

Surgical Reconstruction of Diabetic Foot Ulcer

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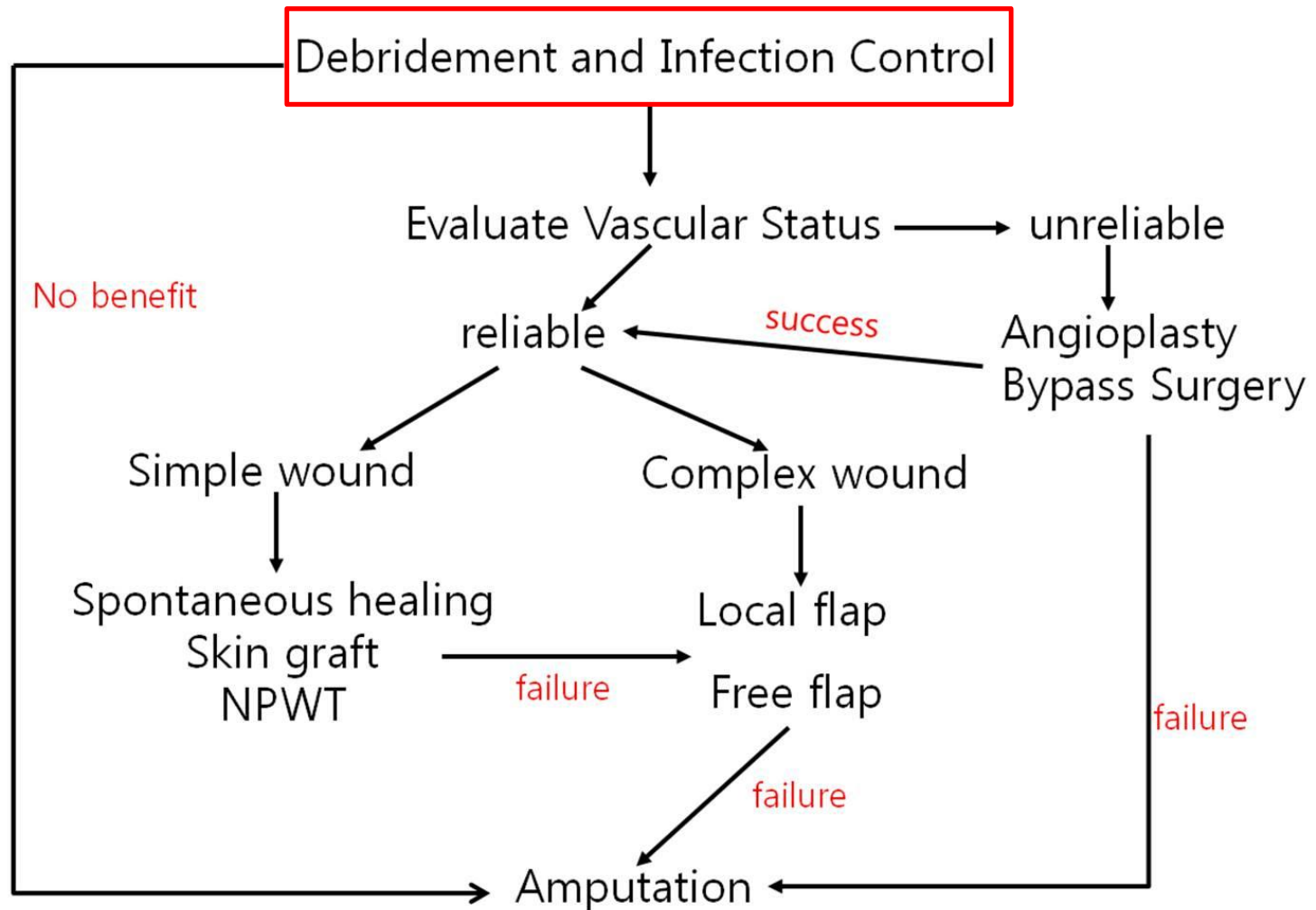
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Why Do Limb Salvage?

- 1-year mortality after major amputation 19%
- 5-year mortality may be as high as 39%
- Medical cost associated with caring for non-traumatic amputation for 1 year : exceeded \$4.3 billion.
- Hospitalizations for amputations >> heart failure, stroke, myocardial infarction, or renal failure.
- Avoidance of amputation
 - Economic consequences
 - Quality-of-life issues.

Surgical Algorithm



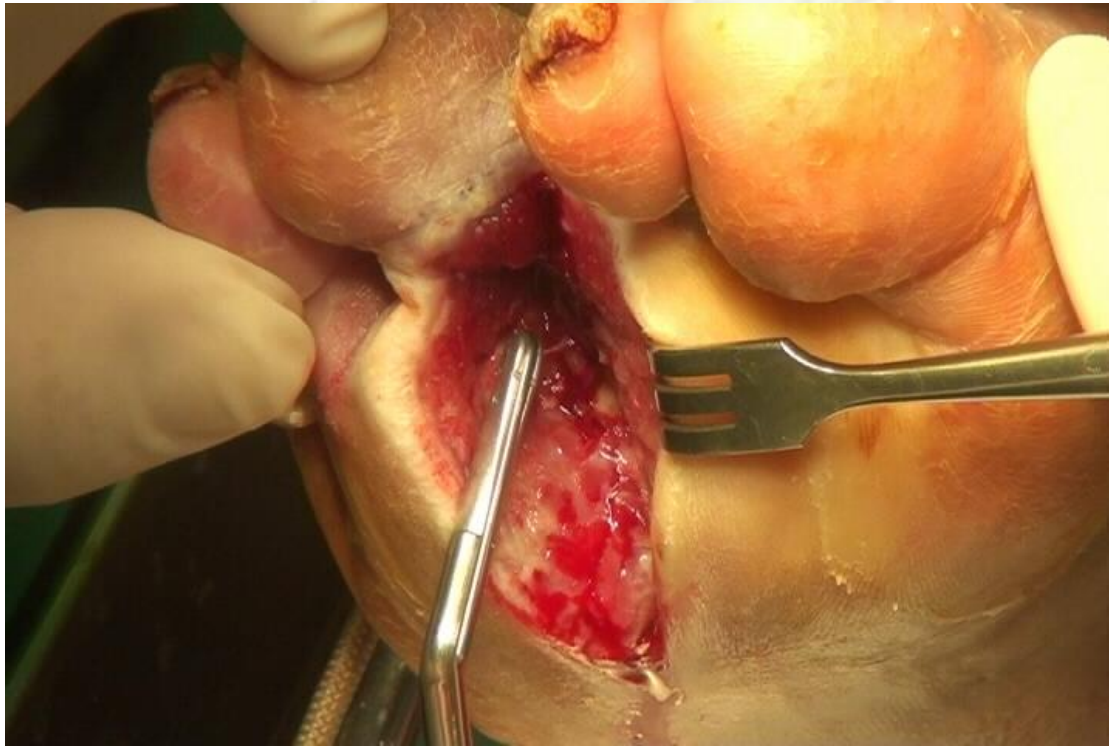
Debridement and Infection Control

- **Sharp debridement**
 - Scalpel, scissors
 - Hydrosurgery
 - Ultrasound
- **Biologic**
 - Maggot therapy



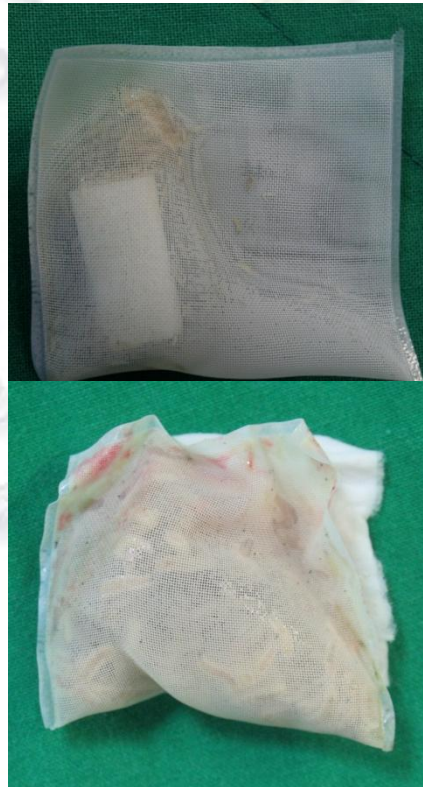
Debridement and Infection Control

- Hydrosurgery



Debridement and Infection Control

- Maggot therapy

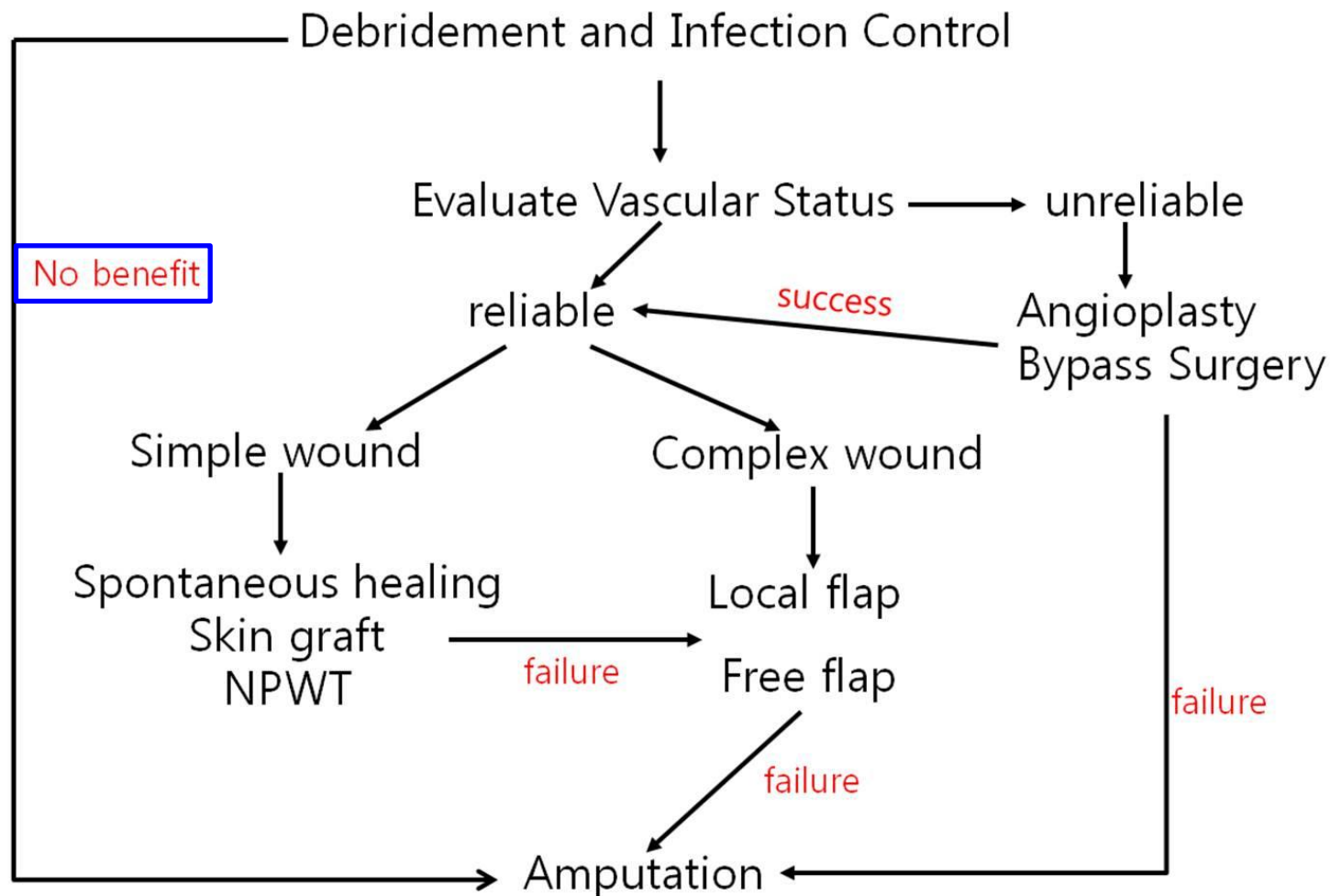


Debridement and Infection Control

- **Personal principles**
 - Serially repeated
 - Culture study
 - Deep tissue culture
 - No growth or few
 - Normal CRP
 - Infected bone : minimal resection
- **Debridement : the most perfect reconstruction as itself**



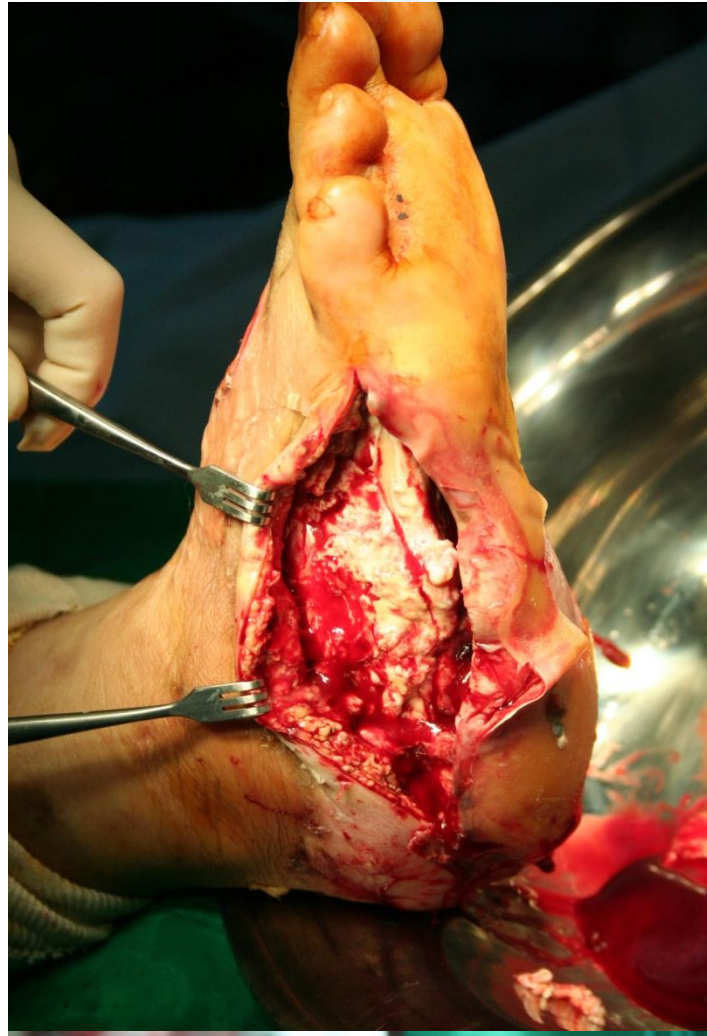
Surgical Algorithm



Debridement and Infection Control



Debridement and Infection Control



Debridement and Infection Control



Debridement and Infection Control



Debridement and Infection Control



Debridement and Infection Control

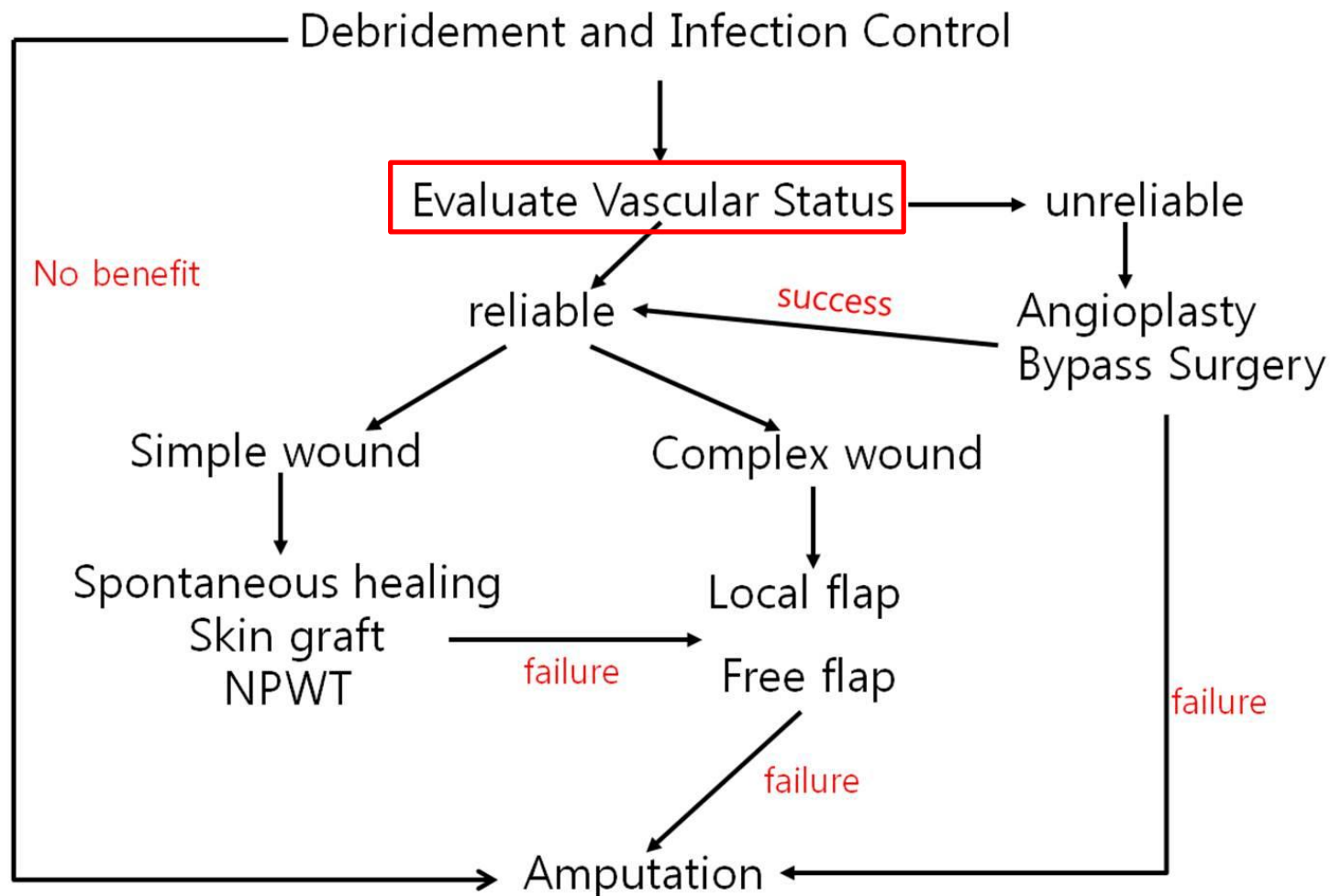


Debridement and Infection Control

**Timely amputation =
Life salvage**



Surgical Algorithm



Evaluation of Vascular Status

- **Evaluation**

- Physical Ex.
- Routine CT angiogram
- Color Doppler ultrasound
- ABI



Evaluation of Vascular Status

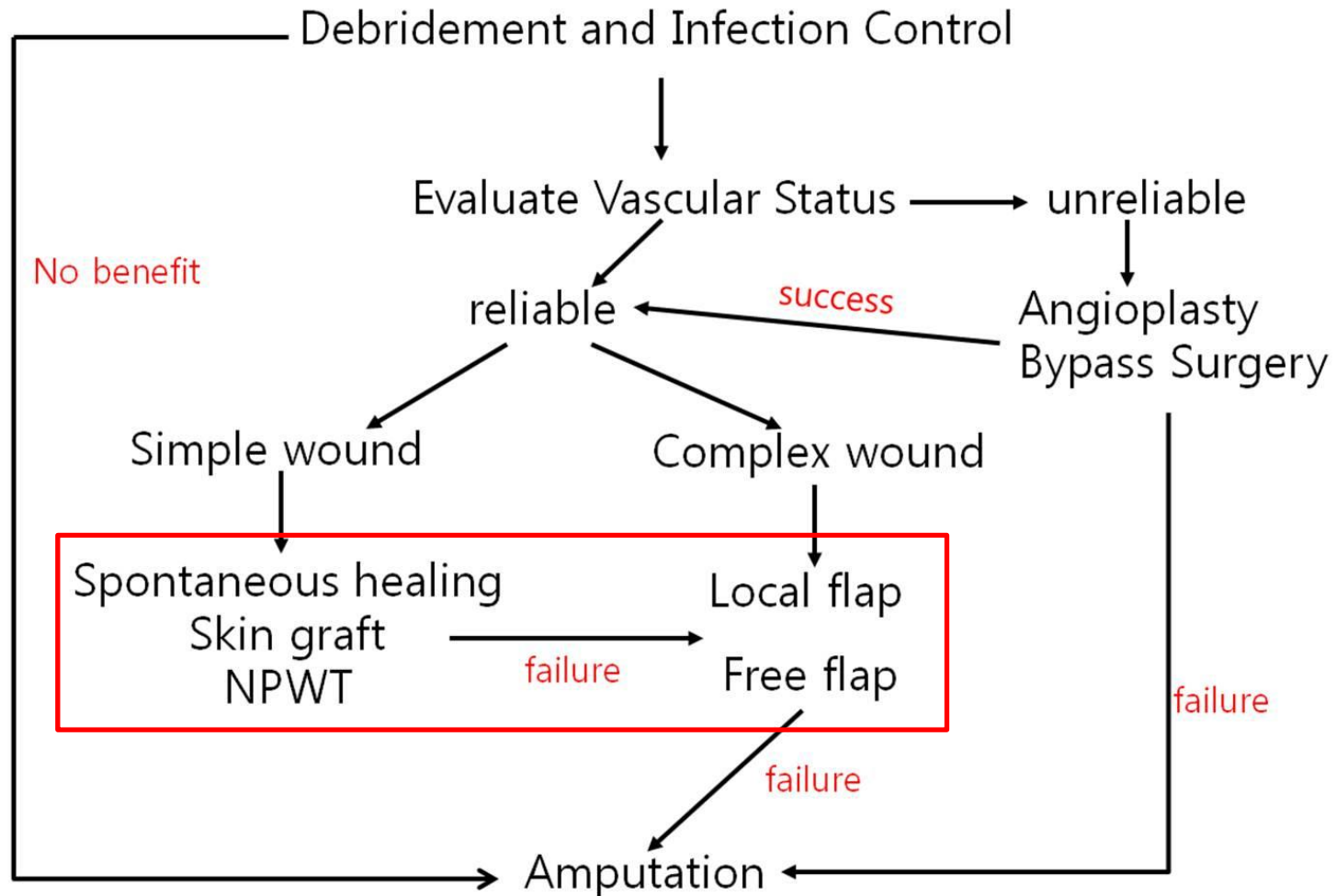
- Interventions
 - Interventional radiologist
 - Surgical bypass



Timing of Reconstruction

- Two view points
 - Infection control
 - Well formed granulation tissue
 - Culture study : no growth or few
 - Normal CRP
 - Hemodynamics
 - Improvement of several finding : pulse, temp
 - How long time elapsed from intervention

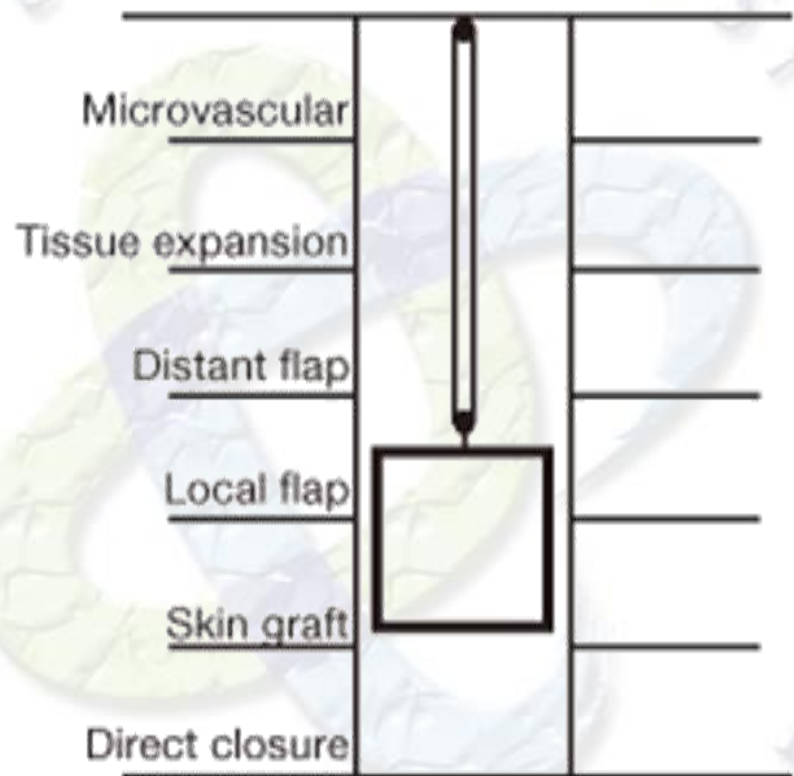
Surgical Algorithm



How to Reconstruct

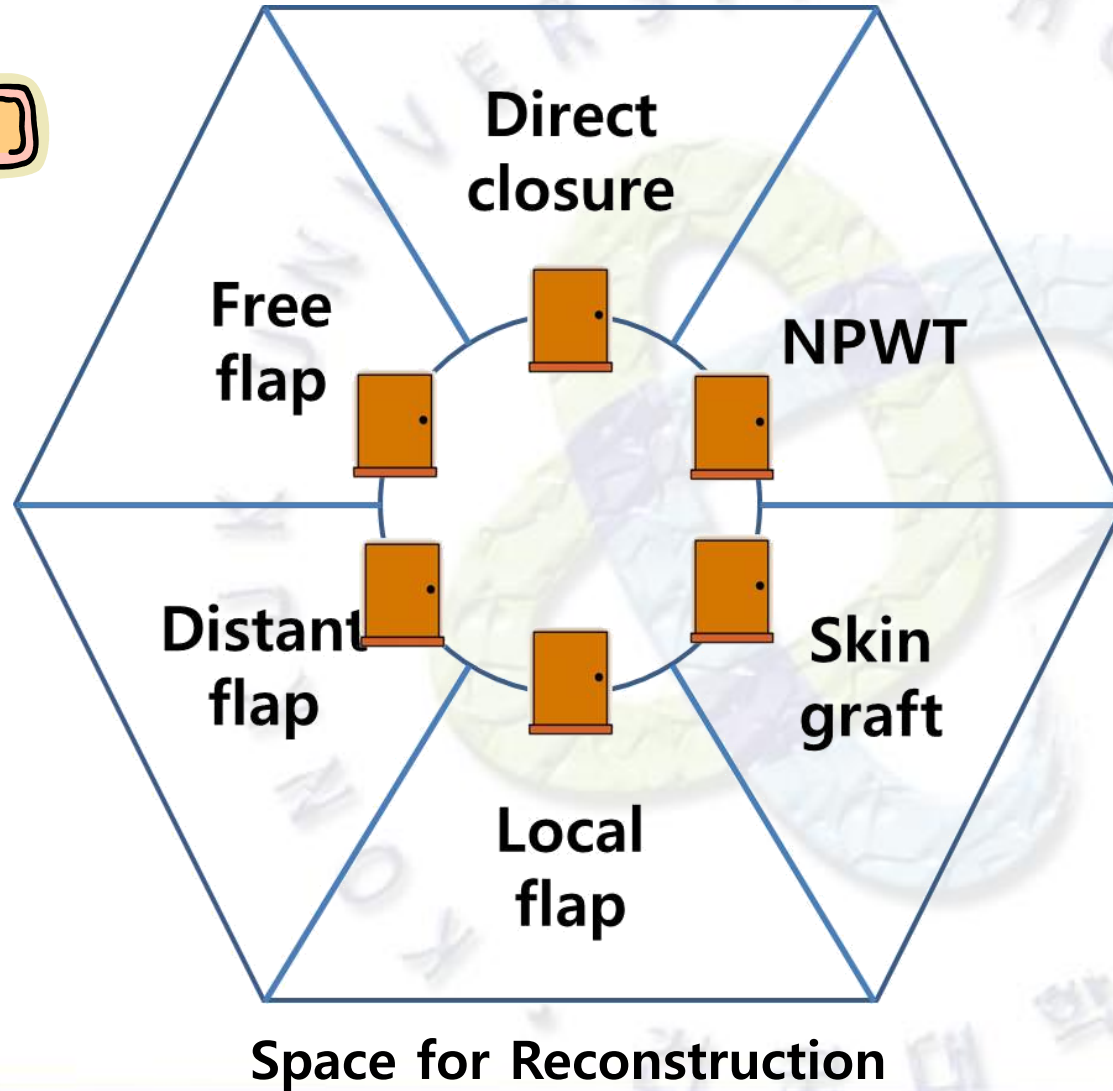
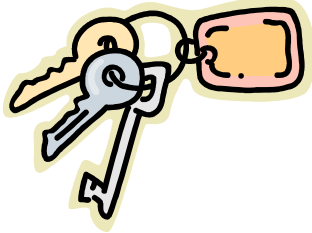


Reconstructive ladder



Reconstructive elevator

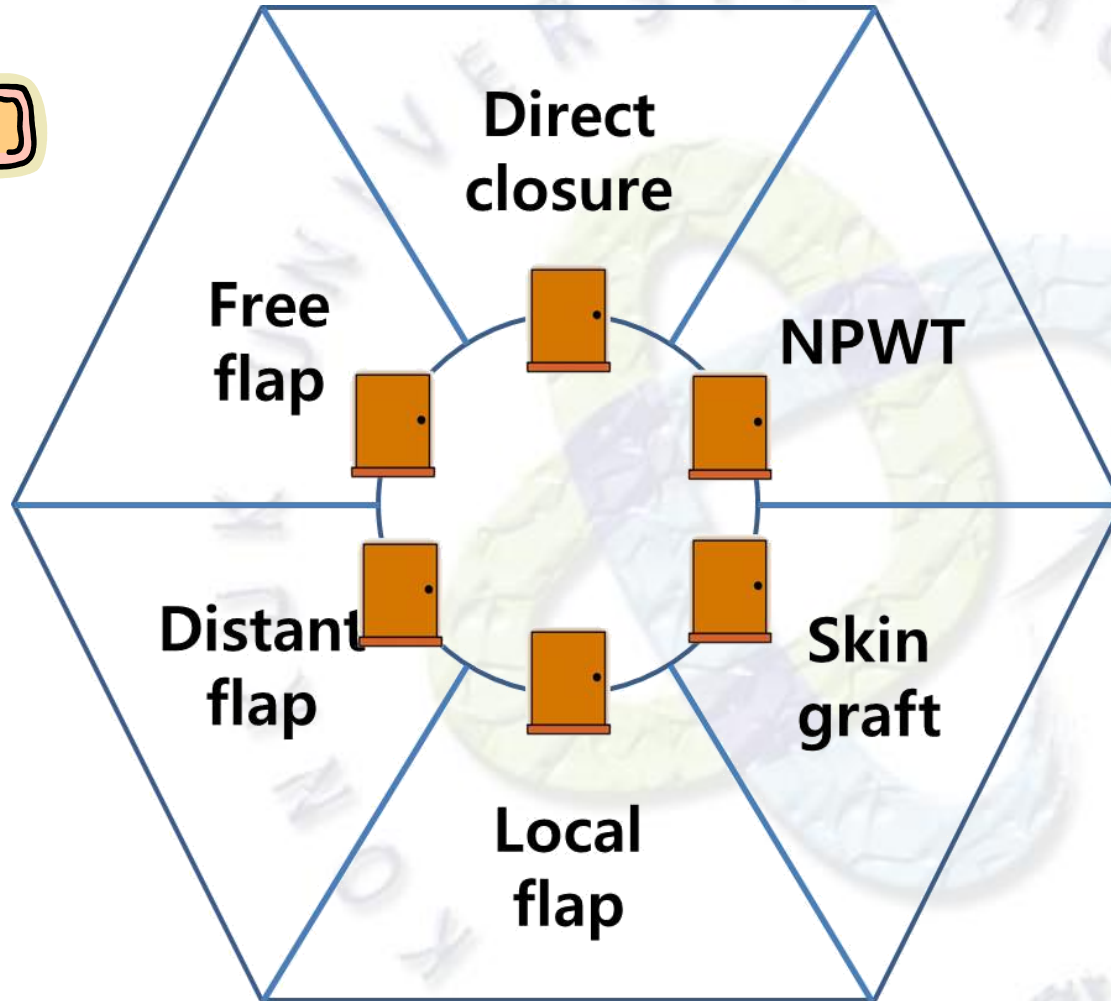
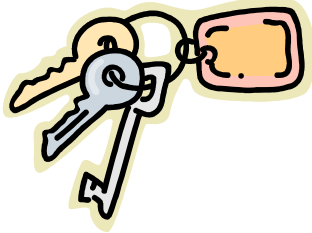
How to Reconstruct



How to Reconstruct



How to Reconstruct



Space for Reconstruction

Where Does It Occur

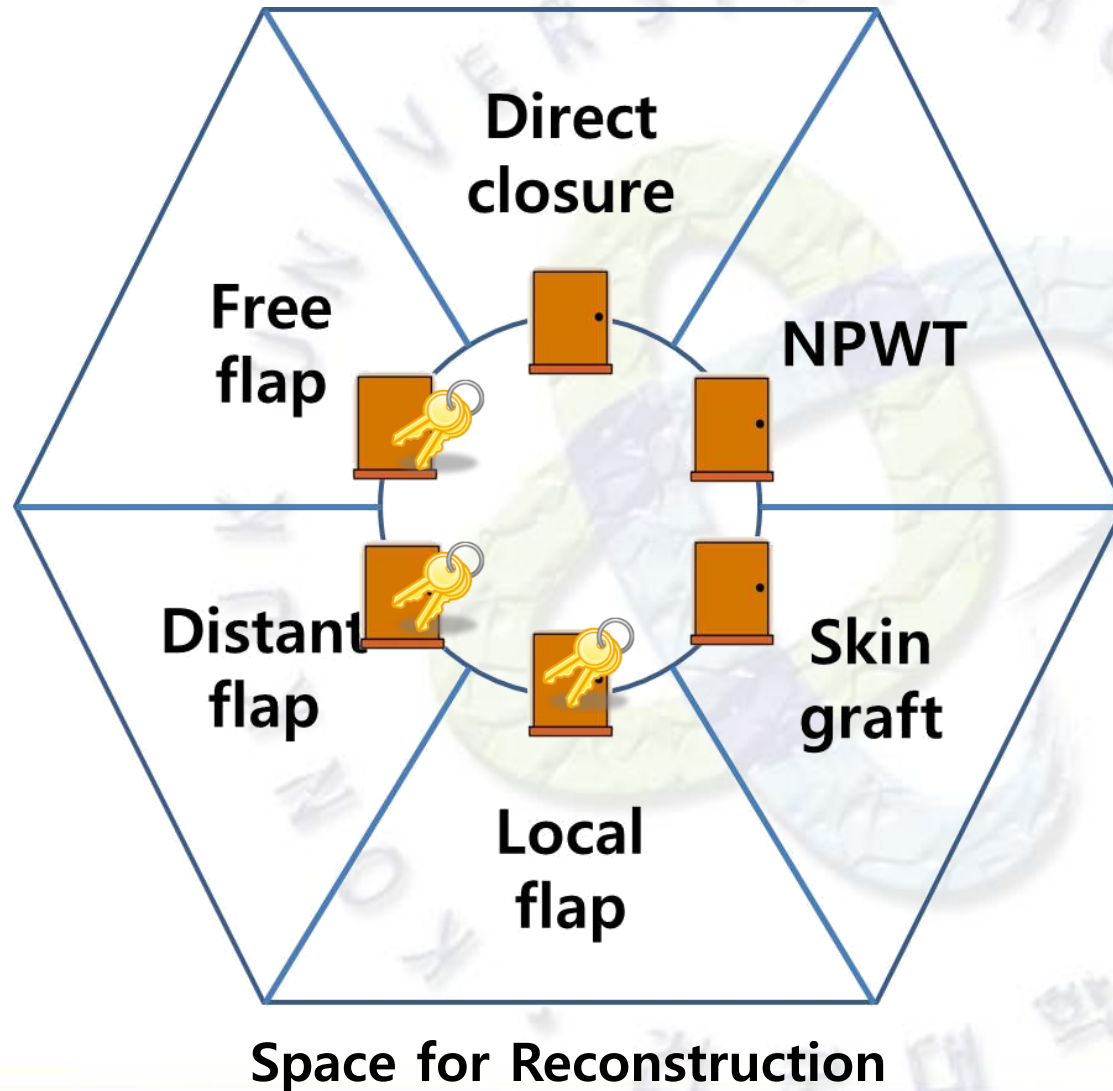


What Should Reconstruction Provide?

- **Well-vascularized tissue**
- **Protection**
 - Proper padding
 - Durable skin
 - Enduring shearing force
- **Good contour**

Flap Surgery!!

How to Reconstruct



Conflict of Local and Distant Flap

- **When**

- Significant occlusion of vasculature
- Distal circulation depending on few collaterals

Flap failure!

Impairing the distal Circulation!!



Can you guarantee the survival of local or distant flap in patient with this vascular status?

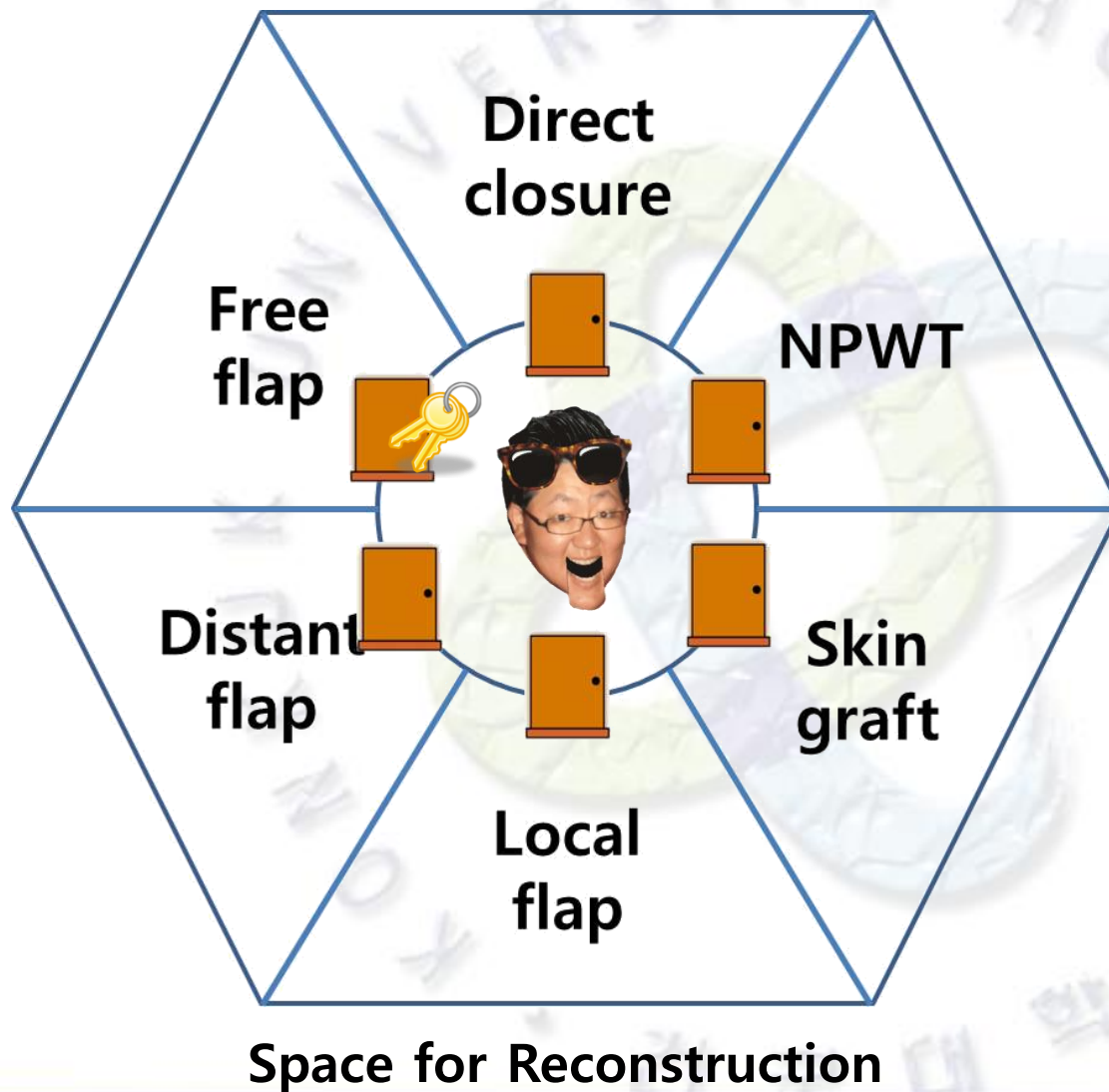
- **Use flap with no doubt in blood supply**
- **Minimal violation on affected limb**

Microsurgery in DFU

- **DM : poor candidate for microsurgery till mid of 1980s**
 - **Goldenberg(1959)**
 - Arteriolar occlusion
 - Endothelial proliferation
- **Subsequent studies : fail to find above findings**
- **Colen(1987)**
 - **Neuropathy rather than microvascular disease as primary cause**



How to Reconstruct



Cases



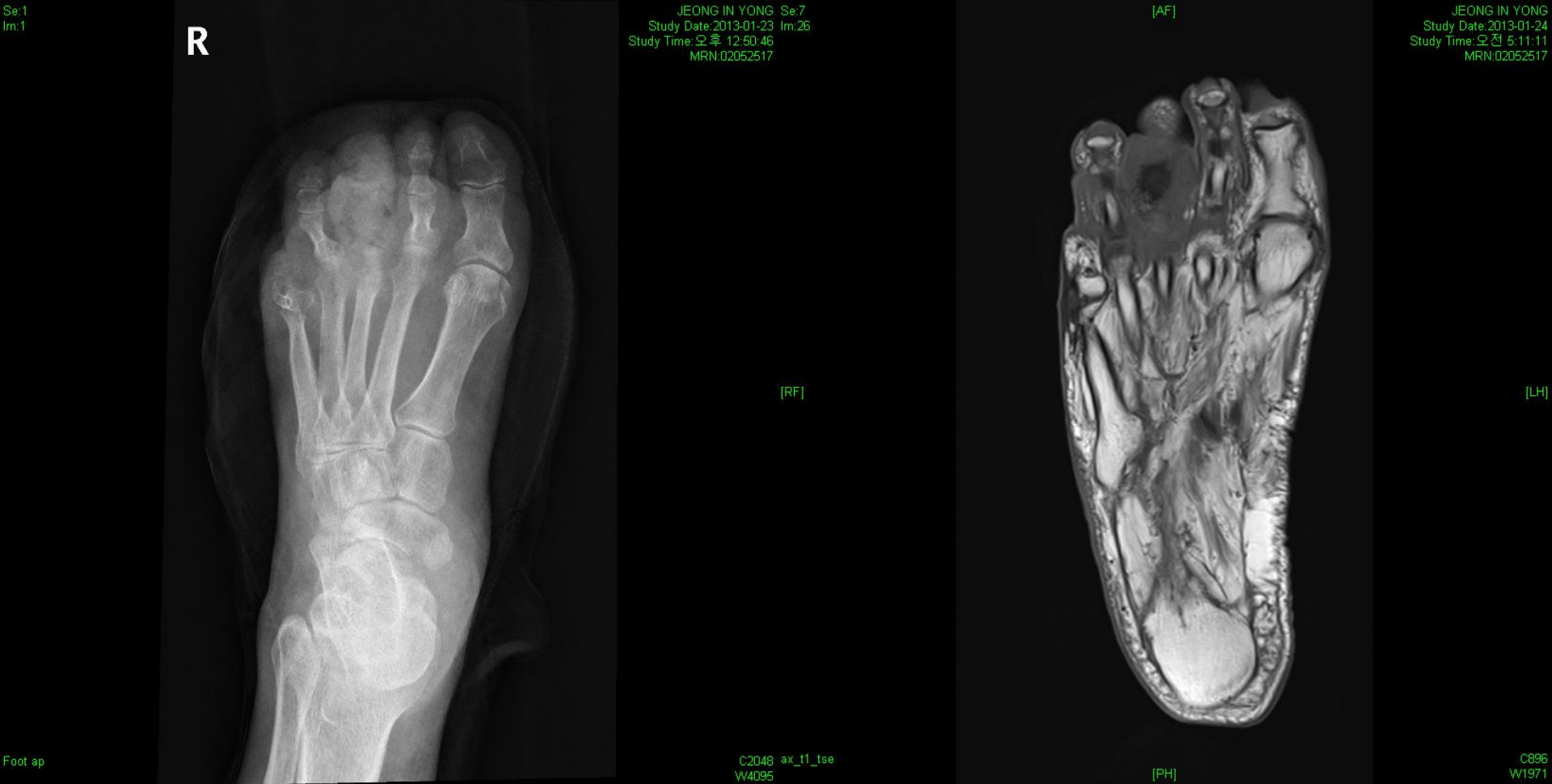
Direct Closure



Direct Closure



Direct Closure



Direct Closure



NPWT with Skin Graft



NPWT with Skin Graft



Local Flap



Random flap

Local Flap



Random flap

Distant Flap



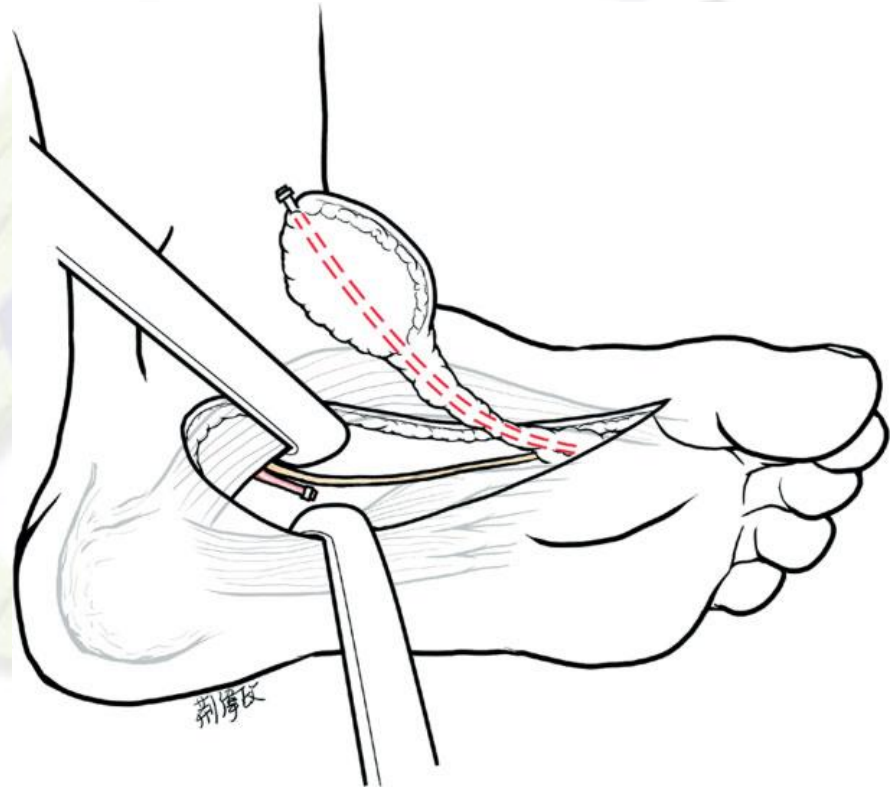
Reverse first dorsal metatarsal island flap

Distant Flap



Reverse first dorsal metatarsal island flap

Distant Flap



Reverse medial plantar flap

Distant Flap



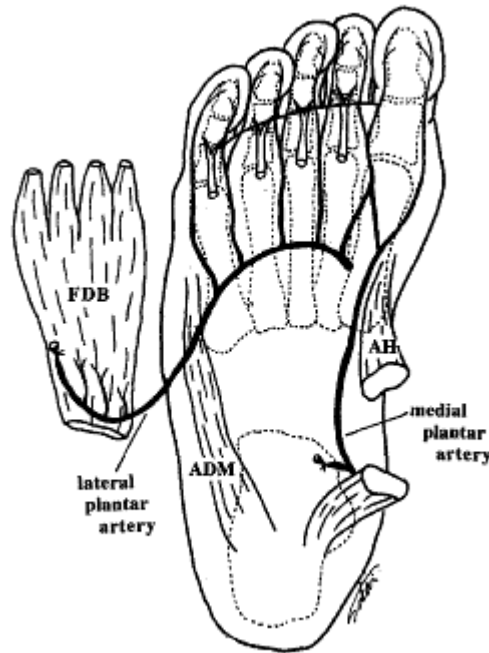
Reverse medial plantar flap

Distant Flap



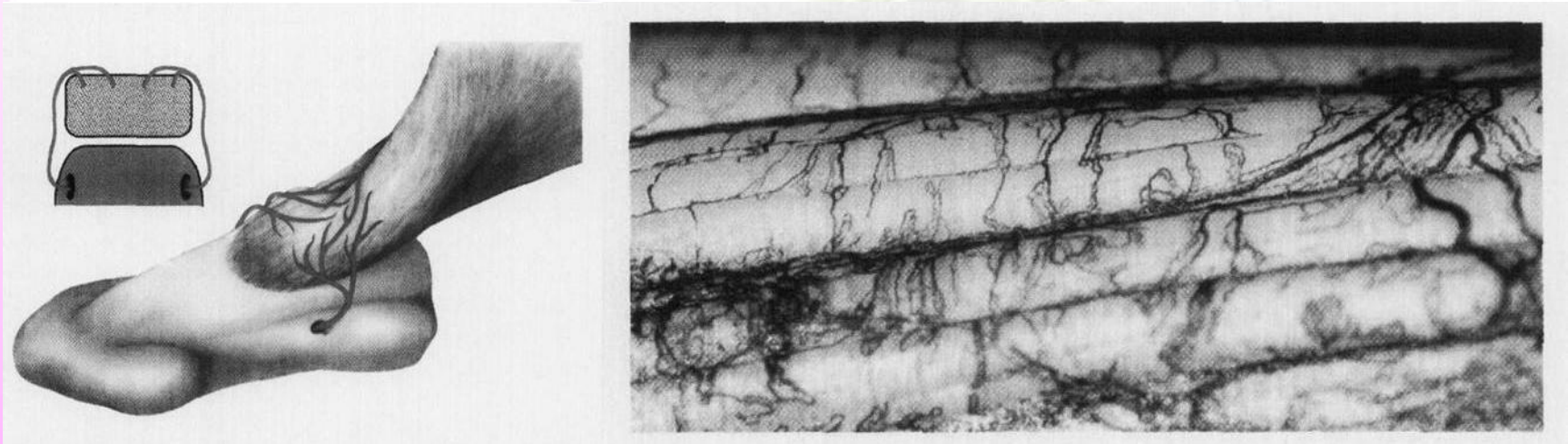
Tendon-based FDB muscle flap

Distant Flap

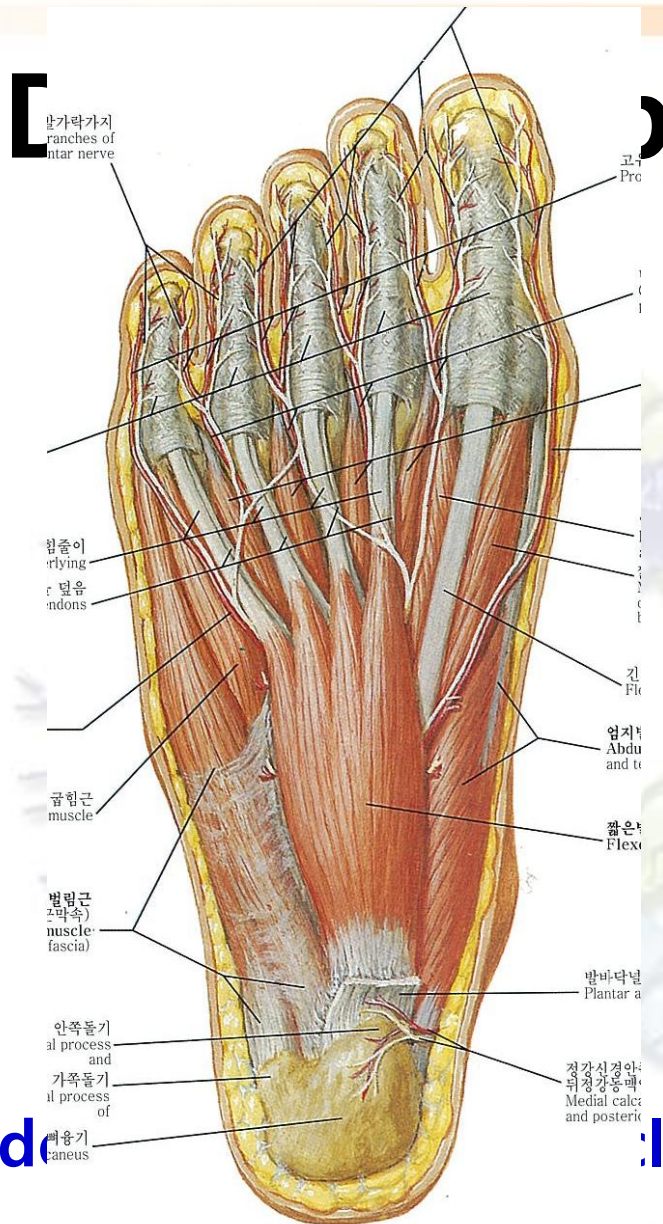


Tendon-based FDB muscle flap

Distant Flap



Tendon-based FDB muscle flap



Tendon flap

Distant Flap



Tendon-based FDB muscle flap

Distant Flap



Peroneal artery perforator propeller flap

Distant Flap



Reverse sural artery flap

Distant Flap



Reverse sural artery flap

Distant Flap



Reverse sural artery flap

Free Flap



Thoracodorsal artery perforator flap

Free Flap



Thoracodorsal artery perforator flap

Free Flap



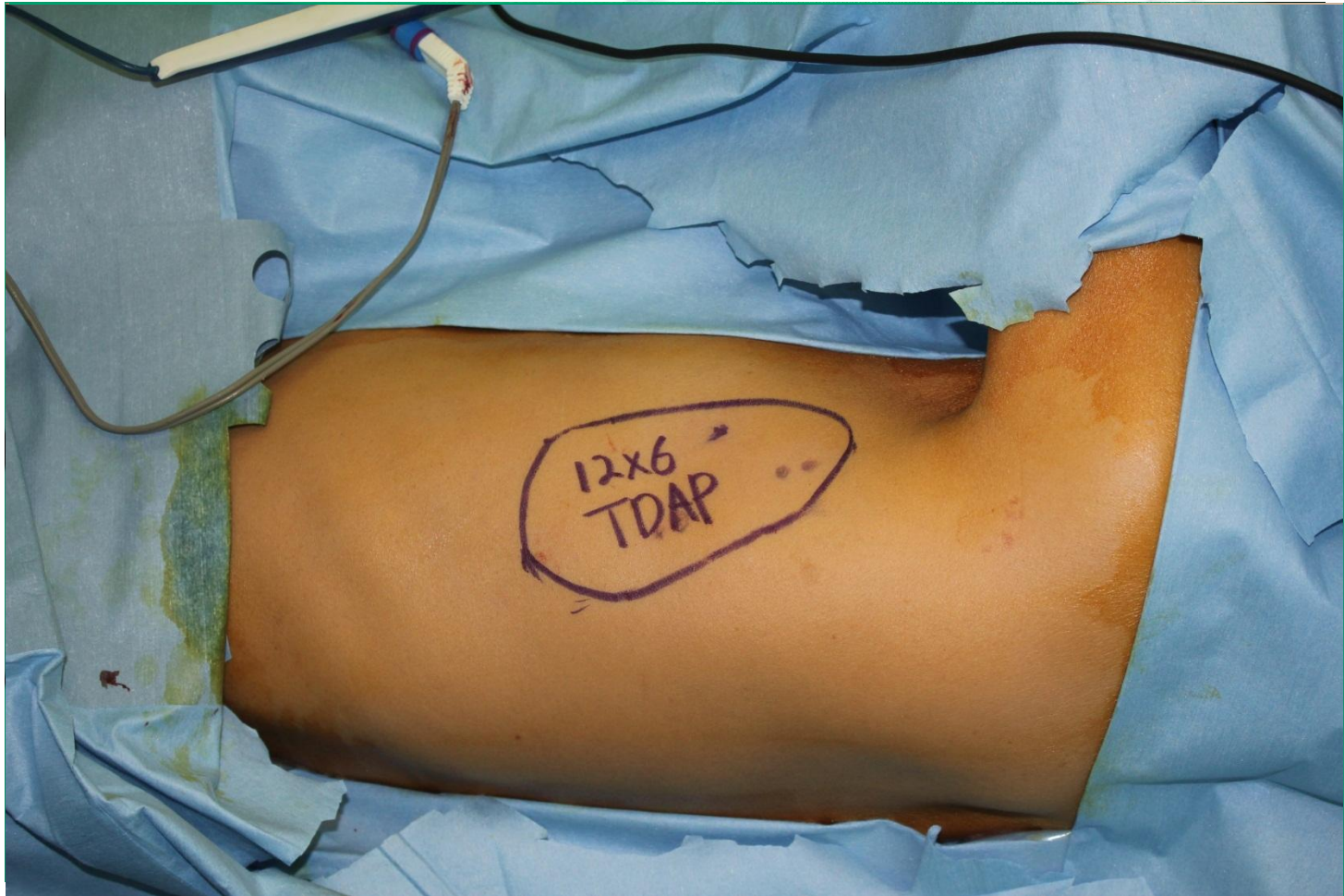
Thoracodorsal artery perforator flap

Free Flap



Thoracodorsal artery perforator flap

Free Flap



Thoracodorsal artery perforator flap

Free Flap



Thoracodorsal artery perforator flap

Free Flap



Thoracodorsal artery perforator flap

Free Flap



Thoracodorsal artery perforator flap

Free Flap



Anterolateral thigh flap

Free Flap



Peroneal artery perforator flap

Free Flap



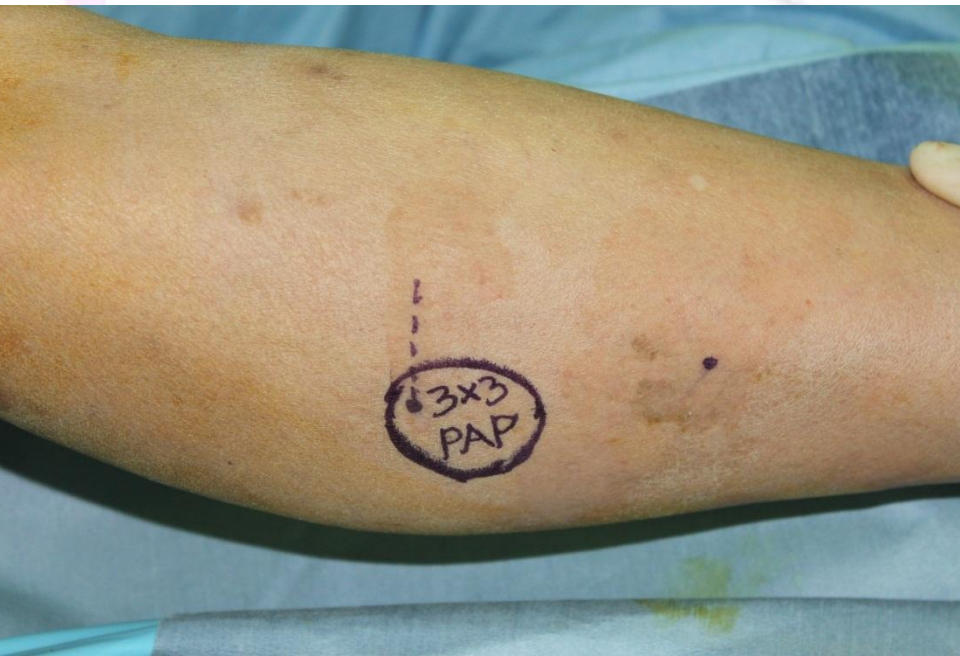
Peroneal artery perforator flap

Free Flap



Peroneal artery perforator flap

Free Flap



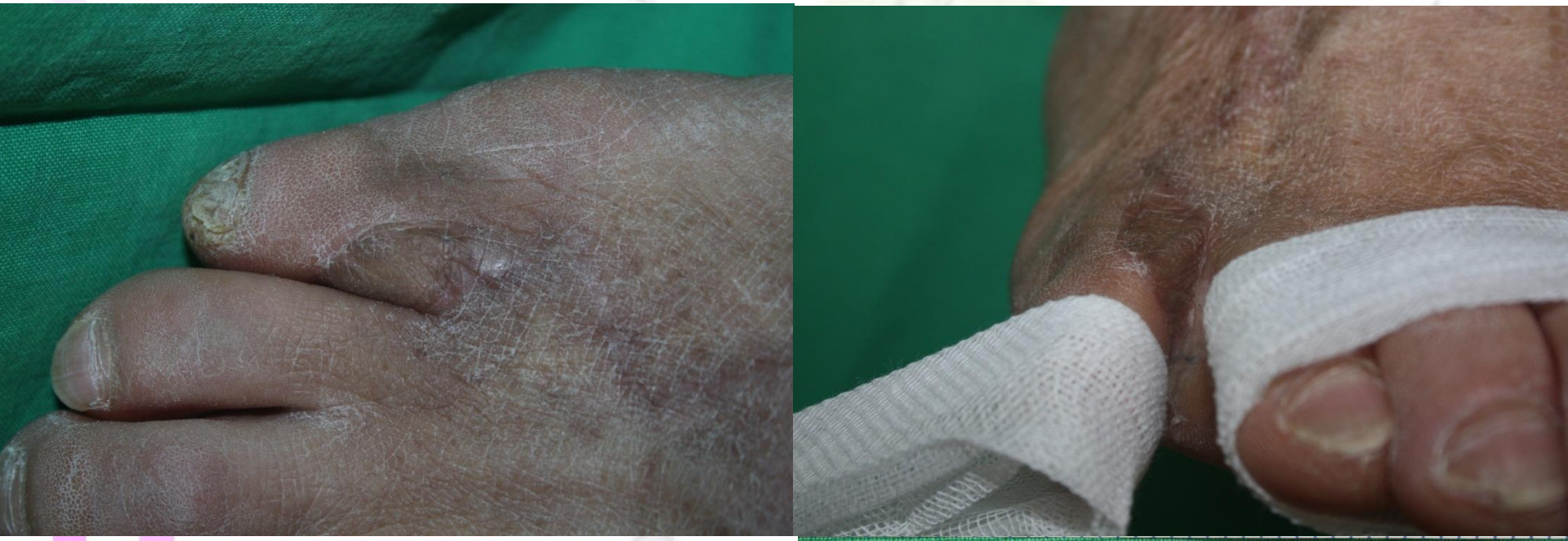
Peroneal artery perforator flap

Free Flap



Peroneal artery perforator flap

Free Flap



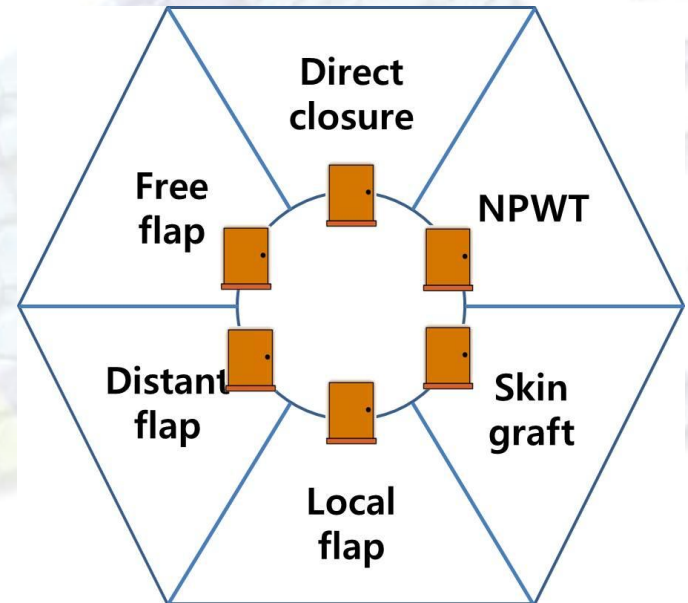
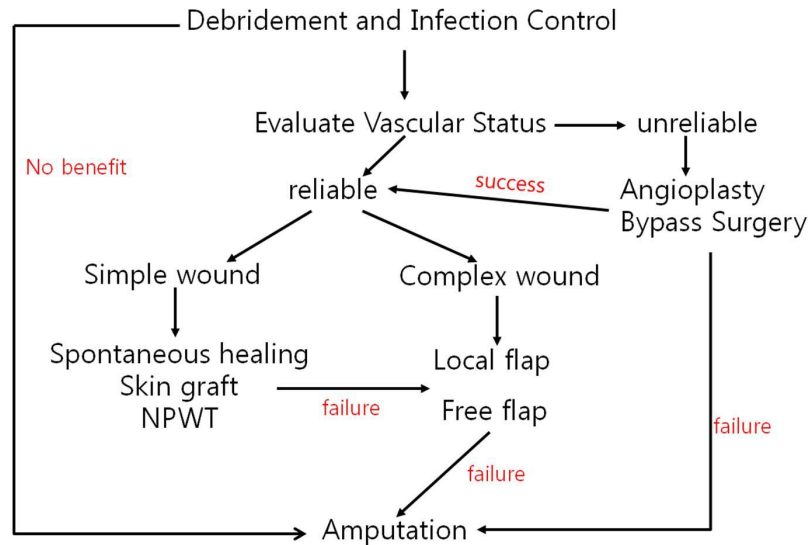
Peroneal artery perforator flap

How about free muscle flap with skin graft?

- **Well-vascularized tissue**
- **Protection**
 - Proper padding
 - Durable skin
 - Enduring shearing force
- **Good contour**

Suboptimal!

Conclusion



- Well-vascularized tissue
- Protection
 - Proper padding
 - Durable skin
 - Enduring shearing force
- Good contour

Conclusion

- How to do it well
 - Team-approach
 - Expert member
 - All mighty



Thank you!!

