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Closure Materials

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Table 1.
Nonabsorbable Sutures

Suture Type	Trade Name (Manufacturer)	Configuration	Reactivity	Knot Security	Use
Nylons	Dermalon (Covidien); Ethilon (Ethicon); Nurolon (Ethicon); Surgilon (Covidien)	Monofilament (Dermalon and Ethilon); braided (Nurolon and Surgilon)	Minimal to moderate	Poor to good	Skin closure
Polybutester	Novafil (Covidien)	Monofilament	Low	Good	Skin closure, running subcuticular; excellent elasticity and pliability for a monofilament
Polyesters	Ethibond Excel (Ethicon) ^a ; Mersilene ^b (Ethicon)	Braided	Minimal	Good	Mucosa
Polypropylenes	Prolene (Ethicon); Surgilene (Surgitech); Surgipro (Covidien)	Monofilament	Minimal	Fair	Skin closure, running subcuticular
Silk		Braided	High	Good	Mucosa, eyelids, intertriginous areas
Stainless steel		Both available	Minimal	Good	Hernia, tendon, sternum, abdominal repair

^aCoated.

^bUncoated.

Table 2.
Absorbable Sutures

Suture Type	Trade Name (Manufacturer)	Configuration	Reactivity ^a	Knot Security	Use	Approximate Tensile Strength
Glycomer 631	Biosyn (Covidien)	Monofilament	Minimal	Poor	Subcutaneous, high-tension closure	75% at 2 wk
Poliglecaprone 25	Monocryl (Ethicon)	Monofilament	Minimal	Good	When minimal tissue reactivity is desired	30% at 2 wk
Polydioxanone	PDS (Ethicon)	Monofilament	Low	Poor	Subcutaneous, high-tension closure, cartilage	75% at 2 wk
Polyglactin 910	Vicryl (Ethicon)	Braided	Low/moderate	Fair	Subcutaneous, vessel ligation	50% at 2 wk
Polyglycolic acid	Dexon (Covidien)	Braided	Low/moderate	Good	Subcutaneous	65% at 2 wk
Polyglyconate	Maxon (Covidien)	Monofilament	Low	Good	Subcutaneous, high-tension closure	75% at 2 wk
Surgical gut		Virtually monofilament	High	Poor	Rarely used in skin surgery, vessel ligation and skin grafts	None
Chromic gut		Virtually monofilament	High	Poor	Skin grafting, surface sutures, children	Negligible
Fast absorbing gut		Virtually monofilament	Moderate	Poor	Skin grafting, surface sutures	None

^aIncreased reactivity in the case of internal sutures may lead to an increased risk for "spitting" or extruded sutures.

Table 3.
Properties of Sutures and Their Clinical Relevance

Memory

- Tendency for a suture to retain its shape after deformation
- Suture memory can be thought to have a direct relationship to strength, though a suture with high memory may be more difficult to handle with less knot security

Elasticity

- Ability of a suture to resume its original shape after being stretched
- Suture with high elasticity can accommodate tissue swelling and then maintain skin approximation once swelling has resolved

Tensile Strength

- Inherent strength of a suture that is directly related to the suture material and diameter; measured by the force required to break the suture
- It is desirable to select the suture with the smallest diameter for the appropriate tensile strength; in general, larger diameter sutures and synthetic sutures have a higher tensile strength

Sizing

- The measured diameter of a suture to achieve a given tensile strength
- The size is expressed in multiples of zero with more zeros indicating a small cross-sectional diameter; 5-0 suture is of a smaller diameter than 1-0 suture of the same material
- Across suture materials, the diameter of the sutures of the same measure is different; 3-0 stainless steel is significantly smaller than 3-0 polypropylene suture because of the increased tensile strength of steel

Capillarity

- Tendency of a suture to absorb or transfer fluid
- Increased capillarity may make transfer of bacteria easier within or into a wound

Pliability

- Refers to the suppleness of a suture and its ability to be bent or formed; the overall ease of use of a suture
- Braided sutures have more pliability and greater knot security; more pliable sutures such as the polyesters are useful in areas such as the lip and eyelid, as they possess low reactivity and high tensile strength and offer more patient comfort

Plasticity

- The tendency of a suture to retain a new length and form after being stretched
- A highly plastic suture will maintain its integrity after tension has been applied, which is beneficial in the setting of edema in a healing wound but can result in loosening of a suture after swelling subsides

Coefficient of Friction

- A measurement of tissue resistance to the passing of suture
- Suture with a low coefficient of friction passes through tissue with ease and can be removed with ease; nonabsorbable monofilament sutures tend to have lower friction, thus less knot security requiring additional throws
- The application of tension on a suture can decrease its coefficient of friction

Configuration

- The physical structure of the suture (monofilament vs multifilament)
- Monofilament sutures tend to have higher memory, less capillarity, and a lower coefficient of friction compared to multifilament sutures
- Braided sutures may be preferred when knot security or comfort, in the case of external sutures, is prioritized

Tissue Reactivity

- The body's inflammatory response to a suture material
- Monofilament and synthetic sutures have less tissue reactivity

Table 4.

Suture Facts

- Gut sutures are twisted fibers of bovine collagen; chromic gut is treated with a chromium salt to increase durability, and fast absorbing gut is heat treated to facilitate its degradation
- Gut sutures are degraded by enzymatic means, whereas other absorbable sutures are degraded by hydrolysis
- Reepithelialization of sutured wound begins within 12 h after injury. Surface sutures should be removed as soon as feasible to decrease risk for track marks; 5–7 d for the face/neck and 7–14 d for the trunk/extremities
- Ideally, tension of a wound closure should be borne entirely by the deep sutures
- Spacing of deep and surface sutures is critical for optimizing outcomes, as is the tension placed on the suture throw; sutures too close to one another and/or too tight will lead to vascular compromise via strangulation
- Deeper placement of buried sutures will aid in avoiding suture “spitting” in some cases
- 2-octyl cyanoacrylate (Dermabond Advanced, Ethicon) and octyl cyanoacrylate (Dermabond, Ethicon) adhesive is a popular, albeit relatively expensive, choice for surface closure in wounds with little to no tension on already everted wound edges; use with caution in patients with hypersensitivity to cyanoacrylate or formaldehyde

Practice Questions

- 1. Which of the following suture properties is most responsible for accommodation of edema postoperatively?**
 - a. memory
 - b. plasticity
 - c. pliability
 - d. size
 - e. stretching

- 2. Which of the following has the highest memory?**
 - a. coated polyester (Ethibond Excel)
 - b. poliglecaprone 25 (Monocryl)
 - c. polyglactin 910 (Vicryl)
 - d. silk
 - e. stainless steel

- 3. The most worrisome consequence of capillarity is:**
 - a. increased potential of translocation of bacterium in a wound
 - b. increased reactivity
 - c. increased spitting of suture
 - d. increased wound edema
 - e. decreased tensile strength

- 4. Which of the following would be an excellent choice for closing the mucosal surface on an Abbe flap repair?**
 - a. 2-octyl cyanoacrylate (Dermabond Advanced)
 - b. 5-0 chromic gut
 - c. 5-0 coated polyester (Ethibond Excel)
 - d. 5-0 polybutester (Novafil)
 - e. polypropylene (Prolene)

- 5. Knot security is thought to be most directly related to which property of suture:**
 - a. coefficient of friction
 - b. configuration
 - c. memory
 - d. size
 - e. tensile strength

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