

Goals

1. Maintain or return tissue to its prior condition and function.
2. Enhance the local wound environment to promote healing.
3. Close the wound primarily without interference to nearby structures or tissues.
4. Approximate straight, sharply incised, vertical wound edges.
5. Undermine skin edges to close the wound under low tension.
6. Spare tissue whenever possible, but excise jagged or devitalized tissue that will interfere with healing.
7. Create the most cosmetically acceptable scar.

Note: See the next procedure, Wound Revision, for preparation and follow-up.

Equipment

1. A minor surgery tray can be used to manage most wounds.
2. Equipment for administering local anesthesia can be included in the minor surgery tray, if desired.
3. Instruments include
 - a. Needle holders
 - b. Adson forceps with and without teeth
 - c. A skin hook
 - d. Metzenbaum scissors
 - e. Iris scissors
 - f. A scalpel blade handle
 - g. Two hemostats
4. Materials include
 - a. A pack of sterile 4-in by 4-in gauze
 - b. Suture materials for subcuticular and skin closure
 - c. A No. 15 scalpel blade
 - d. Povidone-iodine solution to clean the skin surface
 - e. Sterile saline for irrigation
 - f. Sterile gloves

Anesthesia

1. Most wounds can be managed with a local or a field block.
2. Administer anesthesia into the subcuticular tissue to lessen the discomfort.
3. Consider nerve block when appropriate (i.e., facial wounds).
4. Materials include
 - a. 10-cc syringe
 - b. 18-gauge needle to draw up solution from the anesthetic bottle
 - c. 27- or 30-gauge needle to administer the anesthetic solution
 - d. 1 to 2% lidocaine with or without epinephrine
 - e. Nonsterile gloves for anesthetic administration. Change to sterile gloves for wound closure.
 - f. Alcohol or povidone-iodine wipes to clean the skin surface

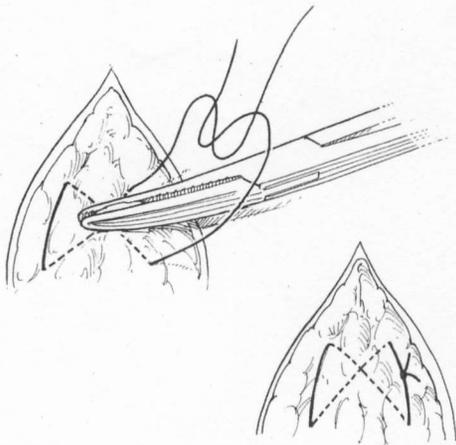
Precautions

1. Never close a wound until the function of the underlying tendons, nerves, and vessels has been ensured.
2. Undermine at a level just below the dermal-fat junction to avoid vessels and nerves that may be in the deep tissue.
3. Do not place povidone-iodine or other toxic solutions into a wound because they interfere with wound healing.
4. Create good hemostasis in all wounds to prevent excess scar formation or scar retraction after the resolution of a hematoma.
5. Do not close tangential wounds without creating vertical wound edges.
6. Do not use skin sutures to pull displaced tissue edges together because excessive stress causes suture marks (railroad tracks).

Technique

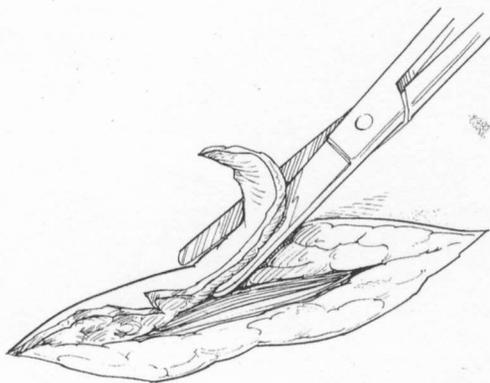
1. Thoroughly inspect all wounds.
 - a. Ensure proper function of the underlying tendons, nerves, and vessels prior to wound closure.
 - b. All foreign bodies or foreign material should be removed from the wound.
 - c. Whenever possible, irrigate the wound with copious amounts of sterile saline.
2. All wounds should have adequate hemostasis.
 - a. Applying hemostats to a bleeding vessel for a brief period usually is adequate.
 - b. Electrocautery can be used in a wound base for hemostasis.
 - c. Deep buried sutures will close dead space below the skin surface and often provide adequate hemostasis.
 - d. Avoid placing povidone-iodine or other toxic substances directly into the wound.

- d. If a vessel continues to bleed, grasp the site with the hemostat tip and place a "figure of 8" absorbable suture into the tissue.

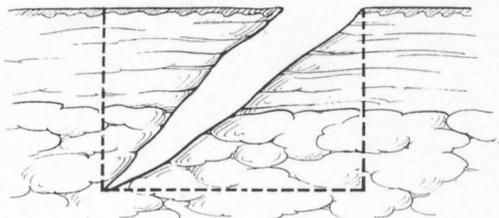


3. Prepare skin edges.

- a. It is advantageous to close sharp, straight, vertical wound edges.
- b. Ragged edges can be trimmed with a No. 15 scalpel or with scissors.



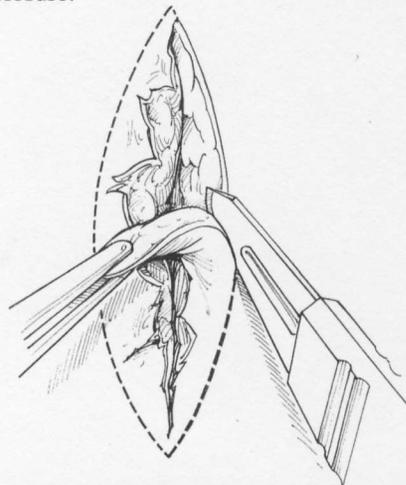
- c. Wound edges should be vertical. Tangential wounds create depressed, noticeable scars when they retract after healing. Tangential wound edges should be transformed into vertical wound edges.



4. Facial wounds are best managed by sparing as much tissue as possible.

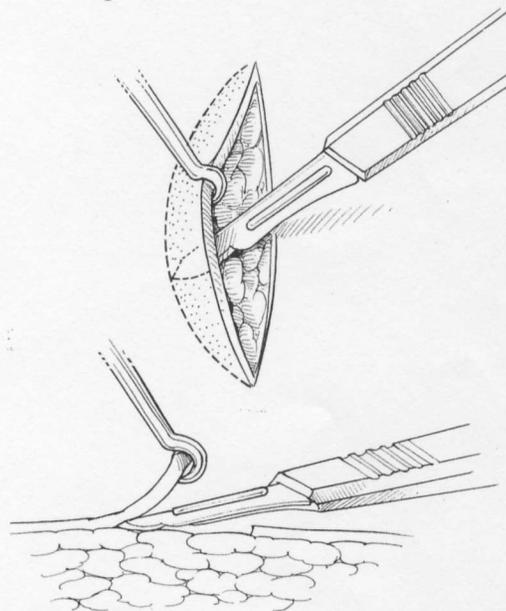
- a. Z-shaped or zigzag wounds can be closed by reapproximating angled skin edges.
- b. If the wound edge is too irregular, crushed, or devitalized, consider excising the entire wound

and transforming it into a fusiform excision for closure.



5. Undermining lateral skin edges frees up tissues for closure under reduced tension.

- a. Undermining is useful in areas where natural tension exists in the skin, such as the scalp or lower legs.
- b. The optimal level for undermining generally is just below the dermal-fat junction, since nerves may be found in deeper tissue.
- c. Undermining can be achieved with scissors or a scalpel.



B Bibliography

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 Trott A: Wounds and Lacerations: Emergency Care and Closure. St Louis, Mosby-Year Book, 1991.
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Procedure **WOUND REVISION**

Thomas J. Zuber

Goals

1. Whenever possible, orient the wound in the direction of the skin lines (least skin tension).
2. Create wounds that lie flat, and avoid elevated corners that have a boat appearance, known as "dog-ears."
3. Repair dog-ears when they are large or create a cosmetic problem.
4. Redirect wounds that cross flexion creases using Z-plasty technique.
5. Close defects using local tissue or advancement flap technique.

Indications

1. Wounds crossing flexor creases
2. Wounds oriented perpendicular to the lines of least skin tension
3. Wounds with large tissue defects
4. Wounds with cosmetically unacceptable dog-ear defects at the end of the wound

Contraindications

1. Wounds that are more than 12 to 24 hours old (relative contraindication)

2. Wounds that are infected
3. Complicated wounds, with injury to deep structures, or wounds that are beyond the expertise of the treating physician
4. Coagulopathy or bleeding disorder
5. Uncooperative patient or one unable to care for his or her wound

Preparation

1. Cleanse the skin surface with povidone-iodine solution.
2. Keep antibacterial solutions or other toxic solutions out of the wound.
3. Irrigate the wound with copious amounts of sterile saline.
4. Inspect the wound for injury to underlying tendons, nerves, or vessels.
5. Confirm proper function of the injured body part.
6. Anesthetize with local or field block.

Note: See the preceding procedure, Wound Management, for equipment and anesthesia.

Technique

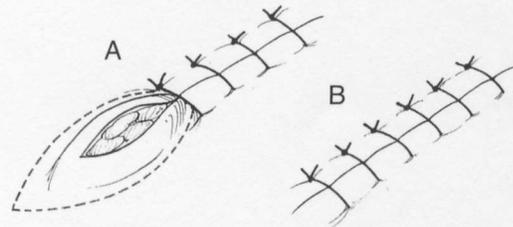
1. The lines of least skin tension often coincide with wrinkles or age lines.
 - a. A scar that is parallel to or oriented in the direction of the lines of least skin tension will heal with a thin, more cosmetically acceptable scar.
 - b. Whenever possible, orient the wound in the direction of the lines of least skin tension.



2. Properly repaired wounds lie flat.
 - a. When a wound is pulled together centrally, ele-

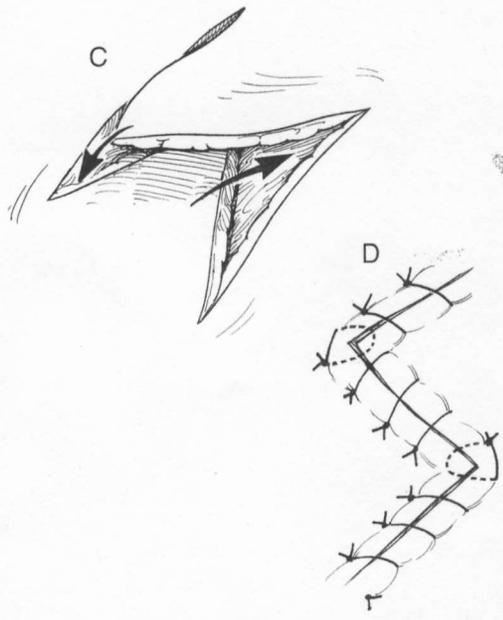
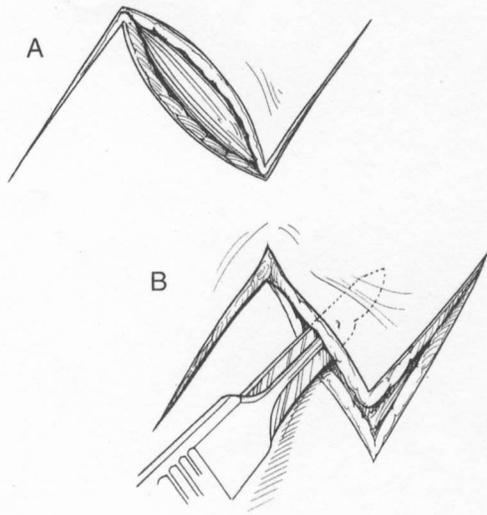
vated tissue may result at the corners of the wound.

- b. The elevated corners make the wound appear boat-shaped or with dog-ears.
3. Large dog-ear defects can create unacceptable scars.
 - a. Many methods of dog-ear repair exist.
 - b. A simple repair can be achieved by creating an elliptical excision at the corner of the wound that continues in the same direction as the wound.



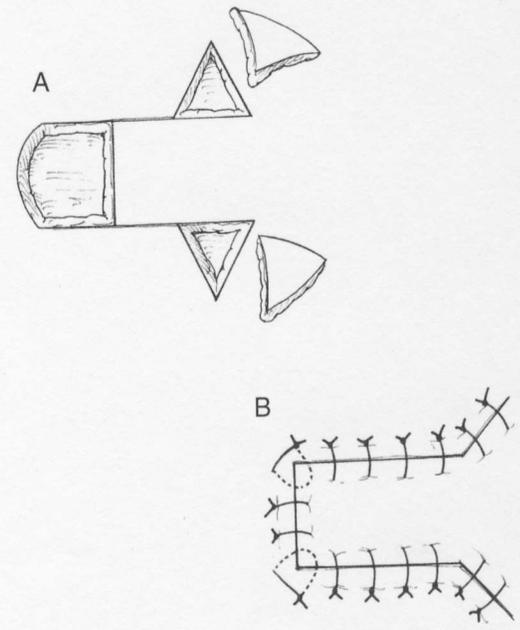
- c. This repair extends the length of the final wound.
4. Wounds that cross a flexion crease can create large scars that contract and interfere with function.
 - a. These wounds can be redirected using Z-plasty technique.
 - b. Incisions are created at each end of the wound that are directed at an angle of 60 degrees to the wound.

- c. Each incision is made on opposite sides of the original wound.
- d. The skin is undermined, creating two triangular flaps of tissue.
- e. The corners of the triangular flaps are transposed.
- f. The wound is repaired with the central axis of the Z-plasty at 90 degrees to the original direction of the wound.



- 5. Large defects may require extensive tissue undermining to permit proper closure.
 - a. Local tissue can be rearranged to close a defect.

- d. Creating a nap from nearby skin (advancement flap) can facilitate closure of the defect.
- c. As the flap of skin is pulled over the defect, dog-ears will develop unless triangles of tissue (Burow's triangles) are excised from the outside skin edges at the far end of the flap.



d. The final result should appear as a flat wound.

Follow-Up

1. Apply antibiotic cream to the wound daily until healed.
2. Apply direct pressure to the surgical site for the first 2 hours after the procedure.
3. Examine wounds promptly if there are signs of infection or hematoma.
4. Remove sutures after an interval appropriate for the repair and body site (see Laceration Repair).

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Procedure LACERATION REPAIR

John L. Pfenninger

Indications

1. Laceration
2. Incision/excision repair

Contraindication

1. Contaminated wound
2. Disrupted nerves or tendons (refer?)

Preparation

1. Copious irrigation (laceration) with saline or lactated Ringer's
2. Proper debridement as necessary to remove devitalized tissue
3. Betadine wash
4. Anesthetic
5. Draping
6. Inform patient of procedure, risks of scarring, infection, discomfort

Equipment

1. 27-gauge, 1½-inch needle and syringe
2. Needle holders
3. Fine tissue scissors
4. Suture scissors
5. No. 15 blade and scalpel handle
6. Sterile gloves

7. Two sterile drapes (one fenestrated)
8. 4 × 4 sterile gauzes
9. 5-0 or 6-0 nylon or Prolene suture for face
10. 3-0 or 4-0 nylon or Prolene suture for trunk, extremities
11. 3-0 or 4-0 Vicryl or Dexon for buried suture
12. Possible Steri-Strips

Anesthesia

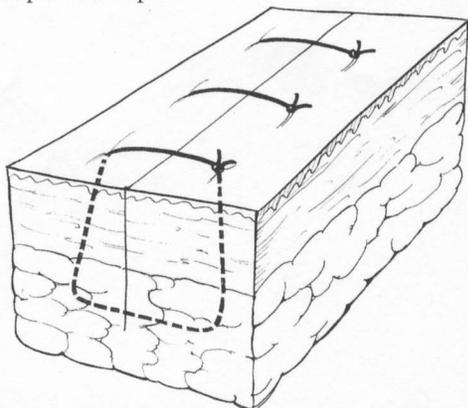
See Procedures on local and regional anesthesia (Chapters 42 and 196). If repairing a laceration, enter through the laceration.

Precautions

1. Use antistaphylococcal antibiotics for prophylaxis in immune-suppressed, diabetic, and elderly patients, and when there is vascular-compromised tissue.
2. Check tetanus status.
3. Before repairing a laceration, document intact neurovascular and tendon structures.
4. Do not use epinephrine with the lidocaine in "dirty wounds" or in the fingers, nose, penis, toes, or earlobes.
5. Close all dead spaces in wound.
6. Approximate but do not strangulate wound edges.
7. Make deeply buried stitches support any wound tension so that skin margins are slightly tented up but without tension.

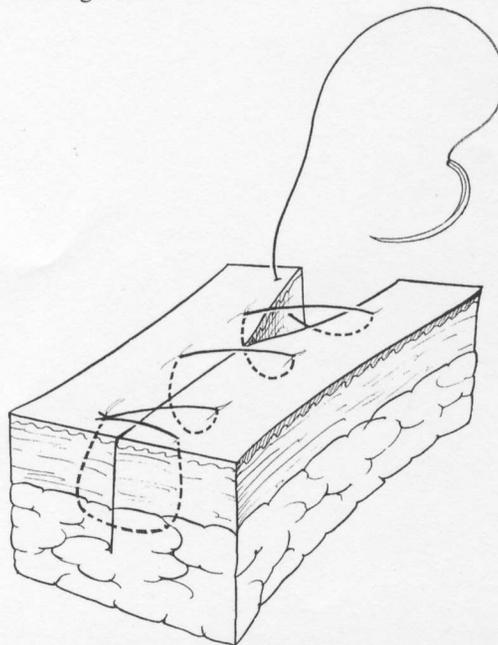
Technique

1. Simple interrupted



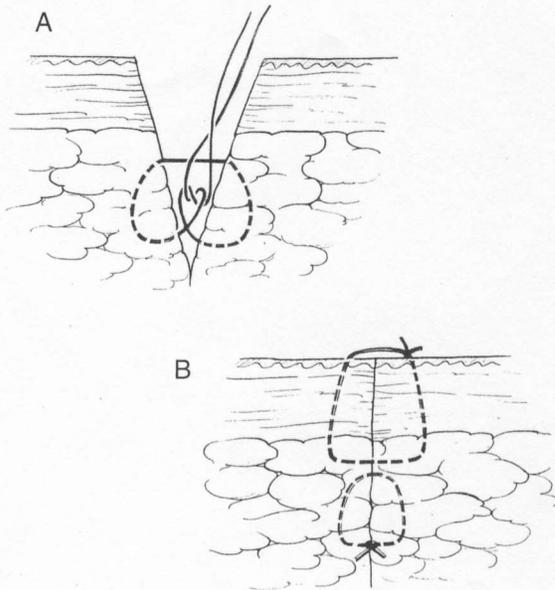
- a. The shape of the path of the suture should look like an Erlenmeyer flask.
- b. The closer the sutures, the less wound tension and thus less scarring. Sutures should be placed as far apart as they traverse across the wound.
- c. The levels of tissue should be approximated to the same levels on the opposite side. This closure can be used for most wounds.

2. Running stitch



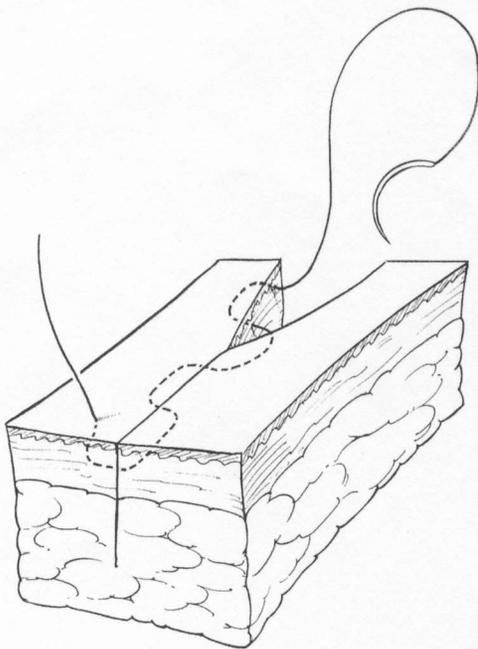
Advantages are that this closure is quick and provides some hemostasis. Use where scarring is not that important (e.g., scalp).

3. Two-layered closure—deep inverted stitch



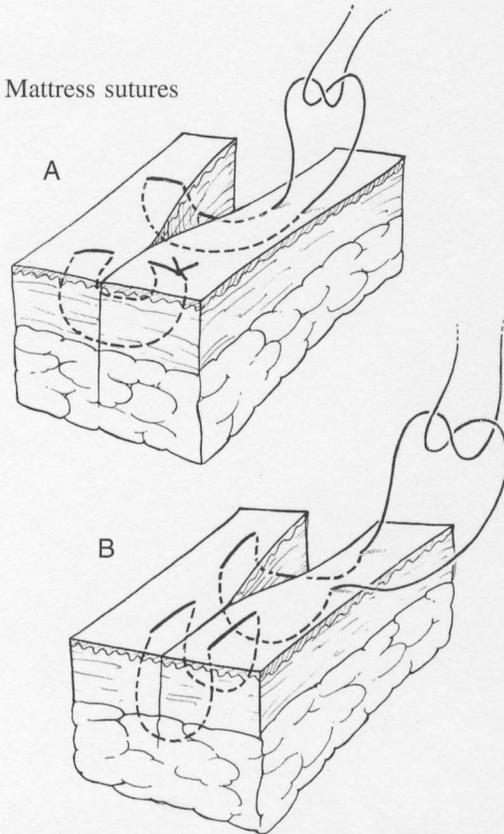
Use with deep wounds, in conjunction with undermining to close wounds under tension or with a significant gap of wound margins. Remember “bottoms up” to obtain an inverted knot—start at the bottom of the wound, go up, across, and then down. The knot ends up at the bottom of the wound, where it will cause less inflammation.

4. Subcuticular closure



Use only if skin margins lie opposed without tension. Real advantage is minimal scarring. May be left in place 2 weeks or more. Use Prolene—it is more slippery and stronger than nylon.

5. Mattress sutures



Use where there is significant wound tension or with very thin or very thick skin.

Follow-Up

1. Keep area dry for 24 hours, and then wash gently with mild soap and water three to four times a day. May cover with antibiotic ointment.
2. Report redness, drainage, or persistent pain (indications of infection).
3. Use Tylenol or ibuprofen for pain.
4. Rest as appropriate; possible elevation and/or ice.
5. Antibiotics as indicated
6. Suture removal according to the following:
 - a. Face, 4 to 7 days
 - b. Trunk, 10 to 12 days
 - c. Extremities, 10 to 14 days

Method of Suture Removal

Cut near knot where suture enters skin. Pull suture across wound edge to avoid pulling “dirty” suture through the wound; pressure tends to pull wound edges together.

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