

**Wayne State University
Department of Surgery**

General Surgery Residency Program

Intestinal Repair Module

Intestinal Repair Module

(Two-layer Hand Sewn Closure of Intestinal Enterotomy)

I. OBJECTIVES

Cognitive

By the end of this laboratory session students should.....

- 1) Know all layers of the intestinal wall.
- 2) Know the technique of a 2-layer hand sewn closure of an intestinal transverse enterotomy.
- 3) Know the appropriate used in hand sewn intestinal repairs.

Technical

By the end of this laboratory session students should be able to.....

- 1) Demonstrate the proper technique for performance of a 2 layer hand-sewn intestinal repair.
- 2) Demonstrate proficiency at performing a *continuous running stitch* for the inner mucosal layer repair, taking care to invert the edges of the mucosa .
- 3) Demonstrate proficiency at placing *interrupted Lembert stitches* for the outer seromuscular layer repair, taking care to invert the seromuscular layer.
- 4) Demonstrate the proper technique to check for intestinal luminal patency following a 2-layered hand sewn intestinal repair.

II. ASSUMPTIONS OF PRE-TRAINING SURGICAL SKILLS AND KNOWLEDGE

Students will have reviewed the appropriate reading material regarding the use of specific surgical instruments and suture in intestinal surgery, the different suturing techniques used for single and two-layer closures of the intestines. Specific reading material is available in the appendix for this module (located in the section after the evaluation forms).

III. PREPARATION

- 1) Operative Strategy in General Surgery-Volume I. Chassin, J.L.. Springer-Verlag, New York, NY 1980
- 2) Chassin's Operative Strategy in General Surgery. An Expositive Atlas. 3rd Edition. Chassin J.L., Scott-Conner C.E.H.. Springer-Science, New York, NY 2002

IV. ANATOMICAL CONSIDERATION

Students will have reviewed and committed to memory all the layers of the intestinal wall. This should include knowledge regarding each layer's specific microscopic and macroscopic composition. Students should know the specific anatomical characteristics for the small and large intestine, respectively.

V. DESCRIPTION OF LABORATORY MODULE

This module will be taught in the Surgical and Simulation Skills lab.

The assigned faculty mentor will present an overview of the cognitive and technical objectives for this module. Following the presentation the faculty mentor will provide a technical demonstration of the module to all of the students. This demonstration will include performance of a 2-layer hand sewn closure of the transverse enterotomy.

Each student will be assigned a W.L. Gore suture board to complete this module. A portion of a 30mm x 200mm double-layer simulated bowel will be used to simulate the intestines.

Each student is expected to perform a 2-layer hand sewn closure of the transverse enterotomy. The surgical techniques for this module should be practiced a minimum of two times. The faculty mentor(s) will circulate around the room offering support and guidance with immediate instructional feedback as required.

Student performance will be evaluated and graded using the following three testing modalities:

- 1) Procedural Evaluation Form - Checklist
- 2) Time to Completion Assessment
- 3) Global Rating Scale

**VI. MODULE INSTRUCTION, NARRATIVE DESCRIPTION,
SKILL DESCRIPTION and TRAINING METHOD**

SKILL	TECHNIQUE	RATIONALE
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<p>1) Excision of intestinal wall injury and conversion to transverse enterotomy</p>	<p>1. Injury to the intestine can result from blunt or penetrating trauma or as a result of inadvertent technical misadventure in the OR during the course of abdominal surgery. No matter what the etiology of the bowel injury – the standard of care requires that areas of ischemic damaged intestinal wall should be excised back to healthy bleeding intestinal wall tissue. Once an area of damaged intestine is identified the area should be excised using either cautery or Metzenbaum scissors. Non-toothed forceps should be used to grasp intestinal tissue. Intestinal wall tissue should never be grasped with a toothed forcep of any kind. Healthy viable intestinal wall will bleed at its cut edges. This is usually a sign of adequate perfusion to the intestinal mucosa. Once the damaged area is removed more often than not the defect in the intestinal wall can not be closed adequately without increasing the risk for luminal narrowing. Instead the defect usually requires transition to a longer more uniform opening – in this case the creation of a transverse enterotomy.</p>	<p>1.1.1. Ensures removal of damaged ischemic intestinal wall.</p> <p>1.1.2. Ensures 2-layer closure involving healthy viable intestinal tissue.</p> <p>1.1.3. Minimizes risk of intestinal wall damage</p> <p>1.1.4. Minimizes risk of suture line breakdown and leakage of intestinal contents into the abdominal cavity and subsequent development of peritonitis.</p> <p>1.1.5. Ensures that an adequate intestinal lumen is maintained following one- or two-layer closure.</p>
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<p>2) Performance of inner mucosal layer repair</p>	<p>1. The inner mucosal layer is closed with either a 3-0 or 4-0 silk suture. However, other absorbable sutures may be used. The student is expected to know which other types of sutures are used for the inner mucosal layer repair.</p> <p>2. The first stitch is placed at one corner of the enterotomy. This <i>origin knot</i> can be placed in such a manner that the knot can be tied either on the inside or outside of enterotomy.</p> <p>3. Suture bites should be at least 3mm from the mucosal edge of the bowel. Stitches should enter the bowel at right angles and multiple passes are to be avoided if at all possible. The inner mucosal layer is closed with a <i>continuous running locked stitch</i>. Care is taken to avoid excess tension on the suture line. This is particularly true with silk suture as it has a tendency to increasingly tighten with each subsequent knot placed.</p> <p>4. At the opposite corner of the enterotomy the final <i>termination knot</i> is tied such that it can reside either on the inside of the mucosa or on the outside of the mucosa. Following completion of the inner layer repair the student then checks the intestinal</p>	<p>2.2.1. Ensures that the mucosa at the corner of the enterotomy is approximated and inverted.</p> <p>2.3.1. Minimizes risk of the suture tearing through the intestinal mucosa.</p> <p>2.3.2. Minimizes risk of damage to intestinal wall.</p> <p>2.3.3. This stitch assures hemostasis and provides good approximation.</p> <p>2.3.4. Excess suture line tension coupled with postoperative edema can result in ischemic necrosis of the mucosa and an anastamotic bowel leak.</p> <p>2.4.1. Checks intestinal luminal patency to ensure that narrowing of the lumen has not occurred during the inner layer repair.</p>
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<p>3) Performance of outer seromuscular layer repair</p>	<p>1. <i>Interrupted Lembert stitches</i> are used to produce the second outer layer closure. This outer seromuscular layer performed using 3-0 or 4-0 ‘pop-off’ silk sutures. The stitch catches about 5mm of tissue, including a bit of submucosa, and emerges about 2mm - 4mm proximal to the cute edge of the serosa. The Lembert stitches can be placed using a <i>successive bisection</i> technique. Each stitch should be about 5mm-10mm apart. Each stitch is secured with a hemostat and knots are not tied until all Lembert stitches have been placed.</p> <p>2. Four two-handed square knots are thrown for each silk stitch. If possible all knots are tied on the same side of the enterotomy. Inversion of the bowel should be performed while the sutures are being tied. Following completion of the outer layer repair the student checks patency of the intestinal lumen by opposing the thumb and forefinger across the 2-layer closure.</p>	<p>3.1.1. Ensures inversion and approximation of the seromuscular layer</p> <p>3.1.2. This technique, ideally suited when the diameters of two ends of bowel (or portions of bowel) are not identical, helps to ensure consistent accurate approximation of the seromuscular edges.</p> <p>3.2.1. Minimizes the risk of the Lembert stitches from pulling through the seromuscular layer.</p> <p>3.2.2. Checks intestinal luminal patency to ensure that narrowing of the lumen has not occurred following the 2-laye closure. Two-layer intestinal closures turn in more tissue than one-layer closures and therefore have a higher risk of luminal narrowing.</p>
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VII. EQUIPMENT REQUIREMENTS and MATERIALS NEEDED

- W.L. Gore Suture Board (old boards if available)
- Double Layer Simulated Bowel: 20mm OD or 30mm OD x 200mm
- Debaquey vascular forceps
- Tissue forceps
- #10 blade scalpel
- Metzenbaum scissors
- Suture scissors
- Doyen non-crushing intestinal clamps (2)
- Regular Mayo-Hegar needle driver
- Tissue needle driver
- 3-0 braided silk sutures
- Stopwatch
- One faculty evaluator

VIII. REFERENCES

IX. TIME LENGTH

1 ½ - 2 hours

X. APPENDIX