The Trauma Professional's Blog

Trauma MedEd

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Retained Foreign Objects After Penetrating Injury

A Chinese man was in the news after having a four inch knife blade removed from his head after four years. What is the best way to deal with a problem like this?

First, get in the habit of imaging any body part with a penetrating injury. Retained objects can be as simple as gravel or as complicated as the knife blade above. And remember, some patients who have been stabbed present with a simple laceration but don't want to tell you how they got it. Image before you close it!

Next, don't remove it. This is common knowledge, but innocent looking objects (pencils, nails) can penetrate arteries and keep them from bleeding while embedded. Unpleasant and sometimes fatal bleeding can ensue if pulled out.

If you do not have specialists versed in the body regions involved in the injury, transfer immediately with the object secured in place. For objects penetrating minimally complex areas like the extremities, surgeons may opt to carefully remove it in the emergency department, or may elect to do so in the operating room.

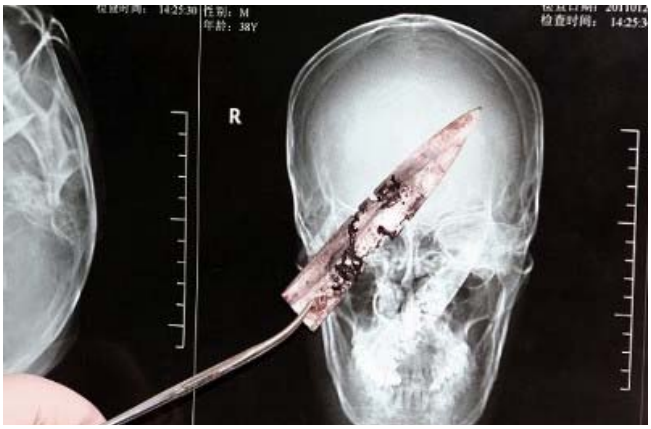
Inside This Issue

Trauma Calendar of Events

Rio Grande Trauma Conference and Pediatric Update
Location: El Paso, Texas
Date: December 4-5, 2014

Eastern Association For The Surgery Of Trauma
Location: Lake Buena Vista, Florida – Disney Comtemporary Resort
Date: January 13-17, 2015

Injuries to complex areas should undergo high resolution CT scanning so that 3D reconstruction can be performed if needed. The surgical specialists can then plan the operative approach. This is dictated by the anatomy of the area(s) involved and the architecture of the object (think about hooks and barbs). For objects located near critical areas, an operative exposure must be selected that provides access to all portions of it, and allows for rapid vascular control if needed.

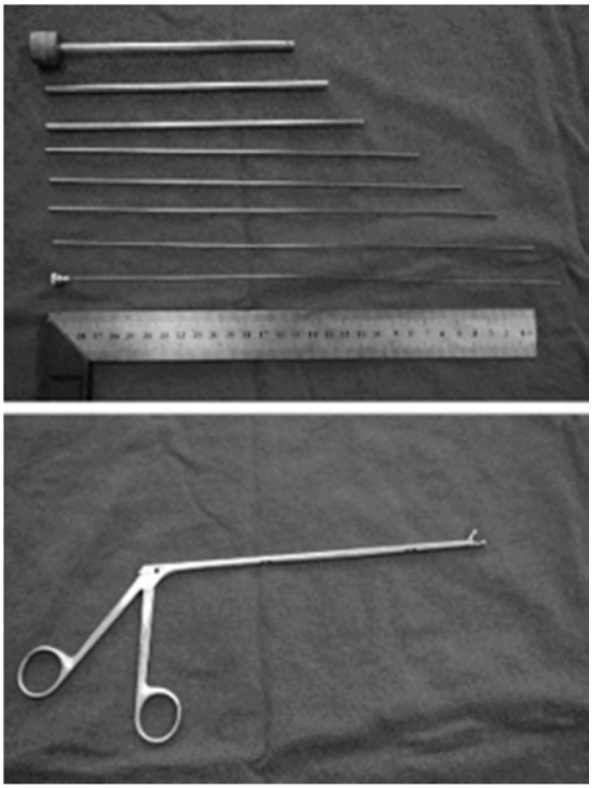


This patient had a knife blade break off after he had been stabbed under the chin. It remained partly within the nasopharynx and the tip came to rest behind his left eye. His symptoms included headaches, stuffy nose and bad breath. The picture above shows the badly corroded blade in front of some of his radiographic images.

A Cool Way To Remove Embedded Foreign Bodies

Unfortunately, many of us have had the experience of digging into bloody tissue for long periods of time trying to locate the object, even with fluoroscopy. Well, there's a better way of doing this.

A group in China described a technique using a fancy form of needle localization. They employed a set of instruments normally used for lumbar diskectomy (see photo). This set includes a long 18 Ga needle with a removable hub, several dilators and an outer cannula with a 5.8mm diameter. A pair of 3.8mm grasping forceps is also used.



The foreign body is located using a C-arm fluoroscopy unit and the best approach is planned. The 18 Ga needle is then inserted using fluoro until it touches the object. The hub is removed and dilators are inserted over the needle, one after the other. The outer cannula is then placed over them, and the needle and dilators are then removed. The cannula is manipulated until the foreign body (or a part of it) is located within the cannula. It is then grasped and removed, along with the cannula if needed. If the object is too large to enter the cannula, the cannula is pulled back slightly and the grasper introduced past the end of it to grip and remove the foreign body.

The writers shared the details of 76 patients who had a total of 251 foreign bodies removed over a 6 year period. The depth varied from 2.5 to 8.5cm. Procedure time ranged from 8 to 15 minutes, and fluoro exposure varied from 1 to 4 minutes. Success rate was 100% (all foreign bodies were removed) and there were no complications.

Bottom line: This is a very slick technique that promises to dramatically increase the success rate and decrease complications from removing foreign bodies. The amount of time spent is much less than the brute force technique, as is the amount of soft tissue trauma. Large objects that cannot be grasped with these forceps cannot be removed with this method. Although I am a little concerned that the authors' results were so perfect, it's certainly worth a try!

Reference: Percutaneous extraction of deeply-embedded radiopaque foreign bodies using a less-invasive technique under image guidance. J Trauma 72(1):302-305, 2012.

Can Lead Poisoning Occur After A Gunshot?

This is a fairly common question from victims of gunshots and their families. As you know, bullets are routinely left in place unless they are superficial. It may cause more damage to try to extract one, especially if it has come to rest in a deep location. But is there danger in leaving the bullet alone?

One of the classic papers on this topic was published in 1982 by Erwin Thal at Parkland Hospital in Dallas. The paper recounted a series of 16 patients who had developed signs and symptoms of lead poisoning (plumbism) after a gunshot or shotgun injury. The common thread in these cases was that the injury involved a joint or bursa near a joint. In some cases the missile passed through the joint/bursa but came to rest nearby, and a synovial pseudocyst formed which included the piece of lead. The joint fluid bathing the projectile caused lead to leach into the circulation.

The patients in the Parkland paper developed symptoms anywhere from 3 days to 40 years after injury. As is the case with plumbism, symptoms were variable and nonspecific. Patients presented with abdominal pain,

anemia, cognitive problems, renal dysfunction and seizures to name a few.

Bottom line: Any patient with a bullet or lead shot that is located in or near a joint or bursa should have the missile(s) promptly and surgically removed. Any lead that has come to rest within the GI tract (particularly the stomach) must be removed as well. If a patient presents with odd symptoms and has a history of a retained bullet, obtain a toxicology consult and begin a workup for lead poisoning. If levels are elevated, the missile must be extracted. Chelation therapy should be started preop because manipulation of the site may further increase lead levels. The missile and any stained tissues or pseudocyst must be removed in their entirety.

Reference: Lead poisoning from retained bullets. Ann Surg 195(3):305-313, 1982

Orthopedic Hardware And TSA Metal Detectors

Many trauma patients require implantable hardware for treatment of their orthopedic injuries. One of the concerns they frequently raise is whether this will cause a problem at TSA airport screening checkpoints (Transportation Safety Administration).

The answer is probably “yes.” About half of implants will trigger the metal detectors, and these days that usually means a pat down search. And letters from the doctor don’t help. It turns out that overall, 38% are detected when the scanner is set to low sensitivity and 52% at high sensitivity.

Here is a more detailed breakdown:

- Lower extremity hardware is detected 10 times more often than upper extremity or spine implants
- 90% of total knee and total hip replacements are detected
- Upper extremity implants such as shoulder, wrist and radial head replacements are rarely detected
- Plates, screws, IM nails, and wires usually escape detection
- Cobalt-chromium and titanium implants trigger alarms more often than stainless steel

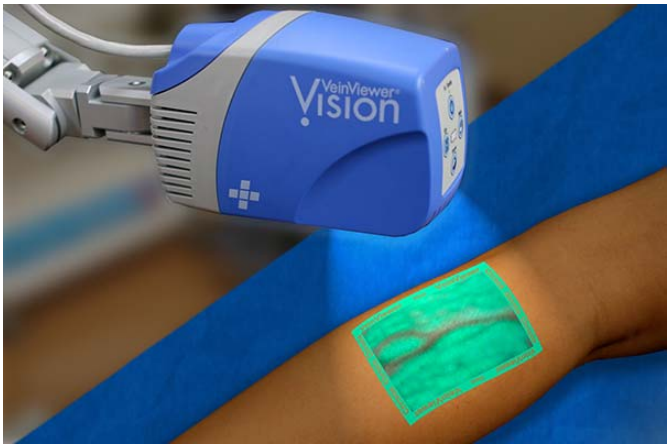
If your patient knows that their implant triggers the detectors, they have two options: request a patdown search, or volunteer to go through the full body millimeter wave scanner. This device looks at everything from the skin outwards, and will not “see” the implant and is probably the preferred choice. If they choose to go through the metal detector and trigger it, they are required to have a patdown. Choosing to go through the body scanner after setting off the detector is no longer an allowed option.

Source: Detection of orthopaedic implants in vivo by enhanced-sensitivity, walk-through metal detectors. J Bone Joint Surg Am. 2007 Apr;89(4):742-6.

Technology: The VeinViewer

I'm always interested in technology that makes what we do easier. Here's an objective look at an interesting machine that's been around for a while. It uses near-infrared light to detect skin temperature changes to allow it to map out veins. It then projects an image of the map in real time onto the skin. In theory, this should make IV starts easier (as long as you can keep your head out of the way of the projector).

A paper published from Providence, Rhode Island looked at this device to see if it could simplify IV starts in a tertiary pediatric ED. It was a prospective, randomized sample of 323 children from age 0 to 17 looking at time to IV placement, number of attempts, and pain scores.



Unfortunately, the authors did not find any differences. They found that nearly 80% of IVs were started on the first attempt with or without the VeinViewer, which is less than the literature reported 2-3 attempts. This is most likely due to the level of experience of the nurses in this pediatric ED.

The authors did a planned subgroup analysis of the youngest patients (age 0-2) and found a modest decrease in IV start time (46 seconds) and the nurse's perception of the child's pain. Interestingly, the parents did not appreciate a difference in pain between the two groups. This may be due to the VeinViewer's pretty green display acting as distraction therapy for the child.

Bottom line: This paper points out the importance of carefully reviewing all new (read: expensive at about $20,000 each) technology before blindly implementing it. In this case, an expensive piece of equipment can't improve upon what an experienced ED nurse can already accomplish.

Reference: VeinViewer-assisted intravenous catheter placement in a pediatric emergency department. Acad Emerg Med, published online, doi: 10.1111/j.1553-2712.2011.01155.x, 2011.

Using A 3D Printer To Plan Orthopaedic Surgery

I've previously written about new printing technology applications in trauma. Here is a new way to use 3D printing technology for planning complex orthopaedic procedures.

An orthopedic registrar in Monklands Hospital (North Lanarkshire, Scotland) found a way to combine new printing technology and orthopaedics. CT scans are routinely taken of complex fractures. Scanners now have powerful software that enables us to create 3D reconstructions from the helical or axial images. However, these are just a series of 2D images viewed on a computer monitor.

Mr. Mark Frame found a way to convert the CT information into a format that can be used as input for a 3D printer. Using two open source (free) software packages for the Mac, OsiriX and MeshLab, he was able to create a medical quality 3D image file. The file was sent to a company that printed it using a 3D printer.

The cost? About $235 US plus a little time for a complete model of the pelvis. The advantage? The actual size 3D model can be used to select hardware and practice the repair technique. And the cost to own a 3D printer keeps coming down!

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