The Trauma Professional's Blog

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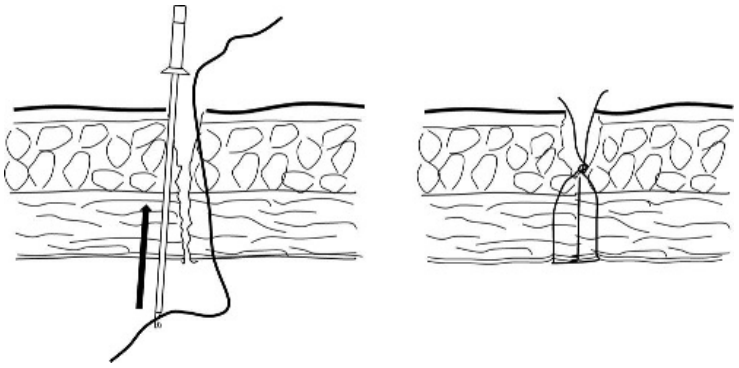
Emphasis: Abdomen | Subscribe: www.TraumaMedEd.com | June 2014

How To Close A Full-Thickness Stab To The Abdomen With A Laparoscope

The algorithm for evaluating a stab to the anterior abdomen includes a number of different techniques for evaluation. In some cases where the chance of entry into the abdomen is thought to be low probability, endoscopic exploration can be used. What if a full thickness stab is detected, but the surgeon is able confirm that no abdominal injuries are present? Should the stab defect be closed?

There is no good data that tells us the incidence of ventral hernia from stab wounds. We do know that 10mm endoscopic port sites and larger can be the source of a ventral hernia and possible bowel obstruction after laparoscopic surgery, so it stands to reason (but be careful) that the same thing could happen with larger stabs. So why not close them?

A number of commercial devices have been developed for port site closure during endoscopic surgery (Carter Thomason Closure System, Cooper Surgical; Endo Close, Covidien). A group in Tokyo published a description of the technique using the Carter device to close the fascial defect of a self-inflicted stab wound.



Bottom line: This is an interesting use for a device used for closing more controlled stab wounds (surgical port sites) in less controlled circumstances. It seems fair to extrapolate our current experience from laparoscopic surgery to trauma in this case. I would be very interested to hear from anyone who is currently using this technique.

Reference: A quick and easy closure technique for abdominal stab wound after diagnostic laparoscopy. J Trauma 72(5):1448-1449, 2012.

Trauma Calendar of Events

American Association for the Surgery of Trauma
Location: Philadelphia, Pennsylvania
Date: September 10-13, 2014

Orthopedic Trauma Association
Location: Tampa, Florida
Date: October 15-18, 2014

Inside This Issue

FAST Is Fast, And FAST Is Last!

Ever been in a trauma activation where it seems like the first thing that happens is that someone steps up to the patient with the ultrasound probe in hand? And then it takes 5 minutes of pushing and prodding to get the exam done?

Well, it's not necessarily supposed to be that way. The whole point of adhering to the usual ATLS protocol is to ensure that the patient stays alive through and well after your exam. And FAST is not part of the primary or secondary surveys, it is an adjunct.

As always, there are a few exceptions to the rule above.

- If an **unstable patient** arrives without an obvious source of bleeding, FAST of the abdomen should be able to detect if a large hemoperitoneum is present. This will expedite the patient's transfer to the OR.
- A patient in **cardiac arrest** may benefit from a quick FAST to determine if cardiac activity is present. If not, it may be time to terminate resuscitation.

Many people say that FAST and physical exam can and should happen simultaneously.

In principle, I agree. The goal is to get all information critical to keeping your patient alive as quickly as possible. In some cases, knowing if there is a significant amount of fluid in the abdomen can be very important. Most trauma resuscitation schemes at trauma centers make use of multiple personnel so that various portions of the patient evaluation can be carried out simultaneously.

But there is also a tradeoff between speed, trauma team size and number of trainees. Centers with fewer or no trainees will have a leaner team with experienced examiners and more room around the patient. At our hospital, we have 8 people clustered immediately around the patient, with half of them being surgery or emergency medicine residents. This means it is more difficult for a physician to step in and do a FAST exam easily. So typically, this physician is the same resident doing the torso portion of the physical exam. This is the main reason for my exhortation to wait until the end of the physical exam and do the FAST quickly.

Bottom line: With the exceptions noted above, always complete the ATLS primary and secondary surveys first. Then pull out the ultrasound machine, but be quick about it. And if it takes more than about 60 seconds to do the exam, then someone probably needs a little more practice. On a different patient!

The FAST Exam In Children

FAST is a helpful adjunct to the initial evaluation of adult trauma patients. Unfortunately, due to small numbers the usefulness is not as clear in children. In part, this is due to the fact that **many children (particularly small children < 10 years old) have a small amount of fluid in the abdomen at baseline**. This makes interpreting a FAST exam after trauma more difficult.

Despite this, use of FAST in children is widespread. A survey of 124 US trauma hospitals in 2007 showed an interesting pattern of ultrasound usage. In adult-only institutions 96% use FAST, and at hospitals that see both adults and kids, 85% use it. Most of these centers that use FAST have no lower age limit, and the physician most commonly performing the exam was a surgeon. **However, only 15% of children's hospitals do FAST exams, and they were usually done by nonsurgeons!** The reasons for this are not clear. It appears that the pediatric surgeons have not embraced this technology as much as their adult counterparts.

What about that confusing bit of fluid found in kids? Several groups have looked at this (retrospectively). Fluid in the pelvis alone appears to be okay, but fluid anywhere else is a good predictor of solid organ injury. Fluid seen outside the pelvis had a 90% sensitivity and 97% specificity for injury, and positive and negative predictive values were 87% and 97% respectively.

Bottom line: FAST exam is useful in pediatric victims of blunt abdominal trauma. Fluid in the pelvis alone is normal in most children, but fluid seen anywhere else indicates a high probability of solid organ injury.

References:

- *Use of focused abdominal sonography for trauma at pediatric and adult trauma centers: a survey. J Pediatric Surgery 44:1746-1749, 2009.*

- *Minimal pelvic fluid in blunt abdominal trauma in children: the significance of this sonographic finding. J Pediatric Surgery 36(9):1387-1389, 2001.*
- *Clinical importance of ultrasonographic pelvic fluid in pediatric patients with blunt abdominal trauma. Ulus Travma Acil Cerrahi Derg 16(2):155-159, 2010.*

DPL: A Dying Art?

Diagnostic peritoneal lavage (DPL) was invented by David Root at my hospital (Ancker Hospital, which then became St. Paul Ramsey, now Regions Hospital) in the 1960's. It enjoyed its heyday during the 70's and 80's, when it was done hundreds of times per year at most major trauma hospitals. **Now, we do it about 5 times per year. What happened?**

As you know, DPL is a *qualitative* test. It gives a yes/no answer to the question "does this patient need an operation?" based on red and white blood cell counts. During the mid-1980s, CT scanning was introduced, which provides much more *quantitative* information about injuries in the abdominal cavity. The improved ability to diagnose abdominal injury, especially solid organ injury, has led to the demise of DPL.

Most solid organ injury results in some free blood in the peritoneal cavity. It doesn't take much blood (**10 cc of whole blood mixed with 1 liter of infused crystalloid**) to exceed the threshold of 100,000 RBC per ml of aspirate that will send the surgeon off to the OR. Therefore, pretty much any liver or spleen laceration would have to be taken to the OR based on a DPL.

But we know that very few liver/spleen injuries actually need an operation. So DPL cannot be used, or the negative laparotomy rate for blunt trauma would escalate. The other downside to DPL is that it's not possible to get all of the infused crystalloid back out of the abdomen. This leads to a confusing amount of free fluid seen on any CT scan done after a DPL.

So DPL is now down but not out. Some practical pointers:

- **DPL should be used primarily as a backup to an equivocal or unbelievable FAST exam in an unstable patient.** An example would be a patient who is hypotensive, has a negative FAST and no other obvious bleeding sources.
- **Remember to insert a gastric tube and urinary catheter so the stomach and bladder are decompressed before the procedure.** The easiest way to remember this is to tape these catheters to the DPL procedure tray.
- **A DPL is actually 2 procedures: peritoneal tap and lavage.** Once the catheter is in, it should be aspirated. If 10cc of gross blood is returned, the test is positive and the patient needs to go immediately to OR.
- **For blunt trauma, the threshold for RBC per µl is 100,000.** The threshold for WBC is 500 per µl. If particulate material or weird colors are seen (stool or bile), the test is also considered positive. Send the sample for cell counts only. Don't send for any other assays (e.g. amylase).
- **For penetrating trauma, the thresholds have never been well defined.** A number around 25,000 RBC per µl probably provides the best balance between sensitivity and negative laparotomy rate.

Reference: Diagnostic peritoneal lavage. HD Root, CW Hauser, CR McKinley, JW LaFave, RP Mendiola Jr. Surgery 57(5):633-637, 1965.

Less Morbidity From Negative Trauma Laparotomies? Really?

Trauma surgeons generally dread the negative laparotomy for trauma. Previous work has shown that complications occur in anywhere from 22% to 53% of cases. Those studies were usually retrospective and included patients with penetrating trauma, which may have skewed the results.

A not-so-good study tried to throw this common wisdom in doubt. It was a retrospective review of a prospectively maintained database of trauma admissions after blunt trauma. Patients were separated into groups who underwent immediate, delayed or no laparotomy, as well as whether they had or did not have associated injuries. Complications

were tracked using an accurate and validated tracking system. The complications tracked included death, DVT, PE, infections, pulmonary issues, as well as other organ system problems.

The authors found that a negative laparotomy did not increase the complication rate, but that a delayed laparotomy did. They also noted that a Complication Impact Score (that they made up) was higher in the delay to laparotomy patients. So **they believe that when clinical and imaging findings are equivocal, doing an operation to establish a diagnosis is justifiable.**

Bottom Line: This study does <u>not</u> look at really delayed complications like small bowel obstruction, which we see with some regularity in old trauma patients. Also, other studies have also shown that brief observation, even in patients with a bowel injury, does not increase complications significantly. ***Unless the potential injury that you are observing is known to have significant complications, my practice is to observe equivocal cases in order to avoid more complications down the road.***

Reference: "Never be wrong": the morbidity of negative and delayed laparotomies after blunt trauma. J Trauma 69(6): 1386-1392, 2010.

Performance Improvement For The FAST Exam

FAST is an integral component of major trauma evaluation. **Unfortunately, although lots of people do them, quality control is not very consistent.**

Researchers at the University of Pennsylvania studied how the use of a standard checklist and it's impact on exam quality. Detection of fluid in any of the standard 4 FAST locations was recorded for every exam performed No attempts were made to grade the amount of fluid seen. The exam was recorded in video format.

Reviewers credentialed in FAST later reviewed the study videos in a blinded fashion using a checklist. They were also not aware of any CT or OR findings. The checklist contained grading for quality (poor, fair, good), result (positive, negative, unclear), and initial interpretation (positive, negative) for each of the 4 areas scanned. The study was also graded for its educational value.

Here are the factoids:

- A total of 247 studies were reviewed. All study results were compared with CT (240) or OR (7) results.
- There 235 true negatives, 6 true positives, 4 false positives and 2 false negatives.
- Sensitivity was 75%, specificity was 98%, and accuracy was 98%.
- Overall, 9% of exams were of good quality, 65% were fair, and 26% were poor.
- Despite this lack of good quality exams, sensitivity, specificity and accuracy adhered to the usual literature standards. The overall quality in both true and false exams were similar.

Bottom line: This study reveals that we are doing an "okay" job with FAST exams in trauma patients. However, it also shows that there is room for improvement, and that FAST evaluation should be a part of the Performance Improvement program of any trauma centers that use FAST.

Reference: Performance Improvement for FAST Exam. University of Pennsylvania. Presented at the Eastern Association for the Surgery of Trauma meeting, Poster #24, January 2010.

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