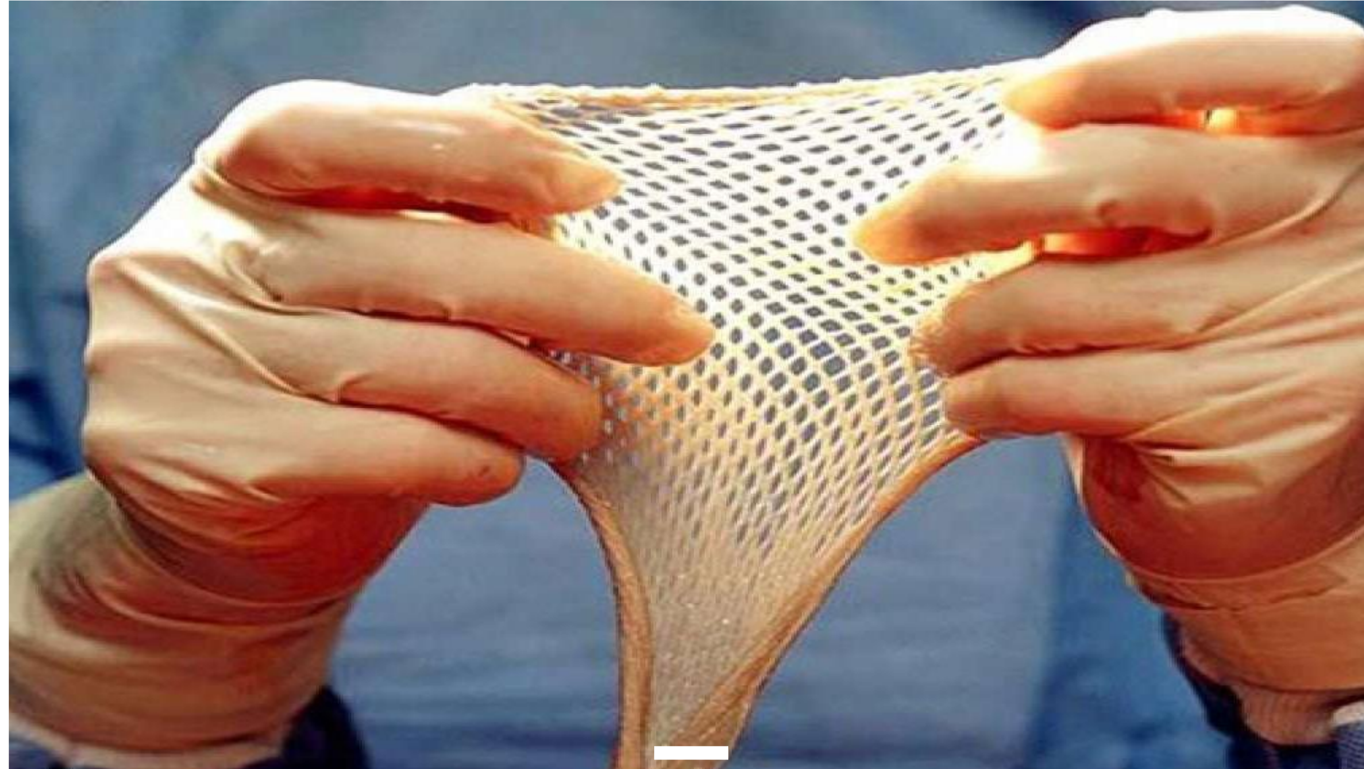
BURN RECONSTRUCTION



PATRYCJA POPOWICZ, MD
VCU BURN SURGERY FELLOW

OBJECTIVES

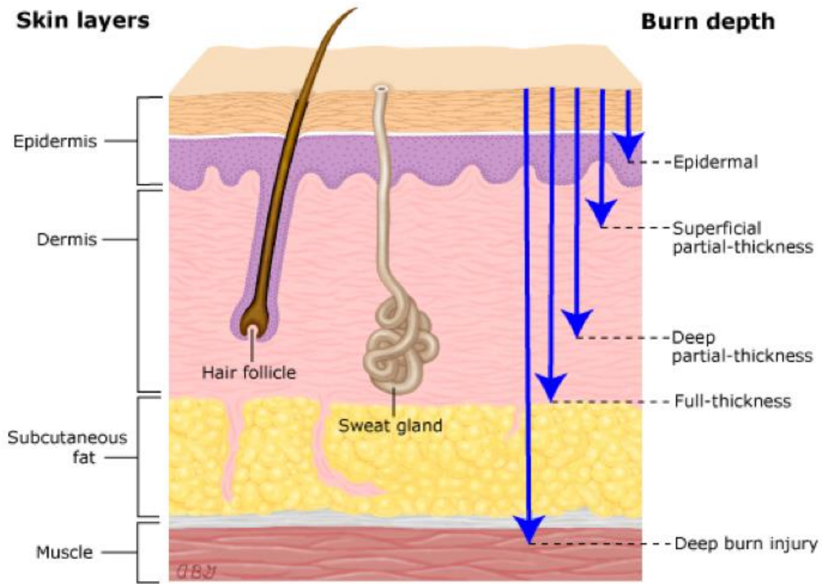
WOUND BED PREPARATION

BASIC GRAFTING TECHNIQUES

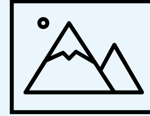
SURGICAL BURN MANAGEMENT

WOUND CARE DRESSINGS

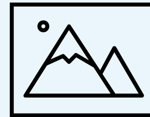
FIRST, A QUICK REVIEW



HOW DO WE CATEGORIZE BURNS

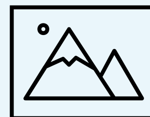


SUPERFICIAL

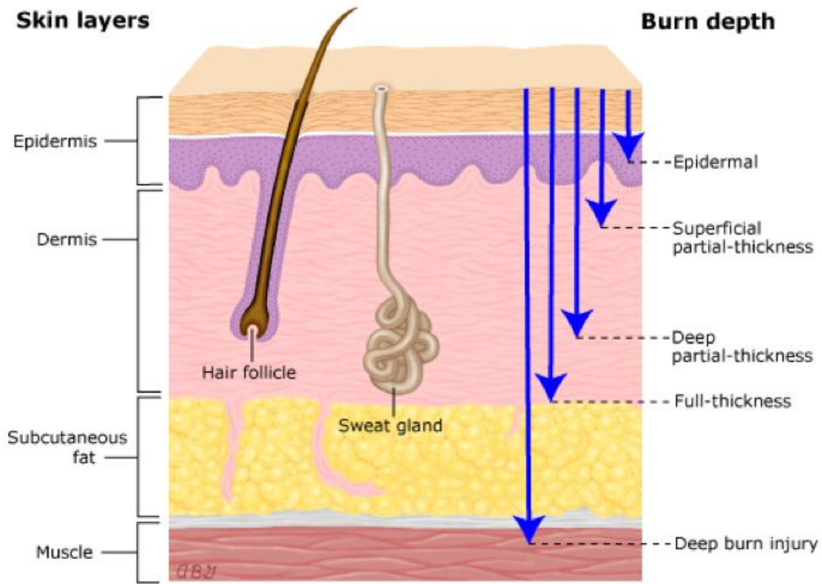


PARTIAL- THICKNESS

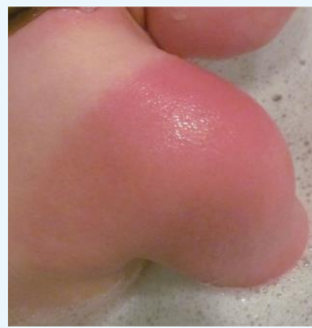
- Superficial
- Deep



FULL-THICKNESS

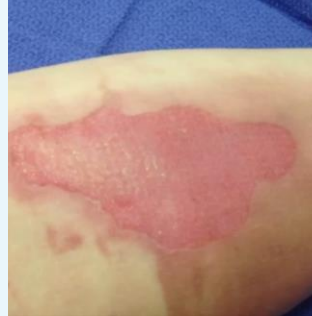


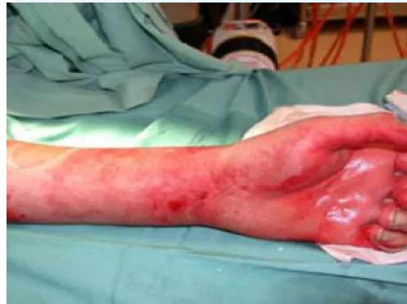
HOW DO WE CATEGORIZE BURNS



SUPERFICIAL

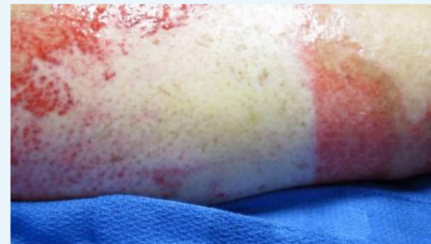
- Affects the epidermis
- Erythema, painful, no blisters





PARTIAL- THICKNESS

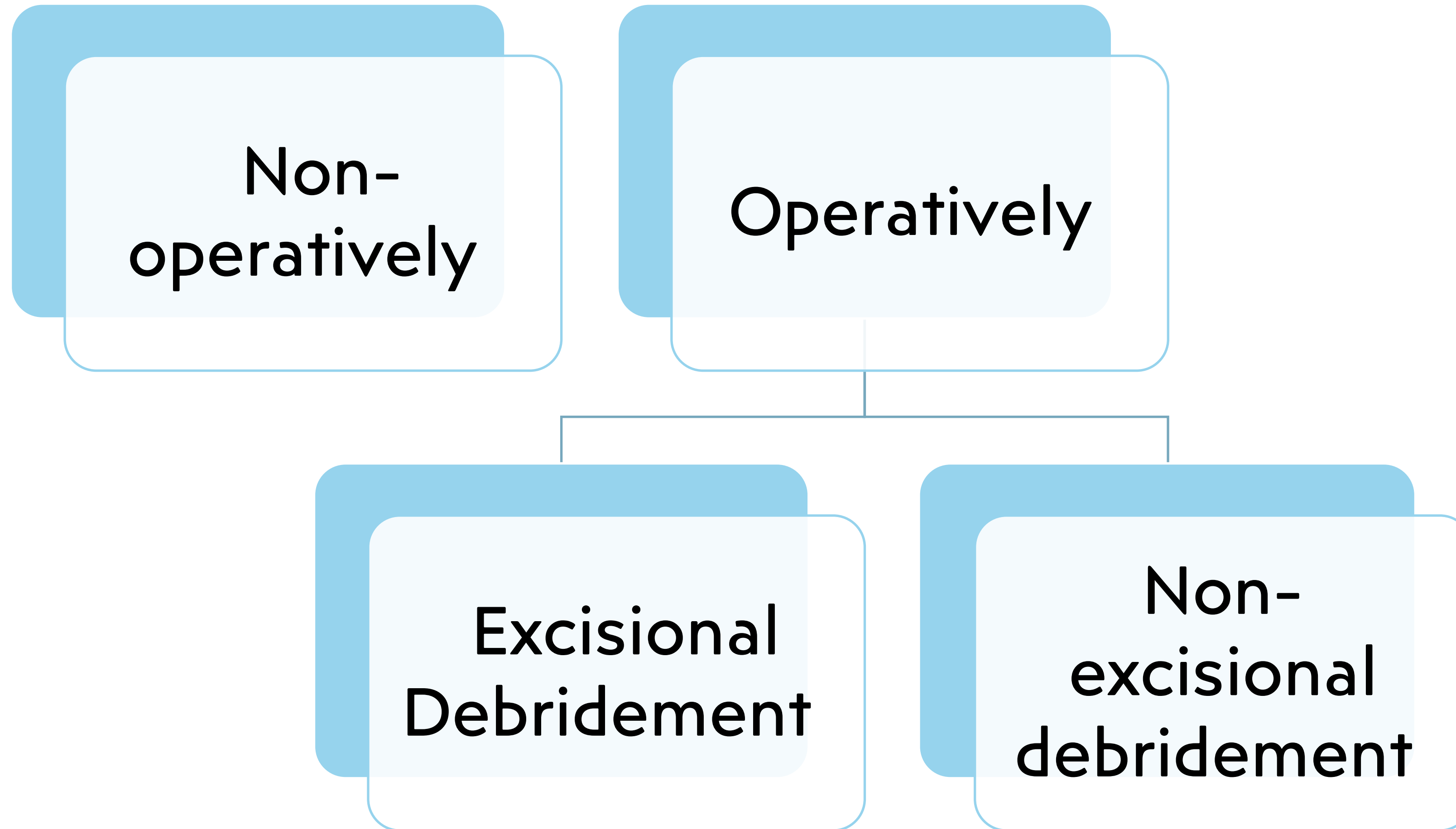
- **Superficial**: affects the papillary dermis
  - painful blisters, underlying homogenous pink/red wound base, briskly blanches
- **Deep**: affects the reticular dermis
  - can be painful, mottled wound bed, slugglishly blanches



FULL-THICKNESS

- Affects tissue deeper than the epidermis and dermis
  - charred, leathery appearance, does not blanch, usually non-painful

WHAT ARE THE DIFFERENT WAYS TO MANAGE A BURN?



CASE #1

Its 2AM and CHOR consults you.

Information given: 3 yo M who was transferred here from Mary Washington after touching the inside of a stove.

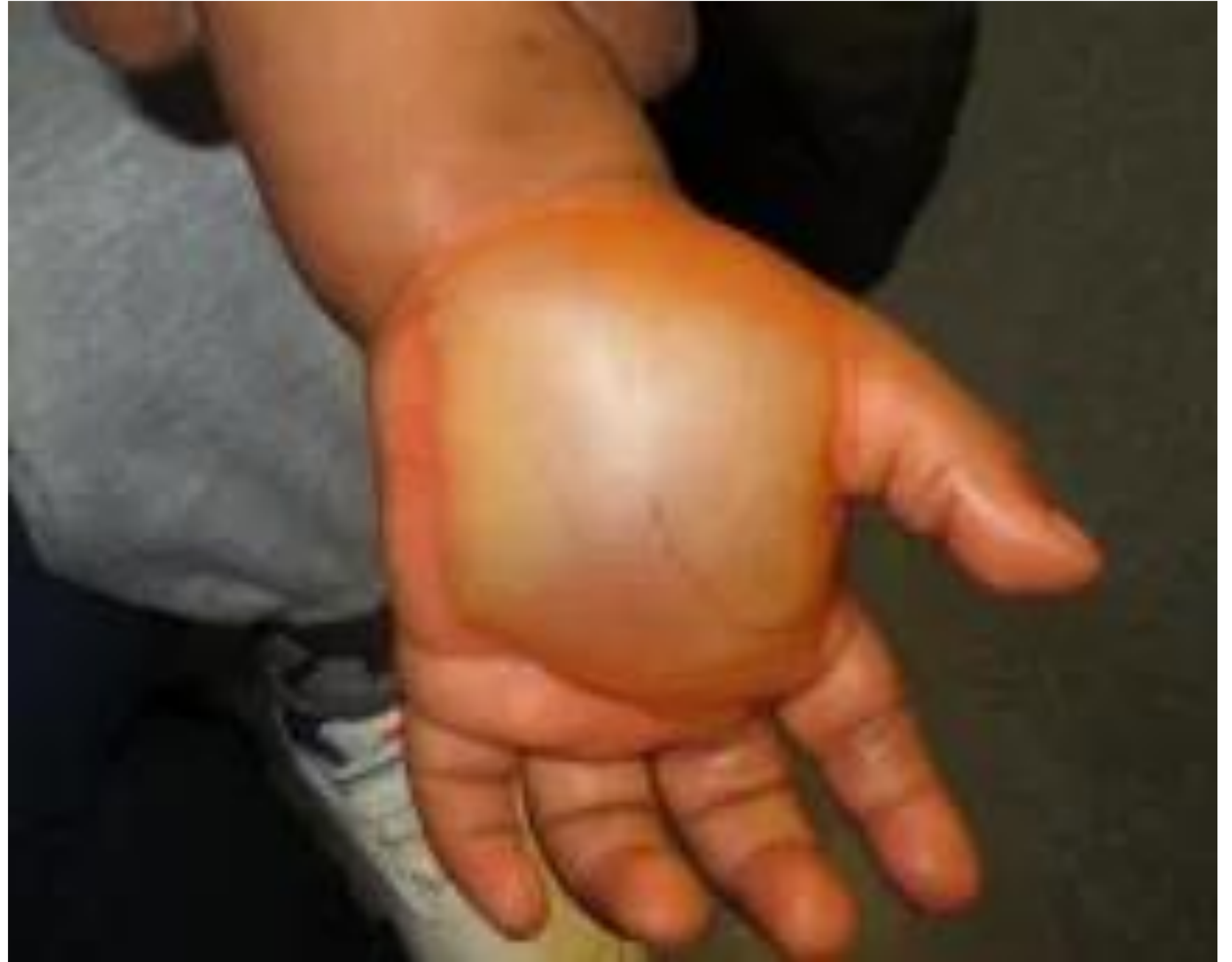
TOI: 5PM today

No pictures in the chart.

No PMHx.

Vaccines UTD.

Mom at bedside and they live 45 min away.



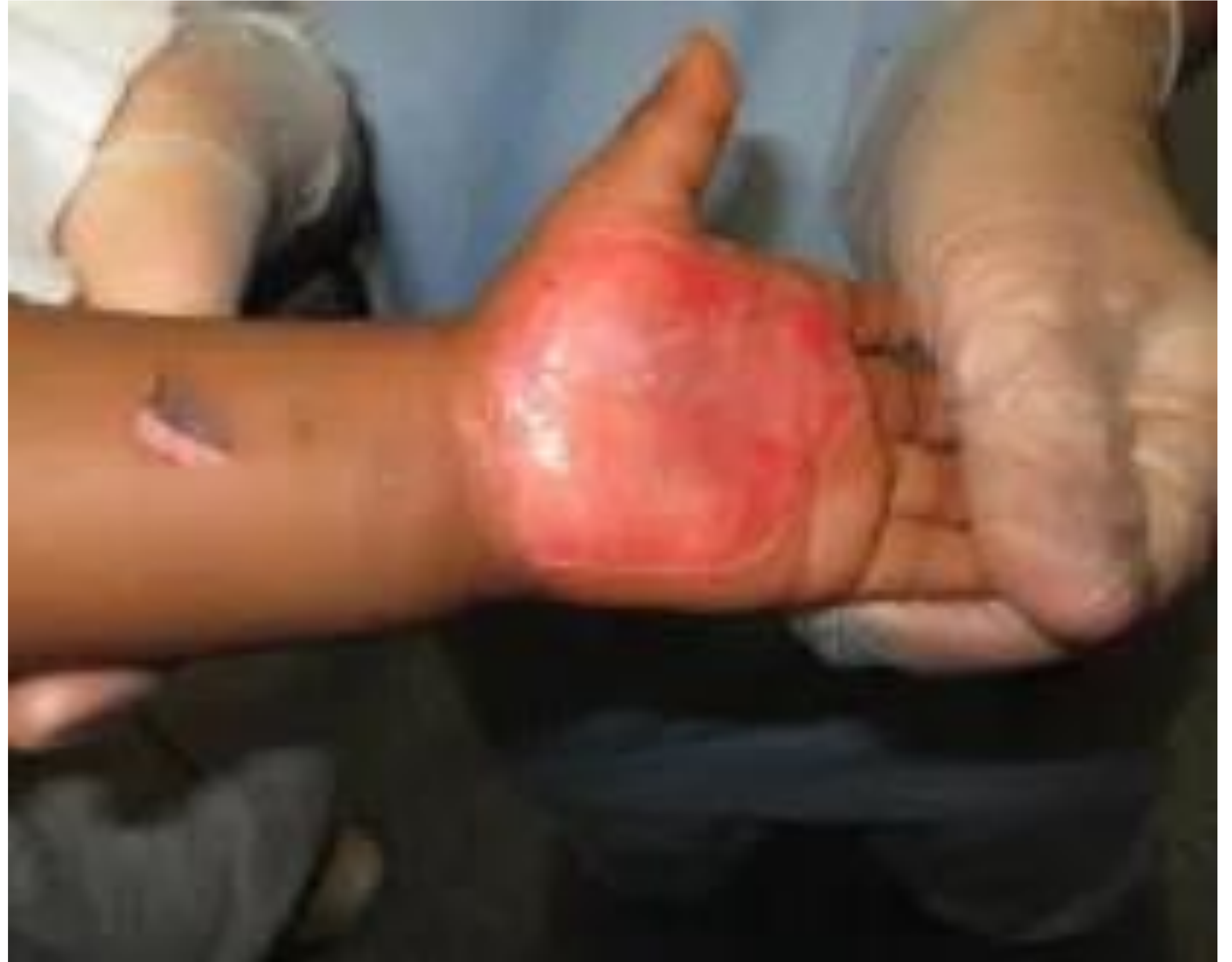
CASE #1

Burn debridement.

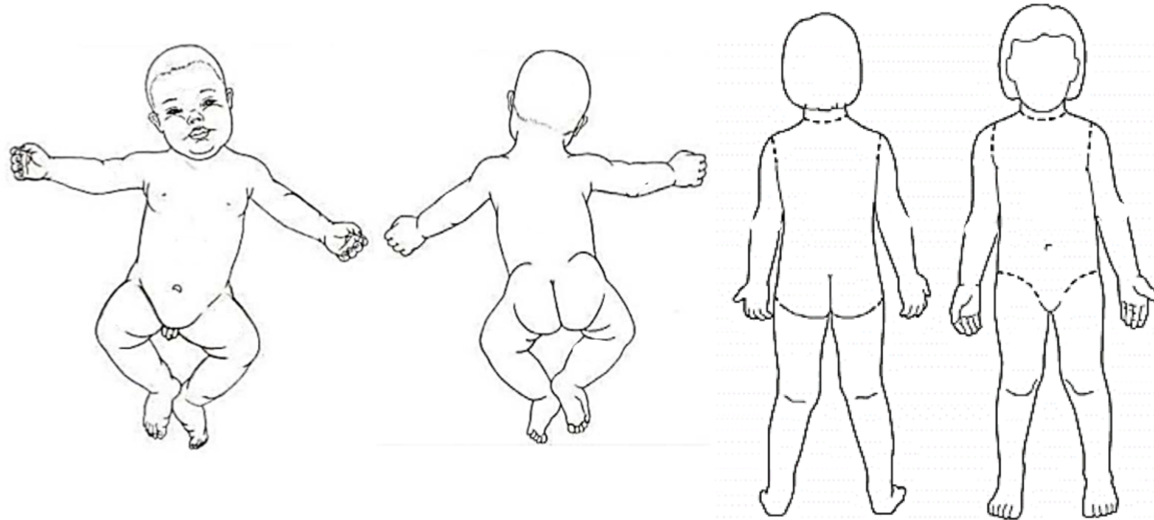
If you were to call the attending on-call, how would you characterize this burn?

- Partial thickness burn to the palmar aspect of left hand.
- Smaller PT burn on volar aspect of left forearm

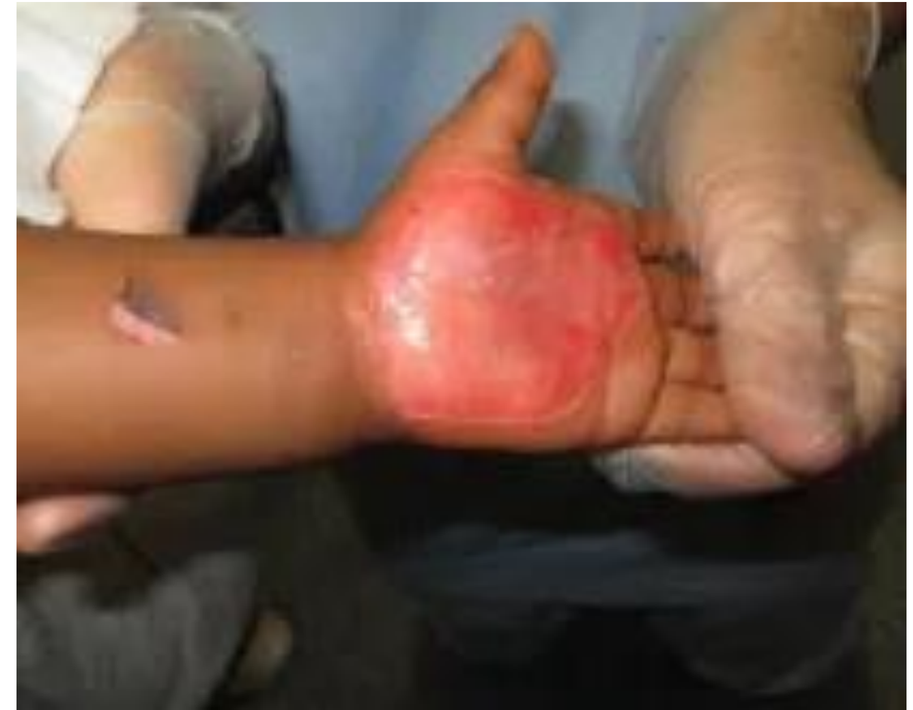
TBSA?



Patient Sticker	USA HEALTH Infant/Pediatric Lund and Browder Burn Chart



Area	Birth-1 year	1-4 years	5-9 years	10-14 years	15 years	2nd Degree	3rd Degree	Total
***Head**	***19***	***17***	***13***	***11***	***9***			
Neck	2	2	2	2	2			
Anterior Trunk	13	13	13	13	13			
Posterior Trunk	13	13	13	13	13			
Right Buttock	2.5	2.5	2.5	2.5	2.5			
Left Buttock	2.5	2.5	2.5	2.5	2.5			
Genitalia	1	1	1	1	1			
Right Upper Arm	4	4	4	4	4			
Left Upper Arm	4	4	4	4	4			
Right Lower Arm	3	3	3	3	3			
Left Lower Arm	3	3	3	3	3			
Right Hand	2.5	2.5	2.5	2.5	2.5			
Left Hand	2.5	2.5	2.5	2.5	2.5			
Right Thigh	***5.5***	***6.5***	***8***	***8.5***	***9***			
Left Thigh	***5.5***	***6.5***	***8***	***8.5***	***9***			
Right Lower Leg	***5***	***5***	***5.5***	***6***	***6.5***			
Left Lower Leg	***5***	***5***	***5.5***	***6***	***6.5***			
Right Foot	3.5	3.5	3.5	3.5	3.5			
Left Foot	3.5	3.5	3.5	3.5	3.5			
Total								



TBSA: 0.5% + 0.1% = ~0.6%

How Would You Manage This Pt?

WHAT DO WE LOOK FOR WITH SKIN SUBSTITUTES?

- **Inexpensive**
- Long shelf life
- Available off the shelf
- Non-antigenic
- Durable
- Flexible
- Prevents water loss
- Bacterial barrier
- Drapes well
- Easy to secure
- Grows with the development of children
- Applied in one operation
- Does not become hypertrophic

Palackic et al 2022

SUPRATHEL

SYNTHETIC SKIN SUBSTITUTE (POLYLACTIC ACID MEMBRANE)

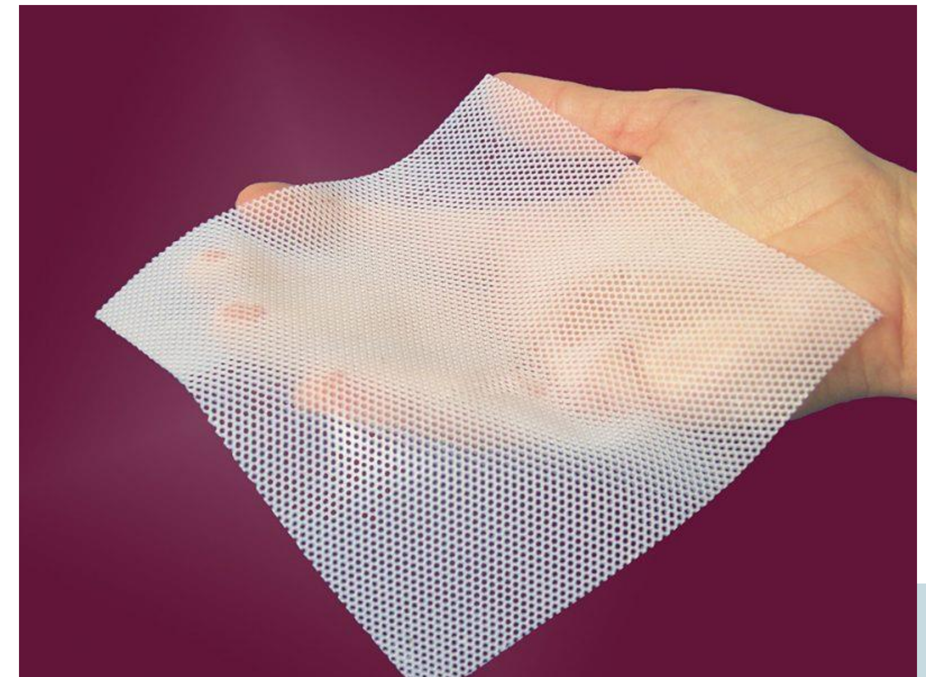
REMAINS IN PLACE UNTIL RE-EPITHELIZATION OCCURS

PERFORATED, OVER TIME BECOMES TRANSLUCENT

ADV: MINIMIZES FREQUENCY OF DRESSING CHANGES, LESS PAINFUL, CAN DECREASE HOSPITAL LENGTH OF STAY

DRESSING: SECURED WITH SINGLE LAYER OF NONADHERENT DRESSING (RYLON)

PLAN: KEEP OVERLYING DRESSINGS IN PLACE FOR 3-5 DAYS, THEN CAN POTENTIALLY LEAVE OPEN TO AIR, PERIODICALLY TRIM LOOSE SUPRATHEL/RYLON



BURN OINTMENTS

Antimicrobials	Polysporin, Bacitracin, Neomycin, Mupirocin
Silver Sulfadiazine	Silvadene Transient leukopenia Decreases colonization, pseudoeschar, impedes reepithelization, oculotoxic
Bismuth-Impregnated Petroleum Gauze	Xeroform
Mafenide Acetate	Sulfamylon Metabolic acidosis, penetrate eschar, painful upon application

Mepilex Ag

- Sponge material, impregnanted silver (antibacterial)
- non-adherent
- typically change daily, can stay on for max 5-7d

Mepitel

-transparent, silicone, porous
- non-adherent
- allows for outer dressings to be changed without disturbing wound
- can stay on for max 14d

Mepilex Border

- absorbant, stronger adhesive
- useful on areas difficult to secure with outer dressings

Mepilex Lite

- thin foam
- non- to low exudating wounds
- typically changed daily
- avoid on Recell at all times

Cuticerin

- smooth acetate guaze with water-repellant ointment
- non-adherent
- typically changed daily

Xeroform

-occlusive, absorbant guaze with bismuth- tribromophenate (bacteriostatic)
- non-adherent
- typically changed daily, can stay up to 7d

Acticoat

- silver (antibacterial)
- useful for infected wounds
- can stay on for max 7d

Telfa

-non-adherent film placed on a thin cotton pad
- often paired with mupirocin

Telfa Clear

- non-adherent transparent film
- used with Recell

Hydrofera Blue

-polyvinyl alcohol (PVA) and polyurethane foam (antibacterial)
- natural negative pressure (pulls debris/exudate from wound bed
-decrease incidence of rolled wound edges
- can stay in place for max 7d

Burn Wound Care

Basics of Inner Dressings

CASE #2

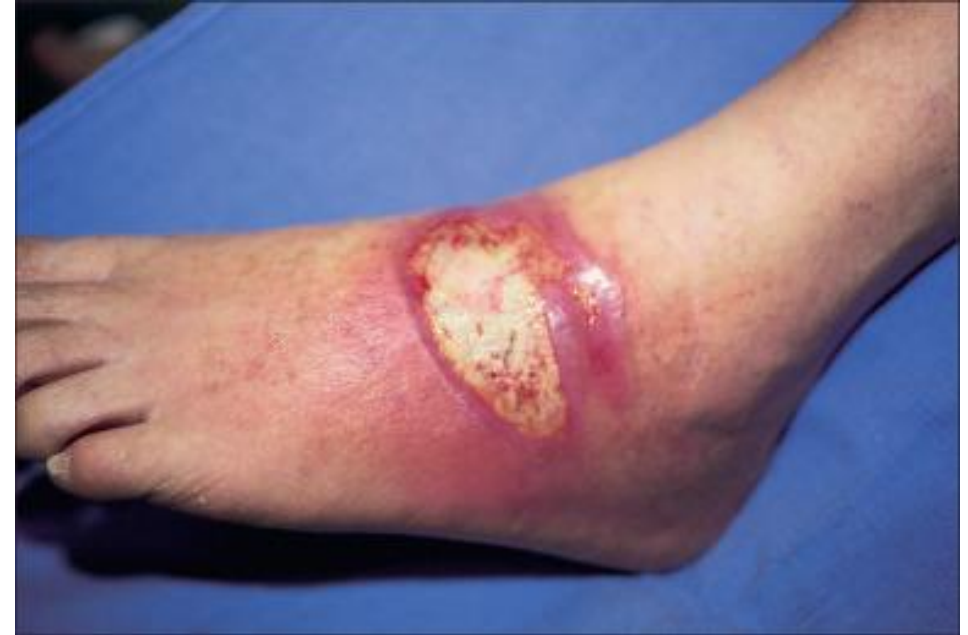
ED Consult.

55 yo F sp scald burn.
DOI: 6 days ago
PMHx: Type 2 diabetes, HTN, smoker, HLD

Went to local hospital 6d ago who sent the patient home with silvadene and was given instructions to apply silvadene daily once the blister opens.

Patient not compliant with wound care at home.

Intermittent subjective fevers. Increased pain and has issues walking. Otherwise, asymptomatic.



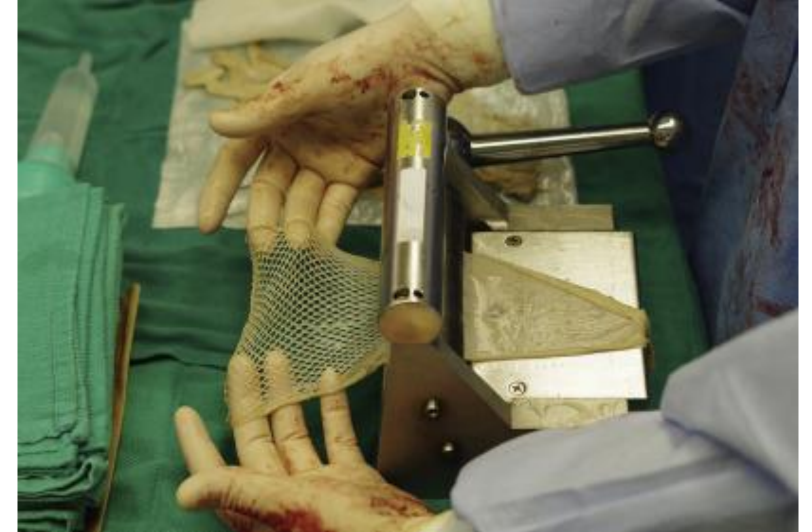
How would you describe the burn?

What is her TBSA?

How would you manage this burn?

SINGLE VS STAGED BURN SURGERY

- **Single stage = Autograft**
  - 1 surgery, potential shorter hospital length of stay



- **Multiple stage: Allograft**
  - Cadaver skin
  - Gold standard when patient's wound bed is not prepared for a graft or when the donor skin is not sufficient
    - Can also be ideal for infected wound
  - Stimulates underlying bed wound healing (fibroblast and collagen production, neovascularization)
  - Reduces fluid losses, protects exposed nerve endings
  - Typically remove in 3-7 days, but can remain on longer

WOUND PREPARATION

- **Tangential Excision:**
  - Excising layers of non-viable tissue while preserving underlying viable tissue
- **Fascial Excision:**
  - Skin and subcutaneous tissue excised en-bloc
  - Reduced blood loss in extensive burns

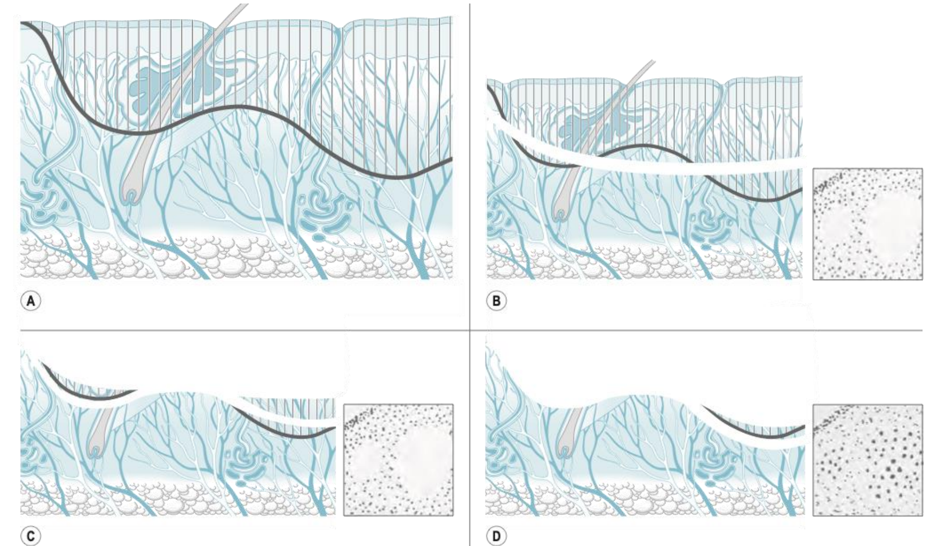
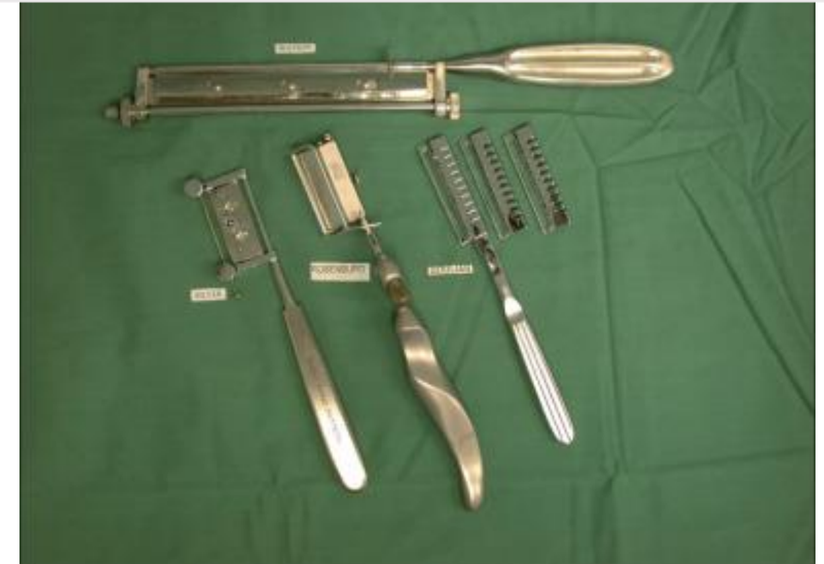
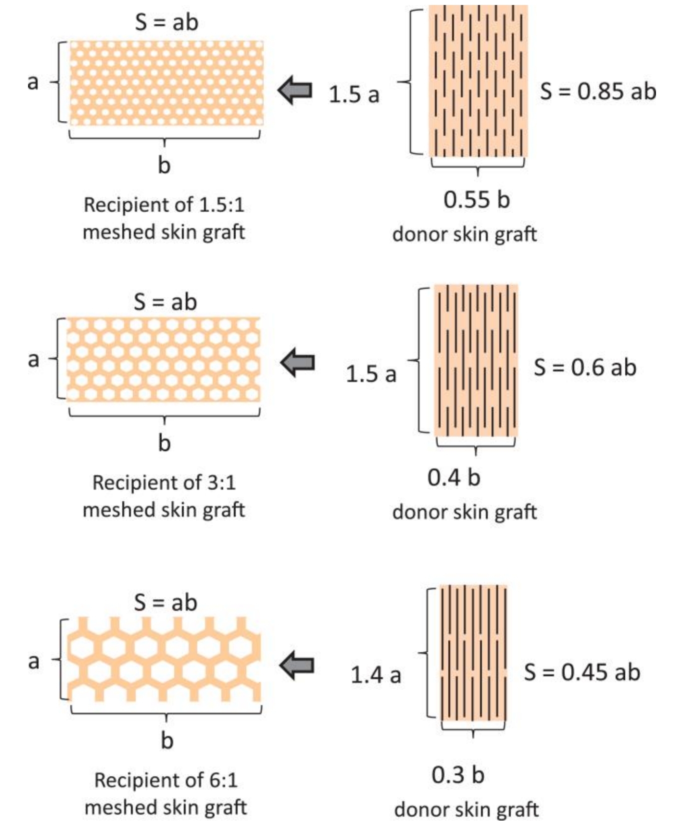


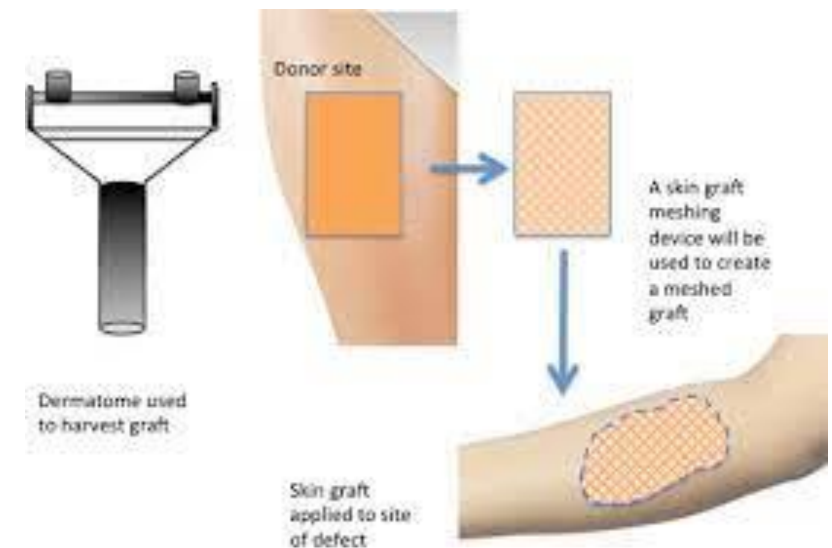
Fig. 12.1 (A–D) Schematic representation of tangential excision; sequential slices are taken until punctate hemorrhage is evident (From Janzekovic Z. A new concept in the early excision and immediate grafting of burns. *J Trauma.* 1970 Dec;10(12):1103–1108.)



GRAFTING BASICS

- Split Thickness Autograft:
  - Meshed, cover larger surface areas
  - Increased risk of contraction
- Sheet Grafts:
  - Not meshed, used for smaller burns or cosmetic areas
- Full-Thickness Autograft:
  - Both epidermal and dermal layers
  - Smaller areas, less contracture



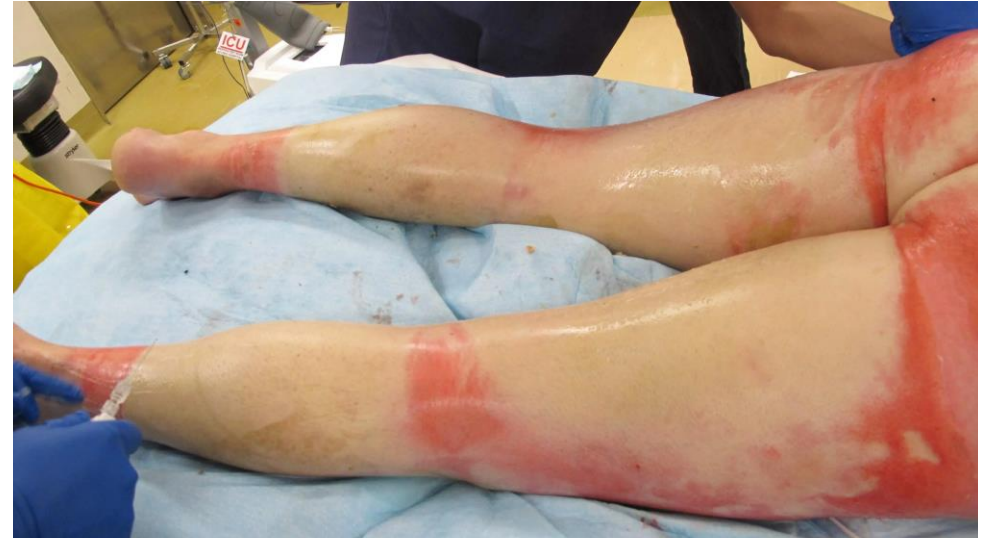


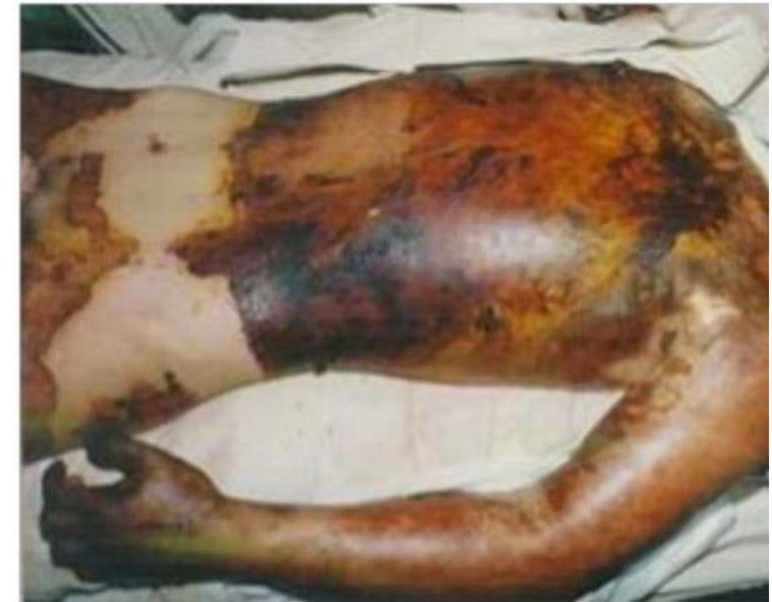
CASE #3

Trauma Alert

21 yo M threw gasoline on a bonfire, clothes caught on fire, and intubated on the scene.

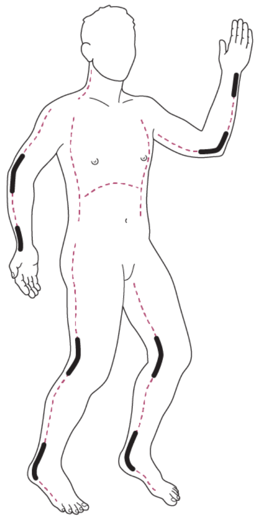
TBSA? (for simplicity: head, neck, back, and b/l feet are spared)

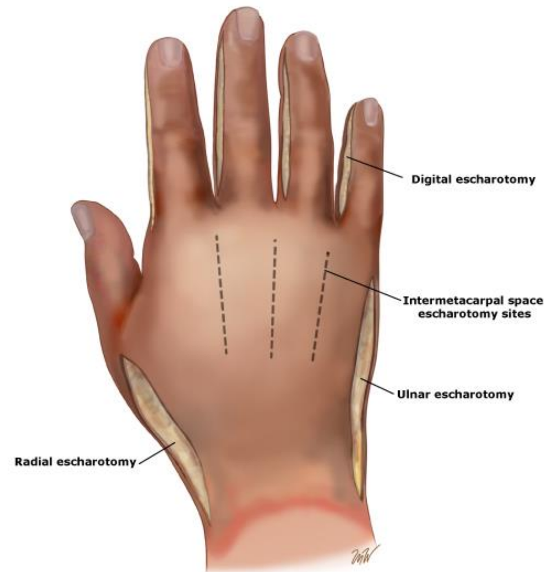


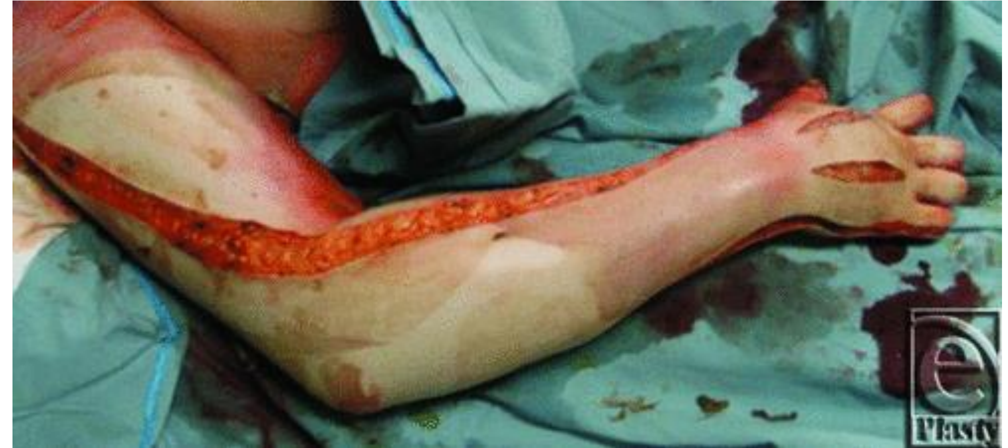


CASE #3

- You have successfully performed BUE/BLE/chest escharotomies.
- When would you want to operate on this patient?
- What are the surgical options?







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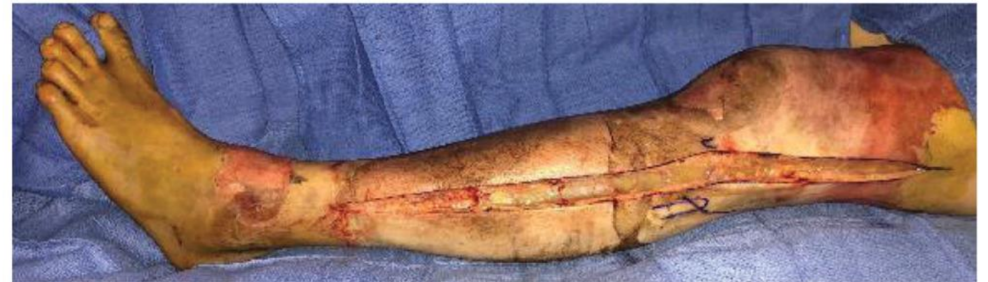
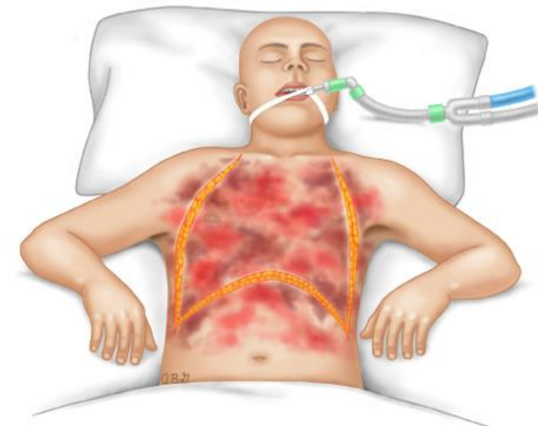




Patient Name
MR #
DOB

Time of Injury:
Time of arrival to ED:
Time of arrival to EHBC:
Patient weight (kg):

Total TBSA from LB:
24 hour expected:
1st 8 HR fluid:

Fluid rec'd pre-EHBC:
(1st 8 hr-pre EHBC volume/ remaing 1st 8hr)
Remaining 16 hour expected fluid:

Evans-Haynes Burn Center Adult Fluid Resuscitation Flowsheet

Date:

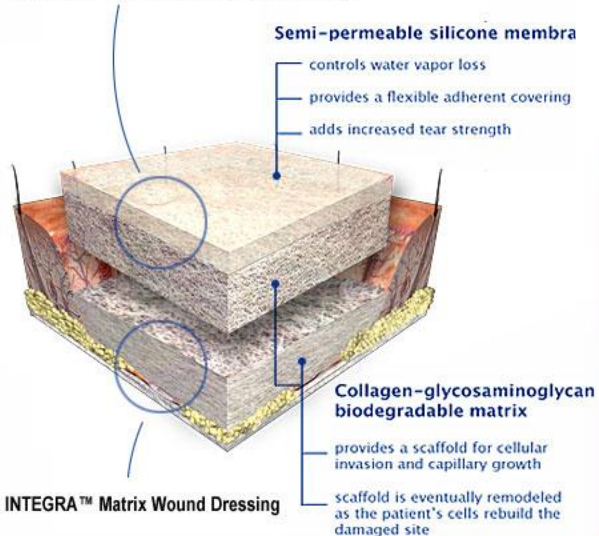
Time / Hour Post Burn Ex. 1300-1359	Crystalloid	Colloid	Hourly Total	Running Total	UOP	Bladder Pressure	Vasopressors	Comments
/ 1								
/ 2								
/ 3								
/ 4								
/ 5								
/ 6								
/ 7								
/ 8								
8h TOTAL								Begin Monitoring Patient for 5% Albumin Infusion for Low Urine Output (< 30 ml for 2 hours)
/ 9								
/ 10								
/ 11								
/ 12								
/ 13								
/ 14								
/ 15								
/ 16								
/ 17								
/ 18								
/ 19								
/ 20								
/ 21								
/ 22								
/ 23								
/ 24								
16h TOTAL								
24h TOTAL								

Medical Records Copy

H-MR-2057 (rev. 03-22)
Evan-Haynes Burn Center

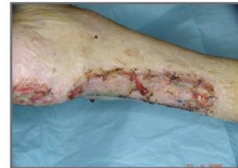
INTEGRA

BURN RECONSTRUCTION



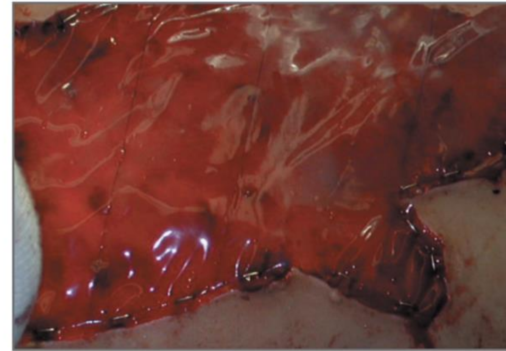
Debridement and wound bed preparation.

IBWM placed with VAC dressing for deep coverage.

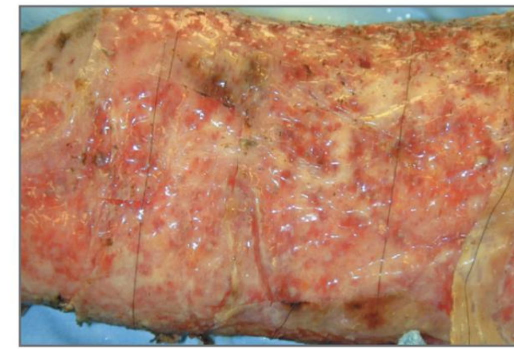


Early epithelialization noted and wound viable with functional soft tissue coverage of achilles tendon.

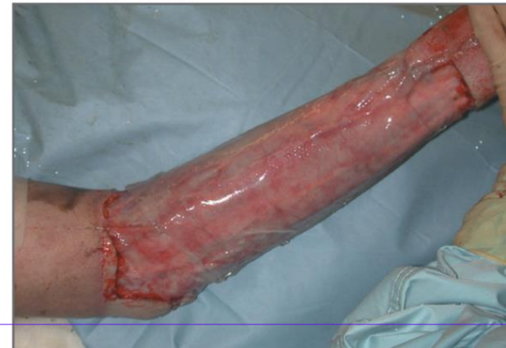
Tissue Remodeling Timeline



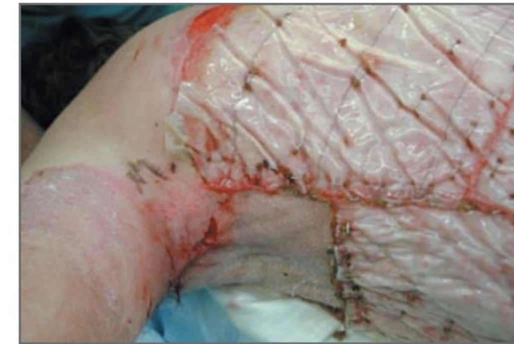
Day 0



Day 14

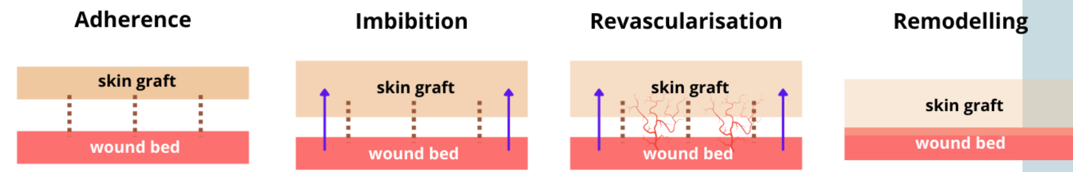


Day 7



Day 21

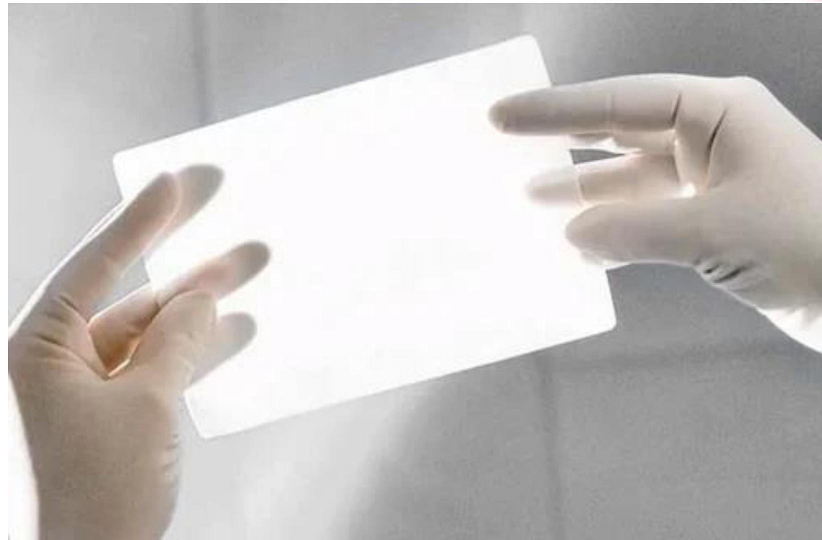
Skin Graft Healing Phases

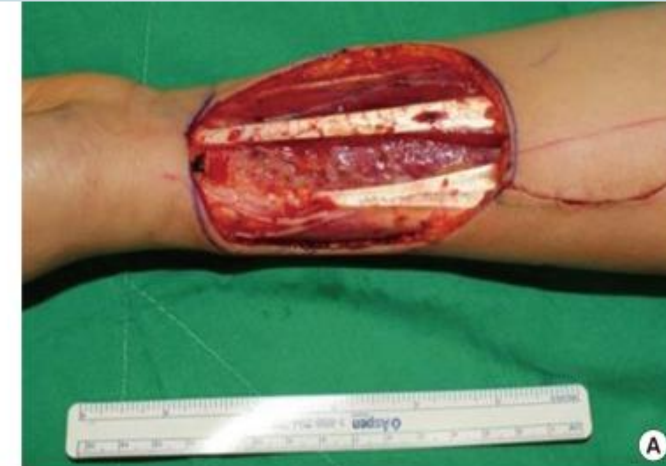


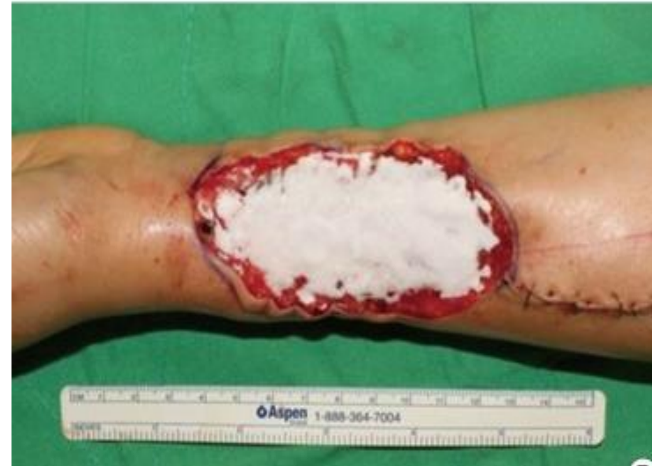
MATRIDERM

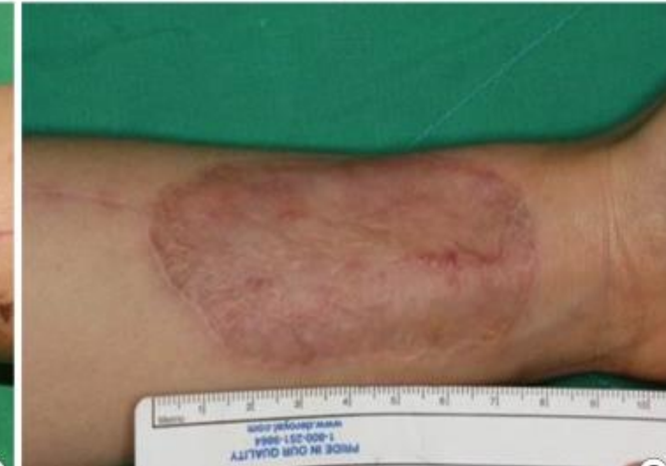
Application of the matrix

- Dry application of MatriDerm® into the wound bed with full coverage of all structures
- Rehydration by sterile physiological saline solution

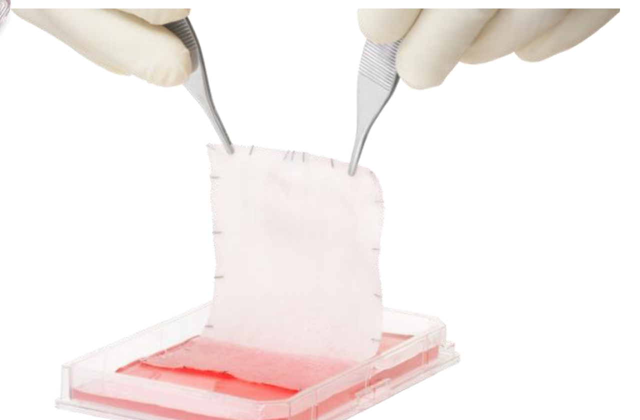




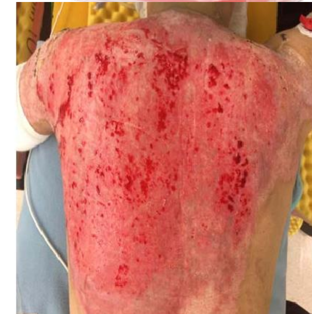




CEA



- **INDICATIONS:** NOT ENOUGH SUFFICIENT COVERAGE W/ UNBURNED SKIN
- **CONTRAINDICATIONS:** INFECTED BURNS, HX OF ANAPHYLAXIS TO VANC, AMIKACIN, AMPHOTERICIN
- **REQUIREMENTS:** TWO 6X2CM FULL THICKNESS BX WITHIN A FEW DAYS OF PRESENTATION
- PROCESSED, EPIDERMAL TISSUE, CULTURED IN VIVO W/ MURINE FIBROBLASTS TO PROMOTE GROWTH
  - Cx expanded over 3wk
  - Use wider meshing ratios (typically 6:1) to increase surface area coverage
  - Use in conjunction with autograft and Recell
- TAKEDOWN OUTER DRESSINGS (ACE/LAPS) ON POD2. AIRTIME TO CEA AREAS 4-5H. BRIDAL VEIL/CEA MATRIX REMOVAL ON POD 4-5.



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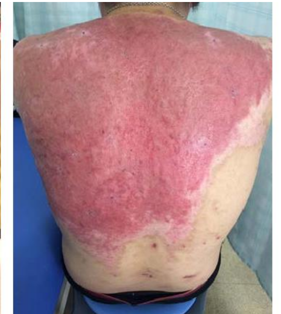

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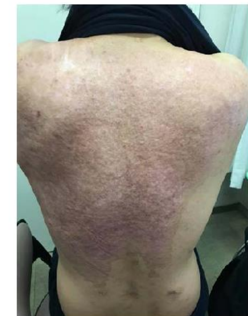


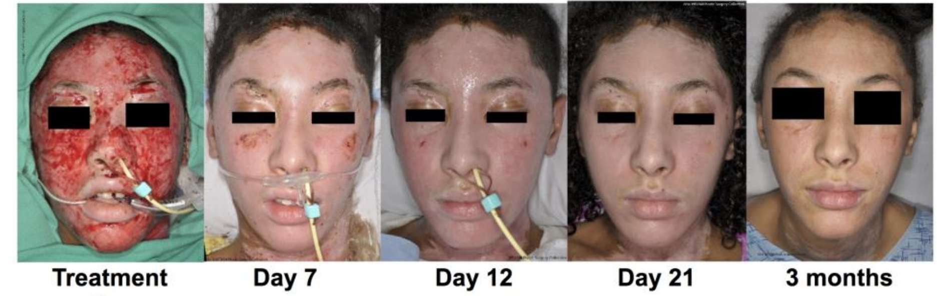
(c)

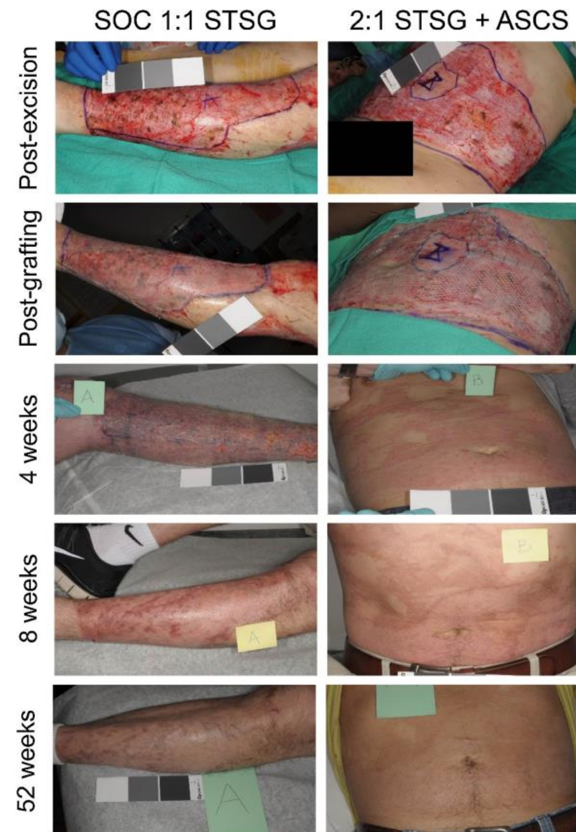
RECELL

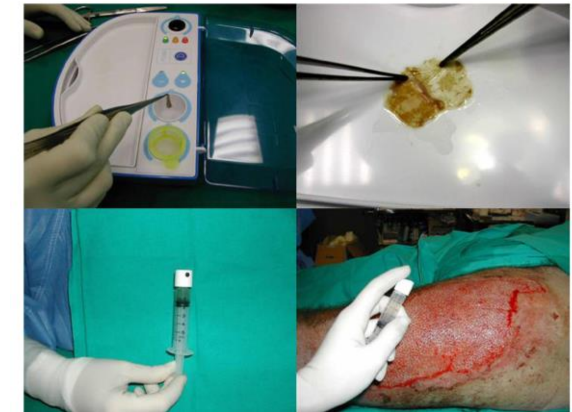
- REGENERATIVE EPITHELIAL SUSPENSION

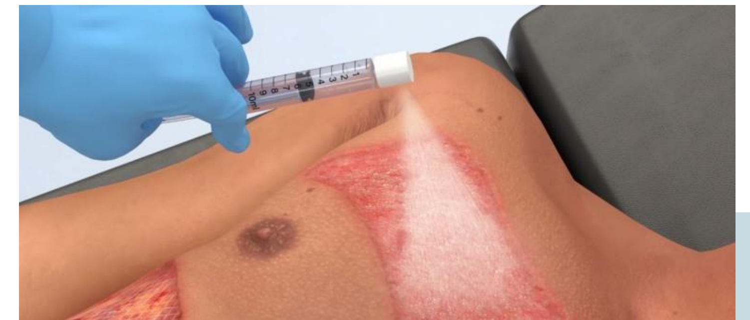
- BEHAVE AS CELLS ON THE EDGE OF WOUND (NO LONGER CONTACT INHIBITED GIVEN IN LIQUID FORM)

- CAN USE LARGER MESHING RATIOS TO OBTAIN SIMILAR COSMETIC RESULTS AS SMALLER RATIOS









COVERAGE AND WHEN TO CHOOSE

Infected, TBSA <5%, more superficial burn	Infected burn, excised, now an exposed tendon	Not infected but has exposed tendon after fascial excision
Larger TBSA, adequate wound bed after preparation	TBSA >60%	PT burn

THANK YOU! QUESTIONS?

& THANK YOU FOR A GREAT YEAR!

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