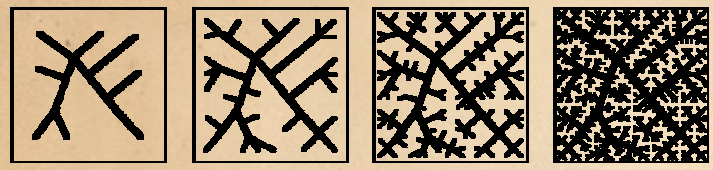
Marc E. Gottlieb, MD, FACS
A Professional Corporation

PLASTIC & RECONSTRUCTIVE SURGERY
Board Certification ••• ••• ••• *Plastic Surgery* ••• *Hand Surgery* ••• *General Surgery*



Specializing in the treatment, reconstruction, and management of
Acute and chronic wounds • Diseases and defects of the soft tissues • Injuries, diseases, and defects of the hand and extremities • Defects of the head and trunk

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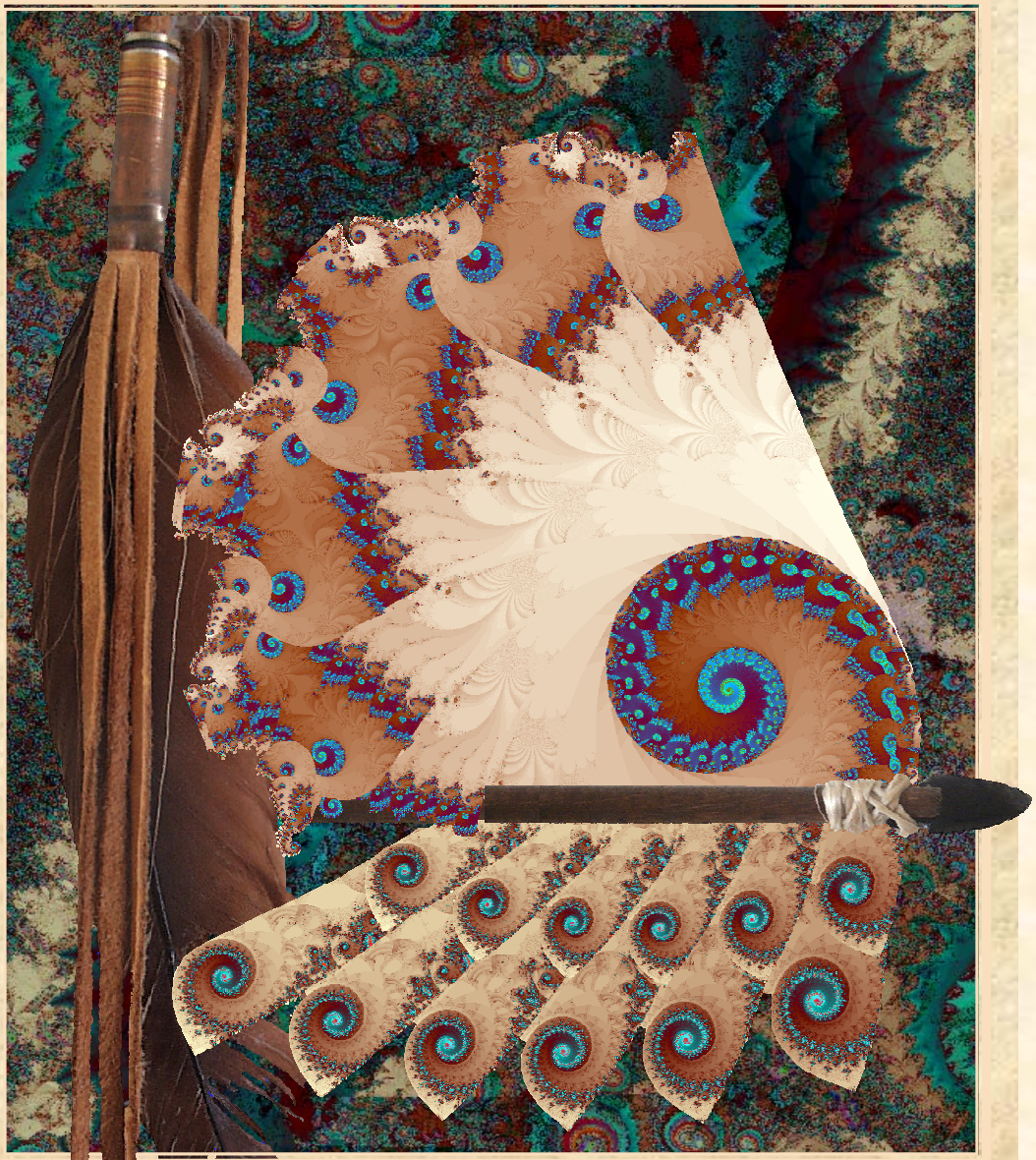
Closing the Foot - Repair, Reconstruction, and Plastic Surgery of the Lower Extremity

Original presentation August 23, 2004, Boston, MA, ay the American Podiatric Medical Association.



WOUND SURGERY

CLOSING the FOOT

repair, reconstruction,
and plastic surgery
of the lower extremity

Presented by

Marc E. Gottlieb, MD, FACS

Phoenix, Arizona

Difficult problems - how do you treat them?


Topical care
and surgery


Topical
care


Topical care

Which heal ?
Which do not ?

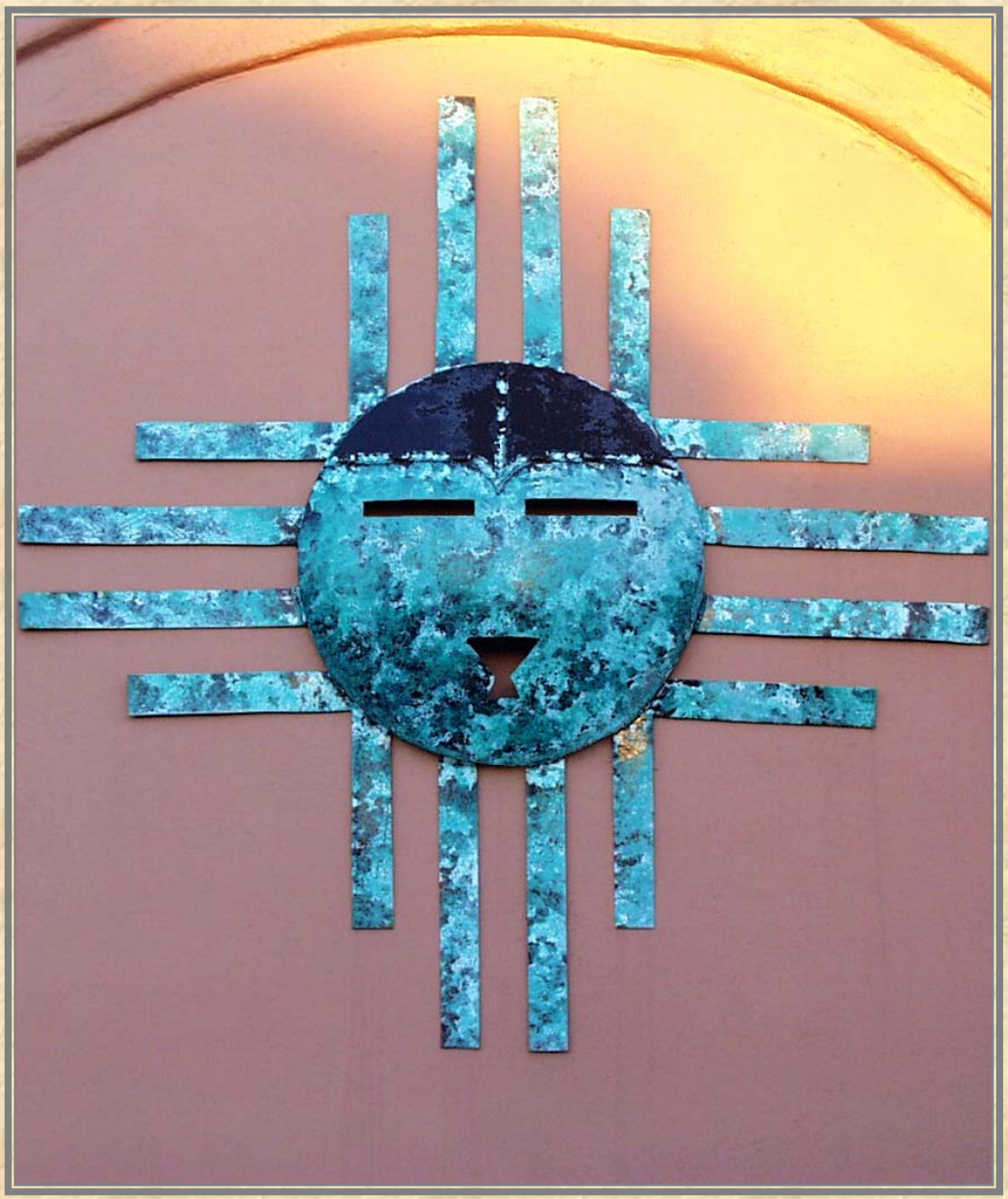
Which need surgery ?
Which do not ?
If surgery, what kind ?

. . . and if surgery is done . . .

topical care ?
simple repair ?
grafts ?
flaps ?
technologies ?

How are poor results minimized ?
How are good results maximized ?

– oh dear –
what's a doctor to do?



WOUND SURGERY

GENERAL PRINCIPLES of WOUND MANGEMENT

when to close it ?

how to close it ?

which options ?

*** golden rules ***

Healthy versus Pathological

Wounds heal. Life is programmed to do it.

Surgeons take this for granted. It lets them do surgery.

There is a paramount distinction between:

healthy, benign, simple, acute

Healthy wounds can heal by themselves.

Support, but do not interfere.

VERSUS

morbid, pathological, complex, chronic

Pathological wounds need your help.

Make the diagnosis, and make a plan.

GOLDEN RULES

(1)
Understand
healthy, benign, simple, acute
versus
morbid, pathological, complex, chronic

(2)
Don't mess up the good ones.
Fix the bad ones.

(3)
Know when not to do surgery.
Know when to do surgery.

The rest is technique
topical care - technologies
simple repair - grafts - flaps

Healthy wounds heal - Don't mess it up

Good care supports this.
Bad care harms - do not interfere with the healthy competent repair process.

Topical care in support of nature is often sufficient.

Surgery is often unnecessary.
But surgery may also be necessary or preferable.

Pathological and complex wounds do not heal by themselves.

Understand the pathophysiology.

Make an accurate diagnosis.

Plan treatment.

WOUND SURGERY

GENERAL PRINCIPLES of WOUND SURGERY

basic concepts

topical care

simple repair

Wound Repair Surgery

"Wound repair" can mean :

(1) the physiological process of wound healing
(2) any type of wound closure surgery
(3) certain tactical methods of wound closure
(usually simple closures, cf. "reconstruction")

The reasons to operate on simple healthy wounds :

Expedite the end result
Simplify care
Minimize cost
Convenience
Symptomatic and psychological relief
Control function and appearance

When a wound cannot or should not be allowed to heal by normal contraction . . .

because of disease, anatomical complexity, altered function, or threat to the patient . . .

this is when choices must be made about surgical closure.

When surgery is required or desirable, the methods generally fall into four categories:

repair
grafts
flaps

technologies

All wounds must be properly prepared prior to any form of closure.

Non-operative repair.

Contraction and epithelialization.

Okay or preferable to treat this way.

Surgical wound closure.

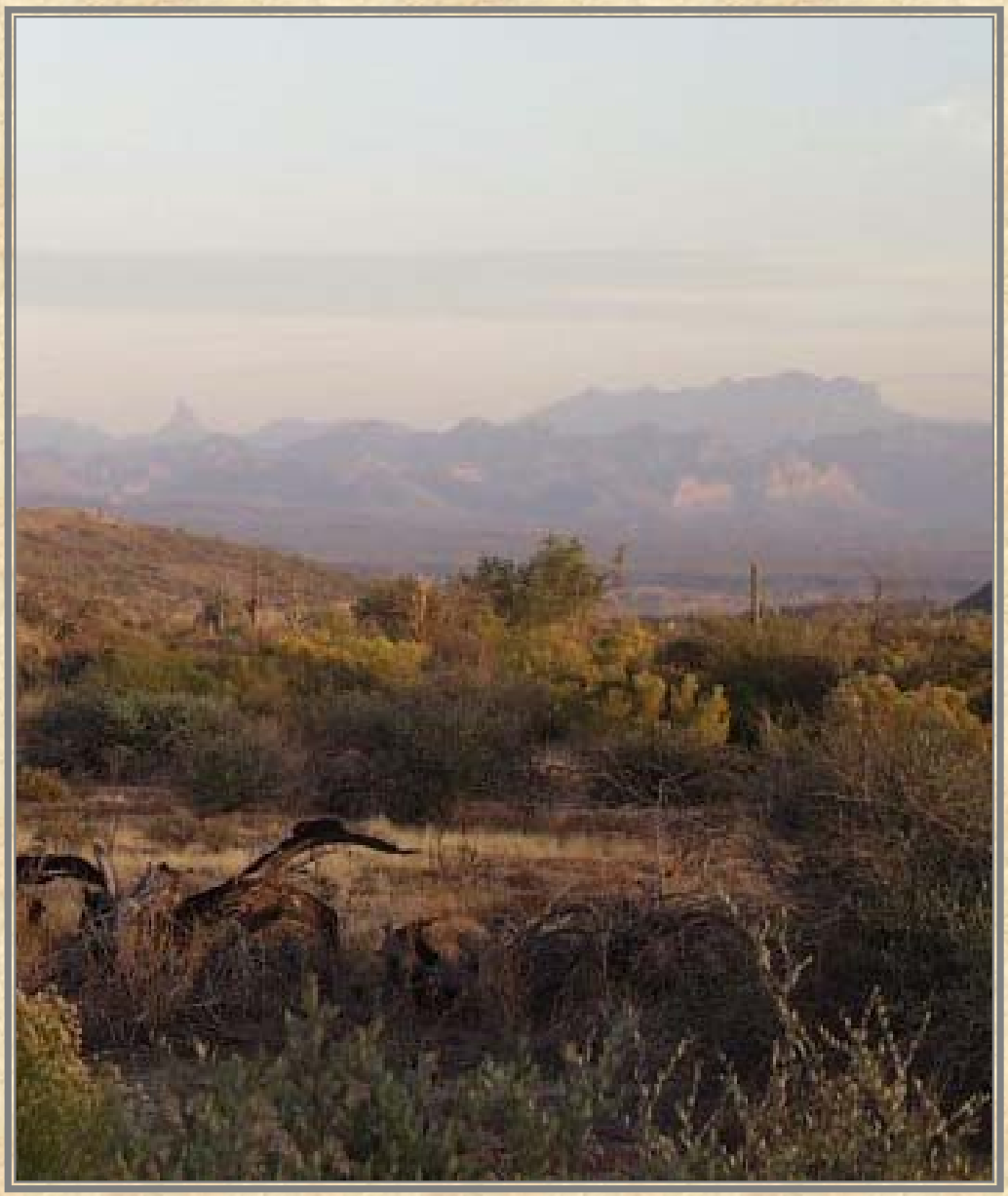
Simple repair.

Optional but desirable.

Surgical wound closure.

Simple repair.

Not optional.



WOUND SURGERY

GRAFTS

convenient closure

biological coverage

special reconstruction

Wound Repair Surgery - Grafts

A graft is a graft by virtue of the fact that it has no anatomical attachment to the host, no circulation of its own, and it is not capable of living independently away from a recipient wound.

(1) Grafts do not carry the cellular machinery of repair.

(2) Grafts depend on the recipient wound to heal.

(3) They do not survive if the wound is incompetent.

(4) The wound must be healthy and properly prepared.

(5) The graft must be in firm contact with the wound.

(6) The graft must be suitably thin to stay alive.

(7) A healed skin graft is epidermis on scar == problems.

(8) Grafts are technically simple but biologically complex.

WOUND SURGERY

GRAFTS

convenient closure

biological coverage

special reconstruction

Grafts are grafts because they are completely detached and have no circulation.

Grafts depend on the host.

Grafts have special requirements:

They must be thin

They must be immobilized

Grafts are technically simple but biologically complex.

They do not survive if the host wound cannot heal.

Wound Repair Surgery - Grafts

Any kind of tissue can be grafted.

Skin grafts are of two varieties.

(1) Split thickness
Pros: Convenience; large areas; donor re-epithelialization
Cons: Scar; contraction.

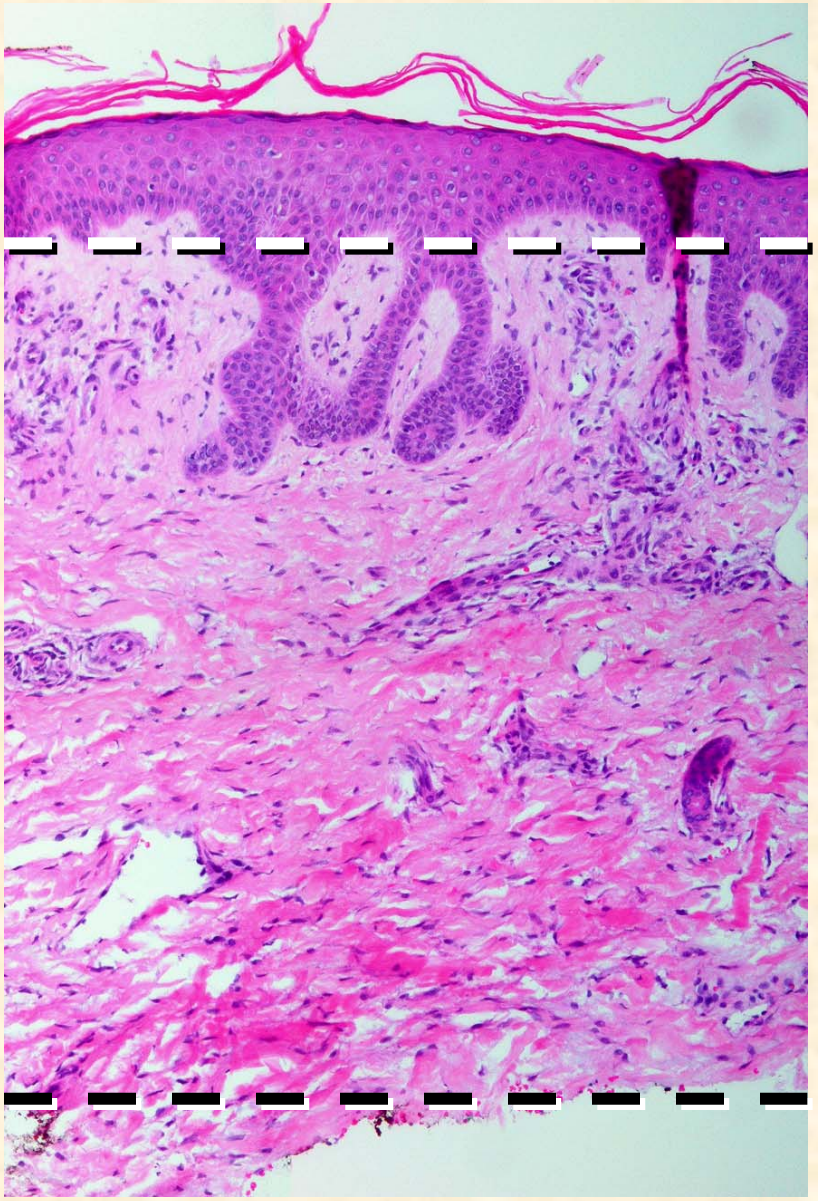
(2) Full thickness
Cons: Limited size; donor site repair
Pros: Quality; mobility

There are three main uses of grafts:

(1) Convenient wound closure. Pragmatic for rapid or extensive closure in healthy wounds.

(2) Biological dressing. Temporary coverage to protect or improve a wound.

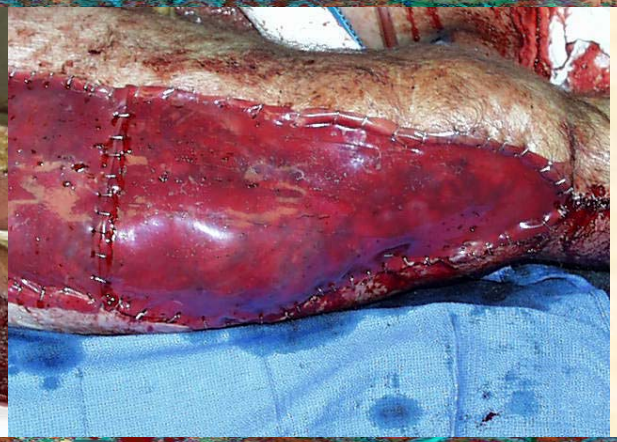
(3) Specialized reconstruction. Specific tissues for reconstructive needs, functional and cosmetic.



Reasons to use a graft

1

Convenient wound closure



Reasons to use a graft

2

Biological dressing

Reasons to use a graft

3

Specialized reconstruction

WOUND SURGERY

FLAPS

convenience

general reconstruction

essential coverage

incompetent wounds

Wound Repair Surgery - Flaps

A flap is a flap by virtue of the fact that it maintains an anatomical attachment to the host (the pedicle), carrying its own circulation, capable of living independent of any anatomy other than its pedicle.

(1) Flaps can transport large volumes of various tissues.

(2) Flaps retain original characteristics and mechanics.

(3) Healthy flaps do not depend on the target wound - The wound need not be intrinsically healthy.

(4) Flaps carry the machinery of wound repair – Flaps live and heal when the target is incompetent.

(5) Flaps can be technically elaborate, but - a healthy flap is biologically simple.

(6) Flap surgery requires finesse – flaps are easy to kill by poor design, poor technique, or vascular disease.

WOUND SURGERY

FLAPS

convenience

general reconstruction

essential coverage

incompetent wounds

Flaps are flaps because they remain attached and have circulation.

Flaps independently initiate and execute the repair process.

Flaps run a technical spectrum:

simple advancements of adjacent tissue

through

remote transfers of micro-revascularized islands

Flaps can be technically complex,
- but -
they are physiologically simple:

They know not they have moved, just that they are injured and must heal.

Reasons to use a flap

1

Convenience

2

General reconstruction

Reasons to use a flap

3

Essential coverage

Reasons to use a flap

4

Wound healing incompetence

Wound Repair Surgery - Flaps

Flaps need finesse.

Crucial technique-dependent caveats.

(1) The flap may not live

(2) The flap may not reach

Skin grafts are a small investment, flaps are a big one - so - don't mess them up.

Two general designs of flaps:

(1) Random. Based on geometry and mechanics.

(2) Anatomical. Based on embryonic angiosomes.

Special strategies and techniques:

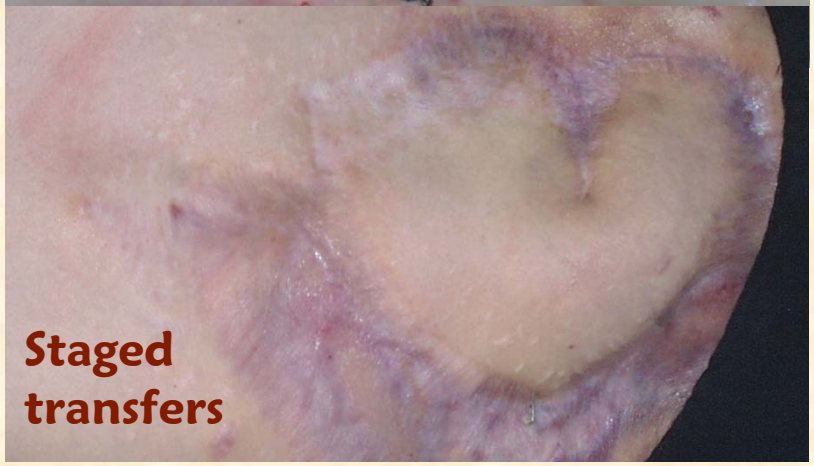
(1) Staged transfers. Time, judgment, delay.

(2) Multiple flaps. One target – many flaps.

(3) Free flaps. Microvascular transfer.


Random
You can't eliminate the middle man.


Axial


Staged
transfers

FLAPS ARE THE ROMANTIC HEROES OF RECONSTRUCTIVE PLASTIC SURGERY

Flaps have a pivotal role in the closure of complex wounds

. . . AND . . .

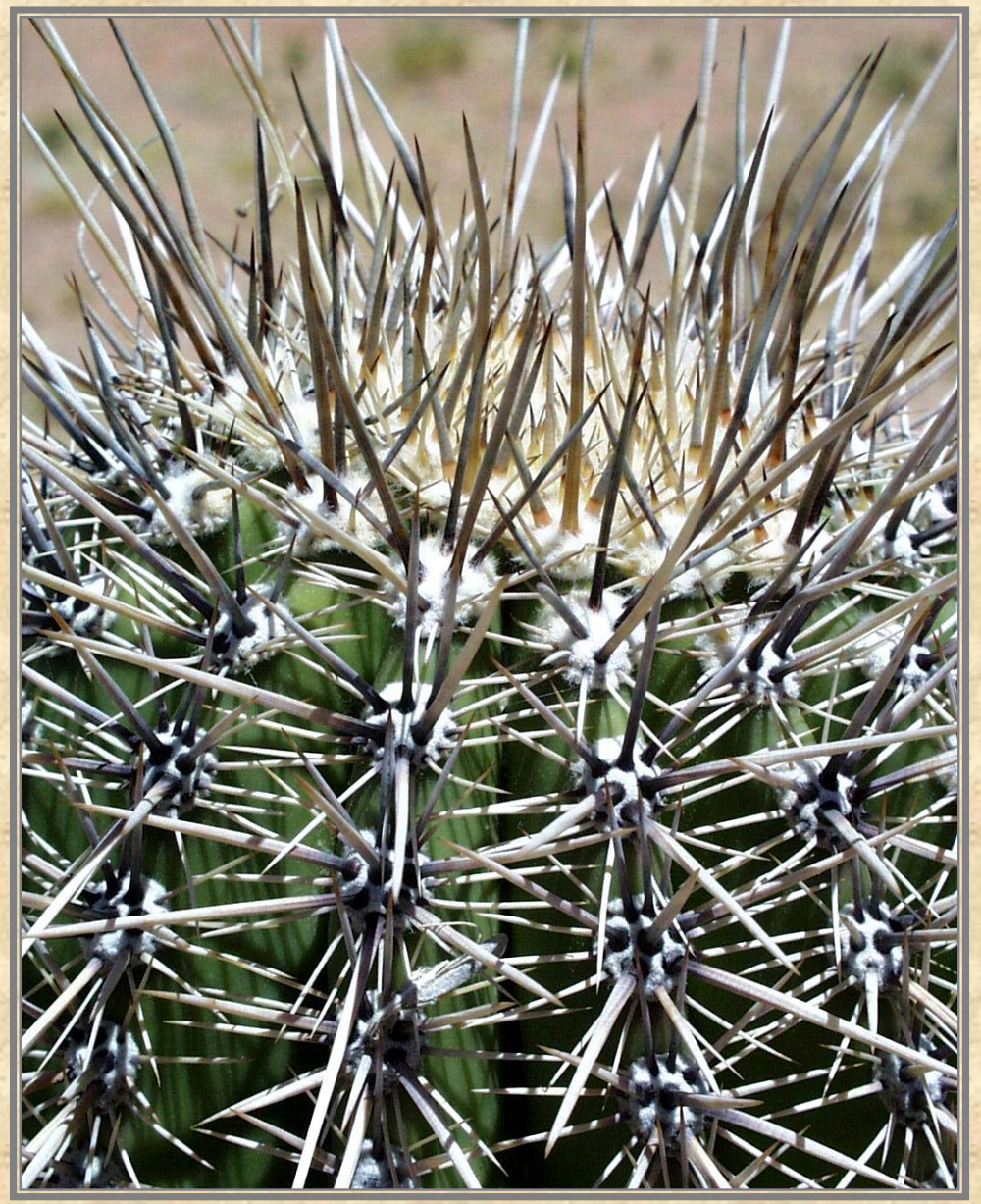
When the stakes are high for successful closure, good flaps get the job done

. . . BUT . . .

There are times when flaps simply cannot be done or will not survive

? ? ? THEN WHAT ? ? ?

Sir Flapalot



WOUND SURGERY

THORNY WOUNDS

what to do when
flaps do not
or cannot
solve the problem

Wound Repair Surgery

Need for better options

Flaps have a pivotal role in the closure of complex wounds, but there are times when flaps simply cannot be done or will not survive.

Not have enough skin

Flap may not reach

No anatomical flaps

Flaps can die

Vascular disease may kill a flap

Atherosclerosis may prevent anastomosis of a free flap

Local flaps can be within zone of injury

Hematological disorders can kill a flap

Inflammation and disease can threaten a flap

Illness and comorbidities can make patient too high risk

Flaps can sacrifice useful parts and create disabilities

Donor site complications can make the problem larger

Failed flaps waste anatomy and limit further options

WOUND SURGERY

TECHNOLOGIES

advanced strategies

pharmaceuticals

bio-integrated devices

High dose radiation

Advanced surgical strategies

Surgery with cells

Pharmaceuticals

Cytokines

PDGF

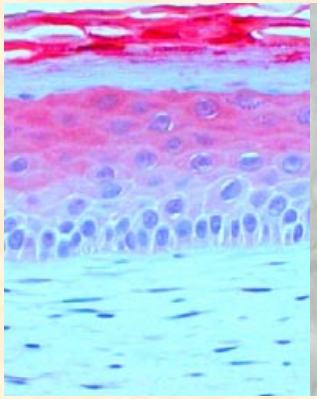
Low dose radiation

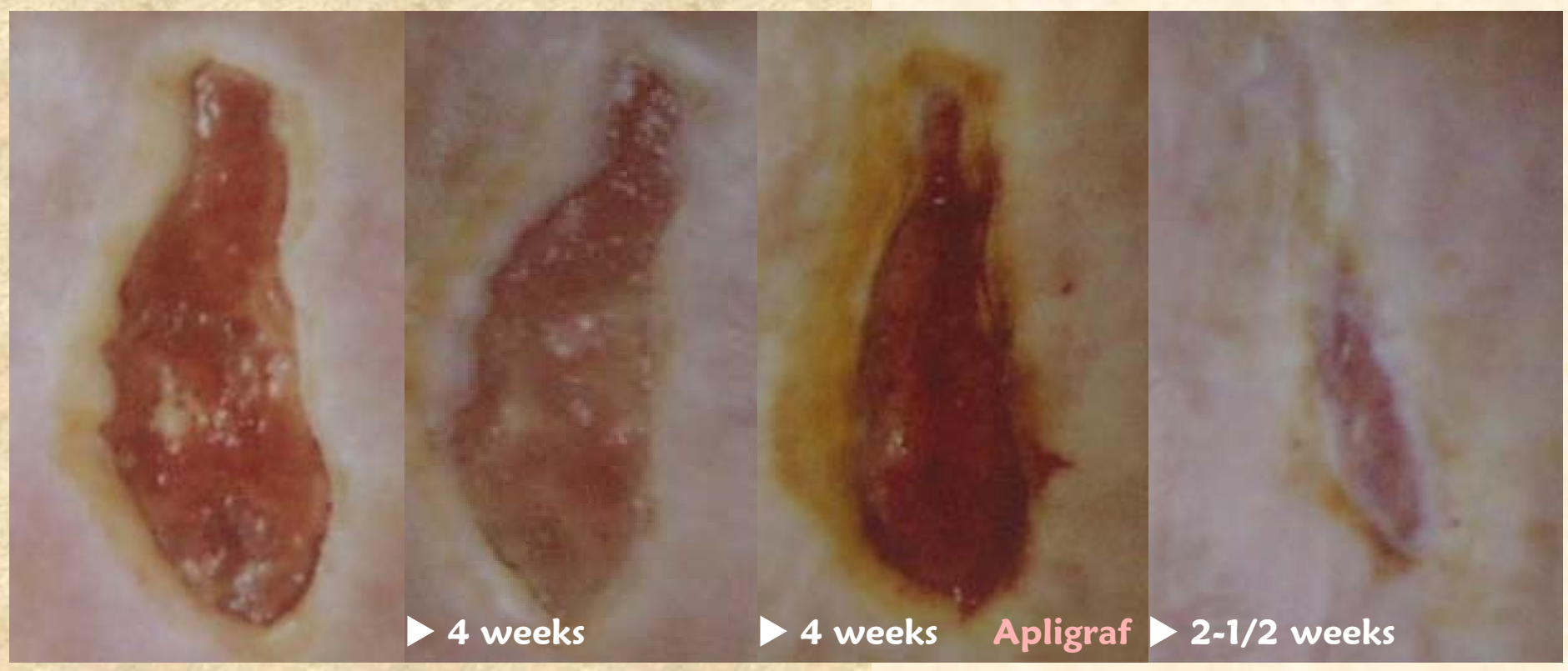
Apligraf

Re-engineered human living skin equivalent

It functions as a pharmaceutical – a drug packaged in a living vehicle.

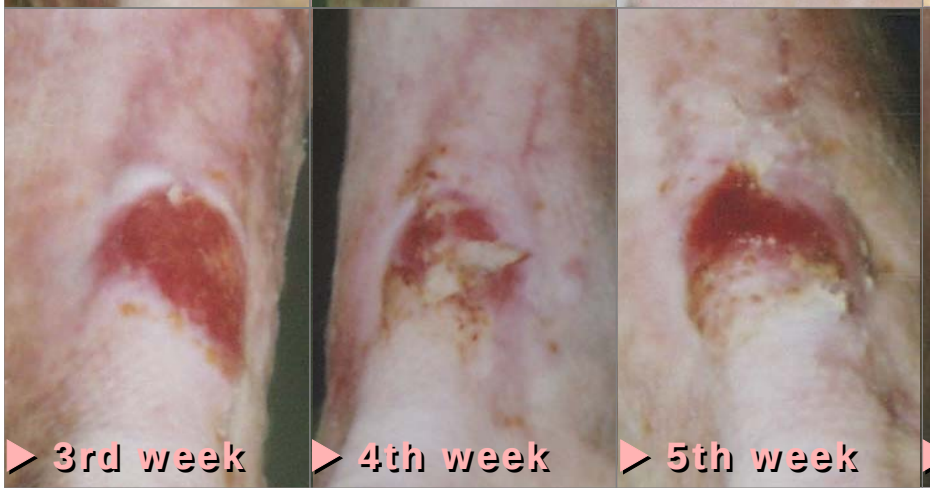
It stimulates repair in chaotic or retarded wounds.

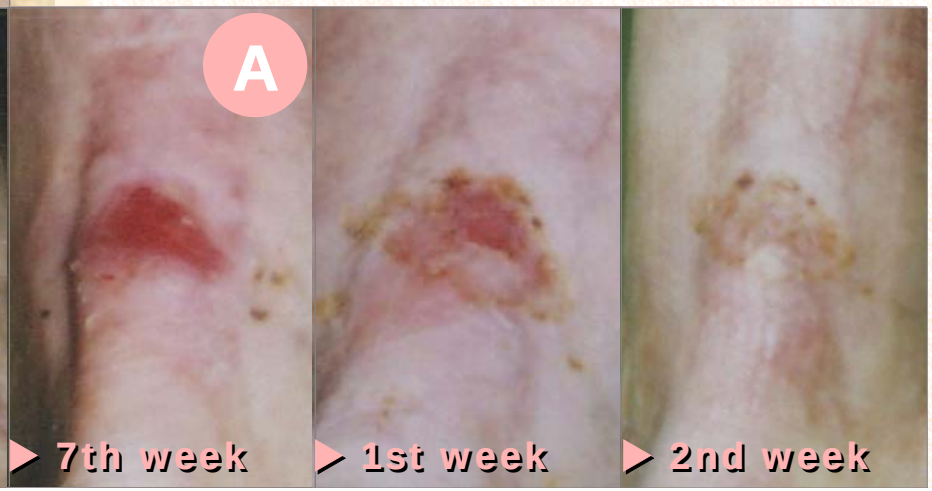


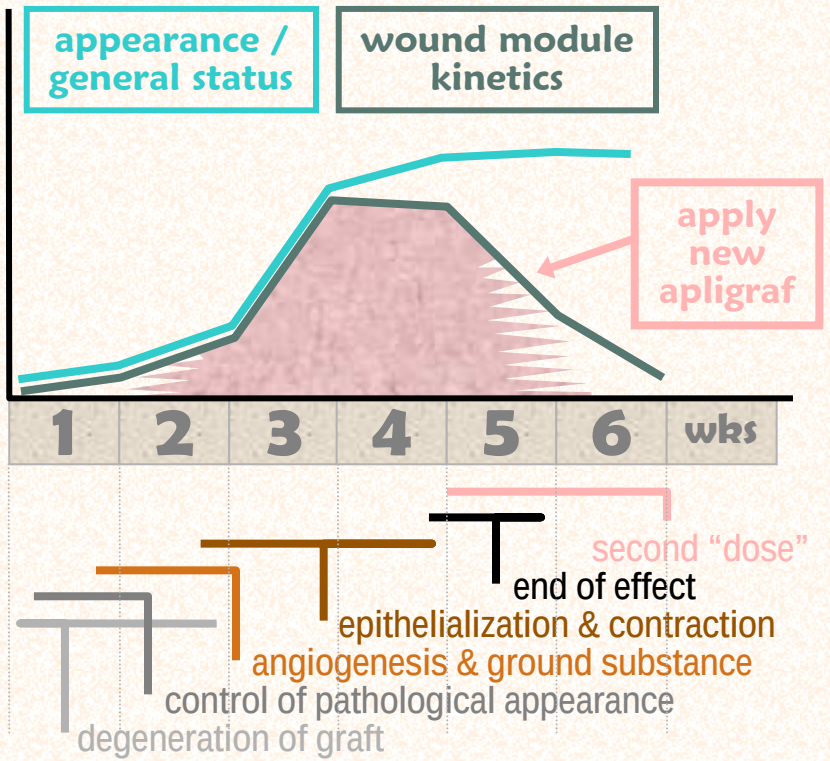



2 months
1 month
1 month


A
2 weeks
1st week
2nd week


3rd week
4th week
5th week


A
7th week
1st week
2nd week


An apligraf cycle, week-by-week
appearance / general status
wound module kinetics
apply new apligraf
1
2
3
4
5
6
wks
second "dose"
end of effect
epithelialization & contraction
angiogenesis & ground substance
control of pathological appearance
degeneration of graft

WOUND SURGERY

TECHNOLOGIES

bio-integrated devices

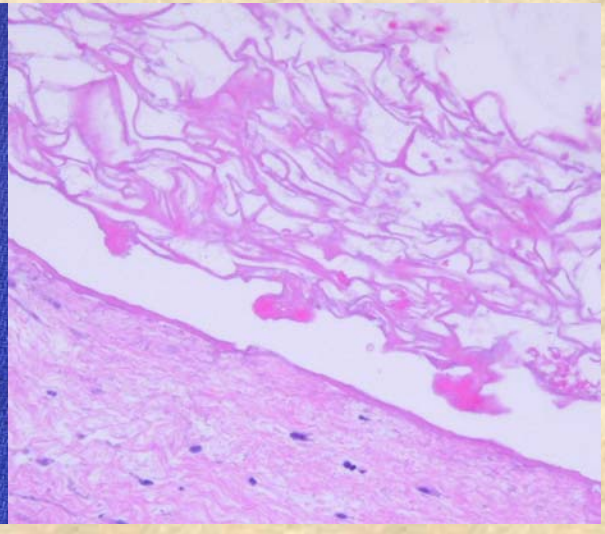
INTEGRA

Bilaminate Surface Implant

Layer 1 **CGM – Collagen-GAG Matrix**
(type 1 collagen & chondroitin-C)
Layer 2 **Silicone rubber "epidermis"**

Integra has amazing properties

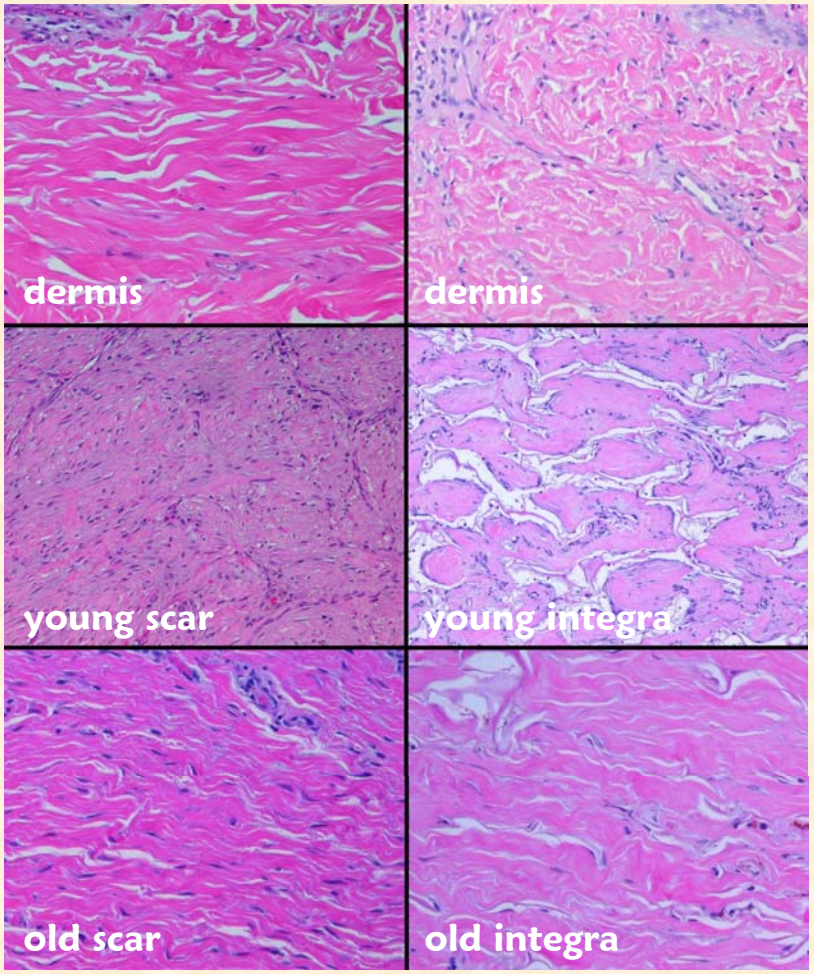
(1) Not alive, so tolerant of adverse conditions.
(2) Complete suppression of inflammation.
(3) Control of residual pathology.
(4) No inflammation ➔ no wound healing ➔ no scar.
(5) Embryonic dermatogenesis ➔ dermal equivalent.
(4) Tangential histoconduction.
(5) No contraction.

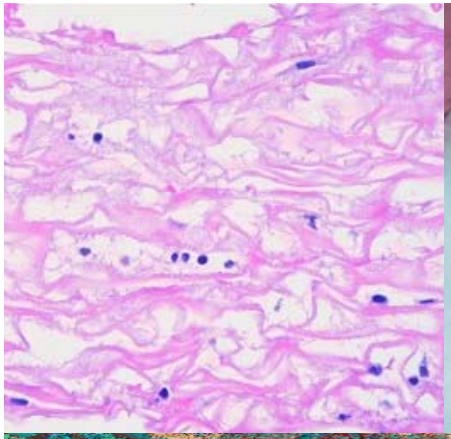


INTEGRA

high quality acute artificial skin

dermal regenerant & agent of reconstruction





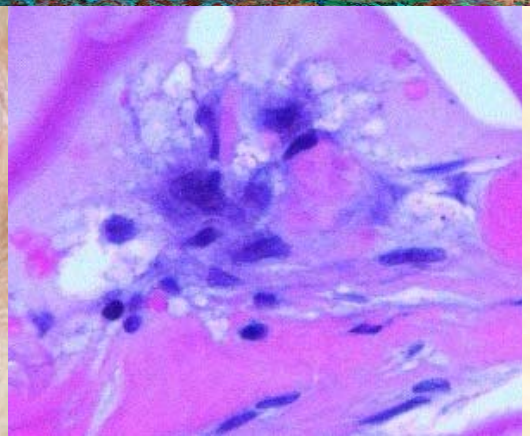
Inflammation is eliminated

Pathological wounds stabilize

Necrosis and ulceration cease

Wound healing is arrested

Proliferative wound module of inflammatory repair is absent



Dermis – not scar

No wound healing = no scar

Syncytial fibroblasts

Embryonic dermatogenesis

Wound Repair Surgery

Need for better options

Flaps have a pivotal role in the closure of complex wounds, but there are times when flaps simply cannot be done or will not survive.

Not have enough skin
Flap may not reach
No anatomical flaps
Flaps can die
Vascular disease may kill a flap
Atherosclerosis may prevent anastomosis of a free flap
Local flaps can be within zone of injury
Hematological disorders can kill a flap
Inflammation and disease can threaten a flap
Illness and comorbidities can make patient too high risk
Flaps can sacrifice useful parts and create disabilities
Donor site complications can make the problem larger
Failed flaps waste anatomy and limit further options

In-situ tissue engineering

Understanding when a flap should but cannot be used is to understand when Integra should be used.

FLAPS ARE THE ROMANTIC HEROES OF RECONSTRUCTIVE PLASTIC SURGERY

Flaps have a pivotal role in the closure of complex wounds

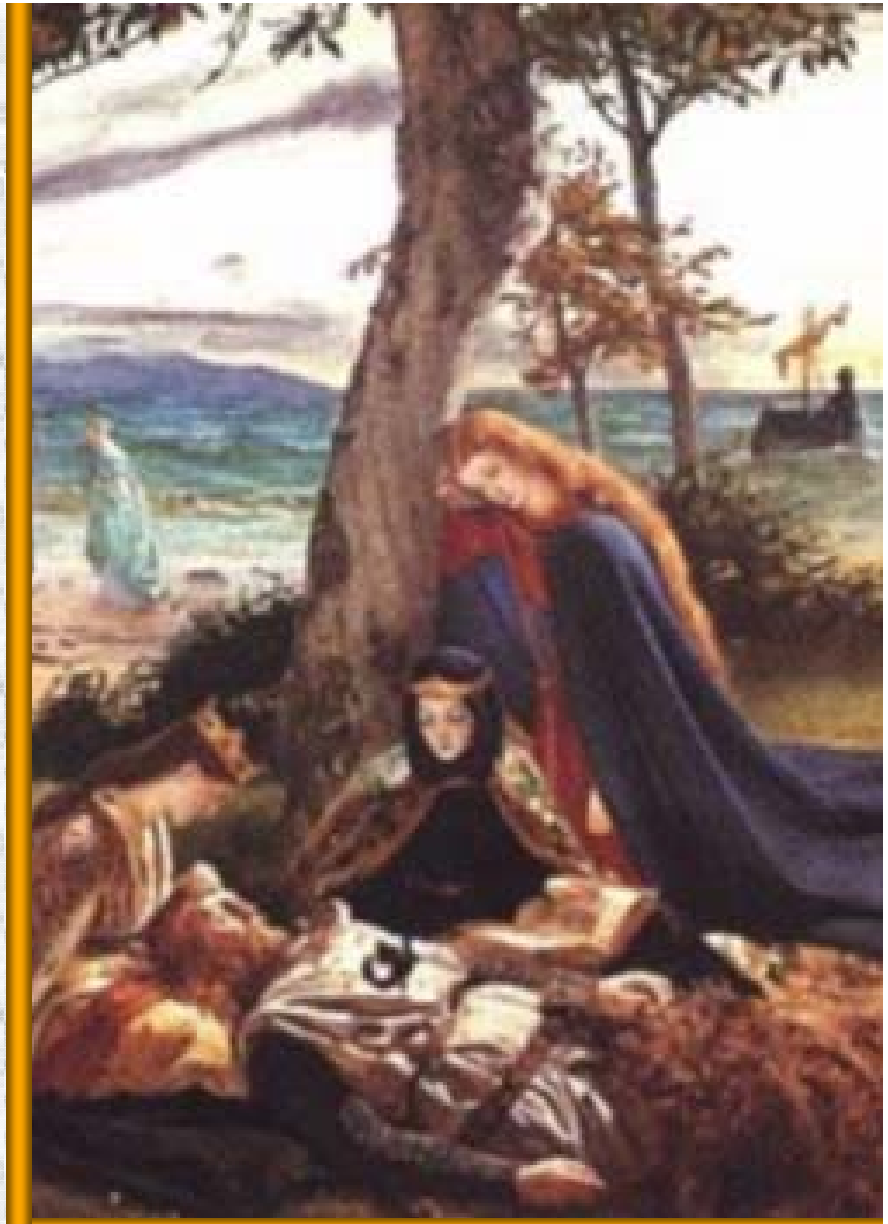
. . . BUT . . .

There are times when flaps simply cannot be done or will not survive

. . . PROVIDENCE . . .

Understanding when a flap should be used but cannot be used is to understand when Integra should be used.

? ? ? THEN WHAT ? ? ?



Le Morte de
Flapalot

WOUND SURGERY

INTEGRA

examples

general usage

Acute and critical coverage

Essential coverage

Wound control

INTEGRA - BASIC MODES of USE

Reconstruction

WOUND SURGERY

INTEGRA

examples

lower extremity and foot

Common and Benign

Trauma

Surgery

Venous

Miscellaneous

In-situ tissue engineering

Chronic and Pathological

Connective Tissue Disorders

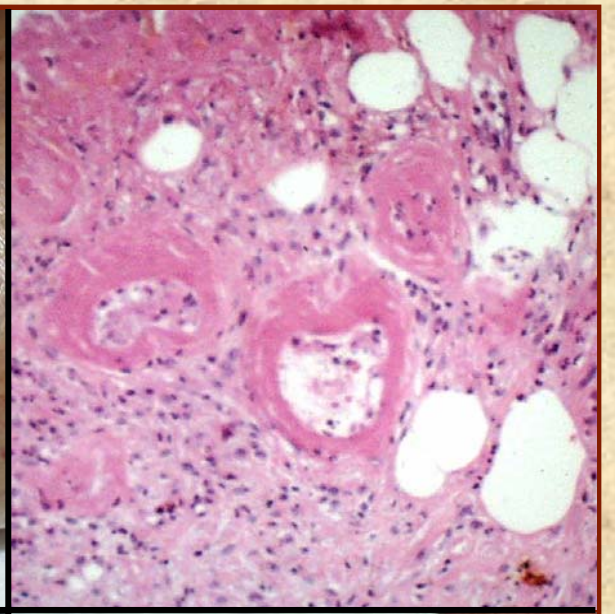
Hypercoagulable Disorders

Hematopathologies

Inflammatory Dermatoses

Miscellaneous Other Diseases

In-situ tissue engineering



Preservation of Foot and Leg

Close complex wounds

Close and salvage distal amputations

Rescue complicated amputations

Save limb segments

Preserve function and lifestyle

In-situ tissue engineering


WARNING:

WOUND SURGERY

CHOOSING OPTIONS

topical care

simple repair

grafts

flaps

technologies

Closure or repair of wounds

How do you choose ???

simple repair - grafts - flaps
topical care - technologies

Decisions are predicated on
<u>these goals - in this order:</u>

keep patient safe
control disease and symptoms
preserve or improve function and lifestyle
heal the wound
do so quickly and efficiently
minimize costs and resource utilization

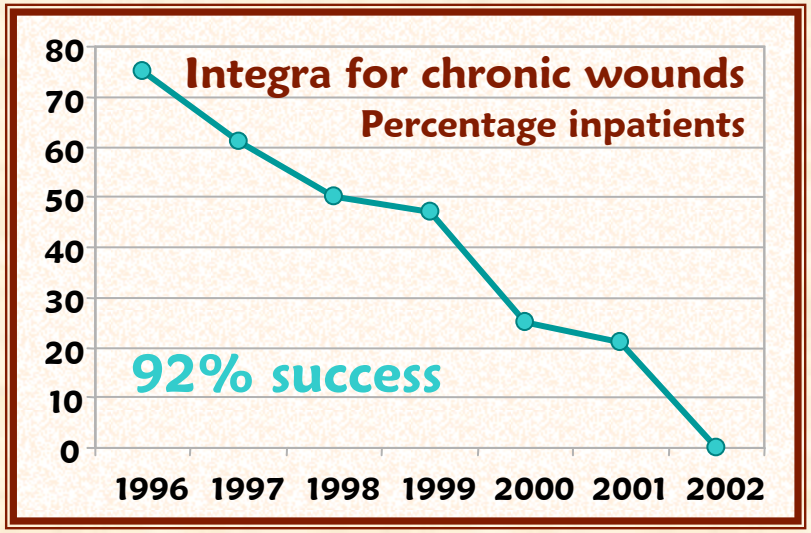
Choose whatever treatment will best fulfill these goals.

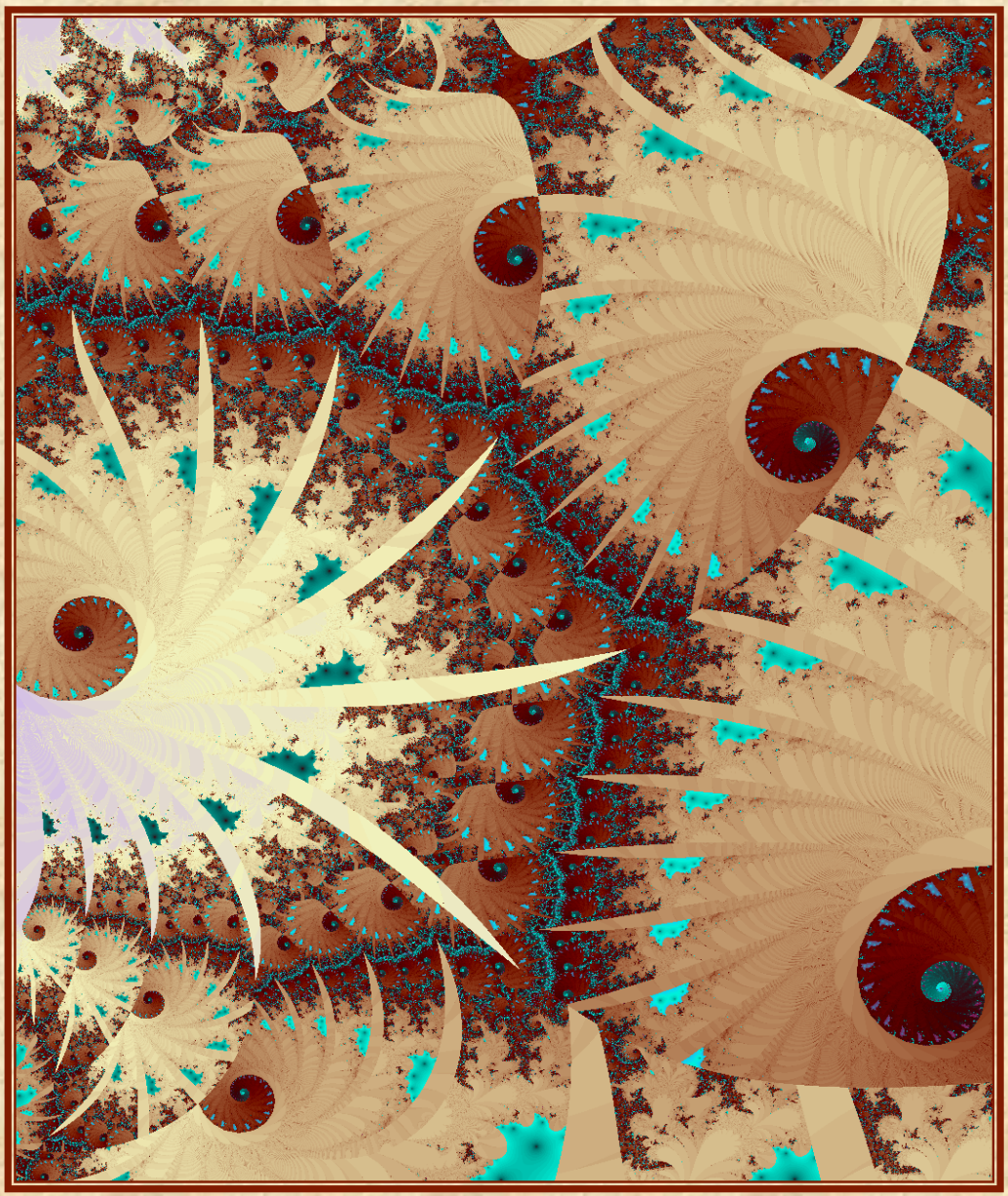
WOUND SURGERY

SUMMARY

topical care - technologies
simple repair - grafts - flaps

In-situ tissue engineering





! OOPS !
THE END

you've gone too far

go back, dude