Chase 1: Hypothermia Post Peds Arrest

EMA 2015 September: Abstract 3: Therapeutic Hypothermia After Out-of-hospital Cardiac Arrest In Children

EM:RAP
Emergency Medicine: Reviews and Perspectives

Trauma Surgeons Gone Wild: Necrotizing Soft Tissue Infections

Kenji Inaba, MD; Stuart Swadron, MD; Brit Long, MD; and Mike Gottlieb, MD

Take Home Points

- **Necrotizing fasciitis may be difficult to diagnose early in the presentation.**
- **Although a negative LRINEC score is reassuring for ruling out necrotizing fasciitis, it may miss some cases and has not been as sensitive upon validation.**
- **The most common presenting complaints for necrotizing infections are pain, edema, and erythema.**
- **Plain x-rays are not sensitive for evaluating necrotizing fasciitis.**
- **Ultrasound may be an option for assessing necrotizing fasciitis.**

CASE

A patient presented for possible necrotizing fasciitis. These cases can be a very difficult diagnostic challenge. The patient was a middle-aged person who had sustained a scratch to the leg from a table while doing some work at home. The patient was otherwise healthy. No history of diabetes or immunocompromise. Over the next 10-12 hours, the injury worsened with pain and redness that was rapidly spreading.

- **The patient was slightly tachycardic but the vital signs were fairly unremarkable.** The surgery team was consulted to rule out a necrotizing soft tissue infection. The ED doctor was concerned about the amount of pain the patient was experiencing. The appearance was fairly unimpressive but the patient had a significant amount of pain with palpation.
- **What is the difference between necrotizing soft tissue infections and necrotizing fasciitis?** Necrotizing soft tissue infections is a broad term for severe infections with necrosis. Necrotizing fasciitis is a subtype of necrotizing soft tissue infections and involves infection and necrosis of the fascial and subcutaneous layers which may extend to the muscle.
- **How reliable is the history and physical exam in the diagnosis of necrotizing fasciitis?**
  - This can be a difficult diagnosis to make early on. The classic features of crepitus, fluctuance, dark and necrotic bullae, and decreased sensation are late findings.
  - Patients often present with pain but this is not very specific. The exam is often underwhelming in light of the pain they are describing. Not all patients will have significant pain. Patients with poorly controlled diabetes and vascular disease are at higher risk for necrotizing fasciitis but they often have neuropathy and may not have the same degree of pain as a normal patient.
  - **One study on proven fasciitis found that the most common complaints were swelling, pain, and erythema.** These were present in nearly 80% of patients. Pain outside of the area of erythema is worrisome. Erythema with indistinct borders. Bullae, overlying skin necrosis, and crepitus were found in less than 25% of cases. Fever was present in 40% and only 60% of patients were tachycardic. Hypotension is an uncommon finding but if present, it has a strong correlation with multiorgan failure and death.
- **The patient had a mild leukocytosis.** The sodium was a little low. The labs were otherwise unremarkable. The LRINEC score has not been well validated. Most of the factors like the sodium, white blood cell count, and CRP are probably useful. If they are all normal, it can help rule out necrotizing fasciitis. However, a high LRINEC score does not mean it is a necrotizing soft tissue infection that requires surgery versus a bad cellulitis.

Criteria	Value	Score
CRP	<150 mg/L	0
	>150 mg/L	+4
WBC	<15 per mm3	0
	15-25 per mm3	+1
	>25 per mm3	+2
Hemoglobin	>13.5 mg/dL	0
	11-13.5 g/dL	+1
	<11 g/dL	+2
Sodium	> 135 mEq/L	0
	<135 mEq/L	+2
Creatinine	< 1.6 mg/dL	0
	>1.6 mg/dL	+2
Glucose	<180 mg/dL	0
	>180 mg/dL	+1

- Wong, C et al. **The LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score: a tool for distinguishing necrotizing fasciitis from other soft tissue infections.** Crit Care Med. 2004 Jul;32(7):1535-41.
  - This was a retrospective observational study looking at 89 admitted patients diagnosed with necrotizing fasciitis compared to 225 control patients with cellulitis or abscess. A score > 6 was found to have sensitivity of 90% and specificity of 95% for the diagnosis.
  - There were major problems with the observational design and retrospective application of the score to the patient cohorts. Subsequent validation found much worse test characteristics.

- Fernando, S et al. Necrotizing soft tissue infection: diagnostic accuracy of physical examination, imaging and LRINEC score: a systematic review and meta-analysis. Ann Surg. 2019 Jan;269(1):58-65.
  - A 2018 meta-analysis found pooled sensitivity of 68% and specificity of 85% using a cut-off of 6.
  - There are case reports of patients with a LRINEC score of 0 having OR-confirmed necrotizing fasciitis. Used in isolation, the score misses too many cases. However, the individual components are markers of systemic derangement and might be helpful for risk-stratification. It might help support your clinical diagnosis.
- **Imaging.** Cross-sectional CT imaging is often obtained when ruling out necrotizing soft tissue infections. If the CT scan is completely normal, it can be helpful as it is unlikely that there is infection that requires surgery. If there is a lot of edema, it can be hard to definitively determine if the edema is consistent with cellulitis or necrotizing soft tissue infection. Severe edema, gas, thickening of the fascia with tracking of the fluid is consistent with necrotizing fasciitis.
  - There isn't great data evaluating whether IV contrast is needed.
  - **Necrotizing infection is a clinical diagnosis and imaging may not be needed.**
  - **Plain x-rays are poorly sensitive for the diagnosis as they require a gas-forming organism and sufficient gas to show up on the x-ray.** Only a subset of organisms are gas-forming. X-ray is only about 50% sensitive but 94% specific. If you see gas, it can help solidify your diagnosis but a negative x-ray should not change your plan.
  - **MRI with gadolinium is considered the gold standard imaging.** The sensitivity approaches 100%. This approach is not feasible in most EDs.
  - **There may be some utility to ultrasound.** It is more accurate than x-ray. It can be performed rapidly at the bedside while talking to the patient. It can be repeated. Many of the other imaging modalities are negative early in the disease course.
    - **STAFF mnemonic.** Subcutaneous thickening, air and fascial fluid. Subcutaneous thickening refers to a thickened and irregular fascia or cobblestoning and edema near the fascial layer. Compare the affected side with the contralateral side. The dual mode feature allows side by side comparison. Air involves shadowing. It can look like clouds scattered in the tissue. 1 mm of fluid at the fascial layer is 87% sensitive but 50% specific. The specificity increases to 98% when there is 5 mm or more fluid.

Related Material

EMA 2019 May: Abstract 19: Prospective validation of the LRINEC score for the extremities

C3 - Soft Tissue Infections

Cardiology Corner: Clinical Decision Instruments

Amal Mattu, MD and Anand Swaminathan, MD

Take Home Points

- **There are new clinical decision instruments for ACS such as T-MACS and EDACS.**
- **Both T-MACS and EDACS are less subjective and have good negative predictive values and sensitivities.**
- **Comparison of the decision instruments found that T-MACS and EDACS were more sensitive than the HEART score but all three are reasonable options.**

- **There are some new scores that have recently come out such as the Troponin-only Manchester Acute Coronary Syndromes (T-MACS) and Emergency Department Assessment of Chest pain (EDACS).**
- Than, M et al. **Development and validation of the Emergency Department Assessment of Chest pain Score and 2 h accelerated diagnostic protocol.** Emerg Med Australas. 2014 Feb;26(1):34-44.

Variable	Value	Score
Age	18-45	2
	46-50	4
	51-55	6
	56-60	8
	61-65	10
	66-70	12
	71-75	14
	76-80	16
	81-85	18
	>86	20
Sex	Female	0
	Male	6
Known coronary artery disease	No	0
or >3 risk factors	Yes	4
Diaphoresis	No	0
	Yes	3
Pain radiates to arm, shoulder,	No	0
neck or jaw	Yes	5
Pain occurred or worsened	No	0
with inspiration	Yes	-4
Pain is reproduced by palpation	No	0
	Yes	-6

Low risk cohort has EDACS<16, non-ischemic EKEG and 0-hr and 2-hr troponin negative.

- Body, R et al. **Troponin-only Manchester Acute Coronary Syndromes (T-MACS) decision aid: single biomarker re-derivation and external validation in three cohorts.** Emerg Med J. 2017 Jun;34(6):349-356.

$$\text{Probability of ACS (p)} = \frac{1}{1 + e^{-(1.713E + 0.847A + 0.607R + 1.417V + 2.085S + 1.208H + 0.089T - 4.766)}}$$

E: EKG ischemia	No	0
	Yes	1
A: Worsening or crescendo angina	No	0
	Yes	1
R: Pain radiation to the right arm or shoulder	No	0
	Yes	1
V: Pain associated with vomiting	No	0
	Yes	1
S: Sweating observed	No	0
	Yes	1
H: Hypotension	No	0
	Yes	1
T: hs-cTnT concentration on arrival	Hs-cTnT value on arrival	

- **Both of these scores are validated.** They have good negative predictive values and sensitivities (98-99%). If the HEART score is 3 or less, especially with two negative troponins, you can discharge the patient knowing the likelihood of an adverse outcome is less than 1%. The EDAC and T-MACS score are similar. They likely allow discharge of more patients than the HEART score.
- Body, R et al. **Comparison of four decision aids for the early diagnosis of acute coronary syndromes in the emergency department.** Emerg Med J. 2020 Jan;37(1):8-13.
  - Patients were enrolled from 18 different centers around the UK and the HEART, EDACS, T-MACS and TIMI scores were applied looking at which score was the best at predicting major adverse cardiac events at 30 days and sensitivity for ACS.
  - They enrolled 999 patients in the study. T-MACS had a 99.2% sensitivity and was able to risk-stratify 46.5% of patients to the extremely low risk group. EDACS had 96% sensitivity with 48% of patients designated low risk. Both scores outperformed the HEART score. The HEART score had 96% sensitivity but only 35% were low risk.
  - Is there bias? This study was done in 18 different centers in the UK. There needs to be external validation.
  - The HEART score often utilizes two troponins. In this study, they only used one troponin on arrival. If they had done the HEART pathway, the HEART score may have performed better.
- **The T-MACS and EDACS scores are good.** Any of these 3 scores are reasonable. The questions in T-MACS and EDACS scores are less subjective.

Related Material

EM:RAP 2018 January: Origin of the HEART Score

Status Epilepticus

Justin Morgenstern, MD

Take Home Points

- **In trials of status epilepticus, the second-line agent failed half the time.**
- **After 15 minutes of seizure, the risk of adverse outcome increases.**
- **Current algorithms for status epilepticus allow too much time to elapse. Be aggressive in trying to control the seizure early.**
- **Anesthetic agents such as phenobarbital and propofol may be helpful in the management of status.**

- **Patients in status epilepticus have high mortality and bad neurologic outcomes.** We do not do a good job managing patients in status epilepticus. The current status epilepticus algorithms take too long and fail too often.
- **There were three large trials published last year.**
  - Dalziel, S et al. **Levitiracetam versus phenytoin for second-line treatment of convulsive status epilepticus in children (ConSEPT): an open-label, multicentre, randomised controlled trial.** Lancet. 2019 May 25;393(10186):2135-2145.
  - Lyttle, M et al. **Levetiracetam versus phenytoin for second-line treatment of paediatric convulsive status epilepticus (EcLiPSE): a multicentre, open-label, randomised trial.** Lancet. 2019 May 25;393(10186):2125-2134.
  - Kapur, J et al. **Randomized trial of three anticonvulsant medications for status epilepticus.** N Engl J Med. 2019. Nov 28;381(22)2103:2113.
- **These three trials showed that it does not matter what second-line agent you use.** However, these trials also showed something much more important. **In all of these trials, the second-line agent failed about half the time.** Even when it worked, it took a long time. Many of these patients were still seizing 45 minutes to an hour after arrival. This is a big problem. The longer a seizure lasts, the risk of bad neurologic outcome and death increases.
- **Prolonged seizures cause physiological problems like rhabdomyolysis, hypoglycemia, metabolic acidosis and airway issues.** Most people can hold their breath for two minutes but

by twenty minutes, you are facing decreased oxygenation, ventilation issues, and increased risk of aspiration. Between 15-20 minutes, you begin to see significant cerebral hypoperfusion, ischemia and hypoglycemia. Excitotoxicity may occur. Once a neuron seizes for 20 minutes, it may begin apoptosis. After about 20 minutes of seizing, the GABA receptors start disappearing from the surface of neurons. This is a problem because most of our seizure medications work through the GABA receptors. If you haven't stopped a seizure by 15-20 minutes, it will be much harder to get it stopped.

- **We need to be much more aggressive in the way we manage status epilepticus. We need to get the seizure stopped by 20 minutes at the latest.** There are three things we need to do.

  1. **We need to use the right dose of benzodiazepine.** The first-line treatment is benzodiazepines. It does not matter what you use but you need to use the right dose. The intravenous or intraosseous dose of midazolam or lorazepam is 0.1 mg/kg. This is the dose used in the classic Veterans Affairs study. This means doses of 8 mg IV lorazepam or 10 mg IV midazolam for some adults.

     - Treiman, D et al. **A comparison of four treatments for generalized convulsive status epilepticus. Veterans Affairs Status Epilepticus Cooperative Study Group.** N Engl J Med. 1998 Sep 17;339(12):792-8.

- **Patients in status are often treated with much lower doses of benzodiazepines.** These are critically ill patients. Give them the dose that they need.

- **We worry about high doses of benzodiazepines and the risk of respiratory depression.** These are critically ill patients. Intubating these patients is part of good critical care. You are probably less likely to have an airway issue if you break the seizure. The seizure itself causes airway and ventilation issues. When benzodiazepines were compared to placebo, the intubation rate was higher in the placebo group.

  2. Give your second line agent earlier. It does not matter what agent you use. Even if your benzodiazepines work, you are still going to load a patient with status epilepticus with the second line agent.

     - Currently we wait five minutes, give a first dose of benzodiazepine, wait another 5 minutes, give a second dose of benzodiazepine, wait 5 minutes and then give the second line agent. The patient doesn't receive the second line agent until 15 minutes (at best) into the seizure.

     - At five minutes, you know the patient is in status epilepticus. Give the second-line agent. There is no point in delaying.

     - This still may not be good enough for our goal of seizure cessation by 20 minutes.

  3. We need to use anesthetic agents early to break the seizures. When the patient is still seizing after two doses of midazolam, Morgenstern gives them propofol. There isn't a randomized controlled trial specifically looking at propofol.

     - There is a study looking at pediatric status in resource-limited settings in South Africa. This was a pediatric study looking at children between the ages of 1 month to 15 years in status epilepticus not responsive to benzodiazepines. The patient population was different than the US; 3% of the children had HIV and 2% had tuberculosis meningitis.

       - Burman, R et al. **A comparison of parenteral phenobarbital vs. parenteral phenytoin as second-line management for pediatric convulsive status epilepticus in a resource-limited setting.** Front Neurol. 2019 May 15;10:506.

       - Children were randomized to one of two different algorithms. In algorithm #1, children were given two doses of benzodiazepines followed by phenytoin at 20 mg/kg followed by a midazolam infusion if seizure continue. In algorithm #2, they gave 2 doses of benzodiazepines followed by phenobarbital 20 mg/kg. If the first dose of phenobarbital didn't work, you could give two additional doses of phenobarbital of 10 mg/kg.

       - **The primary outcome was number of patients with cessation of seizure after a single dose of the second-line agent.** Phenobarbital was much better than phenytoin. They found 86% success with phenobarbital compared 46% with phenytoin. This was a number need to treat of 2.5.

       - In all other trials, we have been able to stop seizures with a second line agent only about half of the time. In this trial, a single dose of phenobarbital was able to stop almost 90% of seizures. There were 5 children who were still seizing after the single dose of phenobarbital and a second dose of phenobarbital stopped the seizure in 4 out of the 5.

       - The median time until seizure cessation was 10 minutes with phenobarbital and 28 minutes with phenytoin.

       - What are the downsides? We should not be scared about intubation if it leads to better outcomes. Approximately 56% of children in the phenobarbital group had respiratory depression. However, 70% of children in the phenytoin group had respiratory depression. Stopping the seizure can fix your airway issue.

     - **Why does Morgenstern suggest propofol over phenobarbital when the evidence supports phenobarbital?** None of the EDs where he works stock phenobarbital. It is located in the central pharmacy and takes too long to get. We use propofol frequently. We know where it is stocked and are familiar with its use. Morgenstern doesn't believe the findings of the phenobarbital study are specific to phenobarbital but can be extrapolated to anesthetics. A randomized controlled trial is

needed. If you have phenobarbital and are comfortable with its use, it does have the best available evidence.

- **What do you need to do after you give propofol?** In the Burman study, only 50% of the patients had respiratory depression. One option is to push the drug and watch the patient. If you break the seizure, maybe there is a chance you don't need to intubate. These are really sick patients who have received big doses of midazolam and propofol so for now Morgenstern intubates these patients. This is a group of patients with mortality as high as 20% and intubation is reasonable.
- **This approach is already in the status guidelines.**
  - Glauser, T et al. **Evidence-based guideline: treatment of convulsive status epilepticus in children and adults: report of the Guideline Committee of the American Epilepsy Society.** Epilepsy Curr. Jan-Feb 2016;16(1):48-61.
  - They suggest the classic algorithm which is too slow. At 40 minutes, you can try propofol or phenobarbital. However, in the guidelines they say depending on the etiology or severity of the seizures, patients may go through the phases faster or skip the second phase to go to the third phase.

Related Material

EMA 2019 October: Abstract 14: ConSEPT: Levetiracetam vs Phenytoin In Status Epilepticus

EMA 2019 September: Abstract 8: Levetiracetam Vs Phenytoin for Status Treatment in Kids (EcLiPSE)

EM:RAP 2019 July: Pediatric Status Epilepticus

October Mailbag

Anand Swaminathan, MD and Jan Shoenberger, MD

Take Home Points

- **Bladder lavage with tranexamic acid may be an option in hematuria.**
- **Ocular HSV may be difficult to diagnose in neonates in the absence of vesicles.**
- **Ingested maternal breast milk may be a cause of hematochezia in neonates.**

- **Roy K writes in regarding a patient who presented to his outlying ED.**
- The patient had a history of end-stage prostate cancer and self-catheterization. He presented with frank hematuria. He was unable to empty his bladder or perform self-catheterization. There was 1000cc of retained urine. They began copious lavage with bright red blood and clots but they were not able to clear the bleeding.
  - They placed 1000mg of TXA in 10cc of saline into 1000cc of saline. They began lavaging with this solution and the urine cleared. They were able to avoid transferring the patient and discharged him home to follow-up with his urologist.
  - **This is an interesting idea.** Rick Pescatore, DO will have an upcoming segment on other uses of TXA.

- **From Mary regarding the normal newborn piece by Zach Drapkin MD.**

  "Are there any clinical pearls for diagnosing herpes simplex conjunctivitis from other pathologies? Obviously if the patient has vesicles it is indicative of herpes simplex. Does it always present this way early on?"

  - Ocular HSV can be challenging to diagnose in neonates. Older patients may present with decreased visual acuity and intense photophobia. This can be difficult to assess in newborns. Things that should raise your level of concern are vesicular lesions on the mother or the baby and a history of fever, hypothermia, ill appearance or abnormal liver function tests in the baby. The presence of dendrites on fluorescein staining is concerning.
  - For neonatal conjunctivitis, you can get bacterial cultures or viral studies which can help with long-term management.

- **"What work up is necessary for isolated hematochezia if the baby is otherwise asymptomatic".**

  - You need to figure out how much blood is coming out. Is it streaks of blood? Is it pure blood? Is it melena? How often?
  - If it is a lot of blood, Drapkin considers admission to the hospital even if everything else is normal.
  - If the baby is well-appearing with normal vital signs, growth and normal physical exam, Drapkin asks if the patient received their vitamin K shot, obtains an abdominal x-ray to look for signs of necrotizing enterocolitis and considers a CBC to look for coagulopathy or anemia.
  - Check for swallowed maternal blood in breastfed infants. You can do this by doing a maternal breast exam or ask the mother to pump breast milk in the ED to see if there is visible blood.
  - Observe the child feeding and have them follow-up promptly with the pediatrician if discharged.
  - Consider milk protein allergy. You can consider switching to a soy-based formula from the emergency department but the patient needs to be followed by the pediatrician as they may need more specialized formula. In breast fed infants, you can advise elimination of maternal dairy products.
  - If the baby is ill-appearing, it warrants a much more aggressive work-up.

NOTES