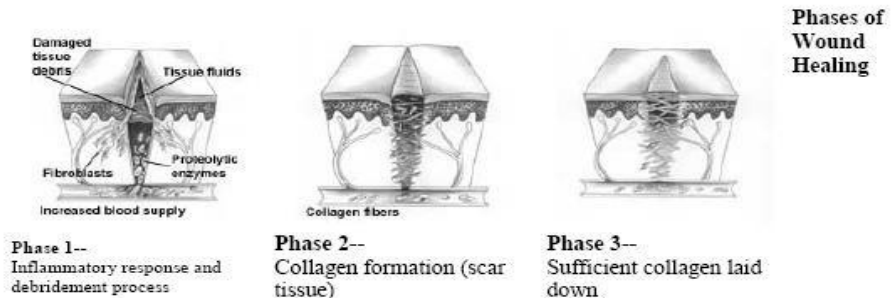


Surgical Suture

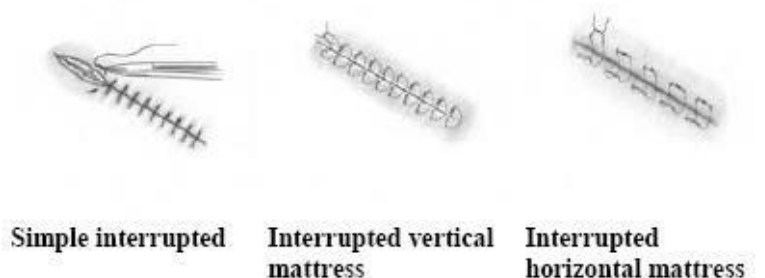
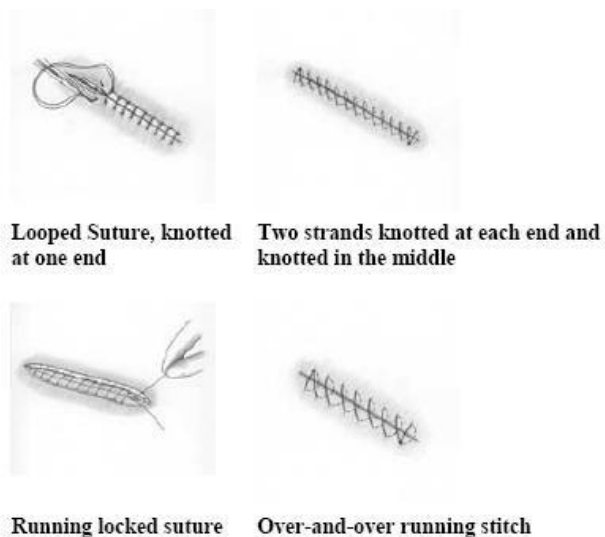


Wound healing: During the first few days, an inflammatory response causes an outpouring of tissue fluids, an accumulation of cells and fibroblasts, and an increased blood supply to the wound. After the debridement process is well along, fibroblasts begin to form collagen fibers in the wound. Collagen, a protein substance, is the chief constituent of connective tissue. Collagen fiber formation determines the tensile strength and pliability of the healing wound.



The Primary Suture Line: Continuous sutures- running stitches- using one strand of suture leaves less foreign body mass in the wound. Interrupted sutures use a number of strands to close the wound. This provides a more secure closure, because if one strand breaks, the remaining sutures will hold

the wound edges in approximation. Deep stitches are placed completely under the epidermal skin layer. Buried stitches are placed so that the knot protrudes to the inside, under the layer to be closed. Purse-string sutures are continuous sutures placed around a lumen and tightened like a drawstring to invert the opening.

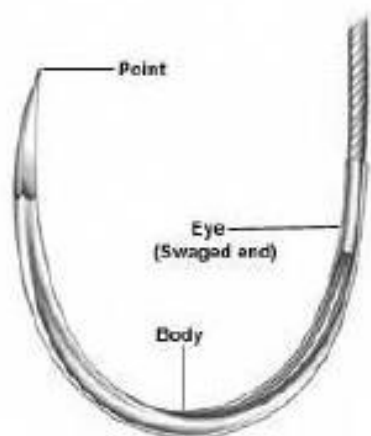


Suture: describes any strand of material use to ligate (tie) blood vessels or approximate (bring close together) tissues. As far back as 2,000 B.C., references have been made regarding suturing. Through the centuries, a wide variety of materials-silk, linen, cotton, horsehair, animal tendons and intestines, and wire made of precious metals have been used in operative procedures. Some of these are still in use today.

Size and Tensile Strength: Size denotes the diameter of the suture material. The smaller the size, the less tensile strength the suture will have. Knot tensile strength is measured by the force, in pounds, which the suture strand can withstand before it breaks when knotted.

Monofilament vs. Multifilament Strands: Monofilament sutures are made of a single strand of material. Multifilament sutures consist of several filaments, or strands, twisted or braided together. This affords greater tensile strength, pliability, and flexibility. Some multifilament sutures are coated to pass easily through the tissue.

Absorbable vs. Nonabsorbable Materials: Absorbable sutures may be used to hold wound edges in approximation temporarily, until they have healed sufficiently to withstand normal stress. Examples are surgical gut, vicryl, monocryl and PDS. Nonabsorbable sutures are those which are not digested by body enzymes or hydrolyzed in body tissue. Some examples are silk, stainless steel wire, nylon, ethilon, nurolon, and prolene.

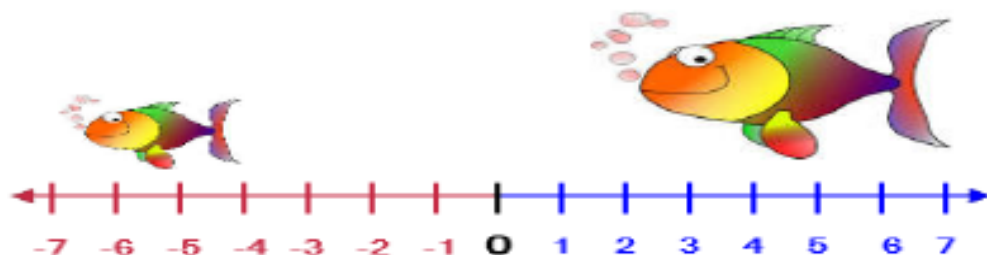


NEEDLE COMPONENTS

Elements of Needle Design:

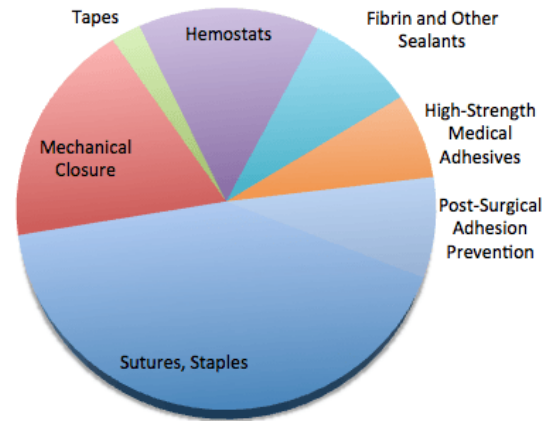
Needles have three components. The point, the body, and the eye. The needle eye falls into one of three categories: closed eye, French (split or spring) eye, or swaged (eyeless). When choosing a suture, think of where they are going to use it, the surgeons' preference and making sure the tissues are subjected to minimal trauma. Some sutures come

in control release. This allows the surgeon to place many sutures rapidly. There are two types of suture tapered or cutting. Depending on the location of the suturing will determine what suture the surgeon will use.



SUTURE	TYPE	COLOR OF MATERIAL	RAW MATERIAL
Surgical Gut Suture	Plain	Yellowish-tan Blue Dyed	Collagen derived from serosa of beef intestine or submucosa of sheep intestine.
Surgical Gut Suture	Chromic	Brown Blue Dyed	Collagen derived from serosa of beef intestine or submucosa of sheep intestine.
Coated VICRYL RAPIDE (polyglactin 910) Suture	Braided	Undyed (Natural)	Copolymer of glycolide and lactide coated with polyglactin 370 and calcium stearate.
Coated VICRYL (polyglactin 910) Suture	Braided Monofilament	Violet Undyed (Natural)	Copolymer of glycolide and lactide coated with polyglactin 370 and calcium stearate.
MONOCRYL (poliglecaprone 25) Suture	Monofilament	Undyed (Natural) Violet	Copolymer of glycolide and epsilon-caprolactone.
PDS II (polydioxanone) Suture	Monofilament	Violet Blue Clear	Polyester polymer.
PANACRYL Suture	Braided	Undyed (Natural)	Copolymer of lactide and glycolide coated with a polymer of caprolactone and glycolide.
PERMA-HAND Silk Suture	Braided	Black White	Organic protein called fibroin.
Surgical Stainless Steel Suture	Monofilament Multifilament	Silver metallic	316L stainless steel.
ETHILON Nylon Suture	Monofilament	Black Green Undyed (Clear)	Long chain aliphatic polymers Nylon 6 or Nylon 6,6.
NUROLON Nylon Suture	Braided	Black Green Undyed (Clear)	Long-chain aliphatic polymers Nylon 6 or Nylon 6,6.
MERSILENE Polyester Fiber Suture	Braided Monofilament	Green Undyed (White)	Poly (ethylene terephthalate).
ETHIBOND EXCEL Polyester Fiber Suture	Braided	Green Undyed (White)	Poly (ethylene terephthalate) coated with polybutilate.
PROLENE Polypropylene	Monofilament	Clear Blue	Isotactic crystalline stereoisomer of polypropylene.
PRONOVA Poly (hexafluoro-propylene-VDF) Suture	Monofilament	Clear Blue	Polymer blend of poly(vinylidene fluoride) and poly (vinylidene fluoride-cohexafluoropropylene)

Sealants, Glues, Hemostats and Other Securement, Global Market by Segment



Factors Affecting Wound Healing

There are a number of factors to take into consideration when waiting for a wound to heal. Any one or a combination of these can multiply how long it will take for a patient to fully recover from a wound of any type, superficial or deep.

- **Developmental Considerations** – Healthy children and adults heal more quickly than the elderly. Older adults are more likely to have chronic diseases, such as peripheral vascular disease, which impairs blood flow. Reduced liver function or diabetes can also impair healing times. Also, with aging, skin loses its flexibility and scar tissue is less elastic.
- **Nutrition** – Wound healing places a lot of demands on the body. Clients need a diet rich in protein, carbohydrates, lipids, vitamins A & C, and minerals, such as iron, zinc, and copper. Obese patients are at an increased risk of wound infection and slower healing because adipose tissue usually has an inadequate blood supply.
- **Lifestyle** – People who exercise regularly tend to have better circulation and are more likely to heal quickly because blood brings oxygen and nourishment to the wound. [Smoking](#) reduces the amount of functional hemoglobin (the iron-containing oxygen-transport protein) in the blood which limits the oxygen-carrying capacity of the blood. Smoking also has been linked to clot formation in the circulatory system.
- **Medications** – Patients who are on anti-inflammatory drugs, (such as steroids or aspirin), heparin or antineoplastic agents (such as medications used in chemotherapy) often suffer delayed healing. Also prolonged use of antibiotics can make a person more likely to develop a wound infection.
- **Infection** – Wound infections slow healing. There may be infectious agents involved at the time of injury, they may be acquired during surgery or come from exposure later in the healing process.

Complications

If any of the aforementioned factors occur while someone is trying to heal from a wound there are a number of complications which can arise:

- **Hemorrhage** – Some escape of blood from a wound site is normal. However, if there is persistent bleeding it may be caused by a dislodged clot or erosion of a blood vessel or even a slipped ligature. Internal hemorrhage is often detected by swelling or distention in the area around the wound or even by symptoms more serious such as a rapid, thread pulse, increased respirations, sweating, restlessness, and/or clod, clammy skin.
- **Hematoma** – Sometimes patients will develop a collection of blood right underneath the skin. A hematoma may appear as a swelling that is reddish-blue in color. A large hematoma may be dangerous because it can place pressure on blood vessels and obstruct blood flow.
- **Dehiscence with Possible Evisceration** – Dehiscence is the partial or total rupturing of a wound. Evisceration is the protrusion of internal viscera through an incision. These complications are most often involve the layers of the abdomen. A number of factors, including obesity, poor nutrition, multiple trauma, failure of sutures, excessive coughing, vomiting, and dehydration, heighten a patient's risk of dehiscence. This is most likely to occur four to five days after the wound has been repaired, before the body has had time to deposit sufficient collagen in the wound site.