HOW TO SUTURE

Caitlin Daff - Suturing Lead
Nidhi Sharma - Suture Coordinator

Scared of needles?
Don’t know your scissors from your scalpels?
Or just want to improve your skills?
Don’t worry you’ve come to the right place! To run alongside the suturing courses we run throughout term time we have developed this new ‘How To Suture’ guide to help enhance your learning and provide a set of notes for students to use as a quick refresher of the suturing basics.
All information on our upcoming suturing courses will be available on the DUSS website: https://dundeesurgsoc.com/
If you have any questions please contact DUSS via duss@dundee.ac.uk

1. Equipment

<table>
<thead>
<tr>
<th>NAME</th>
<th>USES</th>
<th>HOLD</th>
<th>PICTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle Holder</td>
<td>Used for holding sutures to make them easy to maneuver</td>
<td>Tripod Hold</td>
<td><img src="file" alt="Image 1" /></td>
</tr>
<tr>
<td>Artery Forceps</td>
<td>Used to compress an artery to stem bleeding</td>
<td>Tripod Hold</td>
<td><img src="file" alt="Image 2" /></td>
</tr>
<tr>
<td>Tool</td>
<td>Description</td>
<td>Grip</td>
<td>Image</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>Toothed (Adson) Forceps</td>
<td>Used for handling dense tissue, e.g., during skin closures</td>
<td>Pincer/ Pencil Grip</td>
<td>Image 3</td>
</tr>
<tr>
<td>Non-Toothed (Tissue) Forceps</td>
<td>Used for fine handling of tissue and traction during dissection</td>
<td>Pincer/ Pencil Grip</td>
<td>Image 4</td>
</tr>
<tr>
<td>Mayo Scissors</td>
<td>Use depends on the type of mayo scissors. Straight scissors are used for cutting suture (&quot;suture scissors&quot;), while curved scissors are used for cutting heavy tissue (e.g., fascia).</td>
<td>Tripod Hold</td>
<td>Image 5</td>
</tr>
<tr>
<td>Metzenbaum (Metz.) Scissors</td>
<td>More delicate than mayo scissors metzenbaum scissors are used for cutting delicate tissue (e.g., heart) and for blunt dissection.</td>
<td>Tripod Hold</td>
<td>Image 6</td>
</tr>
<tr>
<td>Scalpel</td>
<td>Used for making incisions during surgery. Different blades have different uses * see image below table.</td>
<td>Fingertip Grip Pencil Grip Palm Grip</td>
<td>Image 7</td>
</tr>
</tbody>
</table>

#10 Blade: Used primarily for making large skin incisions, e.g., in laparotomy.

#11 Blade: Used for making precise or sharply angled incisions.

#15 Blade: Smaller version of #10 blade used for making finer incisions.
Suture Types

Absorbable: Catgut, Vicryl, Monocryl
- + tissue reaction & likelihood of infection. May lead to wound failure if absorbed too quickly
- Used in skin & subcutaneous tissue

Non-absorbable: Surgical silk, steel, Nylon, Polypropylene
- + tissue reaction & acts as permanent foreign body. Good strength & permanent support
- Used in prosthetic valves, hernia mesh fixation, tendon repairs, vessel anastomoses

Holds
2. Wound Management

Wound Healing

When a person sustains a wound from trauma or injury, an intricate and dynamic wound-healing process is triggered.

The 4 distinct stages are -

1) Hemostasis (immediate) - This process causes bleeding to stop. In cases of significant injuries, additional steps may be needed to reduce the bleeding. These include pressure, elevation, tourniquet, or suturing.

2) Inflammation (6 days) - This process aids in reducing the risk of infection. Beneficial enzymes and leukocytes (white blood cells) enter the wound area to facilitate inflammation during vasodilation. The physical traits of this stage are marked by redness at the wound site, pain, swelling and heat.

3) Proliferation (2+ weeks) - This process aids in forming granulation that consists of new connective tissue and blood vessels that replace the damaged tissue from trauma. The new tissue looks pink or red indicating normal wound healing.

4) Maturation/Remodeling (2+ years) - This process promotes collagen production to regain tensile strength and skin elasticity leading to scar formation. Scar tissue is approximately 20% weaker and less elastic than pre-injured skin.
**Wound preparation**

Before closing the wound ensure that -

1) Bleeding is under control
2) Mechanical debridement of any necrotic or dying tissue
3) Clean / irritate and removal of all debris.
4) Revise necrotic wound margins.
5) Ensure all deeper structures are repaired such as tendons, vessels.
6) Ensure correct anaesthetic— local/general

**Importance of Debridement**

- This process involves the removal of non-viable tissue from the wound bed to encourage wound healing.
- The best type of debridement depends on your wound, age, overall health and risk of complications.
## Suturing in wound management

<table>
<thead>
<tr>
<th>Indication</th>
<th>Contradictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Clean wounds with minimal skin loss allowing for closure under minimal tension</td>
<td>- Do not close actively infected or grossly contaminated wounds</td>
</tr>
<tr>
<td>- Securing drains/lines to prevent loss (e.g. central lines, intercostal drains)</td>
<td>- Animal bites - require operative washout +/- debridement</td>
</tr>
<tr>
<td>- Operative closure</td>
<td>- Novices should avoid facial suturing if little experience</td>
</tr>
<tr>
<td></td>
<td>- Do not close wounds if you suspect significant underlying vital structure</td>
</tr>
</tbody>
</table>

### Types of debridement

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sharp</strong></td>
<td>Uses surgical tools such as curettes, scalpels, or scissors to cut away devitalized tissue quickly and efficiently.</td>
</tr>
<tr>
<td><strong>Autolytic</strong></td>
<td>Uses occlusive dressings to provide a moist wound environment that promotes wound bed cleaning via patients’ own phagocytic cells and proteolytic enzymes.</td>
</tr>
<tr>
<td><strong>Chemical</strong></td>
<td>Uses enzymatic agents to degrade and chemically digest necrotic tissue and cellular debris; includes fibrinolysin/DNAse, collagenase, streptokinase/streptodornase, and papain/urea.</td>
</tr>
<tr>
<td><strong>Mechanical</strong></td>
<td>Uses methods such as wet-to-dry dressings, hydrotherapy, and irrigation to remove debris from the wound bed.</td>
</tr>
<tr>
<td><strong>Biologic</strong></td>
<td>Uses fly maggots to liquefy / ingest necrotic tissue; also produces a bactericidal effect.</td>
</tr>
</tbody>
</table>
3. Suturing Techniques

The purpose of suturing is to enhance the healing of a cutaneous wound in which the two sides of skin are far enough apart that the healing process could be difficult. Suturing can reduce scarring and the risk of infection therefore allowing wounds to heal properly, there are different techniques for different types of wounds, the main styles are demonstrated in this guide.

- Simple running
- Interrupted
- Running subcuticular
- Figure 8
- Horizontal mattress
- Vertical mattress

**Interrupted**

https://www.youtube.com/watch?v=z8oWv-nVO6g&t=100s

Used for uncomplicated laceration repair & wound closure

- Easiest technique to learn
- Closes wound cleanly & securely
- Maintains integrity even if one stitch breaks
- Slow to apply
Simple Running
https://youtu.be/o5EKmHAIuw
- Quick
- Less scarring without the knots
- Good for long wounds
- Can loose integrity if one loop is broken

Horizontal mattress
https://youtu.be/6qF4mxB7KzM
- Used for deep wounds and or wounds under tension.
- Good for wound edge eversion & approximation
- Good haemostasis
- More complex to insert

Vertical mattress
https://youtu.be/-Sa7VMcMCJA
- Used for deep wound nd or wounds under tension
- Reduces wound tension & gives better support when delayed healing is expected
- Risk of cross-hatching
Running Subcuticular

https://youtu.be/RN991nUXhC4
- Better cosmetic result
- Allows for tight closure of wound
- Complete suture with Aberdeen knot or Z stitch

**4. Knot Tying Techniques**

**Knot application basics**
- Complete knot should be tight, firm and tied so that slippage does not occur
- To reduce infection risk, knot should **not** be placed in incision line
- Knots should be small and ends cut short (2-4mm)
- Avoid excessive tension to finer gauge materials as breakage may occur

**Learning different types of knots**
- Knot tying skills can be learnt through online videos as they demonstrate a step-by-step process.
- **TIP**: Practice Practice Practice!

**Surgeons knot**
The surgeon's knot is a modified reef knot with an extra twist in the first throw which increases the tensile strength of the knot, surgeons will then normally follow this knot with a few more throws to secure it in place.

**Surgeon's Knot Tutorial**

1. Overlap the ends of the 2 lines
2. Form a loop and pass an end through it
3. Pass it through one more time
4. Tighten by pulling both ends
5. Trim the tag ends
6. The finished knot is compact

Video Guide - https://www.youtube.com/watch?v=zoo4QOQoHaz8&feature=emb_title
**Square knot/ Reef knot**
Although not as strong as the surgeon’s knot, square knots are commonly used to secure sutures as it is an easy reliable knot to create.

Image 29

Video Guide - [https://www.youtube.com/watch?v=yuN0NWt6jFA](https://www.youtube.com/watch?v=yuN0NWt6jFA)

**Aberdeen knot**
Used for tying of subcuticular sutures.

Image 30

Video Guide - [https://www.youtube.com/watch?v=tRX5cyZMlSA](https://www.youtube.com/watch?v=tRX5cyZMlSA)
Reading guide reference

- Suture like a Surgeon: A Doctor's Guide to Surgical Knots and Suturing Techniques used in the Departments of Surgery, Emergency Medicine, and Family Medicine
LINK - free on kindle (https://www.amazon.co.uk/Suture-like-Surgeon-Techniques-Departments/dp/1698150857)

References

1. Biodermis - The science of skin. What are the stages of skin healing?
   Available at - https://www.biodermis.com/what-are-the-stages-of-wound-healing-s/221.htm
3. Oxford Medical Education. How to Suture.
   Available at - http://www.oxfordmedicaleducation.com/clinical-skills/procedures/how-to-suture/
4. Mr Brewster, Mr Anderson, Mr COlin, Mr Ali-Khan and Mr Pearson - Geeky Medics Suturing Guides. Available at: https://geekymedics.com/category/surgery/suturing/

Image Links

2. https://www.amazon.in/Aaram-MAF-COF-Artery-Forceps/dp/B00Q8GE2MW
3. https://docs.google.com/document/d/1TmR2HPp5adL7AMUsUfoLr7BUOJTwOoLaQp2bi_U2d0/edit