COMPONENTS OF A SUTURE

• Material
• Package
• Needle
A SUTURE IS A STRAND OF MATERIAL USED TO LIGATE BLOOD VESSELS AND TO APPROXIMATE TISSUE
SUTURE MATERIALS

Why so many different types?

• Manufacturers continue to strive for the ideal suture material or “the all purpose suture”
CHARACTERISTICS OF IDEAL SUTURE

- Can be used in any procedure
- Handles comfortably and naturally
- Causes minimal reactivity
- Has high tensile strength retention
- Knots hold securely
- Absorbs after it has served its purpose
FEATURES BY WHICH SUTURES ARE JUDGED

- Handling characteristics
  - silk is the standard
- Ability to hold a knot
- Smooth passage through tissue
- Predictable performance
  - Must always live up to manufacturer’s claims
  - Re: In-vivo tensile strength retention and absorption profile
CATEGORIES OF SUTURES

ABSORBABLE (Preferred)

NATURAL
• Enzymatic

MONOFILAMENT (single strand)
• Harbour Less Infection
• Smooth Passage
• Less Reactive

V S.

NON-ABSORBABLE (Required)

SYNTHETIC
• Hydrolysis

MULTIFILAMENT (twisted or braided)
• Stronger
• More Pliable
• Better Handling
# Suture Categories

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*Technically multifilament but behaves like a monofilament.*
SUTURE SIZE

- Measures the diameter of the material
- The more zeros in the number the smaller the suture size

5-0 smaller than 2-0

- Sizes 11-0 to 7
TENSILE STRENGTH OF THE SUTURE

• Initial tensile strength ("Out-of-package") refers to the strength of a suture material, expressed in pounds at the knot before the suture will break.

• In-vivo tensile strength retention refers to the amount of strength in-vivo that a suture has retained over time. (In other words, its ability to keep tissue approximated).

• Measured in number of days. (ie., VICRYL* [Polyglactin 910] Suture has 75% of tensile strength remaining at 14 days).

*Trademark
• The loss of mass in-vivo (ie., VICRYL* (Polyglactin 910) Suture 56-70 days)

N.B. There may be mass of suture material in the wound and zero tensile strength retention.

*Trademark
CRITICAL WOUND HEALING PERIOD

• 14 - 21 Days
• The time it takes for the wound to become self supporting.
• Varies according to a number of factors:
  - Tissue layer
  - Tension
  - Condition of the patient:
    . Age
    . Obesity
    . Nutrition
    . Body temperature
    . Physical condition
SURGICAL GUT
Absorbable/Natural/Twisted

• 3 Types
  • FAST ABSORBING GUT
  • PLAIN GUT
  • CHROMIC GUT

• Raw Materials: Beef Serosa, Sheep Submucosa

*Trademark
FAST ABSORBING GUT
Absorbable/Natural/Twisted

- Specially heat treated to accelerate loss of tensile strength retention and absorption rate
- Available in 5-0 and 6-0 on PC-PRIME needles
- Designed for dermal skin closure only
- Tensile strength: lost between 5-7 days
- Uses:
  - primarily on face and eyelids - tension on wound is low and tissue heals quickly (Plastic Surgery; face-lifts, blepharoplasty)
  - can be used in conjunction with PROXISTRIP*. Exposed knots removed with tape. (Emergency Room; pediatrics, indigent)

*Trademark
PLAIN GUT
Absorbable/Natural/Twisted

• Tensile Strength: Lost between 7-10 days
• Absorption Rate: 70 days
• Uses:
  - rapidly healing tissue
  - skin, subcutaneous tissue
  - ligation of superficial blood vessels
  - ophthalmic tissue such as sclera/conjectiva
CHROMIC GUT
Absorbable/Natural/Twisted

- Tru-Chromicizing - bathed in chromium salts to prolongs digestion and increase wound support
- Tensile Strength: 40% @ 14 days, 0% @ 28 days
- Absorption Rate: 90 days
- Uses: - Rapidly healing tissue
  - Hysterectomy
  - Caesarian Section
  - General Surgery
  - Ophthalmology
VICRYL* RAPIDE
Absorbable/Synthetic/Braided

Same as VICRYL in material and coating
Exposed to gamma irradiation to lower the molecular weight
Initial tensile strength less than Coated VICRYL (equal to silk)
Tensile Strength: 50% lost 5-6 days; 100% lost 11-14 days
- Spontaneously dislodges from wound between 11-14 days
- Stitch removal not required
Absorption Rate: - within 42 days
Uses:
- Rapidly healing tissue
- Episiotomy Repair
- Skin Closure (except face)
- Scalp
- Under casts
- Intra-oral mucosa

*Trademark
2 SQUARE KNOTS -
MONOCRYL*
(Poliglecaprone 25)
Absorbable/Synthetic/Monofilament

- Copolymer of 75% Glycolide; 25% Caprolactone

**Tensile Strength:**  60-70% of original tensile strength remains at 7 days
30-40% of original tensile strength remains at 14 days
Wound support up to 28 days

- Absorption:            90 - 119 days

- Features:  - extremely smooth passage through tissue
  - ease of handling, tying (supple)
  - precise knot placement (first throw holding)
  - knot security
  - strongest suture out of package
  - very inert

- Uses:        - Skin / Ob-Gyn / General / Urology

*Trademark

- 2 SQUARE KNOTS -
COATED VICRYL*
(Polyglactin 910)
Absorbable/Synthetic/Braided

- Polyglactin 910: Copolymer of Glycolide and Lactide 9:1
- Coating: Polyglactin 370 and Calcium Stearate (poly to poly coating - does not flake off)
- Tensile Strength: 75% @ 2 weeks / 50% @ 3 weeks
- Absorption: 56-70 days (hydrolysis) - (Average 63 days)
- Features: - smooth passage through tissue
  - smooth tie down on knot
  - knot lock up and chattering decrease
  - decreased tissue reaction - synthetic
  - precise knot placement
- Uses: Applications in virtually all specialties: Plastic / Ob-Gyn / General / Neuro / Orthopaedic / Ophthalmology (monofiflament)

*Trademark

- 2 SQUARE KNOTS -
PDS*II (Polydioxanone)
Absorbable/Synthetic/Monofilament

• Polyester Polymer

• Tensile Strength: 75% @ 2 weeks
  50% @ 4 weeks
  25% @ 6 weeks

• Absorption: 180-210 days (hydrolysis)

• Features: - soft suture - easy handling
  - less package memory
  - smooth passage through tissue
  - high tensile strength
  - smooth knot tie down & compressed knot

• Uses: - long term healing applications (diabetics / oncology)
  - Plastics
  - Orthopaedics

*Trademark

- 2 SQUARE KNOTS -
PANACRYL* Absorbable/Synthetic/ Braided

- PLA/PGA 95:5
- Coated with Caprolactone/Glycolide 90:10
- Tensile Strength: 90% @ 6 wks
  80% @ 3 months
  60% @ 6 months
- Absorption: 18 - 30 months
- Uses: Orthopaedics
  Surgical Oncology
  Debilitated Patients
  Gen/Gyn (Fascia)
  Plastics

- 2 SQUARE KNOTS -

*Trademark
SILK
Non-Absorbable/Natural/Braided

- Raw Silk spun by silkworm
- Degummed before braiding
- Coated with bees wax
- Features:
  - standard by which other sutures are measured
  - mild reactivity
  - loses most or all tensile strength in about a year
  - easy handling
  - precise knot placement
- Uses: Virtually all specialties

- 2 SQUARE KNOTS -
ETHILON*
Non-Absorbable/Synthetic/Monofilament

- Nylon 6 - very strong
- Consistent extrusion - uniform suture strand
- Pre-humidified - more pliable
- Pliabilized ETHILON - exclusive for Plastic Surgery on 3-0 to 6-0
- Elastic

Features:  - low reactivity - inert
            - loses tensile strength by 15-20% per year
            - easy handling
            - smooth passage through tissue

Uses:  - Ophthalmology
       - Skin Closure

*Trademark

- SURGEONS KNOT 2:1:1
MERSILENE*
Non-Absorbable/Synthetic/Braided

- Polyester dacron (uncoated)
- Very strong
- Minimal tissue reaction
- Good handling
- Tensile strength indefinite
  (true non-absorbable - encapsulated by tissue)
- Uses: - Tendon Repair
  - Ophthalmology (monofilament)

*Trademark
- SURGEONS KNOT & MULTIPLE THROWS
ETHIBOND EXCEL*
Non-Absorbable/Synthetic/Braided

- Polyester dacron
- Polybutylate coating
- Very strong
- Minimal tissue reaction
- Good handling
- Smooth passage through tissue
- Tensile strength indefinite (true non-absorbable - encapsulated by tissue)

**Uses:**
- Cardiovascular, Valve Replacement
- General Surgery
- Hernia Repair
- Orthopaedics

*Trademark
- SURGEONS KNOT & MULTIPLE THROWS -
PROLENE*
Non-Absorbable/Synthetic/Monofilament

- Polypropylene
- Consistent extrusion - uniform suture strand
- Non-elastic and more pliable
- Very predictable
- Easy knot placement

**Features:**
- smooth passage through tissue - good handling
  - plastic knot deformity
  - controlled linear elongation

**Uses:**
- peripheral vascular & coronary artery bypass (85% market share)
  - skin closure

*Trademark

- SURGEONS KNOT & MULTIPLE THROWS
PRONOVA*
Non-Absorbable/Synthetic/Monofilament

- Poly(hexafluoropropylene-VDF) suture
- Strong but gentle
- Superior resistance to handling damage
- Smooth passage through tissue
- Good knot security

Uses: Peripheral Vascular Coronary Artery Bypass (Skin stage two)

*Trademark - SURGEONS KNOT & MULTIPLE THROWS
Needle Selection Criteria

- Minimal tissue trauma
- High sharpness (acuity)
- Corrosion resistance
- High strength
- Stable shape
- Abrasion resistance
- Smooth profile
Anatomy of a Needle

Every needle has three parts:

1. Attachment end (swaged or eyed)
2. Body
3. Point
Needle Body Curvatures

- Straight
- 1/4 Circle
- 3/8 Circle
- 1/2 Circle
- 5/8 Circle
Reverse Cutting Needles

- triangular point with third cutting edge on convex side of needle curvature
- configuration provides the needle with greater strength
- ↓ danger of tissue cut out
- hole leaves a wide wall of tissue for the suture to be tied against
Reverse Cutting Needle Applications

- skin
- fascia
- ligament
- tendon sheath
- nasal cavity
- pharynx
- oral cavity
Conventional Cutting Needles

- Triangular points with three cutting edges and flattened body
- Third cutting edge on the concave side of needle curvature
- May cut out of tissue because inside cutting edge cuts toward the edges of the wound
Taper Needles

- also called **round** needles
- point tapers to a sharp tip
- **pierce and spread tissue without cutting it**
- needle body flattens to an oval or rectangular shape
Taper Needle
Applications

- G.I. Tract
- urogenital tract vessels
- biliary tract
- peritoneum
- fascia
- dura
- nerve, muscle
- myocardium
- subcutaneous fat
Tapercut Needles

- combine the features of a taper point needle and reverse cutting edge tip
- 3 cutting edges extend 0.8mm back from the trocar point and merge into a round taper body
- point penetrates dense, tough tissue, round body prevents cutting into tissue
Tapercut Needle
Applications

- Calcified tissue
- bronchus
- trachea
- nasal/oral cavity
- fascia
- periosteum
- perichondrium
- uterus, ovary
- tendon, ligament
Blunt Needles

- **dissect** friable tissue rather than cutting it
- **taper body with rounded blunt point**
- **used for increased safety in OB/GYN procedures when working in deep cavities with space and visibility limitations**
Blunt Needle Applications

- blunt dissection (friable tissue)
- fascia
- intestine
- kidney, liver, spleen
- ligating incompetent cervix