

SUTURING LABORATORY

Lab Developed by:
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OBJECTIVE

Wounds to the integument, caused by trauma or surgery, may require suturing for proper healing. The student will demonstrate a suturing technique and analyze its use in wound healing.

TEKS 121.13 (c) 1A, 1B, 10B

TAKS ELA 1, 5
Science 1, 2

National Science Education Standards A9-12; C9-12; F9-12; G9-12
National Health Care Skills Standards .07

KEY POINTS

- I. Review the integumentary system
 - A. Membranes
 - B. Skin and its tissues
 1. Epidermis
 2. Dermis
 3. Subcutaneous layer
- II. History of sutures –dates back to ancient Egyptians.
- III. Rational for suturing
 - A. Heals faster because tissue is coapted.
 1. Holds the wound margins in close apposition
 2. Allows healing by primary intention vs. secondary intention
 - B. Decreased scar formation because of healing by primary intention (less formation of granulation tissue).
 - C. Reduces the chance of infection
- IV. Needles
 - A. Eye vs. swedged on
 - B. Straight or curved – most have some degree of curvature.
 - C. Sharp point with cutting edges
- V. Suture material
 - D. Natural vs. synthetic – “cat gut”
 - E. Absorbable vs. nonabsorbable
- VI. Suturing techniques
 - a. Simple interrupted suture
 - b. Continuous interlocking suture
 - c. Mattress suture

ACTIVITY

- I. Complete the Suture Laboratory Investigation.

MATERIALS/RESOURCES

Needle holders (hemostats can be substituted)
Forceps
Scissors
Scalpel (single edged razor blades may be substituted)
Pigs feet
Suture material

**Teacher Note*

Pig's feet may be purchased from grocery stores specializing in Mexican food. Pig's feet may be purchased either whole or sawn in half. Either are acceptable. They should be kept refrigerated until just before use as they can have considerable odor.

Suture material is more difficult to obtain. You may try contacting the emergency medicine or OB/GYN department of your local hospital and ask if they have any suture material that has passed its expiration date. You may also try to contact Ethicon at their website at www.ethiconinc.com. If unable to obtain actual sutures, you can improvise with heavy-duty thread and special curved sewing needles designed for quilting. These are available at most fabric stores.

<http://www.ethiconinc.com>

The Stars Program: The University of Texas Southwestern Medical Center at Dallas

Ethicon, Inc. 1961. *Manual of Operative Procedure and surgical Knots*. Johnson & Johnson, Somerville, New Jersey

Lumley, J.S.P. 1990. *Essentials of Experimental Surgery*. Butterworth & Co. Ltd., London

Mackenzie, D. 1973. *Medical History*: The history of sutures. 17(2): 158-68

Niederhuber, J.E. 1998. *Fundamentals of Surgerry*. Appleton & Lange, Stamford, Connecticut.

ASSESSMENT

Laboratory Investigation Rubric

ACCOMODATIONS

For reinforcement, the student will review and redo the suture laboratory.

For enrichment, the student will prepare a report analyzing different suturing materials and techniques showing the application and rational for their use. The different suturing techniques should be appropriately displayed.

REFLECTIONS

Suturing Activity

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Purpose

In this activity, the student will practice basic suturing technique on pig's feet.

Background Information:

Sutures (stitches) are used to close wounds caused by injury or surgical procedures. By holding together tissues at the site of a wound, sutures aid in the healing process and help to reduce the chance of scarring. Skin sutures further help to exclude any pathogens from a wound that may cause infection.

Suture material is manufactured from many different natural and synthetic materials and is available in a variety of sizes. Absorbable sutures are made of materials that are broken down by the body and are used mainly on deep structures and do not have to be removed at a later date. Historically, the most popular absorbable suture material is called "catgut" or simply "gut," and is manufactured from the submucosa of sheep intestine and consists of nearly pure collagen. A number of synthetic absorbable products are also currently on the market. Silk has been the material of choice for nonabsorbable sutures. While extremely strong, silk and other nonabsorbable materials cause some degree of tissue irritation and must be removed once healing has taken place.

The needles used in conjunction with suture material also come in a variety of shapes and sizes for various applications. The earliest needles contained eyes to hold the thread, however in 1920 a technique was developed to attach the suture material directly to the needle. This innovation helped to reduce the amount of trauma caused by pulling a double thickness of material through the tissue. Most suture needles are curved to various degrees, however for some applications straight needles are used. Most have sharp, beveled edges to help cut through the tissues as the needle is advanced.

As you might imagine, there are many different techniques for stitching wounds. The simplest is the simple interrupted suture. In this technique the needle is inserted downward through the tissue on one side of the wound, retrieved with forceps and inserted upwards through the tissue on the other side. A square knot is tied to hold the suture firmly in place and the ends are trimmed. A series of similar sutures are placed evenly along the length of the wound until it is completely closed. Other techniques include continuous sutures that run a single length of suture material through the entire length of the wound.

Materials:

Forceps

Gloves

Scalpel or Razor Blade

Dissecting Pan

Needle Holder or Hemostat

Suture Material

Scissors
Pig's Foot

Procedure:

Beginning the suture

1. Put on your gloves and place the pig's foot in the dissecting pan. Using the scalpel make a single incision through the skin down the length of the pig's foot.
2. Carefully open the package containing the suture material. Clip the needle into the needle holder. The needle should be placed near the end of the jaws of the holder, oriented at a right angle with the concave side up. If you are right handed, the point of the needle should be on the left side of the holder.
3. Make sure that the thumb and 4th finger are inserted into the needle holder only to the first knuckle. The illustration below shows the correct orientation of the needle in the holder and the correct way to grasp the needle holder.
4. With the forceps, grasp the flap of skin on the right side of the incision. Rotate your wrist so that the pointed end of the needle is at a right angle with the surface of the skin. Aim for a spot about 5 mm to the right of the incision and insert the needle point. With a rotation of the wrist, insert the needle through the skin until the point appears beneath the dermis
5. Use the forceps to grasp the end of the needle and pull it through the skin until about 3 cm of suture material remains above the skin. Use a rotation of the wrist to be sure you pull along the line of curvature of the needle.
6. Lift the left side of the incision with the forceps and insert the needle up through the skin so until the point appears on the surface about 3 mm from the edge of the incision. Use your forceps to pull the needle and suture material out, again along the line of curvature of the needle. Make sure that you leave the short end of the suture in place on the right side of the incision.

Tying the knot

7. To make an instrument tie, hold the long end of the suture in your left hand and the unlocked needle holder in your right. Place the jaw end of the holder next to the long suture and wrap the suture two times around the holder in a direction away from your body.
8. While maintaining some tension on the line to prevent it from slipping off the holder, open the jaws and grab the short end of the suture. Pull the holder back to the left, through the two loops of the long end. Move the left hand away from your and to the right to tighten the loops. Now you have made the first throw of the knot. Tighten the

knot enough to hold the flaps of skin together, but not so tight that it puts undue pressure on the skin.

9. Maintaining tension on the long end of the suture with your left hand, repeat the above procedure, but this time loop the long end back toward you around the holder and only make one loop. Grab the short end again and secure the loop. This will hold the first loop in place.
10. Repeat three more times to completely secure the knot. Trim the excess off close to the knot, leaving about 2 mm of free end.
11. Adjust the knot to the right or left as necessary to insure that the two sides of the incision are level with one another.

Complete the remaining sutures

12. Choose a location for your next suture, not too close to the first, nor too far away. About 7 mm is a good distance. Repeat the above procedures to insert the needle to from the stitch and to tie the knot.
13. Repeat until you have placed at least three or four sutures. Then give your lab partners a chance to try their hands.

Data

Draw the placement of the sutures and then label the tissues the suture material goes through.

Conclusion:

1. What are the advantages to using sutures to close wounds?
2. How do pig skin and human skin differ? How are they alike?
3. If this were a human patient being sutured, what procedures would be performed prior to the actual suturing?
4. Why should all instruments, suture material and needles be sterile before suturing on a patient? Aseptic technique should be used to prevent possible infection.
5. Why should nonabsorbable sutures have a very smooth surface? Nonabsorbable sutures must be removed. The smoother the surface, the less painful the removal process will be.