

When Can You Close That Stab Wound?

I find that many trauma professionals are nervous about closing stab wounds. They seem to worry a lot about infections and lean toward leaving the wound open to heal by secondary intention. But is this warranted?

The answer is: probably not. Most knives used for assaults are clean, but not quite sterile. Yes, there are a few bacteria on the blade, but not very many. So if the usual wound management guidelines are followed, patients generally do quite well.



The guidelines are:

- **No gross contamination.** If the knife was used to cut raw chicken or to stir up manure, that's a problem. Leave it open.

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TRAUMA CALENDAR OF EVENTS

SOUTHWEST TRAUMA & ACUTE CARE SYMPOSIUM

PLACE: DESERT WILLOW CONFERENCE CENTERS, PHOENIX, AZ

DATE: NOVEMBER 1-2, 2012

DETROIT TRAUMA SYMPOSIUM

PLACE: MGM GRAND DETROIT, DETROIT, MI

DATE: NOVEMBER 8-9, 2012

TRAUMA HISTORY

TRAUMA 50 YEARS AGO

An article published in the very first volume of the Journal of Trauma reported the then-current practice of gunshot wound management. They concluded that debridement was not routinely needed unless vascular injury was also present.

We generally follow these guidelines today in civilian trauma practice. Cleansing and proper dressing care was thought to be important. Antibiotic administration was routine, but is generally not necessary in most cases today.

The indications for debridement of gun shot (bullet) wounds of the extremities in civilian practice. J Trauma 1(4): 368,372, 1961.

- **No devitalized tissue.** Complex lacerations with dusky skin bridges may get infected. Debride or leave open.
- **Don't close otherwise infection-prone wounds.** See the next article. What is this? It's hard to define, but you probably know one when you see it.

If any of these guidelines have been violated, it's probably best to leave the wound open. Otherwise the default should be to try to close it as soon and as cleanly as possible. This means irrigating with saline to

decrease any bacterial counts. Either sutures or staples are acceptable.

The most important part of this process is patient education. They must be informed about what signs of a wound infection to look for so they can return earlier rather than later to have you deal with it.

Wounds: When Are They Too Old To Close?

At some point in their training, every trauma professional is taught that there is a certain period time during which a wound can be safely closed. The exact number varies, but is usually somewhere between 6 and 24 hours. After that, we are told, "bad things happen."

Always question dogma, I say. Is this true, or is it another one of those "facts" that have been propagated through the ages? Two emergency medicine groups recently performed a meta-analysis to try to answer my question. As usual, they found that much of the published literature is not very good. Out of 418 papers in their original search, only 4 fully met their criteria (laceration repaired primarily, in the ED, with clear early vs delayed criteria.

With the exception of one study with a very limited focus, there was no correlation between wound age and infection or dehiscence after primary closure. None of the studies could reliably provide a specific time beyond which closure was destined to fail. And the use of antibiotics in some of the studies also confounded the results.

Bottom line: It is more likely that infection-prone wounds get infected, not old ones. Although leaving a wound open to heal by secondary intention usually avoids the problem, it's a big patient dissatisfier, especially with large wounds. Since many patients don't present to the ED until their wound is "old", it may be reasonable to try primary closure in all but infection-prone wounds. (The meaning of that phrase is not exactly clear, but most of us know it when we see it.)

Reference: The impact of wound age on the infection rate of simple lacerations repaired in the emergency department. Injury 43(11):1793-1798, 2012.

To Probe or Not To Probe: Penetrating Wounds

There is considerable variability in the way that penetrating wounds are approached. Some are located over areas of lesser importance (distal extremities) or are so superficial that they obviously don't fully penetrate the skin.

Unfortunately, some involve high-value structures (much of the neck and torso), or are too small to tell if they penetrate (ice pick injury). How should these injuries be approached?

Too often, someone just probes the wound and makes a pronouncement based on that assessment.

Unfortunately, there are major problems with this technique:

- The tract may be too small to appreciate with a finger or even a cotton-tip swab
- The tract may be oriented in an unexpected direction, or the soft tissues may have moved after the penetration occurred. In this case, the examiner may not appreciate any significant depth to the wound.
- Inserting an object may violate a structure that you wish it hadn't (resulting in a hissing sound after probing a chest wound, or a column of blood after probing the neck)

A better way to approach these wounds is as follows:

- Is the patient unstable? If so, you know the penetration caused the problem and the patient belongs in the OR.
- Is there other evidence of deep injury, such as peritonitis with a penetrating abdominal wound? If so, the patient still needs to go to the OR.
- Do a legitimate local wound exploration. This entails making the hole bigger with a knife, and using surgical instruments and your eyes to find the bottom of the tract. Obviously, there are some parts of the body where this cannot be done, such as the face, but they probably don't need this kind of workup anyway.

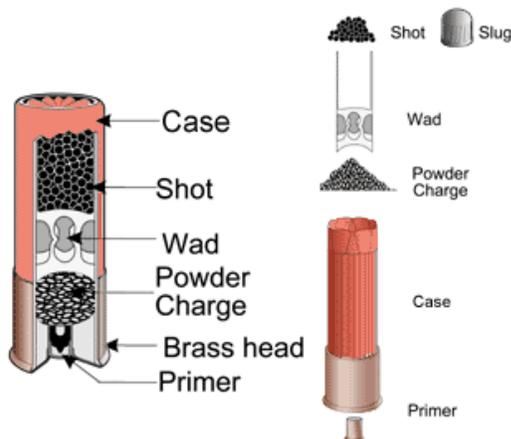
As one of my mentors used to say, "Doctor, do you have an eye on the end of your finger?" In general,

don't use anything that doesn't involve an eyeball in your local wound exploration!

Dealing With Shotgun Wounds

Shotgun wounds are uncommon but potentially disabling or deadly. Here are some basics for dealing with them.

Most people only think about the shot that comes out of the shotgun shell and its effects. While this certainly causes a problem, this foreign body is only a part of it. And it can be challenging to pick them out surgically. However, there are two other foreign bodies that become an issue: the wad, and other material on or around the patient (clothing, pieces of a door, etc).



Look at the diagram above. The wad is a plastic cup that holds the shot and helps the exploding powder charge propel it out of the shell (see sample pictures below). If the shotgun is fired at relatively close range, the wad can enter the patient's wound. It is usually found near the surface and is easily recognized. Be sure to look for it when removing clothing and dressings from your patient.



Any debris from the patient's surroundings will end up deep to the wad. It is usually centrally located in the wound, and may penetrate as deep as the shot. I once found a piece of coat fabric in the middle of an abscess that formed months after the shooting.

Management of these wounds requires general anesthesia and patience. The soft tissue injury is always worse than it appears, and may take up to 3 days to fully declare itself. I recommend debriding all obviously devitalized tissue and then placing a negative pressure dressing (if possible) to help reduce tissue edema.

All easily found shot should be removed during the initial operation. Deeply embedded particles will either scar in place or migrate to the surface. If all dead tissue is removed, infection is not that common. Inspection of all vital structures, especially blood vessels, should be performed at that time. Remember, due to the velocity and force involved, arteries may appear completely normal on the outside but have significant intimal interruption.

The patient should return to the OR every other day until all tissue die-back has stopped. Final closure or reconstruction can be considered at that time.

Determining The Age Of Bruises

On occasion, you may encounter a patient who has bruising and wonder how old the injuries are. Or there may be several bruises and you would like to know if they occurred at different times. This becomes especially important when dealing with injured children in whom there is a suspicion of abuse.



Bruising occurs when blood leaks from blood vessels into the skin and subcutaneous tissues. If the skin and

soft tissues are firm, bruising is not as apparent. In areas where the skin and soft tissues are loose, such as the peri-orbital areas and scrotum, bruising is visible early and may be extensive. The elderly tend to bruise easily because both the skin and subcutaneous tissue are very thin and friable.

A predictable series of color changes occurs with most bruises. During the acute phase, the color is usually reddish and the area may be raised and tender. After about 2 days, the color turns purple and any swelling usually disappears. Over the next week, the color changes to green and yellow as the heme metabolizes. Finally, the color fades and by two weeks most evidence of the injury is gone.

Table 1	
Determining the Age of a Bruise by Its Color	
Color of Bruise	Age of Bruise
Red (swollen, tender)	0-2 days
Blue, purple	2-5 days
Green	5-7 days
Yellow	7-10 days
Brown	10-14 days
No further evidence of bruising	2-4 weeks

The table above is a key to estimating bruise age. However, this is not an exact science! A number of studies have been performed showing that examiners given photographs of bruises of various ages were not terribly accurate. Fresh and intermediate bruises were identified fairly accurately, but not so for older bruises.

The trauma professional may find it helpful to use these guidelines when trying to decide if there are both fresh and older bruises present. This may indicate that an older adult may be suffering from frequent falls, or that a child needs to be evaluated for abuse.

Reference: Estimation of the age of bruising. Arch Dis Childhood 74:53-55, 1996.

Hypothermia And Wound Infection In Trauma

For the most part, hypothermia is a bad thing for trauma patients. Its impact on bleeding and mortality has long been known. A paper just out now implicates it in surgical site infections as well. This fact has already been shown for some types of elective surgery (colorectal), but it appears to be a factor in trauma laparotomy as well.

A retrospective review of 524 patients who underwent a trauma lap looked at the correlation of surgical site infection (SSI) and the depth and duration of hypothermia. The mean low temp across all cases was 35.2° C (!). Nearly a third had at least one measurement below 35° C. About 36% of all patients developed an SSI.

- Hypothermia is a common problem in these patients!
- 35 C was the nadir temp most predictive of developing an infection
- Every degree below 35 C more than tripled the risk of SSI

Bottom line: Yet one more reason to avoid hypothermia in our trauma patients! This effort begins with prehospital providers doing their best to insulate and keep patients warm. The trauma team also has a responsibility to heat up the room and keep the patient covered as much as possible. Baseline temp should be obtained in all major trauma patients. And if they do end up in the operating room, anesthesia needs to monitor the temp closely and keep the surgeon apprised of any concerning drops.

Reference: The Effects of Intraoperative Hypothermia on Surgical Site Infection: An Analysis of 524 Trauma Laparotomies. Annals of Surgery 255(4):789-795, 2012.



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