Trauma Injury Reconstruction

no financial disclosures

Objectives

At the conclusion of this presentation, participants should be able to:

1. Describe the goals of wound reconstruction in the acute setting.
2. Name 3 vital anatomic structures for which stable soft tissue coverage is necessary.
3. Distinguish the difference between a hypertrophic scar, a scar contracture, and a keloid.
4. Describe the surgical approach to flap reconstruction of pressure ulcers.
5. Outline the pertinent psychosocial issues that influence a patient's preparedness for definitive pressure ulcer reconstruction.

The plastic surgeon's role: who I am, what I do

The collaborative component

- I interface in the caring for patients with traumatic injury:
  - Acutely - consulted by emergency physicians and other surgical services (trauma, orthopedic, vascular, ENT)
  - Late - other surgical services, medicine services, wound care service, wound care nursing, rehabilitation service, physical therapy

The plastic surgeon's role:

The procedural component

- Closure/reconstructing acute wounds that are "complex"
  - Exposed vital or sensitive structures (eg. joints, eyelids)
  - "Putting the pieces back where they belong" as early as possible
  - Covering vital structures
  - Preventing late effects of scarring
- Treating aberations in scarring when they occur
- Reconstructing the chronic traumatic wound

The Acute Traumatic Wound

called to the ER to manage this laceration; hit in face with hoc

Cleft lip repair



8


- accurate alignment of landmarks
- early closure to prevent infection
- shorten the inflammatory phase

6 year old boy involved in motor vehicle collision; acute scalp injuries

Principles

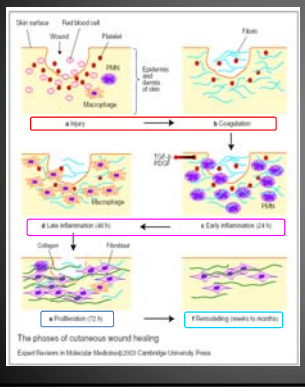
- Tetanus prophylaxis
- Thorough cleansing - scrub brush
- Removal of all gravel/particles to prevent tattooing
- Conservative debridement of devitalized tissue
- Watchful waiting to determine what compromised tissues will survive
- Repair lacerations
- Moist dressings/topical antibiotic

clinic followup after patient fell, catching arm on a fence

approximately 2 weeks later; full function

Aberations in scarring

Phases of Wound Healing



Hemostasis

Fibrin clot, platelet deposition

Inflammation

Neutrophils, Macrophages, Lymphocytes

Proliferation

Reepithelialization, Angiogenesis, Fibrogenesis

Resolution/ Remodeling

Vessel regression, Collagen remodeling

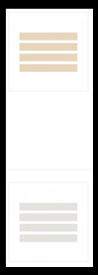
Aberations in scarring: the hypertrophic scar

Aberations in scarring: the keloid

Hypertrophic scars/keloids Treatment: silicone gel

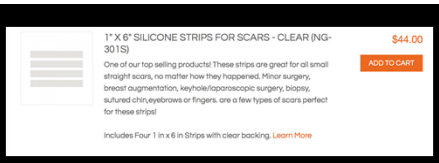
- no prescription required

Silicone gel products

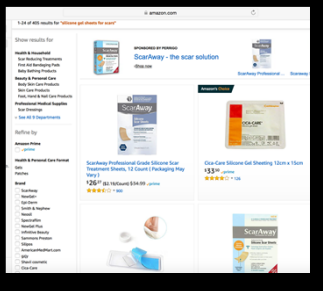


tape/sheet form
-clear/beige
-wherever possible

gel form
-clear
- kids
- facial injuries
- retention issues
- aesthetically sensitive areas



newgelplus.com



amazon.com

Hypertrophic scars/keloids Treatment

- Intralesional steroids - every 4-6 weeks for 3-4 treatments depending on response
- Reexamine between injections to check for dermal atrophy

Aberations in Scarring: Contracture

Scar Contracture

patient fell from bike and struck the left upper face on paveme
approximately one year following eyelid laceration repair

The Nonacute Wound

Reconstructive Modalities

- Skin Grafts (blood supply comes from the recipient site)
  - Split-thickness
  - Full-thickness
- Flap (blood supply comes with the flap)
  - Local
    - Skin rearrangement
    - Muscle/Musculocutaneous/Fasciocutaneous
  - Distant (Free flaps)

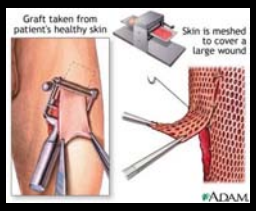
Skin Grafts

Skin Graft

- Used to provide surface coverage of defects
- Relies on good vascularity of the recipient bed for take
  - GOOD: muscle, granulation tissue with punctate bleeding
  - BAD: bone, fat
- Generally not for covering vital structures (major vessels, bone, hardware)
- Generally will not match the color/texture of adjacent tissue (can look like a patch)

Skin Graft

- split-thickness versus full-thickness



split-thickness: sheet (left) meshed (right)

full thickness graft with donor site sutured

Split-thickness versus full-thickness skin grafts

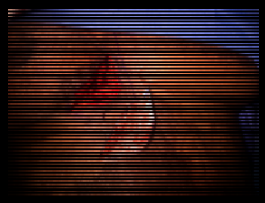
	Split Thickness	Full Thickness
How much epidermis	All the epidermis	All the epidermis
How much dermis	Some of the dermis	All of the dermis
Donor site management	Left open to heal	Primarily closed
Donor site available	Many large areas	Limited by closure
Can cover large areas	Yes	No
Contraction during healing	Lots of shrinkage	Limited shrinkage
Good for joints	No	Yes
Good for cosmetic areas	No	Yes
Better sensation restoration		

- Which of the following sites would be better for a split-thickness skin graft?

a) Eyelid
b) Across the elbow
c) 1st webspace
d) Abdomen

- Which of the following sites would be better for a full-thickness skin graft?

a) Forearm
b) Thigh
c) Nose
d) Back



How does skin graft survive?

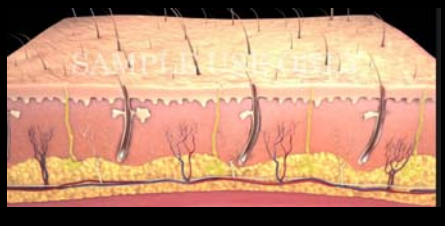
- First 48 hours
  - Imbibition
    - "Drinking"
    - Diffusion
    - Skin graft sucks up nutrients from vascular bed below it

How does skin graft survive?

- First 96 hours
  - Inosculation
    - "Kissing"
    - Joining together
    - Blood vessels in skin graft align with blood vessels in recipient bed and blood/nutrients jump across the gap

How does skin graft survive?

- After 5 days
  - Angiogenesis
    - New blood vessels form from vascular bed and grow into skin graft



Skin graft postop dressings

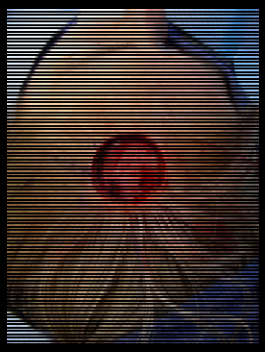
- Day of surgery (prevent seroma/hematoma):
  - compression wrap for extremity
  - tie-over boster
  - VAC/single layer Acticoat for “difficult” contour
- First dressing change: postop day 5
- Thereafter q day xeroform/open to air

Skin graft postop dressings/contd.

- Donor site Duoderm (comfort, ease)
  - leave as long as possible
  - if needs to be changed, then once every 3-4 days
- Alternative: xeroform
- Skin moisturizer when epithelialized

Flap Reconstruction

- Flap (blood supply comes with the flap)
  - Local
    - Skin rearrangement
    - Muscle/Musculocutaneous/Fasciocutaneous
  - Distant (Free flaps)



skin necrosis overlying treated mandible fracture

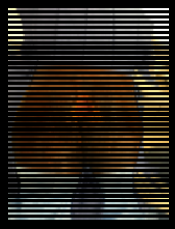
debridement and local skin flap

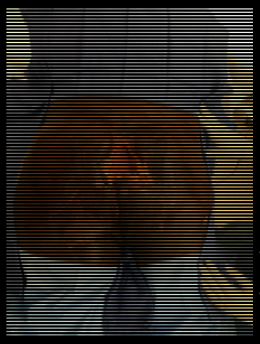
Pressure ulcer reconstruction: multidisciplinary issues

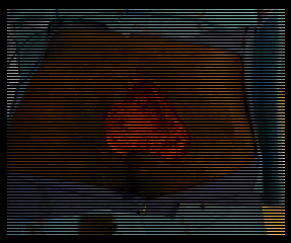
- social issues
  - does patient have a wound care team/PMR physician
  - where does patient live? with whom?
  - type of bed/wheelchair/transportation
  - job/time off
  - bowel program
  - protein intake
  - smoking cessation

Pressure ulcer reconstruction: anatomic issues

- is the wound adequately derided?
- foreign body
- enterocutaneous fistulas
- infection (eg. osteomyelitis)





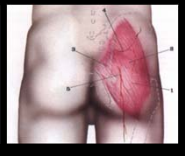


- entire ulcer cavity has been excised
- contracted edges have been released
- much larger defect with large potential space to fill

right V-Y gluteal musculocutaneous flap

bilateral V-Y flaps

- large flaps allow for readvancement



Postoperative care

- Drain maintenance
- Bowel regimen
- Clinton bed
  - still need to reposition
  - sheet is enough
  - chucks not needed

Postoperative care

- Transportation to the postoperative visit
- For ischial ulcer
  - Wheelchair cushions
  - early postoperative sitting regimen

Signs of flap compromise

- color change
  - purplish/brisk capillary bleeding (pinprick) - venous congestion
- pale - ischemia
- pain/swelling - hematoma
- free flaps - change in doppler tones

Case study

55 yo male with severe PVOD, CAD, carotid stenosis suffered a fall with C2 injury (9/2016). He underwent multiple revision procedures associated with wound dehiscence/exposed hardware.

He presents for this non healing wound with near extrusion of occipital hardware.

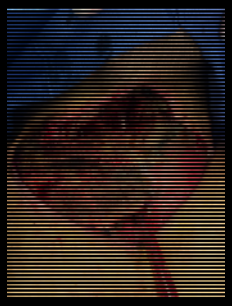
significant tunneling

Plan: trapezius muscle flap with split thickness skin graft

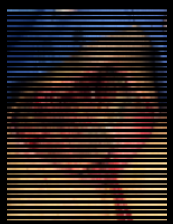
- tunneling/serosalized cavity
- dressing

13 days following flap reconstruction






13 days following flap reconstruction




- flap failed over loose, infected hardware
- skin graft failed over chronically contaminated soft tissue, despite bleeding
- essential to communicate early in a multidisciplinary way about goals/concerns

3 year old girl, foot run over by a car; metatarsal fracture (no surgery required), tendon injury and exposure
depth of tissue loss unclear

8/21/2016

4 days later: debrided, stent nailbed, VAC

8 days later: place Integra over exposed tendons

3 weeks later: skin grafting

Concluding thoughts

- A multidisciplinary approach (surgical - sometimes multiple services, wound care nursing, nutritional, infectious disease, social work, physical therapy)
- Early conversation: the goal, anticipated challenges, approach (timing and treatment)