

## Suture Patterns



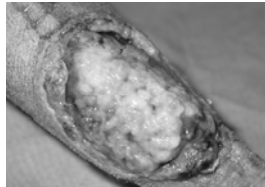
Introduction to Surgery

## Objectives

- Classify suture patterns based on their effect on tissue apposition
- Describe the steps involved in the accurate placement of basic suture patterns
- Discuss the advantages and disadvantages of various suture patterns
- Visually identify suture patterns
- *Know when to apply these patterns in surgery*

## Role of Suture Patterns

- Significant impact on the apposition of tissues
- Plays a large role in wound healing
- Specific patterns can be used to accurately appose tissues, distribute wound tension, invert suture lines, and approximate the ends of tendons



## How to suture (using "surgeon friendly" analogies)

- Right handed:
  - Suture right to left (like driving in golf)
  - Suture top to bottom (like raking in the dough)

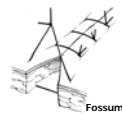


General rule:

If you are suturing and your hand position feels uncomfortable, then stop and try another way (like transferring a case to medicine because it has diarrhea)

## Appositional Suture Patterns

- Bring tissues into close approximation



## Inverting Suture Patterns

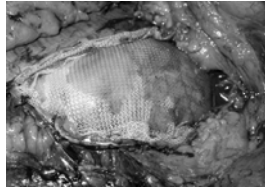
- Turn tissue edges toward the patient, away from the surgeon, or toward the center of a hollow organ



Fossum

## Everting Suture Patterns

- Turn tissues edges outward away from the patient and toward the surgeon
- Rarely used and will not be covered in detail



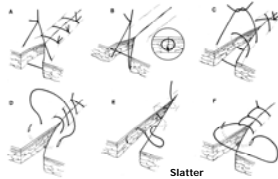
## Perverting Suture Patterns

- Will be discussed by Dr. Birchard



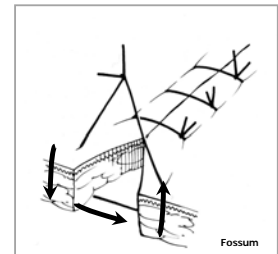
## Appositional Suture Patterns

- Simple Interrupted (A)
- Interrupted intradermal (B)
- Interrupted cruciate (C)
- Simple continuous (D)
- Continuous intradermal (E)
- Ford interlocking (F)



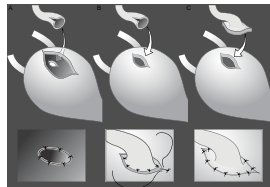
## Simple Interrupted

- Most basic
- Most often used
- Insert needle on one side of wound, cross wound, and through tissue on opposite side



## Simple Interrupted

- Advantages
  - Easy to execute
  - Rapid
  - Disruption of one suture does not result in suture line failure
- Disadvantages
  - Excessive tension yields inversion or eversion
  - Costly in terms of time and suture (foreign) material

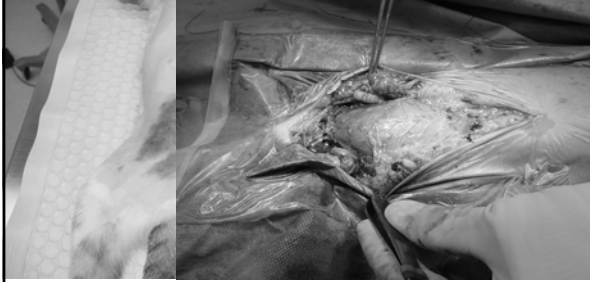


## Simple Interrupted

- Uses
  - Close skin, subcutis, and fascia
  - Ligate blood vessels
  - Close defects in the GI, urinary, and respiratory tracts

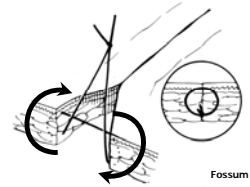


## Simple Interrupted



## Interrupted Intradermal and Subcuticular

- Apposes skin edges and diminishes tension on skin closure
- Essentially an upside down simple interrupted suture, with knot buried
- Deep-superficial, superficial deep, or entirely intradermal

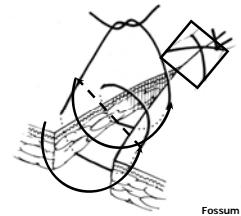


## Interrupted Intradermal and Subcuticular



## Interrupted Cruciate

- Two passes which form an "X"
- SI bite, advance, SI bite
- Best apposition if corners create a square



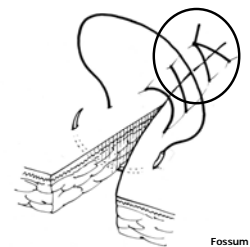
## Interrupted Cruciate

- Advantages
  - Covers a greater distance per suture than SI, thus saves time
  - Stronger closure than SI
  - Resists tension and tissue eversion



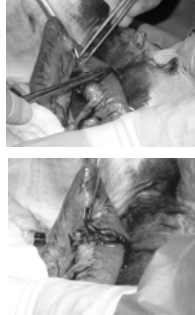
## Simple Continuous

- A series of simple interrupted suture bites oriented at right angles to the incision
- Place SI, cut only tag end
- End by taking a bite in opposite direction and tying to loop



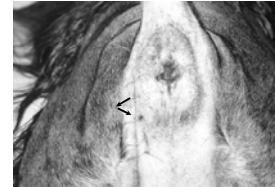
## Simple Continuous

- Advantages
  - Conservation of suture compared to SI
  - Good apposition and a watertight seal
  - Good for layers under little tension



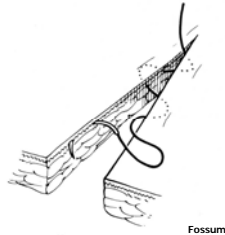
## Simple Continuous

- Excessive tension can cause puckering and tissue strangulation
- A **running suture line** advances both above and below the tissue
- Rarely used in skin for small animals

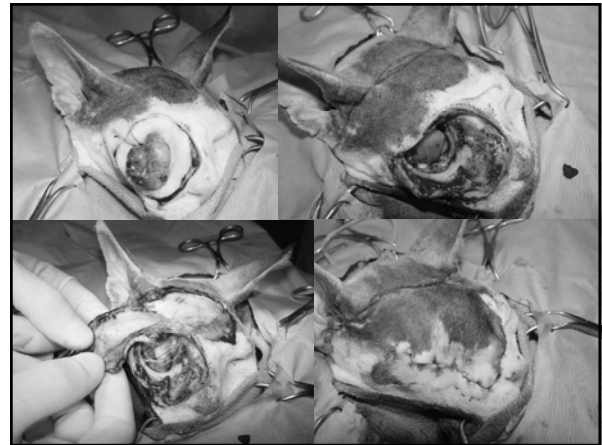


## Continuous Intradermal or Subcuticular

- Modified SC that runs horizontally through the dermis (intradermal)
- Typically used in addition to skin sutures due to lack of strength
- Can be used alone in young, healthy and MEAN animals

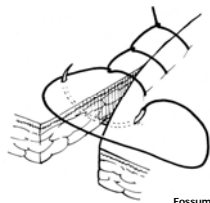


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## Ford Interlocking

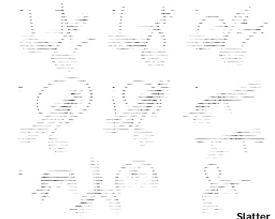
- Modified simple continuous pattern in which each pass is partially "locked" by passing the needle through the loop
- Better apposition than SI
- Requires a lot of suture, and may be difficult to remove
- Used most often in cow skin closure



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## Inverting Suture Patterns

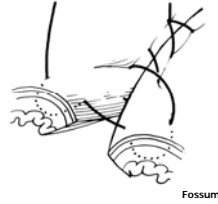
- Interrupted inverting seromuscular (A)
- Lembert (B)
- Halstead (C)
- Cushing (D)
- Connell (E)
- Parker-Kerr (F)
- Purse-string (G)



Slatter

## Lembert

- A variation of the vertical mattress pattern applied in a continuous fashion
- Primarily indicated to close hollow viscera *with large lumen size*
- Begins 8-10 mm from edge, exits 3-4 mm

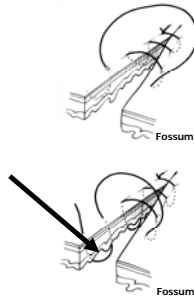


## Lembert



## ~~Cushing and Connell~~

- Create tissue inversion and a watertight seal
- Essentially continuous horizontal mattress sutures with suture advancement parallel to the incision
- Cushing extends only to the submucosa, Connell into the lumen

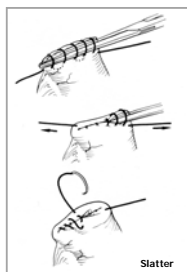


## Cushing



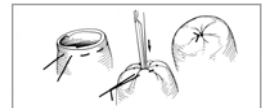
## Parker-Kerr Oversew

- Two layer closure historically utilized to aseptically invert a transected, clamped viscus
- Begins with a Cushing or Connell, followed by an inverting seromuscular pattern



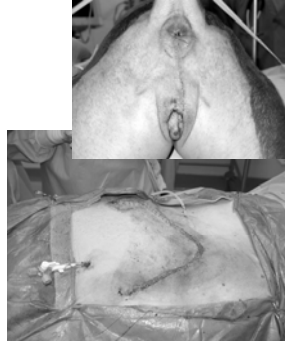
## Purse String

- A series of tissue bites taken adjacent to the tissue edge or orifice until a complete ring is formed
- Essentially a circular Lembert



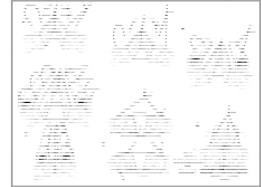
## Purse String

- Used to close the end of a hollow viscus, or to create a watertight seal around a tube



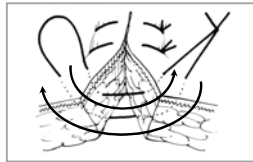
## Tension Relieving Patterns

- Vertical mattress (A)
- Horizontal mattress (B)
- Vertical mattress over a stent (C)
- Far-near-near-far and Far-far-near-near (D)
- Through and through over a stent (E)



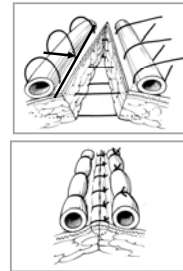
## Vertical Mattress

- Placed by inserting needle 8-10 mm from the tissue edge, exiting 8-10 mm from the other side, reverse order and begin 3-4 mm from tissue edge, exiting 3-4 mm from edge on opposite side



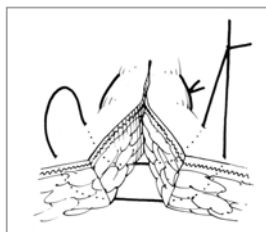
## Vertical Mattress

- Resist tension better than horizontal mattress
- Everts less than horizontal mattress
- More time consuming than horizontal mattress
- Oriented perpendicular or **vertical** with respect to the incision



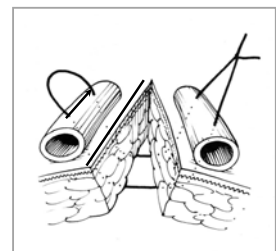
## Horizontal Mattress

- Pass needle across incision, advance 6-8 mm and passes back across the incision
- Used primarily in areas of tissue tension
- May cause tissue eversion

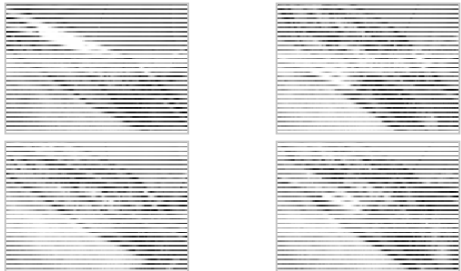


## Horizontal Mattress

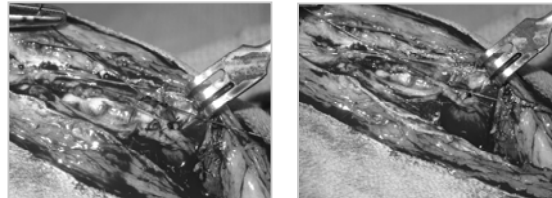
- May cause tissue eversion
- Can be applied over a stent
- Oriented parallel to, or **horizontal** with respect to the incision



## Horizontal Mattress

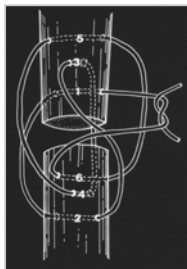


## Horizontal Mattress



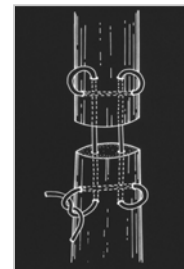
## Three Loop Pulley

- Three loops of suture oriented 120 degrees to the previous loop
- Initial loop is a near-far, next midway, last is far-near
- Higher tensile strength and more resistant to gap formation than the locking loop



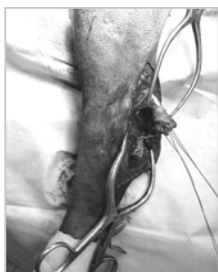
## Locking Loop

- Inserted 1/3 distance from tendon edge, advanced along the tendon, across the gap, looped across the tendon, and passed back 1/3 from opposite edge, looped and tied
- Less bulk in sheathed tendons



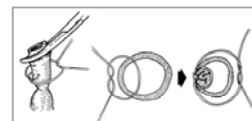
## Locking Loop

- Double locking loop applied to gastrocnemius tendon
- Attached to calcaneus through drill hole

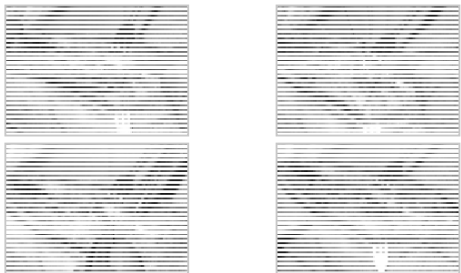


## Transfixation Ligature

- Suture is passed through vessel or pedicle prior to tying of each half
- Transfixation prevents suture dislodgement, recommended on large vessels in which ligature security is critical



Vest Over Pants  
(Mayo Mattress)



Vest Over Pants  
(Mayo Mattress)

