Mastery of NPWT:

Innovations, Technologies, and Transitioning Care across Settings

Supported by an educational grant from Solventum, Medical Surgical Business

Faculty

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Faculty Disclosures

- **Karen Bauer, DNP, APRN-FNP, CWS, FAAWC**
  Advisory Board: Urgo Medical NA; Consultant: Urgo Medical NA; Solventum, Medical Surgical Business; Speakers Bureau: Urgo Medical NA; Solventum, Medical Surgical Business
- **Kara Couch, MS, CRNP, CWCN-AP, FAAWC**
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- **Devinder Singh, MD**
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Disclosures

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Housekeeping

Learning Objectives

- Examine the evolution of negative pressure wound therapy (NPWT) and identify the latest advancements shaping current clinical practice
- Differentiate among NPWT technologies and apply an evidence-based, algorithmic approach to selecting appropriate therapies based on wound characteristics, patient needs, and care setting transitions
- Evaluate the science and clinical utility of novel peel-and-place dressings, including identification of wound types best suited for this technology
- Demonstrate advanced application techniques for NPWT, including instillation therapy, incision management, and the use of hybrid drapes
- Describe effective care transition strategies for NPWT with a focus on optimizing outcomes using portable, adaptable technologies across acute and post-acute settings
- Analyze real-world case scenarios to explore the NPWT toolkit and implement step-down therapy strategies that support wound progression and closure

NPWT = negative pressure wound therapy.

Evolution and Latest Advances Shaping Clinical Practice

Kara Couch, MS, CRNP, CWCN-AP, FAAWC
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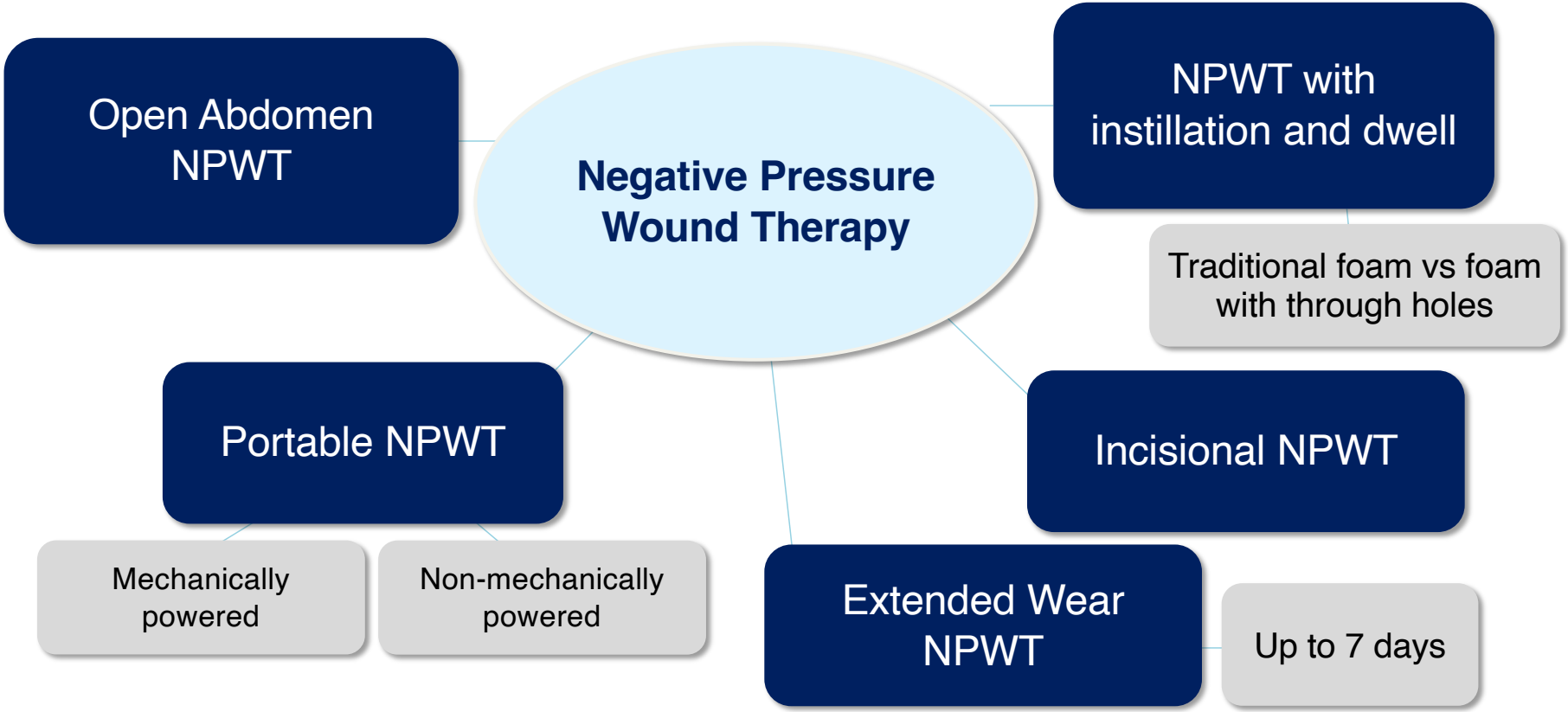
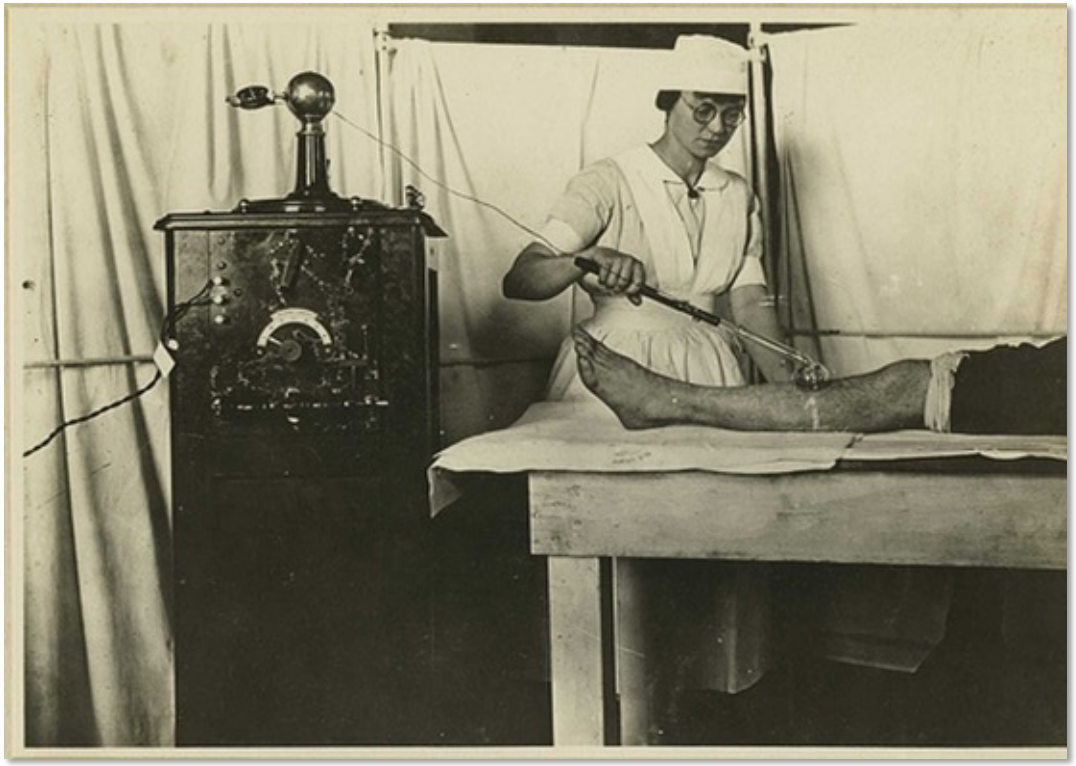
Wound Management with NPWT



History of NPWT

- The idea of NPWT is not new in wound care
- There are descriptions of NPWT in the Roman era
- NPWT officially came to medical professionals in the mid-1990s
- There are now a variety of types and options for NPWT



Roman Era

- Medical personnel applied direct suction with their mouths to deep wounds from battle or to poisonous wounds
- Cupping, using glass jars, was used to “draw out” fluid

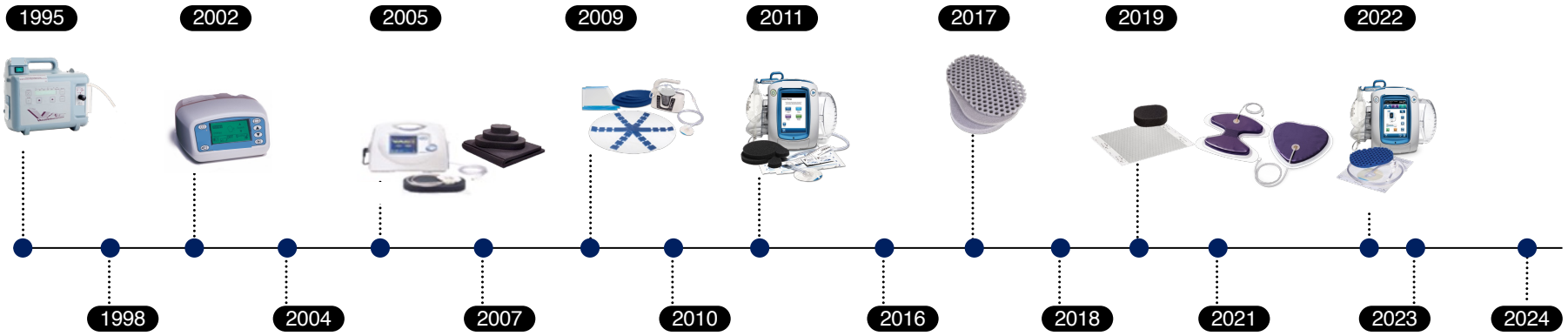
18th Century

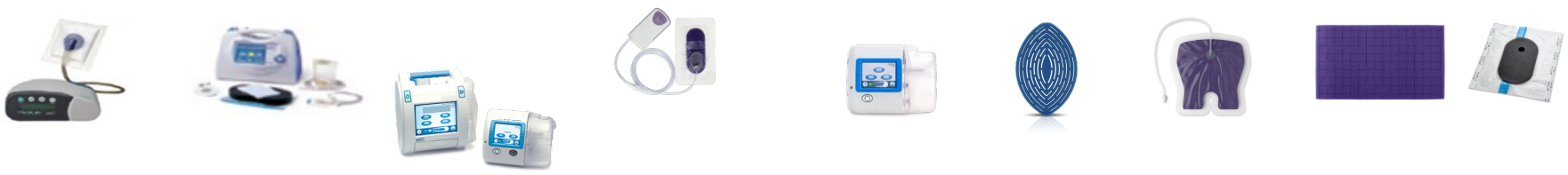
- French surgeon Dr. Dominique Anel created a “wound sucker,” which was a suction syringe with a triangular tip to replace human “lip service”

20th Century

- Soviet surgeon Dr. Nail Bagautdinov began using a negative pressure unit with foam dressings in 1985 to treat infected wounds
- Modern NPWT systems came into being in the 1990s with the use of polyurethane foam and a mechanical vacuum pioneered by Drs. Louis Argenta and Michael Morykwas of Wake Forest University School of Medicine

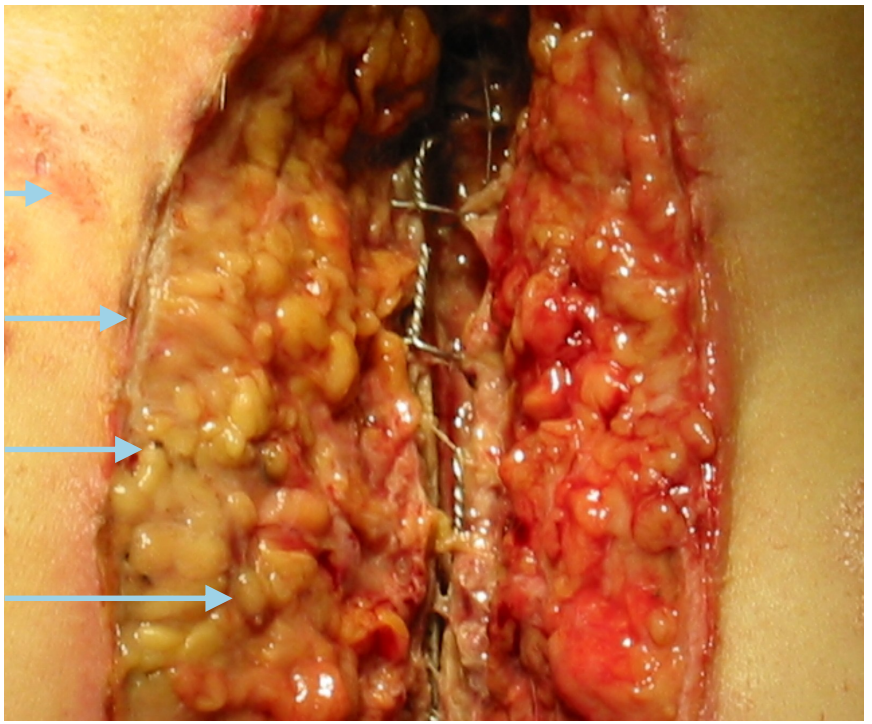
Standing Out Through Innovation





Common Components of Compromised Wound Healing

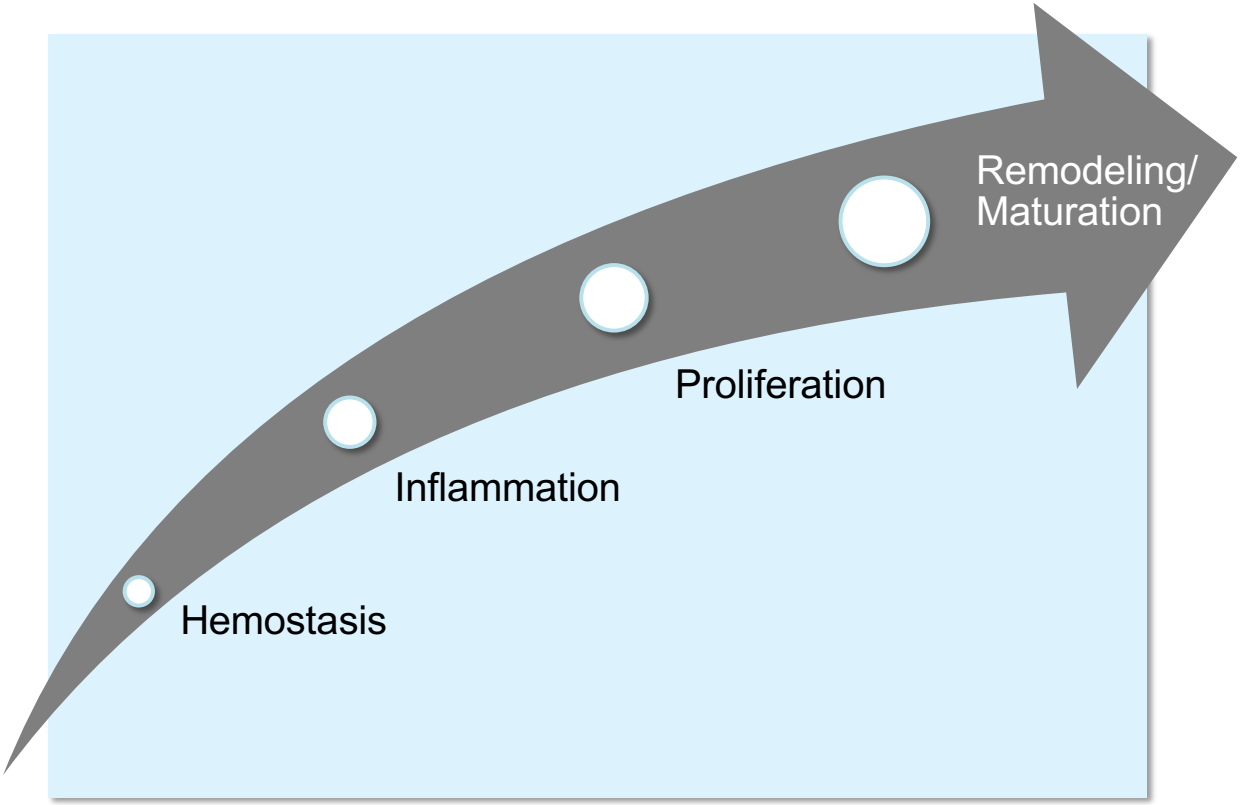
- Exudate
- Matrix metalloproteinases (MMPs)
- Pathogens
- Edema



MMP = matrix metalloproteinase.
Lobmann R, et al. *Diabetes Care*. 2005;28(2):461-471.

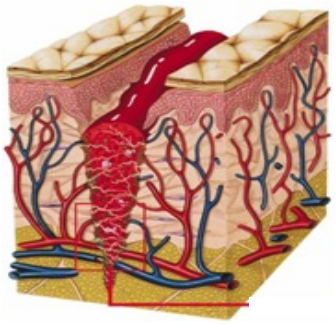
Compromised Wound Healing = “Stuck” Between Phases

- Acute Wounds
  - Compromised systems
  - Environmental issues
- Chronic Wounds
  - High level of proteases
  - Degrading matrix

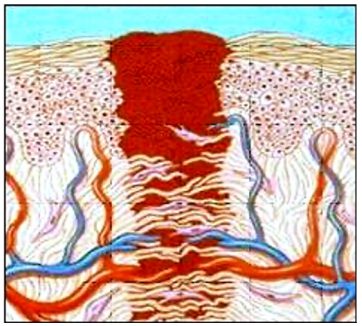


Chronic Wounds Are "Stuck" in the Inflammatory Phase of Wound Healing

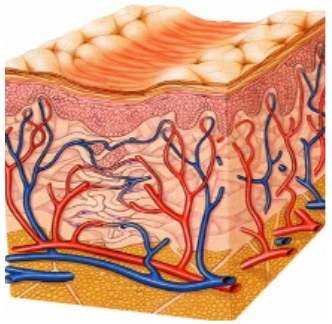
Acute wound



Sequential phases of healing

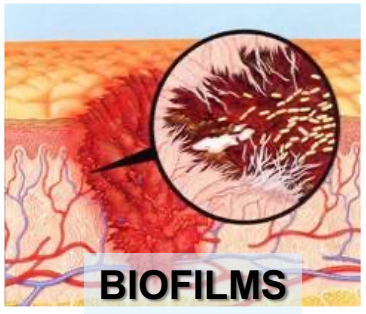


Healed wound

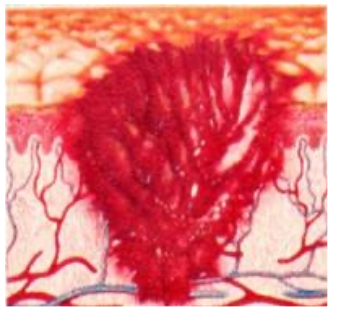


Sequential phases of healing interrupted

Chronic inflammation

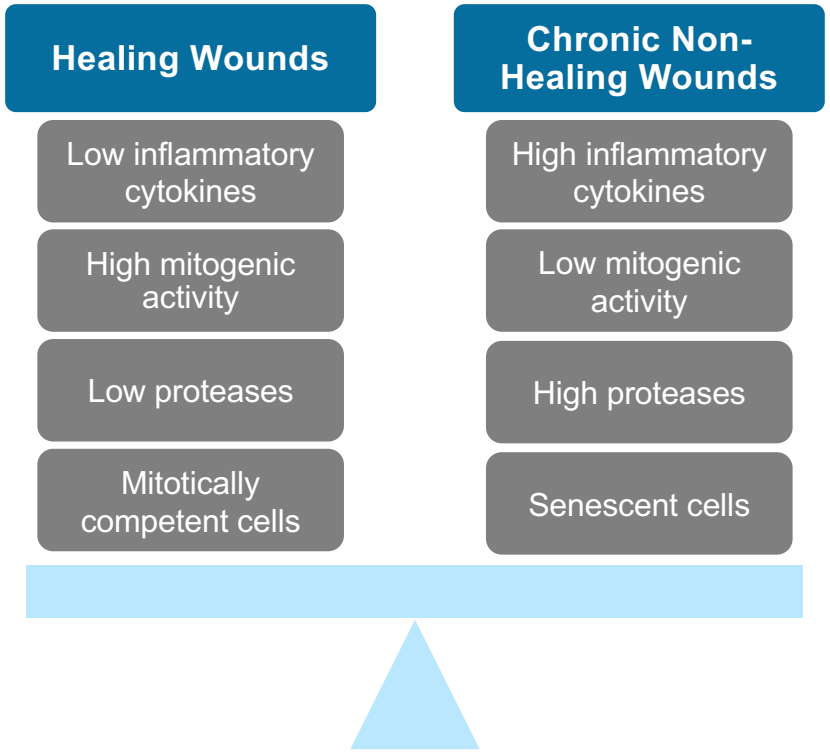


Chronic wound



Courtesy G. Schultz.

Differences Between Healing and Non-Healing Chronic Wounds



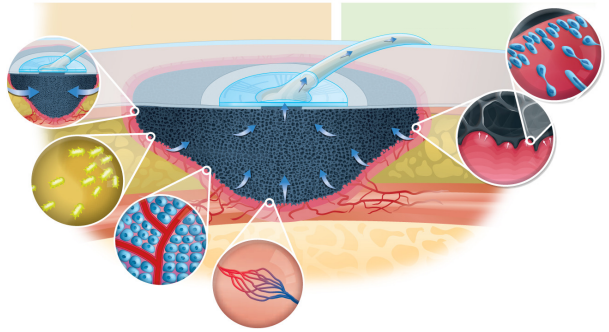
Adapted from Lobmann R, et al. *Diabetes Care*. 2005;28(2):461-471.

It Starts with the Wound Healing Basics

Traditional NPWT Science

Macrostrain

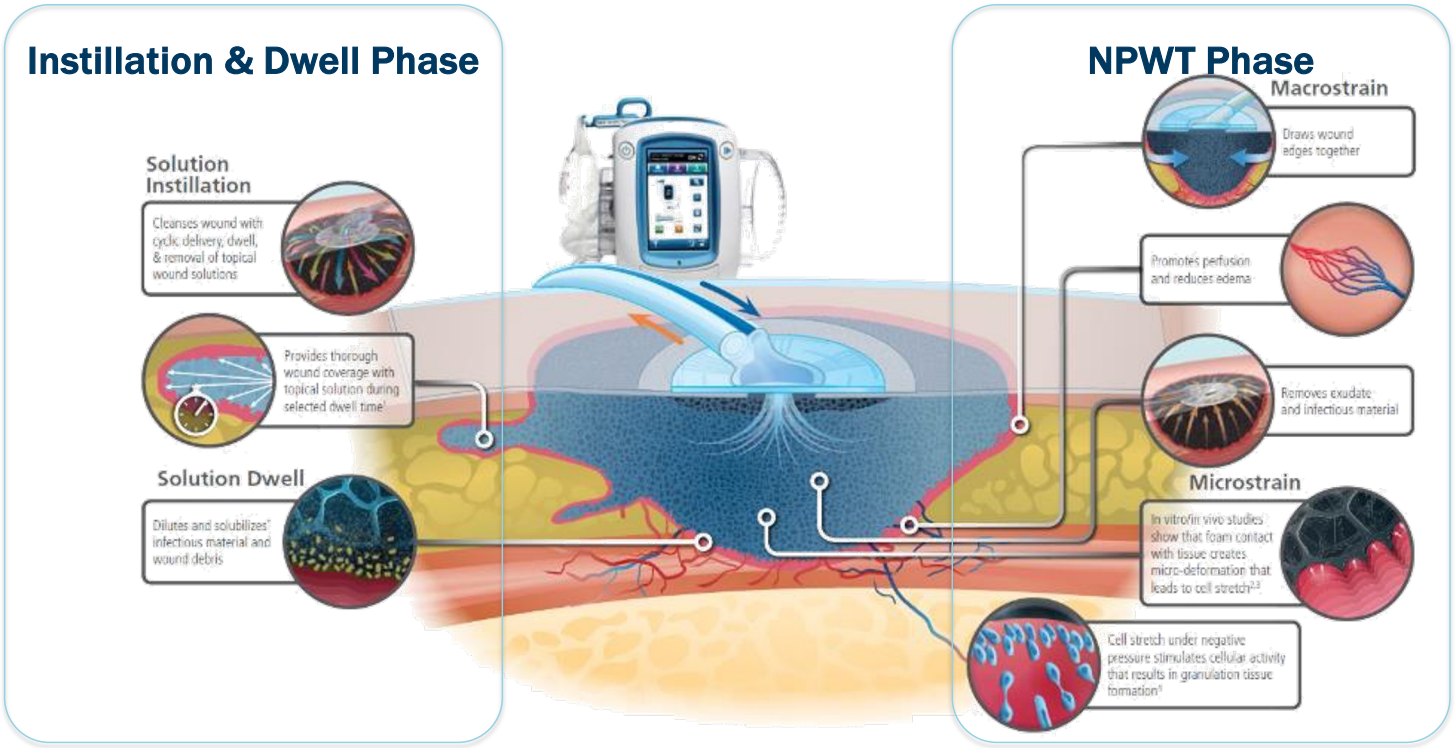
- Draws wound edges together
- Removes infectious material
- Reduces edema
- Promotes perfusion



Microstrain

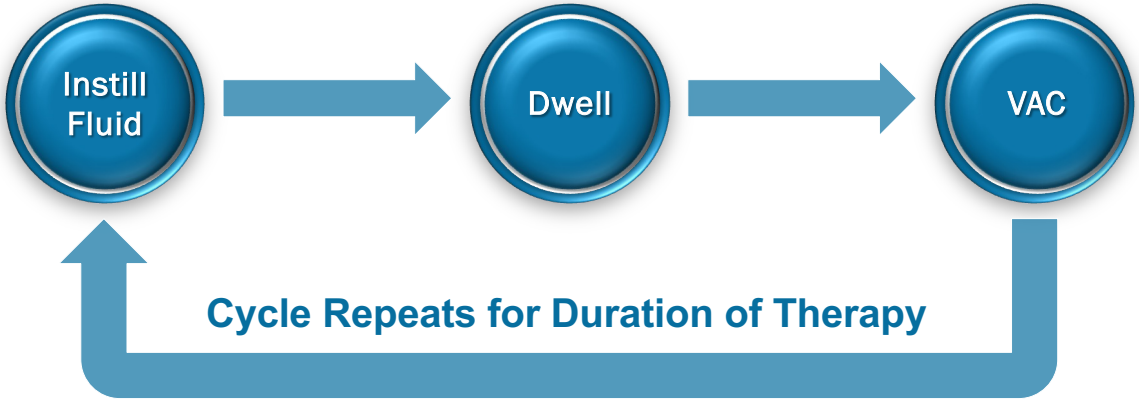
- In vitro/in vivo studies show that foam contact with tissue under negative pressure creates tissue micro-deformation that leads to cell stretch
- In vitro studies show that cell stretch under negative pressure stimulates cellular activity that results in granulation tissue formation

NPWT with Instillation and Dwell (NPWT or NPWTi-d)



Rycerz AM, et al. *Int Wound J.* 2013;10(2):214-220. Saxena V, et al. *Plast Reconstr Surg.* 2004;114(5):1086-1096. McNulty AK, et al. *Wound Repair Regen.* 2009;17(2):192-199. McNulty AK, et al. *Wound Repair Regen.* 2007;15(6):838-846.

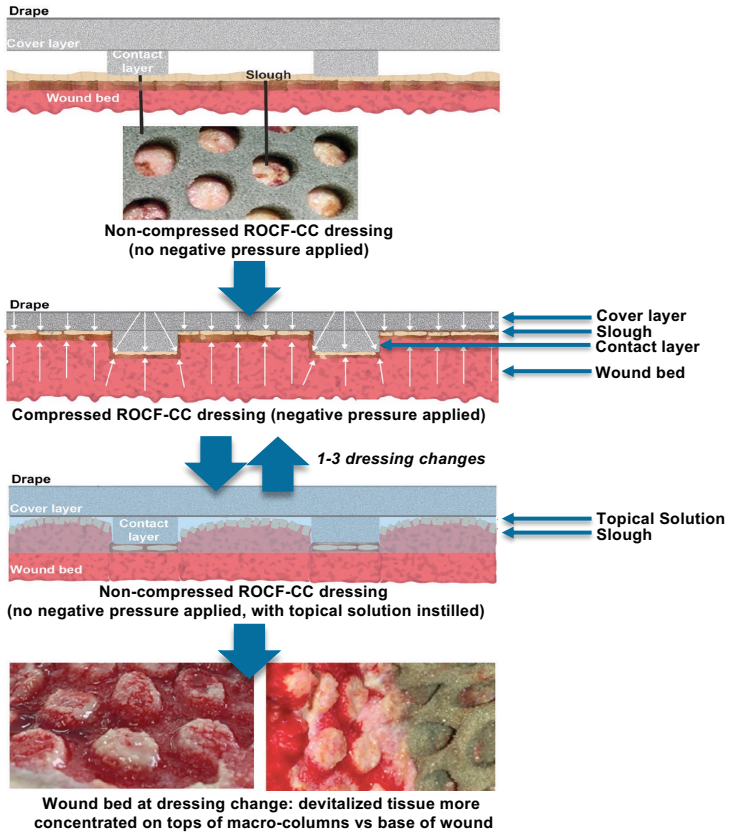
Cleanse, Manage, and Prepare the Wound



Video used with permission and courtesy of Ralph Napolitano, DPM

Proposed Mechanism of Wound Cleansing with ROCF-CC

"Cyclic delivery of the topical solution, as well as dwell time and removal of the solution, is hypothesized to produce a mechanical hydrodynamic force on the stressed wound bed, disrupting and helping to soften and solubilize thick exudate and loosen wound debris for removal during NPWT. The presence of larger openings or through holes in the dressing may then accommodate easier passage of thick, fibrinous materials away from the wound bed."



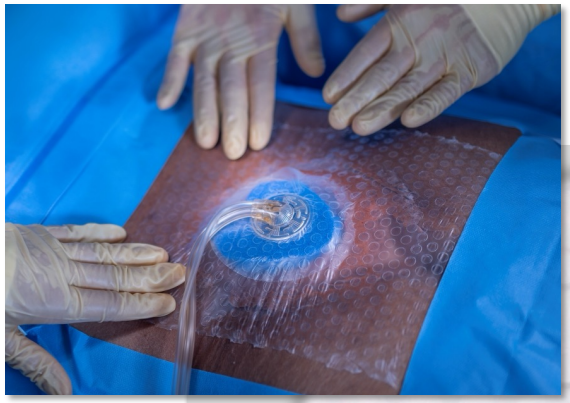
ROCF-CC = reticulated open-cell foam with through holes.

Kim PJ, et al. *Wounds.* 2018;30(3 suppl):S1-S17.

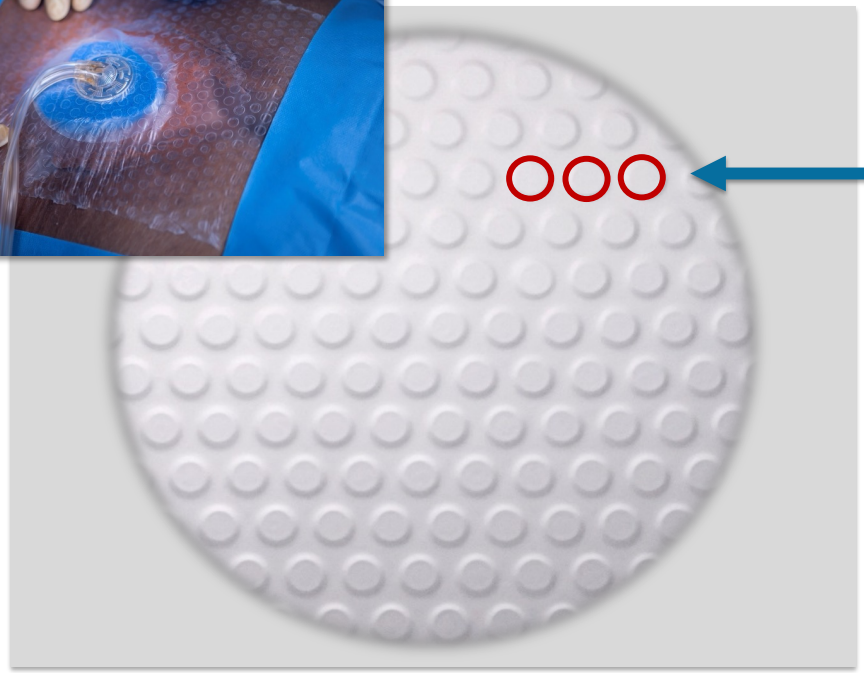
Updated Indication for Use (U.S. Only)

- NPWTi-d with NPWTi-d dressing provides hydromechanical removal of infectious materials, non-viable tissue, and wound debris, which reduces the number of surgical debridements required while promoting granulation tissue formation, creating an environment that promotes wound healing

Silicone-Acrylic Hybrid Drape



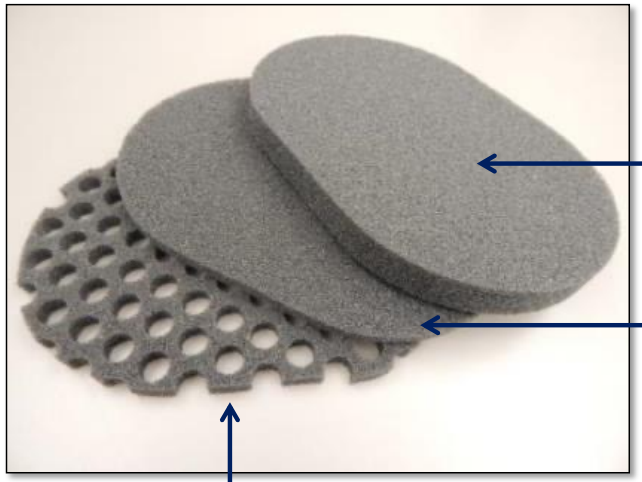
- FDA-cleared hybrid drape for NPWT and NPWTi-d



Acrylic (inside the circles) ensures a tight seal to protect wounds on different anatomical locations

Silicone (outside the circles) allows for repositioning upon initial application, easy handling, and gentle removal during dressing changes

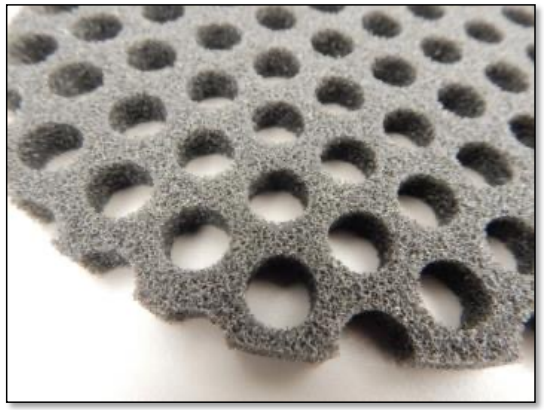
NPWTi-d Dressing



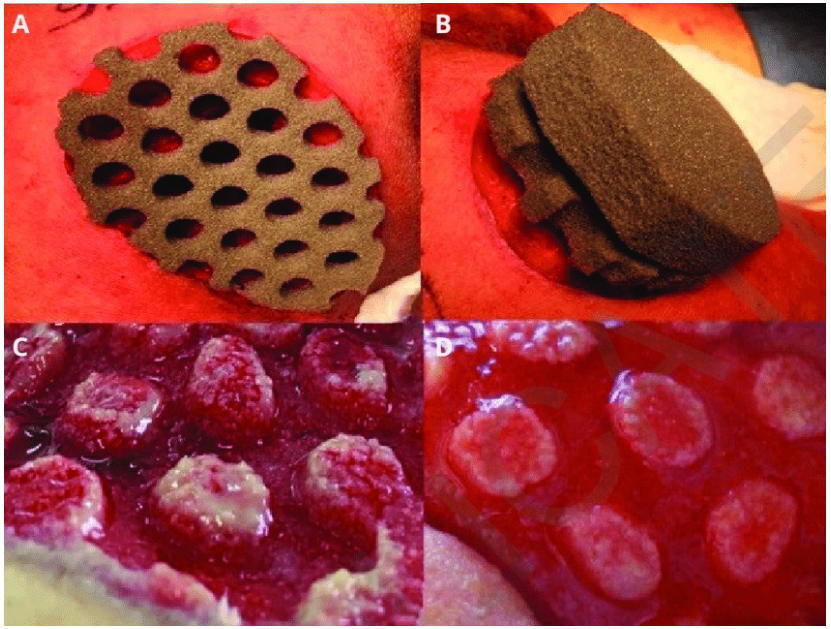
Thick cover layer
(1.6cm thickness)

Thin cover layer
(0.8cm thickness)

Contact layer
- 0.8cm thickness
- 1.0cm circular holes
- 5mm spacing



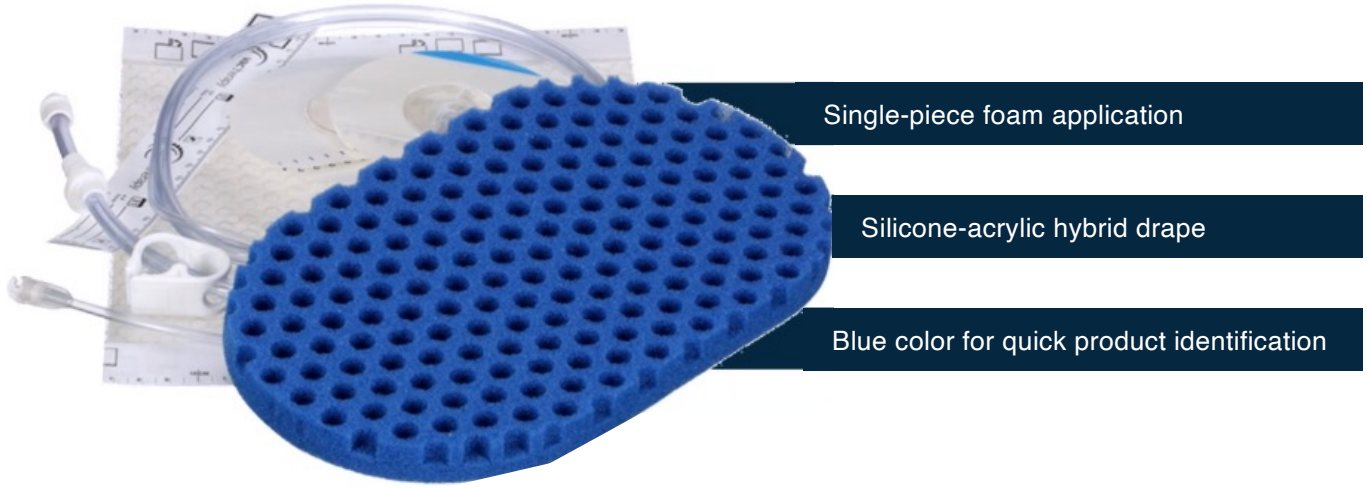
Mechanism of Action



Reticulated open-cell foam dressing with through holes (ROCF-CC) and development of macro-columns. (A) The ROCF-CC contact layer in wound; (B) cover layer applied over contact layer; (C) side view of macrocolumns formed within the holes of the dressing; and (D) top view of macrocolumns.

Kim PJ, et al. *Wounds.* 2018;30(3 suppl):S1-S17.

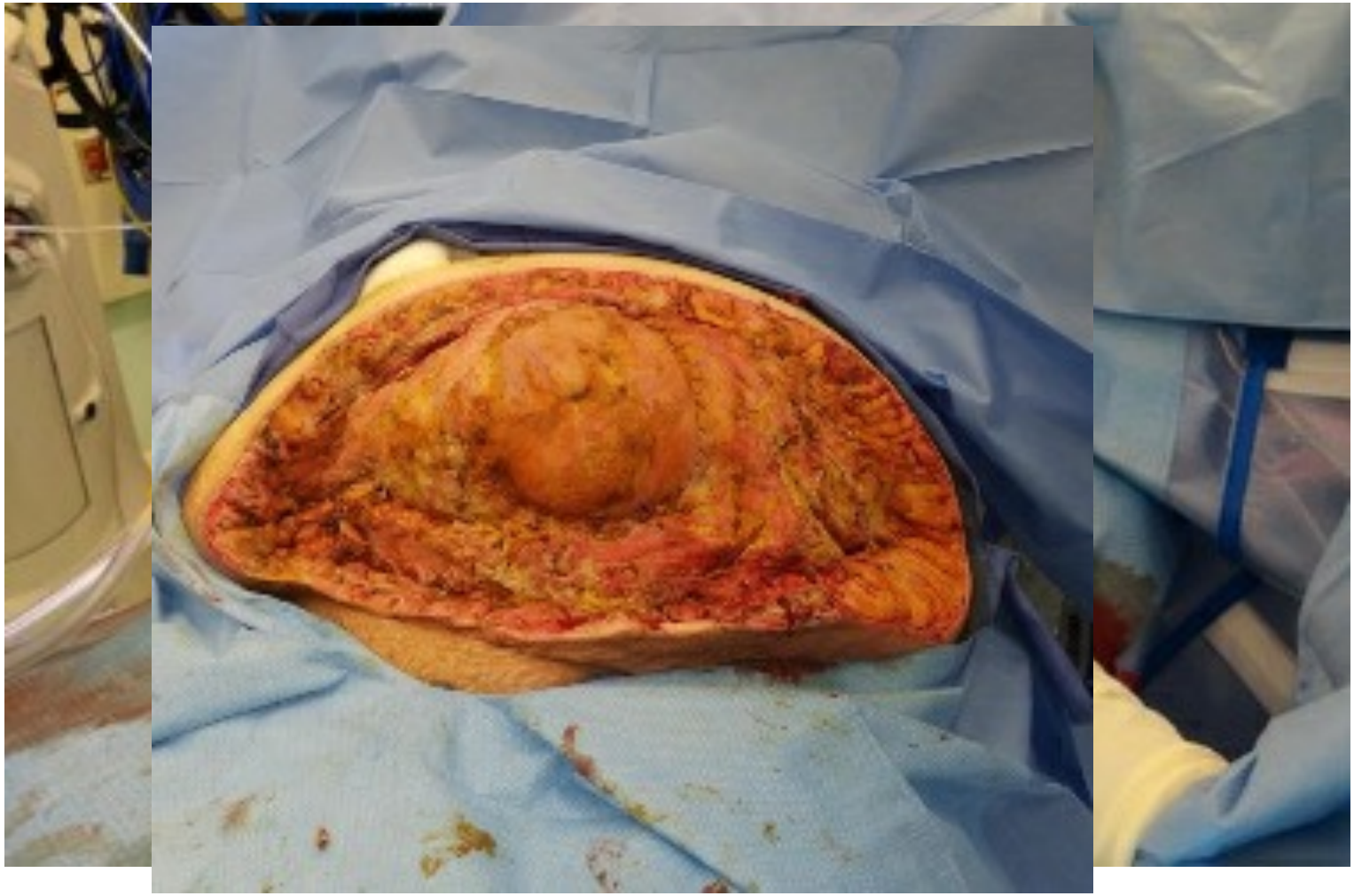
How Does This Dressing Differ From Previous NPWTi-d Dressings?



No-sting barrier film is not included in the dressing kit due to the skin-friendly adhesive properties of the silicone-acrylic hybrid drape

Examples

Open Abdomen NPWT (OA-NPWT)



OA-NPWT Dressing

Negative Pressure Unit

- Compatible NPWT unit applies negative pressure

NOTE: Not for use with instillation therapy

Drape

- Provides closed system to help isolate and protect abdominal contents from external environment

Pad

- Facilitates fluid removal from dressing
- Provides monitoring of negative pressure during therapy

Fenestrated Visceral Protective Layer

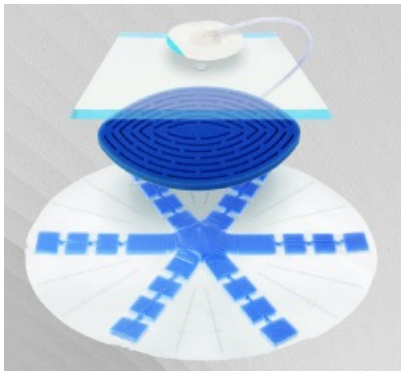
- Manifolds negative pressure throughout abdomen
- Enhances fluid removal from paracolic gutters and allows rapid access for re-entry
- Placement does not require sutures, which minimizes fascial damage
- Provides separation between abdominal wall and viscera; protects abdominal contents

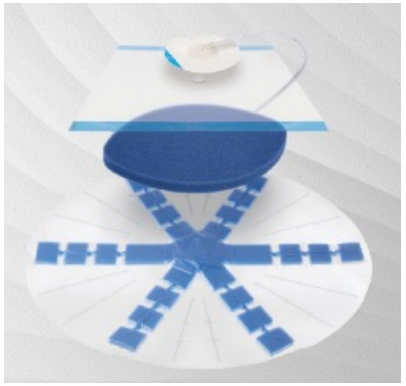
Perforated Foam

- Promotes active fluid removal
- Provides medial tension to help minimize fascial retraction and loss of domain

OA-NPWT Dressing

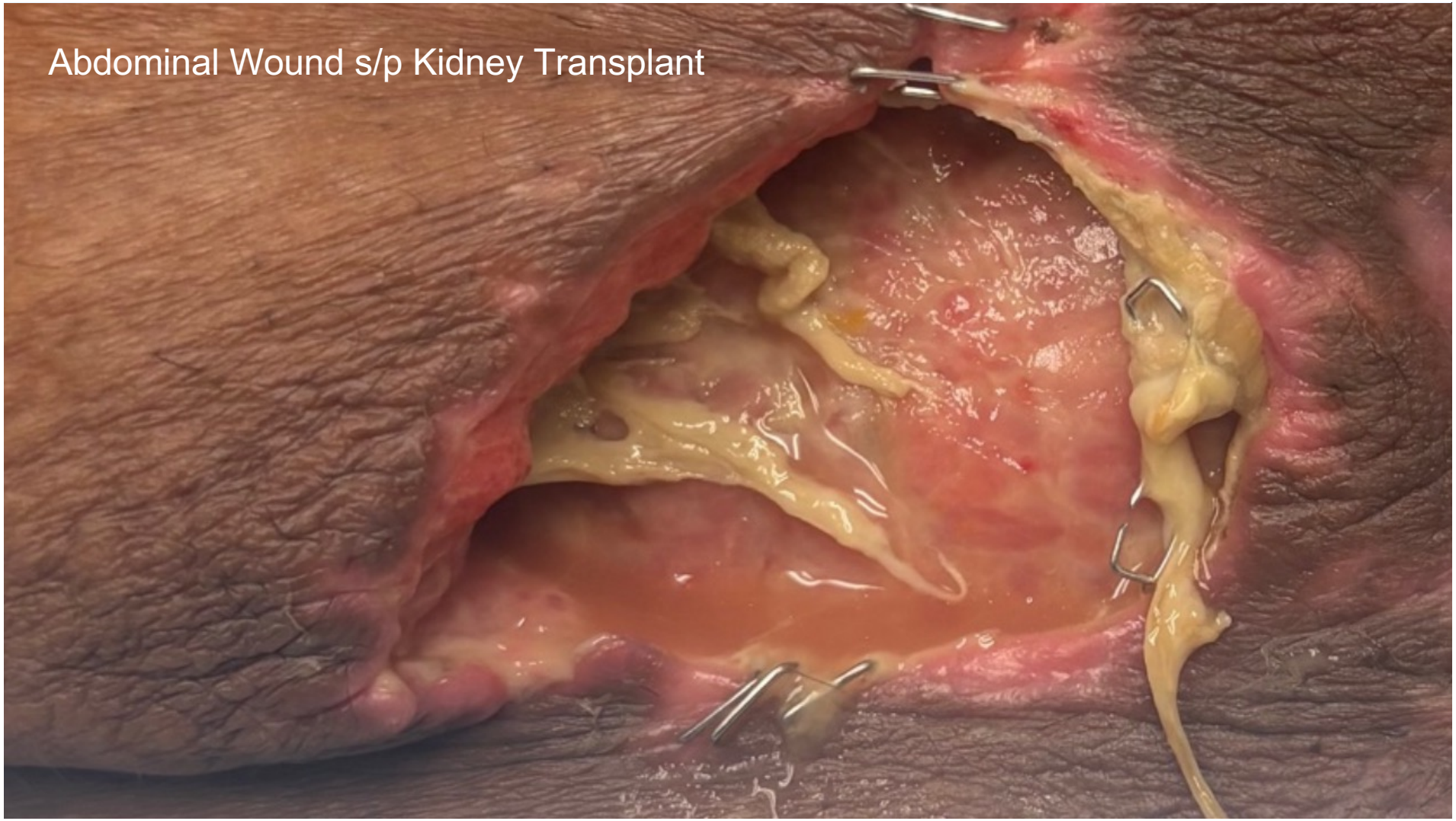
- For temporary bridging of abdominal wall openings where primary closure is not possible or repeat abdominal entries are necessary
- Intended use: Open abdominal wounds with exposed viscera (including abdominal compartment syndrome)
- Intended care setting: Closely monitored area within acute care hospital, such as the ICU
  - OA-NPWT dressing is most often applied in the OR



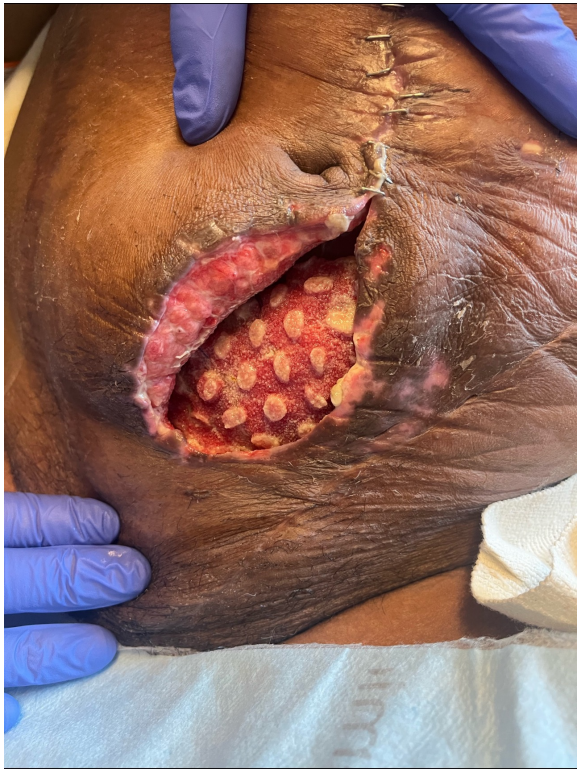


Abdominal Wound s/p Kidney Transplant

- 56y Female
- s/p Kidney transplant (4 wks prior)
- Wound opened in surgeon's office
- Delay of several days to get admitted
- CT scan – no deep abscess


Abdominal Wound s/p Kidney Transplant

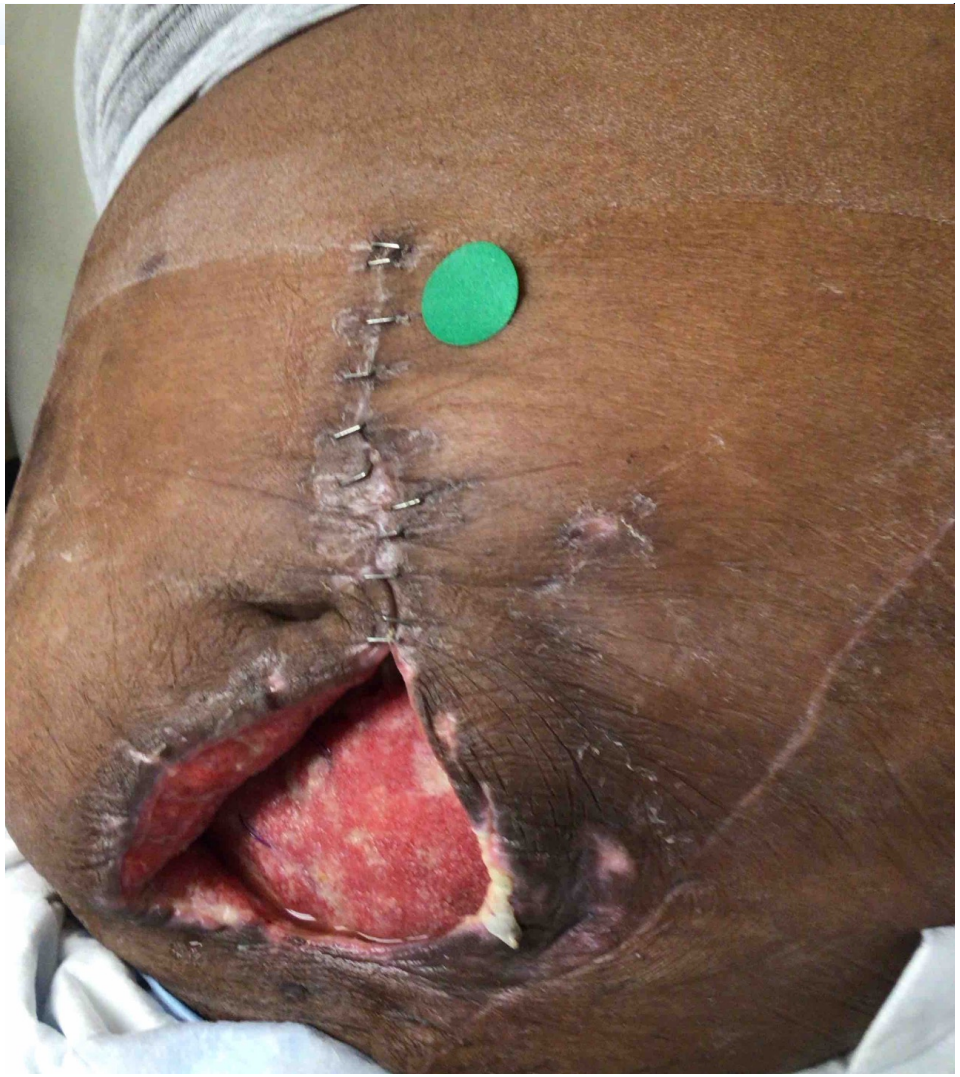
Abdominal Wound s/p Kidney Transplant



- 3 days of NPWTi-d
- Transitioned to NPWT (black foam) for home
- Once undermined area lessened, will transition to NPWT peel and place dressing

Abdominal Wound s/p Kidney Transplant

- 3 days of ROCF
- Home using portable device
- Significant undermining remains



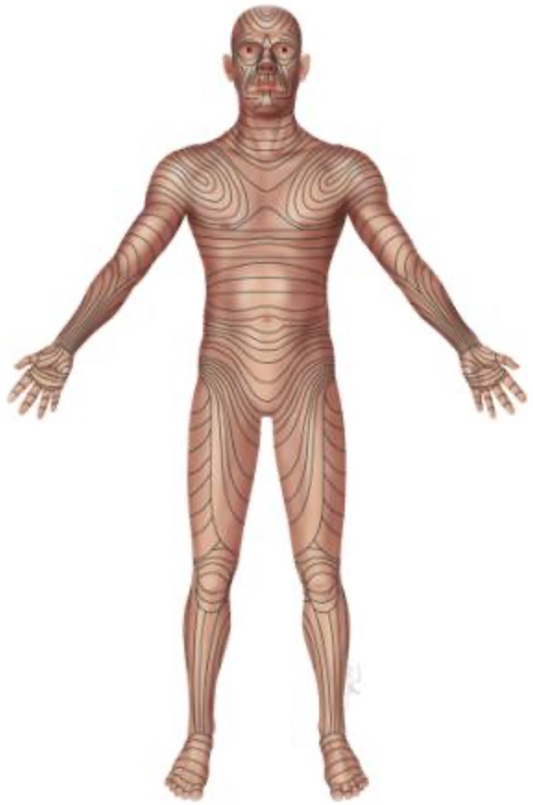
Clinical Pearls

- Always ensure that there is foam under the trac pad
- Adjuncts such as ostomy paste, rings, and silicone gel are very helpful for seals, nooks, and crannies
- Use GOOD scissors for trimming foam

Evolution and Latest Advances Shaping Clinical Practice

Devinder Singh, MD
Chief, Professor, and Program Director, Division of Plastic Surgery
University of Miami and Jackson Health Systems
Miami, FL

Skin Is Naturally Under Tension



- The natural tension from Langer lines causes incisional edges to retract
- This internal tension within the skin opposes the closure of incisions
- In regions of high movement and in obese patients, tension is increased, and sutures or staples experience increased stress

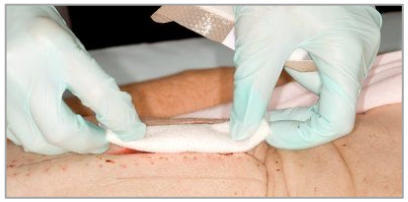
Closure under Tension

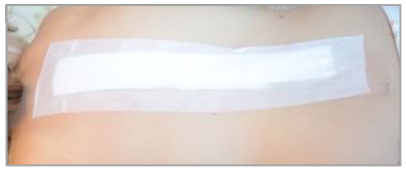
Standard closure techniques for surgical incisions

- Sutures
- Staples
- Tissue adhesives
- Tapes
- Combination of the above

Adjunctive therapies used over closure techniques

- Gauze dressings
- Hydrocolloids
- Growth factors
- Cultured skin
- Amnion
- NPWT





Easterlin B, et al. *Wounds*. 2007;19(12):331-333. Steichen FM, et al. *Br J Surg*. 1973;60(3):191-197. Reece TB, et al. *Am J Surg*. 2001;182(2 Suppl):40S-44S. Coulthard P, et al. *Cochrane Database Syst Rev*. 2010;5:CD004287. Atkinson JA, et al. *Plast Reconstr Surg*. 2005;116(6):1648-1656. Holm C, et al. *Eur J Surg*. 1998;164(3):179-183. Wu L, et al. *Surgery*. 1995;117(5):570-576. Veves A, et al. *Diabetes Care*. 2001;24(2):290-295. Ennis WJ, et al. *Ostomy Wound Manage*. 2005;51(8):24-39. Stannard JP, et al. *J Trauma*. 2006;60(6):1301-1306. Stannard JP, et al. *J Orthop Trauma*. 2012;26(1):37-42. Atkins BZ, et al. *Surg Innov*. 2009;16(2):140-146. Armstrong DG, et al. *Lancet*. 2005;366(9498):1704-1710. Blume PA. *Diabetes Care*. 2008;31(10):e77.

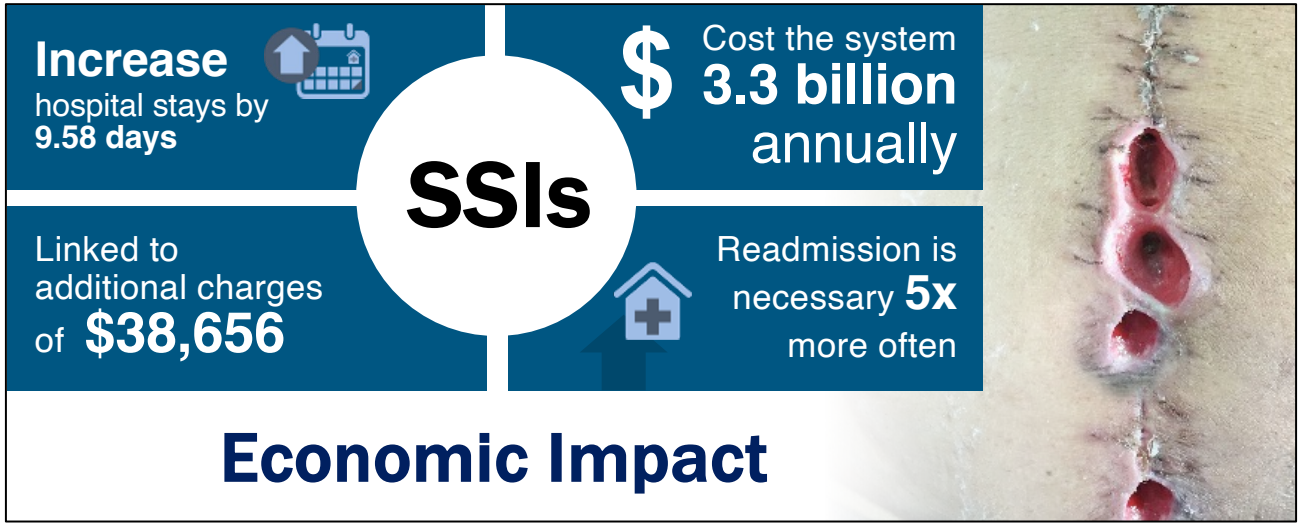
Risk Factors That May Compromise Healing

- Age >65 yrs
- Wound infection
- Pulmonary disease
- Peripheral vascular disease
- Ostomies
- Hypoalbuminemia
- Systemic infection
- Obesity
- Uremia
- Ascites
- Malignancy
- Hypertension
- Length and depth of incision
- Anemia
- Jaundice
- Diabetes – poorly controlled
- Nicotine use
- Type of injury
- Radiation therapy
- Steroid use
- Malnutrition

Riou JP, et al. *Am J Surg*. 1992;163(3):324-330. Wilson JA, et al. *Adv Skin Wound Care*. 2004;17(8):426-435. Abbas SM, et al. *ANZ J Surg*. 2009;79(4):247-250.

The High Stakes of SSIs

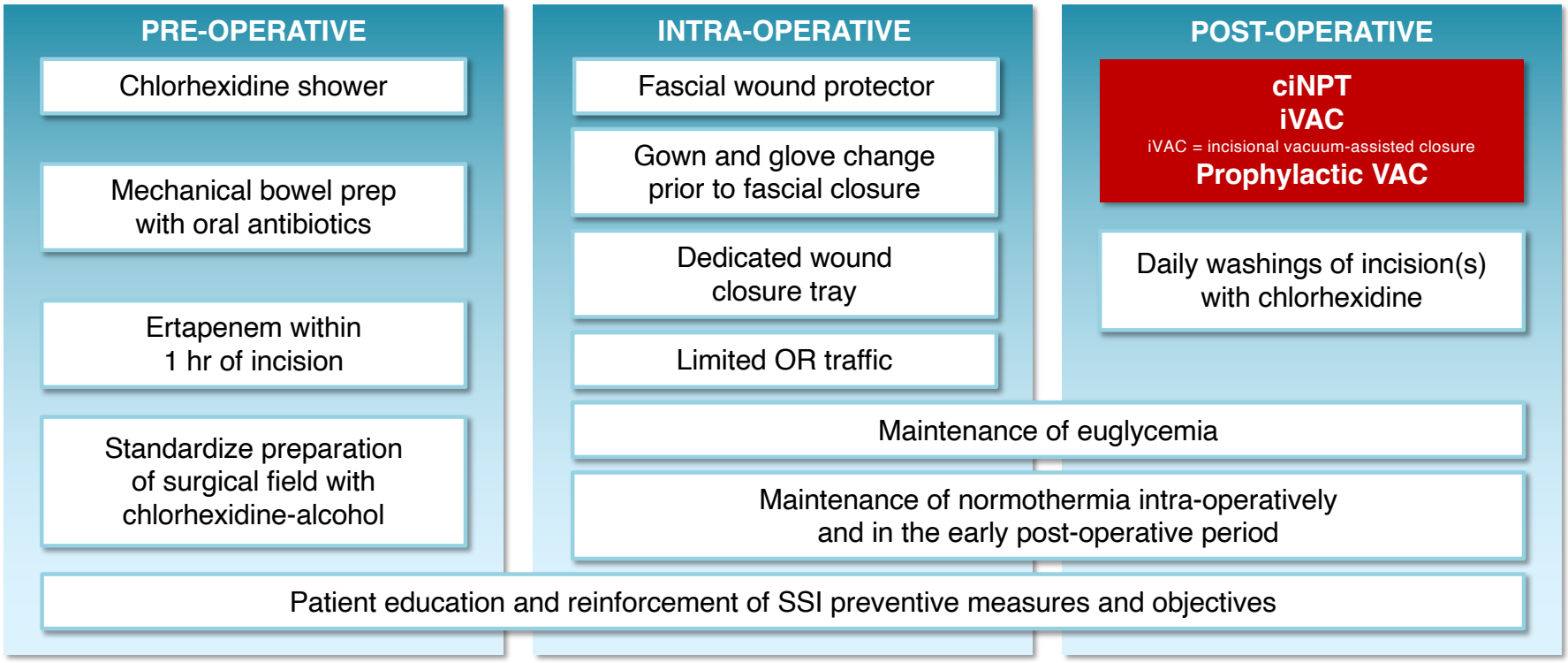
21.8% of hospital-acquired infections (HAIs) are **surgical site infections**



HAI = hospital-acquired infection.

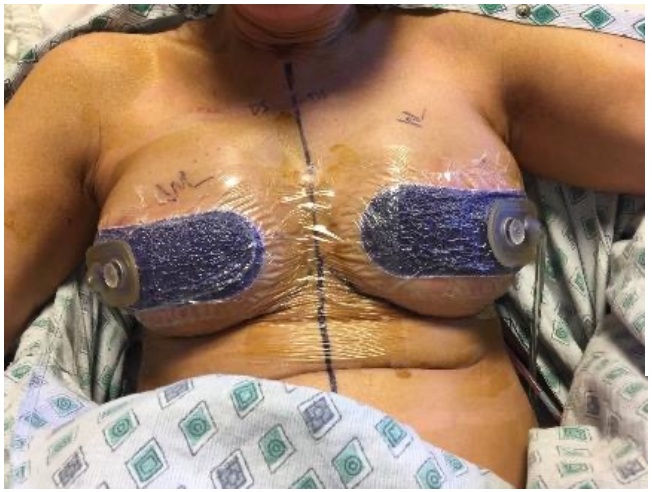
Magill SS, et al. *NEJM*. 2014;370(13):1198-1208. Zhan C, et al. *JAMA*. 2003;290(14):1868-1874. Zimlichman E, et al. *JAMA Intern Med*. 2013;173(22):2039-2046. Urban JA. *Surg Infect (Larchmt)*. 2006;7(Suppl 1): S19-S22.

Is There Anything Else We Can Do?



Keenan JE, et al. *J Am Coll Surg*. 2015;221(2):404-414.e1.

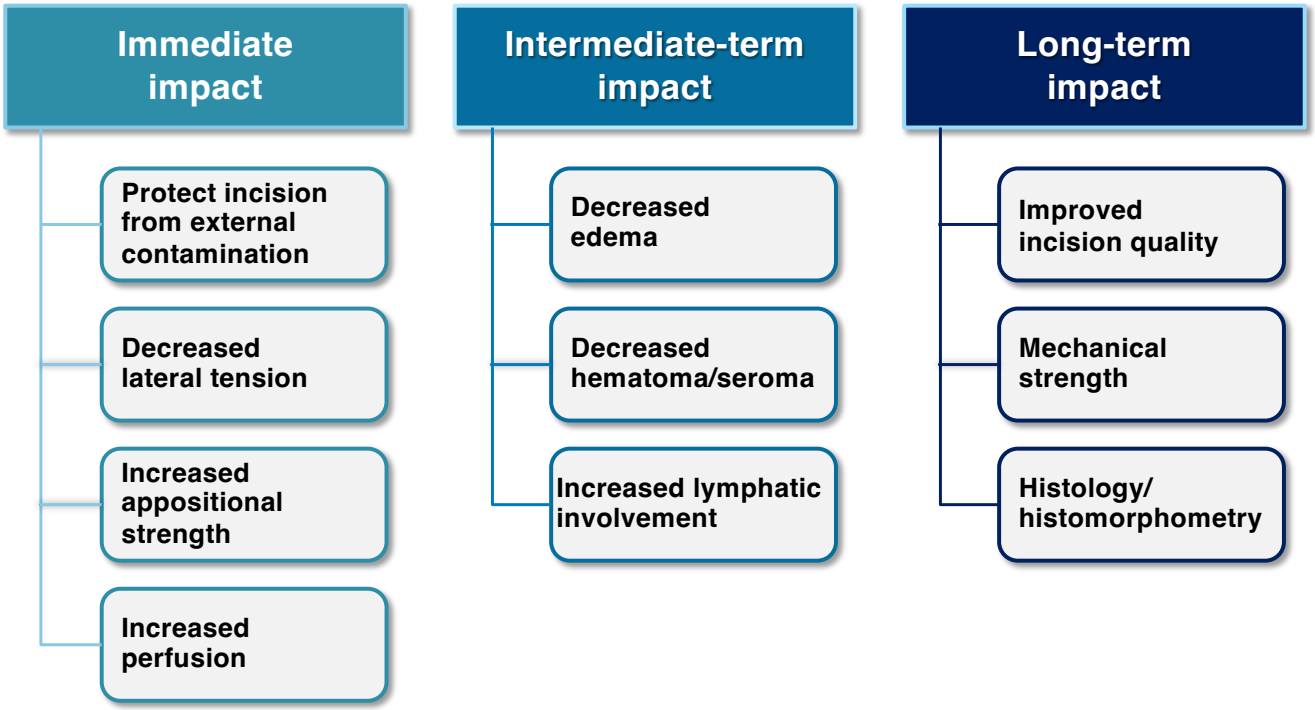
Can a Dressing Improve Outcomes?



Customizable dressing	Peel and place dressing – 35cm	Peel and place dressing – 20cm	Peel and place dressing – 13cm
For linear, non-linear, and intersecting incisions up to 90cm in length	For linear incisions up to 35cm in length	For linear incisions up to 20cm in length	For linear incisions up to 13cm in length

Summary of Scientific Evidence

Computer, Bench, Animal Studies, Clinical



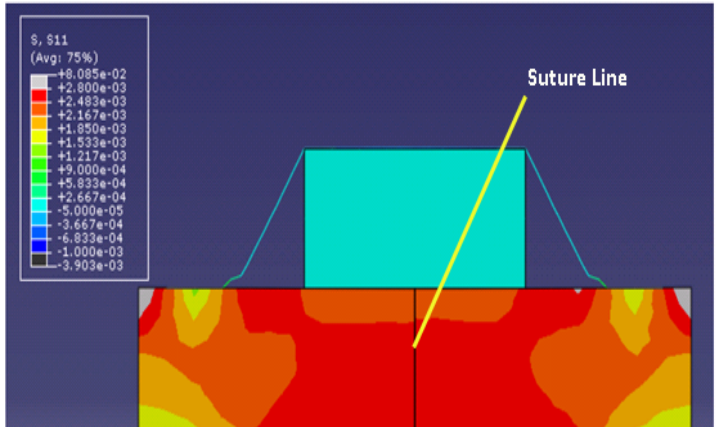
How Does iNPWT Work?

1. Removes fluid through the incisional interspaces that may otherwise percolate and work to break down the incision
2. Acts like a **splint** for the skin to help resist distracting forces on the incision line
3. Protects the incision from external contamination for the duration of therapy

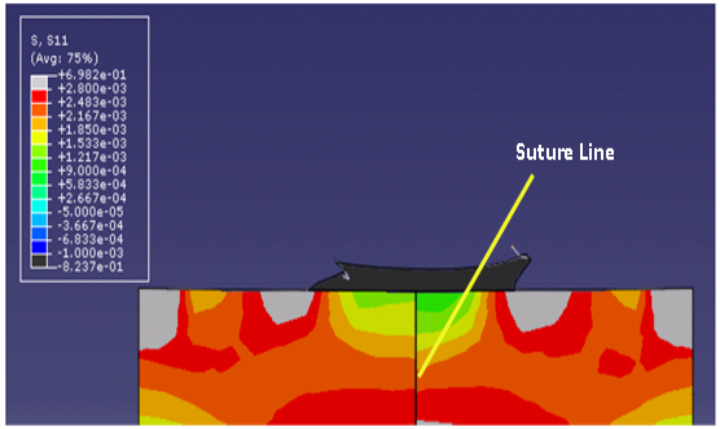
iNPWT = incisional negative pressure wound therapy.

Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75. Agarwal JP, et al. *Plast Reconstr Surg*. 2005;116(4):1035-1040. Lessing MC, et al. Presented at: Wound Healing Society Annual Meeting; April 14-17, 2011; Dallas, Texas. Atkins BZ, et al. *Int Wound J*. 2011;8(1):56-62. Kilpadi DV, et al. *Wound Repair Regen*. 2011;19(5):588-596.

3D Finite Element Computer Modeling Showed Reduced Lateral Tension



Before iNPWT



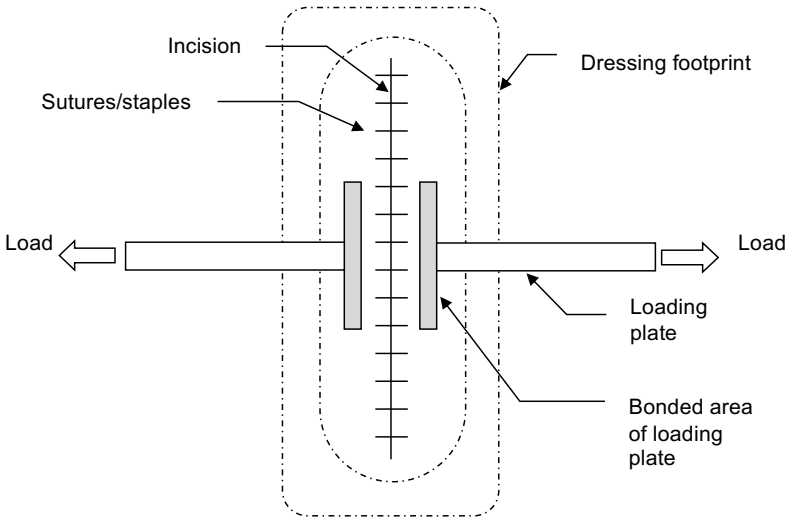
With iNPWT

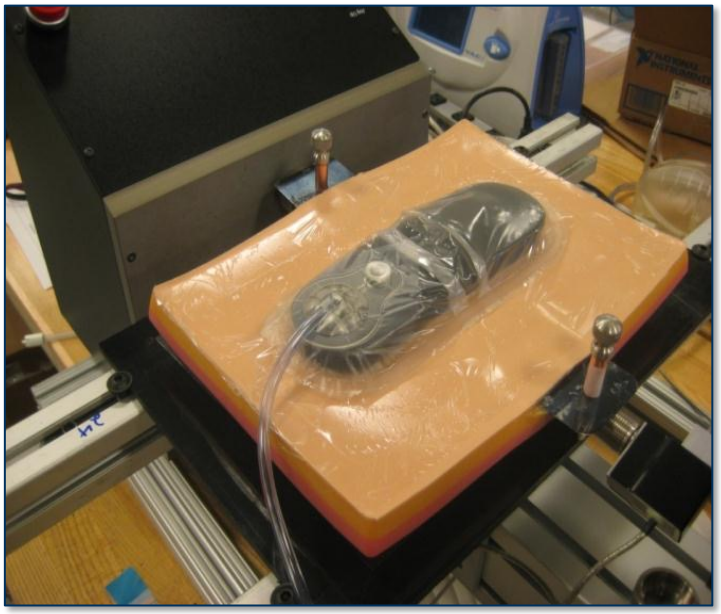
Lateral tension around suture line was reduced by approximately 50%

Immediate impact | Intermediate-term impact | Longer-term impacts

Wilkes RP, et al. *Surgical Innov*. 2012;19(1):67-75.

Bench Study of Appositional Forces



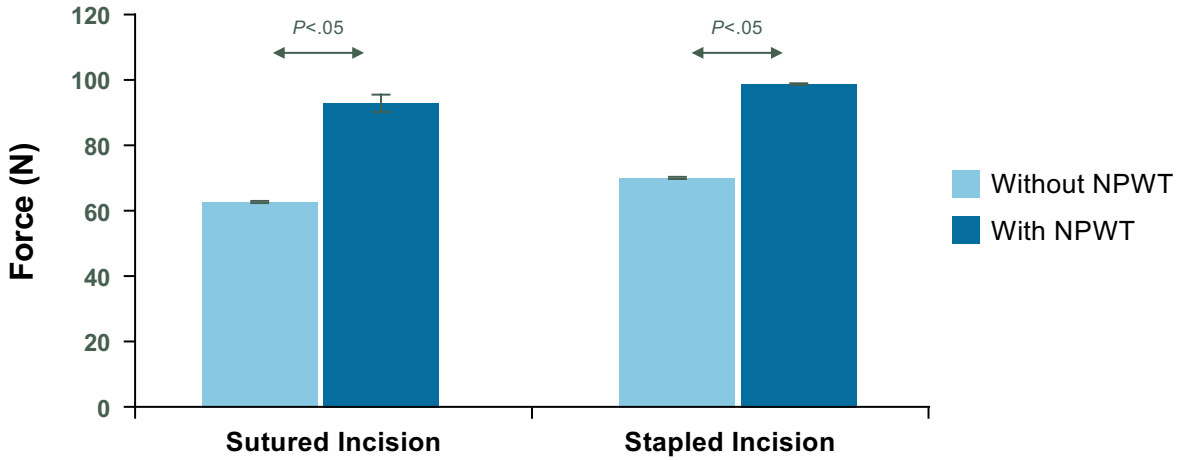


Immediate impact | Intermediate-term impact | Longer-term impacts

Wilkes RP, et al. *Surgical Innov*. 2012;19(1):67-75.

In This Benchtop Model, Appositional Forces Were Increased

Force required to stretch incision 10mm



With iNPWT

- Suture line had 51% stronger approximation
- Staple line had 43% stronger approximation

Immediate impact | Intermediate-term impact | Longer-term impacts

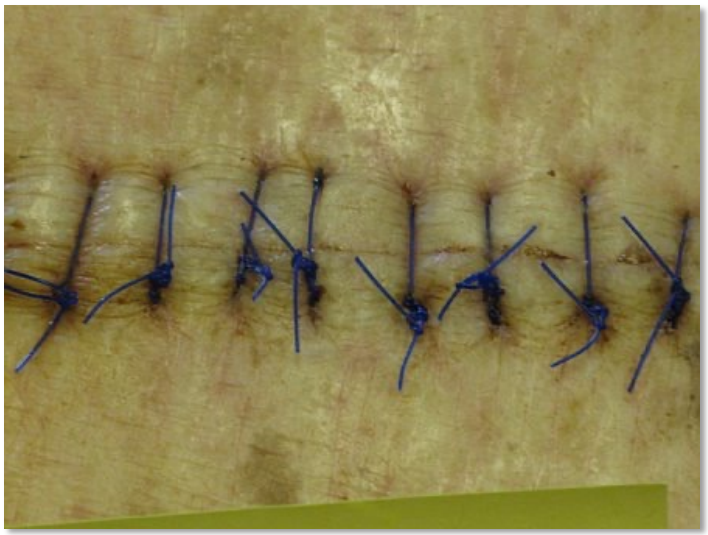
Wilkes RP, et al. *Surgical Innov*. 2012;19(1):67-75.

Porcine Incisions Following 5 Days of ciNPT

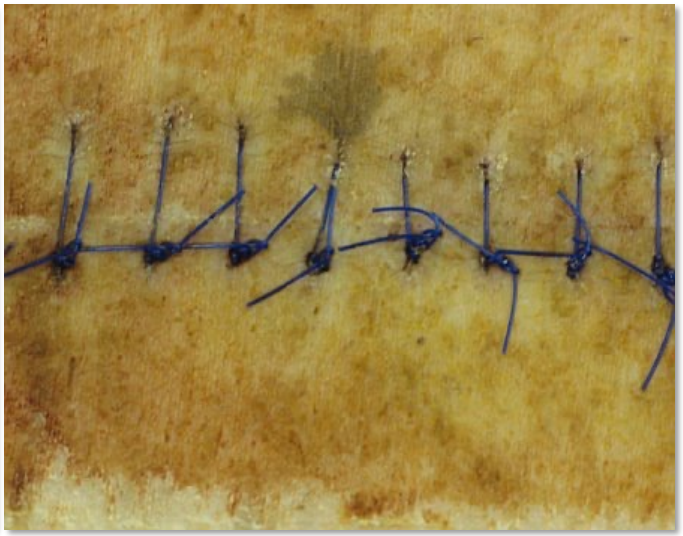
Immediate impact | **Intermediate-term impact** | Longer-term impact

ciNPWT = closed incisional negative pressure wound therapy.
Data courtesy of Yaszay B.
Glaser DA, et al. *Wounds.* 2012;24:308-316.

Porcine Incisions Following 5 Days of ciNPT



Dry dressing



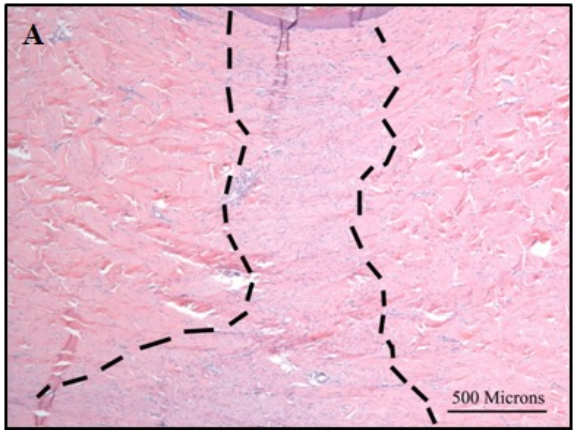
ciNPT

Immediate impact | **Intermediate-term impact** | Longer-term impact

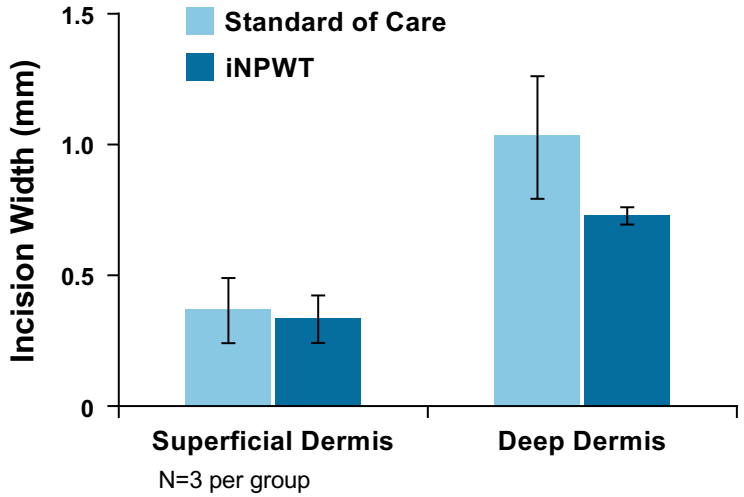
Data courtesy of Yaszay B.
Glaser DA, et al. *Wounds.* 2012;24:308-316.

In a Porcine Study, Incision Apposition Was Increased

Representative 40-Day Histology



Histology 40 Days



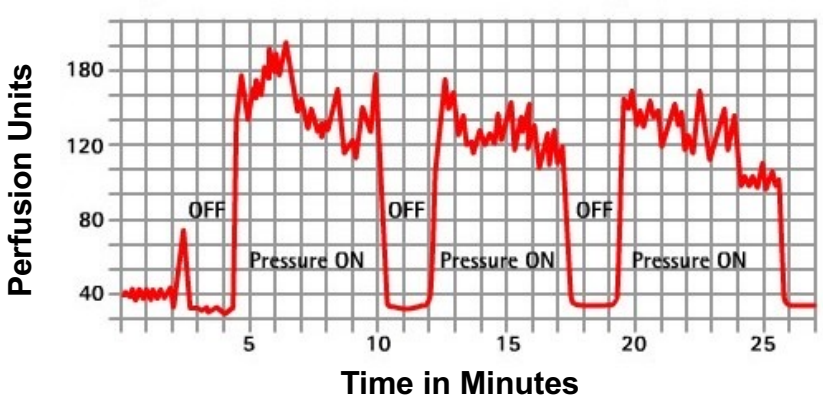
N=3 per group

Immediate impact | Intermediate-term impact | **Longer-term impact**

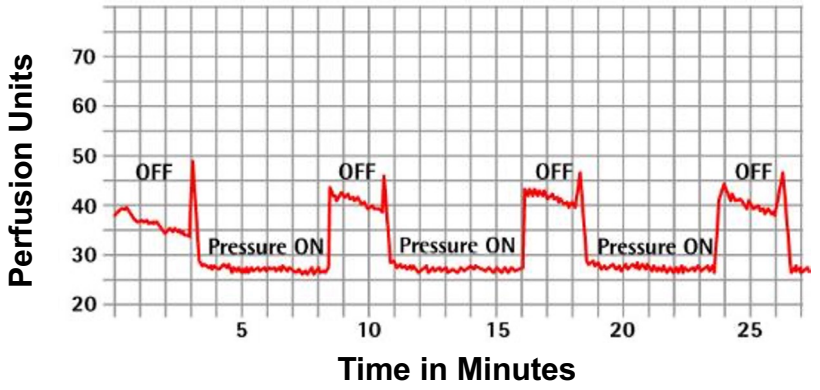
Lessing MC, et al. Presented at: Wound Healing Society Annual Meeting; April 14-17, 2011; Dallas, Texas.

NPWT: Blood Flow vs Pressure

Blood Flow at 125 mm Hg

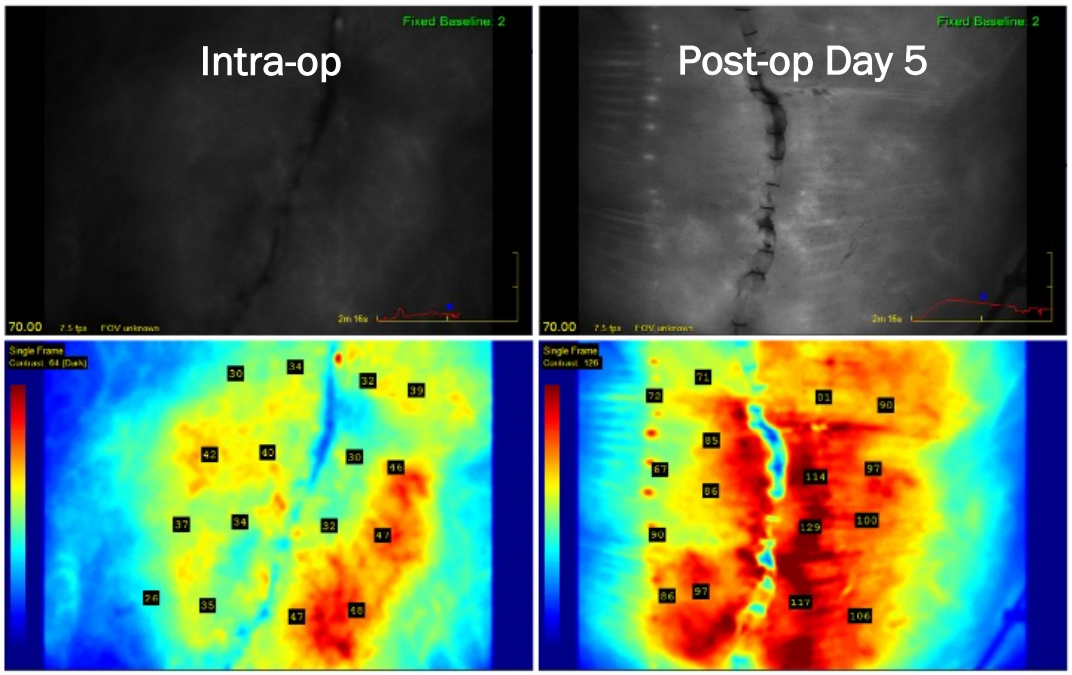


Blood Flow at 400 mm Hg



Morykwas MJ, et al. *Ann Plast Surg.* 1997:38(6):553-562.

Perfusion Analysis of Skin Flaps Treated with NPWT With Indocyanine Green (ICG) Angiography



Spy run initial procedure **Spy run after vac removal**

ICG = indocyanine green.

Maddox JS, et al. Singh D. Presented at: American College of Surgeons Maryland Chapter Meeting; 2014.

Analysis of Key Clinical Studies

Vascular	Orthopedic	Cardiothoracic
Trauma	Plastics	Colorectal
Obstetrics	General	Breast

Meta-analyses

ciNPWT Meta-Analysis
Cooper and Singh, et al. (2023)

46 studies reported on Surgical Site Complications (SSCs) were suitable for analysis

- SSCs can include SSI (superficial and deep), seroma, hematoma, dehiscence, and skin necrosis
- Significant differences in SSC rates in favor of ciNPWT with a risk ratio of 0.543 (p<0.001) indicating the probability of an SSC is approximately cut in half with a relative risk reduction of 46%

65 studies reported in the analysis of Surgical Site Infections (SSIs)

- Significant difference in SSI rates between ciNPT and standard of care (SOC) in favor of ciNPT with a relative risk of 0.524 (p<0.001)
- Significant differences were found in favor of ciNPT for superficial SSI, deep SSI, seroma, dehiscence, and skin necrosis; hematoma was the only complication that did not demonstrate a significant difference

Complication	Number of Studies	Risk Ratio	Lower Limit – 95% (CI) Interval	Upper Limit – 95% (CI) Interval	Relative Risk Reduction	*p*-value
SSC	46	0.543	0.448	0.657	**46%**	**<0.001***
SSI	65	0.530	0.442	0.634	**47%**	**<0.001***
Superficial SSI	*21*	*0.505*	*0.361*	*0.708*	***50%***	***<0.001****
Deep SSI†	*23*	*0.469*	*0.292*	*0.753*	***53%***	***0.002****
Seroma	27	0.677	0.520	0.881	**32%**	**0.004***
Hematoma	22	0.729	0.458	1.161	**27%**	**0.183**
Dehiscence†	38	0.644	0.441	0.940	**36%**	**0.022***
Skin Necrosis	10	0.466	0.302	0.720	**53%**	**0.001***

† NOTE: The use of ciNPWT for reduction in the incidence of deep SSI, dehiscence, and skin necrosis has not been reviewed by the U.S. FDA

*statistical significance p<0.05

Clinical Outcome Key Findings

SSC = surgical site complication; SOC = standard of care.

Cooper HJ, Singh DP, et al. *Plast Reconstr Surg Glob Open.* 2023;11(3):e4722.

ciNPWT Meta-Analysis
Cooper and Singh, et al. (2023)

- Readmissions evaluated for 24 studies; significant difference in favor of ciNPT (p=0.039)
- Return to the OR (ROR) was analyzed for 40 studies; highly significant difference in ROR rates in favor of ciNPT (p<0.001)
- Hospital length of stay (LOS) was compared in 25 studies, ciNPT patients had 0.9 days shorter hospital stay (p<0.001)

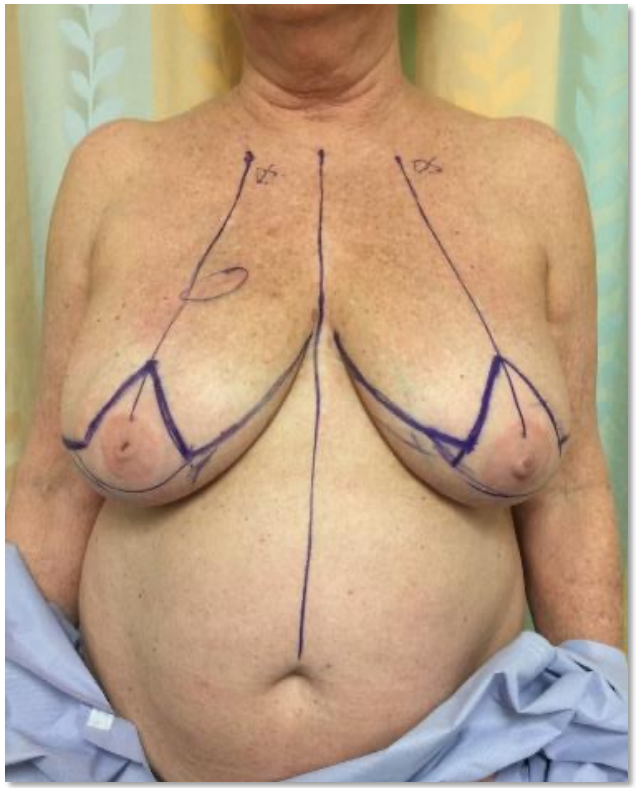
Outcome	Specialty	Statistic	Number of Studies	Lower Limit – 95% (CI) Interval	Upper Limit – 95% (CI) Interval	Statistic	*p*-value
Readmission	All	Risk Ratio	24	0.606	0.987	**0.773**	**0.039***
Return to OR	All	Risk Ratio	40	0.519	0.789	**0.64**	**<0.001***
Length of Stay	All	Difference in Means	25	-1.257	-0.544	**-0.901**	**<0.001***

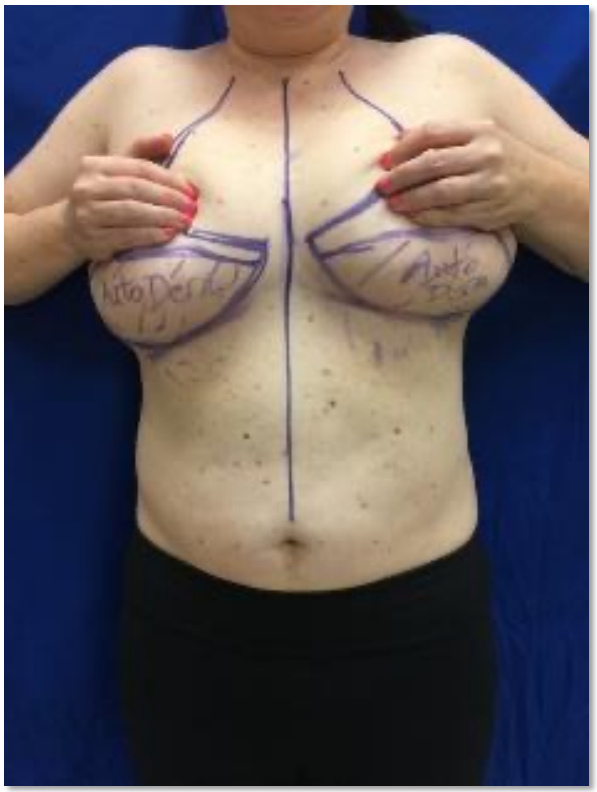
*statistical significance p<0.05

ROR = return to OR; LOS = length of stay.

Case Examples

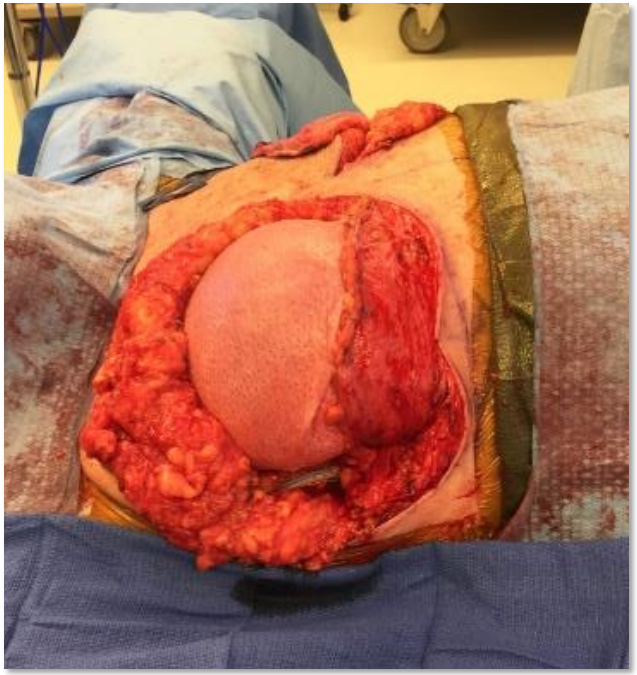
DTI, Skin Reducing Mastectomy with ADM

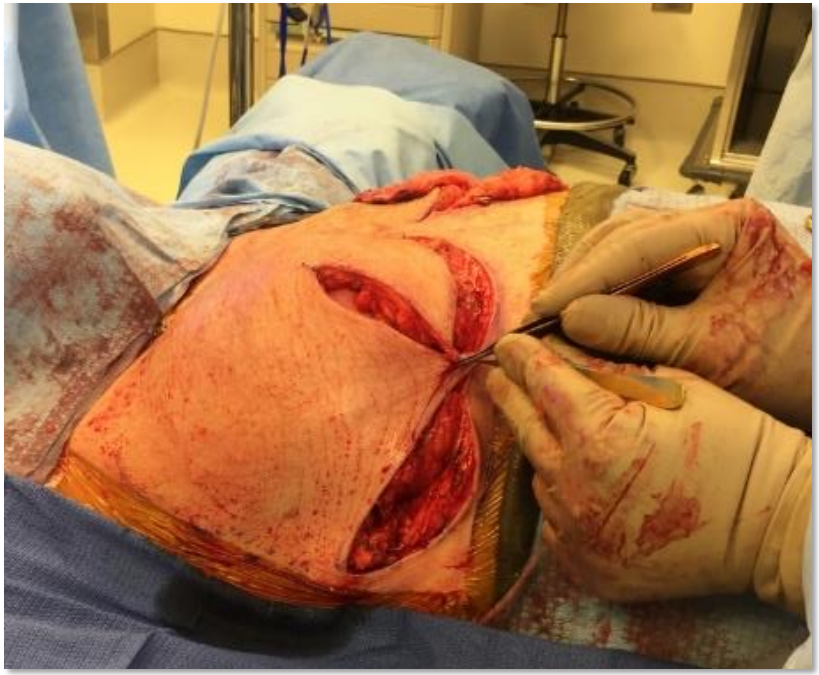




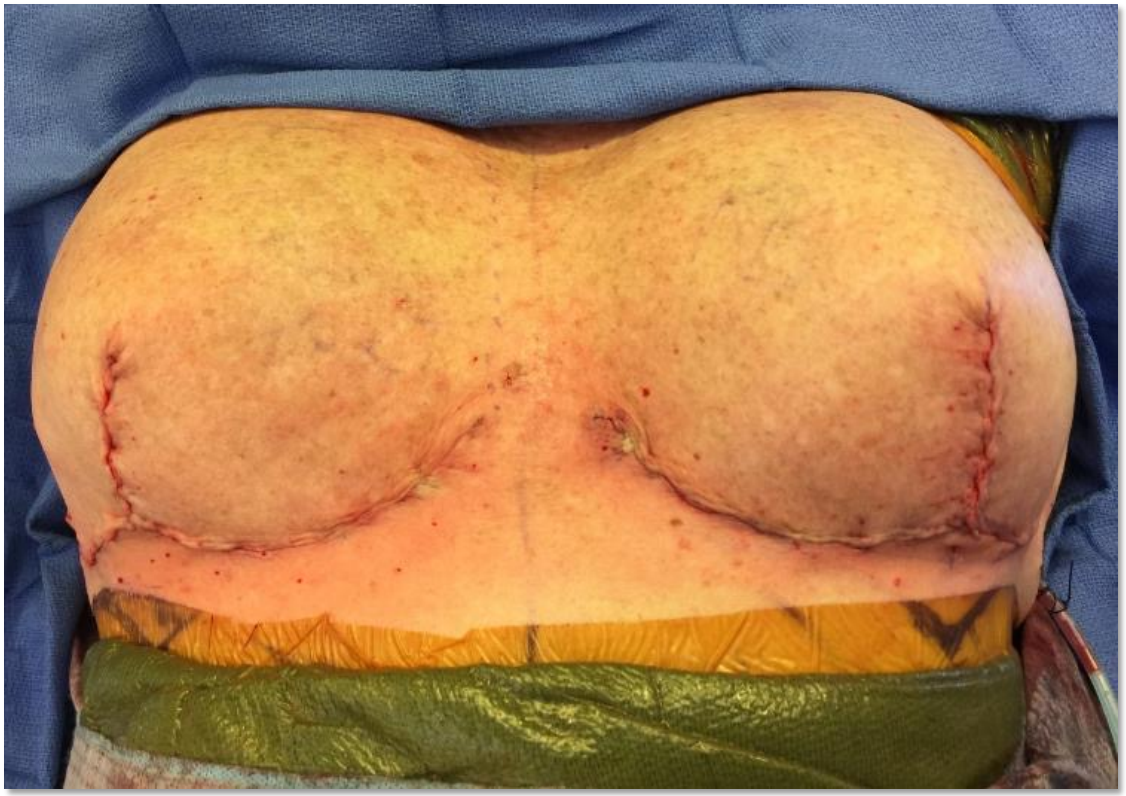
DTI = deep tissue injury; ADM = acellular dermal matrix.

DTI, Skin Reducing Mastectomy with ADM

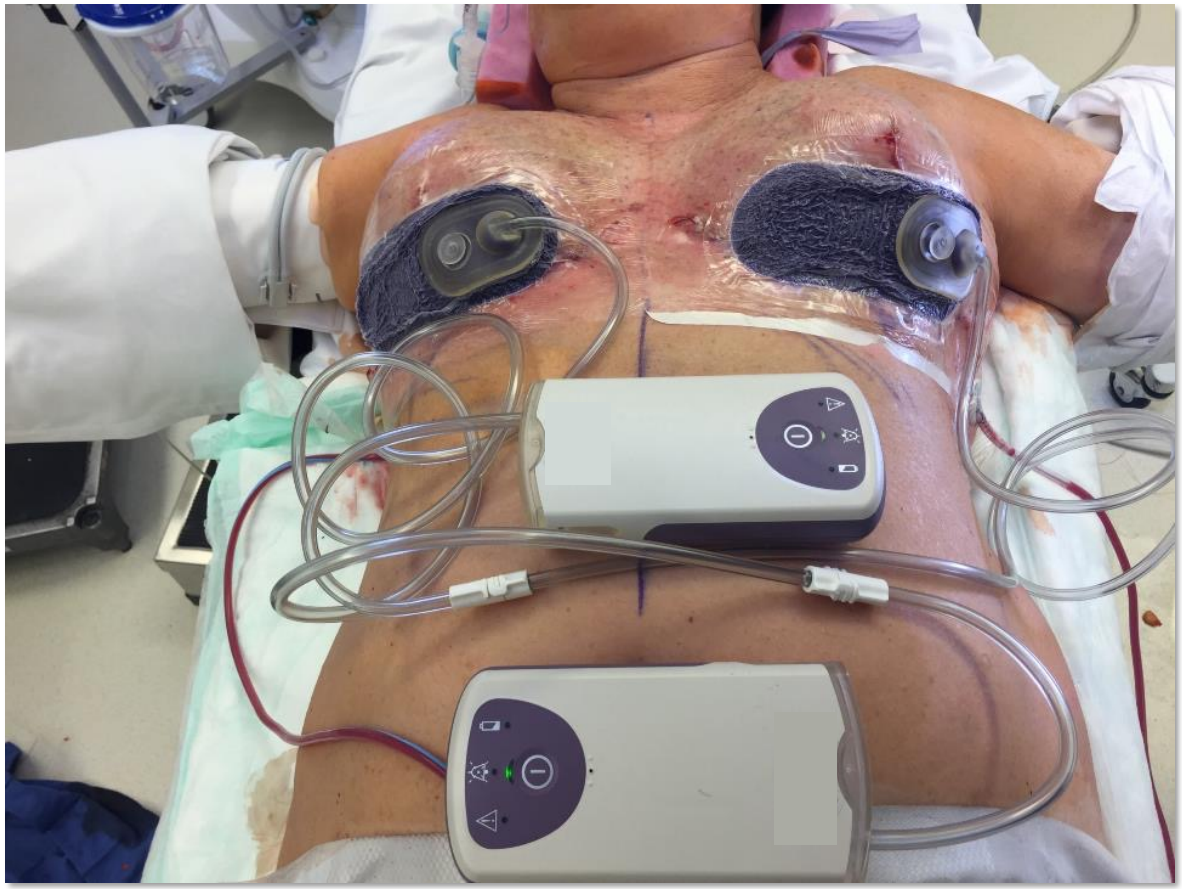




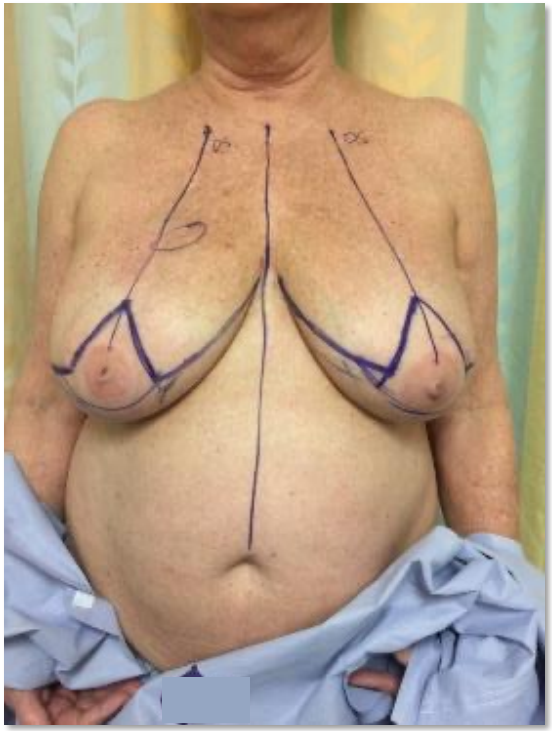
DTI, Skin Reducing Mastectomy with ADM

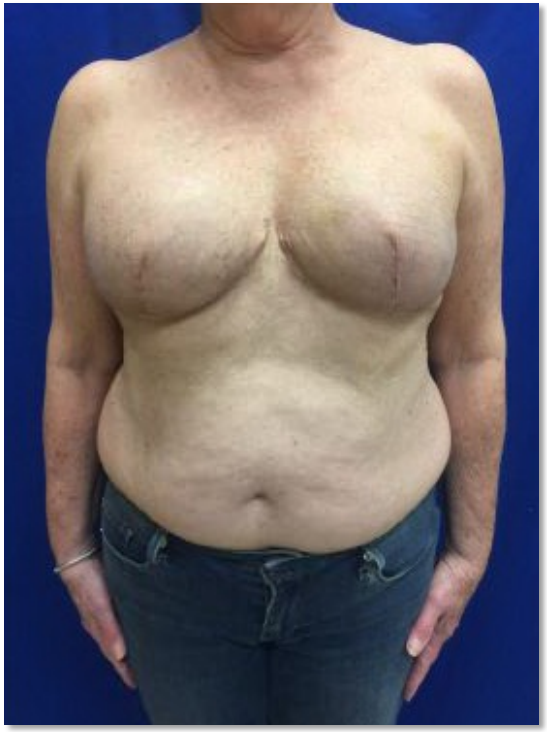


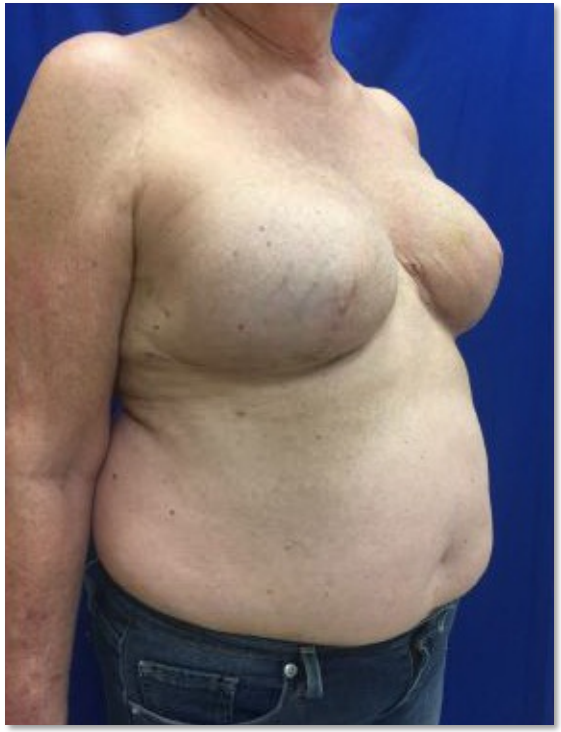
DTI, Skin Reducing Mastectomy with ADM



DTI, Skin Reducing Mastectomy with ADM

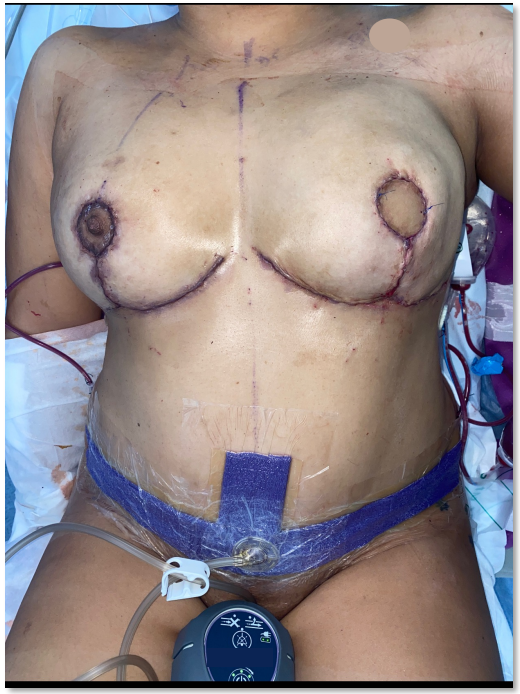


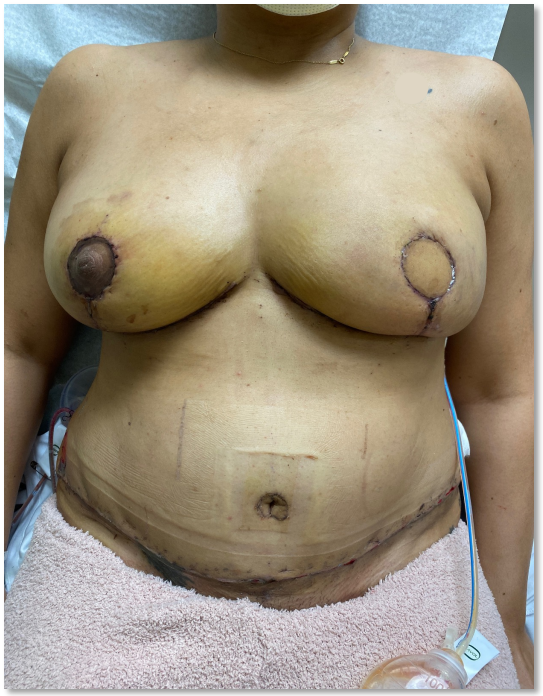




Breast Reduction and Microvascular DIEP Flap

The effect of post-operative ciNPWT on the incidence of donor site wound dehiscence in breast reconstruction patients: dehiscence prevention study (DEPRES), pilot RCT.

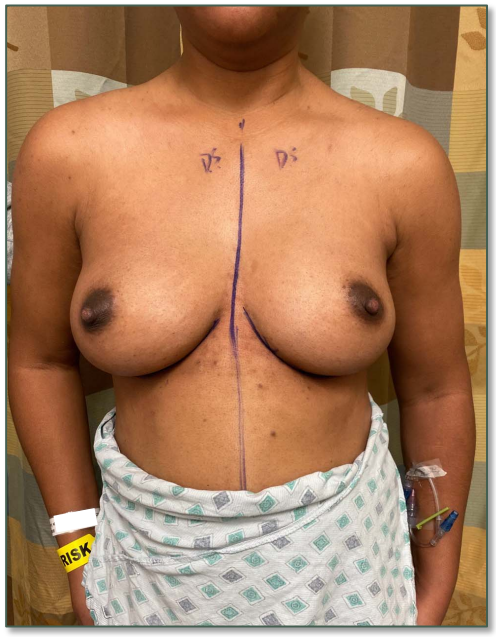




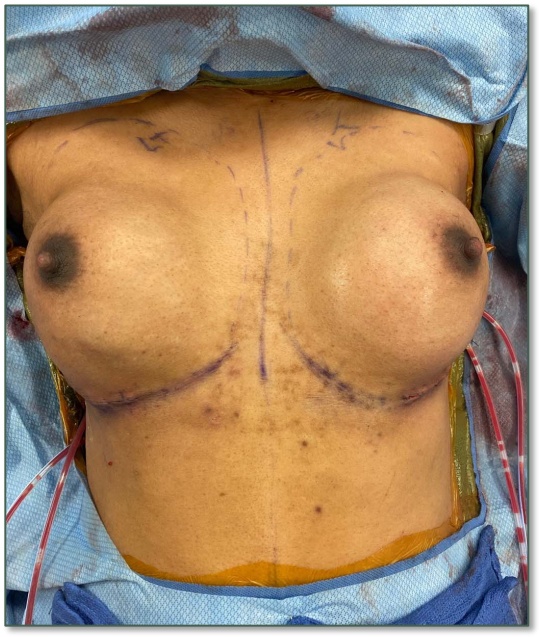
DIEP = deep inferior epigastric perforator.

Muller-Sloof E, et al. *J Tissue Viability*. 2018;27(4):262–266.

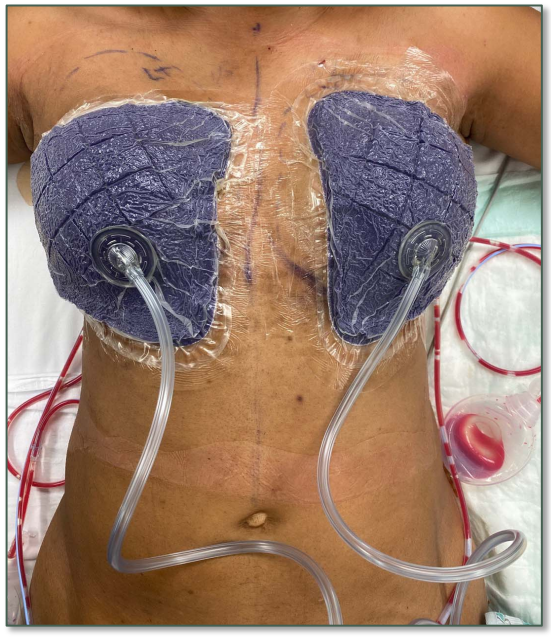
Bilateral Nipple-Sparing Mastectomy (NSM) Direct to Implant



Pre-op



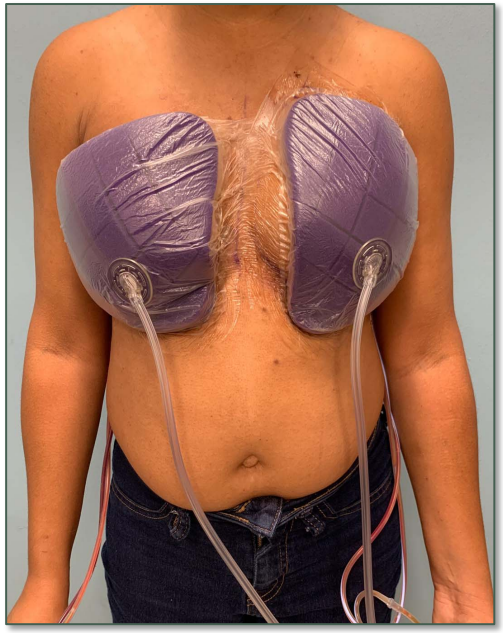
On table



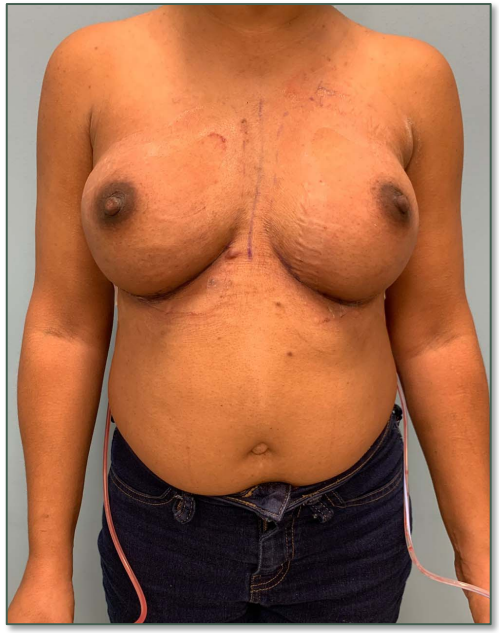
Post-op dressing

NSM = nipple-sparing mastectomy.

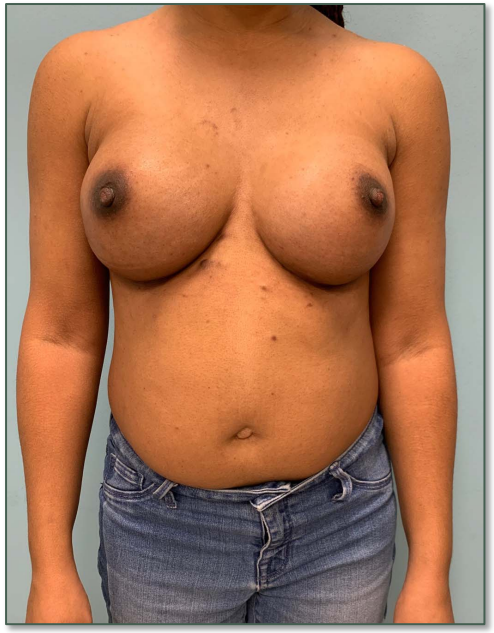
Bilateral NSM and Pre-Pectoral Direct to Implant With ADM Wrap



Clinic post-op day 7



Clinic post-op day 7



Clinic post-op day 14

Benefits of ciNPT

- Mechanical stabilization (immediate reduced lateral tension/increased appositional strength)
- Physical protection of wound
- Early increase in wound-breaking strength
- Narrower zone of scar histologically
- Reduction in edema
- Increased blood flow
- Suggested increase in lymph flow
- Reduction in hematoma/seroma

Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75. Agarwal JP, et al. *Plast Reconstr Surg*. 2005;116(4):1035-1040. Lessing MC, et al. Presented at: Wound Healing Society Annual Meeting; April 14-17, 2011; Dallas, Texas. Atkins BZ, et al. *Int Wound J*. 2011;8(1):56-62. Kilpadi DV, et al. *Wound Repair Regen*. 2011;19(5):588-596.

Clinical Pearls

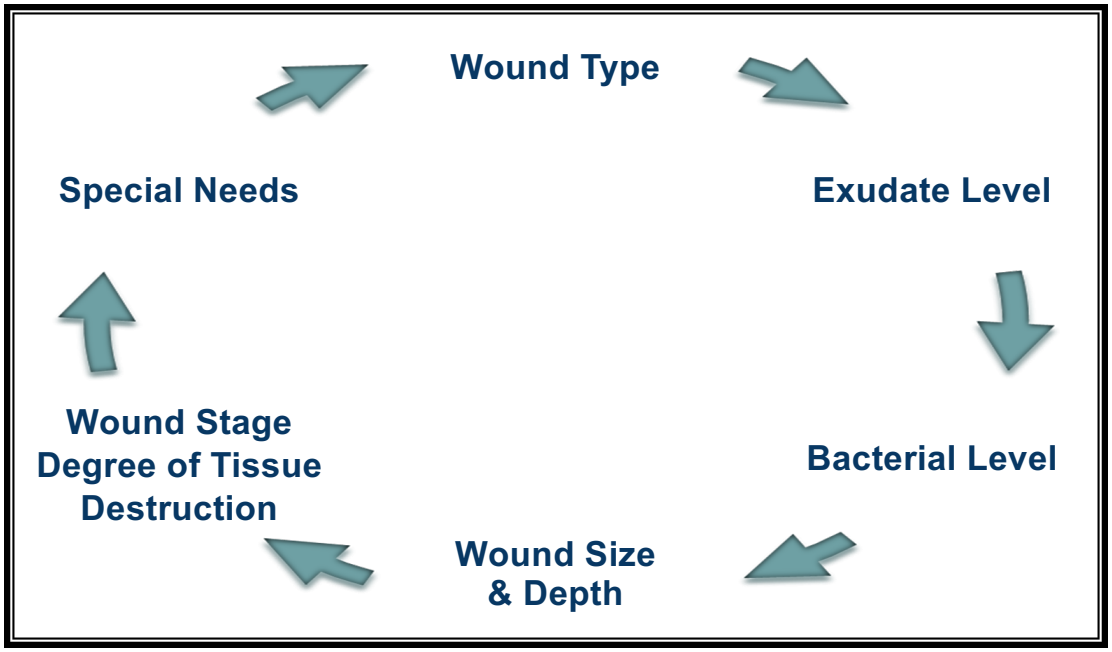
Benefits of ciNPT Dressings

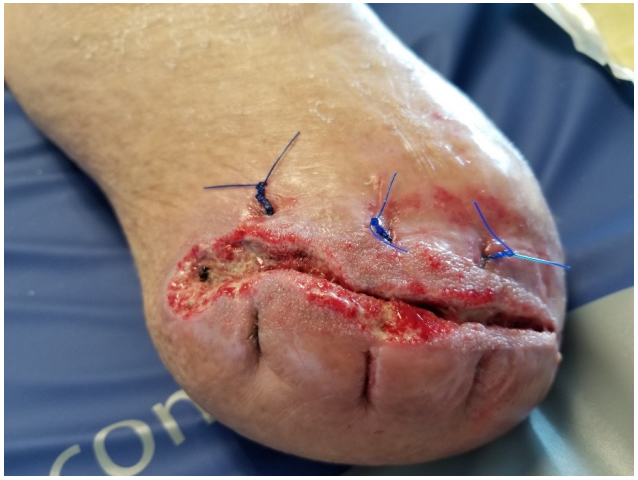
1. **Reduced surgical site complications**
   ciNPT dressings significantly lower risk of SSIs, dehiscence, and seroma formation by managing exudate and promoting a closed environment for faster healing
2. **Enhanced wound healing**
   By applying continuous negative pressure, ciNPT improves perfusion, reduces edema, and enhances tissue approximation leading to faster epithelialization and decreased scar formation
3. **Patient outcomes and satisfaction**
   ciNPT has been shown to decrease post-op pain, reduce the need for dressing changes, and lead to better cosmetic outcomes, contributing to higher patient satisfaction

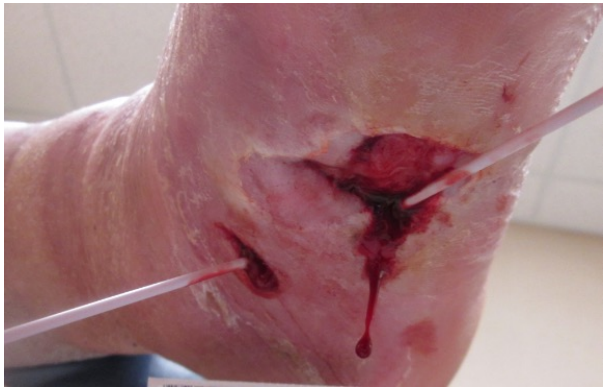
NPWT Toolkit and Step-Down Strategies

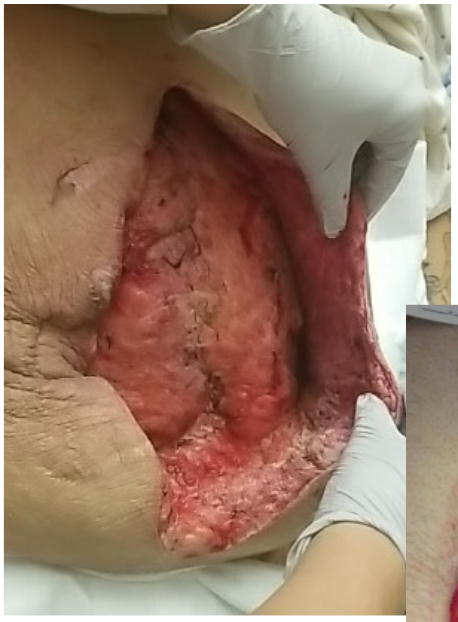
Emily Greenstein, APRN, CNP, CWON-AP, FACCWS
Essentia Health, Vibra Health
Fargo, ND

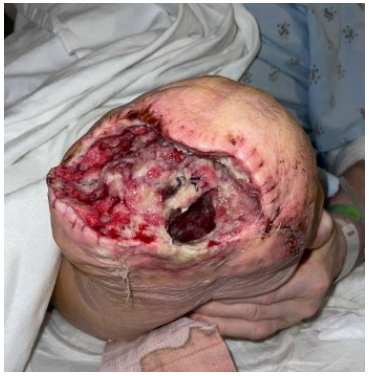
Get to Know the Patient First, then the Wound

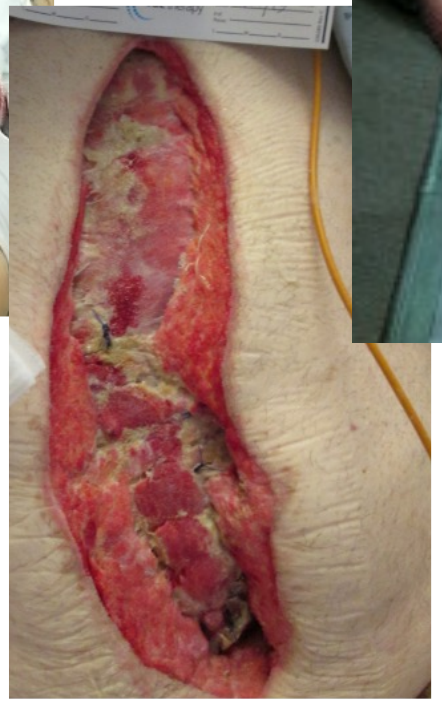


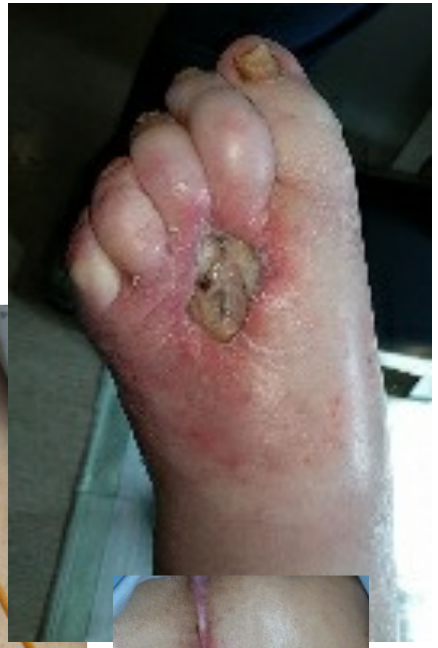


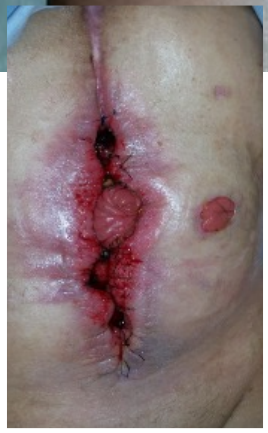






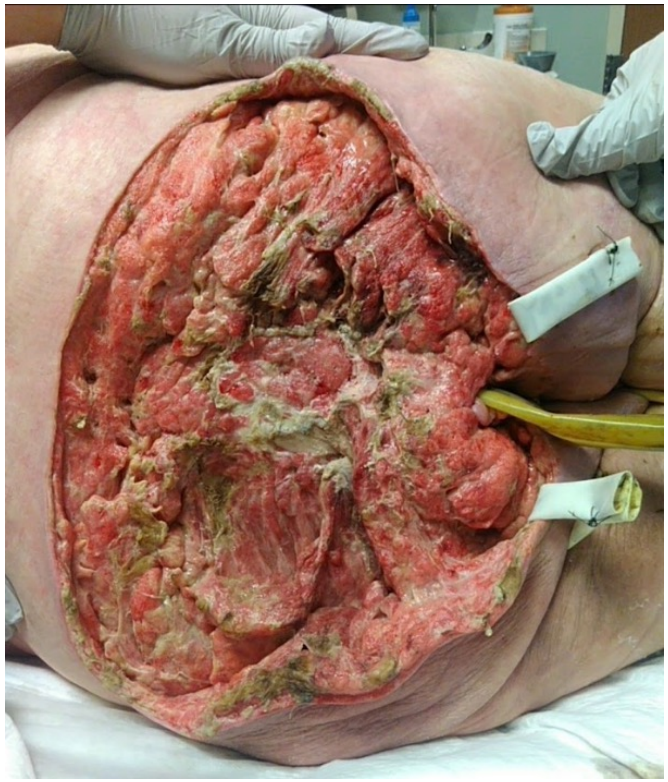






Don’t Shy Away from Complex Wounds

- Challenging applications may include
  - Wound location
  - Large wounds
  - Wounds with multiple contours
  - Wounds with compromised periwound skin



Clarification of Terminology

- Negative pressure wound therapy (NPWT)
- NPWT with instillation and dwell (NPWTi-d)
- NPWT with irrigation (NPWT-I)
- Incisional NPWT (iNPWT) vs closed incisional NPWT (ciNPWT)
- Traditional NPWT (tNPWT) or single-use NPWT (sNPWT)

Care Setting Considerations

- Acute Care Setting
  - “Sick” patients
  - Comorbidities
  - Wound may or may not be primary problem
  - The clock is ticking
  - Discharge planning and transition of care
- Post-Acute Care Setting
  - Complexity of dressing changes
  - Teaching (WOCN vs RN vs caregiver)

Algorithmic Approach

- NPWT for wound management
  - Acute setting
    - NPWT
    - NPWTi-d
    - Goal of therapy? (wound bed preparation vs re-epithelialization)
  - Post-acute setting (NPWT disposable vs non-disposable)
    - Skilled nursing
    - Home
    - Goal of therapy? (wound bed preparation vs re-epithelialization)
- ciNPT for incisional management
- Acute ---------- Post Acute setting

Removing Obstacles and Improving Patient Outcomes

Ultimate Goal

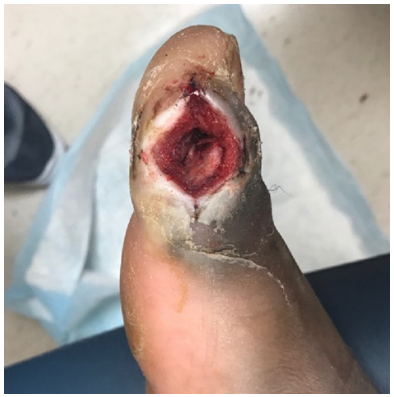
- Reduce healing time while simultaneously improving quality of life

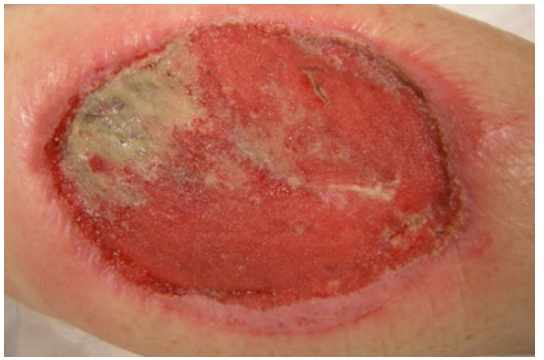
Method

- Using evidence-based advanced wound therapies targeting the physiological disruption in the wound bed

Top Challenges of Using NPWT

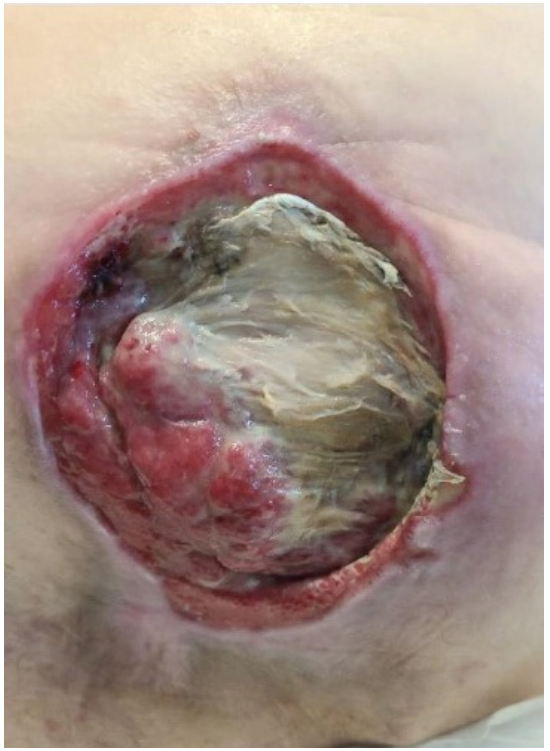
- Maintaining a seal
- Controlling exudate
- Maintaining periwound skin integrity
- Pain with dressing removal
- The drape is hard to separate; once it rolls together, it cannot be taken apart
- It is hard to lift and reposition



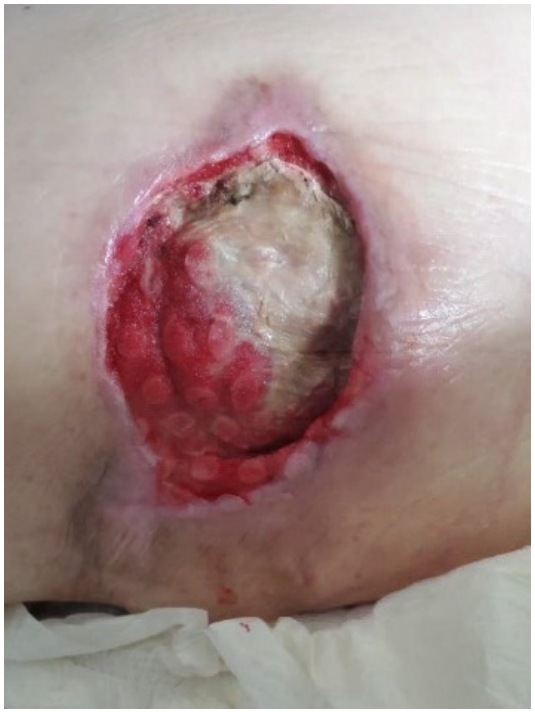


Stage 4 Pressure Injury

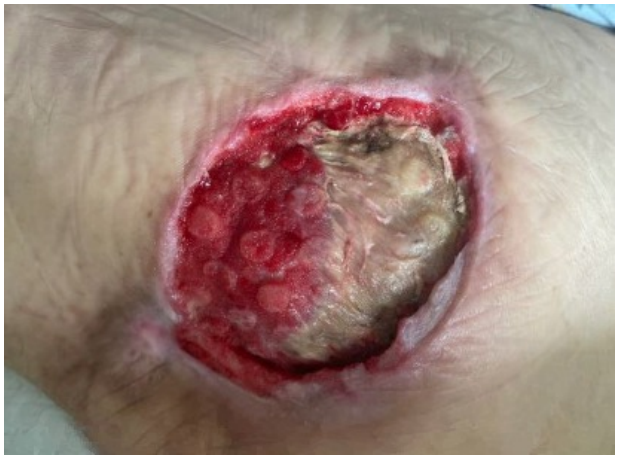
- 66y Male admitted with right lateral hip PI
  - Previously surgically debrided
- Medical history: No other significant medical history
- Treatment:
  - NPWTi-d initiated at bedside; patient did not want further surgical debridement



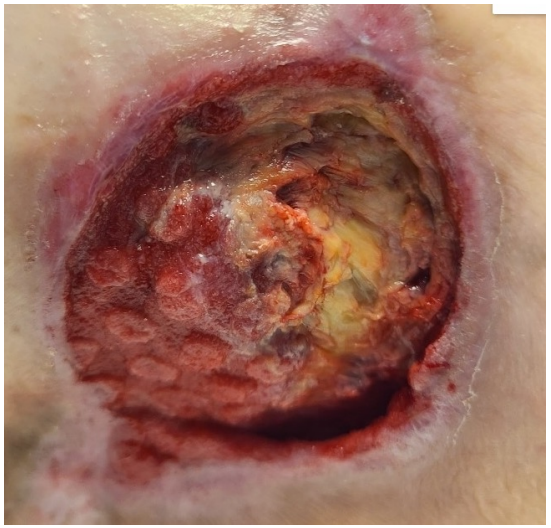
Stage 4 Pressure Injury



Day 3



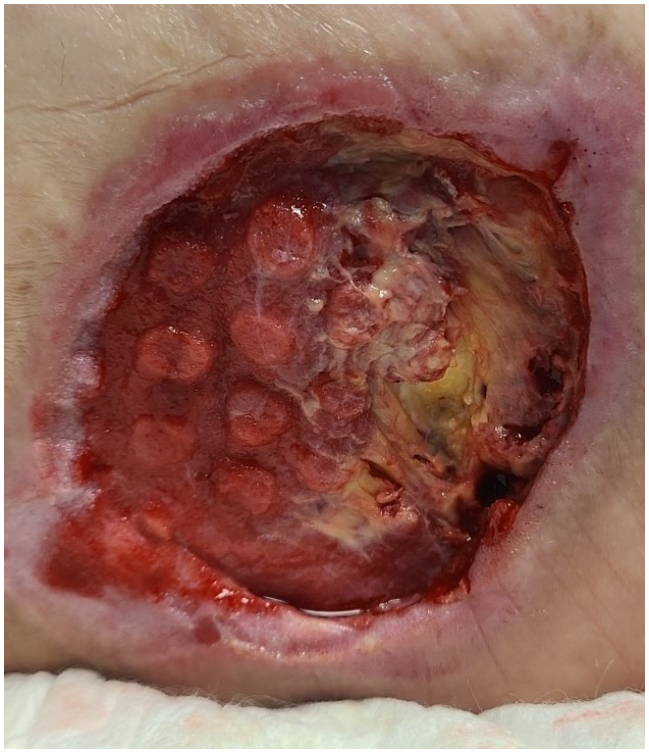
Day 7



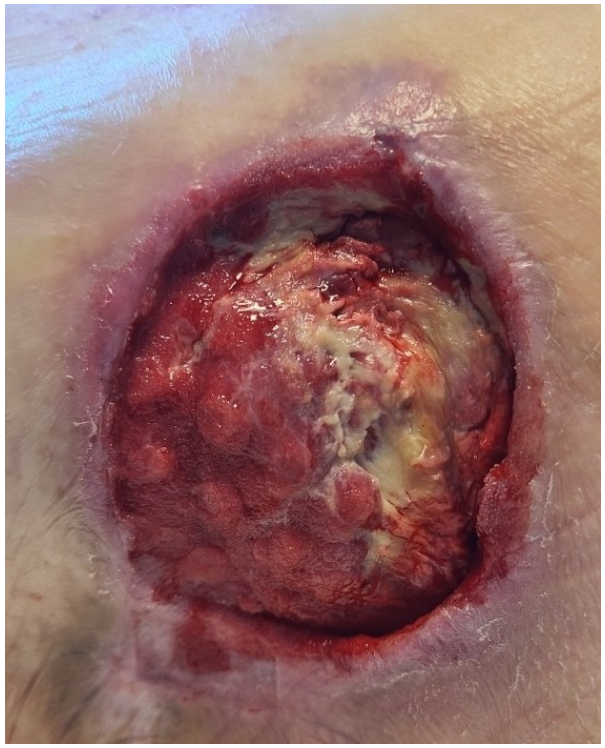
Day 21

Wound Treatment/Procedure
NPWTi-d Settings 125 mm Hg low pressure with 150 mL HOCl q2hrs with dwell time of 10 min.

Stage 4 Pressure Injury



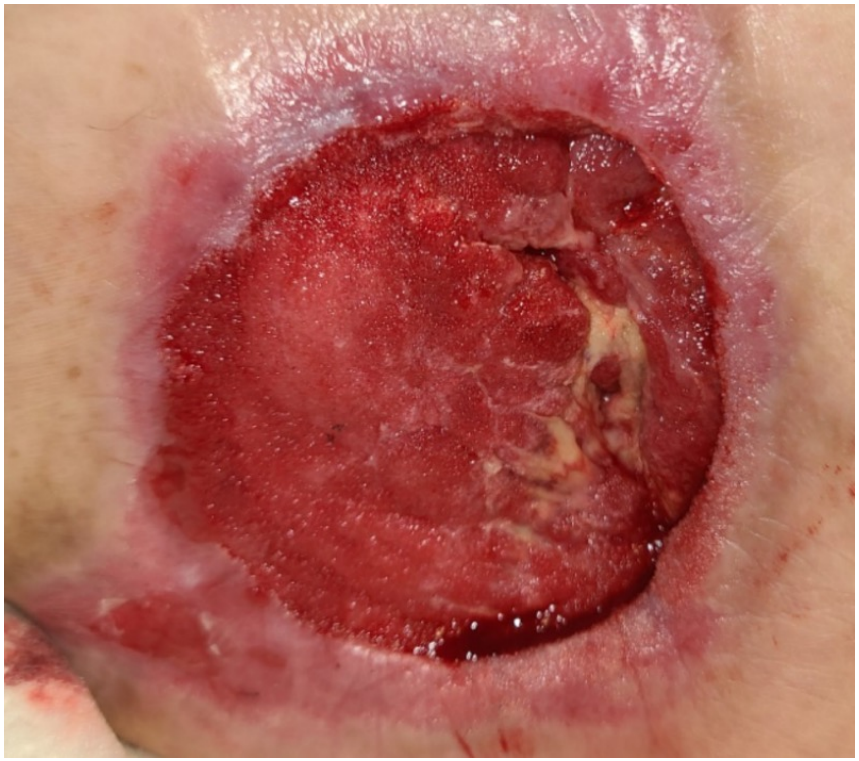
Day 27



Day 30

Transitioned to portable NPWT

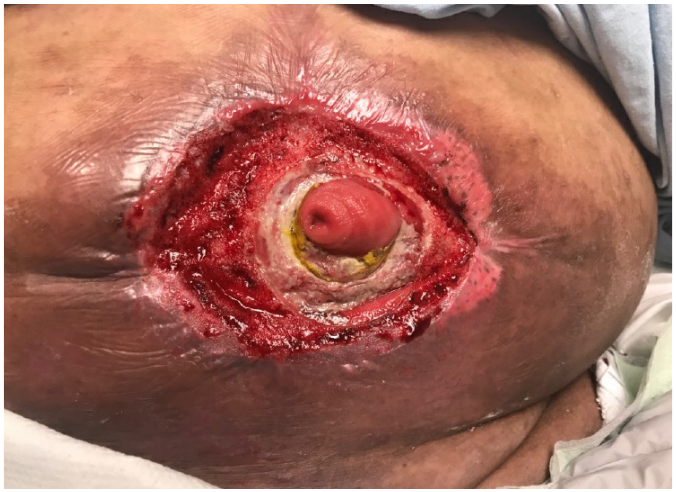
Stage 4 Pressure Injury



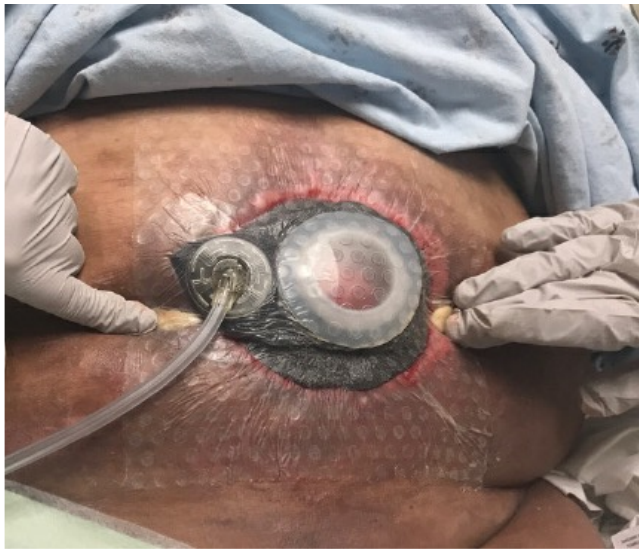
Day 45: 1 wk after discharge on traditional NPWT

Fistula with NPWT

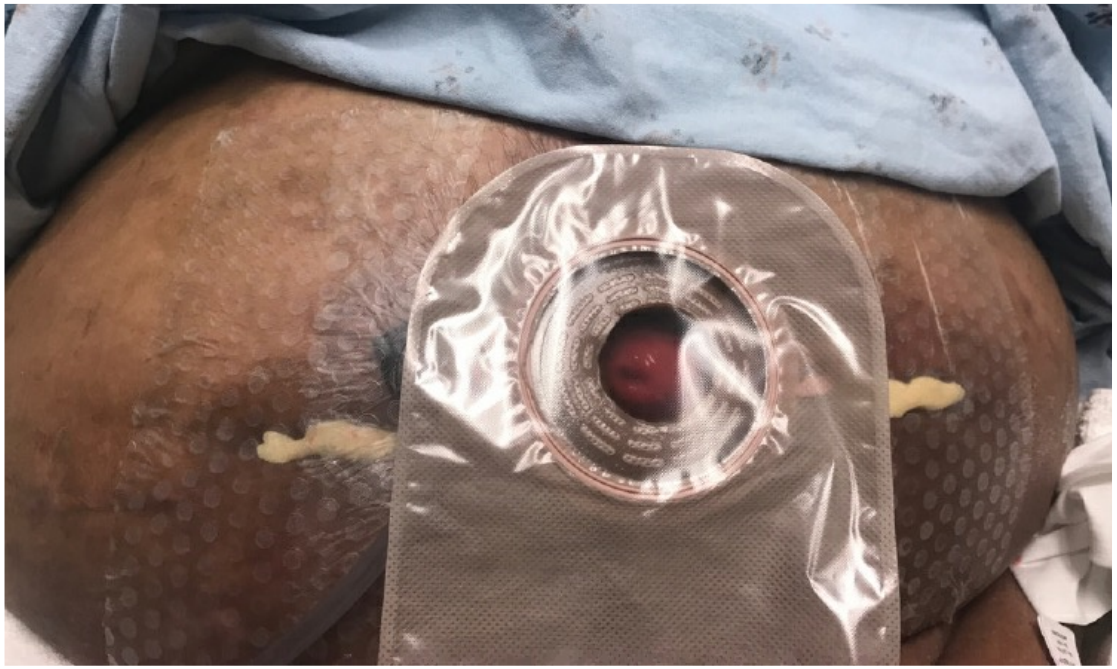
- 62y Female
- Past hernia repair complicated by infection
- Developed enterocutaneous fistula formation
- Treatment:
  - NPWT with fistula management and hybrid drape



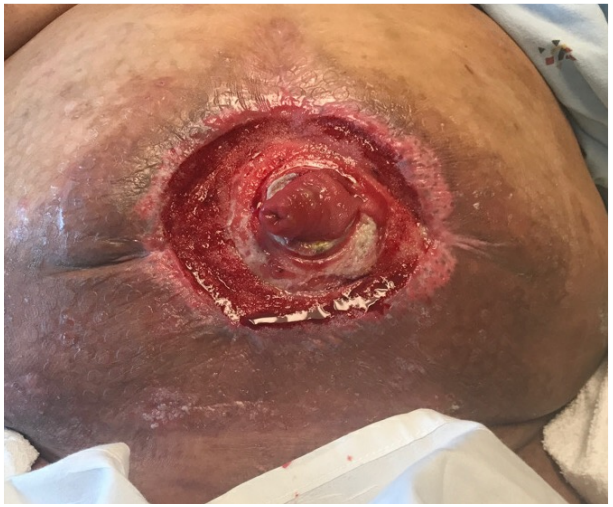
Fistula with NPWT



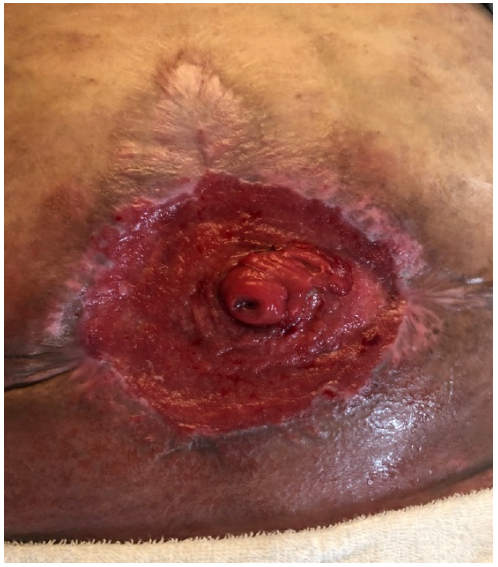
Day 0



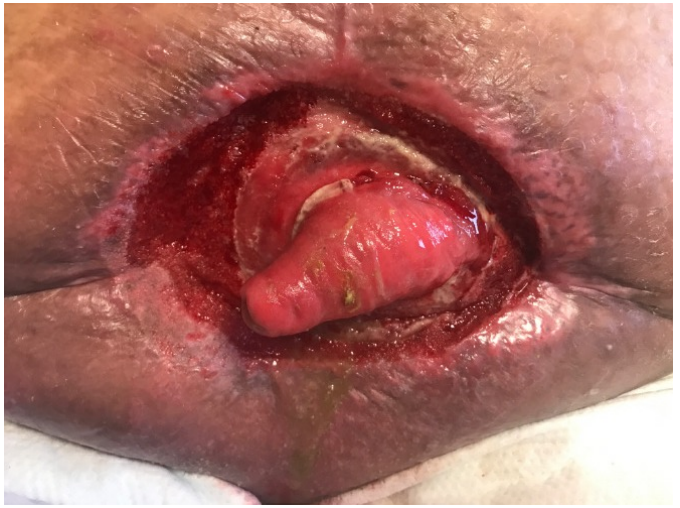
Fistula with NPWT



Day 7



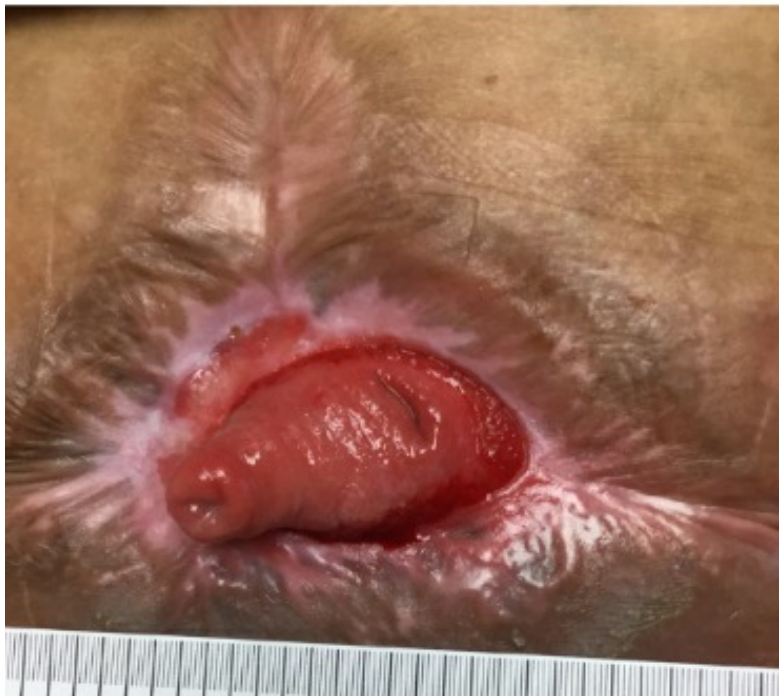
Day 18



Day 14

Fistula with NPWT

Day 90



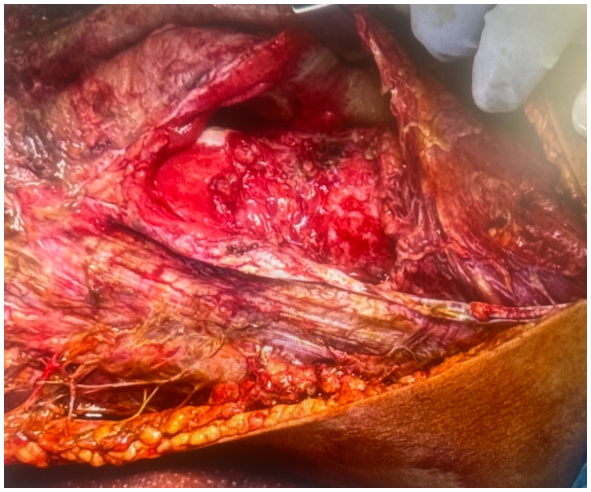
- Continued with NPWT/stoma pouch until day 60
- Transitioned to ostomy pouch with seals/crusting
- Patient did not want a skin graft
- Area was allowed to heal in by secondary intent

Myositis

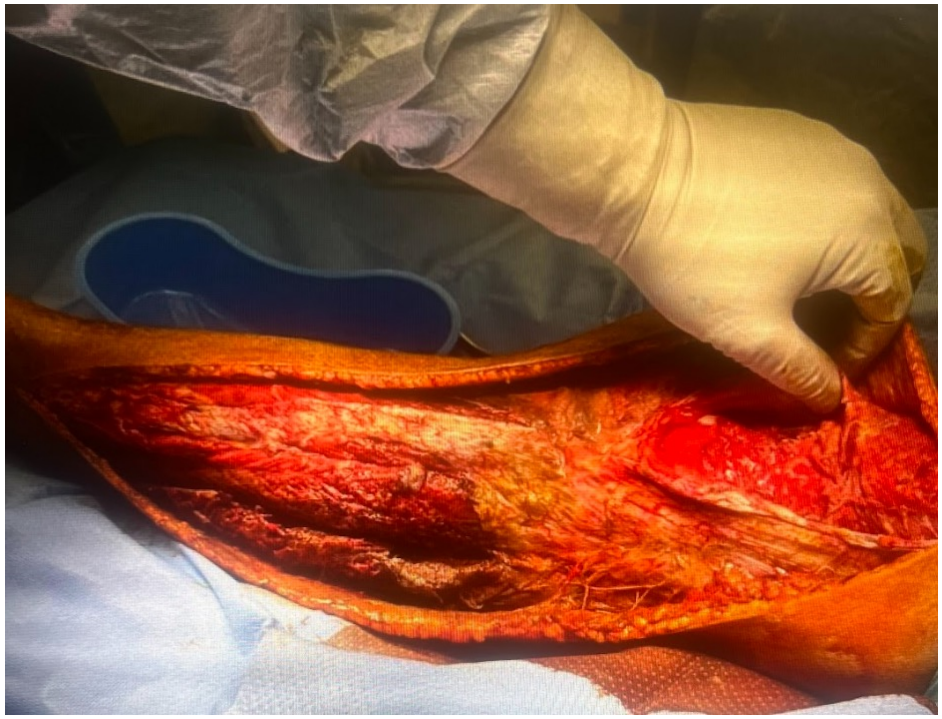
- 46y Male admitted with myositis
- Medical history: Uncontrolled diabetes, alcoholism, HTN

- Treatment:
  - Surgical debridement followed by placement of NPWTi, traditional NPWT, split-thickness skin grafting (STSG), and use of peel and place dressing

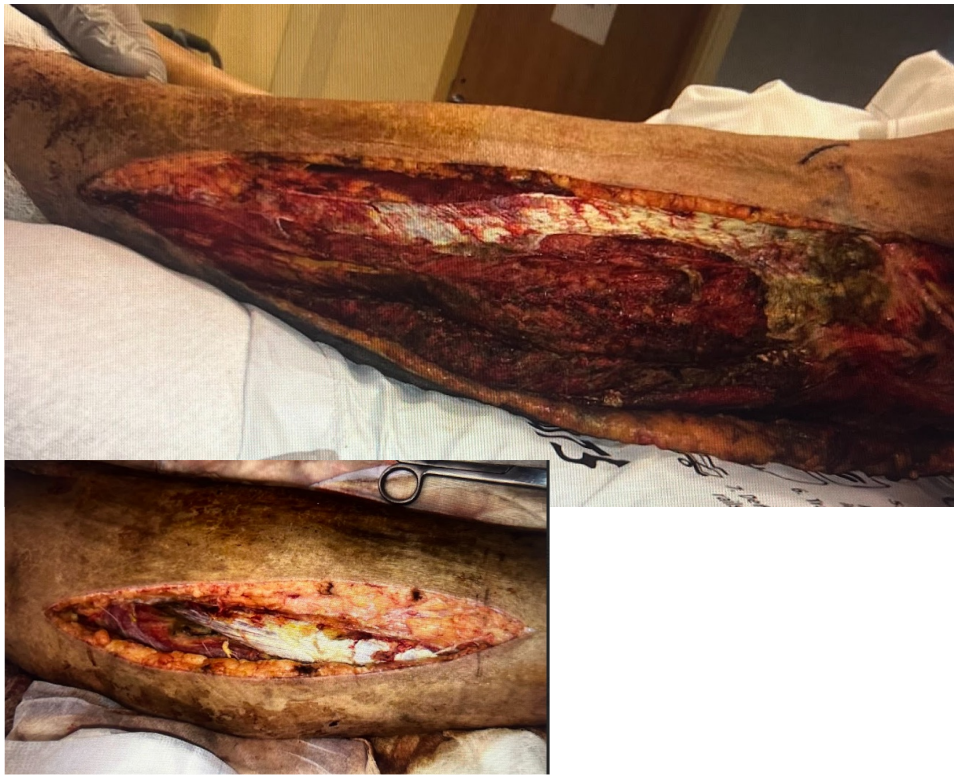
Myositis: 1st Surgical Debridement



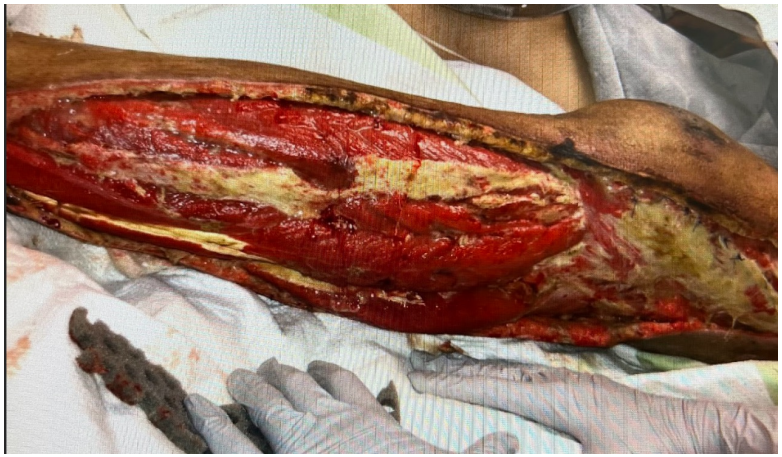
Left leg



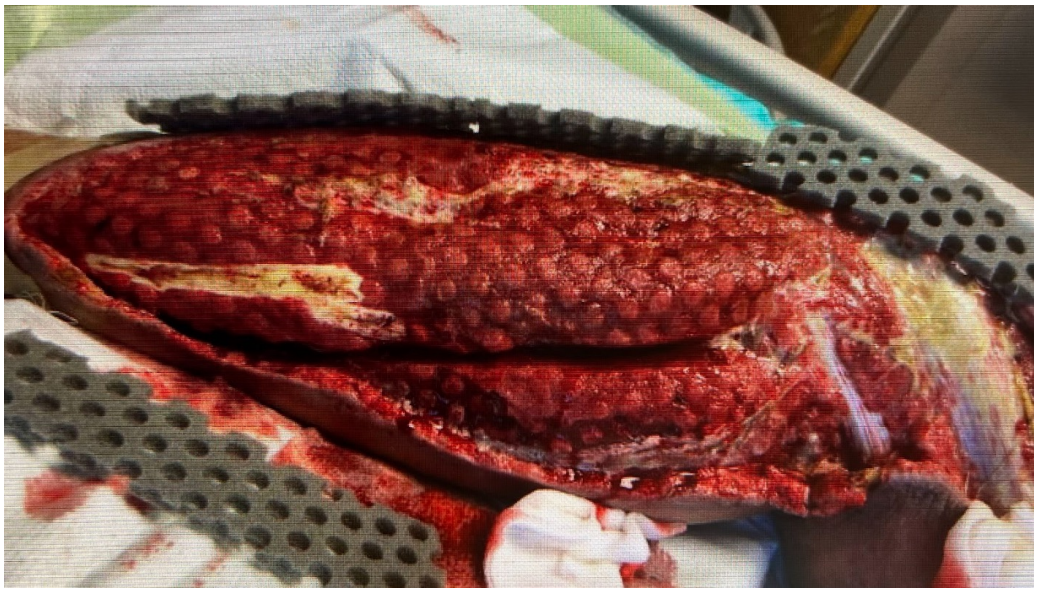
Myositis: Post-Surgical Debridement, Day 2

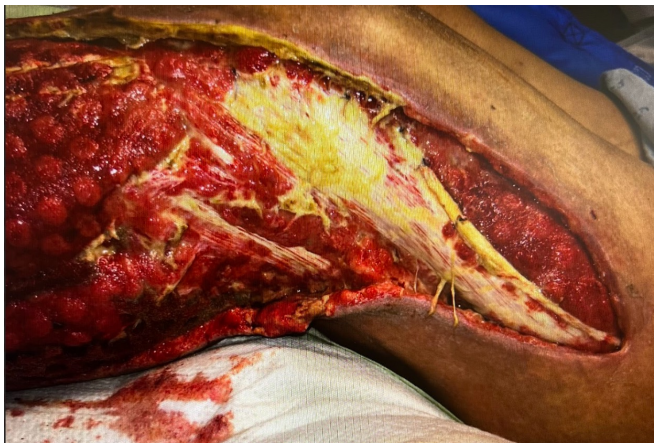


Myositis: NPWTi Application: Dressing Change 1

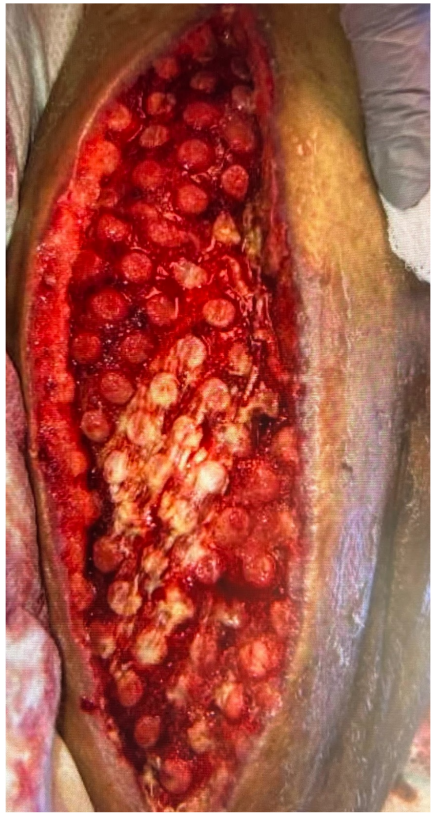


Myositis: Dressing Change 2

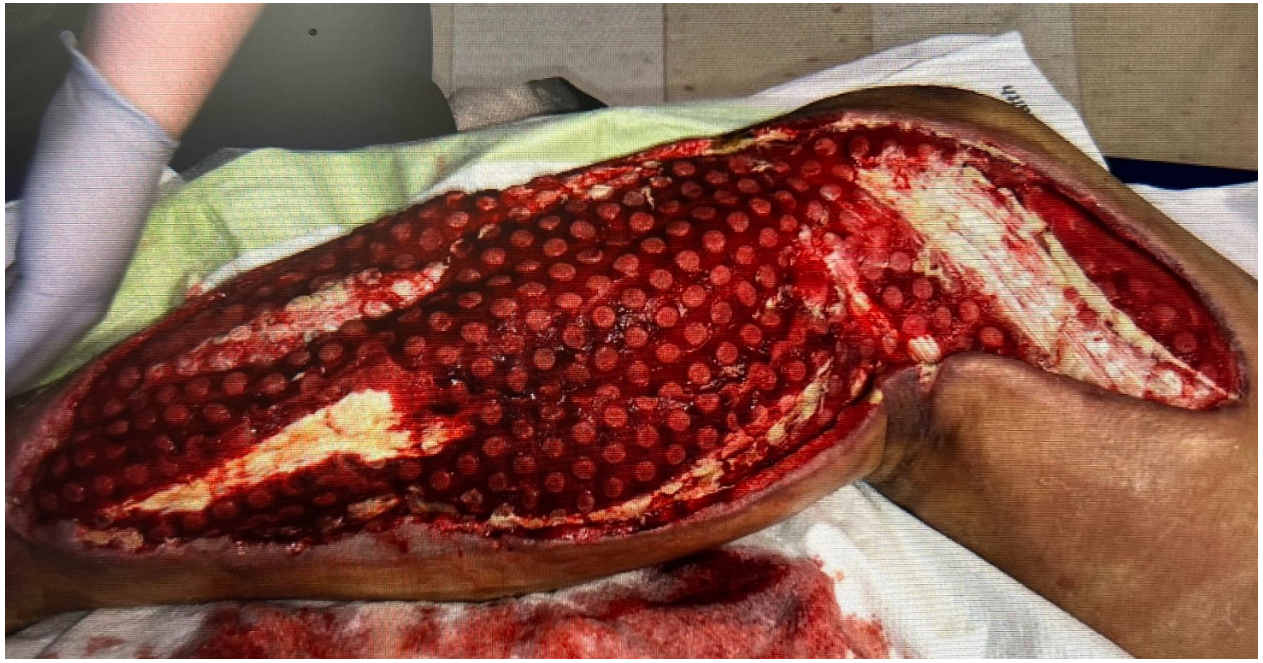


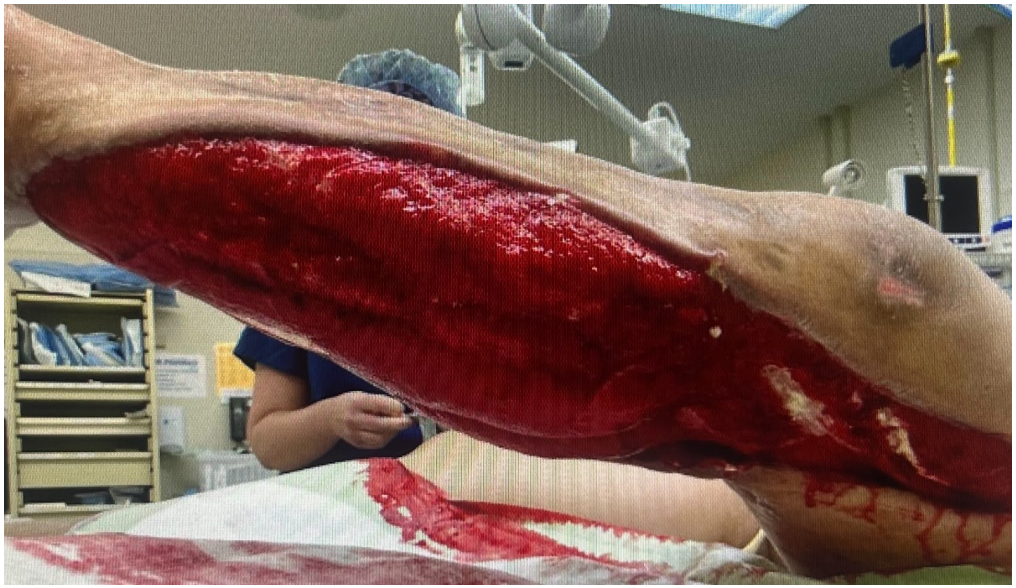


Myositis: Dressing Change 3, Medial

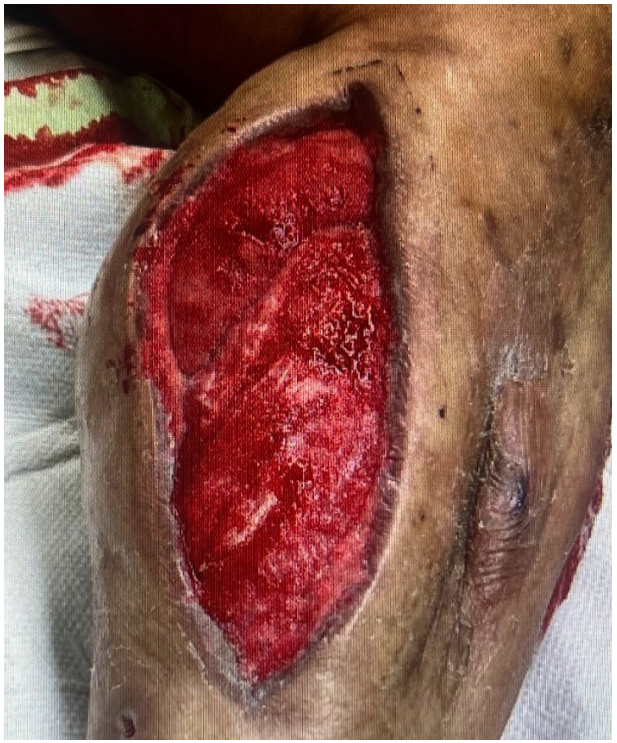


Myositis: Dressing Change 5

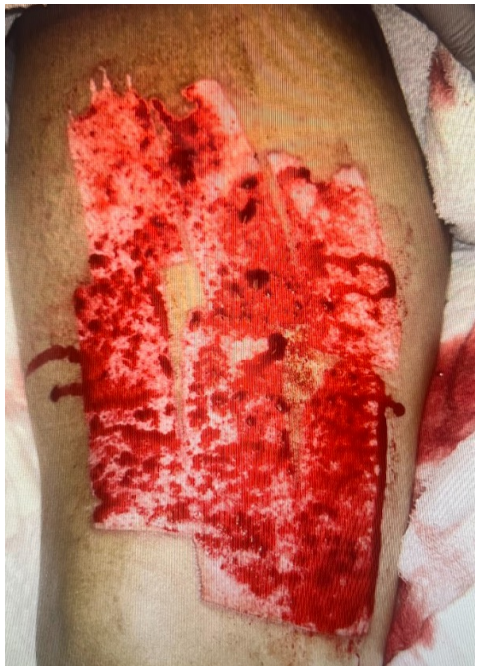


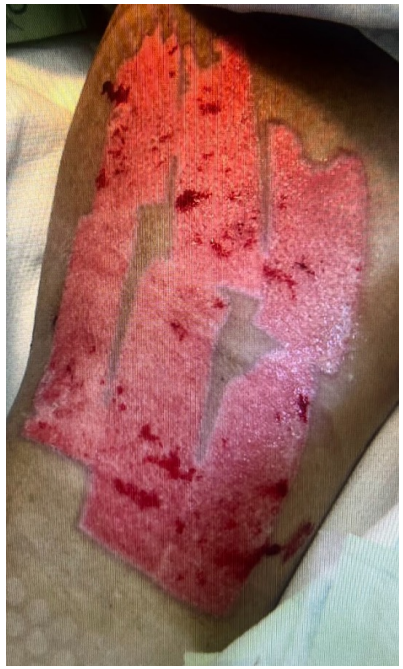


Myositis: Medial Leg, Skin Grafting



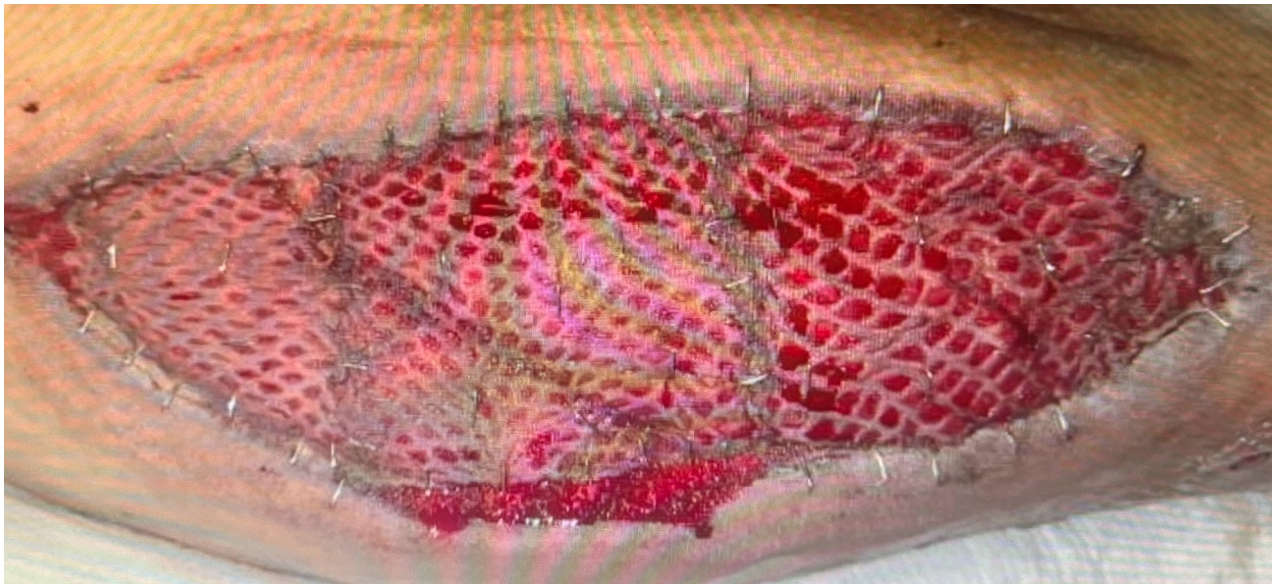
Myositis: Donor Site



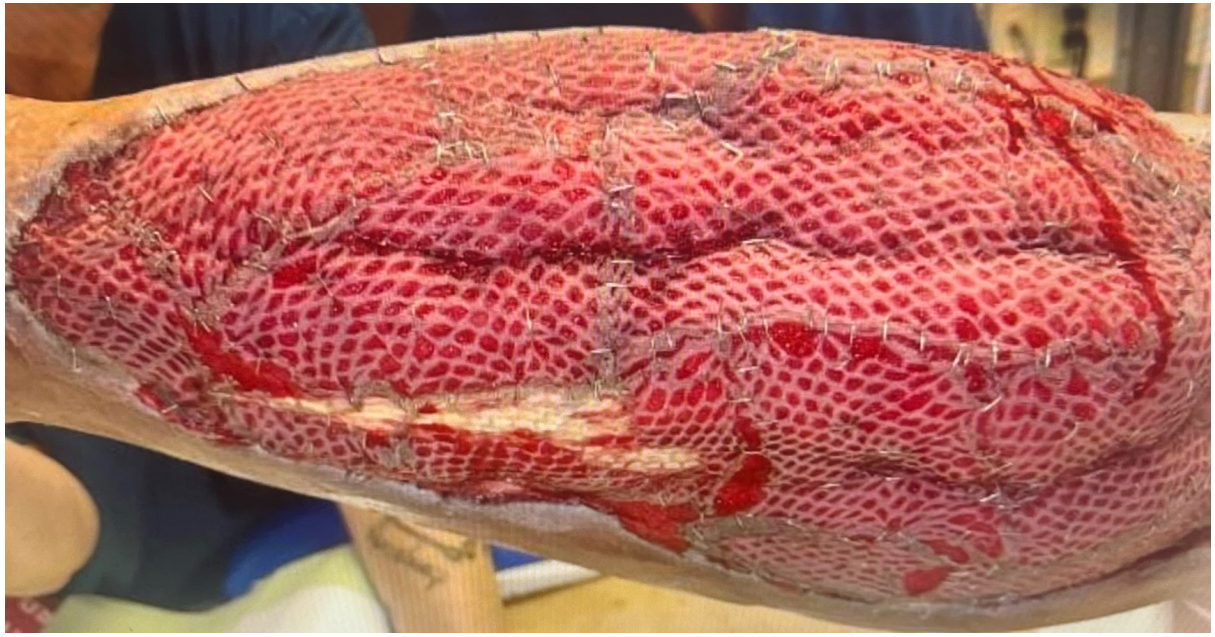


5 days of peel
and place dressing

Myositis: Medial, Dressing Change 1

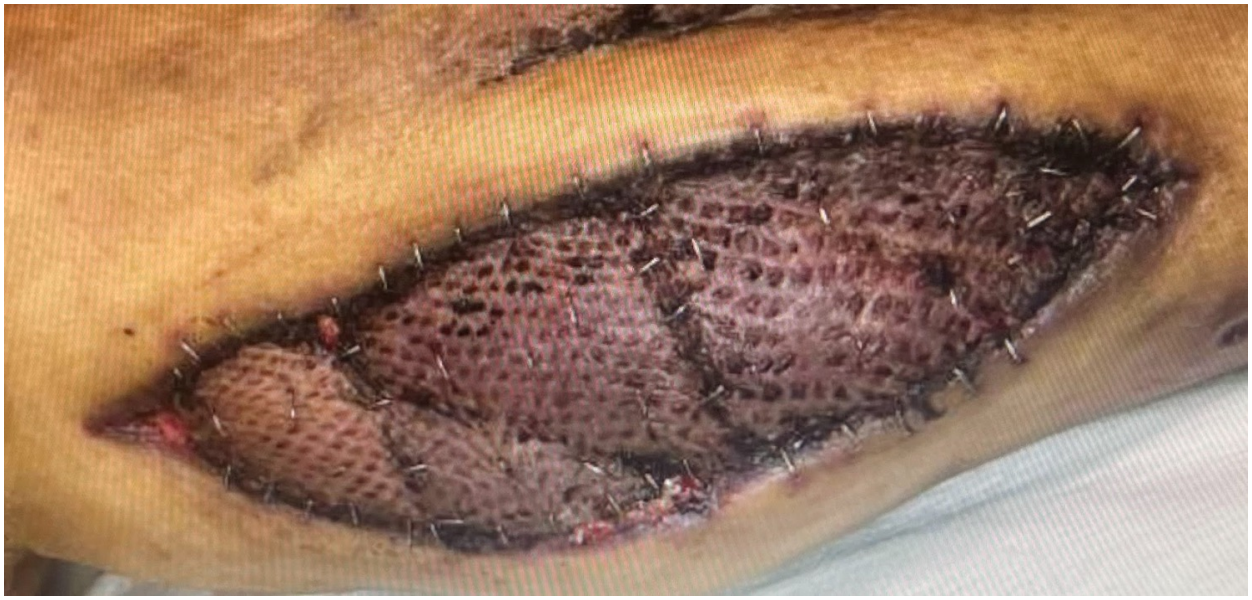


Myositis: Lateral, Dressing Change 1



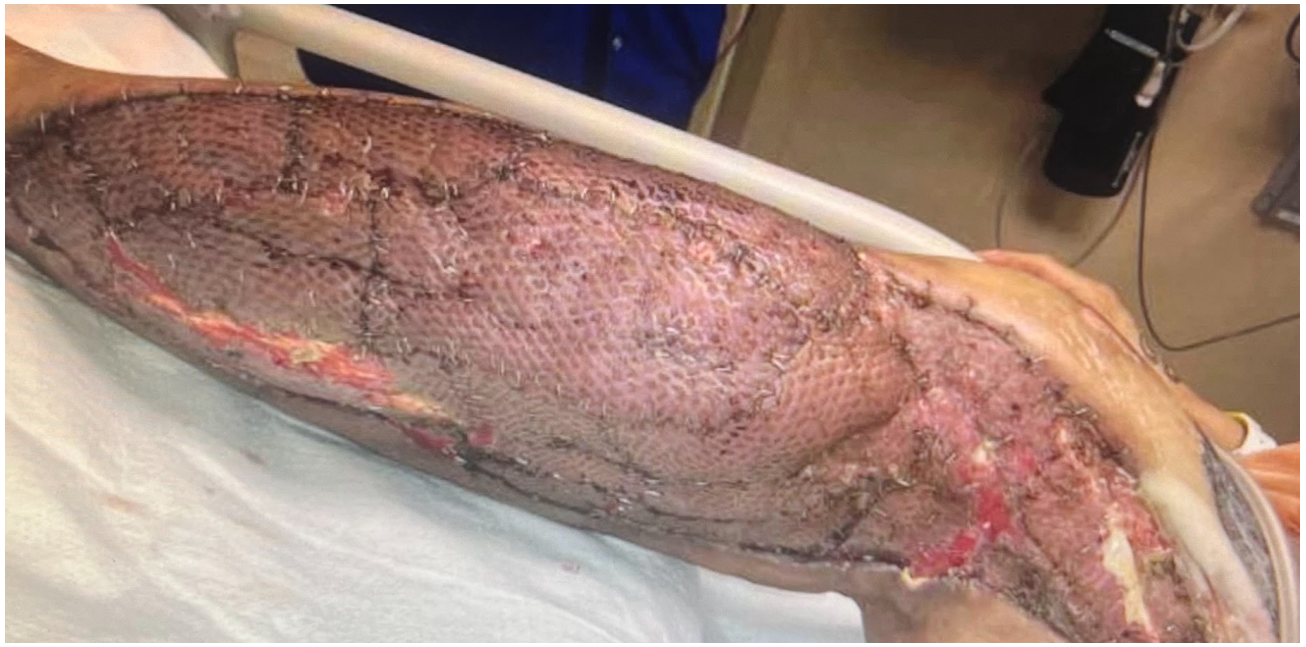
Myositis: Medial, Dressing Change 2

Day 7 after peel and place dressing

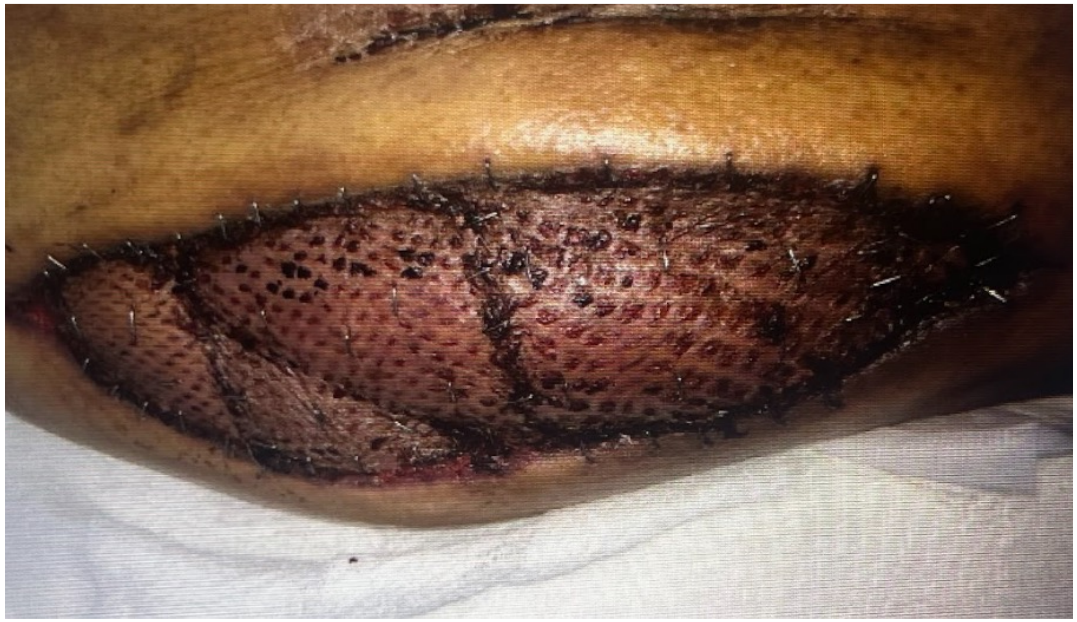


Myositis: Lateral, Dressing Change 2

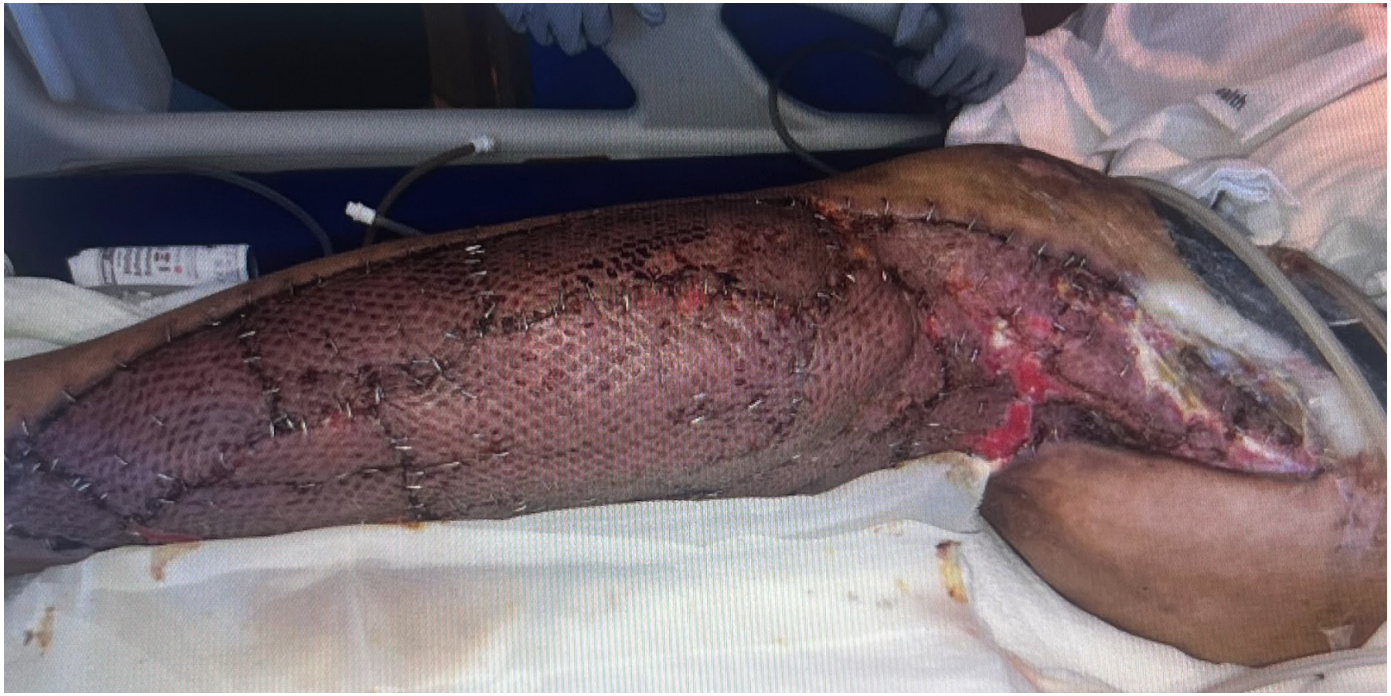
Day 7 after peel and place dressing



Myositis: Medial, Dressing Change 3



Myositis: Lateral, Dressing Change 3



Clinical Pearls

- NPWT is a versatile tool you can add to your toolbox
- You can step up and step down the type of NPWT you are using based on the wound, the patient, and the patient care setting
- When in doubt, you can always phone a friend ☺

Peel and Place Dressing

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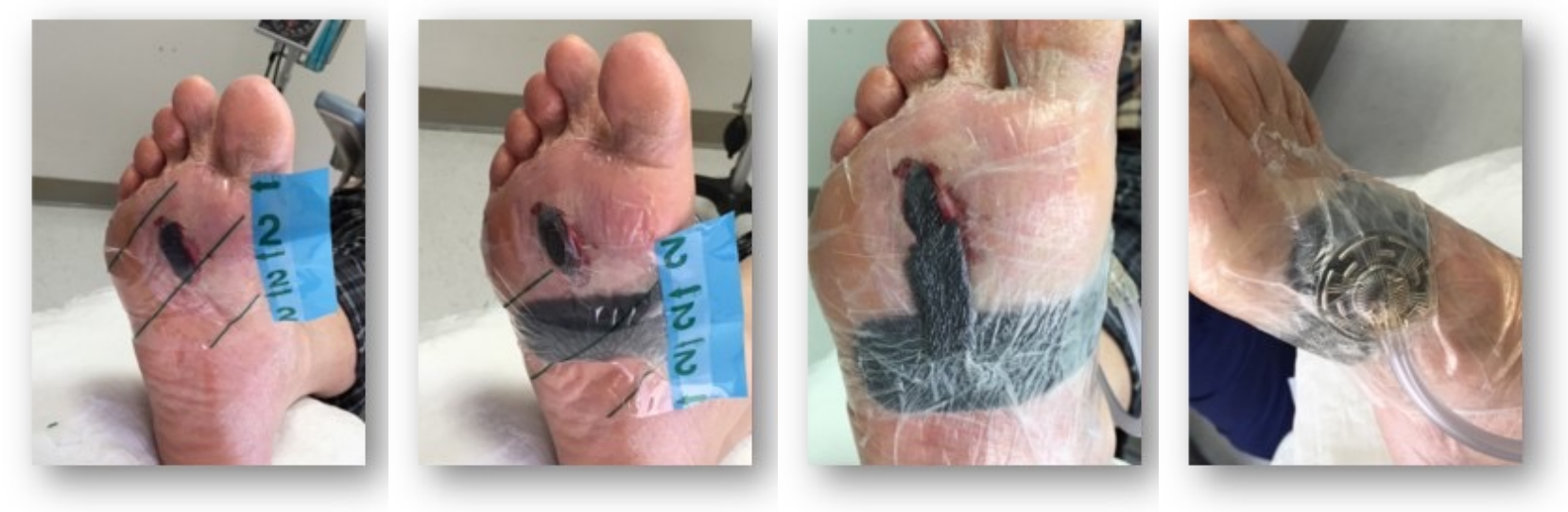
Division Chair, Wound Care – Prisma Health
Assoc. Professor of Surgery, University of South Carolina School of Medicine, Greenville
Adjunct Assoc. Professor, Dept. of Bioengineering, Clemson University
Greenville, SC

Traditional Acrylic Dressing

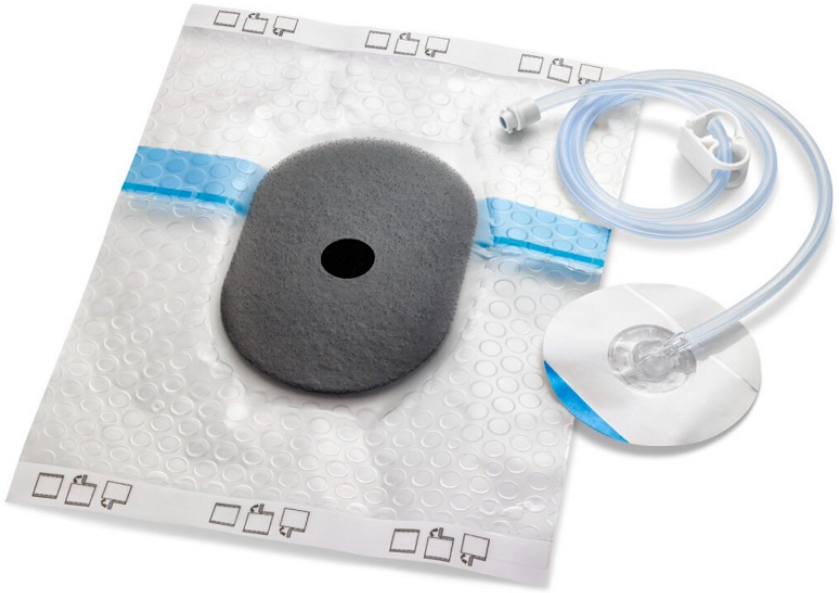


Peel and Place Dressing

Integrated design
Eliminates arts and crafts

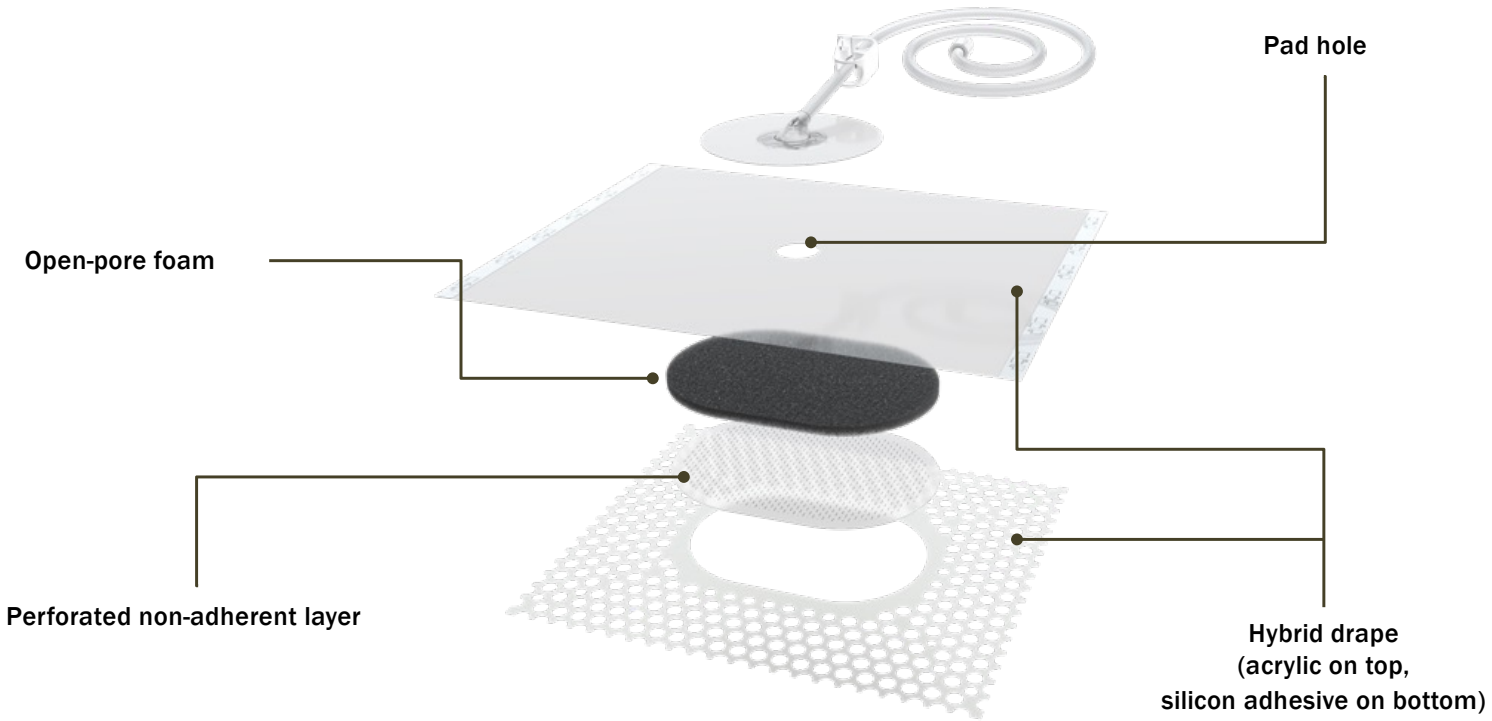
Application time
On average, 2 min*[1]

Wear time
Up to 7 days



*In a simulated test with 12 nurse and surgeon users. Average dressing application time of 01:48

All-in-One Design



The Bottom of the Dressing

Perforated, non-adherent bottom layer allows up to 7 days of wear by mitigating tissue ingrowth and reducing foam adhesion to the wound and pain upon removal.

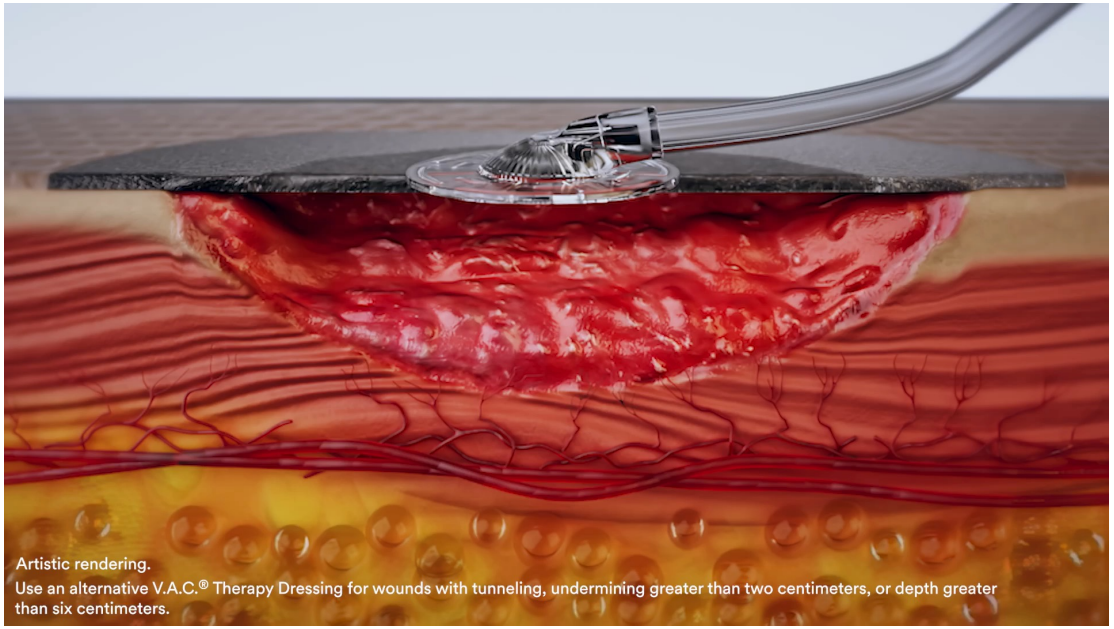
Peel and Place Dressing

- Available in 3 sizes
- Wear time up to 7 days
- Healthcare provider (HCP) might want to change more frequently if
  - Not yet comfortable with a 7-day wear time
  - Concerns over pressure/bony prominence or offloading
  - Wound condition concerns

Mechanism of Action (MOA)

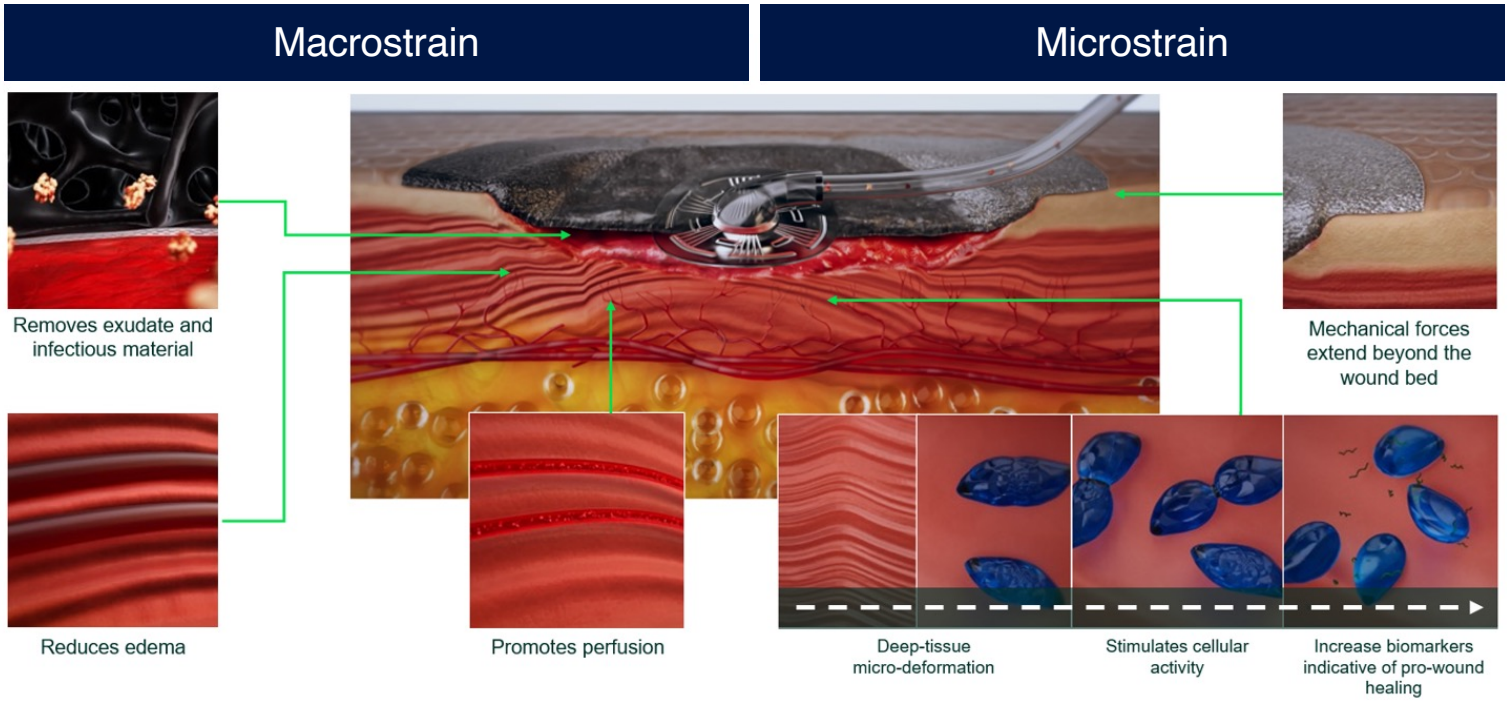
When used in conjunction with NPWT system, the peel and place dressing promotes wound healing by

- Removing exudate and infectious materials
- Reducing edema
- Promoting granulation tissue formation and perfusion
- Preparing wound for closure



Artistic rendering.
Use an alternative V.A.C.® Therapy Dressing for wounds with tunneling, undermining greater than two centimeters, or depth greater than six centimeters.

NPWT Peel and Place Dressing MOA

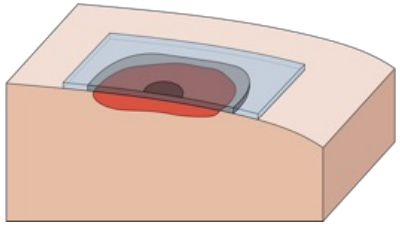


Wound Types that Benefit from Peel and Place Dressing

Where Peel and Place Dressing May Be Appropriate

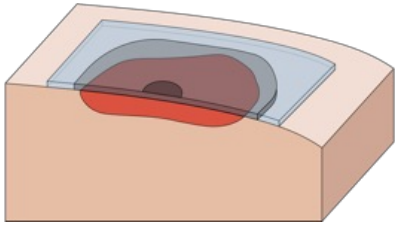
3 sizes to cover a variety of wound depths

Small



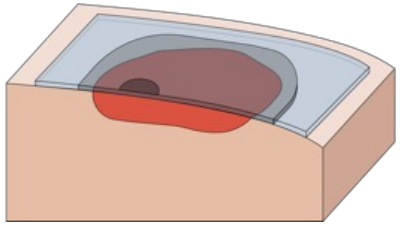
- **Foam:** 6.1cm x 8.6cm
- **Overall Dressing:** 16.9cm x 20.6cm
- **Max Wound Depth:** 2cm

Medium



- **Foam:** 11.1cm x 16.6cm
- **Overall Dressing**: 23.7cm x 29.2cm
- **Max Wound Depth:** 4cm

Large

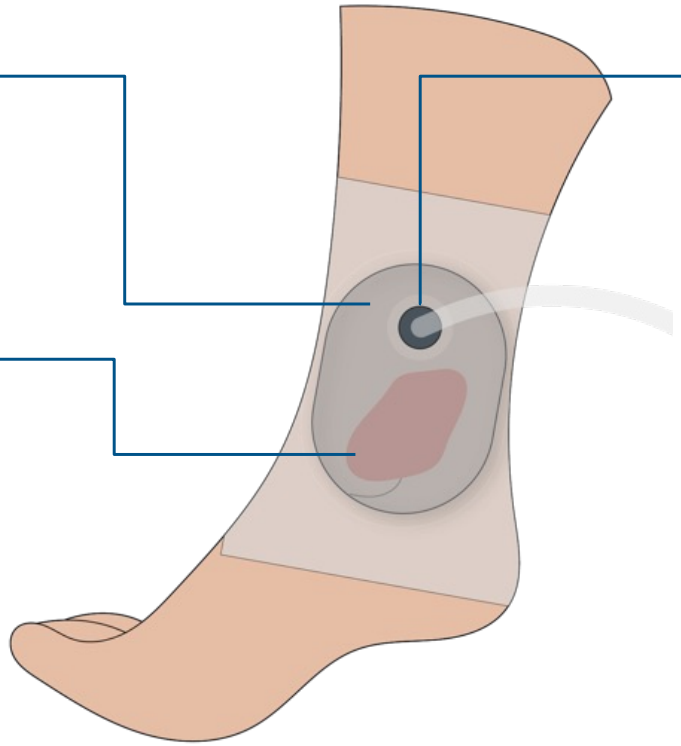


- **Foam**: 13.6cm x 24.2cm
- **Overall Dressing**: 26cm x 35.6cm
- **Max Wound Depth:** 6cm

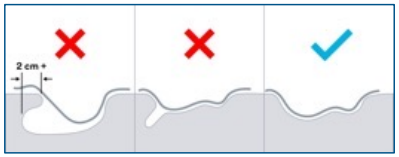
Considerations

1. Foam should extend beyond wound and touch periwound skin.

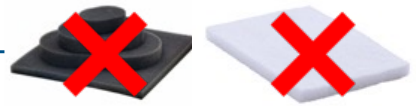
2. To offload, select the Large dressing size



3. Undermining must be ≤2cm; no tunneling can be present



4. Don't mix with other dressings. The use of additional foam fillers is prohibited.



Application Tips

No longer need to

- Cut foam to fit wound
- Count and document number of foam pieces
- Pre-drape or windowpane to protect intact skin
- Cut holes

Do NOT

- Use skin barriers/protectants as this may reduce adhesive properties
- Use with other NPWT dressing kits or foams, as they have a shorter wear time
- Push foam portion of the dressing down. Allow the dressing to draw down and conform to the wound bed as negative pressure is applied
- Stretch dressing

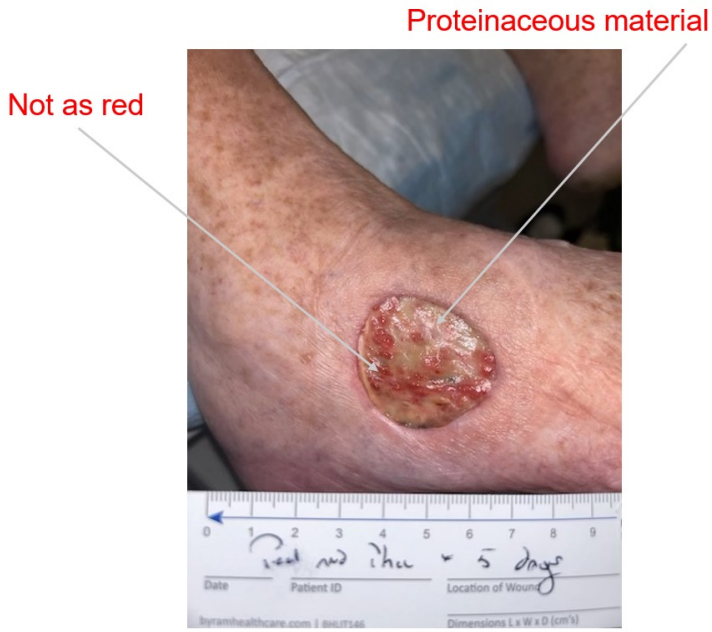
Drape tips

- Apply loosely over the wound area
- Leave at least 5cm border of drape whenever possible
- For curved anatomy, slits may be cut in the drape portion of the dressing to help reduce overlap, drape folds, or remove wrinkles

- **The dressing can stay in place when switching between approved NPWT units**
- **Never leave an NPWT dressing in place for more than 2hrs without active NPWT**

Redefining Expectations

- Granulation tissue
  - Color not as red, texture will be smoother
- Proteinaceous material on wound surface
- Odor
  - Dressing may exhibit moderate odor after longer wear time

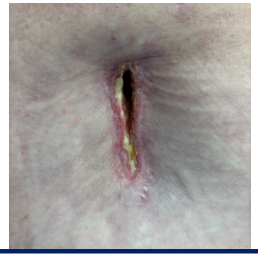


Less than Ideal for Initial Dressing Placement

High exudate in dependent position

Why:

Exudate sometimes pools and may cause maceration on the skin



Skinny and deep

Why:

Dressing is unable to conform to the bottom of the wound bed and can result in exudate pooling

Active bleeding

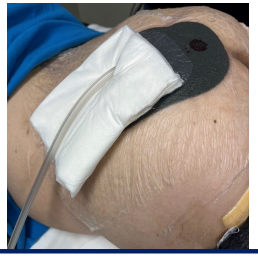
Why:

All VAC dressings require hemostasis to be achieved; and may cause blockage

DFU with inadequate offloading

Why:

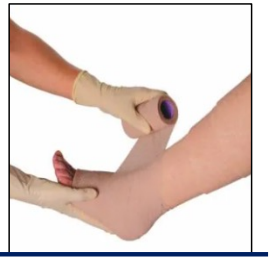
Exudate squeezed out of the tissue may over-wet or macerate periwound skin (eg, bedrest, scooters, etc)



PI with inadequate offloading

Why:

Source of the injury is not addressed, so wound is not likely to progress (eg, turning, positioning, padding, etc)



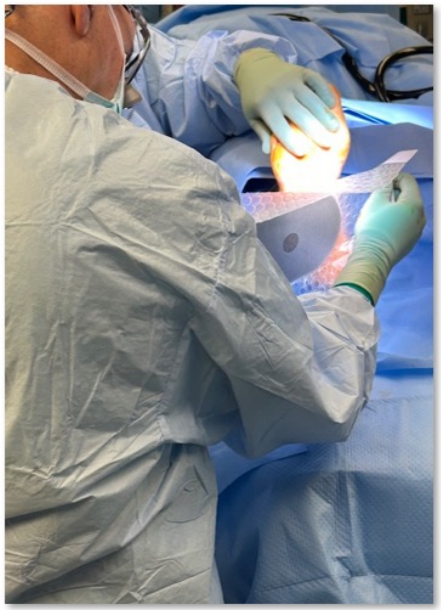
Wounds receiving compression

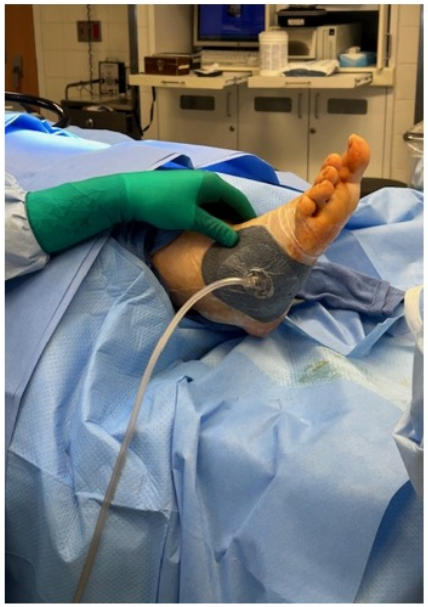
Why:

Not indicated together; compression may lead to reduced exudate removal and maceration or a pressure point

Peel and Place Value in Acute Care

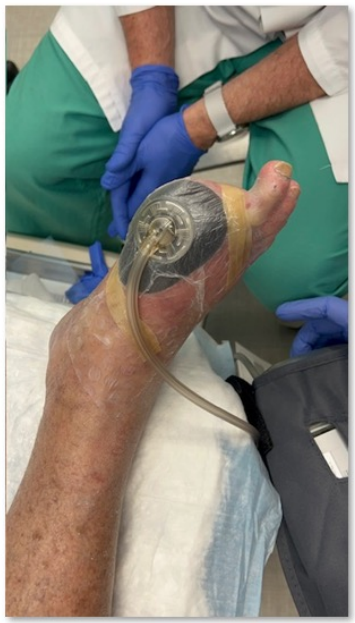
- **Up to 7-day wear time** allows critical staffing and resource flexibility while effectively maintaining NPWT
- **All-in-one design** streamlines application and reduces staff training; staff across skill levels can perform dressing changes
- Covers entire wound and surrounding tissue for **less than 2-min application** on average, saving time in the OR
- Faster dressing applications may **reduce costs** for procedures taking place in the OR





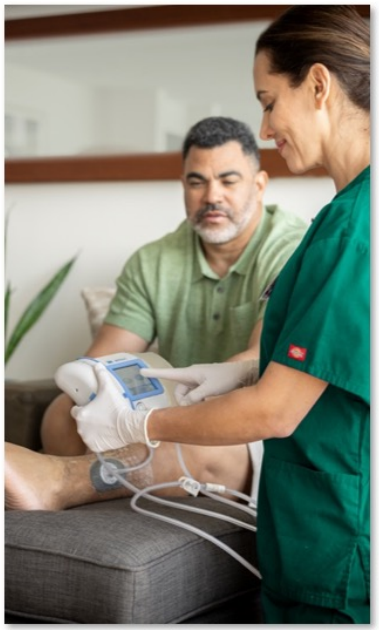
Peel and Place Value in Wound Clinics

- **Up to 7-day wear time** provides opportunity for wound clinic patients who are not eligible for home health visits to benefit from NPWT
- **Nurses** surveyed rated the dressing as **easy to use**
- Less than 2-min average application time is significantly faster
- Available at **no additional cost for at-home patients;** billed to patient's insurance under same code as other NPWT dressings



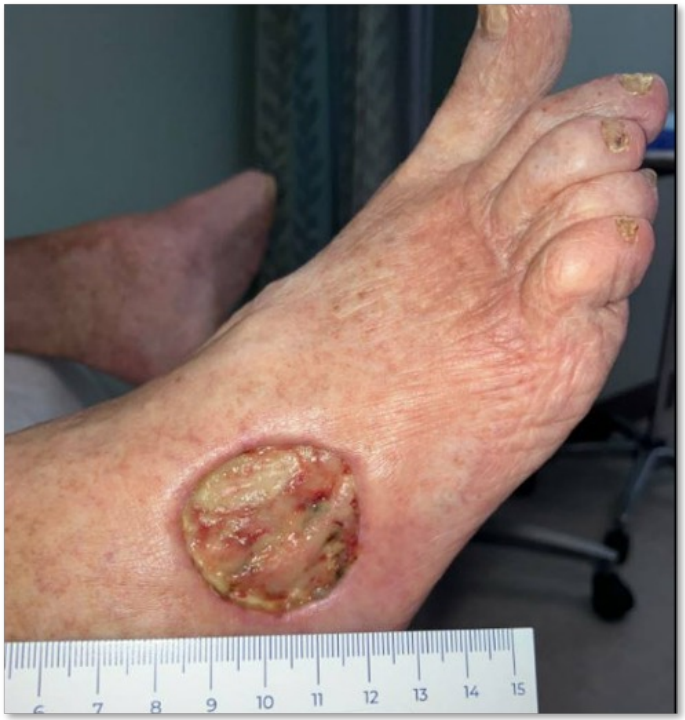
Peel and Place Value in Home Health Setting

- 3x the wear time; 1/3 the nursing visits
- Can reduce number of nursing visits
- Fewer dressing changes mean home health agencies could **manage more patients per month** that require NPWT
- **Easier application** for clinicians who may not have experience or confidence applying NPWT on more complex wounds
- Available at **no additional cost for at-home patients;** billed to patient's insurance under same code as other NPWT dressings

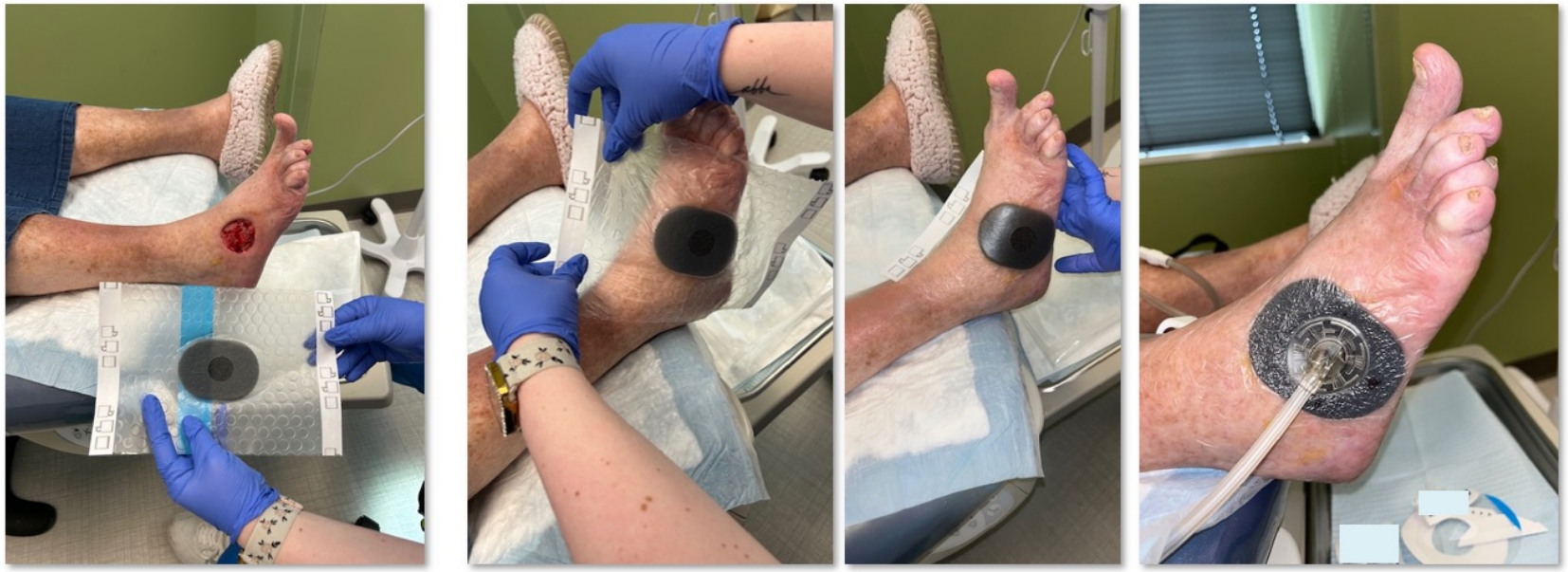


s/p Mohs Surgery for BCC

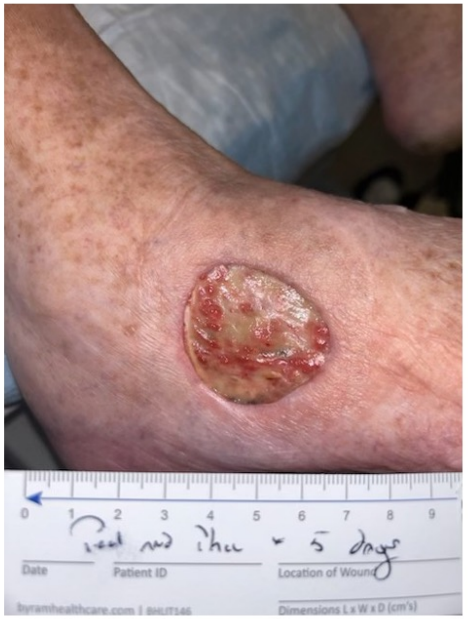
- 83y Female s/p Mohs surgery for basal cell carcinoma
  - Past medical history: DM, A-fib, fatty liver disease

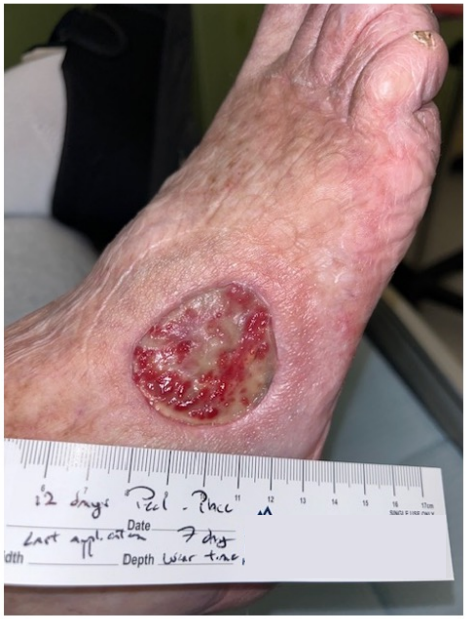


s/p Mohs Surgery for BCC



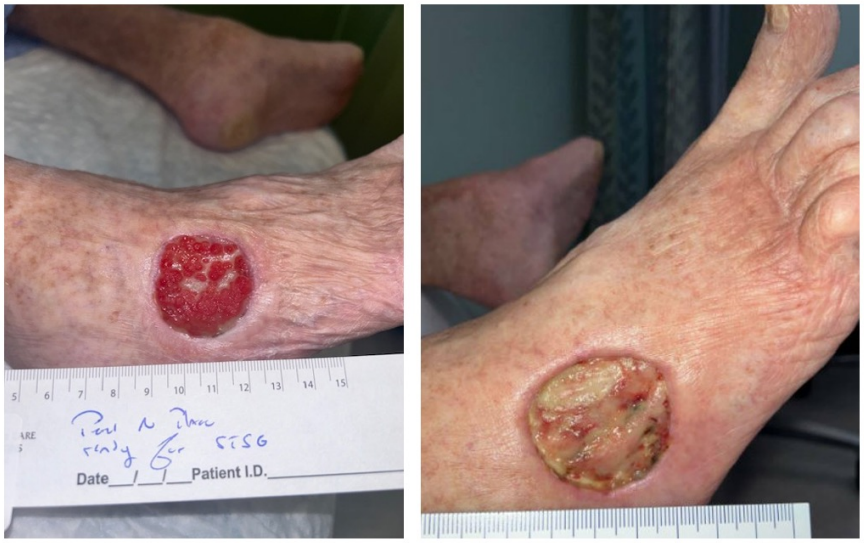
s/p Mohs Surgery for BCC



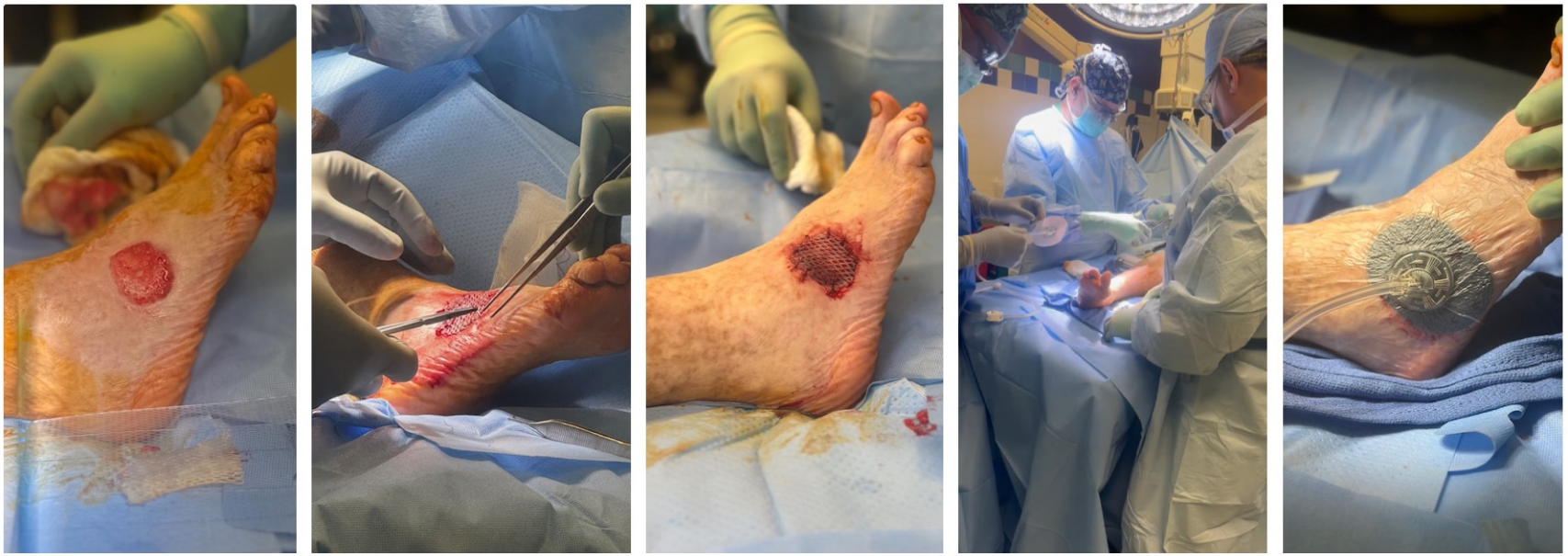


s/p Mohs Surgery for BCC

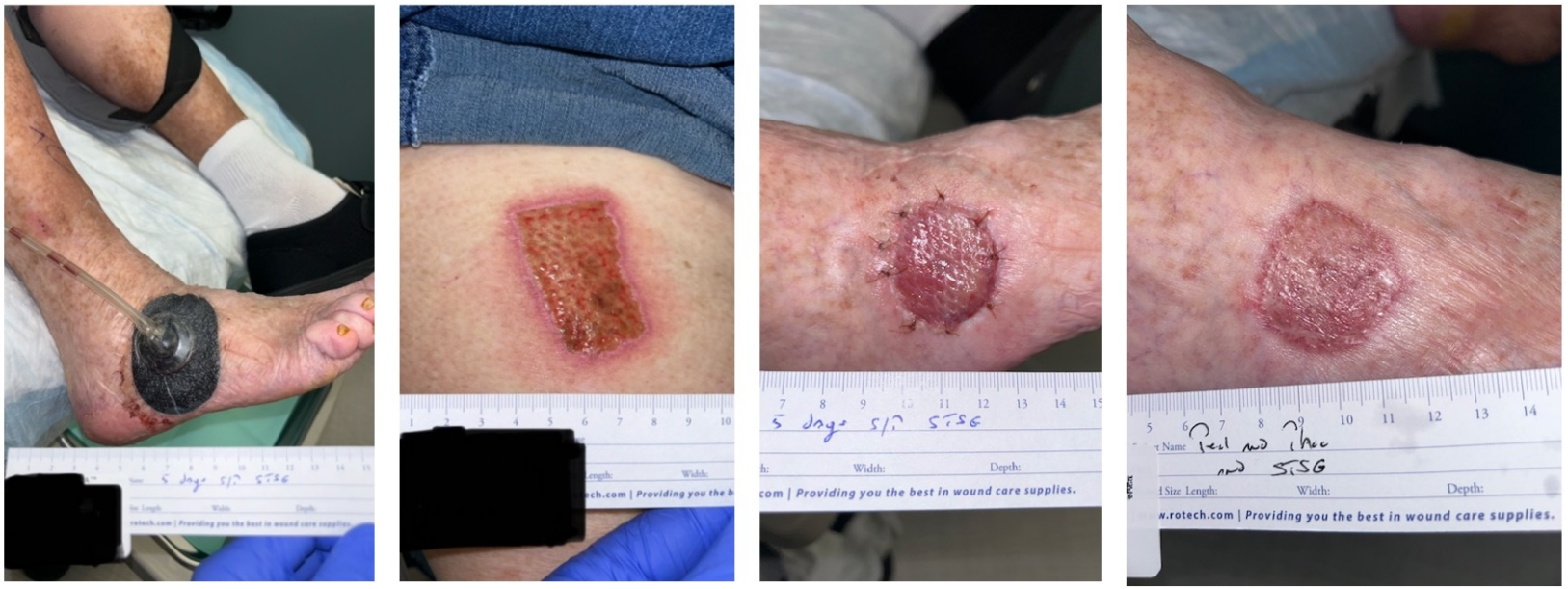
- Peel and place x40 days with most dressing changes at 7 days wear time



s/p Mohs Surgery for BCC

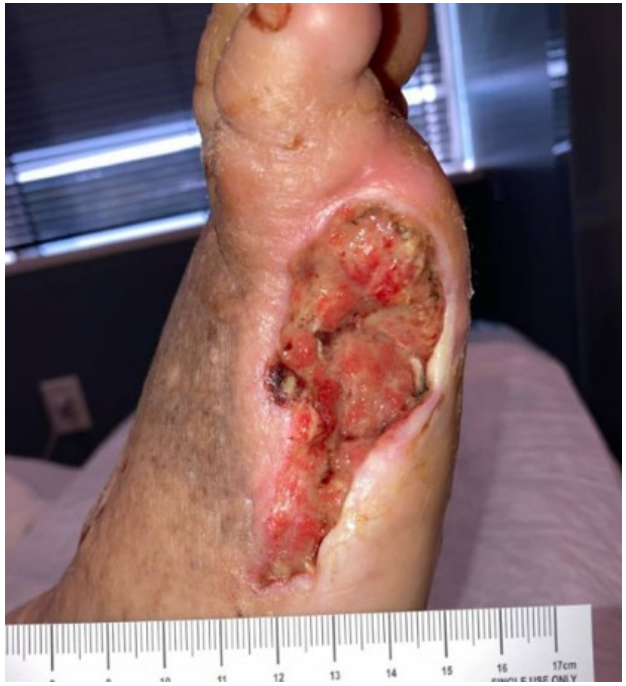


s/p Mohs Surgery for BCC

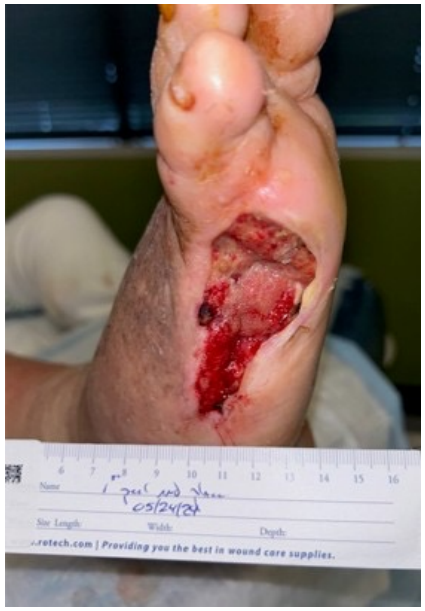


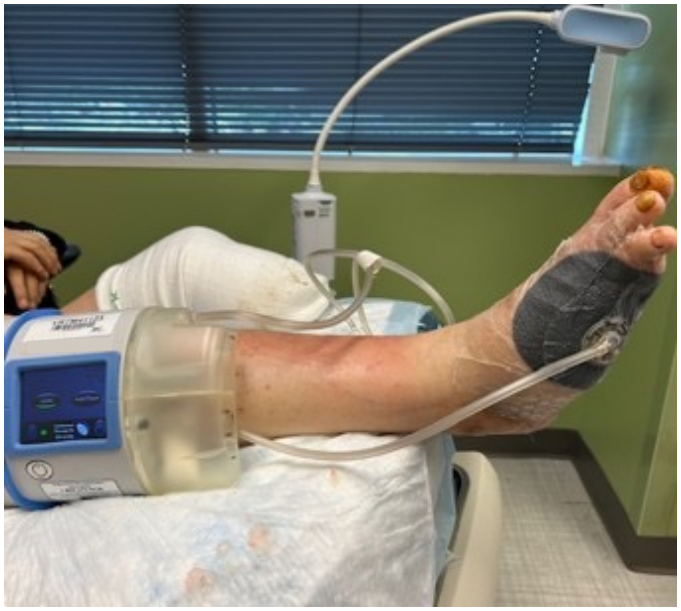
s/p 4th and 5th Ray Amputation

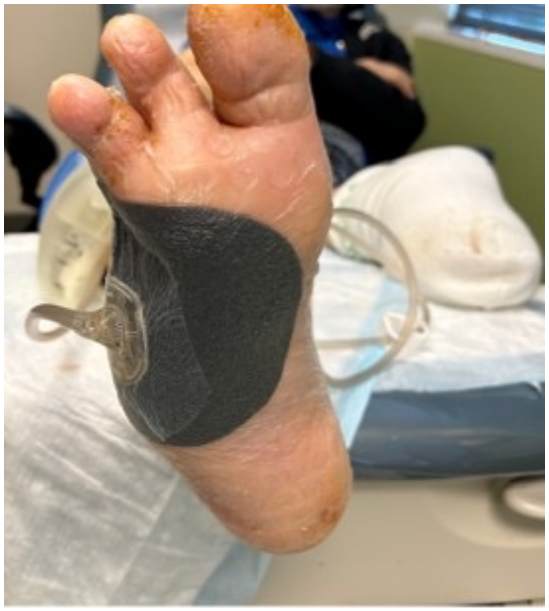
- 75y Male s/p 4th and 5th ray amputation right foot; previous BKA left leg in the same yr
  - PMHx: DM, neuropathy, OM, and BKA left leg



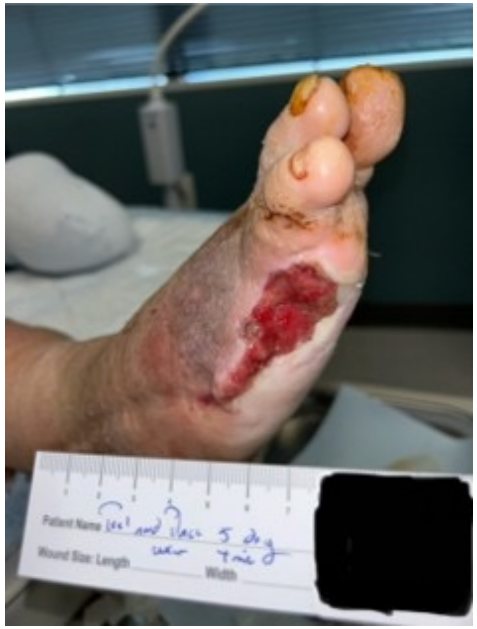
s/p 4th and 5th Ray Amputation

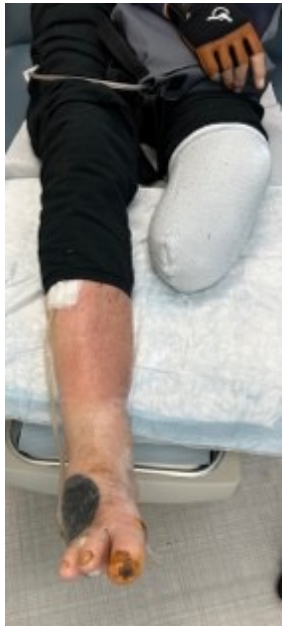






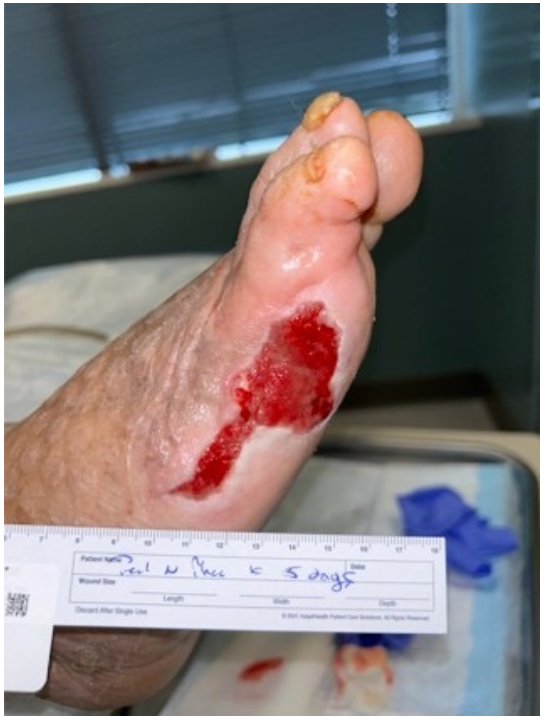
s/p 4th and 5th Ray Amputation



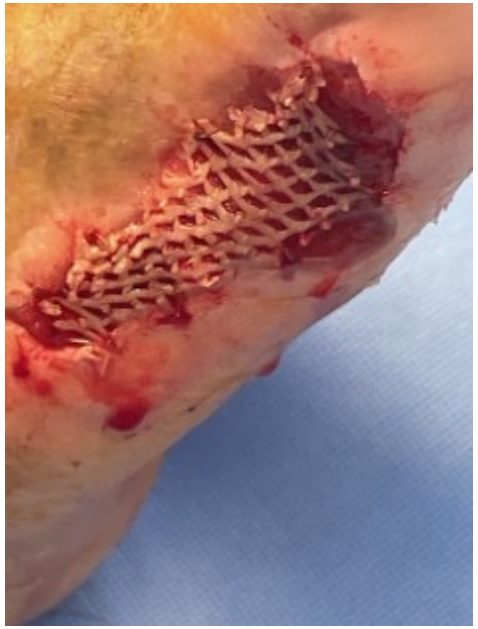


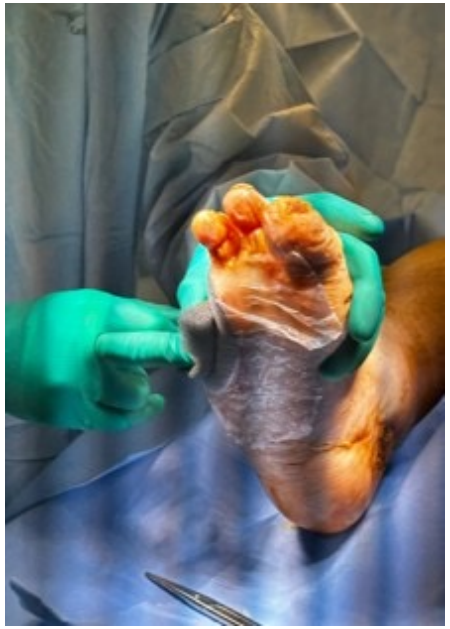
s/p 4th and 5th Ray Amputation

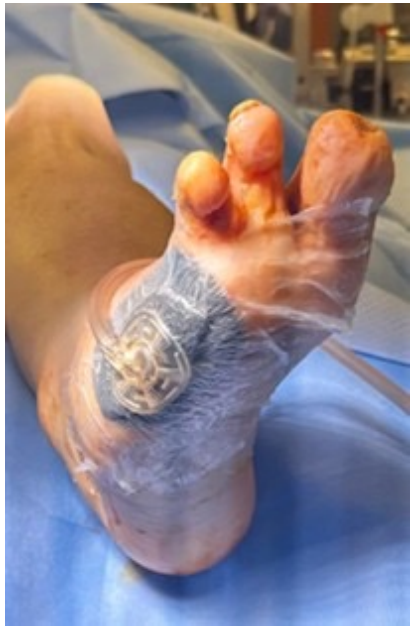
- 24 days peel and place with most dressing changes with 5 days wear time
  - Ready for STSG



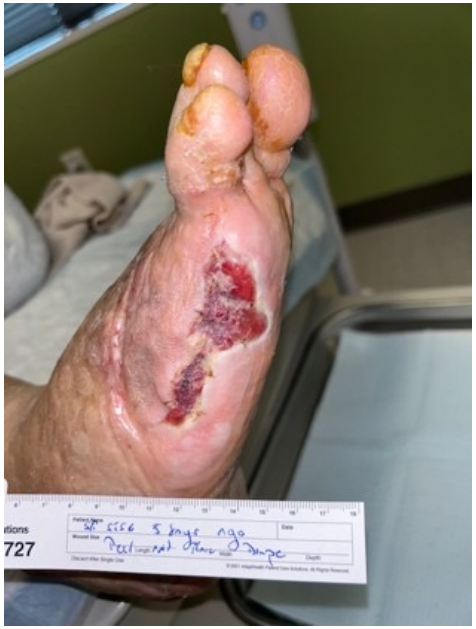
s/p 4th and 5th Ray Amputation

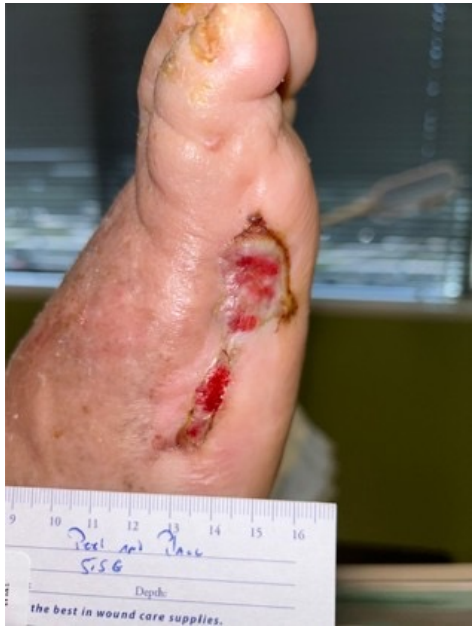


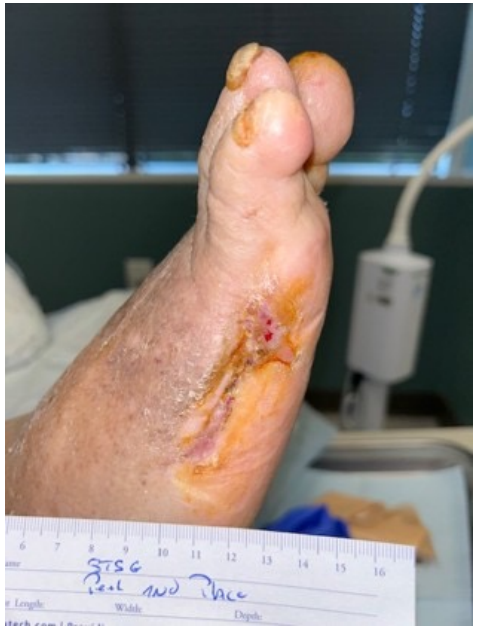




s/p 4th and 5th Ray Amputation







Clinical Pearls

- Wounds will initially look slightly different with the peel and place dressing – color not as red, proteinaceous material on wound (stuff, not slough), and you may notice a moderate odor – stay the course
- Remember, peel and place dressing is appropriate for wounds with ≤2cm of undermining and no tunneling

Bedside and Beyond: Transition Strategies to Power NPWT Success

Karen Bauer, DNP, APRN-FNP, CWS, FAAWC
Emory Healthcare Heart & Vascular
Atlanta, GA

Multi-Location NPWT Challenges

Therapy Consistency

Ensuring consistent use across settings can be challenging

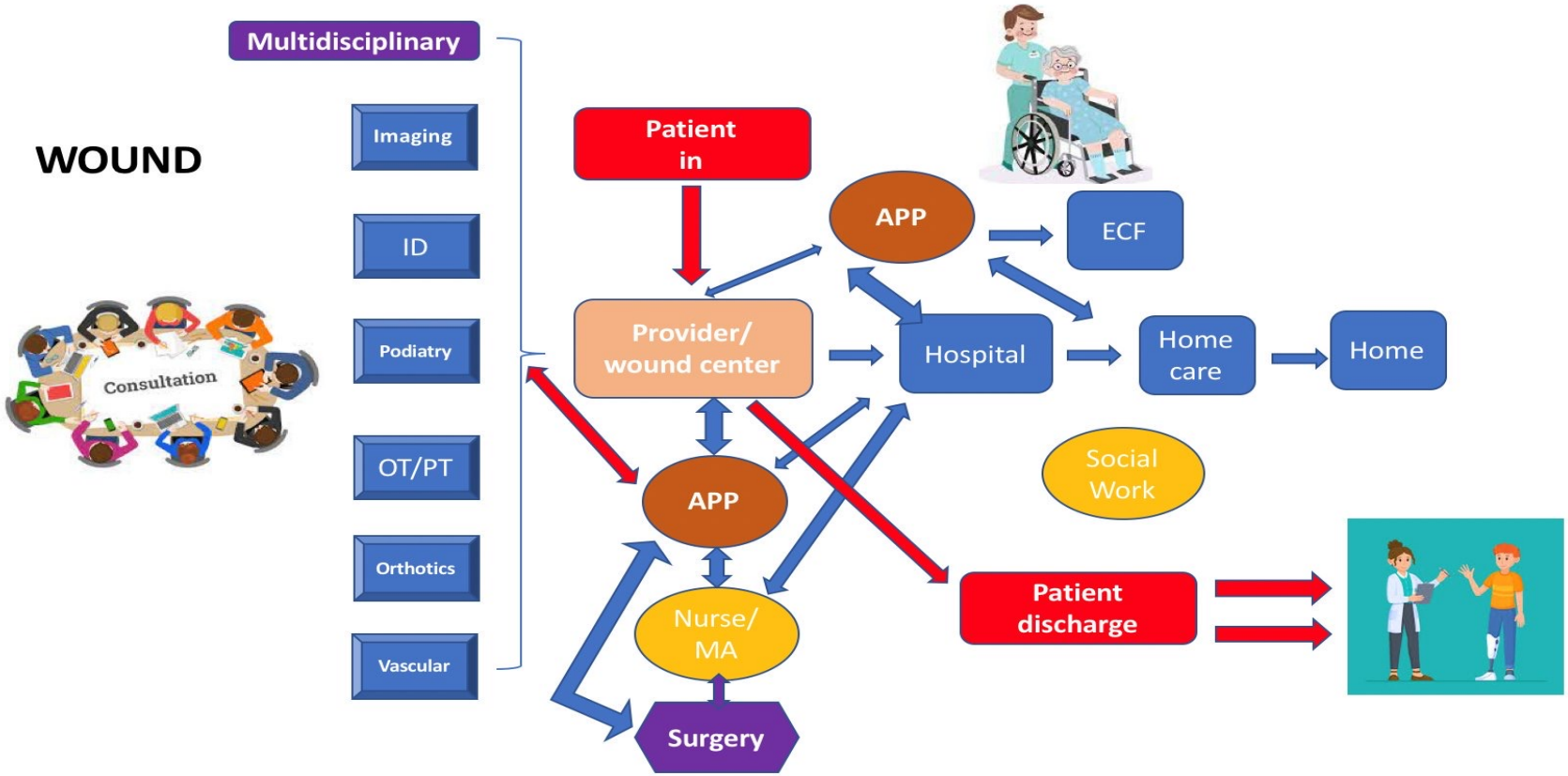
Logistical Complexities

Managing equipment availability and patient mobility

Care Coordination

Effective communication and precise treatment protocols are essential

Easy. Right?!?!


Multidisciplinary
WOUND
Imaging
ID
Podiatry
OT/PT
Orthotics
Vascular
Consultation
Patient in
Provider/ wound center
APP
ECF
Hospital
Home care
Home
Social Work
APP
Nurse/ MA
Surgery
Patient discharge

2019 Qualitative Study

- Most had positive viewpoint on NPWT
- Discontent with tubing and buzzing noise
  - Alarms and “broken seal”
- Some wanted shared decision-making
  - Others had a paternalistic view

➢ **Meet the patient where they are!**

Moffatt CJ, et al. *J Wound Care*. 2019;28(11):738-756.

Roadmap Overview

- Care setting transition
  - Collaborative and careful planning
  - Focus on patient education, staff training
  - Ensure access to necessary supplies
  - Ongoing support
- **Inpatient:** After debridement, prep for closure or grafting, maintenance, or initial therapy
- **Outpatient:** Reduce readmission, optimize healing, manage exudate, reduce infection risk
  - Home health vs ambulatory clinic
- **SNF/ECF**: Reduce readmission, optimize healing, manage exudate, reduce infection risk

- NPWT can improve patient satisfaction, reduce cost, and allow for a comfortable environment
- No clear "best" answer for many specific patient-wound scenarios
- Needs diligent and HOLISTIC care

Keenan C, et al. *Adv Wound Care* (New Rochelle). 2025;14(1):33-47.

Roadblocks and Detours

- **Training:** NPWT, proper technique, troubleshooting
- **Logistics:** Access to supplies, equipment, timely communication
- **Patient Education:** Benefits, complications, maintenance
- **Patient Adherence:** NPWT protocols
- **Wound Complexity:** Careful assessment and planning

Paving the Path: Tools for the Road

- **Collaborative Care:** Clear communication — written and verbal
- **Patient-Centered:** Assess individual needs, involve patients/families in planning and decision-making
- **Comprehensive Training:** Lunch & Learn, shared clinic visits, virtual sessions
- **Standardized Protocols**
- **Access to Resources:** Smart sets, consignment programs, know who has what

Lumbers M. *Br J Community Nurs.* 2024;29(Sup12):S36-S38.

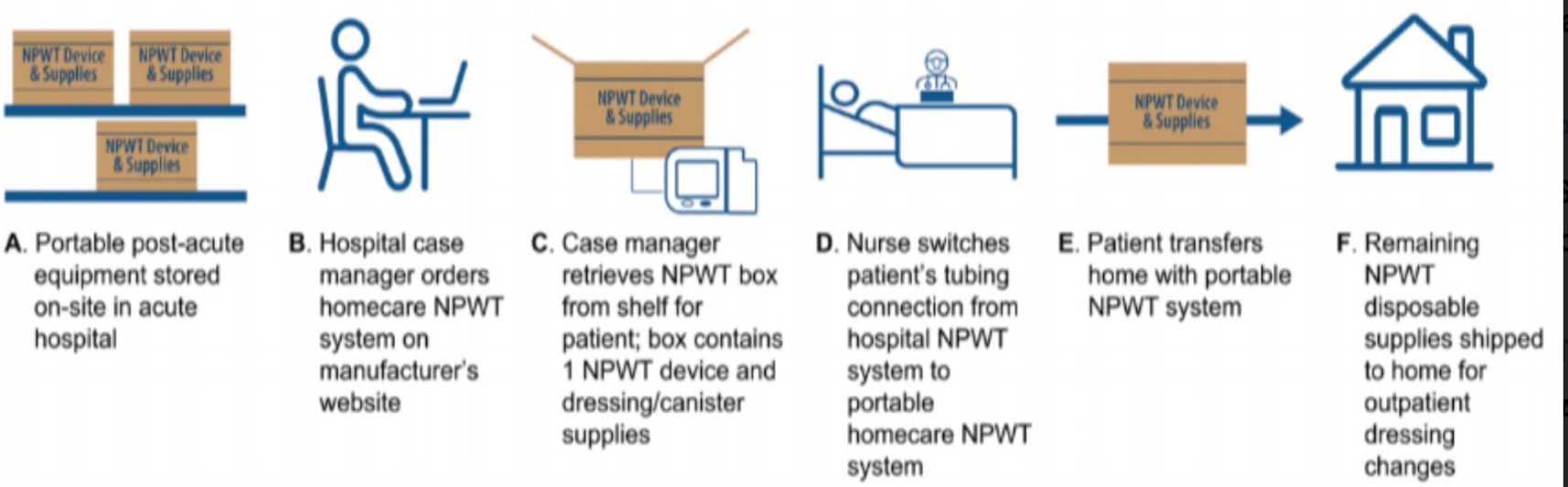
Driving Toward Success

- **Reduced Hospital Stays:** Shorter hospitalizations, quicker transitions
- **Improved Patient Outcomes:** Promote healing, reduce surgical needs, improve QoL

Cost Reduction

Mobile NPWT Systems: Easier to manage wounds in outpatient setting

Consignment at Discharge



A. Portable post-acute equipment stored on-site in acute hospital

B. Hospital case manager orders homecare NPWT system on manufacturer's website

C. Case manager retrieves NPWT box from shelf for patient; box contains 1 NPWT device and dressing/canister supplies

D. Nurse switches patient's tubing connection from hospital NPWT system to portable homecare NPWT system

E. Patient transfers home with portable NPWT system

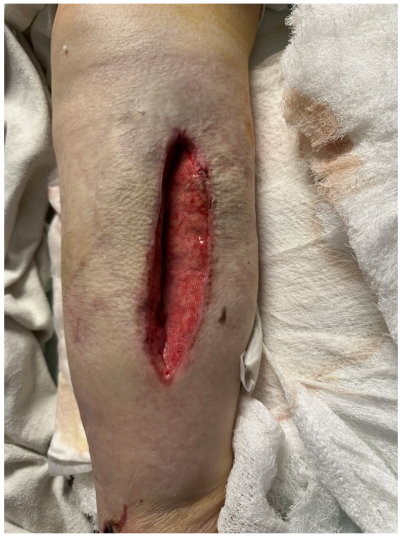
F. Remaining NPWT disposable supplies shipped to home for outpatient dressing changes

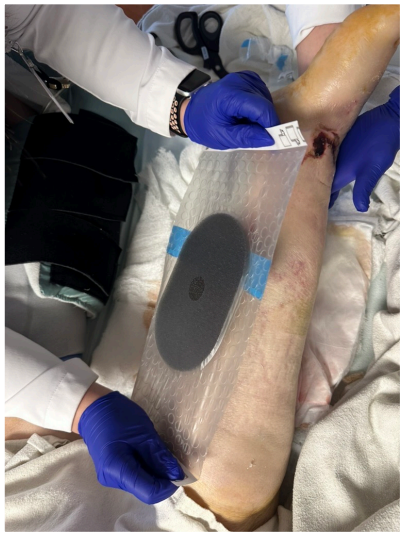
Figure 1. The FT process from hospital to home with NPWT.
Abbreviations: FT, facilitated transition; NPWT, negative pressure wound therapy.

Boti L, et al. *Wounds.* 2022;34(12):E118-E120.

Novel NPWT in Acute Care

- **Up to 7-day wear time:** Decreased staff time/supplies with frequent dressing changes
- **All-in-one design:** Reduces staff training and quick application
- Covers entire wound and surrounding tissue for **less than 2 min application** on average, saving time in the OR
- Faster dressing applications may **reduce costs** for procedures taking place in OR





Novel NPWT in Ambulatory Care

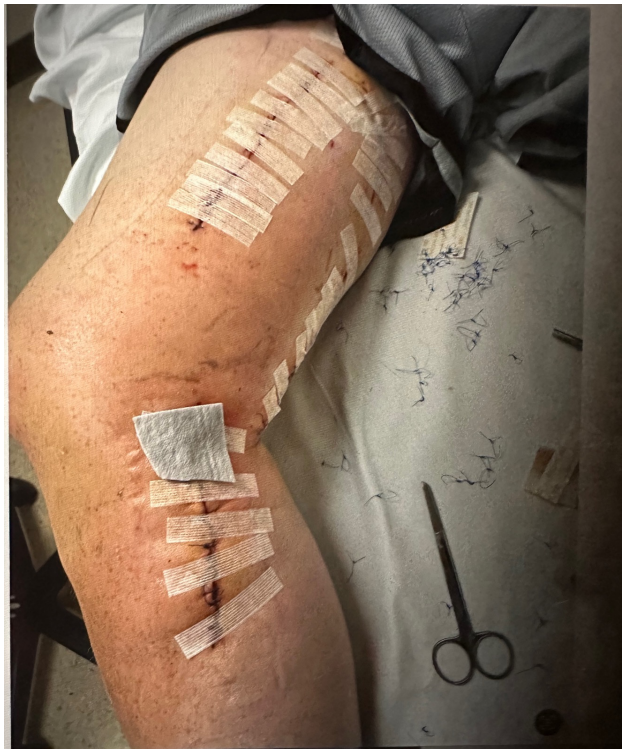
- **Up to 7-day wear time:** Wound clinic patients who are not eligible for home health visits can benefit
- Available at **no additional cost for at-home patients;** billed to patient's insurance under same code as other NPWT dressings

Home Health

- 3x the wear time; 1/3 of the nursing visits
- Fewer dressing changes mean home health agencies can accept more NPWT patients — volume
- Easier application for clinicians who may lack experience or confidence applying NPWT on more complex wounds

Closed Incision

- Support needed
- Conceal tubing/dressing
- Expand involvement and self-care
- Individually tailored information is essential for transition from hospital to home, and that written information needs improvement



Journal of Vascular Nursing 41 (2023) 171–179

Contents lists available at ScienceDirect

Journal of Vascular Nursing

journal homepage: www.sciencedirect.com/journal/journal-of-vascular-nursing

Patient experiences of closed-incision negative pressure therapy on groin incisions after discharge following peripheral arterial surgery: A qualitative study

Camilla Borch Graversen, RN, BScN[a], Malene Missel, RN, MScN, PhD[b], Sally Jakobsen, RN, MScN[a,*]

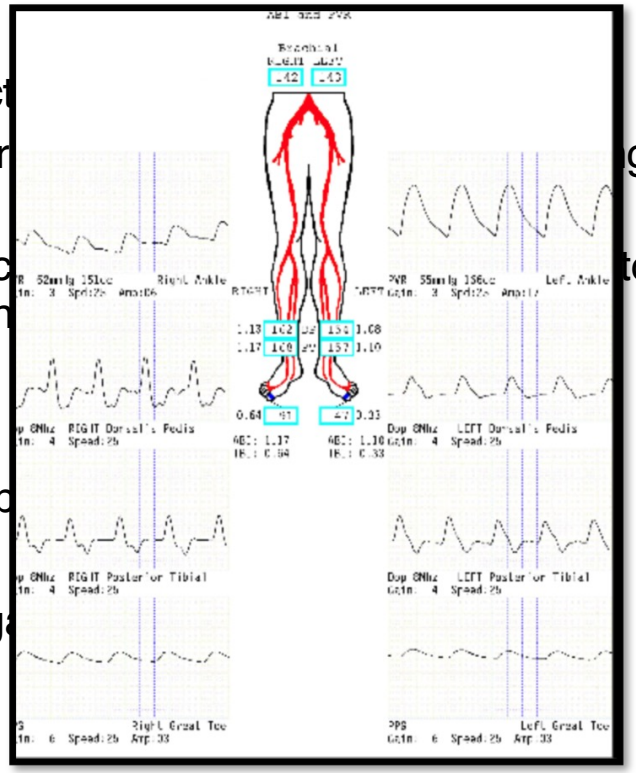
[a] Department of Vascular Surgery, Copenhagen University Hospital – Rigshospitalet, Inge Lehmanns vej 5, 2100 Copenhagen, Denmark
[b] Department of Cardiothoracic Surgery, Copenhagen University Hospital – Rigshospitalet, Inge Lehmanns vej 5, 2100 Copenhagen, Denmark

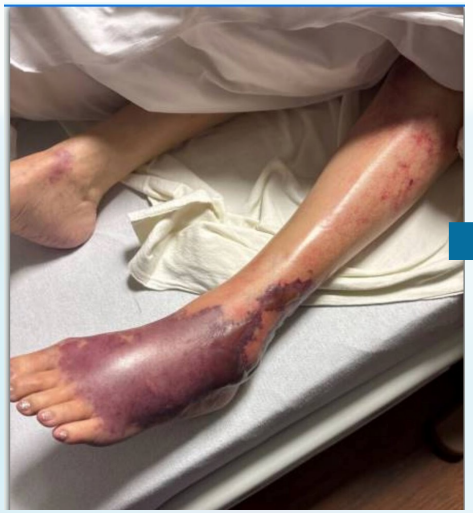
Graversen CB, et al. *J Vasc Nurs.* 2023;41(4):171-179.

Everything and the Kitchen Sink

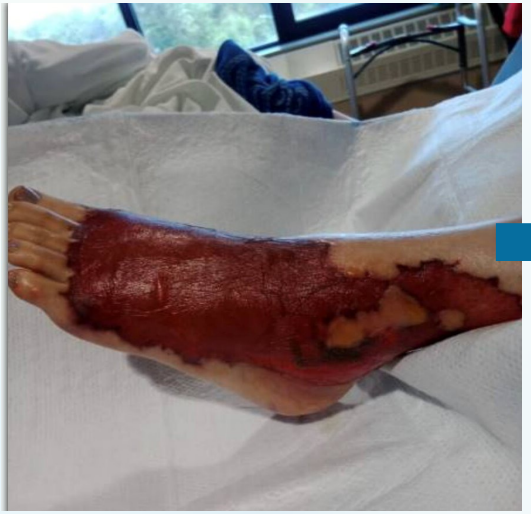
Unplanned Care Transitions and Treatment Changes

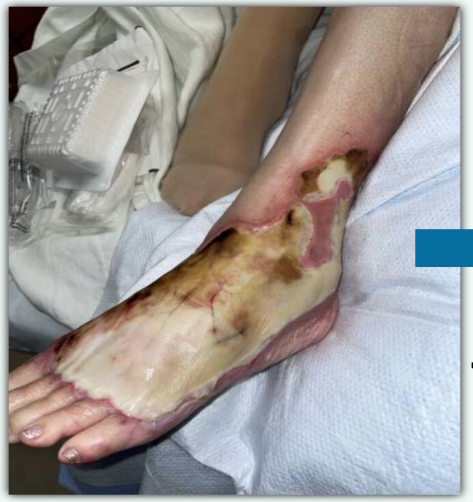
- 68y Female
- PMH/PSH: Gastric bypass, prior cholecystect
- Presented 2/2 diffuse body bruises, left lower g, bruising malaise, anorexia
- CT: Atrophic pancreatic parenchyma, hepatic tomy, nonspecific colitis edema, left pleural effusion
- Lap-assisted ERCP 6/15
- Rheumatology: Vasculitis?
- ECHO: Noted clot in pericardium along with p
- Venous DUS negative
- Biopsy of LLE wound from 7/24/24 showed g (dermatopathology)
- High-dose steroids with taper at discharge





June



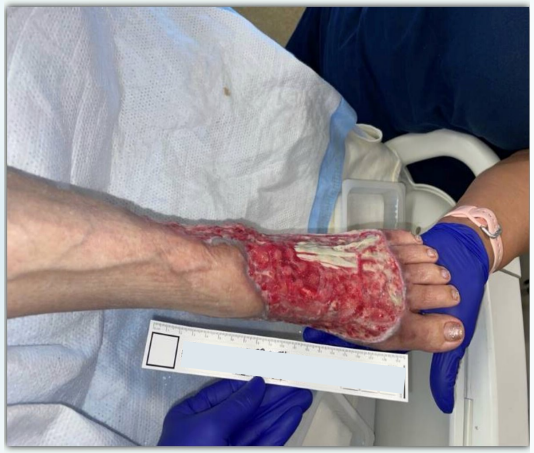


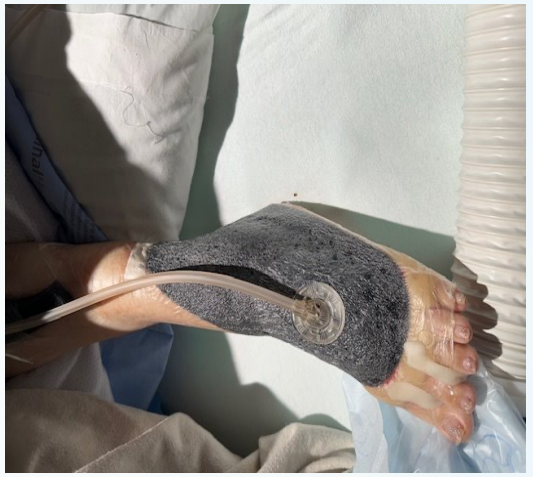
July

NPWTi-d after OR with HOCl

10min dwell time q2hrs at
-125 mm Hg, 3x/wk

Multidisciplinary Coordination
GIM; ID; Rheumatology; Vascular



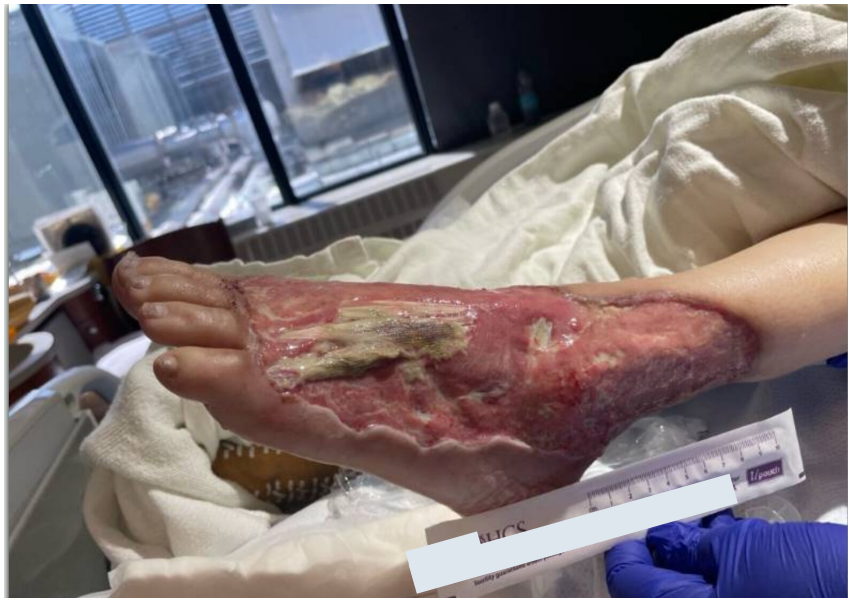


Real-World Obstacles

Challenges

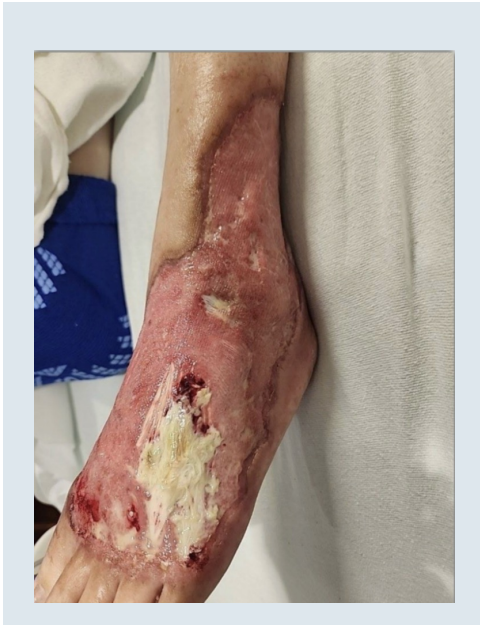
- Pain control
- Health literacy
- Isolation
- Ulcer location
- Etiology not fully delineated
- NPWT varied
- **Care transition**

Portable NPWT with non-adherent over tendon, black foam, 75 mm Hg with titration goal 125 mm Hg, as tolerated



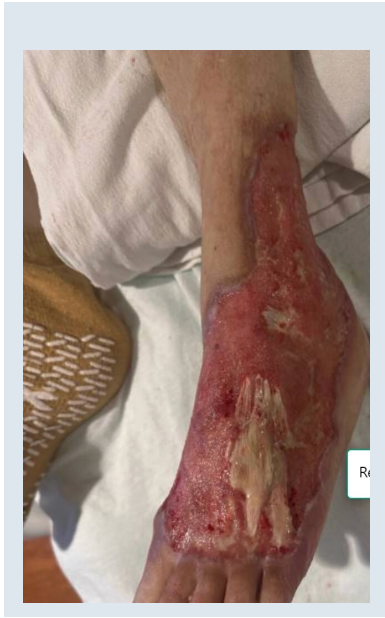
August

Interrupted NPWT: Consider Patient Factors!



Sept 10

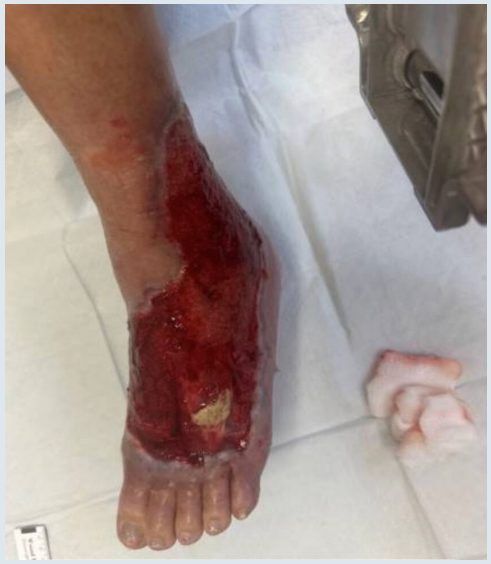
NPWT held prior at ECF
Readmitted, started novel NPWT



Sept 14

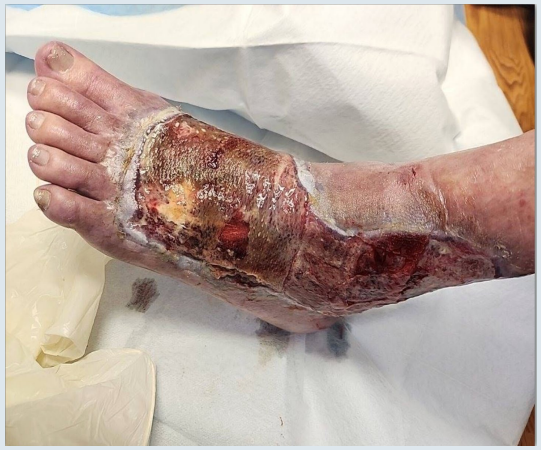
Discharged on portable NPWT
Non-adherent, black foam, -75 mm Hg

Multi-Modal Therapy



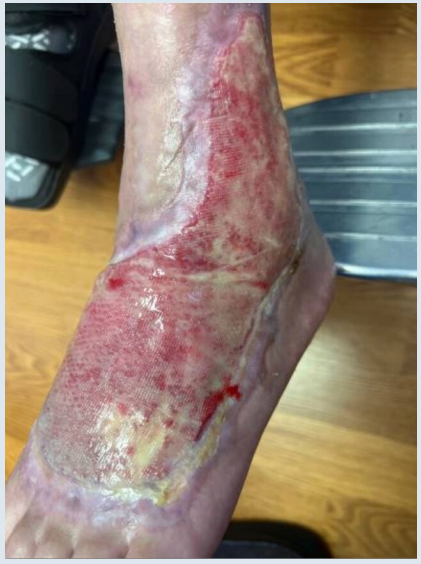
Oct 5

CTP/Wash-out booked



Oct 14

1 wk post CTP: portable NPWT
Non-adherent, black foam, -75 mm Hg

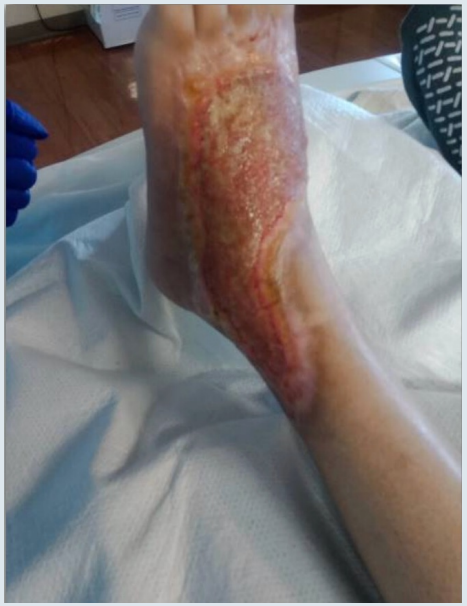


Oct 26

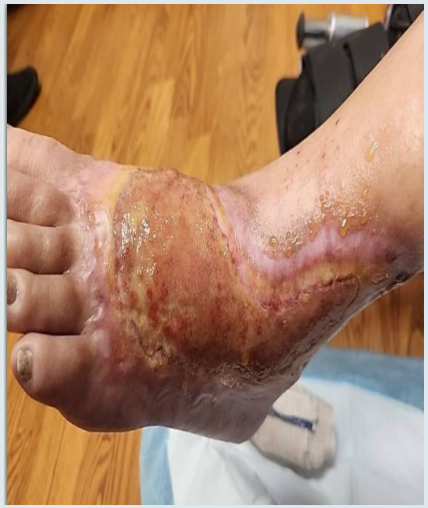
Portable NPWT
Non-adherent, black foam, -75 mm Hg

CTP = cellular and/or tissue-based product.

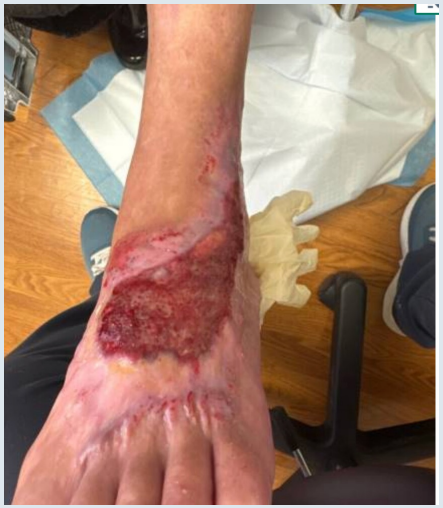
Inpatient to Outpatient Transitions — Coordination



Nov 24
Inpatient: NPWT and peel and place



Dec 2
Portable NPWT
Non-adherent, black foam, -75 mm Hg



Feb 12
Collagen, off dapsone

Large Abdominal Wound Post Renal Transplant

- 65y Female, Type 2 DM with diabetic retinopathy and h/o DFUs
- HTN, CAD s/p old MI (2016) and CABG X 2 (9/21/2021, LIMA to LAD and reverse SVG to OM)
- HFpEF, h/o paroxysmal atrial fibrillation
- Carotid artery stenosis s/p right carotid endarterectomy (12/13/2018)
- Secondary hyperparathyroidism and anemia of CKD
- Stage 4 oropharyngeal cancer (left tonsil)
- COPD, HPL, GERD, gout, hypothyroidism, skin melanoma s/p excision
- Osteoarthritis s/p right knee replacement (2017)
- h/o right rotator cuff tear
- Anxiety, obesity, OSA (on CPAP), h/o colon polyps, diverticulosis, h/o MRSA infection, hearing loss (left ear)
- Anesthesia problems, difficult IV access
- Dermatitis, chronic sinusitis, headaches, dental disease, h/o fecal incontinence

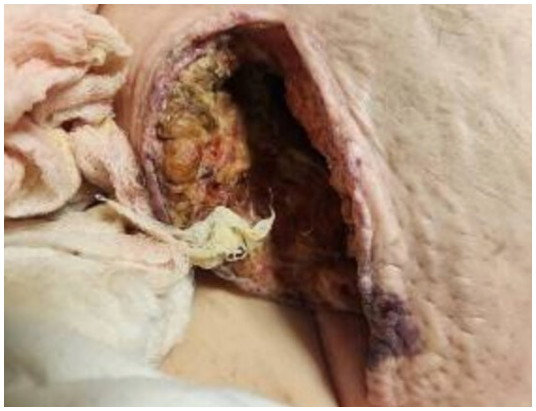
Surgical Progression

NPWT: The Power of Wound Specialist Persuasion
(Getting other services to buy in)

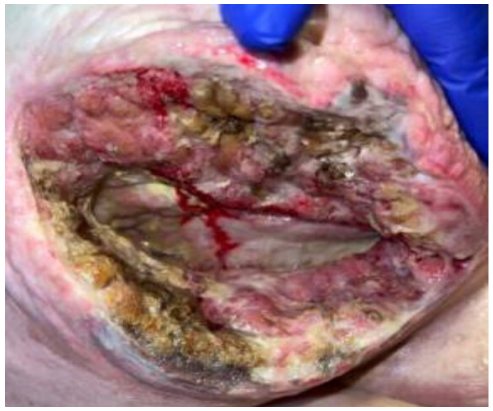
Deceased Donor Kidney Transplant: June 28

Incisional Infection Washout: July 9, July 25

Consulted July 10



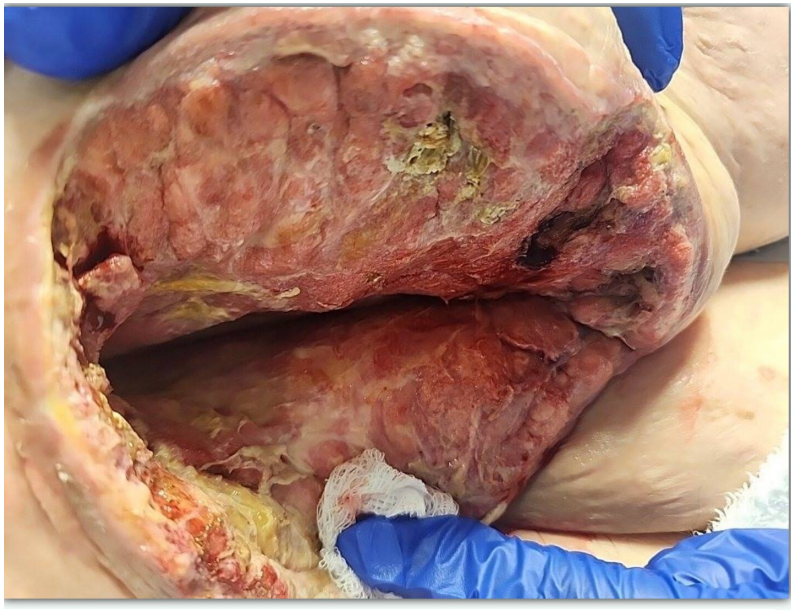
July 10



July 18

Post-Operative

- **S/P 7/25 wash-out**
- **NPWTi initiated:** NPWTi-d dressing, 10min dwell time q2hrs with hypochlorous acid (HOCl), -125 mm Hg
- **Multi-Disciplinary Care:** ID, Transplant APP
- Wound/Vascular, Patient and Family



POD 1: 2nd I&D

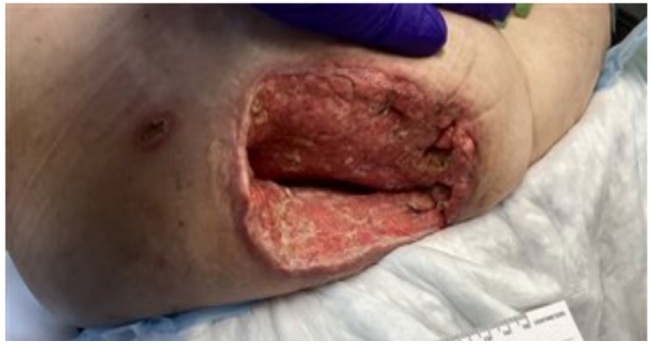
Kim PJ, et al. *Int Wound J*. 2020;17(1):174-186.

ECF Transition

Discharge to SNF: Aug 4

→ Portable NPWT, black foam, -125 mm Hg

Clinic Follow-Up Aug 14 →



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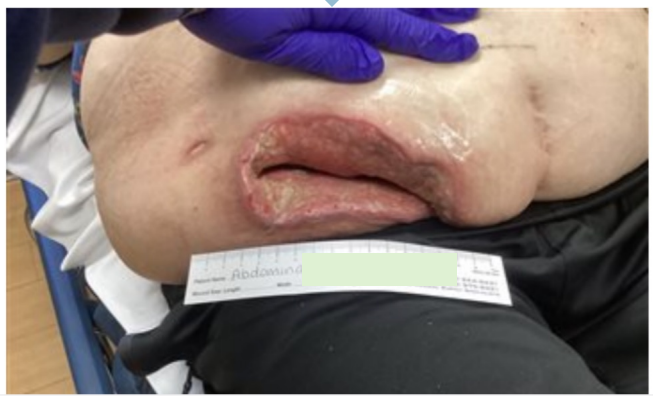


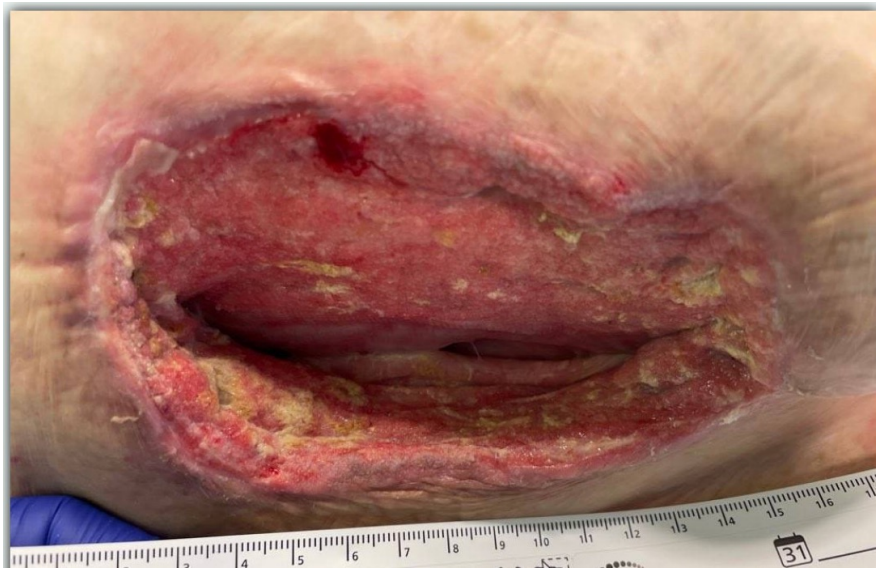
Keys: Multi-morbid, immunosuppressed
Goal: Meticulous wound hygiene, HOCl, nutrition

Clinic Follow-Up Aug 30 →

Pain at wound edge
Intervention: *hydrocolloid*

Transition Home

- Discharged home with home health
- Clinic follow-up Sept 2
- Still having pain at edges, improved
- Portable NPWT continued
- Focused on diet
- **Patient frustrated: Goal is to swim**



Multiple conversations with home health nurses

Normandin S, et al. *Plast Surg.* 2021;35(3):164-170.

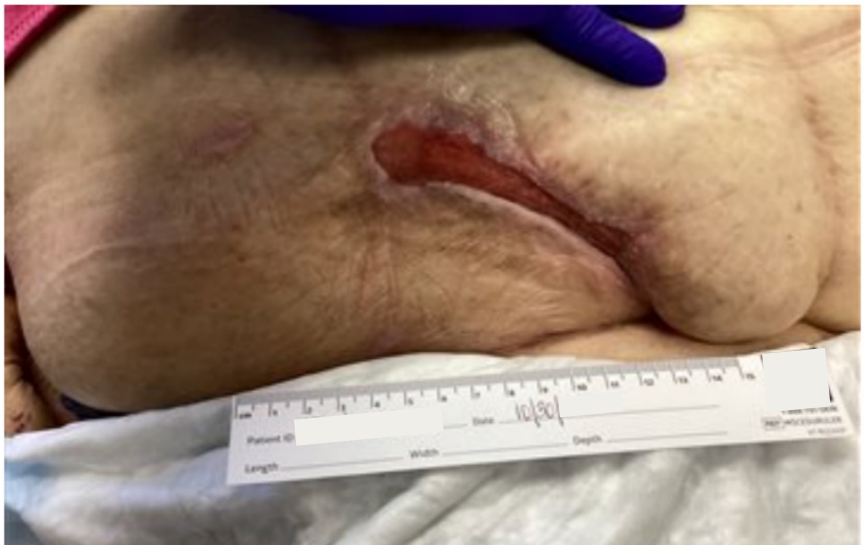
Polling Question

The wound is now <6cm deep and does not have tunneling or significant undermining. Which modality can you consider?

A. NPWTi-d
B. Betadine
C. Closed incision NPWT
D. Peel and place dressing

Novel NPWT

- **Oct clinic follow-up:** Started NPWT peel and place dressing
- HOCl, Collagen



Watch how-to-apply video →

Indications

V.A.C.® Peel and Place Dressing can be used on:

- Chronic wounds
- Acute wounds
- Traumatic wounds
- Subacute wounds
- Dehisced wounds
- Partial-thickness burns
- Ulcers (such as diabetic, pressure or venous insufficiency)
- Flaps
- Grafts

Warnings

Do not use on wounds with:

- Undermining greater than 2 cm
- Tunneling
- Depth greater than 6 cm

Dressing should cover the entire wound bed and extend onto intact skin.

Find the right size

Small - EZ5SML	Medium - EZ5MED	Large - EZ5LRG
Max wound size: 6.1 cm x 8.6 cm **Max Depth:** 2 cm	**Max wound size:** 11.1 cm x 16.6 cm **Max Depth:** 4 cm	**Max wound size:** 13.6 cm x 24.2 cm **Max Depth:** 6 cm

Always read and follow the detailed Instructions for Use along with important safety information provided in the packaging.

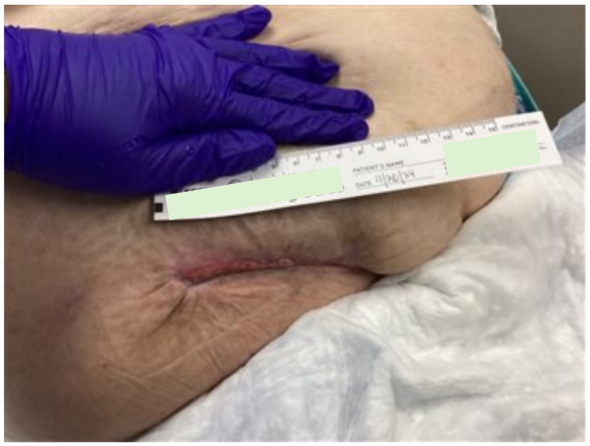
Application tips for 3M™ V.A.C.® Therapy with 3M™ V.A.C.® Peel and Place Dressing

Wear time
Dressing can remain in place for **up to 7 days**.[1]

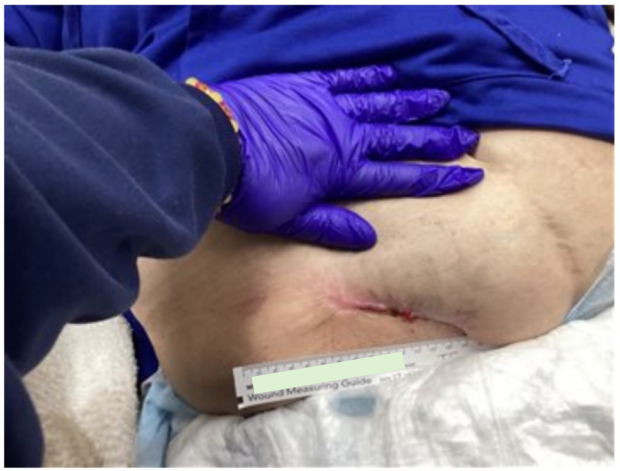
Device settings
Set the device to **-75 to -150 mmHg** on **continuous mode**.

Do not	Drape Tips
• Cut foam. • If skin barrier/protectant is used under the adhesive portion of the dressing, do not reposition the dressing as adhesive properties may be reduced. • Use with other V.A.C.® Therapy Dressing Kits or foams, as they have a shorter wear time. • Push foam portion of the dressing down. Allow the dressing to draw down and conform the wound bed as negative pressure is applied. • Stretch dressing.	• Apply loosely over the wound area. • Leave at least a 5 cm border of drape wherever possible. • Can reposition within 20 minutes of initial application. • For curved anatomy, slits may be cut in the drape portion of the dressing to help reduce overlap, drape folds or remove wrinkles.

Coordination



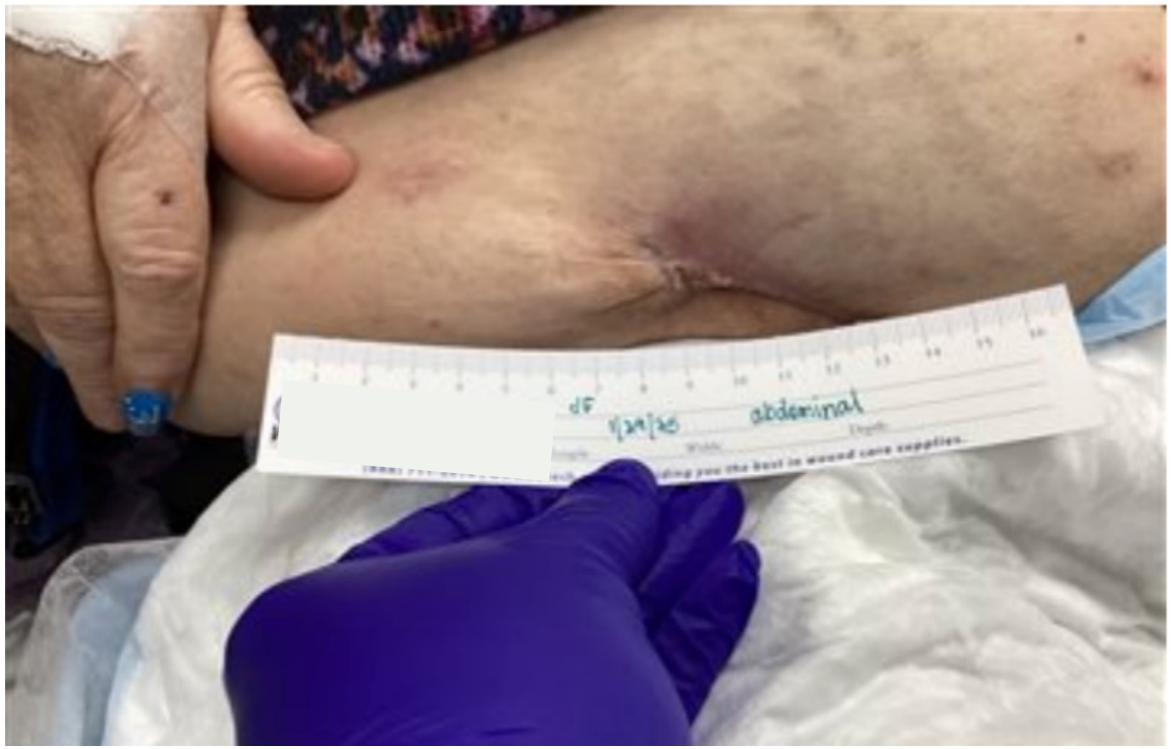
Nov: Peel and place dressing



Dec: Collagen

Ulcer reportedly closed → ***Patient had*** COVID → Collagen re-initiated via telemed

Closed



Jan 29, 2025

TEAMs

Take-Home

- Clinical algorithm useful
- Need for flexibility
  - Care setting
  - Skill/training/comfortability of teams
  - Insurance
  - Patient tolerance and needs
- Step-down consideration with subsequent monitoring; can backtrack, if needed
- Safety first
- Shared decision-making!

Thank You!

Questions?