Suturing for foundation doctors

Introduction

Suturing a wound is a useful skill for foundation doctors, especially those working in the emergency department. The main purpose of suturing is to secure the wound edges in close opposition to provide a favourable environment for wound healing resulting in minimal scarring. This article outlines the basic steps involved in assessment of a wound and then, if it is suitable, how to go about suturing it in the emergency department.

Assessment

It is important that a full history is taken and an appropriate examination of the wound is made. Some wounds may be the result of an assault or accident in the workplace and a report may be required at a later date, so it is important that the circumstances of the injury and history are documented. The tetanus status of the patient should be recorded in order to determine if prophylactic treatment is required (*Table 1*).

Adequate anaesthesia is essential to allow adequate assessment and good placement of the sutures. In the emergency department this is usually under a local anaesthetic. The most commonly used local anaesthetic in the emergency department is 1% lignocaine (*Figure 1*).

Examination

The wound should be as clean as possible. If it is a clean wound, closure may be embarked upon. However, if the wound is contaminated, or if it is a traumatic wound, then liberal wound toilet is necessary and may involve referring the patient to a surgical specialty. An X-ray may be required to rule out the presence of a foreign body.

Underlying structures need to be evaluated. If there is injury to tendons, nerves, vessels or viscerae, refer to the appropriate specialist for assessment and/or repair (*Table 2*). Any bleeding must also be controlled.

If there is any infected or non-viable tissue, this should be debrided (Singer et al, 2002). Foreign bodies should also be removed if present (Singer et al, 2002). Once again, it is vital that all examination findings are well documented.

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Table 1. Determining tetanus prophylactic treatment

Consider giving human tetanus immunoglobulin for tetanus-prone wounds where the risk of infection is especially high
Person fully immunized (three doses for primary vaccination and two boosters) – tetanus booster not needed
Primary vaccination complete, boosters incomplete but up-to-date – tetanus booster not needed but may be given if booster is due
Primary vaccination incomplete, or boosters not up-to-date – give tetanus booster and further doses as needed to complete the primary vaccination
Not vaccinated or status uncertain: give an immediate dose of vaccine

From PRODIGY Knowledge (2005)

Figure 1. Using lignocaine safely.

Lignocaine has a maximum safe dosage of 3 mg/kg and 1 ml of 1% lignocaine contains 10 mg of lignocaine

For example; for a patient who weighs 70 kg, 70 kg x 3 mg/kg = 210 mg maximum safe dose, 210 mg ÷ 10 mg/ml lignocaine = 21 ml of lignocaine 1% can be used safely to assess and suture the wound

When injecting the wound aspirate first to ensure you are not injecting into a blood vessel thus avoiding a fatal cardiac arrhythmia

Lignocaine with adrenaline can be used in areas such as the scalp which reduces bleeding but should be avoided in areas with end-artery circulation, e.g. digits or the penis

Choice of suture

Once the wound is assessed and deemed safe for closure the type of suture to use should be considered (*Table 3*). Sutures should retain strength until the wound edges can keep together on their own, particularly when dealing with skin. Classification of sutures includes absorbable *vs* non-absorbable, multifilament *vs* monofilament and size.

The most commonly used sutures for skin in the emergency department tend to be either nylon or polypropylene. They are monofilament and non-absorbable suture materials. They are popular despite needing removal as they resist infection in vulnerable wounds, provide good strength to the wound during healing, and cause minimal foreign body reaction. If a deeper layer of fat or subcutaneous tissue needs closure underneath the skin an absorbable suture such as polyglactin is used as it will degrade over time and not require removal.

Suture size also needs to be considered. Thicker sutures have greater tensile strength, but cause greater tissue reaction (Ethicon, 2003) and a poorer cosmetic result. Ideally the finest size suture should be used which is strong enough to hold the wound together. The most frequently used sizes of suture material range from 3/0 (large) to 6/0 (fine).

As a general guide the following sizes should be used on the following areas of

Table 2. Wounds which should be referred to the appropriate specialties

Wounds on the face (ear, nose, lips, near the eyes)
Where neurovascular injury cannot be ruled out
Tendon damage
Wounds involving a joint or viscera
Wounds that cannot be cleaned adequately under local anaesthetic
Wounds that cannot be adequately debrided or examined thoroughly under local anaesthetic
Penetrating wounds
Blast wounds
Wounds contaminated with organic matter
Animal or human bites

the body (use one size finer for children) (PRODIGY Knowledge, 2005):

- Trunk and lower limbs – 3/0
- Scalp – 3/0, 4/0
- Upper limbs – 4/0
- Face – 5/0, 6/0.

Suturing the wound

Equipment required includes sutures, suture set (forceps, needle holder and scissors), dressing pack, local anaesthetic (if not used already), waste collection, sharps bin, normal saline or povidone-iodine and a dressing (*Figure 2*). An assistant is useful and often saves time.

Local anaesthetic should be administered if this has not already been done and the wound cleaned. When suturing, the deep layers should be closed if necessary. This is usually performed with interrupted absorbable sutures. This helps to obliterate any dead space and minimizes bleeding. It also provides some support and strength to the wound closure and avoids excessive stretching and depression of the scar.

The commonest suture used to approximate the skin edges is the simple interrupted suture which is demonstrated here by using a wound made in chicken skin (*Figure 3*).

Figure 2. Equipment required for suturing. From left to right: suture material, gloves, forceps, needle holder, scissors, dressing pack.

Technique

The needle should be held in the needle holder two thirds of the way from the point of the needle to the end joining the suture (*Figure 4*).

The needle is passed through the skin at a 90° angle (*Figure 5*) and using a smooth curved course exits the wound edge at a 90° angle (*Figure 6*).

The forceps pulls the needle through the skin (*Figure 7*) and the needle is then remounted on the needle holder (*Figure 8*).

The needle is passed through the wound edge on the opposite side of the wound at 90° by picking up skin with the forceps (*Figure 9*), and again exits the skin at 90° (*Figure 10*).

The needle should always pass through the skin at 90° to help evert the skin edges. This is important as it optimizes epidermal approximation and improves healing. Eversion also minimizes the risk of scar depression secondary to scar contraction during the healing process.

The needle tip should not be held with the needle holder as this damages it, making it blunt and risking fragmentation of the needle tip.

Figure 3. Wound.

Figure 4. Holding the needle.

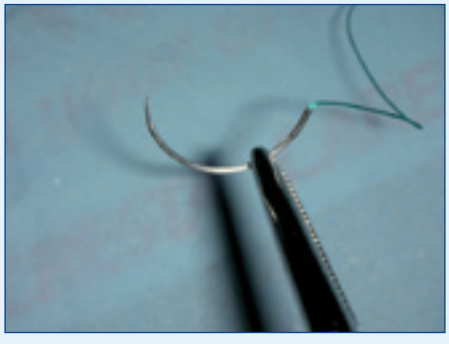


Figure 5. Entering the skin.

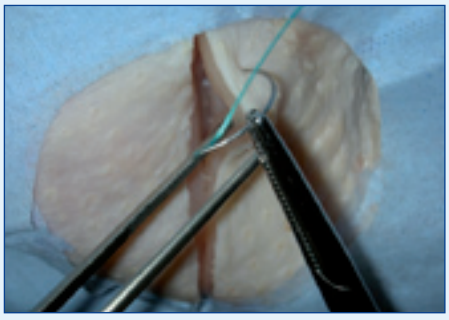
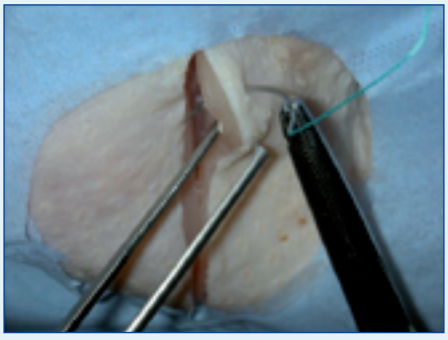


Figure 6. Exiting the skin.



Knot tying

When a satisfactory suture has been placed, it must be tied with a surgical knot. This is

Figure 7. Pulling needle through skin.

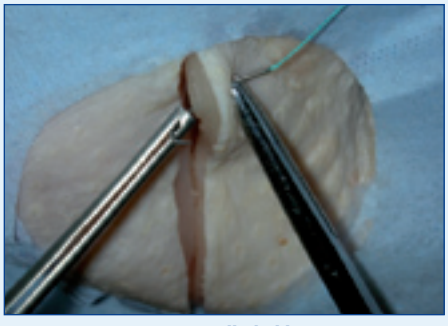


Figure 8. Remounting needle holder.

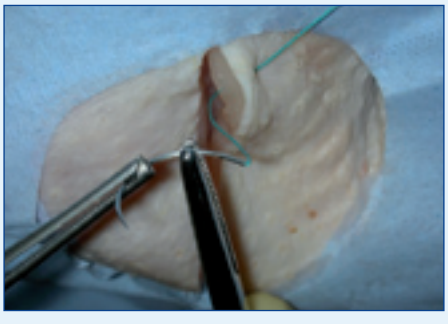


Table 3. Advantages and disadvantages of sutures

	Advantages	Disadvantages
Monofilament	Resists infection Knots smoothly	Difficult to handle
Multifilament	Easy to handle	Foreign body reaction Infection risk
Absorbable	Does not need removal	Inadequate strength to wound
Non-absorbable	Reduced foreign body reaction	Needs removal

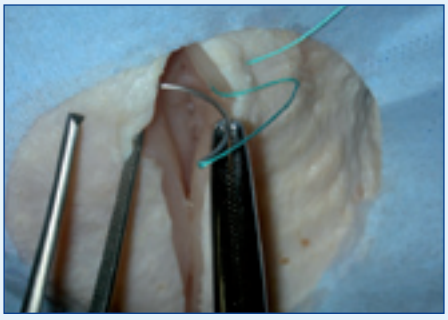


Figure 9. Entering at 90° angle on opposite wound edge.

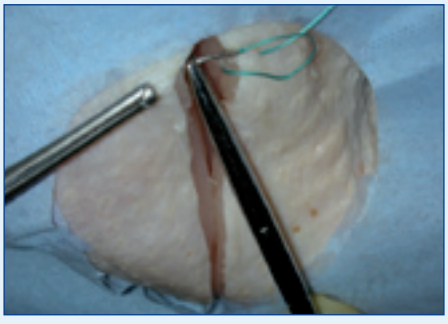


Figure 10. Exiting at 90° angle on opposite wound edge.

done by winding the long end of the suture (the end with the needle on it) twice around the needle holder in a clockwise direction (*Figure 11*).

Then the short end of the suture with the needle holder is grasped (*Figure 12*) and pulled through the two loops of the long end. The knot should be secure but not over tight (*Figure 13*).

This step is repeated, but by winding the long end of the suture once in an anti-clockwise direction around the needle holder. The second knot down is squared down onto the first one. Squaring the knot is important as this prevents slippage of the knot. This knot is locked by performing a third clockwise final knot (*Figure 14*).

The knot needs to be tight enough to ensure apposition of the wound edges.

Figure 11. Wrapping long end of suture around needle holder.

However, it should not be too tight that it causes local tissue ischaemia leading to poor healing and an unsightly scar.

The two ends of the suture are cut at approximately 10 mm so that the stitch is easy to remove at a later date.

The minimum number of sutures are placed along the wound ensuring the wound edges remain well opposed (*Figure 15*). A good rule of thumb for the gap between sutures is twice the distance they are from edge of the wound.

In some locations the wound can be dressed with an appropriate dressing. Consideration should be given to the use of plastic spray dressing particularly on awkward places such as the scalp.

Once completed all materials should be disposed off appropriately including sharps, clinical waste and surgical instruments that may need to be sterilized. If the wound was particularly contaminated or was a result of a bite consideration should be given to prescribing a course of antibiotics to prevent infection. Painkillers should be provided.

Figure 12. Grasping short end of suture.

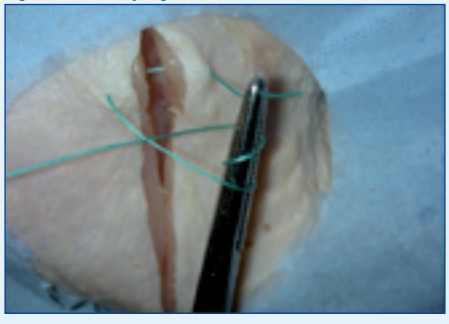


Figure 13. Result of pulling short end through loops of long end.

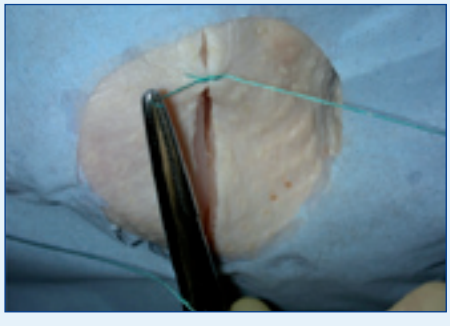


Figure 14. Completed knot.

Suture removal

The time until removal depends on the location of the wound: 5 days for the face, 7–10 days for the scalp, and 14 days for the trunk and limbs. The practice nurse or district nurse can usually perform this. Suture removal is important as if sutures are not removed they can cause potentially disastrous infection and cosmetically unacceptable puncture or cross hatch marks.

Go forth and suture!

Suturing is an important skill that all doctors should have. As with many other skills, the best way of improving your suturing technique is with plenty of practice. **BJHM**

Conflict of interest: none.

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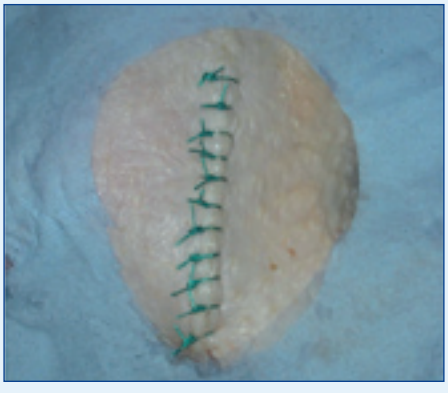
Figure 15. Sutured wound.



KEY POINTS

- This article outlines the techniques required for suturing and for the management of wounds.
- Tetanus prophylaxis is an important component of wound management.
- Safe use of local anaesthetic in wounds is essential.
- Suture selection in wound management needs to be appropriate to the type and location of the wound.