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**DISCLOSURES**

This presentation is provided for informational and educational purposes only and is not intended to endorse any named institution. The presentation and information contained therein may not be appropriate for all countries and/or jurisdictions.

The presenter prepared the information contained in this presentation and the views and opinions expressed within are those of the presenter(s) only and may not reflect the opinion, or guidelines for clinical care of any other person, institution, scientific association, or product manufacturer.

**CURRENTLY WORKING WITH THE FOLLOWING COMPANIES**

OrthoElite Performance & Recovery  
 Gough Surgical PLLC  
 Onesource Medical  
 Midwestern University  
 Smith & Nephew  
 Ethicon  
 Avanos  
 Vumaris

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**TODAY'S AGENDA**

- Wound Assessment  
What do I have?
- Closure techniques  
What do I do?
- Wound containment (Bandages)  
How do I keep it safe?

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**INTRODUCTION**

Tenets of Halsted: Seven basic principles of surgical technique regarding tissue handling

- Gentle handling of tissue
- Meticulous hemostasis
- Preservation of blood supply
- Strict aseptic technique
- Minimum tension on tissues
- Accurate tissue apposition (approximation)
- Obliteration of dead space



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**WHY GOOD CLOSURES & MANAGEMENT ARE IMPORTANT**

- Improve healing
- Prevent infection
- Good Cosmesis

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**WHAT'S THE COST OF INFECTION?**

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**WHAT'S THE COST OF INFECTION?**

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<b>500,000 SURGICAL SITE INFECTIONS EACH YEAR.</b>	<b>8,000 DEATHS EACH YEAR DUE TO SSI</b>	<b>UP TO 60% CONSIDERED PREVENTABLE</b>
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**\$138 SPENT BY MEDICARE ON NON-HEALING AND INFECTED WOUNDS**

References: 1. Wound Care: A Systematic Approach to Wound Management, Understanding the Role of Wound, Slough & Eschar, 2015. 2. Surgical Site Infections: prevention and treatment. Clinical Guidelines 2016. [https://www.aaha.org/~/media/Assets/2016/06/2016-06-20-SSI-Prevention-and-Treatment-Clinical-Guidelines-2016.pdf](#). 3. Yoder JR, Smith DA. High-quality antibiotic and prevention of SSI. Surg Clin North Am. 2012;92(2):267-281.

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**WOUND ASSESSMENT**

What do I have?

**2** Clean & Prep the wound

- Many products
- Surgeon preference



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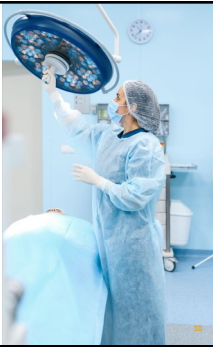
**WOUND ASSESSMENT**

What do I have?

1 Can I see?

- Adjust Bed Height or Plane
- Adjust Patient Position  
- Typically the "out" position
- Adjust Lights

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**WOUND ASSESSMENT**

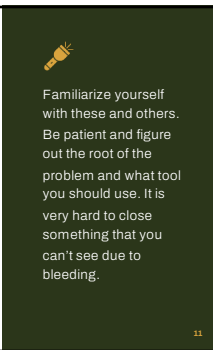
What do I have?

3 Is it bleeding?

- Electrocauterization (Bovie, Aquamantis)
- Topical hemostatic agents  
- Surgicel, Arista, Flowseal, Vistaseal.

Familiarize yourself with these and others. Be patient and figure out the root of the problem and what tool you should use. It is very hard to close something that you can't see due to bleeding.

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**WOUND ASSESSMENT**

What do I have?

4 What type of wound is it?

- Portal
- Linear
- Non-Linear L or T-Shape
- Traumatic

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**WOUND ASSESSMENT**

What do I have?

5 How many layers are there? Different suture products depending on layer of tissue.

Capsule	Subdermal
Tendon	Subcuticular
Muscle/Fascia	Epidermal
Adipose	Typical Joint has 3-6 layers

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**WOUND ASSESSMENT**

What do I have?

6 How are the tissues?

Thick & Healthy?	Adipose tissue as far as the eye can see?
Thin, Friable & Weak?	There's no tissue here, there should be? - Torn or destroyed during surgery - Trauma
Really Thick, Hard, No elasticity? - Scar tissue	Discuss options with surgeon.

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**WOUND ASSESSMENT**

What do I have?

7 Does it approximate easily?

Yes? Great! Let's get started.

No? Re-check patient position  
- remember the cut position. Get there.



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**WOUND ASSESSMENT**

What do I do?

**8** Closure Techniques

- Have a Plan
- Know what you need to execute that plan
- Understand that you can change your mind



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**WOUND ASSESSMENT**

What do I do?

**9** How Long Does it Take Tissues to

- Skin: 1-2 Weeks
- Muscle: 2-4 Weeks
- Tendon: 4-6 Weeks
- Bone: 6-8 Weeks
- Ligaments: 10-12+Weeks



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**SUTURE**

The ideal suture is the smallest possible size needed to produce uniform tensile strength and securely hold the wound approximated for the required time for healing, then be absorbed or removed.

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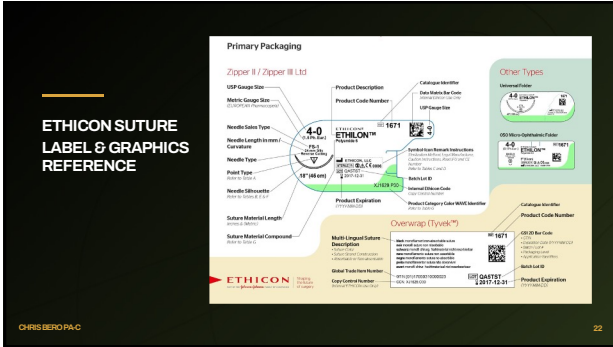
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# CLOSING TECHNIQUES BY INCISION TYPE

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Closing Techniques by Incision Type

## PORTALS

<b>Technique</b>	Generally simple interrupted or "figure 8"
<b>Product</b>	Nylon or Monofilament
<b>Size</b>	Generally 2.0 or 3.0

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Closing Techniques by Incision Type

## LINEAR REPAIR

 <p><b>Arthrotomy/tendon</b></p> <p>"Figure 8" or Knotless runner (Stratafix)</p> <p><b>Product:</b> Vicryl, Ethibond, Stratafix (Monofilament), PDS (Infection)</p> <p><b>Size:</b> 0-1.0</p>	 <p><b>Subdermal</b></p> <p>Simple interrupted (bury knot) or "runner."</p> <p><b>Product:</b> Vicryl, or knotless (Stratafix)</p> <p><b>Size:</b> 2.0</p>	 <p><b>Subcuticular</b></p> <p>"Runner" or Topical (Dermabond, Primes, Staples, Zipline)</p> <p><b>Product:</b> Monocryl, Stratafix Monocryl, above products</p> <p><b>Size:</b> 3.0 or 4.0</p>
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Closing Techniques by Incision Type

## NON-LINEAR REPAIR / TRAUMA

- Approach and product vary based on injury
- Stronger suture
- Generally Monofilament to minimize infection chance
- Or Non-absorbable (Ethibond) for permanent fixation.



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Closing Techniques by Incision Type

## GENERAL STRATEGY

Remember Halsted Tenets

Approximate don't strangulate	Eliminate dead space	Don't do this
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Closing Techniques by Incision Type

## HAND TIE VS INSTRUMENT TIE

**National Institute of Health:**  
 Hand ties are often preferred over instrument ties, as force and tension on the suture can be maintained during tying, resulting in more secure knots. A square knot, which is the current reference standard, has alternating throws placed parallel on top of one another.

**Keep tension!**

**Pull tight IN-LINE with incision**  
 -Come to Sunday lab for more help.



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Closing Techniques by Incision Type

## PICTURES OF CLOSED INCISION



<p><b>Inflammatory phase</b></p> <p>4-6 days</p>	<p><b>Proliferative phase</b></p> <p>6-21 days</p>	<p><b>Remodeling phase</b></p> <p>21 days to 2 years</p>
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# WOUND CONTAINMENT

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**WOUND CONTAINMENT**

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**BANDAGES**

<b>Physical Barrier</b>	<b>Absorb drainage</b>	<b>Provide moisture</b> <small>(optimize proliferative phase)</small>	<b>Accelerate Healing</b> <small>(silver, zinc, collagen, vitamins)</small>
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**WOUND CONTAINMENT**

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**POSITIONING**

<b>Remember patient positioning &amp; needed ROM</b>	<b>Don't cut off flexibility</b>	<b>Place bandage at expected ROM by removal time</b>	<b>Often bandage is at or near 90 degrees (Knee)</b>
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**WOUND CONTAINMENT**

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**CLEAN & DRY**

<b>Clean and dry closure</b>	<b>Clean and dry total area needed for bandage.</b>	<b>Did you dry the whole area needed?</b>
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**WOUND CONTAINMENT**

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**REMEMBER!**

Remember that patient swelling will fluctuate over time in early phases

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**Bandage placement**



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Wound Containment

**TYPES OF BANDAGES**



**Prineo, Zipline**  
Not exactly a bandage, but functions as one



**Aquacel, Mepilex, Jumpstart**  
Imbued with agent to promote healing



**Negative pressure wound therapy**  
PICO, Provena

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Wound Containment

## THINK ABOUT YOUR PATIENT'S SKIN TYPE AND FRAILITY

- May cause deviation from your "standard" product
- Wrong product on patient may cause blistering and ulceration



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Wound Containment

## BANDAGE REMOVAL TIME

 <p><b>Basic bandages</b></p> <p>Remove: 1-3 days</p>	 <p><b>Imbued or Specialty bandages</b></p> <p>Remove: 5-10 days</p>	 <p><b>NPWT</b></p> <p>Remove: 1-2 weeks</p>
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Wound Containment

## SUTURE ABSCESS

- They happen
- Can be caused by braided suture (Vicryl)
- But can also be immune response of patient "spitting" suture before it has time to dissolve
- Generally treat patient with oral antibiotic.
- +/- surgical removal vs let body do it's thing



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Wound Containment

## DRAINAGE

<b>This is a bad thing!</b>	If something can get out, something can get in
Deep tract vs superficial	Serosanguinous vs pus
Take patient health into consideration	+/- Antibiotics. Discuss with surgeon
May respond to glue, suture, or NPWT	May need I&D. Discuss with surgeon



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Wound Containment

## DEHISCENCE

Spontaneous vs traumatic
Spontaneous generally due to closure failure <ul style="list-style-type: none"> <li>- Was your strategy flawed?</li> </ul>
Traumatic (fall, etc.) can happen
Almost always a trip to the OR <ul style="list-style-type: none"> <li>- Try to remove old suture during procedure</li> <li>- Close with more secure product due to compromised tissues.</li> </ul>



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Wound Containment

## BLISTERING

<b>OUT OF CONTROL SWELLING OR FLUID FLUCTUATION</b>	<b>FRIABLE OR FRAIL SKIN</b>	<b>POOR BANDAGE PLACEMENT IN SURGERY</b>	<b>WET BANDAGE</b>
Patient education on swelling management	Your fault (poor choice in bandage)	Your fault	Patient education issue or poor compliance

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**IN SUMMARY**



What do I have?      What do I do?      How do I keep it safe?

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**SINCERELY THANK YOU FOR YOUR TIME AND ATTENTION!**

CHRISBERO PAC'S FOUNDER

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