

# Wound management and suturing

## Principles of wound management<sup>[1]</sup>

- Assessment.
- Haemostasis.
- Analgesia.
- Skin preparation and wound toilet.
- Closure.
- Dressing.
- Infection prevention.
- Follow-up.

## Assessment of wound<sup>[1]</sup> <sup>[2]</sup>

- Mode of injury: blunt, penetrating, blast.
- Time of injury.
- Type of wound: puncture, laceration, incision, crush, burst, bite. (Consider removing rings from injured fingers before oedema starts.)
- Location: proximity to major vessels (potential damage to blood supply for healing), nerves and organs.
- Shape: linear, curved, stellate, Y-shaped, inverted V, etc.
- Depth and direction: risk to underlying tissues, skin tension lines.
- Potential foreign body: suggestive history - whether it will be radio-opaque or require ultrasound scan location.

- Potential underlying structural injury: bone fracture, tendon rupture, organ perforation.

## Haemostasis<sup>[3]</sup>

This may be spontaneous. However, it may require:

- Pressure.
- Elevation.
- Tourniquet.
- Clamp/suture (for arterial bleeders).

## Analgesia

Do not forget analgesia; this is not only humane but facilitates the remainder of the wound management.

### Local anaesthesia

- Topical: tetracaine–lidocaine combinations can be used to good effect on wounds in children, even if just to allow infiltration of local anaesthetic.
- Infiltrative: most often lidocaine (up to 3 mg/kg. **NB:** a 1% solution contains 10 mg/mL). Caution is generally advised in the use of adrenaline (epinephrine), especially around end arterioles such as those in digits, the penis, etc. However, there is insufficient evidence to justify this fear<sup>[4]</sup>. If used, the lidocaine dose can be increased up to 7 mg/kg.

## Skin preparation and wound toilet<sup>[5]</sup>

- Disinfect the skin around the wound with antiseptic, but do not put antiseptic inside the wound.
- Also consider debridement of ragged, non-viable skin edges.
- If necessary you can trim hair; however, avoid shaving. Simple ointment can be used to flatten any remaining hair away from the wound.

- Remove foreign bodies but make sure personnel and equipment to control any increase in bleeding are at hand.
- Irrigation is more important where there is high risk of infection. The aim is to remove foreign matter and bacteria. Normal saline, drinking-quality water, or cooled boiled water can be used.
  - For lacerations that are not visibly contaminated, low-pressure irrigation using a syringe is sufficient.
  - If high pressure is required, use 50-100 mL/cm liquid under pressure from a syringe with a 25G needle.

## Wound closure<sup>[5]</sup>

### Timing

- Primary closure: immediate closure for simple wounds <12 hours old (24 hours on the face), with opposable edges.
- Delayed primary closure: if there is high risk of infection, give prophylactic antibiotics and close after approximately four days if there is no infection.
- Secondary closure: allow the wound to close by itself if a bite (except on the face) or it has separated edges or infection. This may result in increased scarring.

### Options

- Take account of the location and severity of the wound and the age, comorbidities and preferences of the wounded person.
- Suturing (with local anaesthetic) is preferred for wounds longer than 5 cm, or those 5 cm or shorter when:
  - There is likely to be excessive flexing of the wound and tension (eg, over joints or thick dermis), or wetting.
  - Deep dermal sutures are required, to allow low-tension apposition of the wound edges.

- Tissue adhesives or adhesive strips may be used to close wounds 5 cm or shorter where the risk to infection is low *and* the wound edges are easily apposed without leaving any dead space, *and* the wound is not subject to excessive flexing, tension, or wetting:
  - Tissue adhesives are not suitable if any risk factors for infection are present.
  - Always use adhesive strips on pretibial flaps (not tissue adhesives or sutures).

### Important information

#### Technique tips <sup>[6]</sup>

Generally use interrupted sutures; mattress sutures may be required for larger wounds.

First appose midpoint if linear, or corners if jagged wound. There are special tricks for when there has been skin loss or complex-shaped lacerations.

Ensure good bite of tissue taken with needle entering and leaving vertically.. Space sutures about 2-5 mm apart <sup>[7]</sup> .

#### Suggested sizes and durations <sup>[5]</sup> <sup>[8]</sup> <sup>[9]</sup> <sup>[10]</sup>

- Child's face: 6'0 monofilament nylon; remove after 3-5 days.
- Other parts of children: 5'0 catgut; deep part absorbs and the top part sloughs off after 10-14 days.
- Adult's face: 5'0 monofilament nylon; remove after five days.
- Adult hand: 4'0 nylon; remove after seven days.
- Adult scalp: 4'0 nylon/silk; remove after 3-5 days.
- Adult arm/trunk/abdomen: 3'0 nylon/silk; remove after 7-10 days.
- Adult leg: 3'0 nylon; remove after 7-10 days (10-14 days if over a joint).

#### Risk factors for delayed healing <sup>[5]</sup>

- Size, location and motion of wound.
- Age.

- Genetics.
- Race.
- Marfan's syndrome, connective tissue disorders.
- Nutrition; deficiencies in protein, vitamins A, C, E, B1 (thiamine), other B vitamins, and zinc have been shown to retard healing. However, supplements to non-deficient patients probably have little or no benefit.
- Local infection.
- Ischaemia.
- Glucocorticoid therapy.
- Diabetes mellitus.
- Smoking.
- Foreign bodies.

## Wound dressings<sup>[5]</sup>

- The first layer in contact with the wound surface should be non-adherent – eg, a lightly lubricated gauze with interstices.
- Occlusive dressings can lead to maceration with retained fluid.
- If there is a large amount of exudate, the next layer should be absorbent material such as alginate or foam.
- Finally, soft gauze rolls tape can be used to secure the initial materials in place.
- Dressings may not be necessary if the wound is dry and extra protection is not required.

## Wound infection<sup>[5]</sup>

### Signs and symptoms

- Increasing local inflammation – rubor, dolor, calor and tumour.
- Discharge/collection of pus.

- Systemic signs – fever.

## **Risk factors**

- Delayed presentation (>12 hours).
- Foreign bodies.
- Heavily soiled wounds.
- Bites (especially human, cats).
- Puncture wounds (especially on the foot).
- Intra-oral wounds.
- Open fractures/exposed tendons.
- Crush wounds.

## **Antibiotic usage in wound management**

This is advisable for high-risk wounds or if there are already signs of infection. It may be advisable to have a lower threshold for prescribing for hand and foot wounds.

- Take a swab of the wound before starting antibiotic treatment.
- If the wound is contaminated with high-risk material (eg, soil, faeces, saliva, or purulent exudates), treat with co-amoxiclav. If the person is allergic to penicillin, treat with erythromycin or clarithromycin combined with metronidazole.
- If the wound is clean, treat with flucloxacillin. If the person is allergic to penicillin, treat with erythromycin or clarithromycin.
- Mode of delivery is usually oral, unless there are systemic signs or rapid spread. Topical antibiotic ointment is an option. Be aware of side-effects/resistance.

## **Follow-up**

- Give written advice on wound care.
- Check for healing progress and signs of infection at 48-96 hours.

- Removal of sutures, if present, at the appropriate time.

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## Further reading

- [Lalonde D, Joukhadar N, Janis J](#); Simple Effective Ways to Care for Skin Wounds and Incisions. *Plast Reconstr Surg Glob Open*. 2019 Oct 29;7(10):e2471. doi: 10.1097/GOX.0000000000002471. eCollection 2019 Oct.
- [Bal-Ozturk A, Cecen B, Avci-Addali M, et al](#); Tissue Adhesives: From Research to Clinical Translation. *Nano Today*. 2021 Feb;36. doi: 10.1016/j.nantod.2020.101049. Epub 2020 Dec 20.

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