



Chapter 59 – Wound Management Principles

Episode Overview:

- 1) List risk factors for wound infection
- 2) List the 5 stages of wound healing
- 3) List toxic doses of local anesthetics
- 4) List 3 types of wound closures
- 5) List advantages of and contraindications of tissue adhesives
- 6) List indications for tetanus immune prophylaxis
- 7) List 5 specific wound care instructions
- 8) List 7 situations where antibiotic prophylaxis is indicated in wound management

WiseCracks:

- 1) Evidence guided tips for scar healing?
- 2) How to decrease pain of anaesthetic injection?
- 3) Where can I find a concise guide to Suture material use?

Rosen's in Perspective

Infection risk is proportional to location, mechanism, host and care. Varies <1% to 20%.

Infection also affects ultimate scar outcome and wound related complaints are 4th most common cause of malpractice.

1) List 8 risk factors for infection

- Injury > 8-12 hours old
- Locations with poor blood supply (Leg and thigh > arms > feet > chest > back > face > scalp)
- Contaminated wound
- Blunt mechanism
- Subcutaneous sutures
- Repair material (sutures > staples > tape)
- Anaesthesia with epi (really?)
- High-velocity Missile injuries

2) List 5 stages of wound healing

- Coagulation (immediate)
 - Standard cascade of intrinsic and extrinsic clotting factors culminating in platelet plug with fibrin crosslinking
- Inflammation (immediate - 48 hours)



- Platelets release factors which encourage WBC migration into wound. Specifically Neutrophils and monocytes scavenge debris and bacteria
 - Maturation of monocytes into macrophages promotes release of chemotactic substances triggering fibroblast replication and neovascularization
- Collagen metabolism (>48 hours, peaks 7d, greatest mass 3wks)
- Fibroblasts synthesize and deposit collagen disordered collagen
 - Requires oxygen
 - Remodeling and cross linking continues for 6-12 months
- Wound contraction
- Immediately skin retracts, when during next 3-4d wound length decreases independent of collagen
- Epithelialization 48 hours - days
- Epithelial Cell migrate across wound, soon resembling uninjured skin

3) List the toxic dose local anaesthetics

Silly naming %, not just giving concentration....1% lido = 10mg/ml (water is 1g/ml or 1000 mg/ml)

Lido without epinephrine is 3-5mg/kg (max 35 ml 1% in 70kg), with epinephrine its 5-7 (max 49 ml 1% in 70 kg)

Bupivacaine 2.5mg/kg without (25ml of 0.5% in 70kg) 3mg/kg with (max 42ml 0.5% in 70kg)

- Max intraoral = 90mg

The theory is that having epinephrine promotes vasoconstriction and reduces systemic absorption of the anesthetic

4) List 3 types of wound closure

Primary

- Use in cases of clean wound, generally <8-12 hours (face up to 24 hours). Physician judgement is best method for deciding safety in wound closure. For guidance see Question 1

Delayed Primary Closure

- For wounds that meet risk factors from question 1 but require closure for satisfactory cosmetic outcomes (ie face, visible area)
- Typically not done in ED as requires primary packing, daily follow up and re-closure in 4-5d

Left Open

- Typically not seen in ED except in very dirty wounds or exceedingly small
- Rosen's notes few studies looking at wounds <2cm, no difference in scar formation at 3 months



5) List advantages of and contraindications of tissue adhesives

Advantages:

- Quick, comfortable, no suture removal, antibiotics properties, no risk of needle stick injuries, similar cosmetic outcomes

Disadvantages:

- Inability to use petroleum based products on the wound (ie. antibacterials), can't use in high tension areas, can't swim, must limit forces to glue, greater risk of dehiscence

6) List indications for tetanus immune prophylaxis

Caveat: * some sources say if wound is 'dirty' reduce to 5 years

IMMUNIZATION HISTORY	DTaP (0.5 mL)	TIG (250 IU)
Fully immunized, <10 yr since booster	No	No
Fully immunized, >10 yr since booster	Yes	No
Incomplete series (<3 injections)	Yes [†]	Yes

DTaP, diphtheria, pertussis, tetanus toxoids; *TIG*, tetanus immune globulin. All injections are intramuscular.

*Consider more frequent immunization for elderly patients. DTaP recommended for ages 11-64 yr (diphtheria and tetanus [DT] vaccine to be used in those older than 64 years).

[†]Refer these patients to complete their series; DTaP in 6 weeks and 12 months.



7) List 5 specific wound care instructions

Box 59-2 Wound Care Instructions

- A. Elevate the injured extremity above the level of the heart. Wear a sling when appropriate.
- B. Cleanse daily in a gentle manner to remove debris and crusting that develops. Use dilute hydrogen peroxide.
- C. Immobilization should be maintained at least until suture removal.
- D. Signs of infection
 1. Redness
 2. Increasing pain
 3. Swelling
 4. Fever
 5. Red streaks progressing up an extremity
- E. Wound check
 1. As needed to check signs of infection
 2. Routine at 48 hours for high-risk wounds
- F. Suture removal (*Note: Suture may be removed earlier if Steri-Strips reinforce the wound.*)
 1. Face: 3-5 days (always replace with Steri-Strips)
 2. Scalp: 7-10 days
 3. Trunk: 7-10 days
 4. Arms and legs: 10-14 days
 5. Joints: 14 days

8) List 7 situations where antibiotic prophylaxis is indicated in wound management

- a) Cat bites - all. (Staphylococcus, streptococcus and Pasturella multocida). Amox clav (875mg x 7d)
- b) Dog bites - controversial. Guidelines say limit to hand, very dirty, older patients, deep puncture and immunocompromised. Amox clav x7d
- c) Fight bites - human bites or assumed to the hand. First thoroughly look for tendon or joint damage. Streptococcus, staphylococcus, eikenella corrodens and bacteroides. Amox Clav , plastic surgery consultant opinion
- d) Puncture wound of foot - no data supporting but should be considered especially in puncture through rubber shoe (pseudomonas). Ciproflox for pseudomonas, keflex for staph/strep. ?MRSA Septra or Doxycycline
- e) Delayed primary closure in high risk patient
- f) Open fractures
- g) High velocity missile wounds

Wise Cracks:

1) Evidence guided tips for scar healing

- a) Silicone dressings?



- i. Cochrane: There is weak evidence of a benefit of silicone gel sheeting as a prevention for abnormal scarring in high-risk individuals but the poor quality of research means a great deal of uncertainty prevails. Trials evaluating silicone gel sheeting as a treatment for hypertrophic and keloid scarring showed improvements in scar thickness and scar colour but are of poor quality and highly susceptible to bias.
 - ii. Seems to be up to 12 months
- b. Pressure/compression therapy
- i. Initial pressure dressing as soon as tolerated by patient
 - ii. Massage - our local plastics cite massage after first 1-2 weeks up to 6 months
- c. Avoiding sun exposure up to a year - good evidence
- d. No evidence for anything else including aloe, vitamin E, etc. Although good practice is probably keeping the skin hydrated

2) How to decrease pain of anaesthetic injection?

- a. Buffering: 1:10 with lido (ie 1ml bicarb in 10 ml lidocaine) or 1:100 bupivacaine
- b. Inject through broken tissue - no increased risk of infection
- c. Smaller needle with low pressure
- d. 'Jiggle' skin
- e. Consider block for large area
- f. EMLA/cold spray/LET/Lidocaine prior to needle
- g. Inject slowly
- h. Bring local to skin temperature

3) Where can I find a concise guide to Suture material use?

- a. Shout out to Dan Ting and Jared Baylis: published a guide to suture use with wonderful infographics at our host site CanadiEM.

Search google for CanadiEM sutures or see link here:
<https://canadiem.org/nice-threads-guide-suture-choice-ed/>