



Objective: discuss the assessment of skin lacerations, the decision of when to suture and when not to, the choice of correct suture material, wound preparation beforehand, and follow-up/prophylaxis in proper wound care.

Wound assessment: before suturing should be considered, an assessment of the wound must occur.

-History: How did the injury occur? How old is the injury? Is it contaminated/foreign body present?

-Physical: Assess the "Big 3": neurological, vascular, and muscle/tendon function: check sensation, check pulses, check muscular function, feel for bony tenderness. Look for the presence of foreign bodies.

-Strongly consider X-ray if concern for 1) foreign body (glass can be found in up to 87% of x-rays), 2) fractures, displacement, joint involvement.

-Need for specialist consultation: any open fracture or joint involvement, or there appears to be neurovascular compromise. Consultation with the appropriate specialty is strongly encouraged in certain cases if the wound is in cosmetically or vitally sensitive areas and you feel uncomfortable with doing the repair yourself or are short on time (lip, eye, eyelid, any place involving cartilage, etc).

When to suture: no set guideline, but basically when there is a deep enough laceration (e.g. through the dermis) in which wound closure through primary intention will not properly occur and a scar will form.

Alternatives to suturing: **Tissue adhesives/glue** (steri-strips, dermabond): if the cut is small enough (< 5 cm, shallow, linear laceration, dry skin, no active bleeding, not under tension (not overlying joints, etc)).

Staples: same indications as suture. Only difference is that staples are faster and do not require any real technical skill (just learn how to use the stapler). They are most often used on the scalp or long, linear wounds where time is an issue. All skin staples are nonabsorbable and must be removed. Great for extremities too. They are a perfectly acceptable alternative to suturing especially in long lacerations and/or time is an issue.

When to NOT suture (i.e. when to allow the wound to heal by secondary intention):

-Deep puncture wounds where there are no clear wound margin edges or where the underlying fascia is disrupted.

-Any penetrating trauma: any "pointed object" (GSW, stabs, metal poles, etc). A good rule of thumb is to hesitate on suturing if you cannot feel or see the bottom of the wound.

-Crush injuries where there is no clear delineation between normal and damaged tissue.

-Wounds that only involve the epidermis (e.g. simple abrasions, skin tears in elderly). Sutures would likely increase scarring.

-Wounds >18 hours old or >24 hours old if on the face.

-Contaminated wounds: either an infection is clearly present (purulent discharge or abscess), or you suspect an infection based on the patient history or exam. One example is non-facial animal and human bites. These are not often sutured and are often assumed to be contaminated. Risks for contamination: puncture wound method of injury, material causing the injury (soil, organic material, stellate shape), host comorbidities (Diabetes, immunocompromised, obesity, malnutrition, time since injury). (We refer you to our podcast and handout on "Bites in the ED- Bark for Dogmentin" for a detailed approach to these; the episode is <15 minutes and can be streamed on our website, on iTunes, Spotify, or Android for free).

For all the situations mentioned directly above, saline irrigation is critical to both visualize the extent of injury and remove any potential foreign bodies.

Preparing the wound for suturing (in order):

1) Hemostasis: hold pressure for 10-15 minutes. 1-2% lidocaine with epinephrine can help with hemostasis as well as achieve analgesia before stitching. If major bleeding present: tourniquet application → 20-30 mmHg above SBP. Apply no longer than 30 min.

2) Analgesia: as mentioned above (lidocaine +/- epi). No studies have ever shown digital necrosis from local epinephrine injection, so we support its use in the digits or distal extremities.

2) Irrigation: For noncontaminated wounds: Tap water or normal saline is fine. Both show no difference from multiple studies if tap water is of safe quality. For contaminated wounds: dilute betadine with saline or soap and water. Avoid H₂O₂ or chlorhexidine due to their skin toxicity which impairs wound healing. Make sure to achieve pressure using a syringe (do not just lightly rinse or soak the wound- this is worthless). How much should you rinse? The general rule we follow: laceration 1 cm in length = 300 mL minimum. Add 100 mL to each additional cm.

3) Debridement: equally as important as irrigation. Any dead tissue excision should be parallel to skin tension lines. Clinical discretion. Hair removal is not needed. Studies have shown hair removal increases the risk of infection. Lubrication and combing the hair away is sufficient.

Types of suture and when to use them. This is often left to clinical discretion and availability of resources, but after researching multiple sources and obtaining a general consensus, the following is provided as a helpful guide.

-Two overarching classes of suture: **nonabsorbable** and **absorbable**.

Absorbable: material is absorbed into the dermis after a certain amount of time. Might be inflammatory.

Generally reserved for deep tissue suturing, skin closure in children, or those with poor follow up for removal.

Nonabsorbable: suture material must be removed from skin after a certain amount of time.

-Two types of physical configuration of suture: **monofilamentous** or multifilamentous (**braided**). Braided sutures are much easier to tie (just like yarn) but have a higher risk for infection than non-braided suture.

-Size is determined by tensile strength. The higher the number (1-0 → 10-0), the smaller the suture size and lower the tensile strength.

Basics of suturing and wound care

EM Board Bombs, Twitter/Instagram @emboardbombs

-Memory = when stretched, the suture will return to its former shape (i.e. stiff).

Always pick the right size:

1-0, 2-0: high stress areas, fascia repair.

3-0: relative stress. Scalp, trunk, hands

4-0: minimal stress: extremities, neck. This is the most common size used.

5-0: delicate areas: face, nose, ear, eyebrow/lid

6-0: cosmetic repairs only.

Absorbable:

Chromic gut: absorbed in 10-14 days. *Best for oral mucosa or tongue. Not in dermis because of its reactivity.*

Fast gut: absorbed in ~5-7 days. Same as chromic gut in terms of usage.

Vicryl- absorbed in 8-12 weeks. Excellent handling, easiest to tie. *Best for small subcutaneous stitches or muscle bodies.*

Vicryl Rapide- same as above but absorbs in ~1 week. *Best for skin closure in those in which suture removal cannot happen (poor patient f/u, under a cast).* Higher infection rate.

PDS- absorbed in 6 weeks. Monofilament. Handles/used like Vicryl but more stiff, more expensive.

Dexon- first absorbable suture invented. Absorbed in 3 weeks. Poor handling when wet

Monocryl- absorbed in 3 weeks. Monofilament (low infection risk). Great for facial stitches.

Maxon- the "Rolls Royce" of absorbable sutures. Like PDS, but very expensive.

Nonabsorbable:

Silk: braided. Only used to tie down lines, chest tubes, and in the OR.

Nylon- monofilament. A solid choice. Strong, low cost, very elastic. However, non-braided means one must tie 4 knots to hold in place.

Prolene- monofilament. Highest memory. Slippery, needs ~5 knots to hold in place. More expensive than nylon. Blue color allows one to remove it easier in darker skinned patients or in hair

Equipment checklist: ☐correct suture material, ☐needle holder (4" standard), ☐scissors, ☐forceps, ☐hemostats, ☐scalpel (#15 blade for small debridement; #10 for extensive debridement; #11 for I&D), ☐gauze/towels. Typically, all of this material (excluding the suture) comes with a basic lac tray.

"Special" sites: the following require special consideration when suturing as to avoid lasting cosmetic damage:

Ear: *never* suture cartilage. If the ear canal appears to be involved, do not suture and acquire a 2nd opinion/consult ENT.

Lip: close approximation of the Vermillion border is critical. The rest of the mucosa will heal well on its own. Always acquire a consult if there are any craniofacial fractures or dental involvement.

Cheek: Deep lacerations can injure the parotid gland or facial nerve. Adequate visualization is essential to evaluate damage.

Eyebrow: never shave off. If it appears to involve the orbital bones or globe, acquire an ophthalmology consult.

Tongue: repair only if through-and-through laceration, significant hemorrhage, or bad deformity (i.e. anterior split tongue)

The above scenarios are beyond the scope of this review, and often require expert evaluation and technical expertise to suture.

Suture removal times:

Eyelids, neck → 4d*

(hint: **4** letters in the word **neck**)

Face → 5d*

(hint: **Face** means **Five** days)

Scalp, trunk, arms → ~7d

Lower extremities → ~10d

*Warmer temperature and more blood flow mean wound healing occurs faster and therefore sutures can come out faster.

What to do after finishing your suturing:

-24-hour, non-adhesive, non-occlusive dressing is unnecessary, but studies have shown that occluded wounds epithelize *faster in 7 days* as opposed to non-occluded wounds. However, at the end of 14 days, both epithelized at the same rate. So, in the end, it doesn't really matter if you do it or not. Patients almost always think they need a bandage so just offer one and maybe they'll be happier. It's more important just to keep the wound clean and dry.

Wound prophylaxis:	Clean, minor wound	All other wounds (e.g. contaminated)
Tetanus status:	Vaccine	Only give if vaccine was >5y ago
	Tetanus Ig	Give if patient has had <3 total vaccine doses or never completed childhood 4 Dtap doses

Antibiotics: not needed in those with minor, noncontaminated, non-bite wounds. All bite wounds that are sutured will need antibiotics with gram+ and anaerobe coverage. For most bites (especially human), **Augmentin** is first line therapy.

Patient follow/up

-If nonabsorbable, all patients need to follow up with clinician to remove sutures at a certain time that is indicated above.

-All contaminated wounds must be evaluated in <3 days if they were irrigated +/- debrided. Close monitoring should occur as to avoid infectious complications.

-Patient instructions on washing: Washing is acceptable as long as the following rules are understood:

-Gentle washing only! No scrubbing at all.

-Cleaning is not preferred in absorbable sutures (especially Vicryl), as this can undo the braided suture and decrease its tensile strength.

-Never soak the wound. That means no baths, no pools (Cl- destroys suture), no tubs of water to soak in.