

### WOUND CARE POST-TEST

- 1) After primary survey excludes life/limb-threatening injury, the initial management priority for a wound requiring suture repair is:
  - a) Sterile prep
  - b) Radiographic evaluation
  - c) Exploration
  - d) Irrigation
  - e) Local anesthesia
- 2) All the following are considered toxic to wounded tissues EXCEPT:
  - a) Hydrogen peroxide
  - b) Isopropyl (rubbing) alcohol
  - c) Chlorhexidine
  - d) Povidone-iodine solution
- 3) Which of the following statements regarding irrigation is FALSE?:
  - a) Pediatric wounds are at low risk of infection.
  - b) Pediatric irrigation practices are adequately supported by human clinical data.
  - c) Syringe and needle systems generate acceptable irrigation pressures
  - d) A typically recommended irrigation volume is 50-100 mL/cm of wound.
- 4) Which of the following will NOT decrease the pain of anesthetic infiltration?:
  - a) Counter-irritation
  - b) Alkalinization of lidocaine with addition of 8.4% sodium bicarbonate in 1:9 ratio (bicarb:lido).
  - c) Chilling anesthetic fluids.
  - d) Subdermal (vs. intradermal) infiltration.
- 5) Calculate the maximum volume of 1% plain lidocaine which may be safely given to a 30 kg child: \_\_\_\_ mL.
- 6) Buried sutures are most effective:
  - a) If they approximate wound edges nearly completely.
  - b) When the risk of infection is high.
  - c) When placed in subcutaneous fat.
  - d) With fast-absorbing material
- 7) Wound followup (separate from suture removal) is least useful for:

- a) Long facial lacerations resulting from blunt injury
  - b) Lacerations resulting from mammalian bites.
  - c) Lacerations involving removal multiple foreign bodies
  - d) Lacerations incurred in “unusual” locations (e. g., a stable)
- 8) Epinephrine-containing anesthetics are contraindicated in:
- a) Vermilion border
  - b) Extensive scalp laceration with active bleeding
  - c) Narrow flap from pinna
  - d) Thigh laceration
- 9) Which of the following prep solutions minimizes tissue toxicity while maintaining bacteriocidal effect?:
- a) Isopropyl alcohol
  - b) Hydrogen peroxide
  - c) Povidone-iodine scrub diluted 1:5
  - d) Povidone-iodine solution diluted 1:10
  - e) Poloxamer 188 (Shur-Clens)
- 10) The most effective and least toxic means of reducing the risk of wound infection is:
- a) Cephalexin 50-75 mg/kg/d
  - b) Normal saline irrigation 50-100 ml/cm of wound
  - c) Hydrogen peroxide skin preparation
  - d) Povidone-iodine scrub
- 11) Specialized surgical intervention is most likely to be needed for lacerations involving:
- a) The vermilion border
  - b) Fingertip/nailbed with suspected phalangeal fracture
  - c) Large forehead flap
  - d) Medial portion of eyelid margin
- 12) The most appropriate location for a *non-absorbable* suture (such as nylon or polypropylene) is:
- a) Forehead of a vigorous toddler
  - b) Dermal (buried) layer of complex facial laceration
  - c) Intraoral repair in 4-year-old child
  - d) Scalp laceration in adolescent



## ANSWERS

- 1) Correct response: **e**. Only pain can result from proceeding with wound care before local anesthesia is achieved. Sterile prep is a time-honored surgical tradition, but a true sterile field cannot be achieved for skin lacerations. Radiographs are unnecessary for most wounds (fractures and foreign bodies are most often excluded by thorough exploration).
- 2) Correct response: **d**. Povidone-iodine *solution*, despite “common knowledge” to the contrary, is not toxic to tissues, based on the preponderance of evidence. A 1:9 dilution of the stock solution gives a 1% solution, which may contain comparable amounts of free iodine, thus reducing the total iodine load (This is the author’s personal practice). Povidone-iodine *scrub* is likely harmful. Alcohols act as fixatives, and hydrogen peroxide generates microbubbles in the microvasculature.
- 3) Correct response: **b**. Most irrigation data are from animal experiments, often under conditions which do not replicate clinical reality. Well-designed human data are lacking; however, pediatric wounds overwhelmingly affect the head and neck region (very low risk), and data exist to suggest that pediatric wound infection rate is about 1% regardless of irrigation. Certain traditions suggest that a 30-35 mL syringe with 19 ga needle generates an “optimal” pressure of approximately 7 psi at the wound-fluid interface. A volume of 50-100 mL is commonly recommended despite a dearth of clinical evidence.
- 4) Correct response: **c**. *Warming* anesthetic agents to 40-42° C may reduce pain but may be impractical for many practice settings. Despite concern over adverse effect of alkaline substances on catecholamines, bicarbonate buffering is effective for lidocaine solutions with or without epinephrine. Bupivacaine buffering is more problematic; although some sources state that 1:100 addition of bicarbonate is effective, I have witnessed precipitation with this method.
- 5) 15 mL (= 5 mg/kg x 30 kg ÷ 10 mg/mL). Shortcuts: for 1% lidocaine, 5 mg/kg = 0.5 mL/kg. For 0.25% bupivacaine, 1 mL/kg = 2.5 mg/kg.
- 6) Correct response: **a**. Deep sutures approximate: fascia of muscle (e. g., frontalis muscle); important functional structures (e. g., tendon, nerve, vessel—often left to the consultant); dermis. Layered repairs of pediatric wounds most often involve a dermal layer. Dermal sutures are only worth the effort if they: a) eliminate tension exerted by the surface layer of sutures and b) achieve skin approximation that often eliminates the need for a surface suture overlying the same location.  
If the above functional results are not achieved, buried suture material merely serves as foreign body and a nidus of infection. In most cases, closure of dead space with “fat stitches” confers no advantage (cosmetic or infectious). Prolonged wound strength is a desired result of deep suture placement, and rapid absorption (gut) is not desired.
- 7) Correct response: **a**. In the absence of other risk factors, lacerations of head and neck, regardless of length or complexity, have such a low incidence of infection that neither antibiotic prophylaxis nor specific follow-up are required. All the other scenarios imply an increased risk of infection. In all cases, patients should be advised that the

risk of infection (or, in choice c, that the risk of retained, unrecognized foreign body) is never zero.

- 8) Correct response: **c**. Although there is some controversy, vasoconstrictors are traditionally contraindicated in regions with end-arterial circulation. Long and/or narrow-based flaps and pinnae (in addition to finger, toes, penis, noes) are examples. No contraindications exist for the other regions. Although some authors have concerns about blanching (and thus obscuring) the vermilion border, this is not a problem in clinical practice.
- 9) Correct response: **d**. Diluted povidone-iodine solution delivers a similar free iodine concentration as undiluted solution and appears non-toxic as used in typical wound repair. Isopropyl alcohol, hydrogen peroxide, and povidone-iodine scrub have some degree of tissue toxicity. Poloxamer 188 (Shur-Clens) is non toxic and is highly effective in removing ground-in dirt and grease but has no anti-bacterial activity.
- 10) Correct response: **b**. NS irrigation (traditionally 50-100 ml/cm under pressure) reduces infection in animal models and lacks the potential adverse effects of the other listed agents.
- 11) Correct response: **d**. Lacerations in this portion of the eyelid may involve injury to the lacrimal duct, whose repair requires specialized techniques such as cannulation. The other injuries can be repaired with standard materials (time and confidence may be needed).
- 12) Correct response: **d**. The scalp typically requires suture or staple implantation of 7-10 days duration, and an adolescent will more easily tolerate suture removal. Although technically feasible, non-absorbable repairs in patients who require restraint or sedation for suture placement results in great difficulty during removal (answers a. and c.) Fast absorbing gut (often protected by a layer of wound tapes) is appropriate for the skin layer of a facial closure, and chromic gut is suitable for mucosal repair. Most emergency physicians use a longer lasting absorbable suture such as polyglactin 910 (Vicryl) for dermal (buried) sutures.