Micro-Surgery Sutures
Wound Closure through history

Cautery
Cotton
Flax
Silver
Kangaroo Tendons
Driver Ants
Bark Fibre
Linen
Gold
Animal Intestinal Tissue
Synthetic material
What is a Suture?
strand of material used to ligate (tie) blood vessels or approximate (bring close together) tissues.

Optimal Suture characteristics:

• High uniform tensile strength
• Consistent uniform diameter
• Sterile
• Pliable for ease of handling and knot security
• Inert - minimal tissue reaction
• Predictable performance and easy to handle
• Predictable absorption
### 3 ways to classify sutures

<table>
<thead>
<tr>
<th>Absorbable</th>
<th>Non Absorbable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monofilament</td>
<td>Multifilament</td>
</tr>
<tr>
<td>Synthetic</td>
<td>Biological/Natural</td>
</tr>
</tbody>
</table>
Common Sutures used in Plastic Surgery

**ABSORBABLE**
- BIOLOGICAL
  - Chromic Gut
  - Plain Gut
- SYNTHETIC
  - VICRYL® RAPIDE
  - MONOCRYL®
  - MONOCRYL® PLUS
  - Coated VICRYL®
  - Coated VICRYL® PLUS
  - PDS II

**NON-ABSORBABLE**
- BIOLOGICAL
  - Silk
- SYNTHETIC
  - PROLENE®
  - ETHILON®
  - NUROLOM®
  - ETHIBOND® EXCEL
  - Stainless Steel Wire
Micro-Surgery Sutures

• ETHICON’s micro-surgery sutures commonly used in:
  – Hand surgery (tendons, nerves, vessels)
  – Peripheral nerve surgery (suturing, glueing)
  – Replantation surgery
  – Reconstructive operation / intervention
    (Nerve graft, Local or stemmed flap grafts)

• Suture material is usually required to be small, strong, easy to handle, and non-absorbable

• Needle required to be strong, ductile, consistently sharp, and able to penetrate small vessels
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ETHILON®
Nylon Suture

- Available in small gauges (ie. 8/0; 9/0; 10/0; 11/0 or comparable metric gauges would be 0.4 metric, 0.3 metric, 0.2 metric & 0.1 metric)

- Monofilament Structure
  - No capillarity
  - Low tissue trauma - No sawing effect
  - Good cosmesis
  - Excellent handling, easy to knot

- High Tensile Strength
  - Medical grade nylon is strongest available for sutures
  - High resistance to snapping, even in the thinnest strands
  - Less risk of wound dehiscence

- Deep dyed black makes it easily visible under the microscope

- Degrades at a rate of 10-15% strength per year
PROLENE®
Polypropylene Suture

- Available in small gauges (ie. 8/0; 9/0; 10/0)

- Monofilament Smoothness - Passes easily through delicate tissue because of its extremely smooth surface finish

- Inert suture with minimal tissue reactions even in the presence of infection

- Controlled Linear Elongation gives the surgeon a ‘built-in’ indicator of appropriate knot tension when tying

- Plastic Knot Deformity - Prolene suture deforms and flattens when knotting to provide excellent knot security

- Special care is needed when handling PROLENE® Sutures to avoid damaging the material with surgical instruments.
Suture Gauges in Micro-Surgery

HUMAN HAIR - GAUGE 6/0 (0.085mm)

- 8/0: 0.045mm
- 9/0: 0.035mm
- 10/0: 0.025mm
- 11/0: 0.015mm
Suture Gauges in Micro-Surgery

Monofilament thread (USP 10-0) knotted onto human hair
The Ideal **Needle**

Surgical needles must be designed to carry suture material through tissues with minimal trauma.

**They must be:**

- **Sharp** enough to penetrate tissues with minimal resistance
- Rigid enough to *resist bending*, yet flexible enough to bend before breaking.
- **Sterile and corrosion resistant** to prevent introduction of microorganisms or foreign bodies into the wound.
Needle **Strength**

- **ETHICON stainless steel alloy:**
  needles are heat treated to give them the maximum possible strength and ductility.

- **ETHALLOY needle alloy:**
  exclusive patented alloy developed for unsurpassed strength in precision needles. Used in CV, ophthalmic, plastic, and microsurgical procedures. It is produced economically without sacrificing ductility or corrosion resistance.
Common needles used in Plastic Surgery

- Conventional Cutting Needle
- Reverse Cutting Needle
- PRIME Needle
Micro-Surgical Needles

- Needle profile
- Needle length
- Needle diameter
Micro-Surgical Needles

This ‘to scale drawing’ shows the relative thicknesses of ETHICON’s ultra fine needles when compared to needle wire which is 1mm in diameter.
Common needles used in Micro-Surgery

- Taperpoint Needle
- Tapercut Needle
- BV Needles
- VISIBLACK Needle
BV Needles in Micro-Surgery

- Taper point geometry
- 12:1 ratio
- I-BEAM Technology
- Multipass Coating (except VISIBLACK)
- VISIBLACK & SILVER

<table>
<thead>
<tr>
<th>Needle</th>
<th>Alloy</th>
<th>Body Geometry</th>
<th>Swage Type</th>
<th>Chord Length</th>
<th>Wire Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV130-5</td>
<td>Ethalloy</td>
<td>Round Cornered I-Beam</td>
<td>Channel</td>
<td>5</td>
<td>0.0057</td>
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<tr>
<td>BV175-6</td>
<td>Ethalloy</td>
<td>Round Cornered I-Beam</td>
<td>Channel</td>
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<td>0.0075</td>
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<td>Ethalloy</td>
<td>Round Cornered I-Beam</td>
<td>Channel</td>
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<td>0.0075</td>
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<tr>
<td>BV175-8</td>
<td>Ethalloy</td>
<td>Round Cornered I-Beam</td>
<td>Channel</td>
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<td>0.0075</td>
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<tr>
<td>BV-1</td>
<td>Ethalloy</td>
<td>Round Cornered I-Beam</td>
<td>Laser</td>
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<td>0.0097</td>
</tr>
</tbody>
</table>
BV Needles in Micro-Surgery

- BV = Blood Vessel
- BV-1
  - Chord length 7 mm
  - wire diameter = 197 microns
- BV Fine Wire needles (BV175 and BV130)
  - “175” & “130” = Wire Diameter (microns)
  - 175 microns = 8 mil
  - 130 microns = 6 mil

- “-8, -7, -6, -5” = Chord Length (mm)
BV Needles in Micro-Surgery

Comparing the size of a BV needle and strand of human hair
Summary

• Sutures in Micro-Surgery
  – ETHILON and PROLENE
  – Fine gauges
  – Excellent Handling

• Needles in Micro-Surgery
  – Taperpoint, Tapercut
  – VISIBLACK and BV Needles
  – Strong ETHALLOY with special coating
  – Fine gauges
Thank You

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