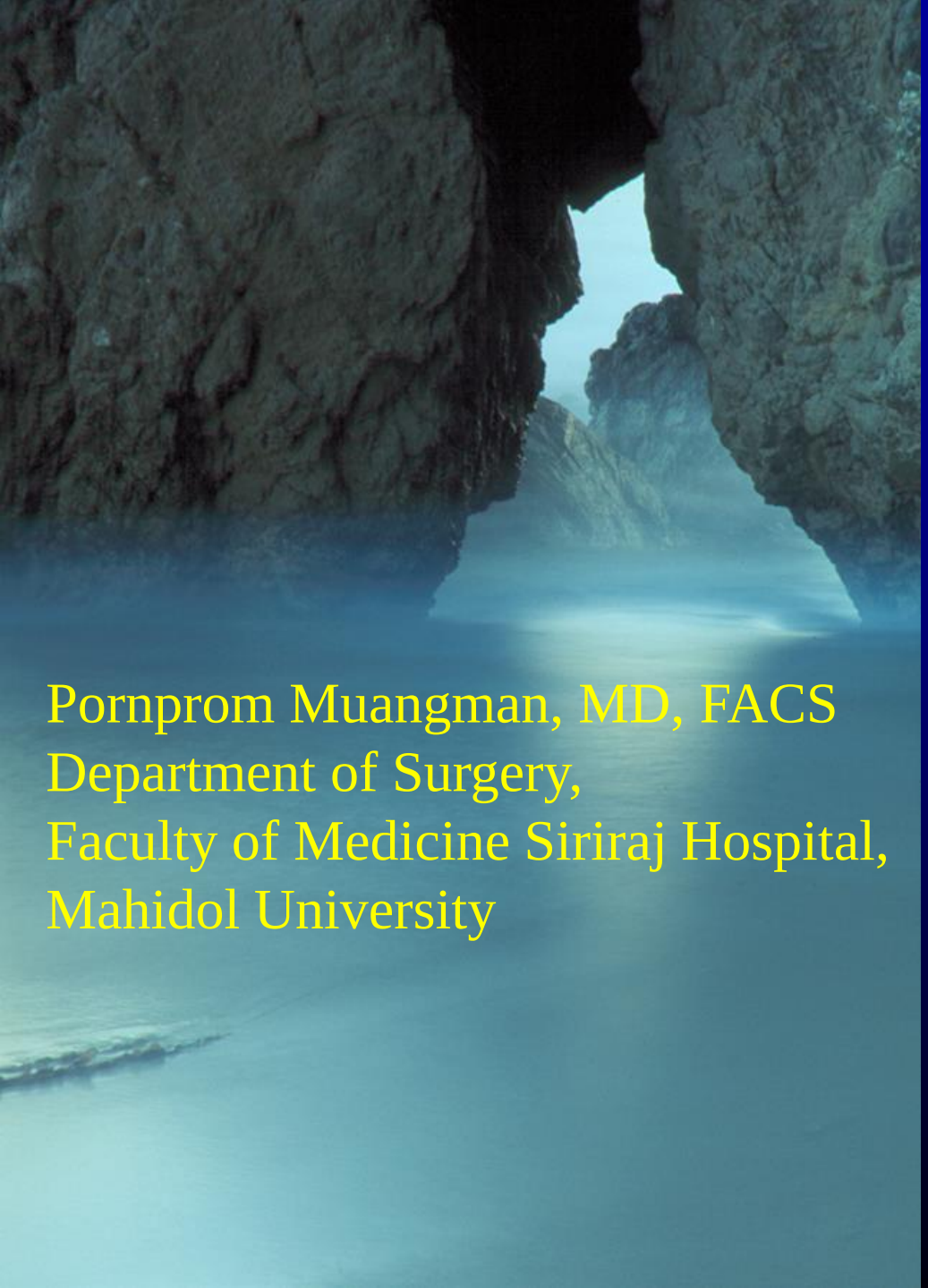

Innovative Wound Care and Dressing

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Department of Surgery,
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Mahidol University


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ฟิวซิดิน
Fucidin
MEBO

Evolution of the Wound Dressing Materials

BC → 1980 | **1980 → 2000** | **2000+**

Traditional

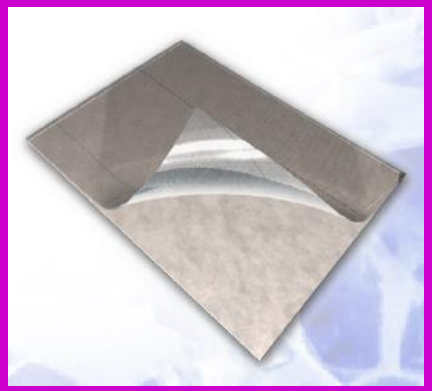
Gauze & Tape
First Aid Dressings

Advanced

Moist Wound Healing
Chronic & Acute

Active

Tissue Engineering
Growth Factors
Antimicrobials



Wound Management

- **Wound**
  - **Acute wound**
  - **Chronic wound: 3 months (2 weeks- 3 months)**
    - **Proceeded through the repair process without producing an adequate anatomic and functional result**

F. Brunicardi et al., Schwartz's Principle of Surgery.9th ed. 2010

Wound Bed Preparation (TIME)

: The removal of local barriers to healing

Tissue **T** Non-Viable or Deficient

Infection or **I** Inflammation

Moisture **M** Imbalance

Epidermal Margin **E** Evaluation

Leaper DJ et al. Int Wound J. 2012 Dec;9 Suppl 2:1-19

Wound Depth Classification

- Superficial Partial thickness (Dermal) wound

  - Redness with blister
  - Very painful
  - Healed within 2–3 weeks
  - Topical treatment or wound dressing

Wound Depth Classification

- Deep Partial thickness (Dermal) wound

  - Extends into deep dermis
  - Yellow or white
  - Healed within 3-8 weeks
  - Topical treatment or wound dressing
  - Surgery to close wound if not heal in 3 weeks

Wound Depth Classification

- Full Thickness Wound
  - Totally dermis+ subcutaneous layer damage
  - Stiff and white/brown
  - Painless
  - Surgery for wound closure

5 Steps of Wound Care Consideration

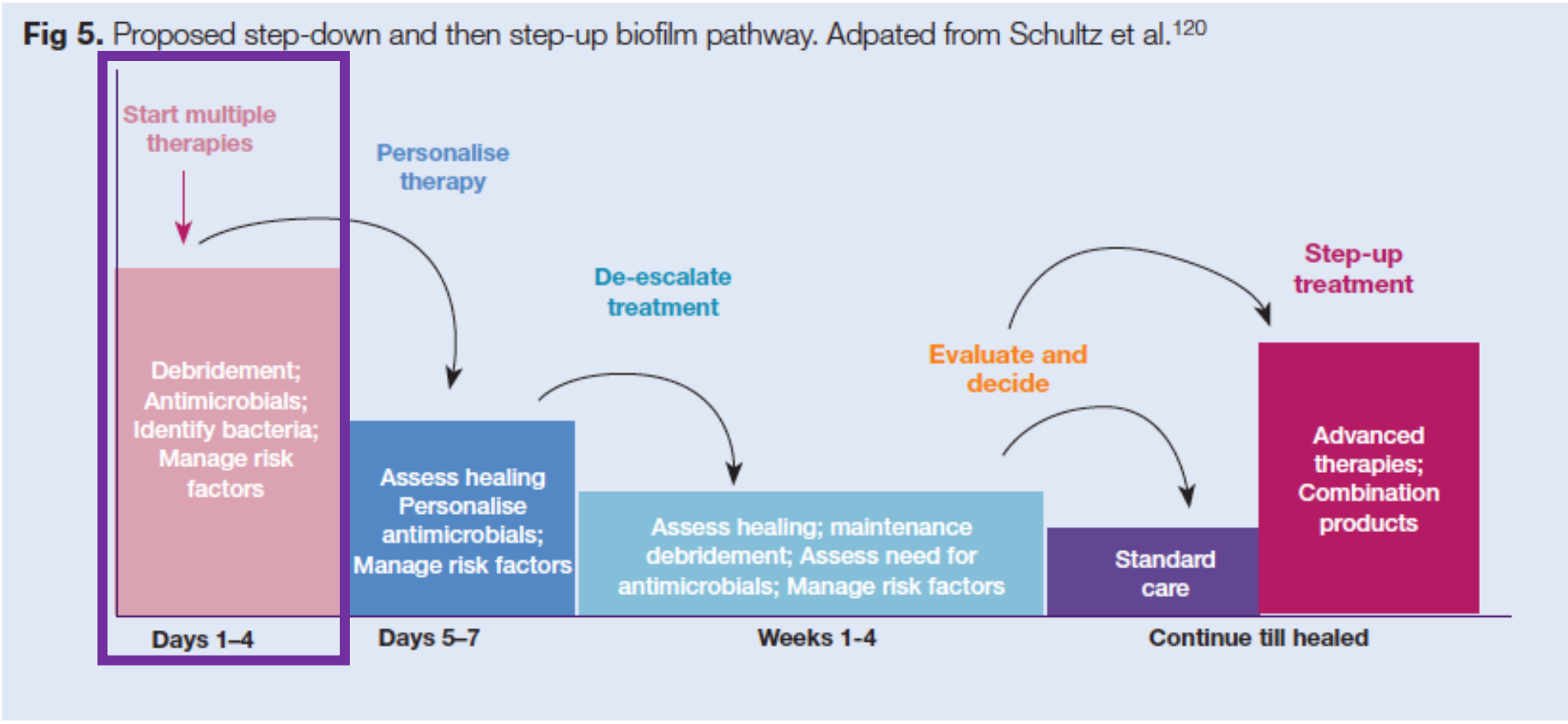
- Wound dressing
- Wound cleansing
- Wound debridement
- Wound closure
- Underlying condition

Change of Wound Terminologies

Old	New
Chronic Wound	Hard to Heal Wound
Complete sterile care techniques in all wounds	Hygienic care concept in most of all wounds
Dry wound healing concepts	Optimal moist wound healing concepts
Limit Technology	Numerous Technology

Wound cleansing

Biofilm Management



Anti-Biofilm Product

Biofilm Management:

- Reduce biofilm burden
  - Debridement
  - Wound cleansing
- Prevent biofilm reformation
  - Good Wound dressing:Topical antimicrobials

Wound Dressing

- Promote wound healing
  - Keep moisture, remove easily
  - Not destroy wound bed
- Prevent infection
  - Silver / antibiotic can kill organisms
  - No infection : no silver or antibiotic
  - Infection : add silver or antibiotic

Basic Rules of Dressing Selection

- Infected wound ?
  - If infected …the wound dressing should coated with topical antibiotic or silver.
- Amount of wound fluid
  - High wound fluid should use the high absorptive dressing.
    - Foam , hydrofiber, alginate dressing etc.
- Cost appropriate

Wound Dressing Everyday : When ?

Checking wound bed and perform wound dressing everyday with silver sulfadiazine cream if

- Wound bed is not good
- Contaminated wound
- Wound is dirty
- Patient has underlying disease with poor healing
- Large superficial or deep burn $\geq$15-20% TBSA

Topical 1% AgZnSDZ cream

application approximately 5-10 mm. in thickness

Gauze dressing then on top with Gamgee

Dressings

- If wound bed appearance is stable without change for 2-3 days

- Advanced wound dressing can be applied and changed every few days depend on amount of exudate

List of Wound Dressing

Temporary

- Biological dressing
- Synthetic wound dressing
- Tissue engineering

Permanent

- Cell culture
- Tissue engineering
  - Artificial dermis

Dressings

- **Natural (gauze etc.)**
- **Films**
- **Hydrocolloids**
- **Hydrogel**
- **Alginates**
- **Foams**
- **Tissue engineering**

Absorbency

Hydro fiber/Foam

Ca-Alginate

Hydrocolloid

Hydro-Gel

Film*

Low

Moderate

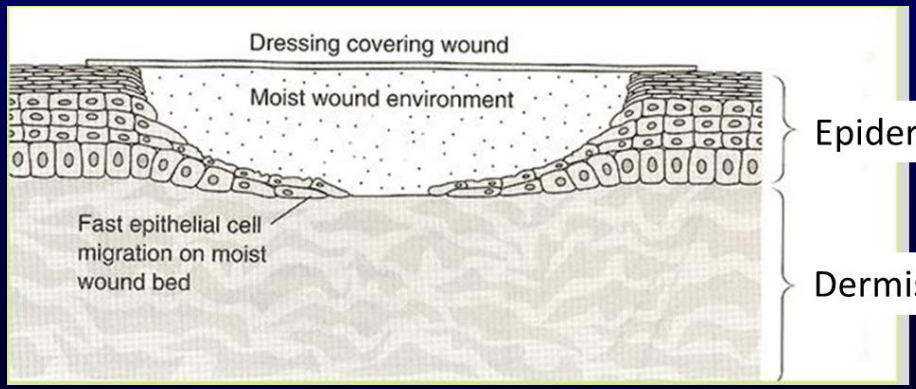
High

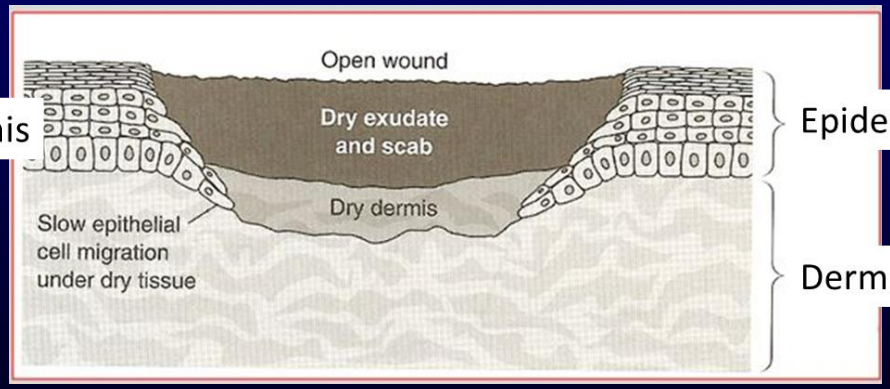
Exudates

Moist and Dry Wound Healing

- Moist
- Epithelial cells move across moist dermal surface
- Wound heal faster without scab

- Dry
- Dermis dries and forms scab that impedes epithelial cells migration
- Epithelial cell must move further to repair wound site





Winter GD, Formation of the scab and the rate of epithelialization of superficial wound in the skin of the young domestic pig. Nature 1962 193:293-9.

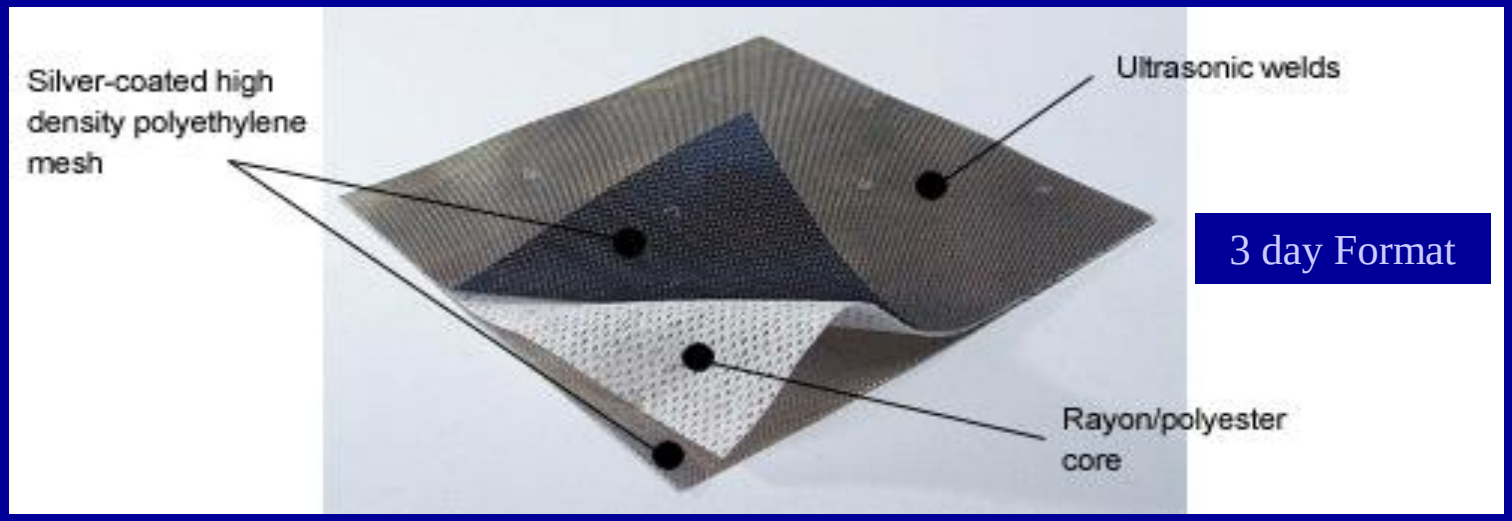
Film Dressing

- Impermeable to microorganisms and moisture
- Flexibility and transparency
- Do not permit the absorption of exudate
- Secondary dressing
- Suitable for flat, shallow wounds with low exudates

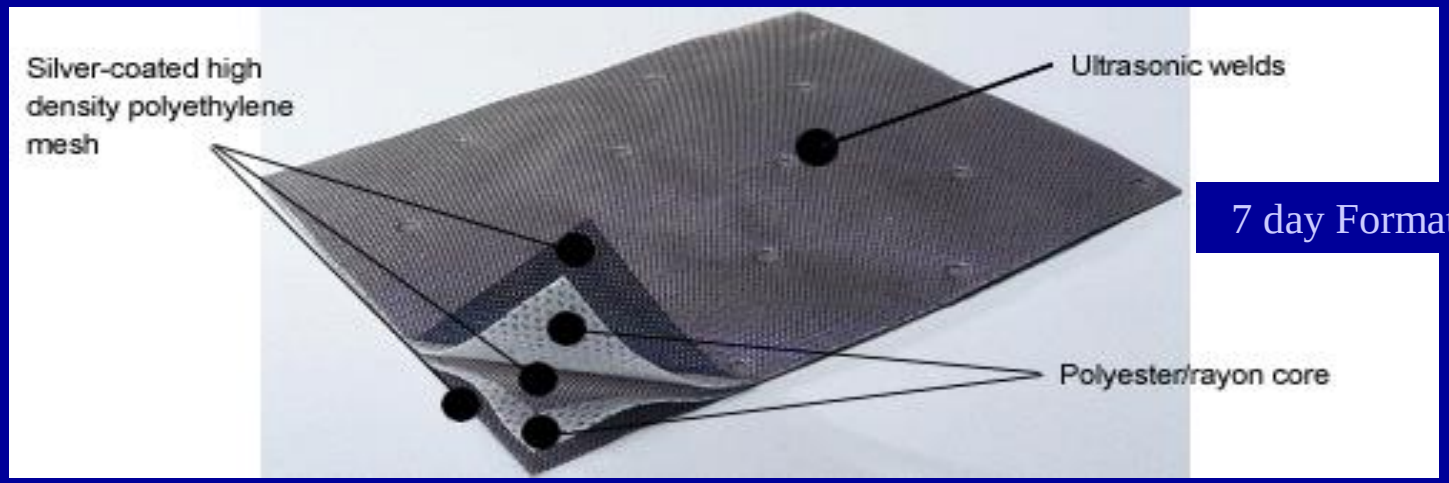
Hydrocolloids dressing : Chemical properties

- Hydrocolloid = Hydro + colloid
- Crosslinked polymer matrices
- Starches, cellulose, gelatin, pectin, and sodium carboxymethylcellulose
- React with wound exudates
  - gel-like forming
  - keep moist
  - protect the wound bed

Nanocrystalline silver on HDPM

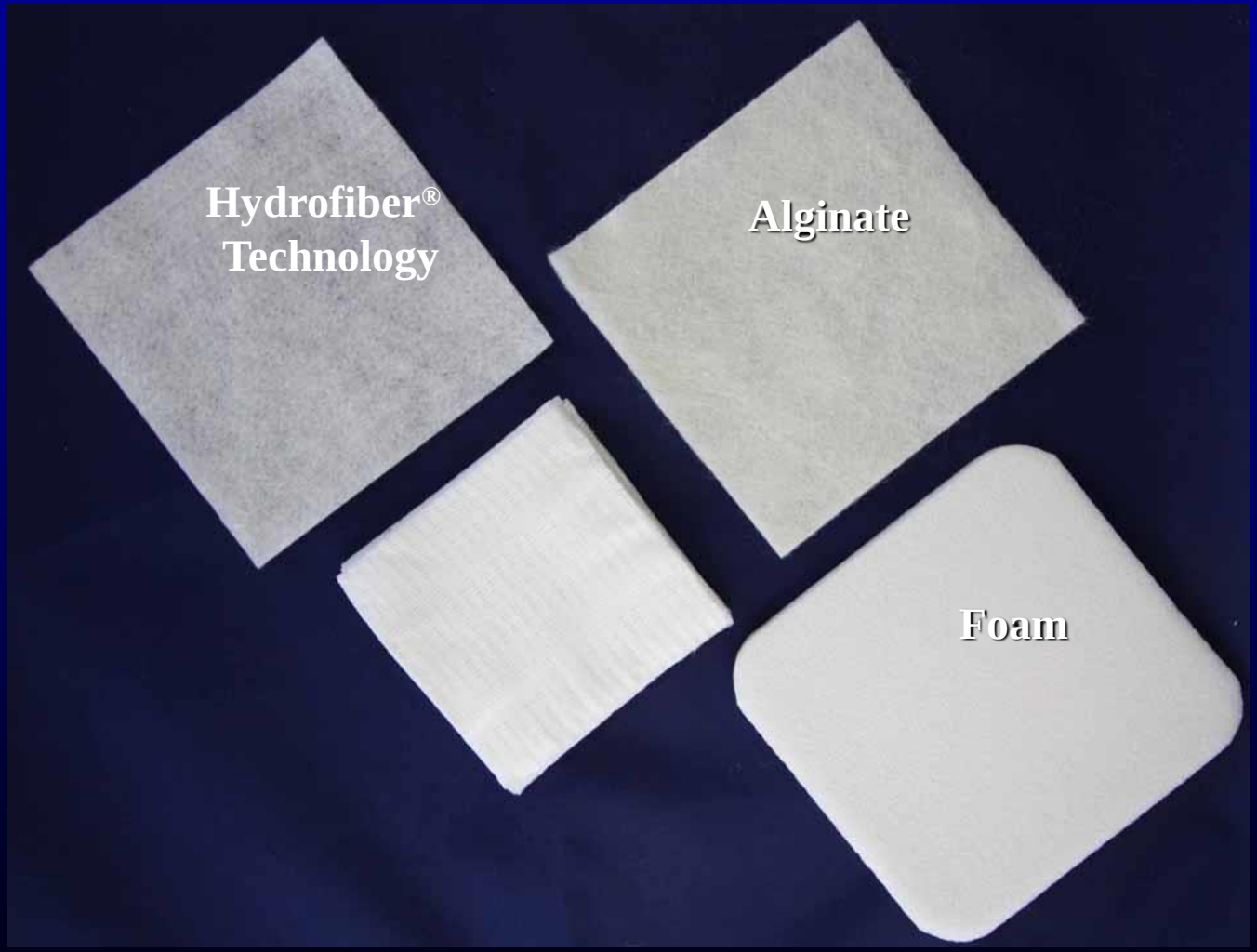


3 day Format



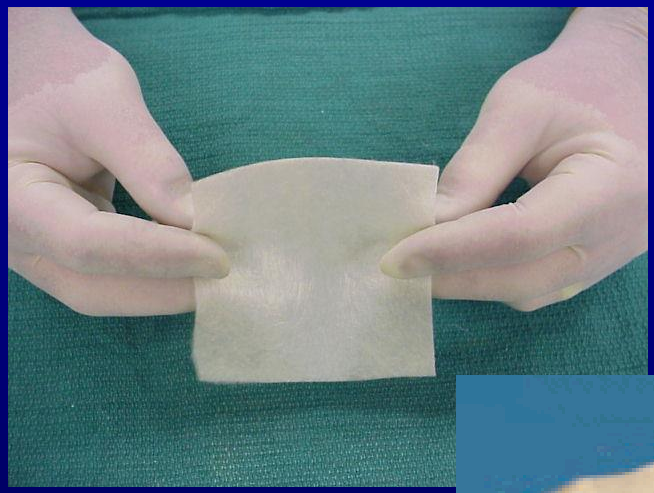
7 day Format

High Absorptive Dressing Types

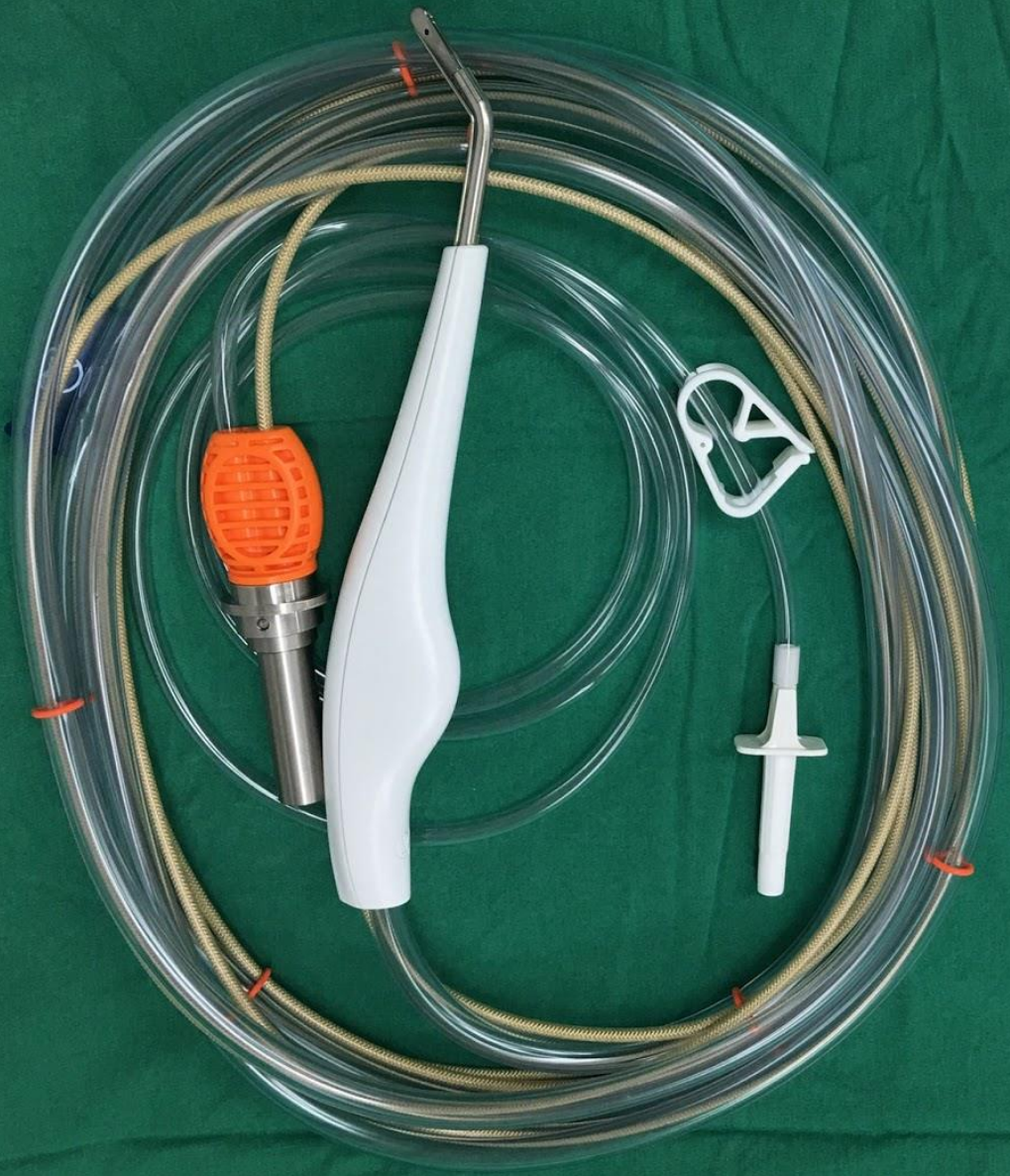


High exudative wound: Hydrofiber and foam dressing

Alginates



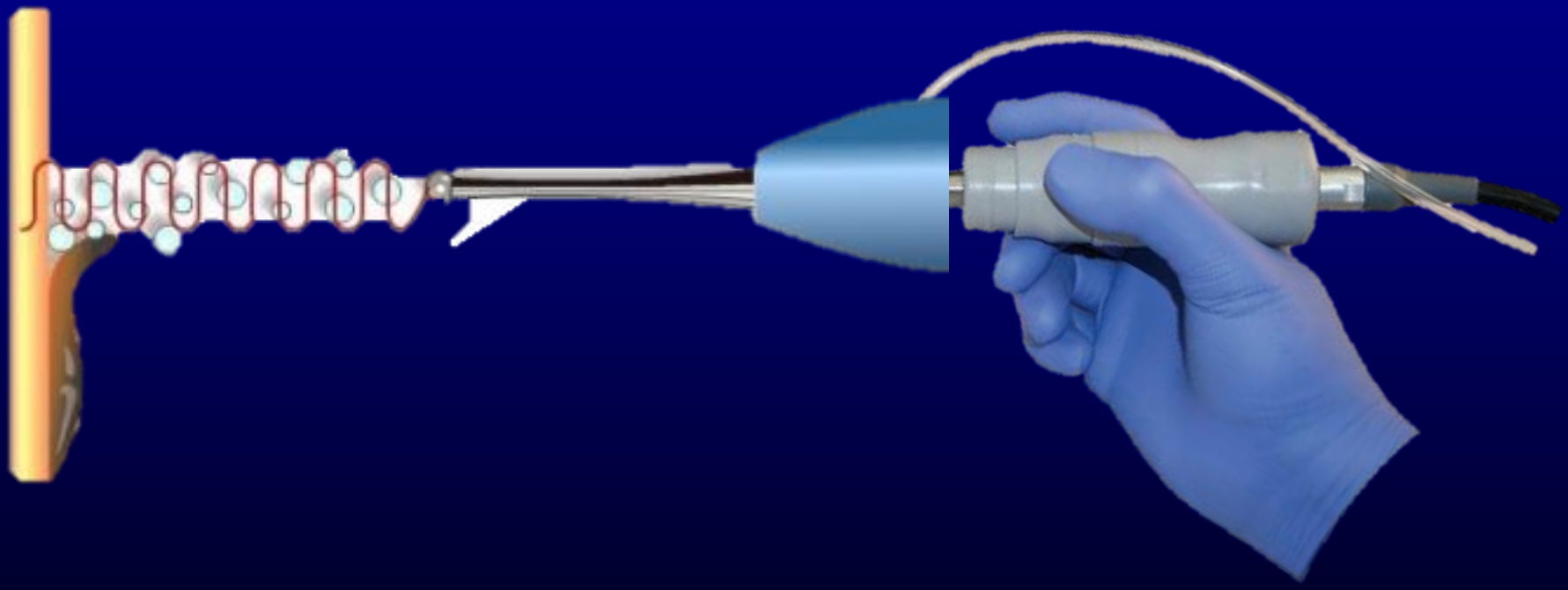
Hydrosurgery



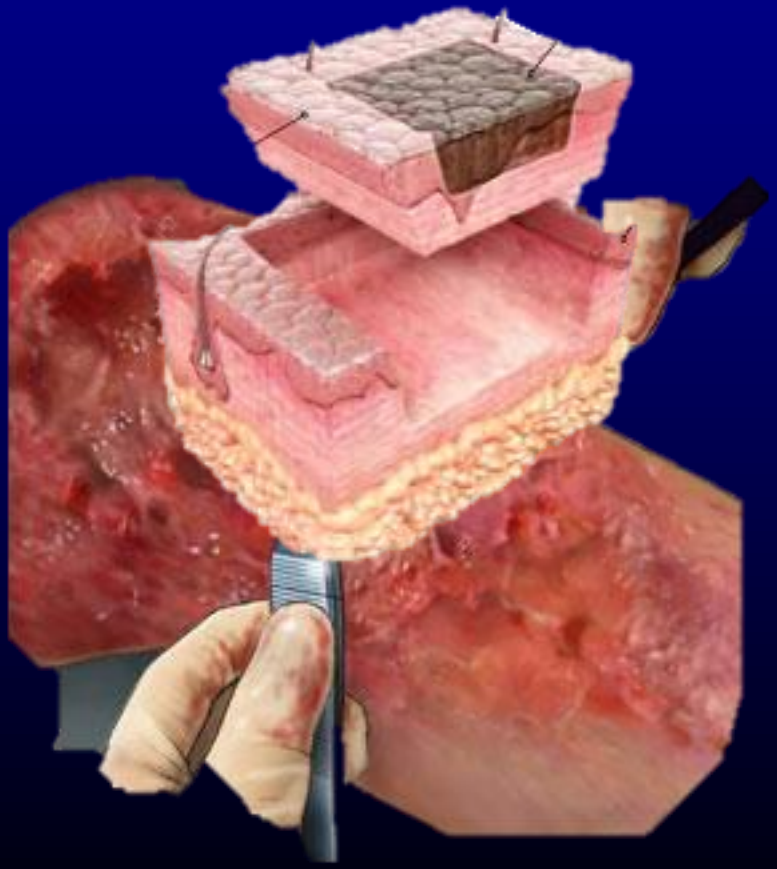
Goulian knife

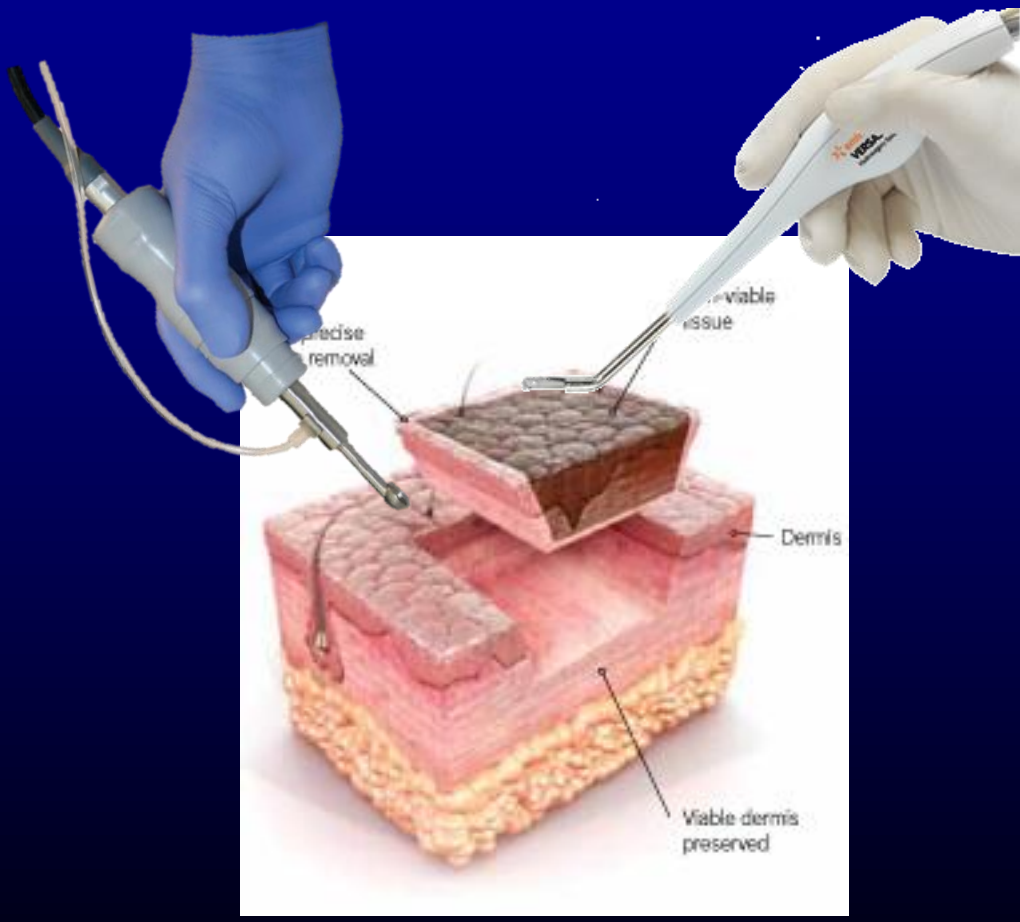
Humby knife

Ultrasonic surgery



Manual VS Advanced Techniques





Skin Substitutes
Tissue Engineering

Skin Substitutes

Synthetic Dermis

- ✓ Limited donor sites
- ✓ Replaces dermis
- ✓ Decreases scar formation

- ✗ Infection prone

Cultured Epidermis

- ✓ Limited donor sites
- ✓ Replaces epidermis

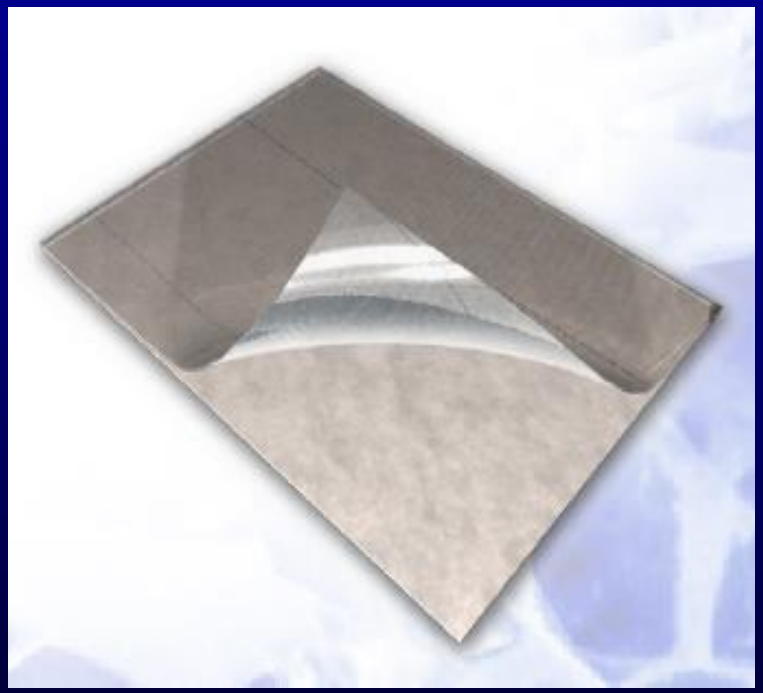
- ✗ Poor “graft take”
- ✗ Delayed rehab
- ✗ Prolonged LOS

TISSUE ENGINEERING FOR WOUND COVERAGE

: LARGE WOUND, NOT ENOUGH SKIN GRAFT

: CORRECTION OF DEFORMITIES

Tissue Engineering: Artificial Dermal Skin



- Bilayer skin replacement system
- Composed of 2 layers
  - Dermal regeneration layer
    - Cross-linked bovine or porcine collagen
    - +/-Glycosaminoglycan
      - (Chondroitin-6-sulfate)
  - Temporary epidermal layer
    - Silicone layer

Artificial Dermal Substitutes

Integra®
(Bovine collgen)

Terudermis®
(Bovine atelocollagen)

Pelnac®
(Porcine atelocollagen)

Artificial dermal template skin substitutes used in Thailand from the last 10 years.

TERUMO®

TERUDERMIS® applied

Regeneration

Infiltration of fibroblasts and capillaries.

Grafting

removal of silicone membrane

Thin split-skin graft applied

Healing

regeneration of epidermis.

Skin closure in Massive wounds ≥40%TBSA

Meshed skin graft : 1:3

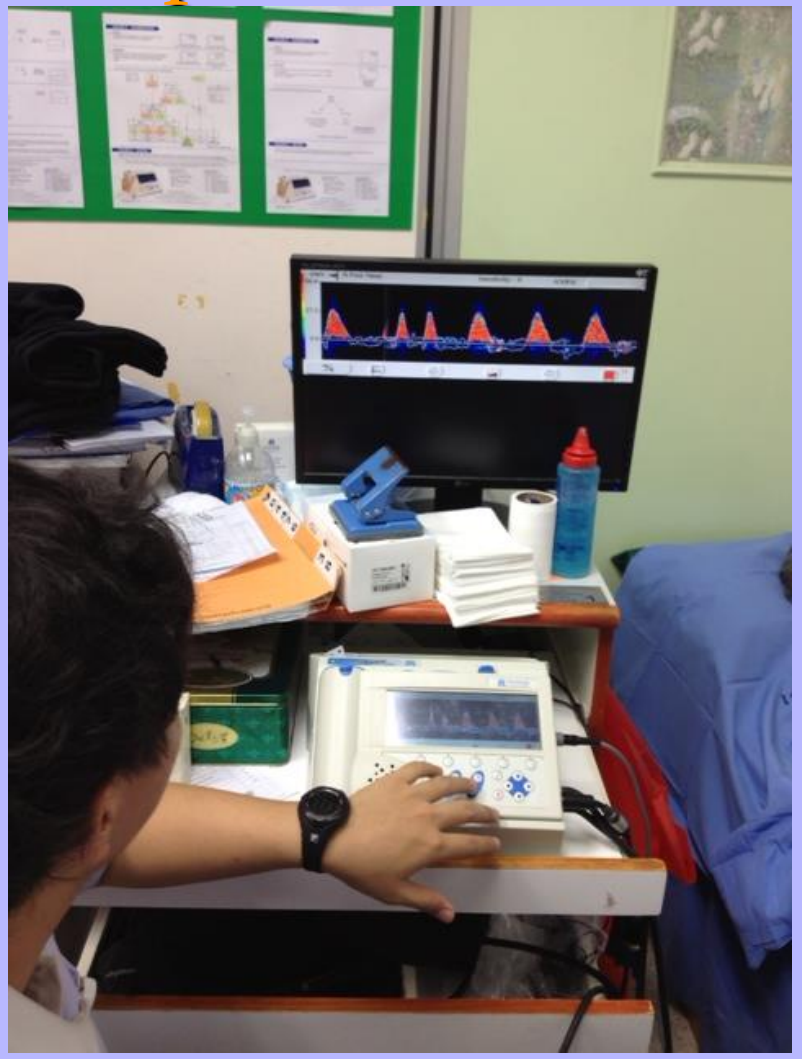
or

Meek micrograft technique

Underlying causes

- ***Arterial ulcer → Revascularize***
- ***Venous ulcer → Compression therapy***
- ***Diabetic foot ulcer → Off-weight the foot/ulcer***
- ***Pressure ulcer → Pressure reduction***

Segmental & Toe pressure



Ischemic rest pain most commonly occurs at an ankle pressure < 50 mmHg or toe pressure < 30 mm Hg

Patients with ulcers or gangrene, the presence of CLI is suggested by an ankle pressure <70 mmHg or toe systolic pressure <50 mmHg

Physiology Training

Systemic Oxygen Therapy

LED Biomodulation

Gas Plasma Therapy

Local Oxygen Therapy

Growth factor

Epidermal Growth Factor

0.0001% ointment, 10 g

150 mcg/g gel, 15 g

0.005% spray solution, 10 mL

Platelet Rich Plasma; PRP

Basic Consideration for Wound Dressing Materials Selection

- Amount of wound exudate or fluid
- Wound dressing should coated with topical antibiotic or silver if suspect wound infection.
- Available and easy to use with cost appropriate

Thank You