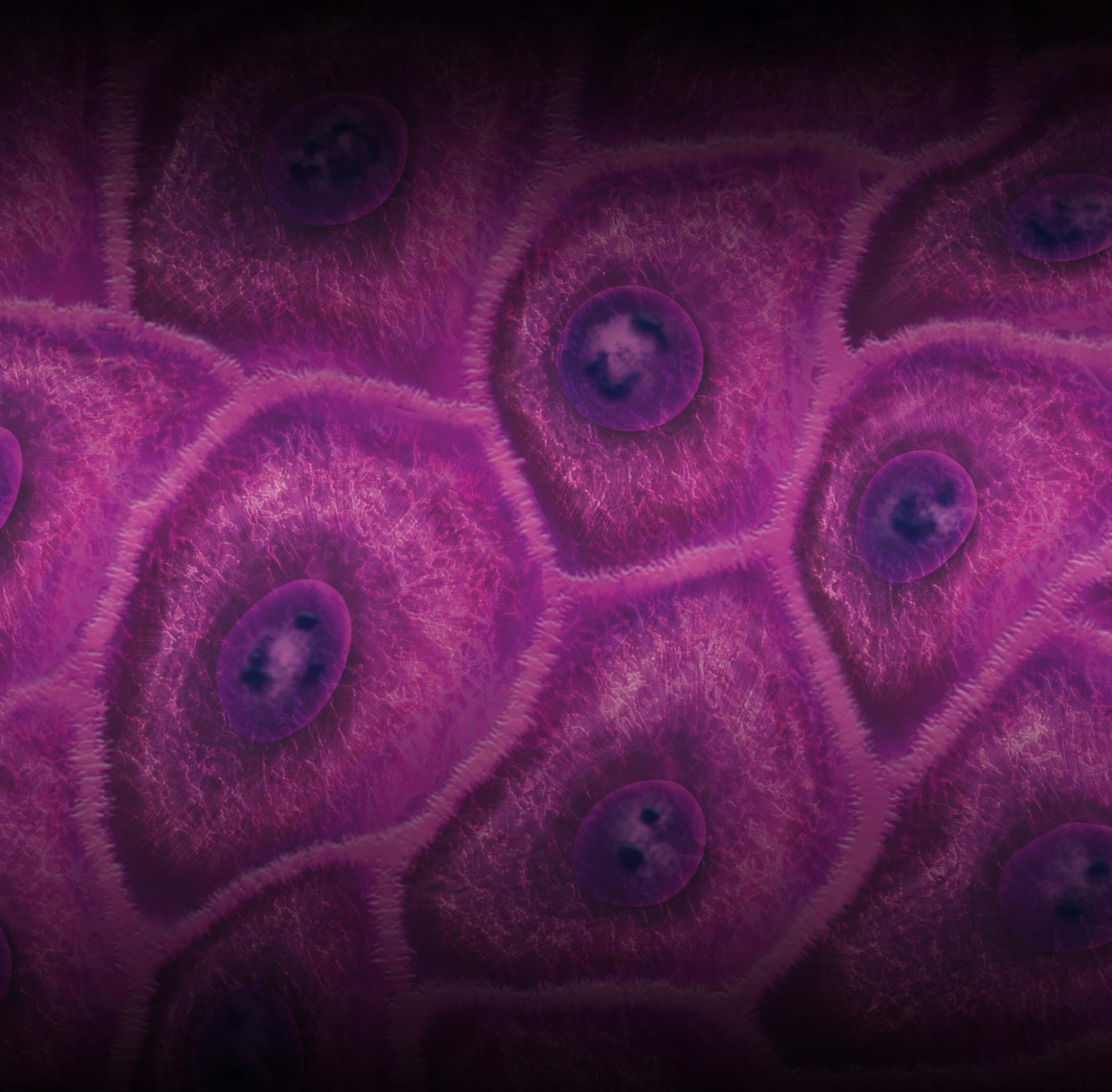


# Advanced Wound Care Technology

Orthobiologics



**Arthrex**® 

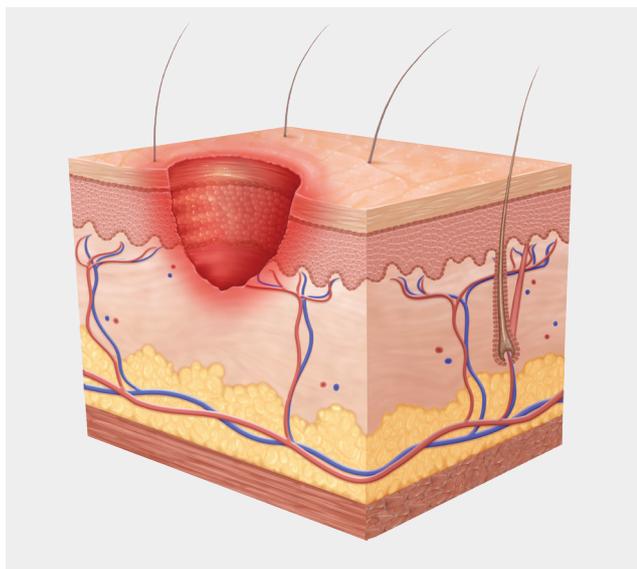
# Advanced Wound Care Technology

## Wound Classification

Wounds are generally classified based on:

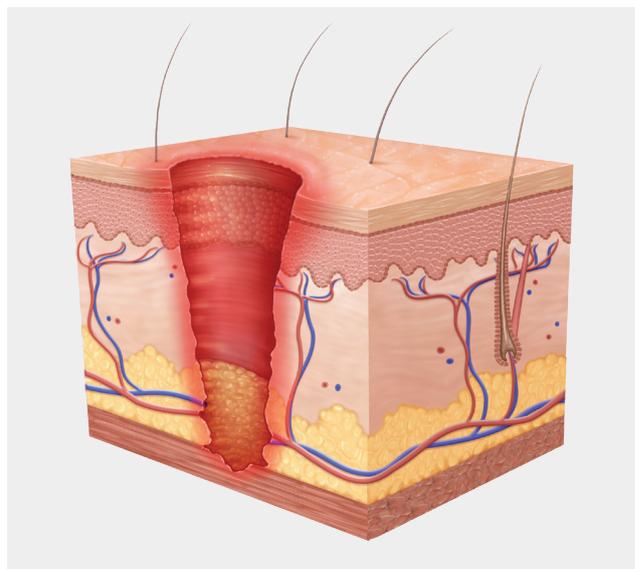
- Degree of **wound severity**
  - Partial thickness
  - Full thickness
- **Chronicity** of the wound
  - Acute
  - Chronic

## Partial and Full Thickness Wounds



### Partial Thickness

- Involves only the epidermis; may extend into the dermis but not through it



### Full Thickness

- Extends through the dermis into the tissue beneath and may expose adipose tissue, muscle, or bone
- Requires advanced wound care

## What to Expect From Partial or Full Thickness Wounds

Exudate **types** will vary

- **Acute wounds**  
More sanguineous (bloody) exudate in acute wounds
- **Healed wounds**  
Serous (clear) color exudate as the wound heals

Exudate **amounts** will vary

- **High exudate**  
Greater exudate in acute wounds
- **Low exudate**  
Decreased exudate as wound heals

## Acute Wounds

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Acute wounds occur suddenly, rather than developing over time.

### Surgical Wounds

Cut precisely with clean wound edges; closed with stitches, staples, adhesive, or left open to heal



### Traumatic Wounds

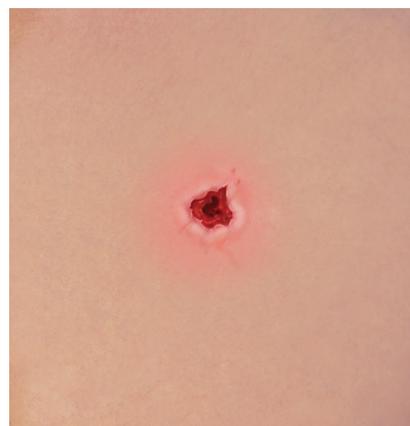
Vary from superficial abrasions to deep wounds with extensive tissue damage



Abrasion



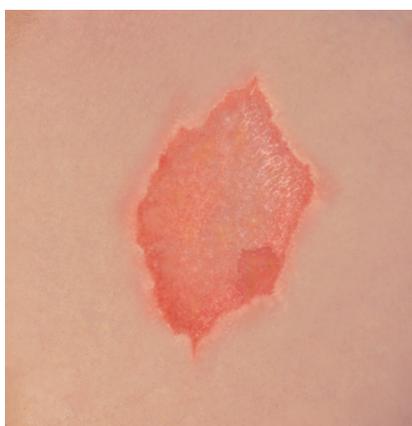
Blister



Puncture



Laceration



Burn

## Chronic Wounds

- Any wound that does not heal in a timely fashion (usually within 2-3 months)
- Healing has slowed or stopped
- The wound is no longer getting smaller and shallower
- A wound that appears healthy, red, and moist can still be chronic



## Types of Chronic Wounds



### Ulcers

Most common type of chronic wound



### Ischemic

Inadequate blood supply prevents oxygen and nutrients required to heal



### Infectious

May be bacterial, fungal, or viral

## Types of Ulcers



### Pressure Ulcers

- Known as "bedsores"
- Skin breakdown caused by prolonged pressure and/or friction
- Develop over bony prominences (ankle, heel, hip, sacrum)



### Venous Ulcers

- Known as "stasis" ulcers
- Account for >50% of lower limb ulcers
- Associated with DVT, varicose veins, valve insufficiency



### Diabetic Ulcers

- Complication in poorly controlled diabetes
- Skin breakdown associated with neuropathy, compromised circulation, immune function



### Arterial Ulcers

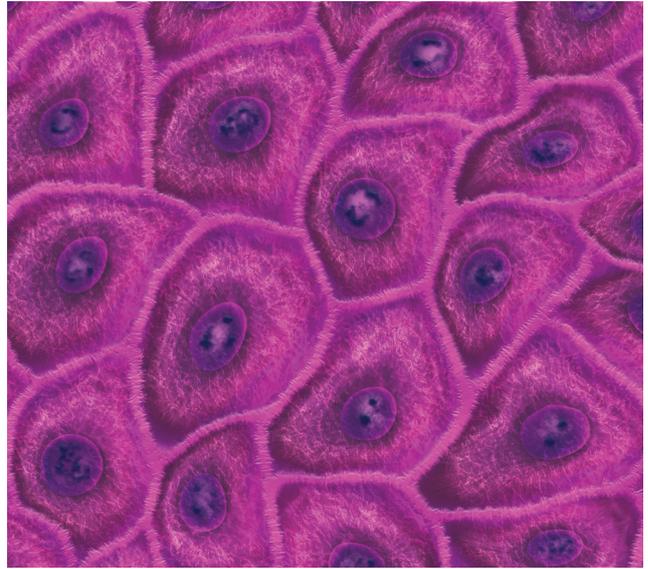
- Associated with atherosclerosis, thrombosis, hypertension

# Basic Terminology

## Wound Tissue

### Keratinocytes

- Major cell component found in the epidermis
- Involved in wound healing from start to finish
- Communication between keratinocytes and other wound healing cells is critical for successful wound closure
- To close the wound, keratinocytes begin at the edges and migrate toward the center of the wound



### Granulation Tissue

- Soft, red, fleshy tissue that fills in the wound and appears during the healing process
- Consists of new capillaries surrounded by collagen
- Appears reddened from a rich blood supply



### Epithelial Tissue

- Tissue that develops when the epidermis regenerates over the wound surface
- Keratinocytes migrate from the wound edges, where they multiply until they meet in the middle and close the wound
- Appears silver or light in color
- Initially, only a few layers thick and very vulnerable to damage



### Necrotic Slough

- Dead wound tissue
- Usually characterized by string-like, moist, necrotic debris
- Can be yellow, gray, green, or brown in color

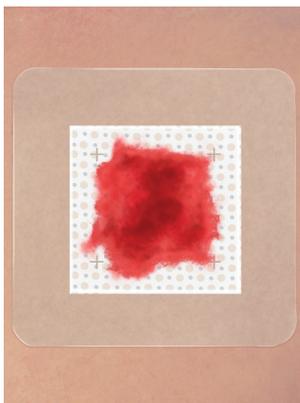


### Necrotic Eschar

- Nonviable/dead wound tissue
- Characterized by dry, leathery, black tissue

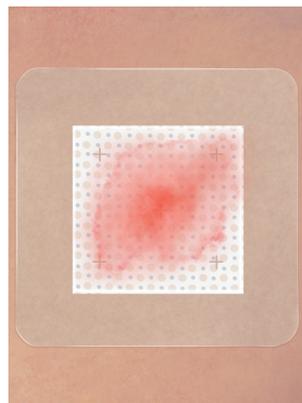
**Note: Both of these types of tissue must be removed before a wound can heal.**

## Exudate Types



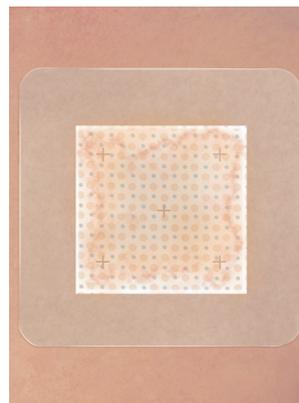
### Sanguineous

Red and thin, with fresh blood



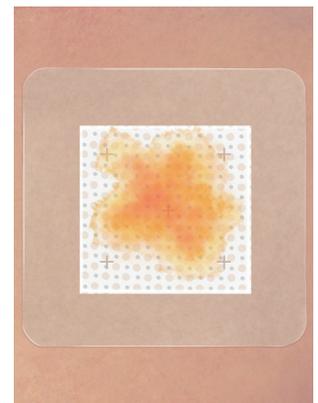
### Serosanguineous

Pink to light red; thin and watery



### Serous

Clear or light yellow; thin and watery



### Purulent

Creamy yellow, green, white, or tan; thick and opaque



### Maceration

- Exposure of peri-wound skin to excessive moisture
- White in color



### Dehiscence

- Reopened surgical site or incision



### Hypergranulation Tissue

- Overgrowth of granulation tissue
- Usually caused by excessive moisture and/or bacteria
- Epithelial cells can't climb the "hill" created by hypergranulation tissue to close the wound
- Must be resolved prior to wound closure



### Epibole

- Rolled wound edges usually seen with chronic wounds
- Epithelial cells grow down on themselves and "think" the wound has healed
- Rolled edges must be removed before the wound can heal properly

# Arthrex Wound Care Solutions



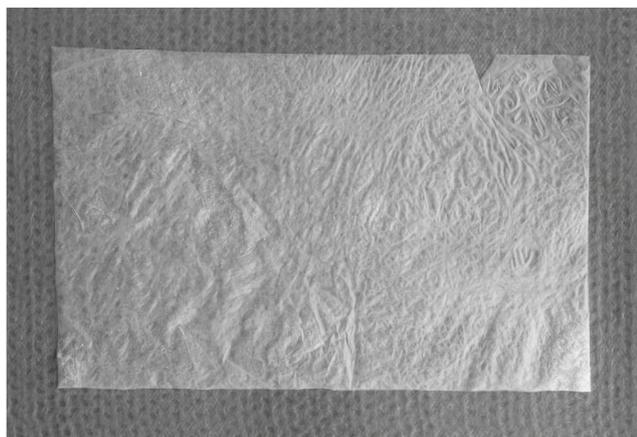
## Amnion™ Matrix - Thin

Amnion thin matrix is derived from the amnion membrane layer of the placenta. This semitransparent tissue can be applied directly to the surgical site for use in a number of soft-tissue applications. Amniotic-derived tissues contain endogenous growth factors and cytokines<sup>1-4</sup> that maintain the natural properties of amnion. Amnion matrix is an anatomical barrier that helps provide mechanical protection<sup>5</sup> while supporting tissue with nutrient-rich growth factors.



## Amnion Matrix - Thick

This thicker membrane is derived from the umbilical cord. This resilient graft is thick enough to hold a stitch when hydrated. Amniotic-derived tissues contain endogenous growth factors and cytokines<sup>1-4</sup> that maintain the natural properties of amnion. Amnion matrix is an anatomical barrier that helps provide mechanical protection<sup>5</sup> while supporting tissue with nutrient-rich growth factors.



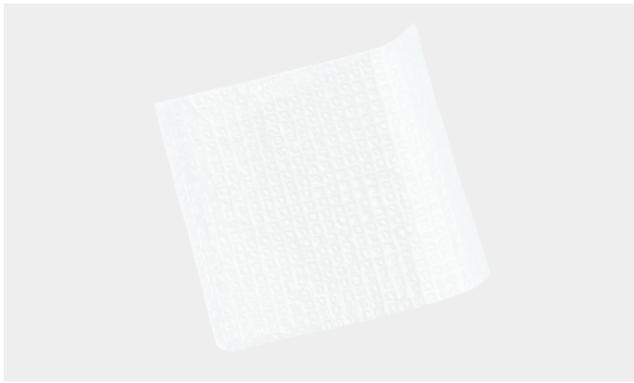
Amnion Matrix - Thin



Amnion Matrix - Thick

## References

1. Coolen NA, Schouten KC, Middelkoop E, Ulrich MM. Comparison between human fetal and adult skin. *Arch Dermatol Res.* 2010;302(1):47-55. doi:10.1007/s00403-009-0989-8
2. Coolen NA, Schouten KC, Boekema BK, Middelkoop E, Ulrich MM. Wound healing in a fetal, adult, and scar tissue model: a comparative study. *Wound Repair Regen.* 2010;18(3):291-301. doi:10.1111/j.1524-475X.2010.00585.x
3. Tseng SC, Espana EM, Kawakita T, et al. How does amniotic membrane work? *Ocul Surf.* 2004;2(3):177-187. doi:10.1016/s1542-0124(12)70059-9
4. Riordan NH, George BA, Chandler TB, McKenna RW. Case report of non-healing surgical wound treated with dehydrated human amniotic membrane. *J Transl Med.* 2015;13:242. doi:10.1186/s12967-015-0608-8
5. Kim SS, Sohn SK, Lee KY, Lee MJ, Roh MS, Kim CH. Use of human amniotic membrane wrap in reducing perineural adhesions in a rabbit model of ulnar nerve neurotomy. *J Hand Surg Eur Vol.* 2010;35(3):214-219. doi:10.1177/1753193409352410



### **Biovance® Human Amniotic Membrane Allograft**

Biovance human amniotic membrane allograft is derived from the placenta of healthy, full-term pregnancies. Unlike other placenta-derived allografts, Biovance allografts are completely decellularized and devoid of cells, hormones, growth factors, cytokines, and other substances. Biovance allograft acts as a barrier membrane during the wound regeneration process and supports tissue growth. It contains key extracellular matrix proteins that allow for the migration of host cells to permeate the graft.



### **CentaFlex™ Human Placental Matrix**

CentaFlex decellularized human placental matrix allograft is derived from human umbilical cord. CentaFlex placental matrix has the strength to support repairs, without the trade-off of an overly thick tissue. It serves as a cell-friendly structure to allow noninflammatory cell attachment, proliferation, and growth.



### **Interfyl® Human Connective Tissue Matrix**

Interfyl connective tissue matrix is used to fill irregular spaces or soft-tissue deficits resulting from wounds, trauma, or surgery. Derived from the placenta of a healthy, full-term pregnancy, Interfyl connective tissue matrix is suited for a variety of surgical applications when there is a need to replace or supplement damaged or inadequate integumental tissue. Interfyl connective tissue matrix is minimally manipulated and retains the fundamental structure and functional characteristics of connective tissue. It is available in particulate and flowable formulations.



### **JumpStart® Antimicrobial Wound Dressing**

JumpStart dressings are provided on an ultra-thin, lightweight, polyester substrate and contain laser-cut fenestrations to allow easy passage of wound exudate into the absorbent layer or a secondary dressing. The flexible design easily contours to the body. JumpStart dressings may be applied directly over sutures, staples, Steri-Strips™ wound closure strips, amnion membrane, and liquid skin adhesives. The dot-matrix pattern of embedded microcell batteries generates microcurrents on the dressing surface in the presence of a conductive medium, such as sterile saline, water-based gel, or wound exudate.



Thoroughly clean and disinfect the skin surrounding the sore or wound.



Probe the wound with a metal instrument to determine its depth and look for foreign material or objects in the ulcer.



Excise the hyperkeratotic, infected, and nonviable tissue and wash out the ulcer.



Position the Amnion™ matrix, CentaFlex™ matrix, or Biovance® allograft to cover the wound, followed by the JumpStart® dressing as supportive medical therapy.

# Arthrex Amnion™ Matrix, Biovance® Amniotic Membrane Allograft, and CentaFlex™ Placental Matrix

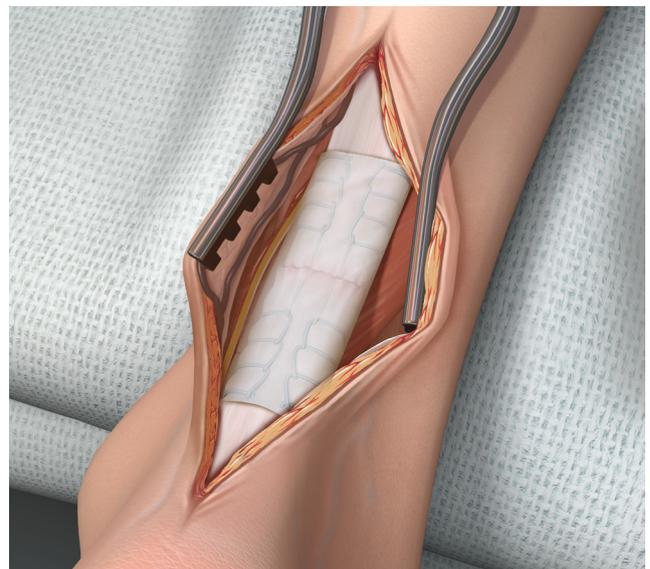
## Introduction

Arthrex Amnion matrix, Biovance allograft, and CentaFlex matrix can be used as anatomical wraps, acting as a natural structural barrier. In general orthopedic, arthroplasty, hand and wrist, and foot and ankle procedures, these products have been used as protective barriers to provide essential mechanical protection.

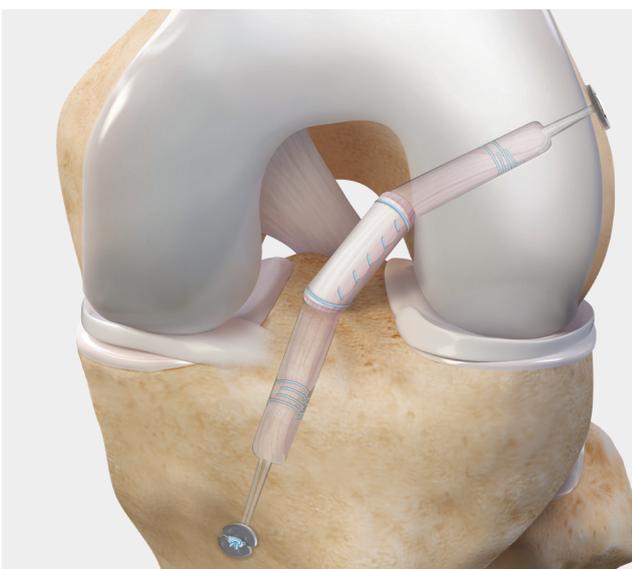
- Shoulder
- Knee
- Wound covering
- Hand and wrist
- Tendons, including Achilles
- Nerves



Rotator Cuff Repair



Achilles Tendon Repair



ACL Reconstruction



After repair, isolate the tendon so that it is easily visualized.



For a tendon in the ankle, the placental tissue may be placed along the superior aspect of the tendon.



Work the placental tissue around the tendon prior to suturing.



Wrap tendon with the Amnion™ matrix, Biovance® allograft, or CentaFlex™ matrix.



Make a cerclage stitch at each end of the graft.



Finalize with a running stitch along the construct.

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# Interfyl® Human Connective Tissue Matrix

## Introduction

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Interfyl connective tissue matrix is intended to replace or supplement damaged or inadequate integumental tissue. Indications include, but are not limited to, augmentation of deficient/inadequate soft tissue and treatment of deep dermal wounds, surgical wounds,

soft-tissue voids as a result of tunneling wounds, fistula tracts, and dermal undermining, including those with exposed vital structures (bone, tendon, ligament, or nerve).

## Interfyl Flowable Matrix Mixing Guide

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Fill the empty syringe with equal parts sterile saline or other sterile non-viscous fluid. The 1:1 product-to-liquid ratio will achieve a toothpaste-like consistency.

**Note: Based on physician preference and/or clinical application, the consistency can be altered by adding more or less liquid.**

Remove the needle from the syringe and attach the provided double female luer lock connection. Set syringe aside.

Do not remove the cap on the Interfyl connective tissue matrix product syringe. Pull back on the plunger slightly to create space, and hold. Tap the syringe until the product particles are loosened.



Connect the two syringes with the luer lock.

Holding the connected syringes vertically (with the syringe containing the sterile fluid on top), push down on the plunger to release sterile fluid into the Interfyl® product syringe.



Holding the two connected syringes horizontally, push both plungers back and forth a minimum of 15 times to create a homogeneous mix.

**Note: If desired, an 18-ga needle can be used when more sterile fluid is added.**

## Interfyl® Particulate Matrix Mixing Guide

Interfyl particulate connective tissue matrix packages (both 50 mg and 100 mg) contain one product vial. The product is supplied in a double-pouch configuration; the inner pouch and its contents are sterile. Always handle Interfyl matrix using aseptic technique. Once opened, use within 2 hours.

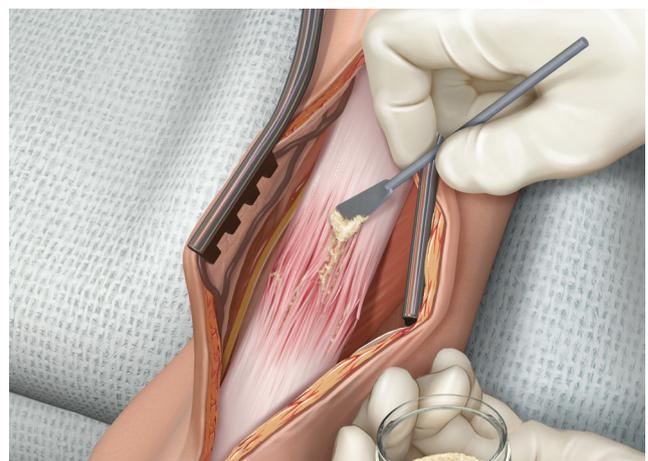
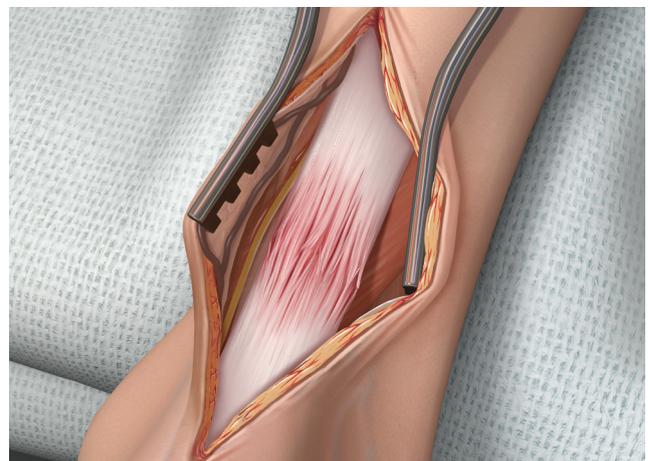
After proper preparation of the treatment area site, open product package and remove inner pouch containing the product vial. Unscrew the cap to open the vial.

The product may be used dry. Placement of the product can be achieved by either tapping or sprinkling the contents out directly from the vial or by using nontraumatic forceps to pick up the particulate for placement at the desired area.

Sterile saline or other sterile fluid may be added to the particulate for a wet application. To achieve a paste-like consistency, add 0.6 mL sterile fluid for the 100 mg vial or 0.3 mL sterile fluid for the 50 mg vial.

The consistency can be altered by adding more or less liquid. The resulting wet particulate may be placed as desired.

**Note: NOT to be used as an injectable.**



# JumpStart® Antimicrobial Wound Dressings

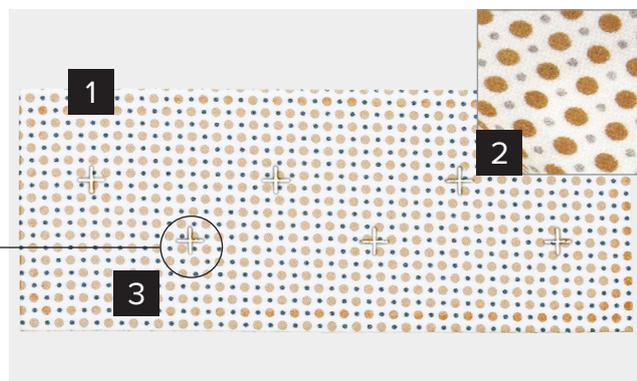
## Product Features

JumpStart dressings are provided on an ultra-thin, lightweight, polyester substrate and contain laser-cut fenestrations to allow easy passage of wound exudate into the absorbent layer or a secondary dressing. The flexible design easily contours to the body. JumpStart dressings may be applied directly over sutures, staples, Steri-Strips wound closure strips, and liquid skin adhesives. The dot-matrix pattern of embedded microcell batteries generates microcurrents on the dressing surface in the presence of a conductive medium, such as sterile saline, water-based gel, or wound exudate.



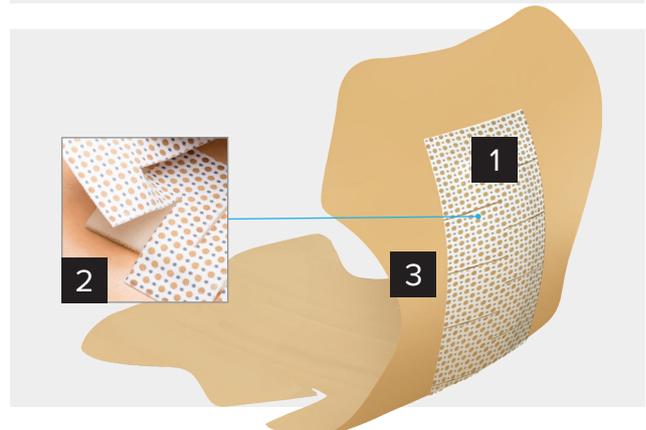
## JumpStart Wound Dressings

### JumpStart Contact-Layer Dressing



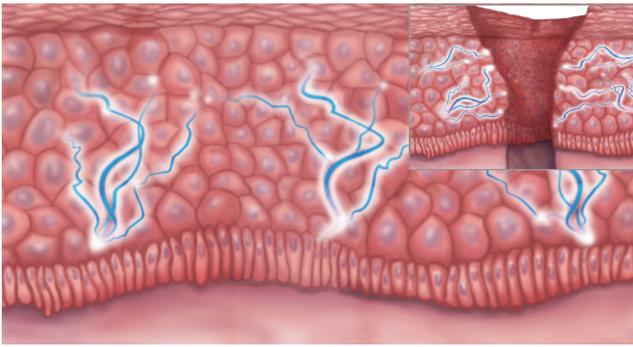
1. JumpStart antimicrobial wound contact-layer powered by V.Dox™ technology
2. Polyester substrate with embedded microcell batteries made of elemental silver and elemental zinc
3. Fenestrations allow wound drainage to pass through dressing to absorbent layer

### JumpStart Composite Dressing



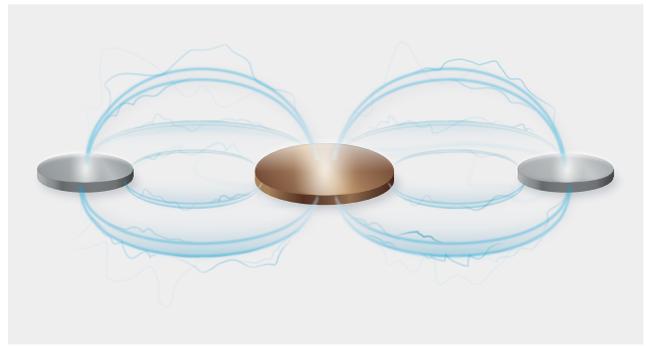
1. JumpStart antimicrobial wound contact-layer powered by V.Dox technology
2. Polyester substrate with embedded microcell batteries made of elemental silver and elemental zinc
3. Fenestrations allow wound drainage to pass through dressing to absorbent layer

## A New Generation of Wound Care Solutions



### Inspired by the body.

The skin naturally creates and uses electrical energy to promote healing. Electric fields in the skin create surface energy potential, known as transepithelial potential (TEP). When skin is wounded, a change in electric potential occurs, driving the cell migration and wound healing process.



### Powered by electricity.

Powered by patented V.Dox™ technology, JumpStart® antimicrobial wound dressings employ moisture-activated microcell batteries that wirelessly generate microcurrents designed to mimic the skin's electrical energy.



### Energized by results.

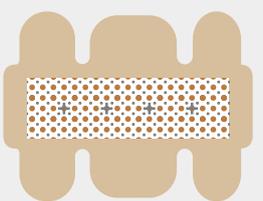
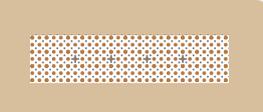
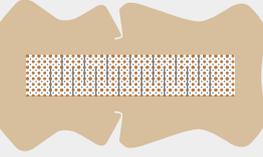
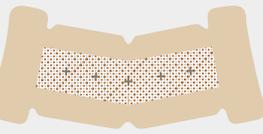
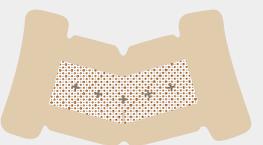
JumpStart dressings reduce the risk of infection by killing a broad spectrum of bacteria without antibiotics while supporting the body's natural healing process.

### JumpStart Dressing Indications for Use

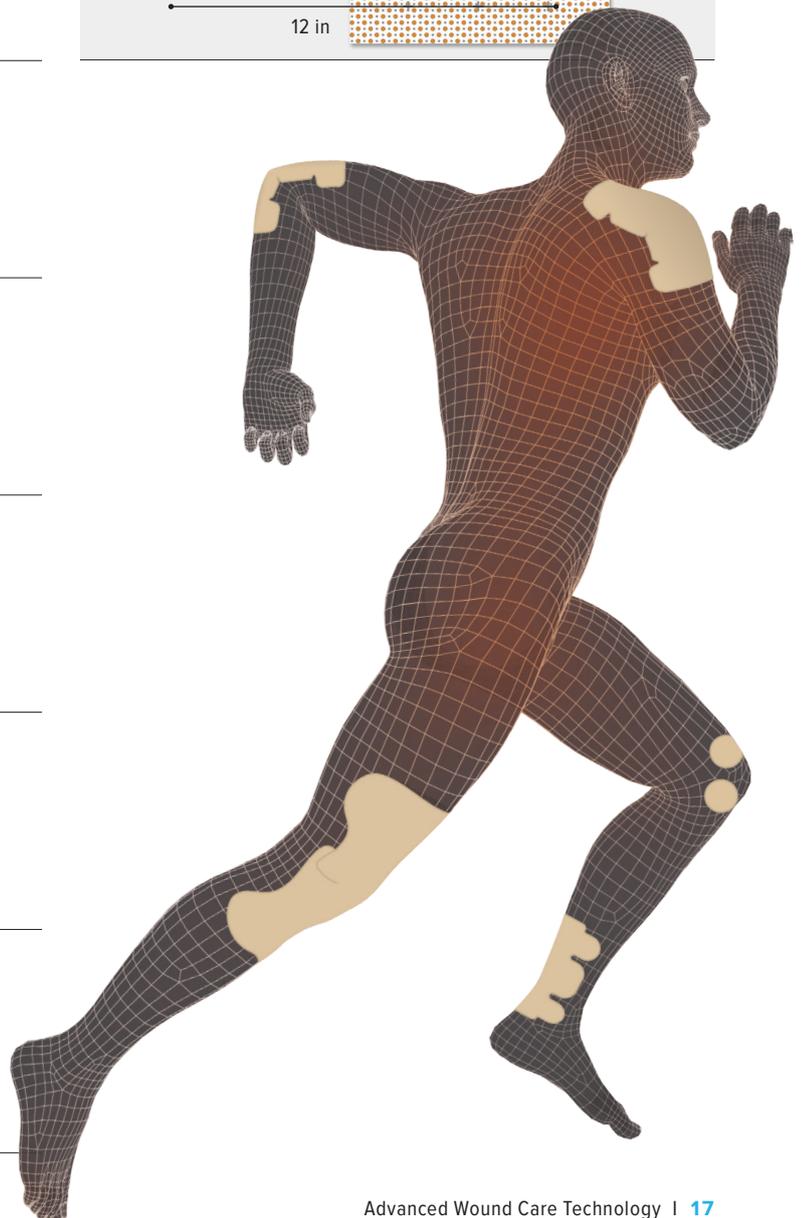
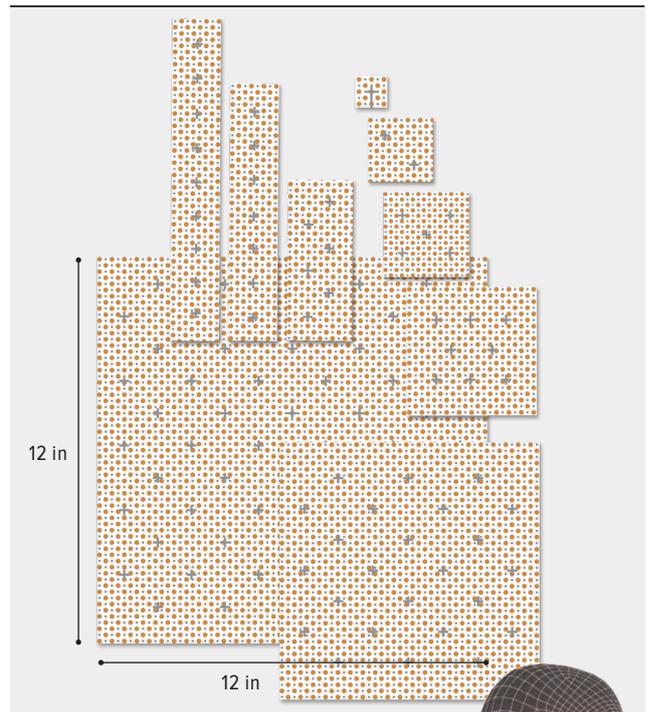
	JumpStart Contact Layer Dressing	JumpStart Composite High-Performance Adhesive	JumpStart Composite OrthoElite™ Line	JumpStart FlexEFit™ Universal Fit Dressing
<b>Chronic Wounds</b>				
Ulcers (diabetic foot, venous leg, pressure)	✓			
Dehisced incision, infected, other	✓	✓	✓	
<b>Acute Wounds</b>				
Surgical incisions	✓	✓	✓	✓
Traumatic	✓	✓	✓	✓
First- and second-degree burns	✓	✓		

# Address All Your Wound Needs

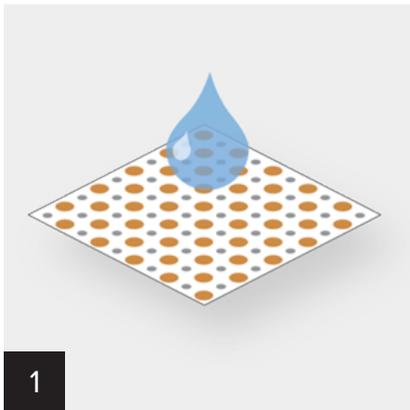
## JumpStart® Composite Dressing Types

Product Image	Product Description	Item Number
	Foot, Ankle, and Shoulder Dressing	ABS-4051
	Direct Anterior Hip Arthroplasty Dressing	ABS-4052
	Hip and Knee Arthroplasty Dressing	ABS-4050
	Partial- and Full-Thickness Dressing	ABS-4053
	Total Shoulder Arthroplasty Dressing	ABS-4057
	Medial/Lateral Elbow Dressing	ABS-4058
	2.5-in Diameter Scope Site Dressing	ABS-4054
	4-in Diameter Scope Site Dressing	ABS-4056

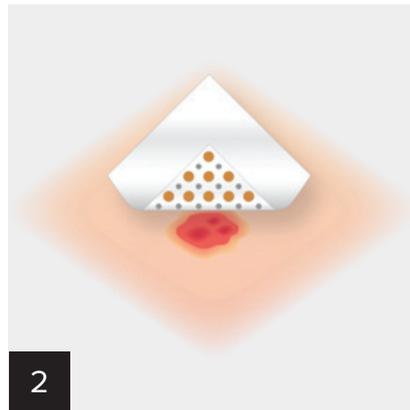
## JumpStart Contact-Layer Dressing Sizes



## Single Layer Dressing Application



**Moisten** dotted side of dressing with sterile saline, water, or water-based hydrogel.



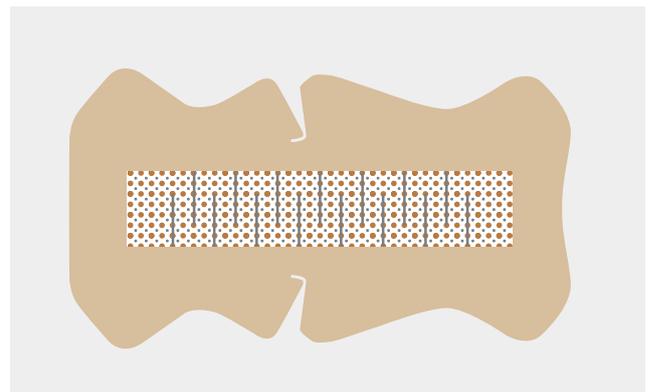
**Apply**, dots down, onto wound surface.



**Cover** with secondary dressing(s) appropriate for drainage levels.

## Knee Dressing Application

1. **Orient** the dressing to anatomy.
2. **Remove** center liner and **moisten** pad.
3. **Apply**, dots down, onto wound surface, with knee in slight flexion (~30°).
4. **Remove** both shin liners and **secure** to skin.
5. **Remove** both thigh liners, overlap, and **secure** to skin.



## Composite Dressing Application



**Remove** center liner and **moisten** dotted pad with sterile saline, water, or water-based hydrogel.

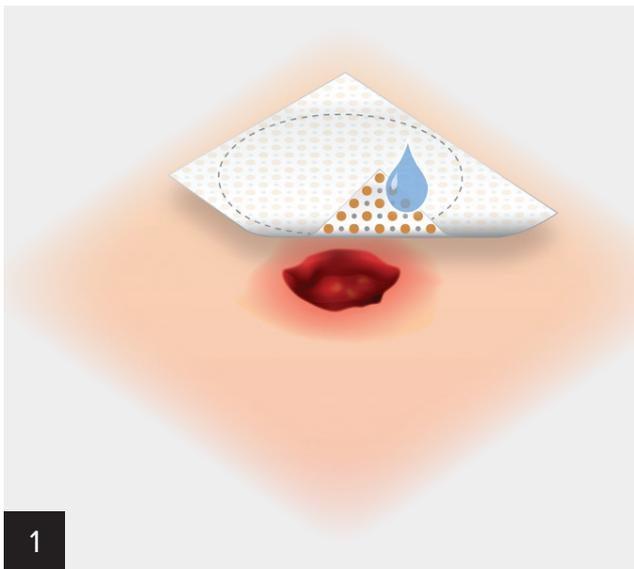


**Apply**, dots down, onto wound surface.



**Remove** remaining liners and **smooth** adhesive down over skin.

**Note: If dressing a joint, apply while joint is in slight flexion.**



**Hydrate** dotted side of dressing with sterile saline, water, or water-based hydrogel.

**Note:** If desired, trim to size and shape prior to moistening (include 1 cm to 2 cm overlap of wound edge).



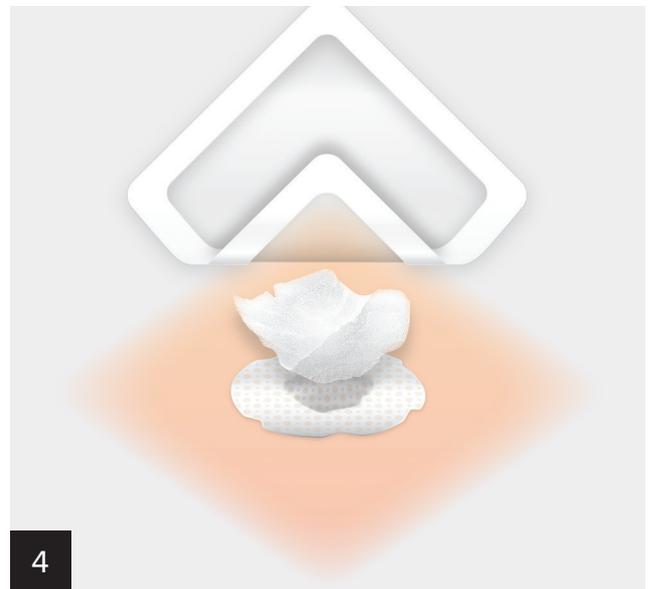
**Apply**, dots down, onto wound surface.

**Note:** Completely line deep wound and extend 1 cm to 2 cm beyond wound edges.



**Fill** "dead space" with gauze.

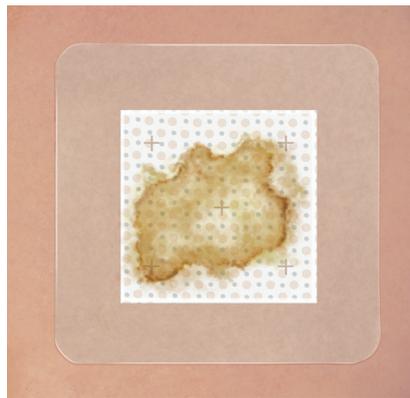
**Note:** If desired, moisten gauze to keep JumpStart® dressing moist.



**Cover** with secondary dressing(s) appropriate for drainage levels.

## What to Expect From an Open Wound Dressing Change

- Improved wound bed appearance
- In some cases, dressing appearance may be deceptive (discoloration and staining may be present). While this may be interpreted as increasing colonization or infection, it may also be normal and disappear after soiled dressing removal and mild wound cleansing.
- If dressing sticks to wound, moisten prior to removal. Gently peel back to reduce risk of wound bed disruption.



Discoloration and staining



Clean wound bed with increased granulation tissue and active epithelial edge

### What if drainage increases at dressing change?

- Drainage may increase initially on partial and full thickness wounds
- Change absorbent layer and outer covering as needed to accommodate drainage level
- If heavily and/or continuously exuding, consult treating clinician

### What if the wound is dry at dressing change?

- Use hydrogel or hydrogel and saline when wound is not lending adequate moisture
- Adequately moistened dressings don't normally stick to wound beds. However, if dressing adheres, moisten top of dressing with saline and gently peel back to avoid wound bed disruption.

## Dressing Use for Surgical Incisions

Follow surgeon's normal dressing change protocol as it pertains to frequency and duration of treatment.

### Dressing Change Protocol Examples

Dressing Protocol	Number of Dressings Needed	Typical Wear Time
If surgeon removes dressing to inspect incision <b>before discharge</b>	Two	<ul style="list-style-type: none"> <li>■ 1 to 2 days for 1st dressing</li> <li>■ 7 to 10 days for 2nd dressing</li> </ul>
If surgeon only inspects incision at <b>first post-op visit</b>	One	<ul style="list-style-type: none"> <li>■ 7 to 10 days</li> </ul>

## What to Expect From a Surgical Incision Dressing Change

- Minimal drainage on the JumpStart® dressing
- Will typically only exude for first 48 to 72 hours

If the JumpStart dressing adheres to the incision site, moisten dressing with saline and gently peel back to avoid tissue disruption.

# Ordering Information

## Arthrex Wound Care Solutions

### Arthrex Amnion™ Matrix

Product Description	Item Number
Amnion Matrix - Thin	
2 cm × 2 cm	ABS-4100-022
2 cm × 3 cm	ABS-4100-023
3 cm × 3 cm	ABS-4100-033
4 cm × 4 cm	ABS-4100-044
4 cm × 6 cm	ABS-4100-046
4 cm × 8 cm	ABS-4100-048
7 cm × 7 cm	ABS-4100-077
2 cm × 12 cm	ABS-4100-212
Amnion Matrix - Thick	
2 cm × 2 cm	ABS-4200-022
2 cm × 3 cm	ABS-4200-023
3 cm × 3 cm	ABS-4200-033
3 cm × 4 cm	ABS-4200-034
3 cm × 6 cm	ABS-4200-036
3 cm × 8 cm	ABS-4200-038
5 mm × 40 mm	ABS-4200-054

### Biovance® Human Amniotic Membrane Allograft

Product Description	Item Number
1 cm × 2 cm	DHAM-0012
2 cm × 2 cm	DHAM-0022
2 cm × 3 cm	DHAM-0023
2 cm × 4 cm	DHAM-0024
3 cm × 3.5 cm	DHAM-0035
4 cm × 4 cm	DHAM-0044
5 cm × 5 cm	DHAM-0055
6 cm × 6 cm	DHAM-0066

### CentaFlex® Human Placental Matrix

Product Description	Item Number
2 cm × 2 cm	HPM-0022
2 cm × 3 cm	HPM-0023
3 cm × 3 cm	HPM-0033
3 cm × 4 cm	HPM-0034
3 cm × 6 cm	HPM-0036
3 cm × 8 cm	HPM-0038
4 cm × 0.5 cm	HPM-0054

### Interfyl® Human Connective Tissue Matrix

Product Description	Item Number
0.3 ml Flowable Matrix	HCTM-030
0.6 ml Flowable Matrix	HCTM-060
1.0 ml Flowable Matrix	HCTM-010
1.5 ml Flowable Matrix	HCTM-015
50 mg Particulate Matrix	HCTM-050
100 mg Particulate Matrix	HCTM-100

### JumpStart® Antimicrobial Wound Dressing

Product Description	Item Number
JumpStart Contact-Layer Dressing	
1 in × 1 in (fenestrated)	ABS-4001
2 in × 2 in	ABS-4002
3 in × 3 in	ABS-4003
4 in × 4 in	ABS-4004
1.5 in × 8 in	ABS-4005
1.5 in × 10 in	ABS-4006
8 in × 8 in	ABS-4008
12 in × 12 in	ABS-4012
2 in × 5 in	ABS-4025
JumpStart Composite Dressing	
6 in × 11.5 in	ABS-4050
5 in × 6 in	ABS-4051
4.5 in × 10 in	ABS-4052
4 in × 4 in	ABS-4053
2.5-in Diameter	ABS-4054
4-in Diameter	ABS-4056
4.4 in × 9.6 in	ABS-4057
4.2 in × 7.5 in	ABS-4058
JumpStart Pin Site Dressing Kit	
<ul style="list-style-type: none"> <li>■ JumpStart Antimicrobial Wound Dressing, qty. 5</li> <li>■ Absorbent Disk, qty. 5</li> <li>■ Holding Clip, qty. 5 (compatible with 4 mm, 5 mm, and 6 mm pins)</li> </ul>	ABS-4059







This description of technique is provided as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific Arthrex products. As part of this professional usage, the medical professional must use their professional judgment in making any final determinations in product usage and technique. In doing so, the medical professional should rely on their own training and experience, and should conduct a thorough review of pertinent medical literature and the product's directions for use. Postoperative management is patient-specific and dependent on the treating professional's assessment. Individual results will vary and not all patients will experience the same postoperative activity level and/or outcomes.

View U.S. patent information at [www.arthrex.com/corporate/virtual-patent-marking](http://www.arthrex.com/corporate/virtual-patent-marking)

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