

整型外科生理病理評估處置

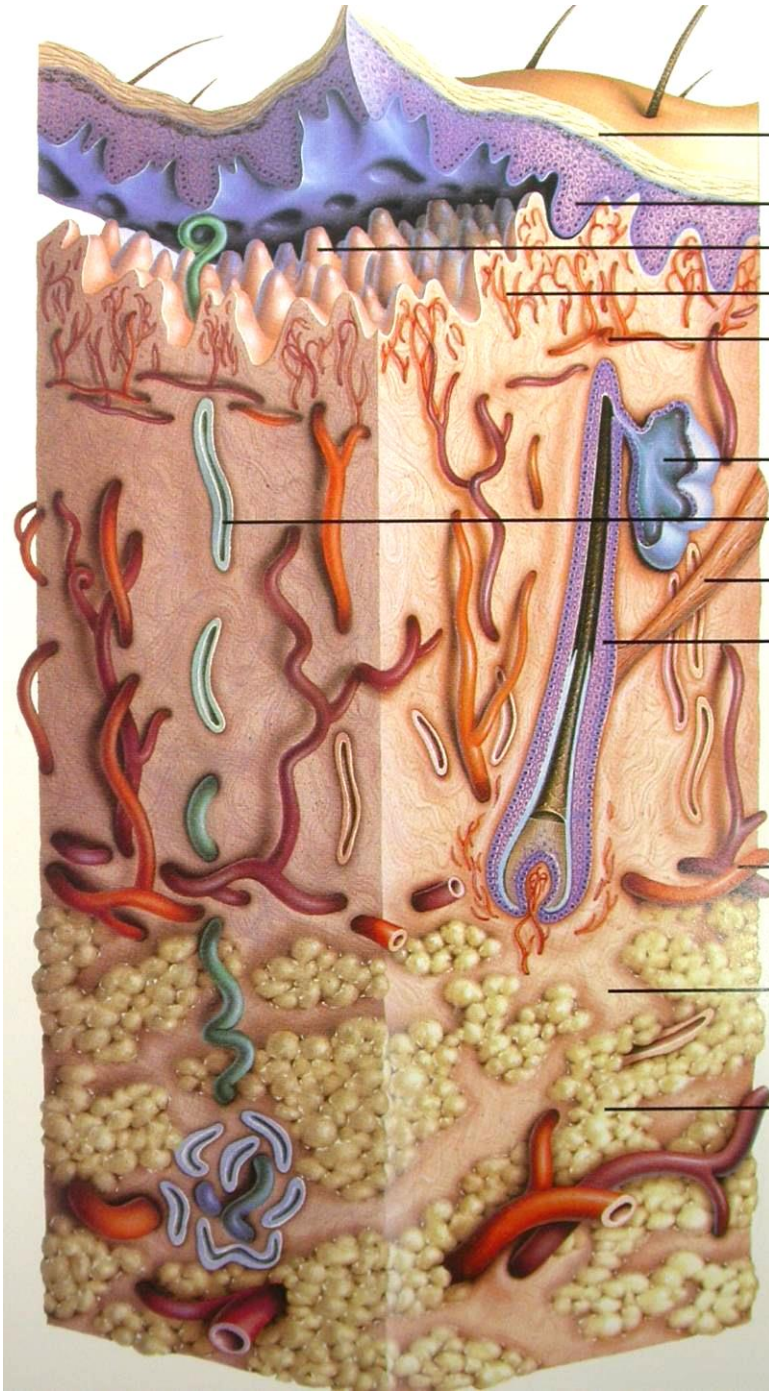
國軍左營總醫院 賴冠宏

What you know



the **Reality** is





皮膚之構造

1. Epidermis, 最外層為 keratinous layer
2. Dermis, 較 epidermis 厚 (1mm~4mm不等), 含有 vessels, nerve, sensory organs, sebaceous glands, sweat glands and hair follicles
3. Sub-cutis, 位於 dermis 下方, 含 fat cells

Dermal layer 真皮層

- Dermal cells: 基本為 fibroblast
- Collagen fibers: 由 fibroblast 製造, give the skin its strength.
- Elastin fibres: 提供皮膚彈性
- Dermis 富含血管,可營養 epidermis layer

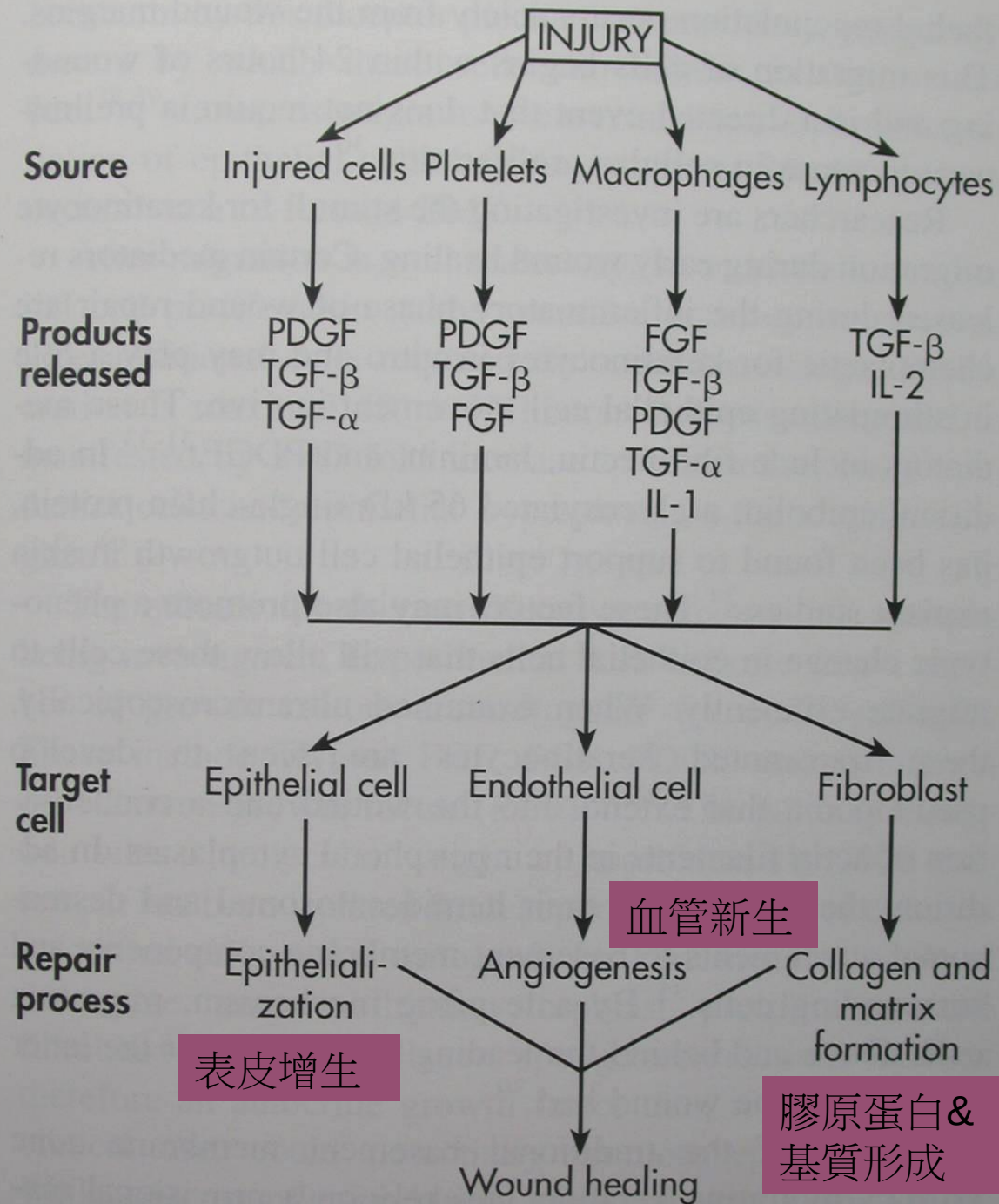
皮膚的功能

1. Protective layer (保護層)
2. Transmits sensations (感覺傳導)
3. Assisting body temperature regulation (協助體溫調節)
4. Vitamin D 生成
5. Social interaction (人際關係)

Wound healing 傷口癒合

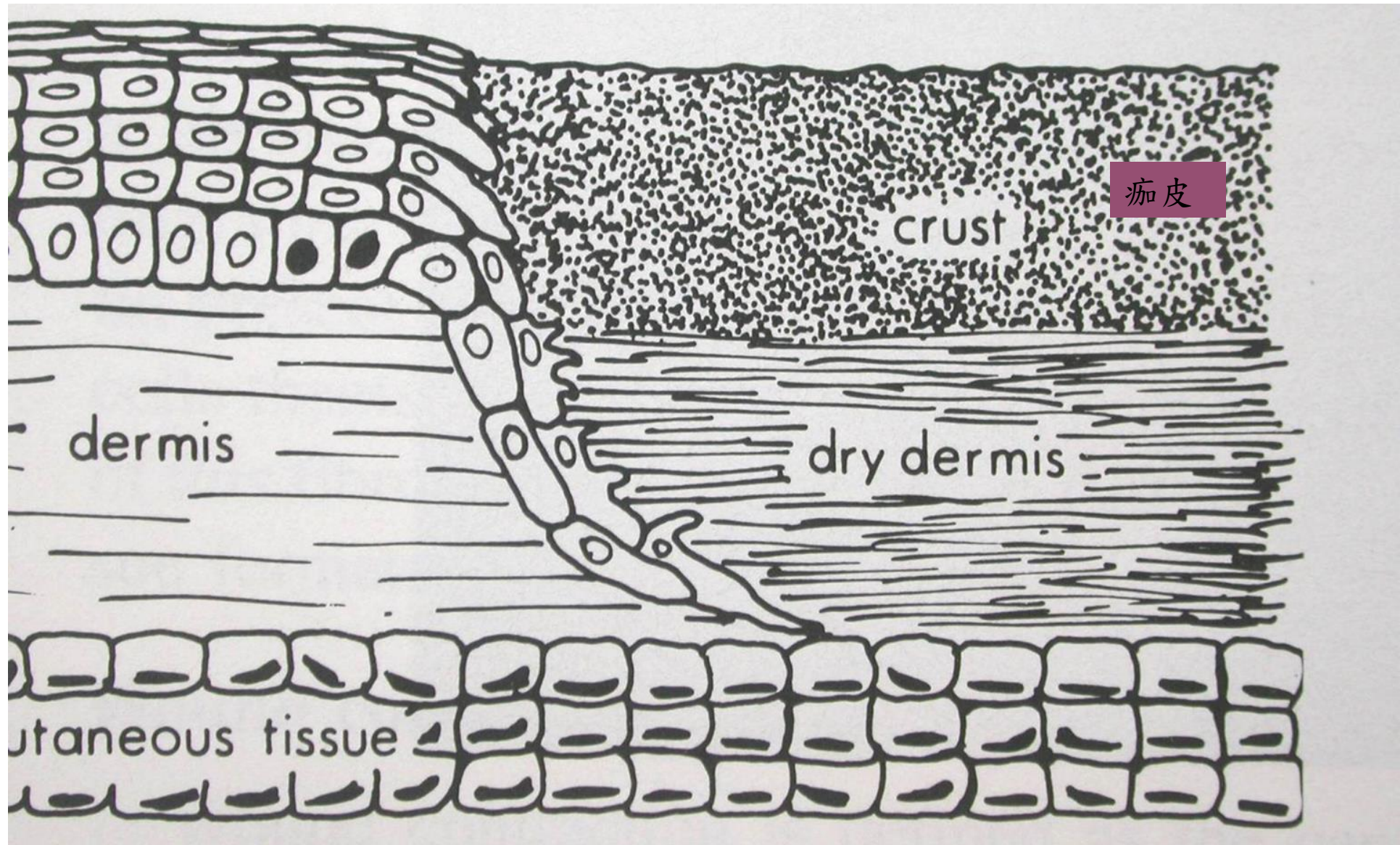
- Stages
 1. Coagulation
 2. Inflammation
 3. Proliferation- epithelialization, fibroplasia and matrix formation, angiogenesis
 4. Wound contraction
 5. Remodeling

Cytokines



外科處理

- Wound healing by primary intention (直接縫合) ---- Oppose of the wound edges.
- Wound healing by secondary intention (不縫, 等待慢慢長)
 1. Deposition of matrix proteins
 2. Neovascularization to form granulation tissue
 3. Migration of keratinocytes



Open wound: epithelium migrates beneath a desiccated crust

上皮細胞在痂皮下方慢慢前進

occlusive or semioclusive dressing

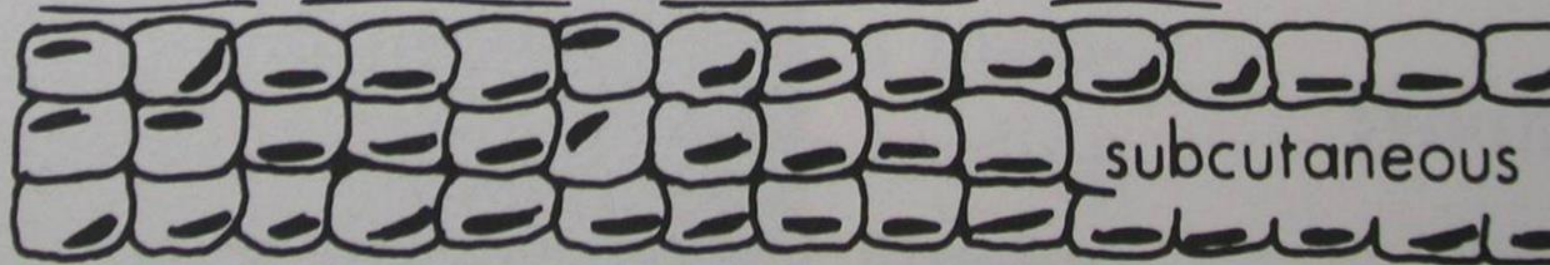
潮濕環境有利上皮細胞前進

moist exudate

dermis

wound bed; provisional matrix of fibronectin
fibrin, type I and type III collagen, and elastin

subcutaneous



慢性傷口 (Chronic Wound)

定義: 超過1個月未癒合的傷口

慢性傷口分類:

- 褥瘡 (Pressure sore)
- 淤血性小腿潰瘍 (Stasis leg ulcer)
- 缺血性小腿潰瘍 (Ischemic leg ulcer)
- 糖尿病足潰瘍 (Diabetic foot ulcer)



褥瘡 (Pressure sore)

- 組織在骨頭突出處有持久壓迫所造成。
- 營養不良的病人，組織較難以抵抗壓力的傷害。



Sacral pressure sore

人體壓力分佈

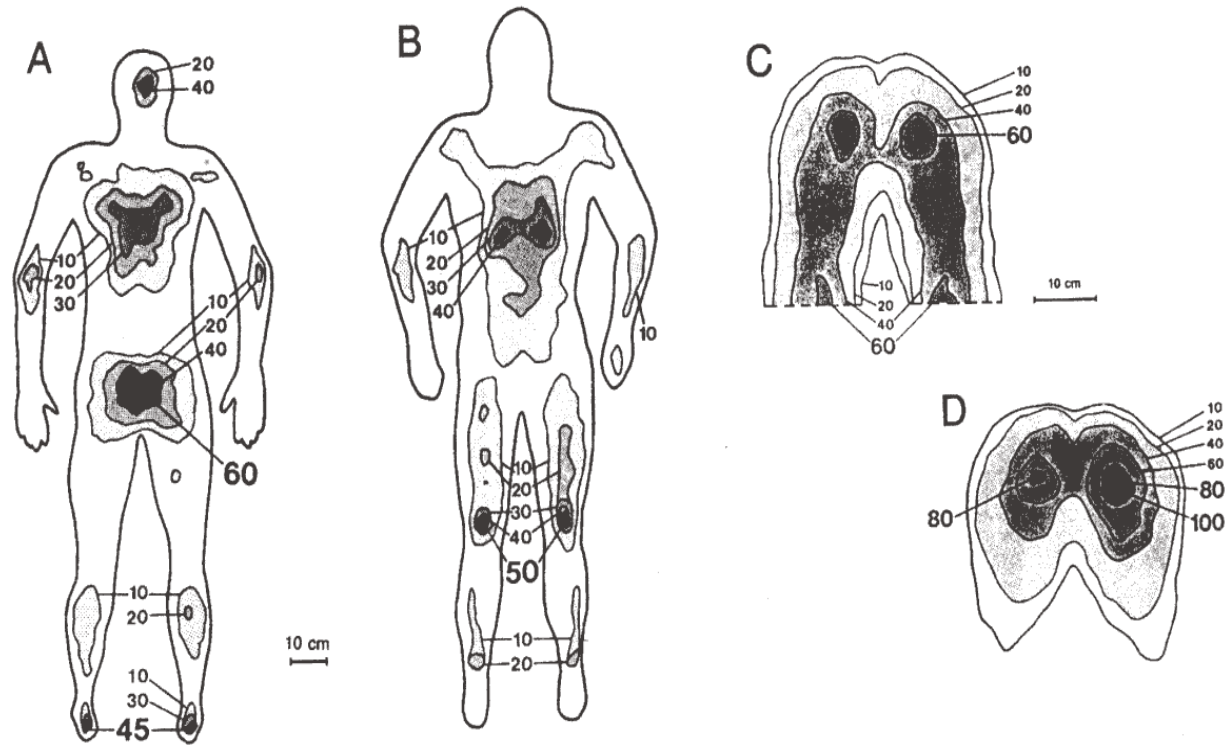


Fig2. Distribution of pressure in a healthy adult male while (A) supine, (B) prone, (C) sitting with feet hanging freely, and (D) sitting with feet supported. Values expressed in mmHg. (Adapted with permission from Lindan O, Greenway RM, Piazza JM: Pressure distribution on the surface of the human body 1. Evaluation in lying and sitting positions using a "bed of springs and nails." Arch Phys Med Rehabil 46:378, 1965.)

褥瘡深度 (Stage of Pressure Sore)

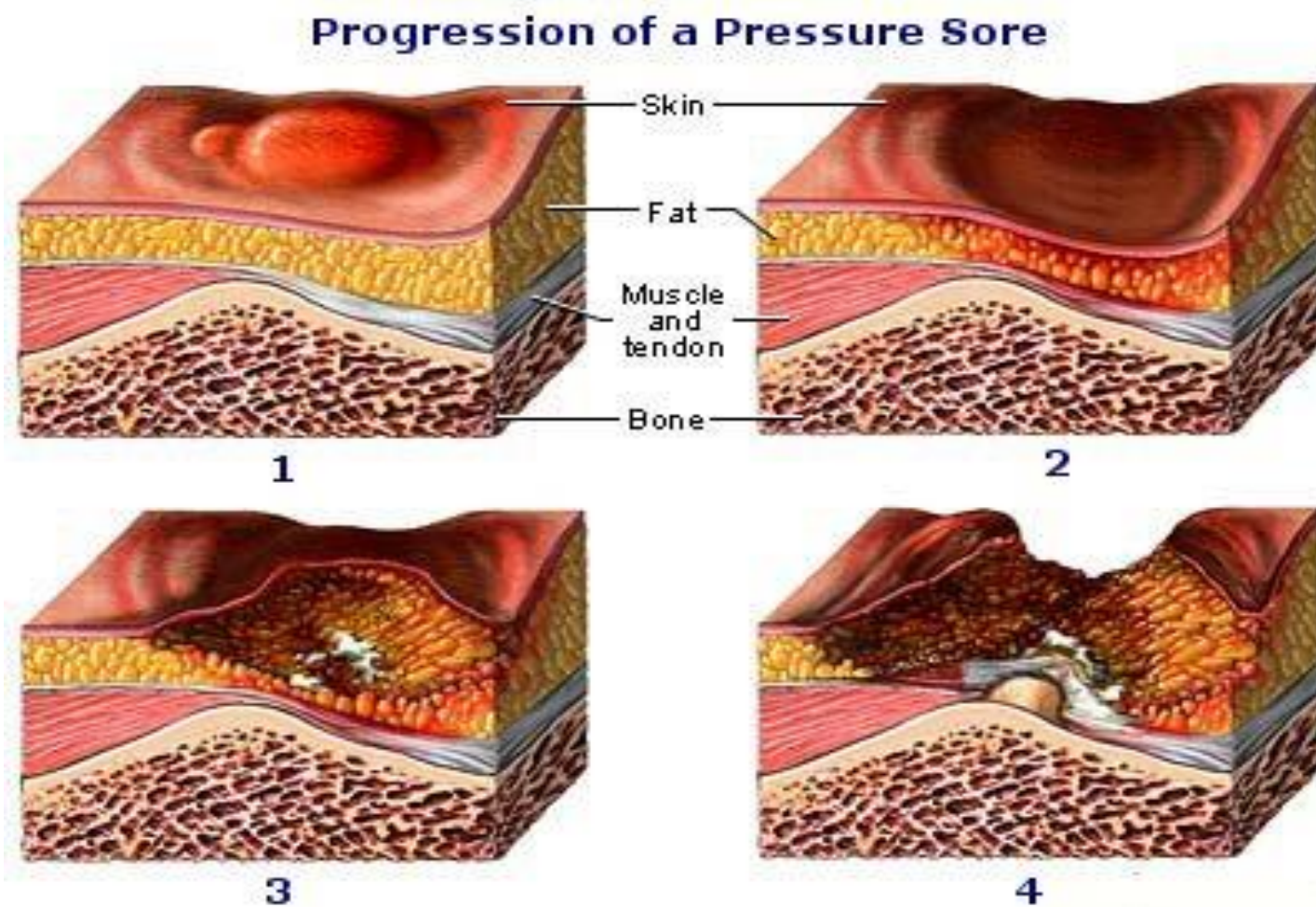
National Pressure Sore Advisory Panel分類

- Stage I : 皮膚變紅 (Non blanchable erythema)
- Stage II : 部分層皮膚壞死
- Stage III : 全層皮膚壞死
- Stage IV : 擴及肌肉骨頭壞死



Sacral pressure sore

褥瘡之分級



褥瘡深度 (Stage of Pressure Sore)



Stage III：全層皮膚壞死



Stage IV：全層皮膚壞死
及肌肉骨頭壞死

褥瘡的照護 (Care of Pressure Sore)

一般照護

- 減少骨頭突出處壓力：
讓病人睡大氣室氣墊床。
- 改善病人營養狀況：
給予鼻胃管灌食。

傷口照護

- 切開壞死皮膚，引流出膿瘍。
- 每日用生理食鹽水紗布換藥四次。

褥瘡的照護 (Care of Pressure Sore)

手術原則

- 徹底清創，使用旋轉皮瓣 (Rotation Flap) 來重建傷口。
- 避免直接縫合大的褥瘡傷口；也避免在大的褥瘡傷口植皮。



Trochanteric pressure sore

褥瘡的照護 (Care of Pressure Sore)

術後照護

- 給予三天Imodium, 1 QD
- 讓病人睡大氣室氣墊床。
- 儘量讓病人俯睡，病人儘量少翻身。
- 進食能力差的病人，給予鼻胃管灌食。



旋轉皮瓣 (Rotation Flap)

淤血性小腿潰瘍 (Stasis Leg Ulcer)

源自慢性靜脈功能不足
(Chronic venous
insufficiency)，因靜脈
高壓，造成微血管灌流
壓力不足及組織水腫。



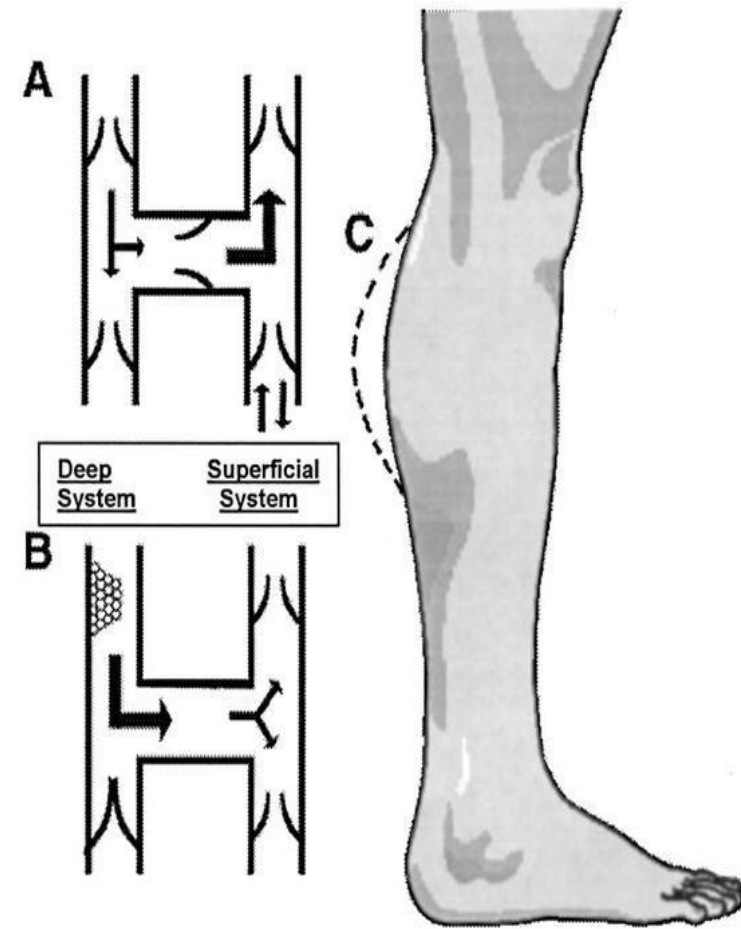
下肢靜脈循環 (Venous Circulation of Lower Extremity)

下肢靜脈系統

- 表淺靜脈
- 深部靜脈
- 交通靜脈

下肢靜脈回流

- 肌肉內靜脈幫浦
- 靜脈內單向瓣膜



淤血性小腿潰瘍的照護 (Care of Stasis Leg Ulcer)

- 讓病人穿治療型彈性襪
(Compression garment)
- 下肢抬高
- 無法以二級癒合方式來癒合時，施行植皮手術。



彈性襪 (Pressure Garment)

- 下床前穿上
- 站立時穿著
- 穿至膝下即可



淤血性小腿潰瘍 (Stasis Leg Ulcer)



Secondary healing



Skin grafting

缺血性足部潰瘍 (Ischemic Foot Ulcer)

源自週邊動脈阻塞或血管炎，因而微血管灌流壓力不足，組織因缺氧及缺少血流。



缺血性足部潰瘍的照護 (Care of Ischemic Foot Ulcer)

- 微小動脈擴張藥物，如 PGE1 (Promostan)。
- 血小板抑制藥物，如 Tapal 1 qd。
- 血管擴張術、血管成形術或血管繞道手術。
- 若無法重建，且病人無法忍受缺血性疼痛 (Ischemic pain)，施行膝下截肢。
- 術後不要使用壓迫性包紮。

危急性下肢缺血 (Critical Limb Ischemia)

- Rest pain > 2 weeks
- Gangrene or ulceration
- Ankle brachial index (A/B) < 0.7
- Ankle systolic blood pressure < 50 mmHg



危急性下肢缺血的照護 (Care of Critical Limb Ischemia)

- Pressure care
- Slow release opiate analgesia
- Prostacyclin analogues (PGE1): Promostan
- Chemical lumbar sympathectomy



糖尿病足部潰瘍 (Diabetic Foot Ulcer)

- 糖尿病病人有神經病變 (Neuropathy) 產生時，足部的感覺能力變差，以致足部外傷或感染仍不自覺，因而形成潰瘍。



糖尿病足潰瘍 (Diabetic Foot Ulcer)

Wagner 分類

- Stage 0 : normal
- Stage 1 : superf. ulcer
- Stage 2 : deep ulcer
- Stage 3 : osteomyelitis
- Stage 4 : toe gangrene
- Stage 5 : foot gangrene



慢性傷口的處置

- 治療慢性傷口，需針對其致病原因治療
 - 血糖過高: 需有效控制血糖
 - 血管狹窄: 需血管重建
 - 感染: 清創手術
- 清創手術是傷口治療的第一步
 - 傳統的清創手術能建立乾淨的傷口是促進傷口癒的最基本治療。
 - 切除壞死組織，保留新生的肉芽組織，可以促使傷口癒合或是提供下一步的重建準備。

慢性傷口手術前的營養評估和手術後的傷口照護。

- 術前營養評估:
 - 營養指標:albumin , transferrin , prealbumin
 - 改善病人營養狀況，進食能力差的病人則適時給予高蛋白的食物
- 術後傷口照護:
 - 每日以生理食鹽水浸濕之紗布換藥，必要時每6 個小時換藥一次。
 - 現有多種敷料可供使用，但須評估病人傷口狀況後決定最適合之敷料。

燒燙傷的種類

- 燙傷 (Scald Burn)
- 火焰傷 (Flame Burn)
- 化學灼傷 (Chemical Burn)
- 電擊傷 (Electric Burn)
- 接觸灼傷 (Contact Burn)
- 摩擦灼傷 (Friction Burn)
- 輻射性灼傷 (Radiation Burn)



燙傷 (Scald Burn)



火焰傷 (Flame Burn)





•化學灼傷
(Chemical Burn)



•電撃傷 (Electric Burn)



•接觸灼傷 (Contact Burn)

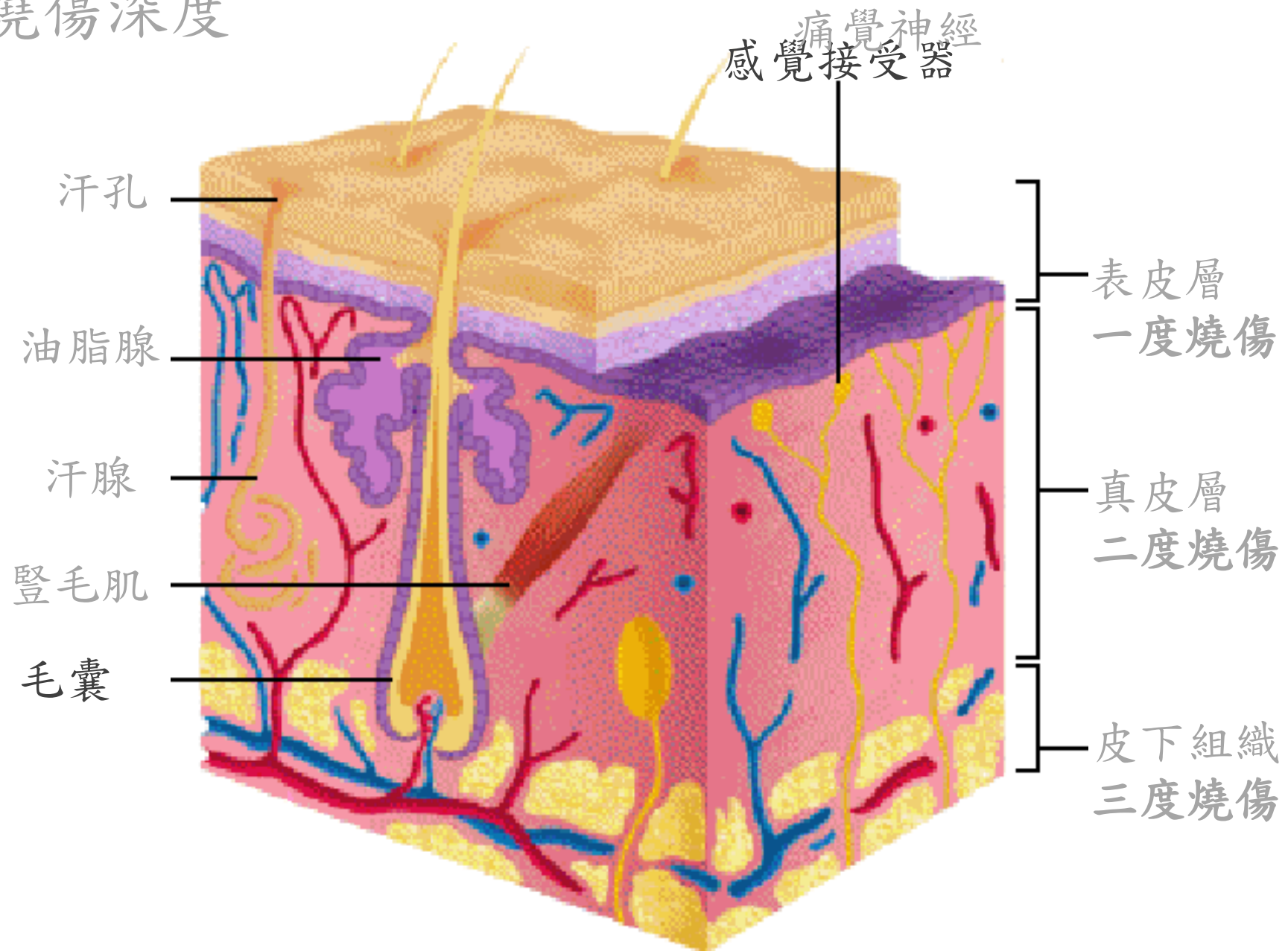


摩擦灼傷 (Friction Burn)



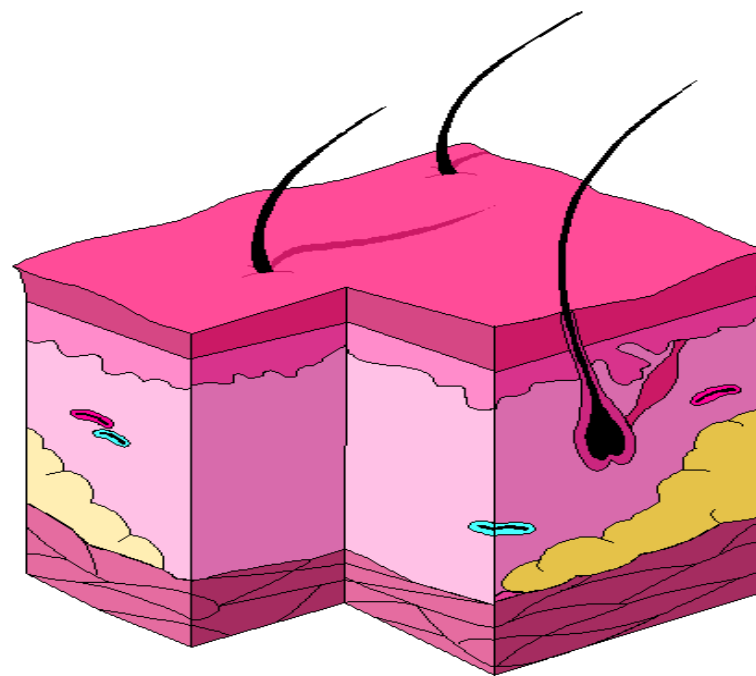
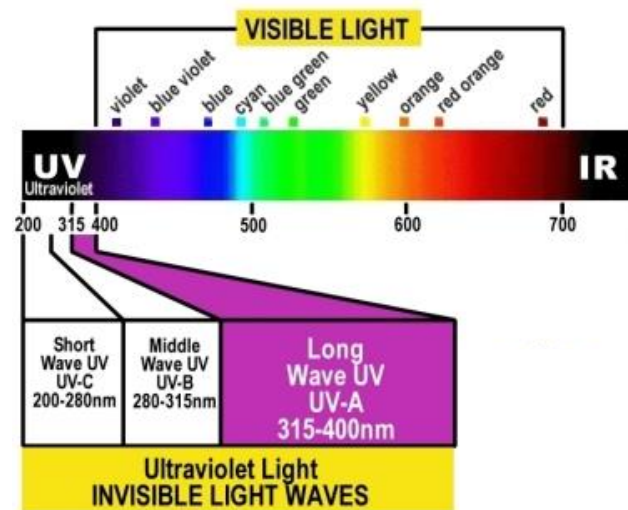
輻射性灼傷 (Radiation Burn)

燒傷深度



一度燒傷

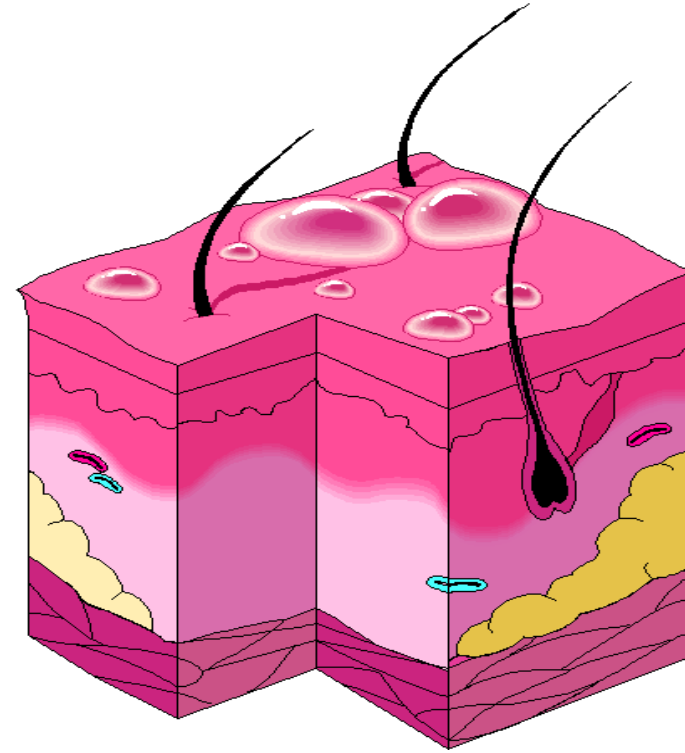
- 發生原因
 - 曬傷
- 症狀
 - 紅、腫、熱、痛
- 傷口照顧
 - 冰敷，止痛劑
- 復原時間
 - 3 至 5 天
 - 不留疤痕

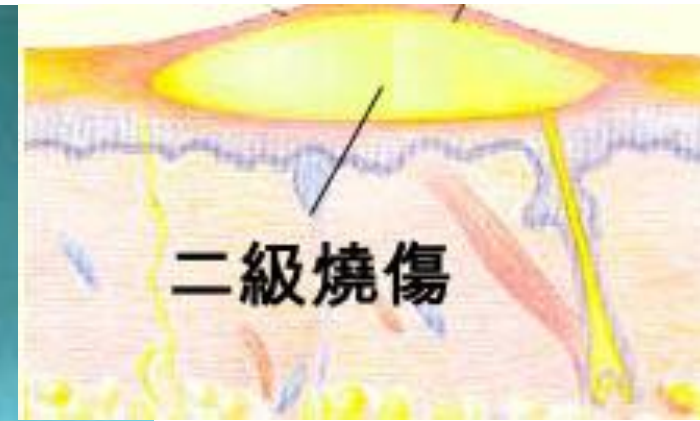




二度燒傷

- 發生原因
 - 燙傷、蒸氣
- 症狀
 - 紅、腫、熱、痛
 - 起水泡
- 傷口照顧
 - 沖、脫、泡、蓋、送
 - 可自然癒合
- 復原時間
 - 14 至 21 天
 - 留下疤痕





二級燒傷

熱水二度燙傷

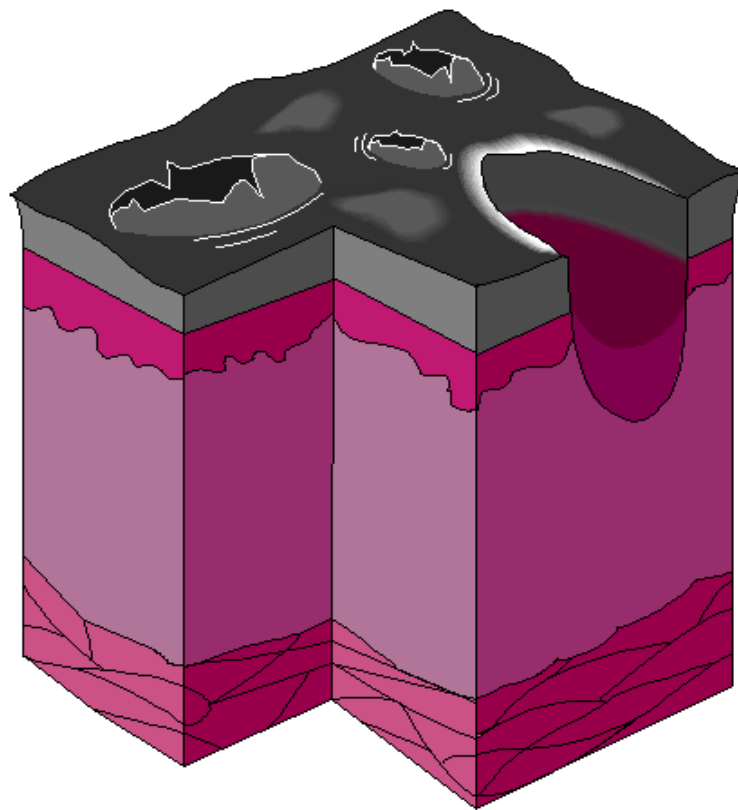


排氣管二度燙傷

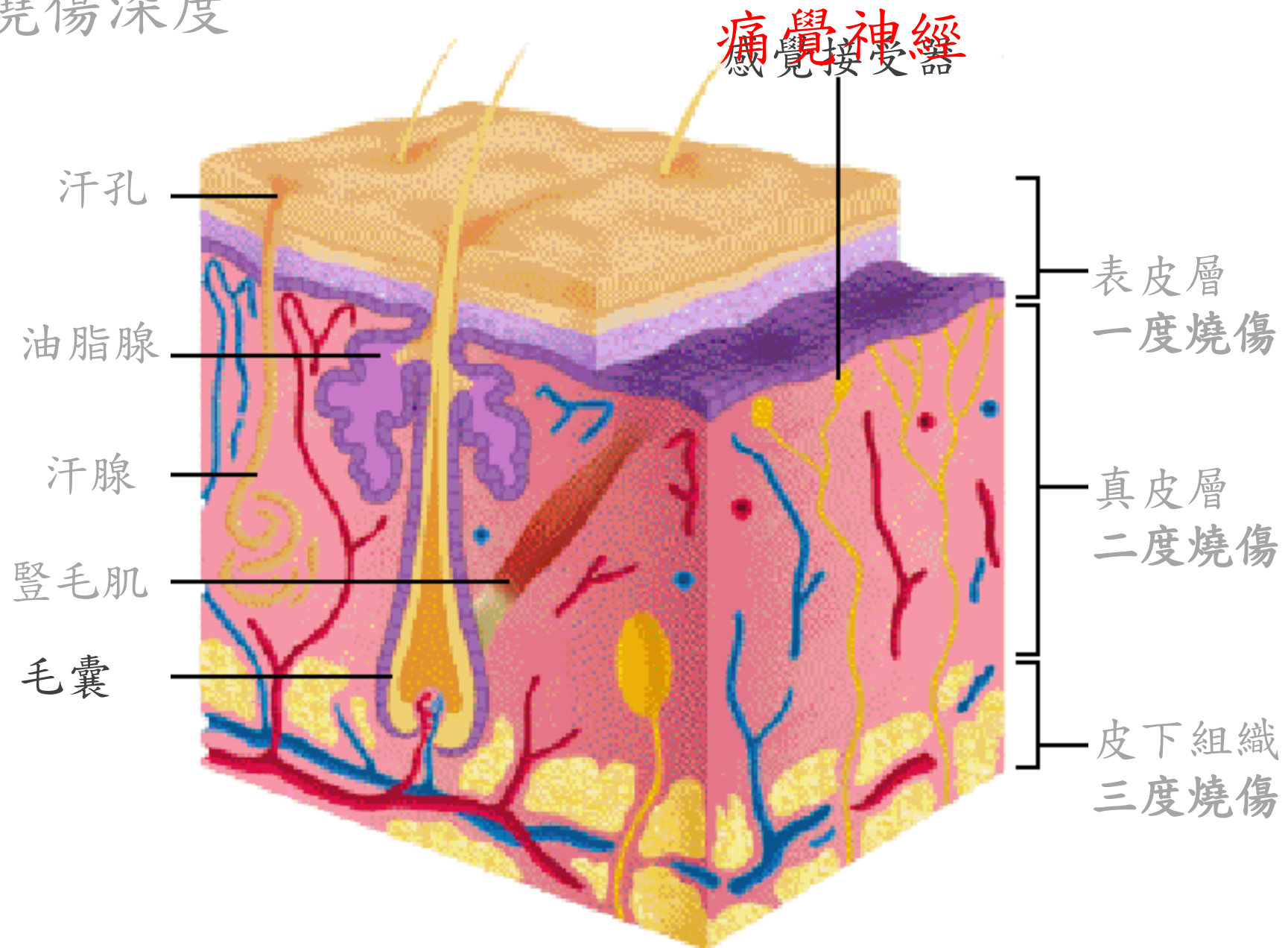


三度燒傷

- 發生原因
 - 火燒傷、電擊傷、化學藥品灼傷
- 症狀
 - 皮革狀皮膚，呈焦黑或珍珠白
 - 無痛覺
- 傷口照顧
 - 須經植皮手術始可癒合
- 復原時間
 - 留下疤痕，疤痕攣縮



燒傷深度





三度燒燙傷
Third Degree



四度燒燙傷
Fourth Degree

燒傷深度

燒傷深度	第一度	淺二度	深二度	第三度	第四度
深度範圍	表皮淺層	表皮層真皮表層 (約三分之一以上)	表皮層真皮 深層	全層皮膚	全層皮膚、 皮下組織、 肌肉、骨骼
症狀	皮膚發紅， 腫脹，有明 顯觸痛感	皮膚紅腫、 起水 泡，有劇烈疼痛 及灼熱感	皮膚呈淺紅 色起 白色大 水泡較不感 覺疼痛	皮膚呈 焦黑 色，乾硬如 皮革或為 蒼 白色 ，色素 細胞與神經 皆遭到破壞， 疼痛消失	皮下脂肪、 神經、骨骼 等組織壞死 ，呈焦炭狀
癒合情形	約3-5天即 可癒合，無 疤痕	約14天內即可癒 合，會留下輕微 疤痕或無疤痕	約21天以上 即可癒合， 會留下明顯 疤痕 ，需儘 早 植皮 治療， 避免感染	無法自行癒 合 ，會留下 肥厚性疤 ， 造成功能上 的障礙，須 依賴 植皮 治 療	須依賴皮瓣 補植治療、 電療等特殊 醫療，部份 需 截肢

溫度及時間對細胞之影響

1. 45°C · 1小時：細胞膜破壞、細胞死亡
2. 可逆性（急速降溫）

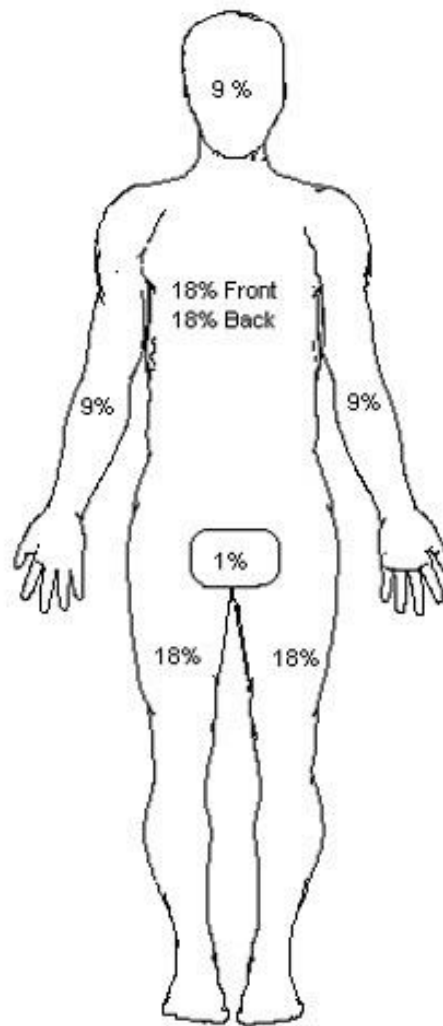
Immersion time to produce **full-thickness burns**

Time	Temperature (°F)
1 second	158 (70°C)
2 seconds	150 (65°C)
10 seconds	140 (60°C)
30 seconds	130 (55°C)
1 minute	127 (53°C)
10 minutes	120 (48°C)

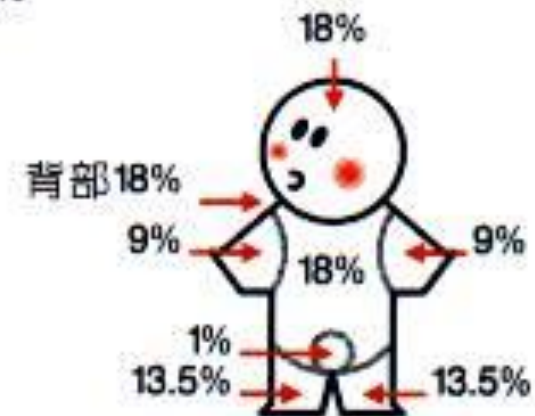
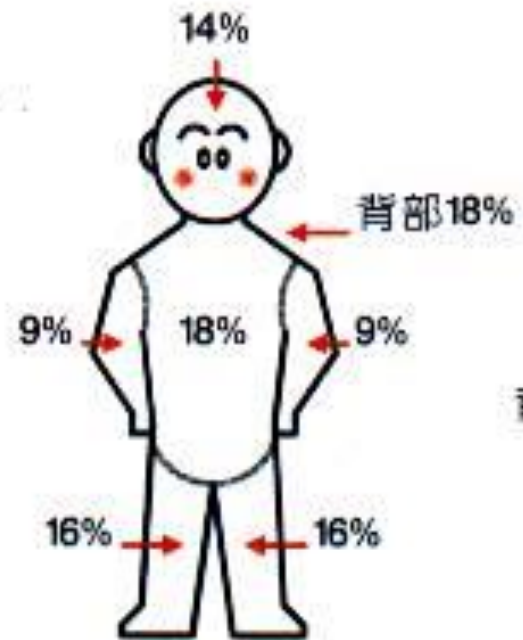
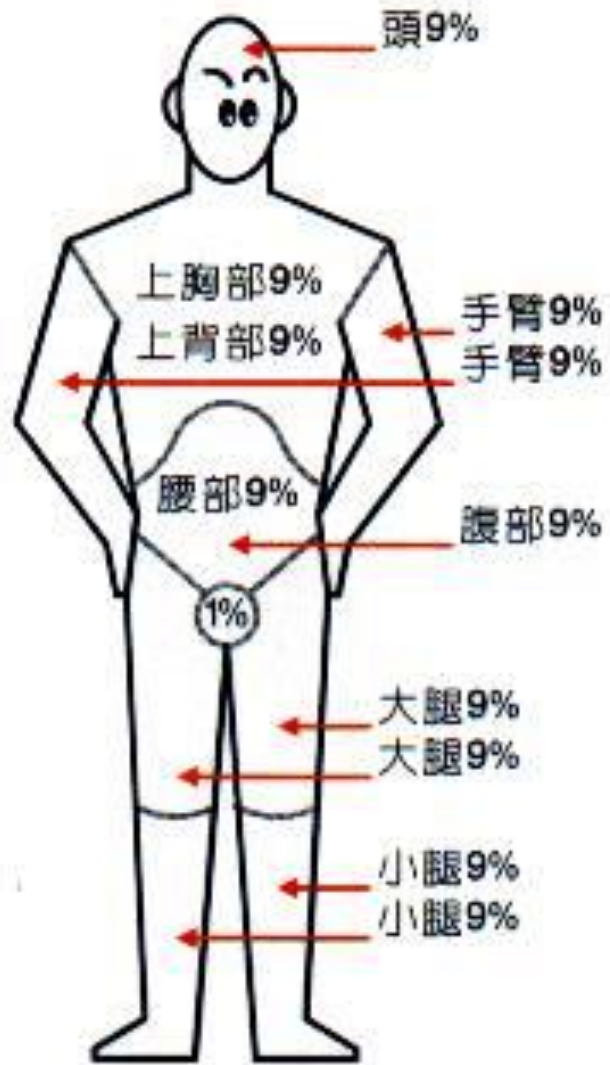


燒燙傷面積估算

- “九” 的原則
 - 頭、頸部 (9%)
 - 前軀幹 (18%)
 - 後軀幹 (18%)
 - 上肢 (9%) x 2
 - 下肢 (18%) x 2
 - 會陰部 (1%)



燒傷面積計算準則



嚴重度評估

輕度: 1. 第二度: 成人 < 15%, 兒童 < 10%
2. 第三度: 成人兒童 < 2%

中度: 1. 第二度: 成人 15-25%, 兒童 10-20%
2. 第三度: 成人兒童 2-10%

重度: 1. 第二度: 成人 > 25%, 兒童 > 20%
2. 第三度成人兒童 > 10%
3. 臉、頸、手、腳、會陰部2度以上之燒傷、吸入性燒傷、電燒傷、燒傷連帶外傷 (骨折、頭部外傷等)、燒傷含既存疾病 (糖尿病、癲癇等)

門診

住院

燒傷中心

緊急手術

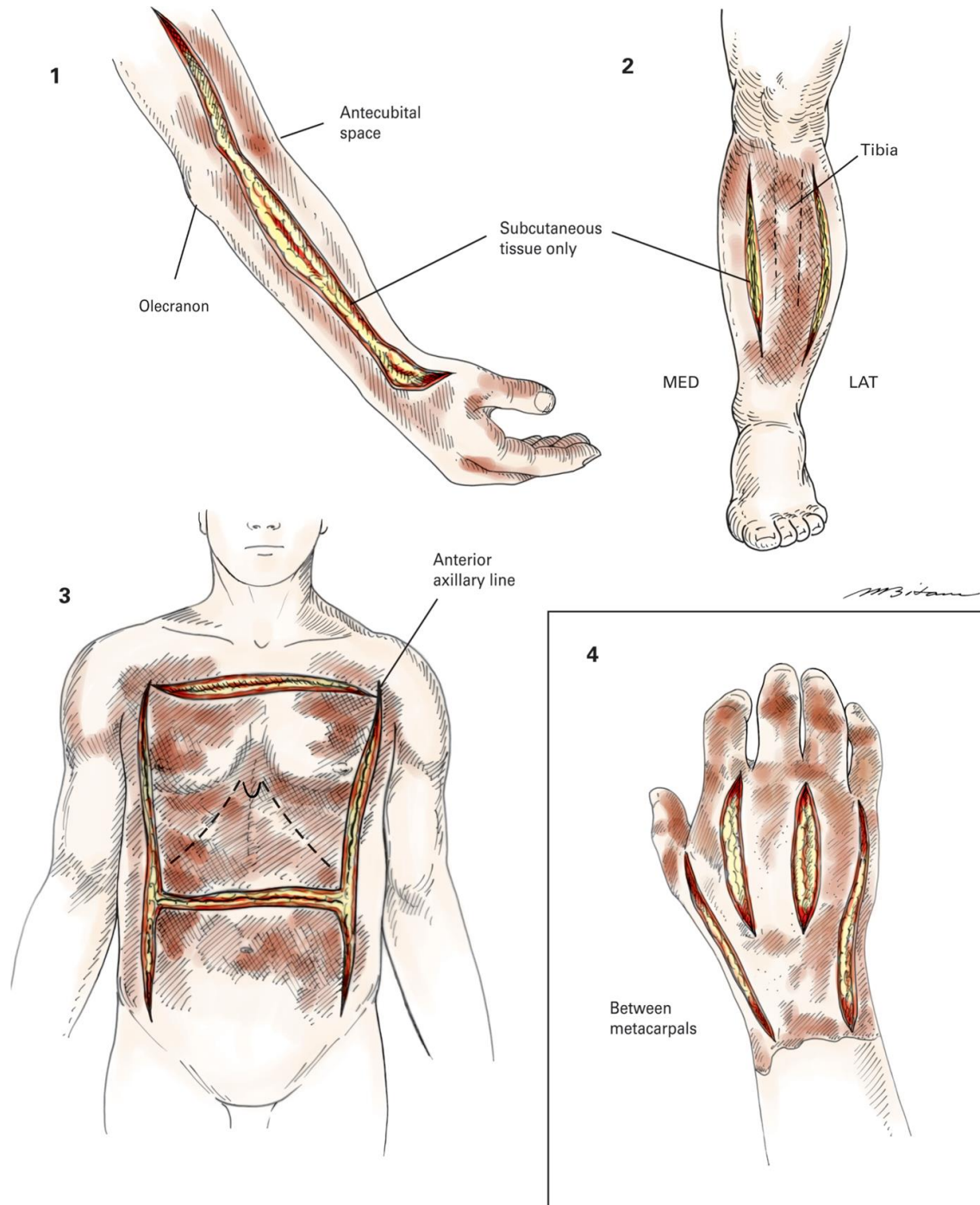
肢體環繞性深度燒燙傷

• 焦痂切開術 (Escharotomy)

腔室症候群5P

- 疼痛(pain)、皮膚變蒼白(pallor)、
- 麻痺(paresthesia)、患肢無力(paralysis)、
- 無脈搏(pulselessness)

• 筋膜切開術(Fasciectomy)







Parkland formula

**First 24 hours: 4 cc. Lactated Ringer's x %
burn x kg body weight**

- $\frac{1}{2}$ dose in 0~8 hrs
- $\frac{1}{2}$ dose in 8~24 hrs

**Second 24 hours: 5 % Dextrose in water
(1/2 first day requirement)**

PARKLAND FORMULA

1st 24 hours

LACTATED RINGER'S 4ml/kg/%

RATE OF ADMINISTRATION

1/2 dose - first 8 hours

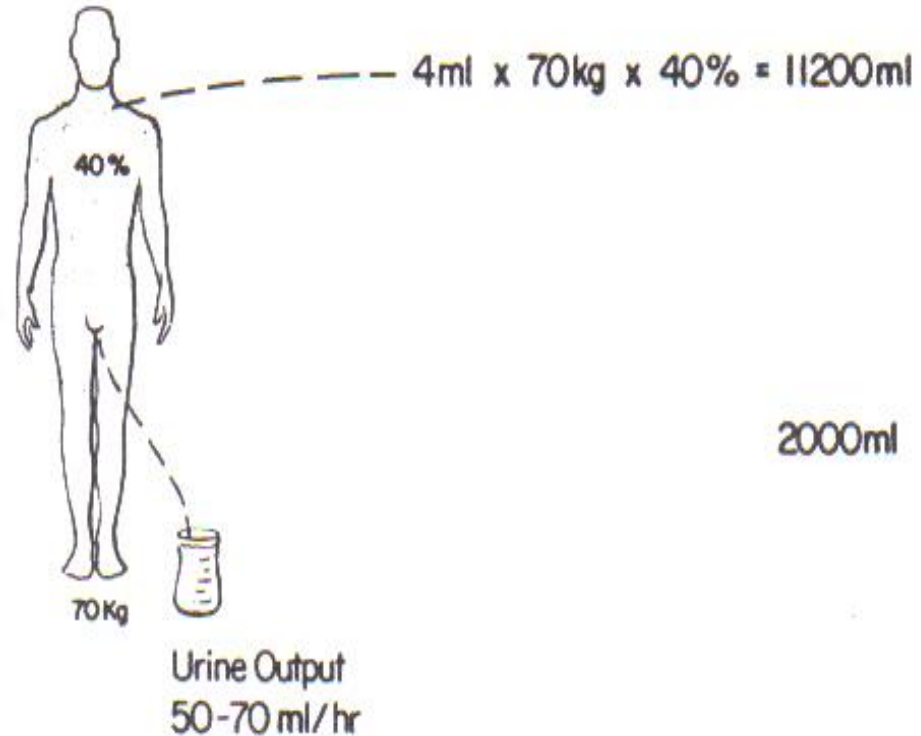
1/4 dose - second 8 hours

1/4 dose - third 8 hours

2nd 24 hours

GLUCOSE IN WATER - 2000 ml

(add potassium)

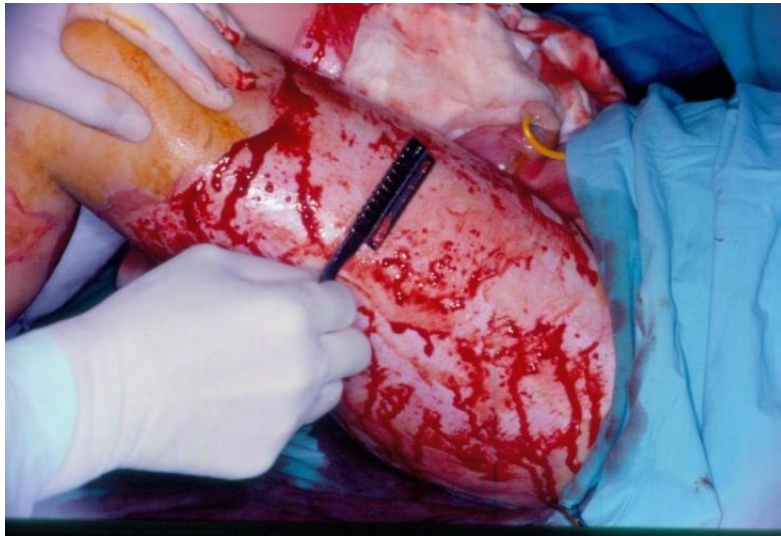


All the described regimens:

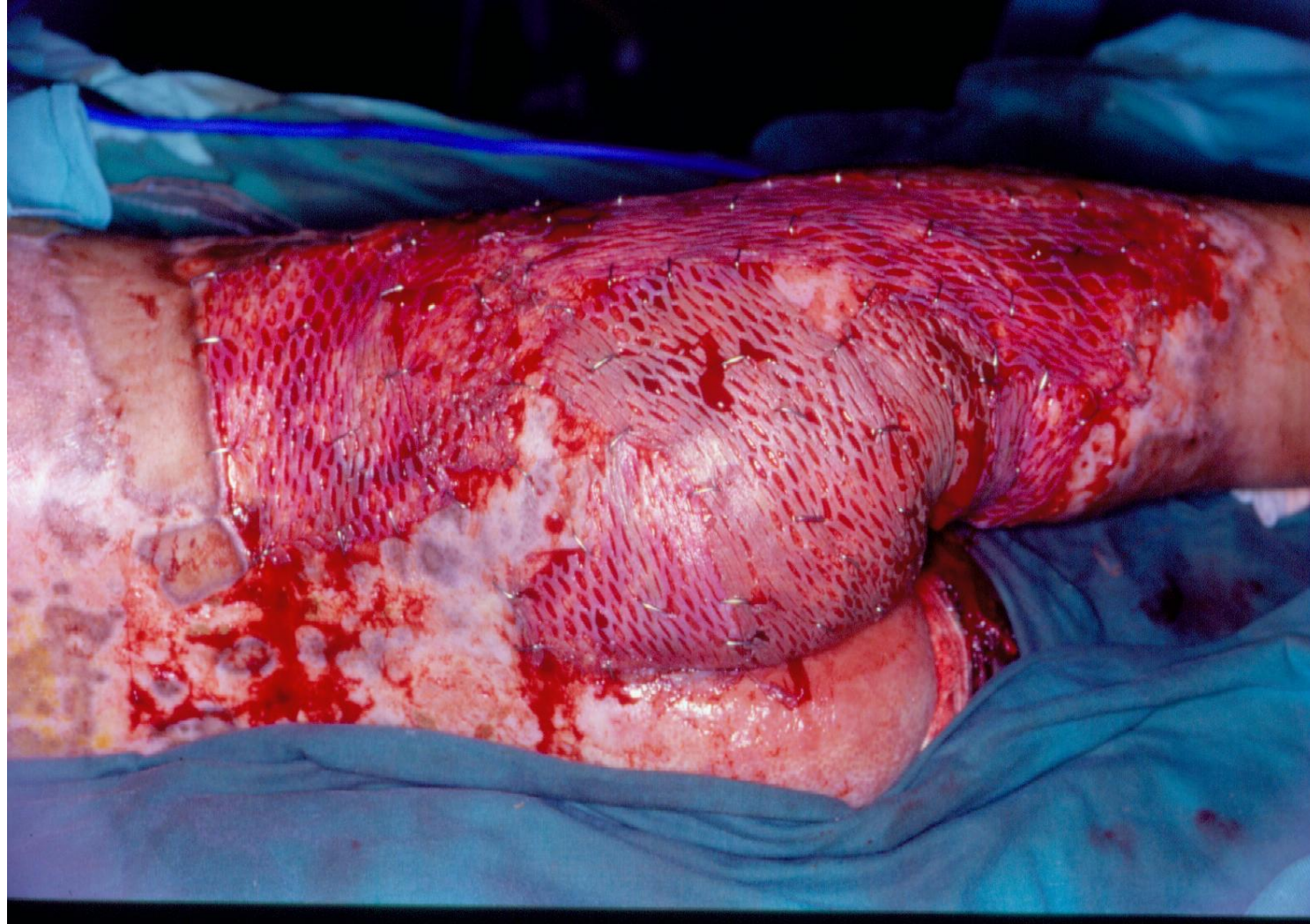
Achieve a urine output of 0.5-1 cc/kg/hr

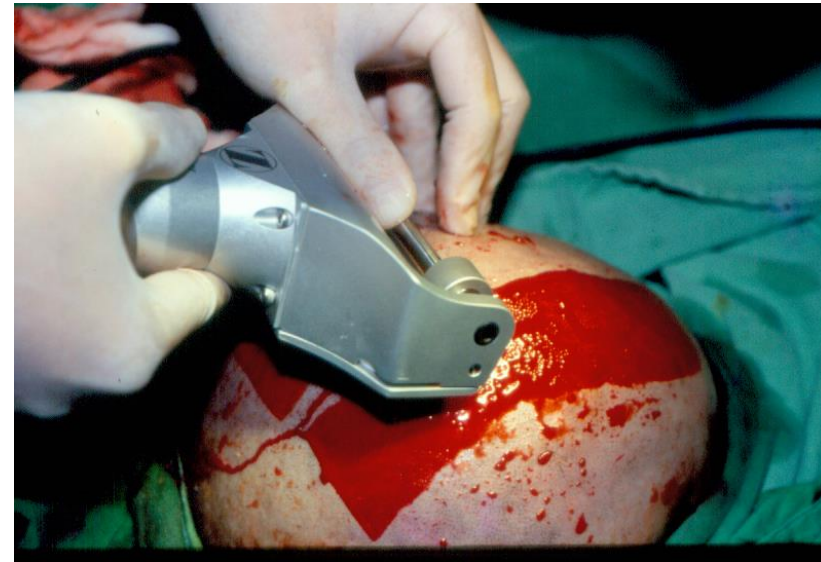
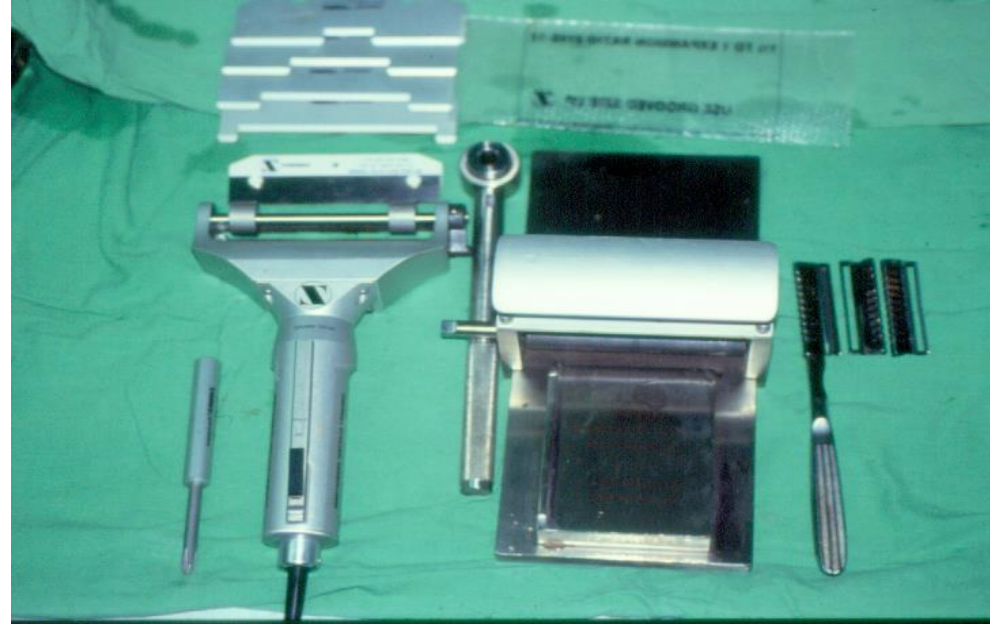
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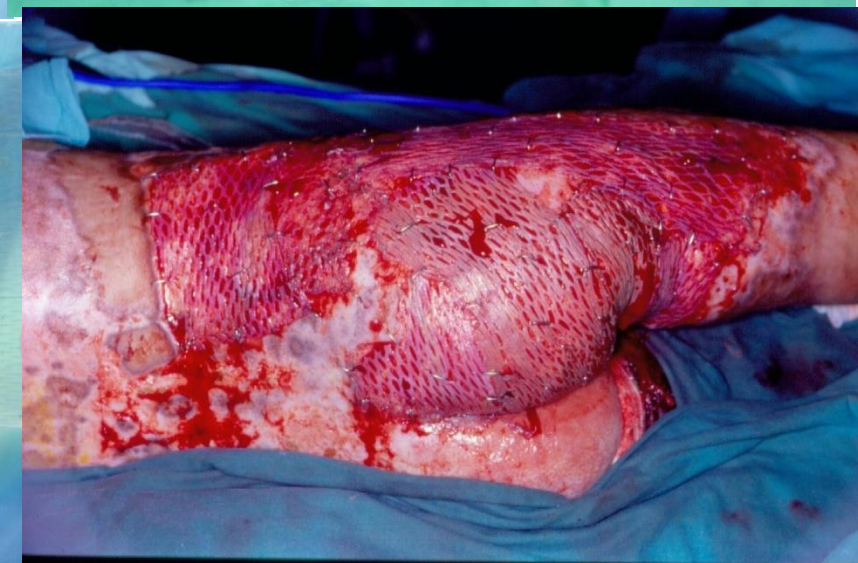
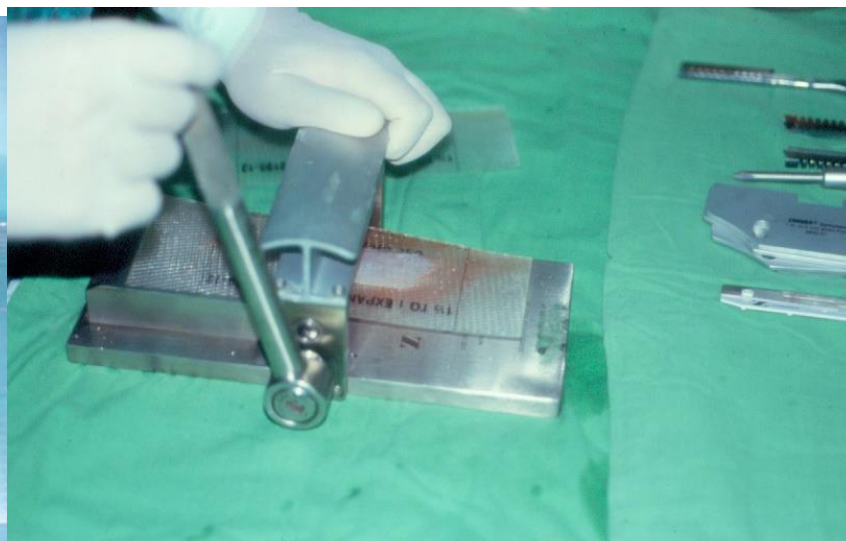
清創手術和各種敷料覆蓋



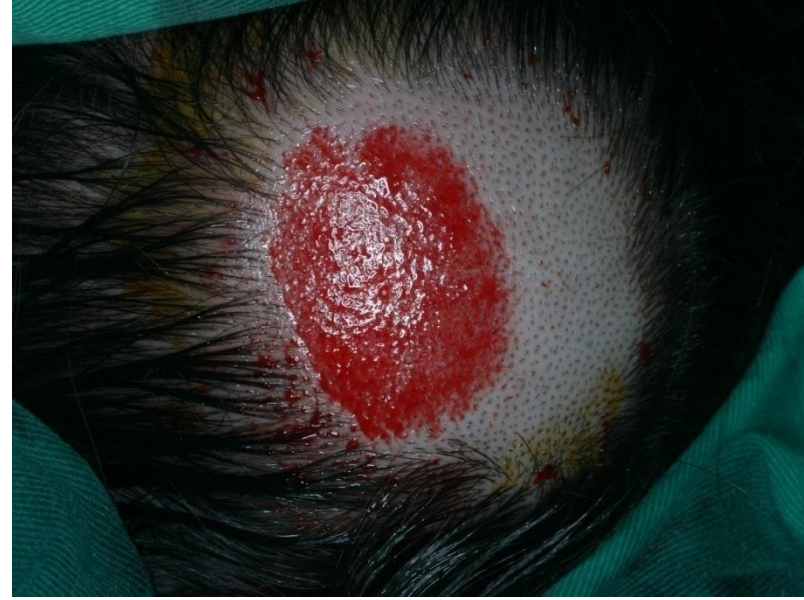
自體皮膚移植 S.T.S.G.







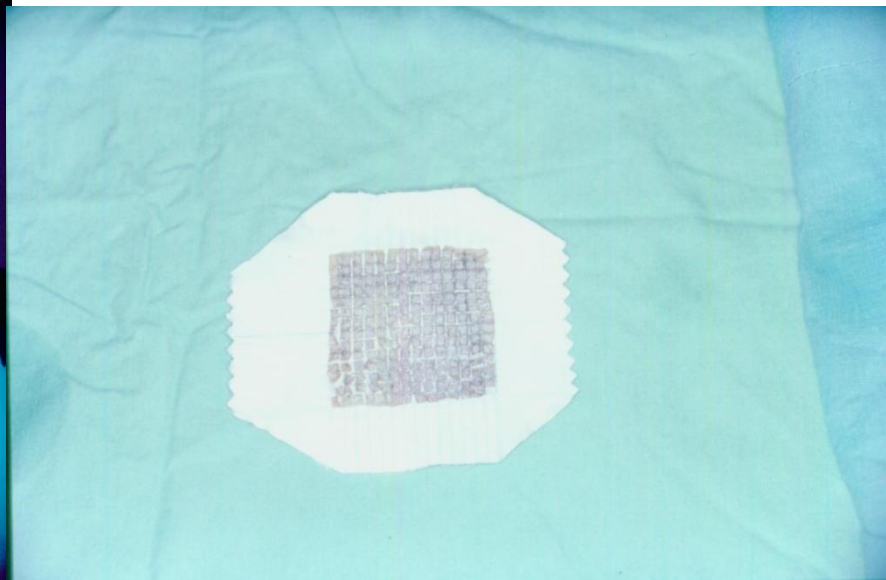
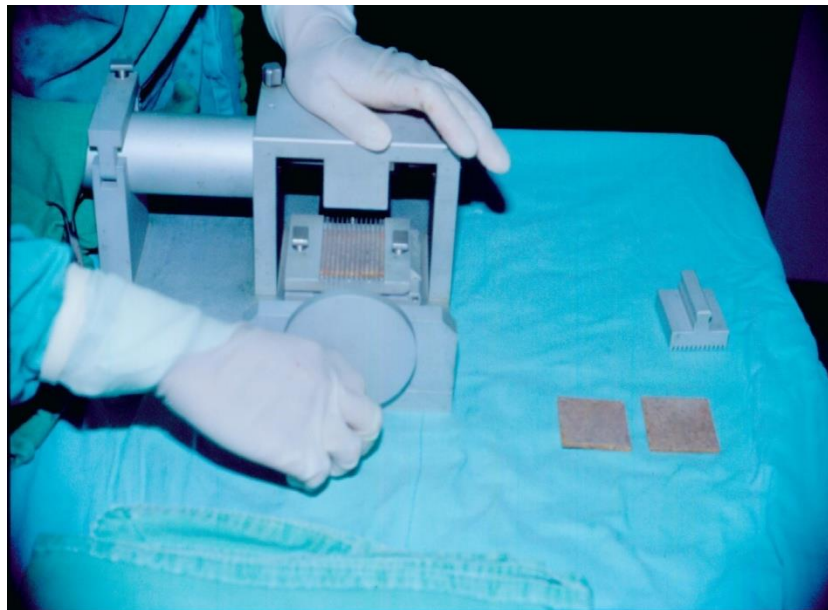
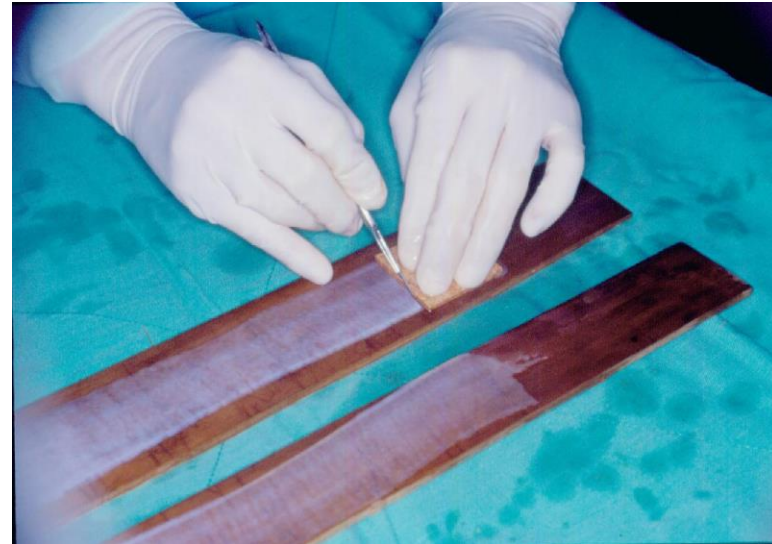




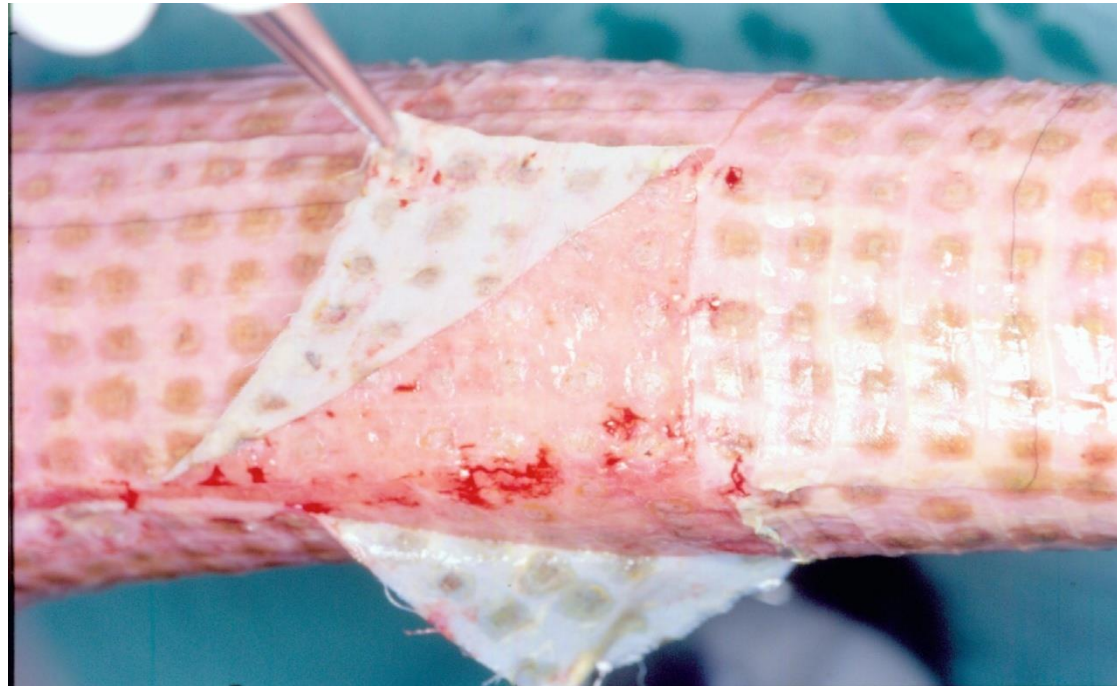
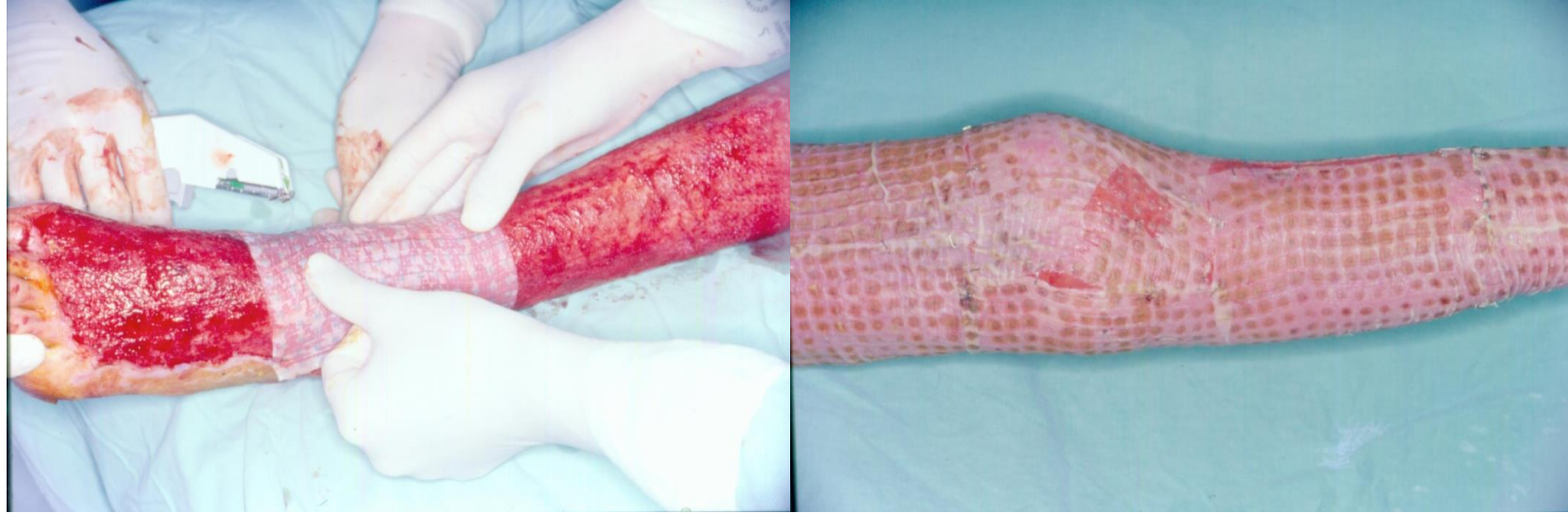
No skin staples and no splint



擴皮墊式顯微植皮術(Humeca)



擴皮墊式顯微植皮術(Humeca)



大面積燒傷



面積燒傷



大面积烧伤



燒燙傷的晚期治療

- 傷口的照顧
 - 傷口清潔;疤痕按摩; 癢, 水泡, 潰瘍處理;避免陽光紫外線
- 穿戴彈性衣
- 持續復健治療
- 適當的心情舒解
 - 心理調適及治療, 社會參與
- 定期回診



Skin abscess/carbuncle



壞死性筋膜炎(Necrotizing fasciitis)

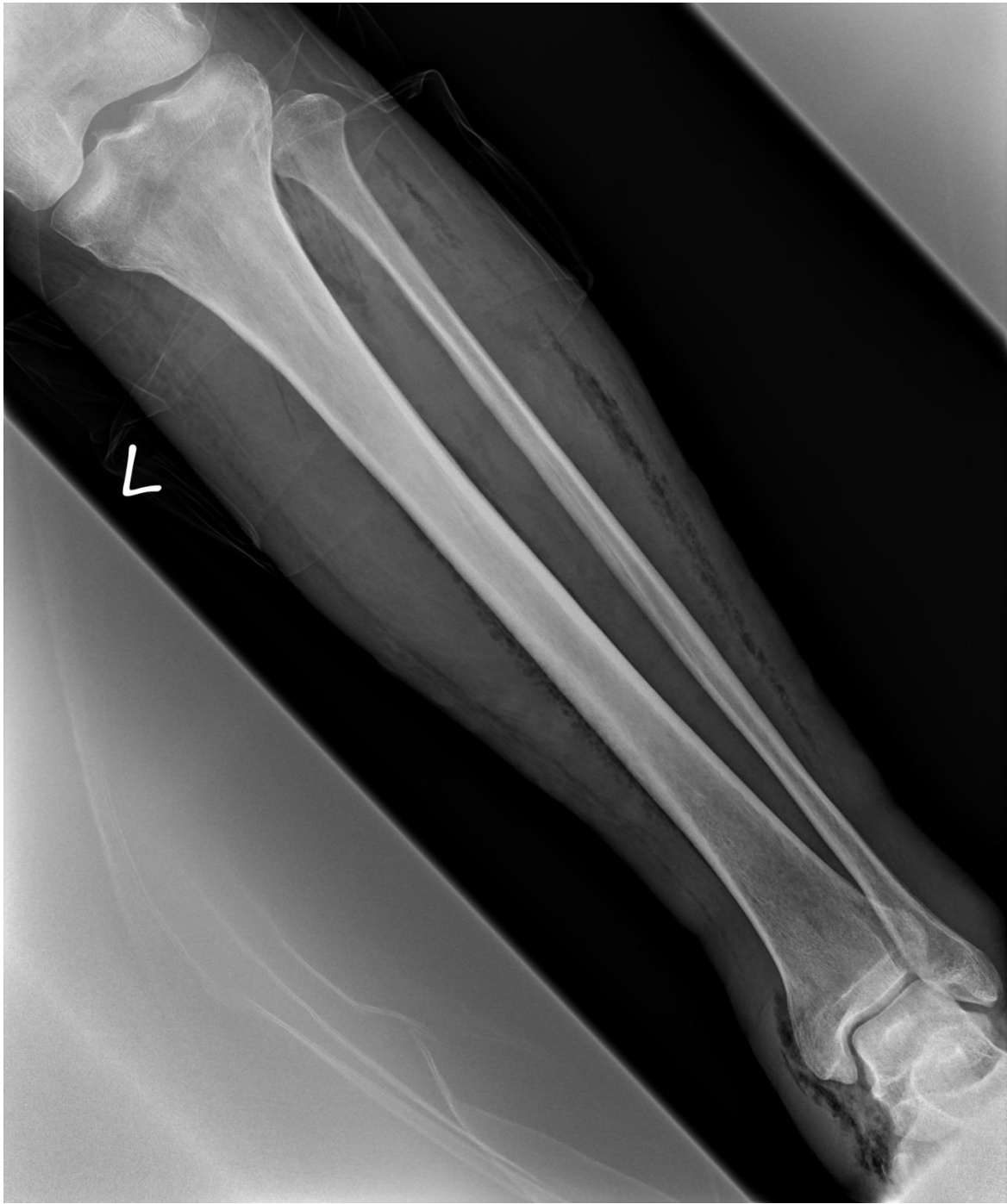




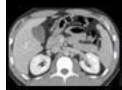


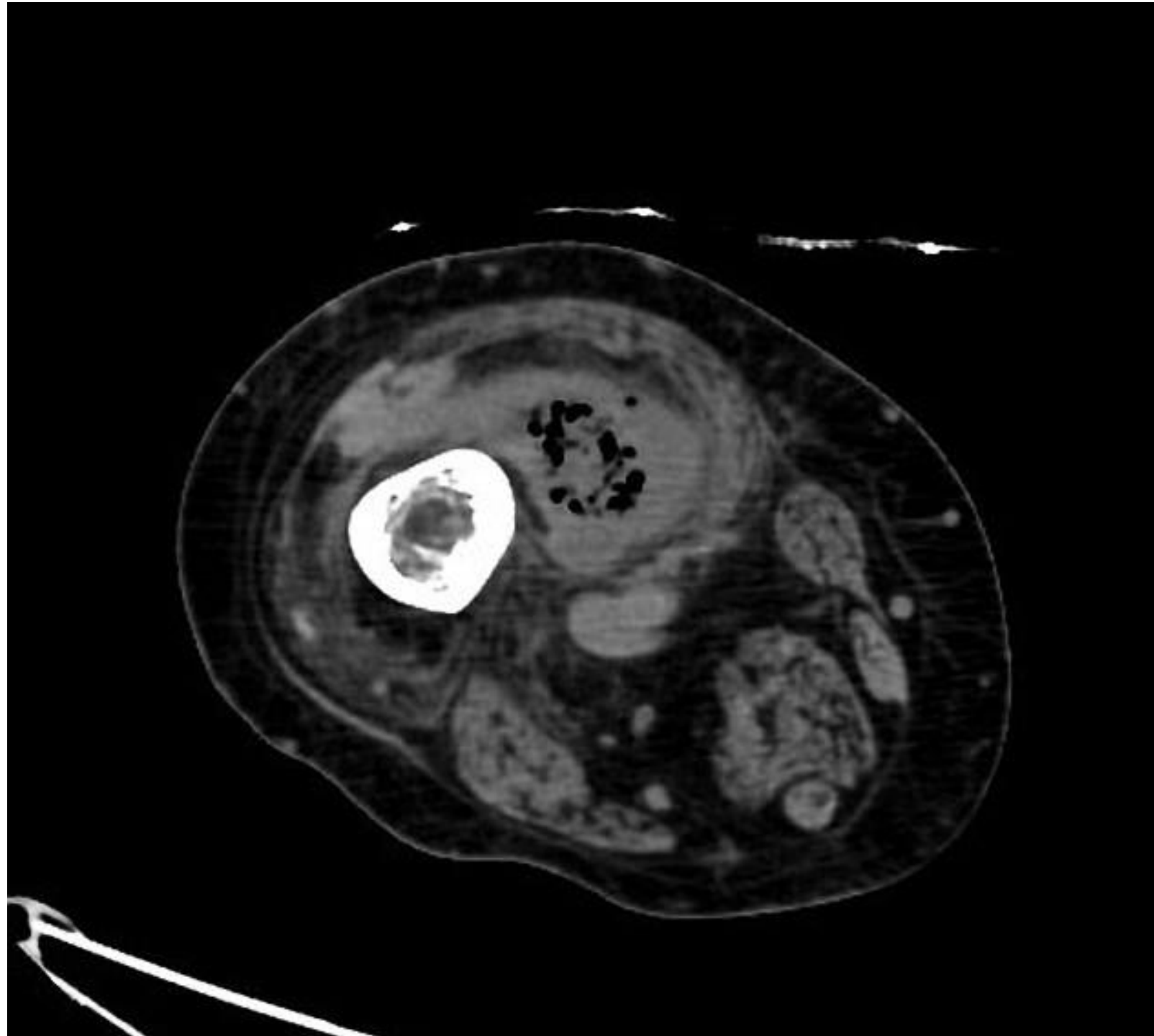


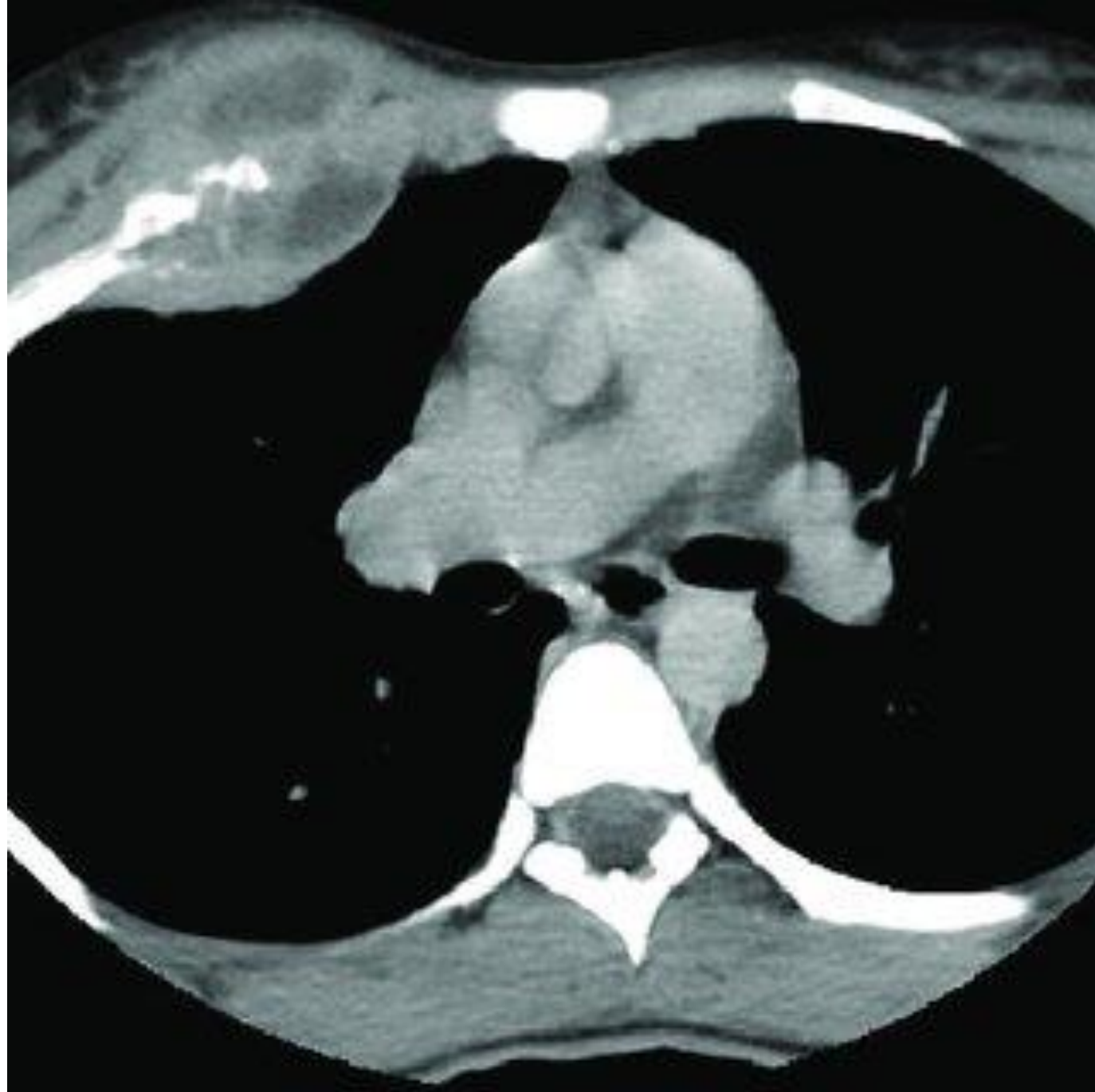












Fournier Gangrene



Introduction of KAFGH

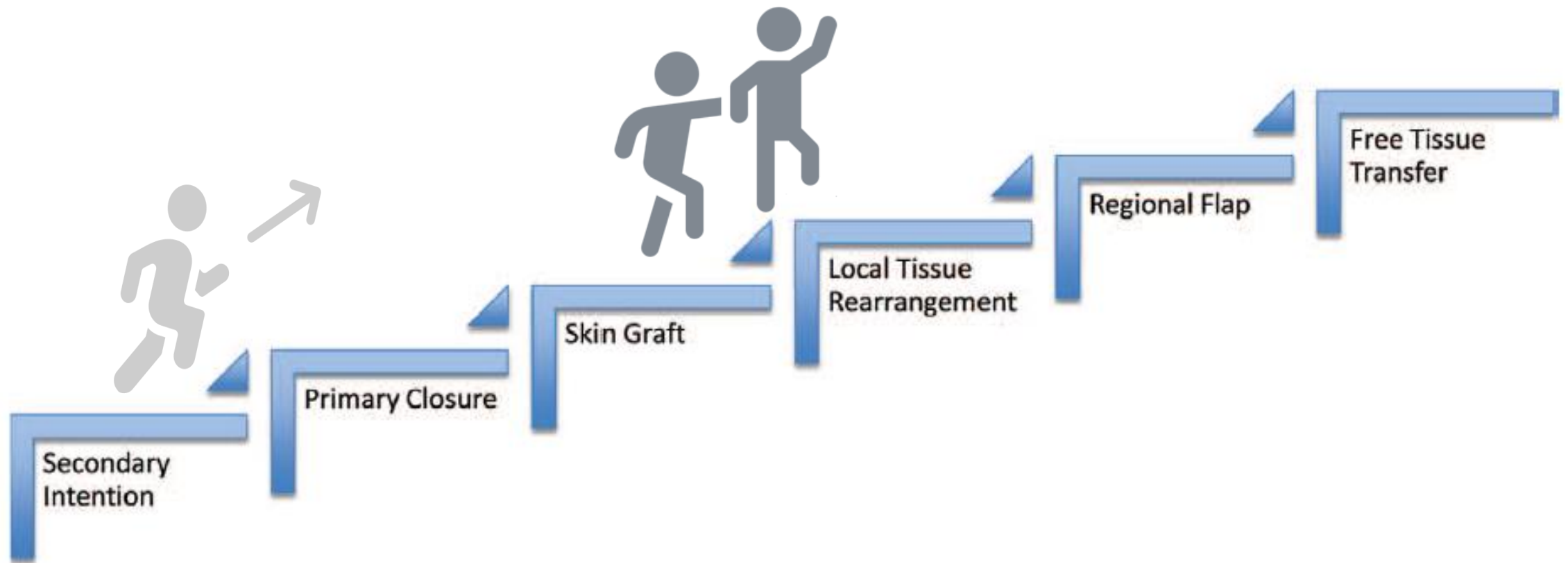
Wound Management
Concept

Wound healing and wound
hygiene

Role of different Dressing

Choose the Mr. Right

Wound Management Concept



Traditional Reconstruction Ladder

New Reconstruction Ladder

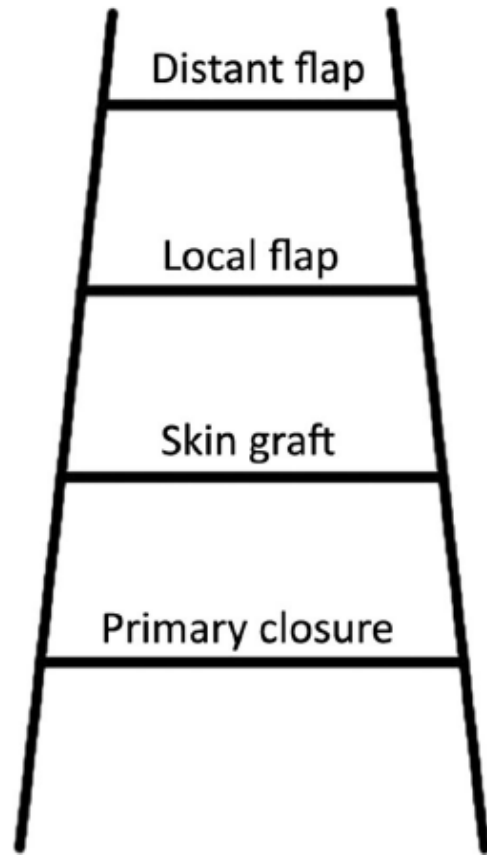


Fig. 1. An early version of the reconstructive ladder.

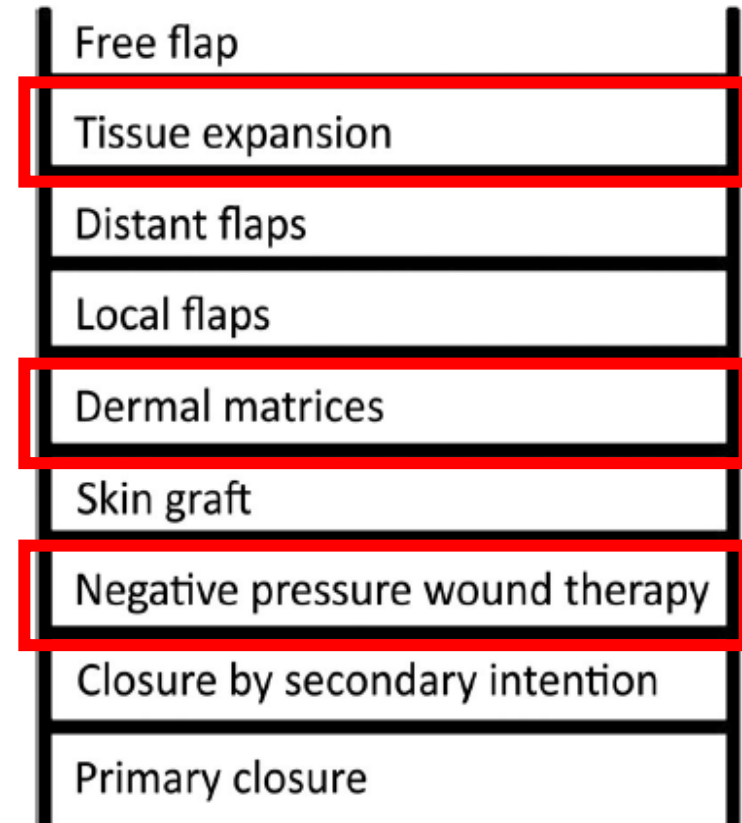


Fig. 8. A new reconstructive ladder incorporating the concepts described in this article.

Reconstructive Ladder Elevator

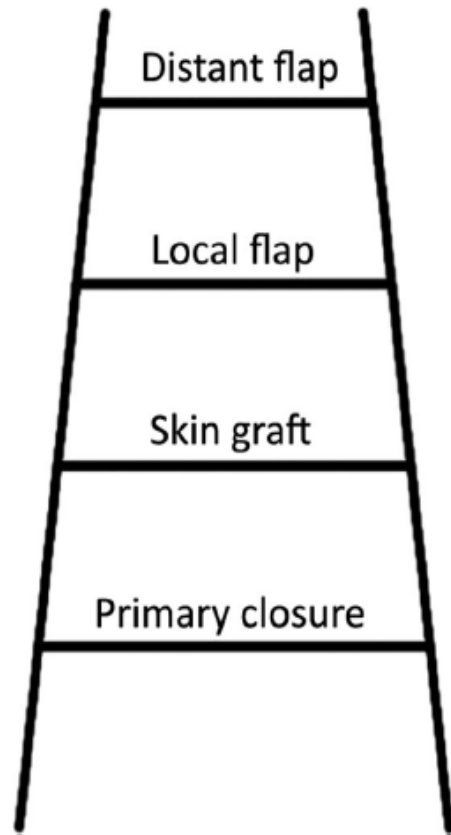


Fig. 1. An early version of the reconstructive ladder.

(*Plast. Reconstr. Surg.* 127 (Suppl.): 205S, 2011.)

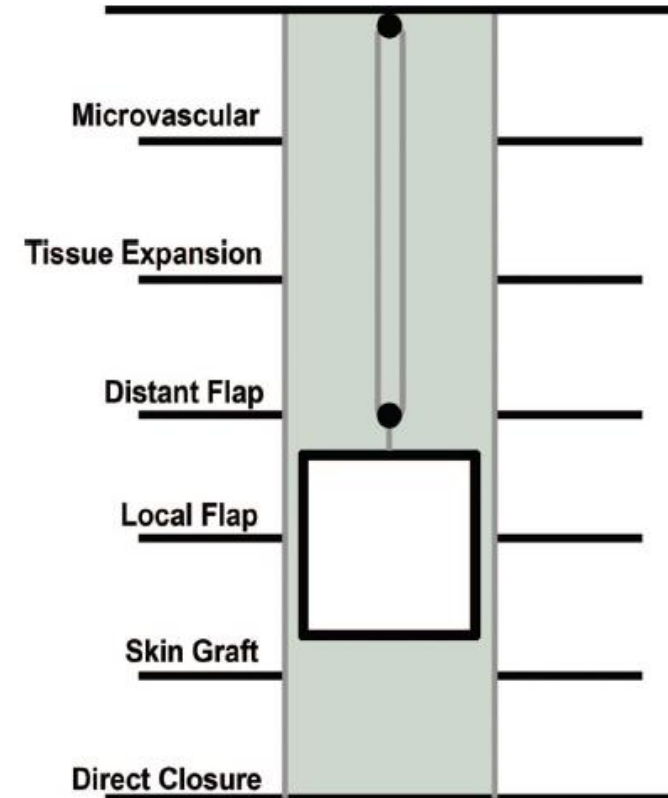
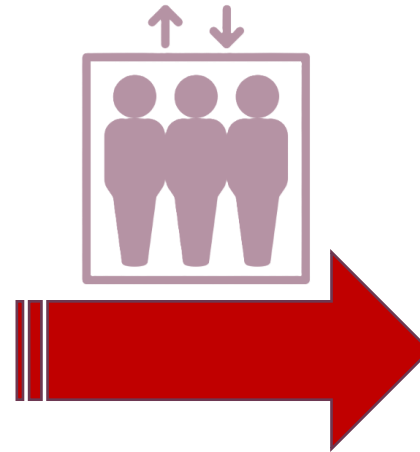
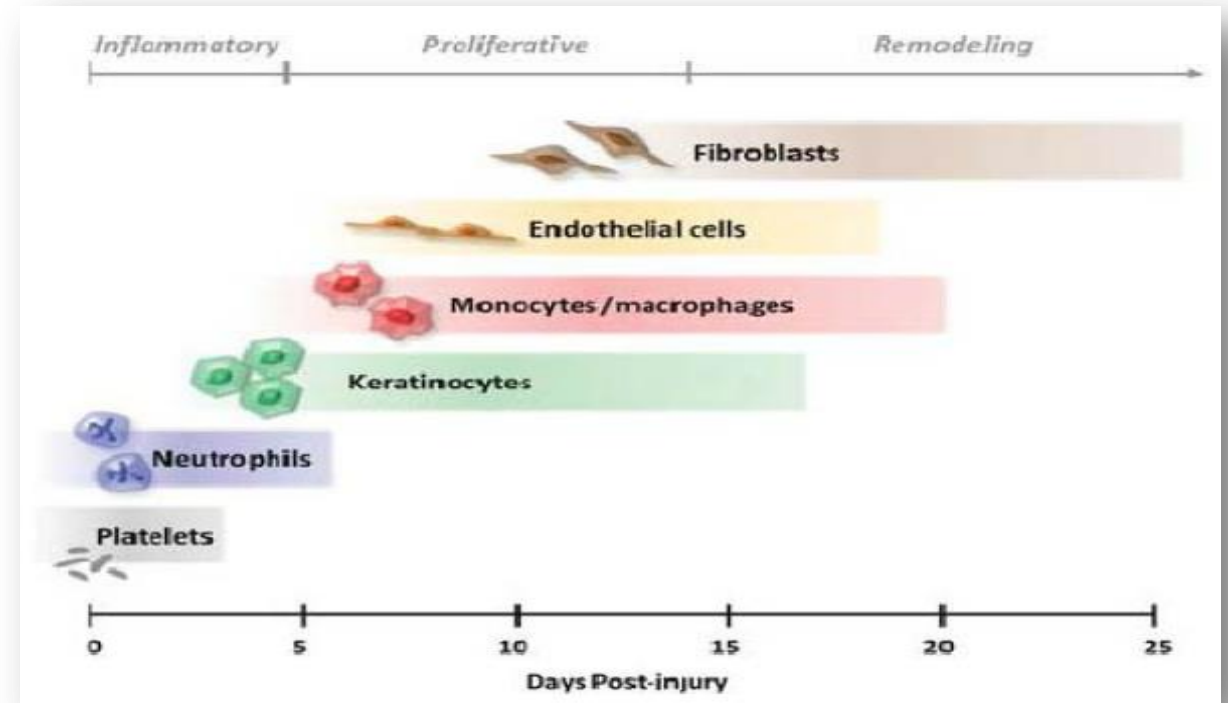
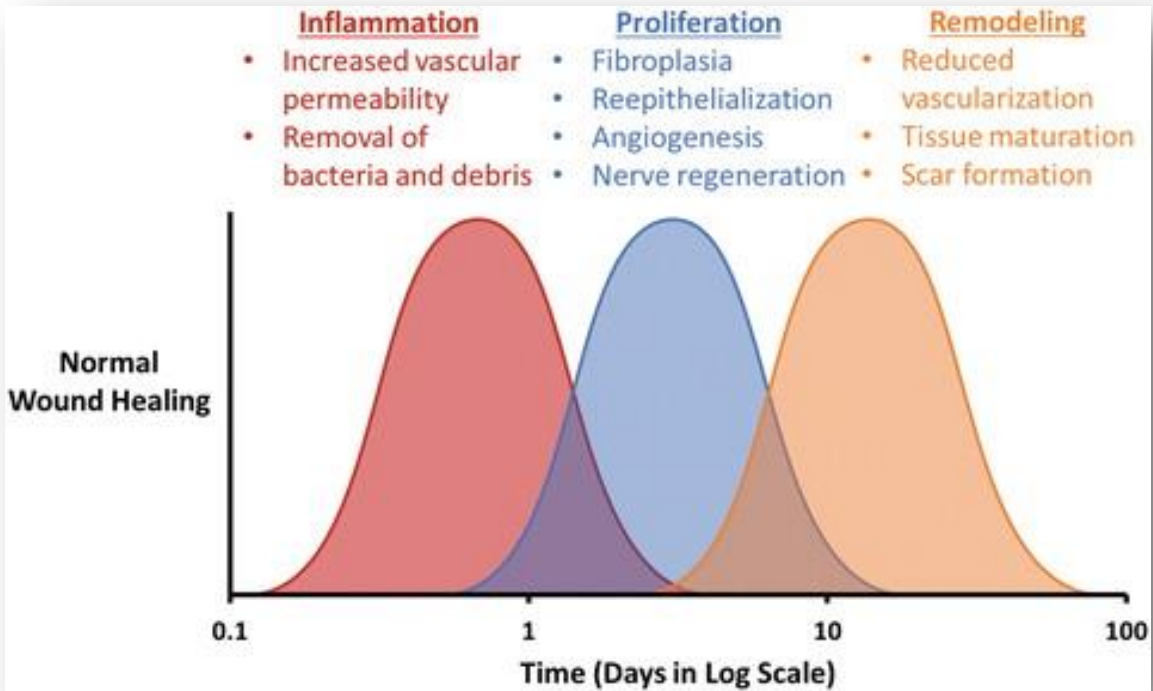


Fig. 3. The reconstructive elevator, as proposed by Gottlieb and Krieger. This formulation emphasizes the importance of selecting the most appropriate level of reconstruction as opposed to defaulting to the least complex. (Reprinted from Gottlieb LJ, Krieger LM. From the reconstructive ladder to the reconstructive elevator. *Plast Reconstr Surg.* 1994;93:1503–1504.)

Wound Healing



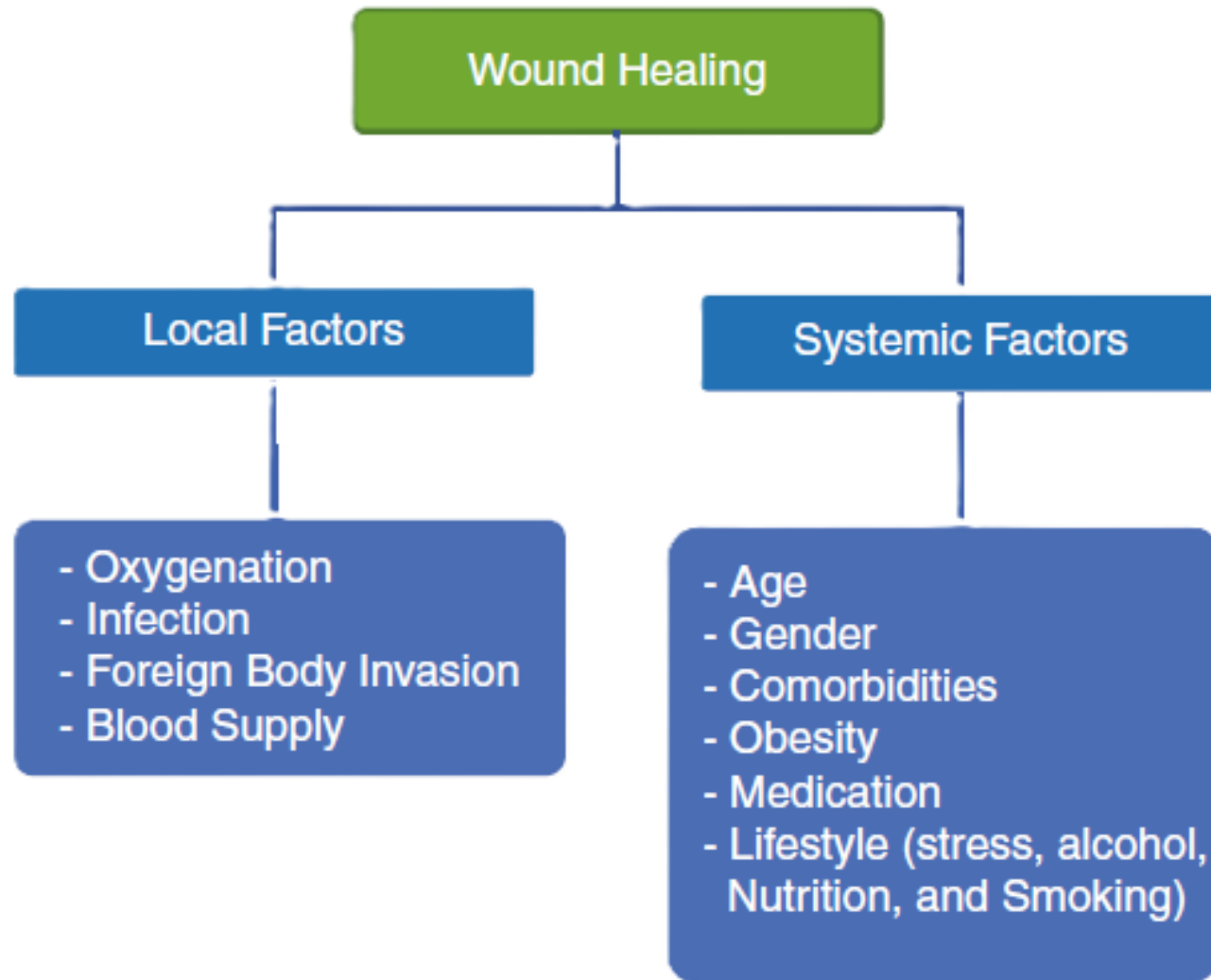
Wound Healing Phases

Table 1. Factors that may prevent a wound from progressing

Systemic inhibitors of wound healing	Local inhibitors of wound healing	Normalisation of wound healing
• Venous insufficiency (venous hypertension) • Diabetes mellitus (acute and long-term complications) • Nutritional deficiency • Inflammation (autoimmune disease, immunosuppression) • Carcinogenesis (progression from wound healing to cancer) • Arterial insufficiency	• Excessive protease levels (MMPs, PMN elastase) • Growth factor inactivation/matrix destruction • Aberrant local inflammation (M1/M2 dominated inflammation, oxidative stress) • Missing angiogenesis/granulation tissue formation/epithelial cell migration • Nutrient/oxygen deficiency • Persistent trauma	• Angiogenesis • Granulation tissue formation • Epithelial cell migration • Normalisation of inflammation • Change of the microenvironment towards normal healing



Factors prevent from healing progressing



Factors affect healing

TISSUE

← VIABLE (PROTECT)

NON VIABLE (DEBRIDE) →

Epithelial

Granulating

Slough

Necrotic

MOISTURE/ EXUDATE

← ABSORB MOISTURE

CONTRIBUTE MOISTURE →

Too wet/ macerated/
excoriated

Too dry/ eschar

INFECTION/ INFLAMMATION

← CLEAN

DEBRIDE

TOPICAL
ANTIMICROBIAL

SYSTEMIC
MEDICATIONS →

Contamination

Colonisation

Local
infection

Systemic
infection

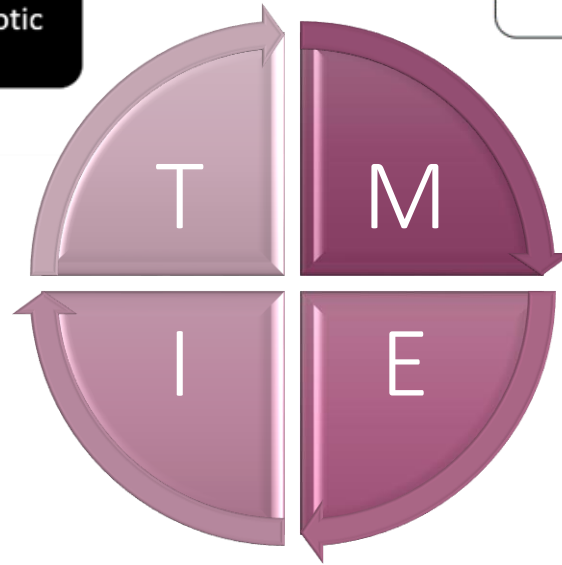
EDGES

← HEALING

REASSESS RISK FACTORS →

Advancing

Not advancing



Evolving the notion of Wound Hygiene

常見傷口組織類型

黑

壞死組織

傷口床組織和細胞缺血造成的，也可能因感染而出現。黑色/棕色，具有硬/乾/像皮革或柔軟/濕，可以牢固或鬆散地附著在傷口床上。



黃

腐肉

傷口床上的黃色/白色物質。可能出現在傷口表面的厚斑塊或薄層。



肉芽組織（健康）

外觀呈鮮紅色和鵝卵石狀，應濕潤有光澤。



紅

上皮化

外觀無光澤，淡粉色/白色，非常脆弱。在部分厚度的傷口中，上皮的小島會形成毛囊等結構。



粉

Biofilm抑制上皮生長→傷口不癒合

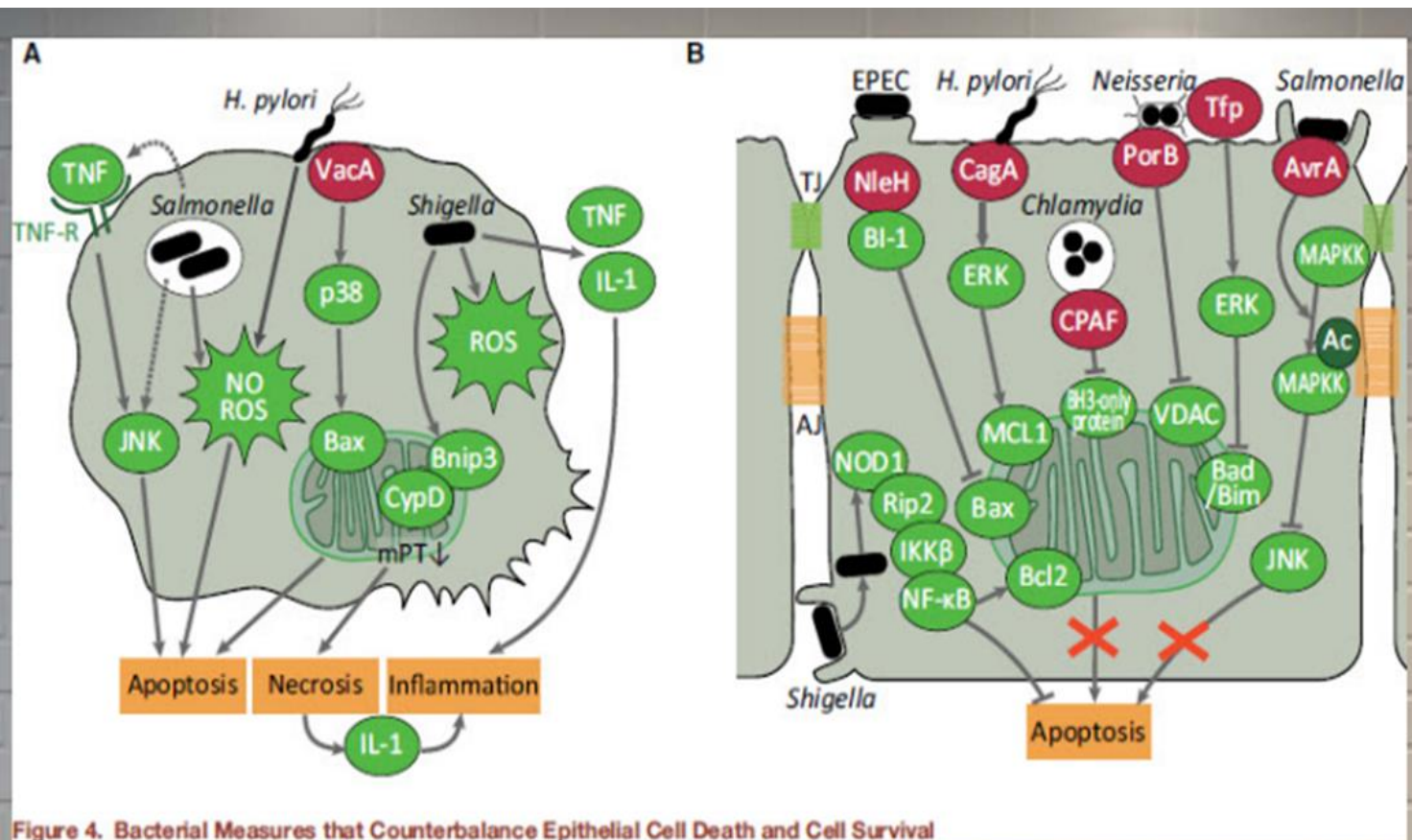
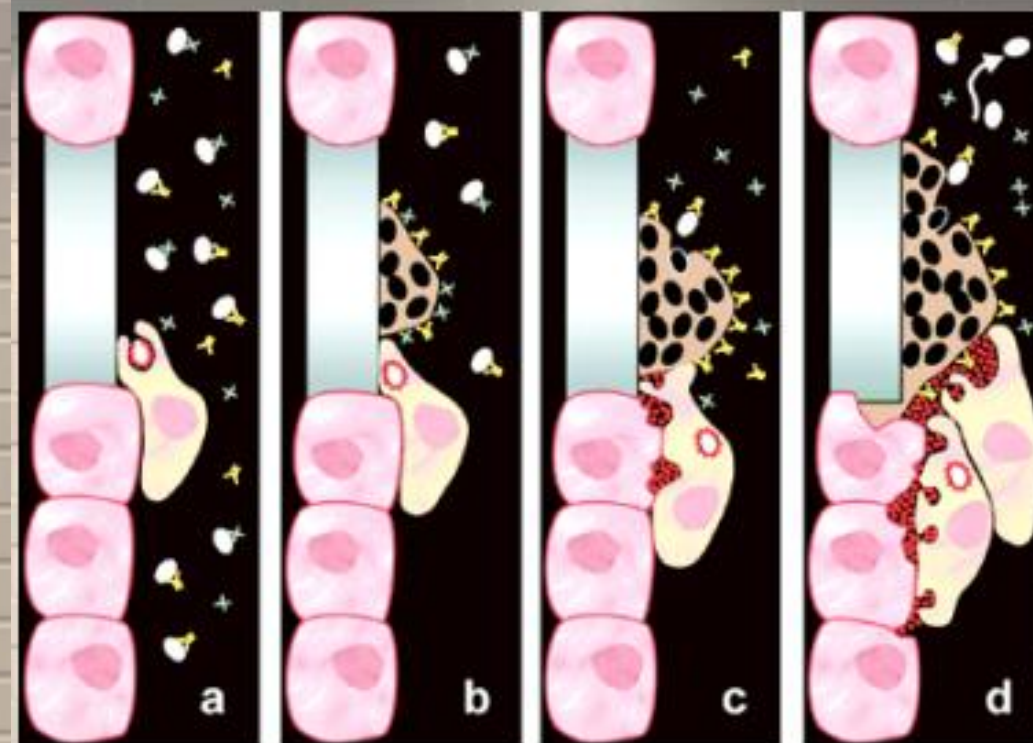
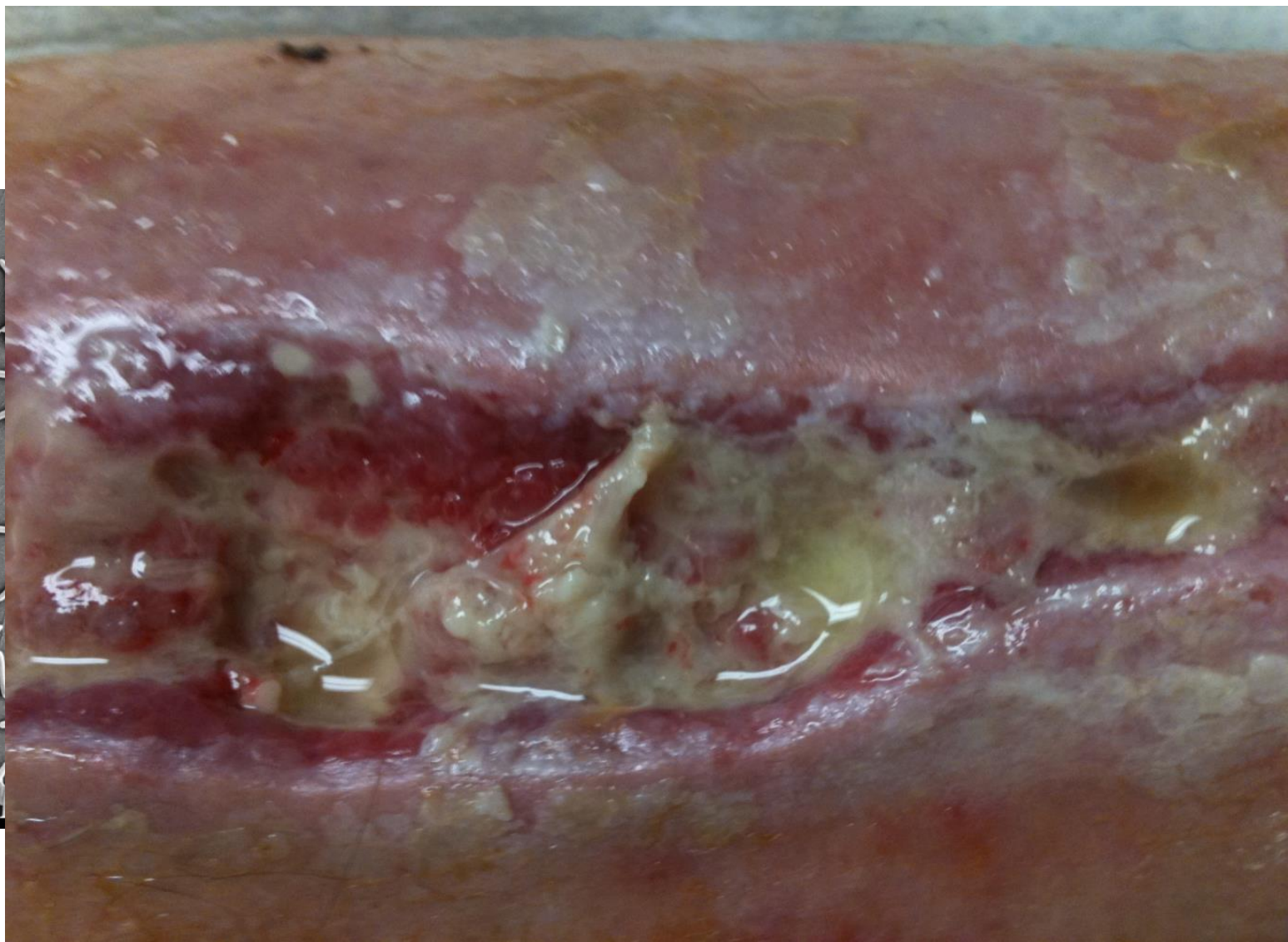
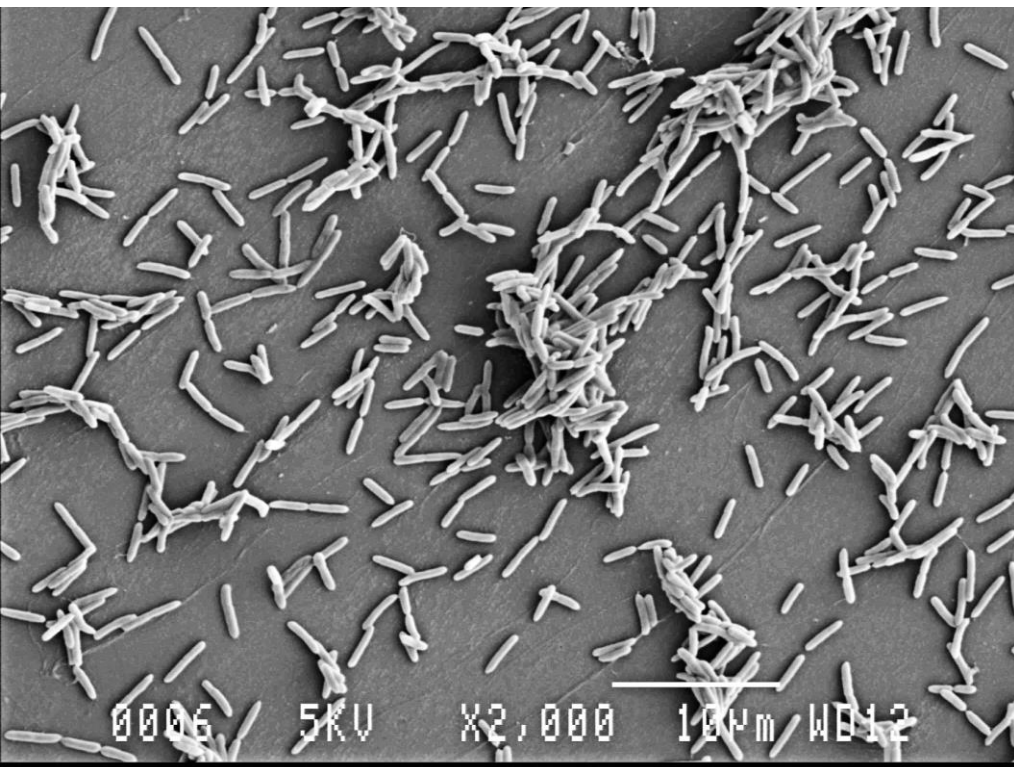


Figure 4. Bacterial Measures that Counterbalance Epithelial Cell Death and Cell Survival

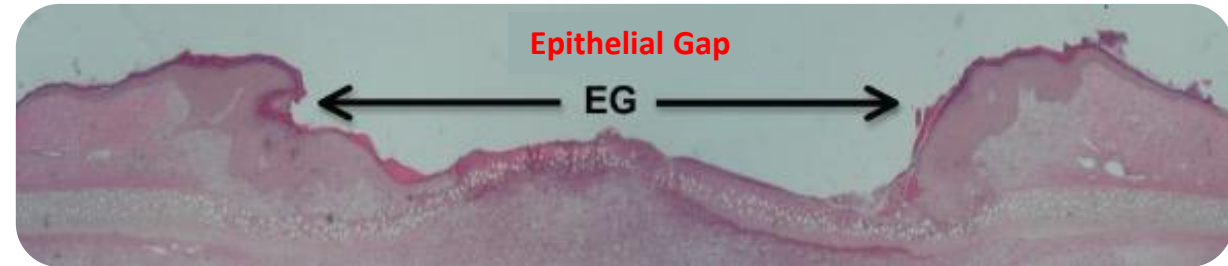
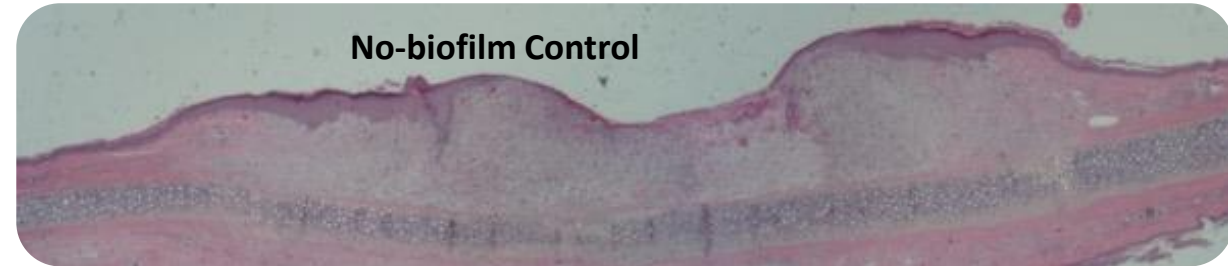
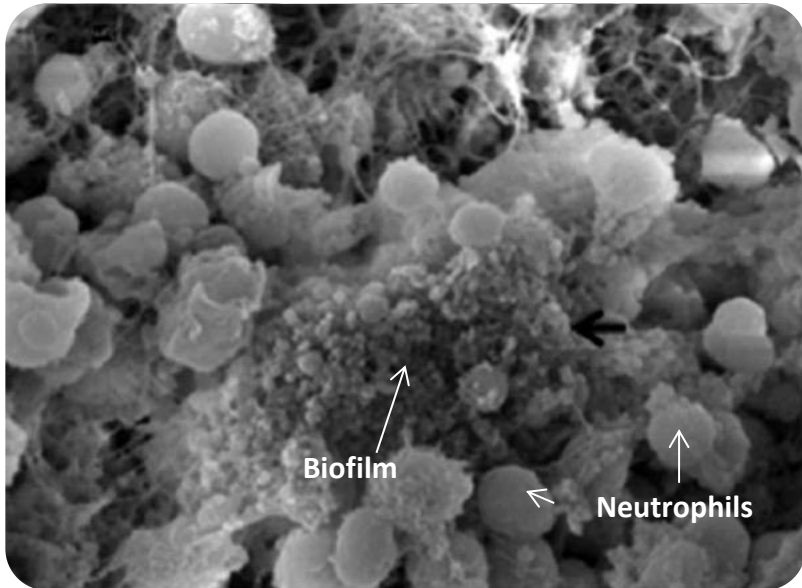
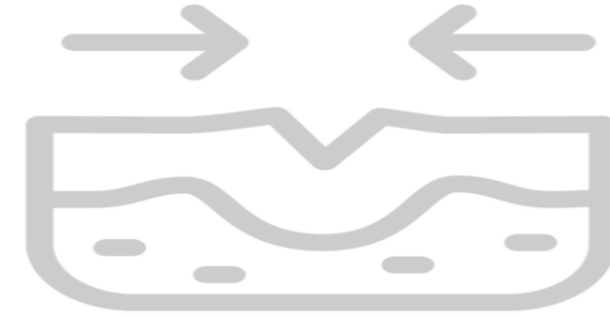


✕ Antibiotic
⚔ Antibody
○ Planktonic cell
● Biofilm cell
🔥 Phagocyte enzymes



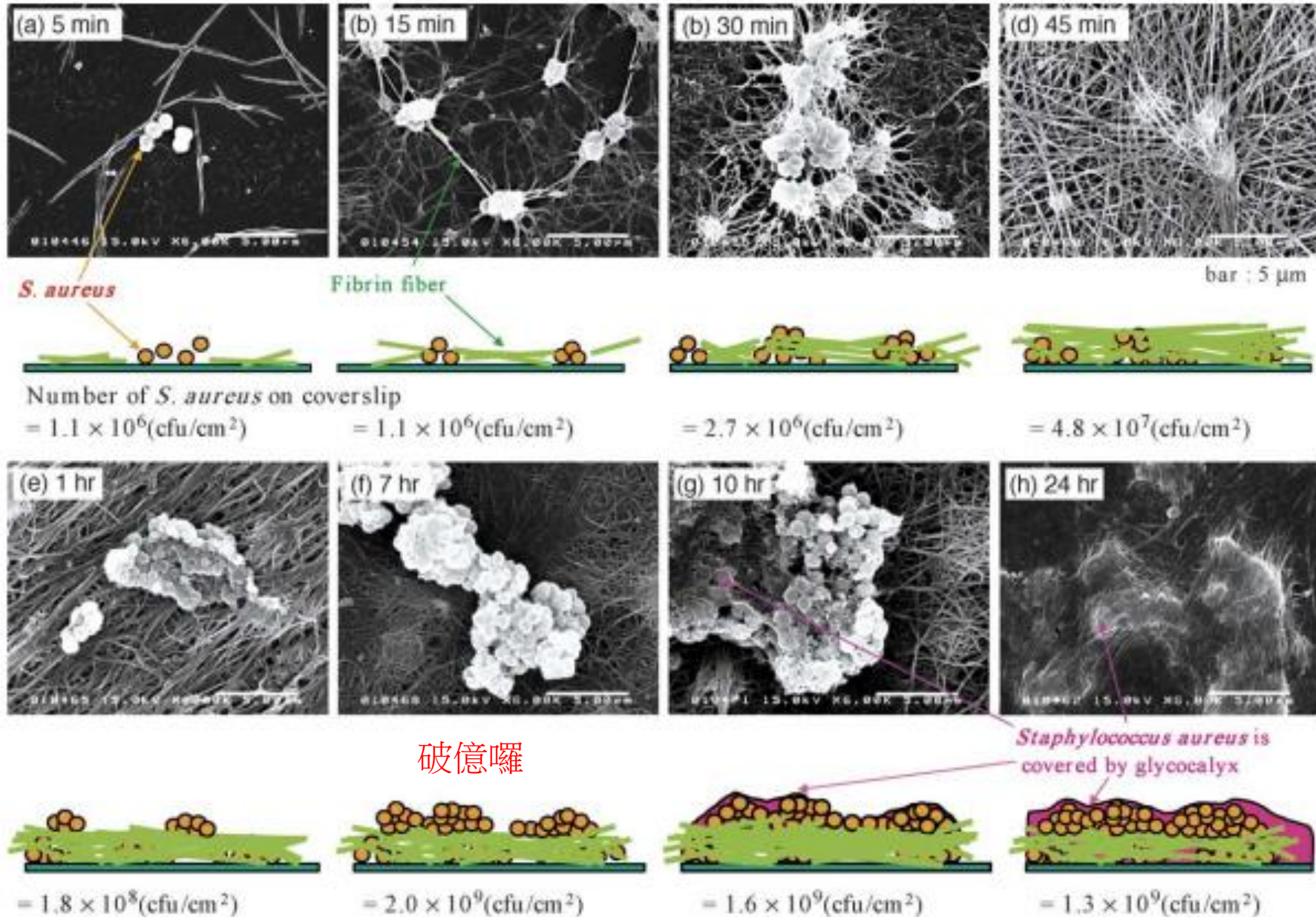
Biofilm Delays Wound Healing

- 生物膜延遲傷口癒合
- 產生持續但輕微的炎症反應
- 損害肉芽組織和上皮形成



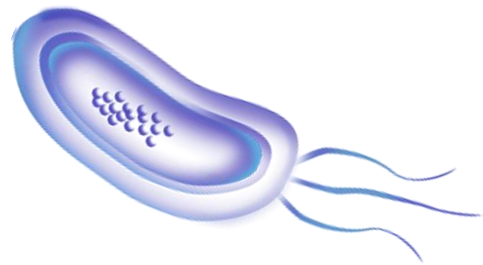
- 嗜中性白血球聚集在生物膜周圍，但不能穿透和殺死生物膜相關微生物²

Biofilm比你想像的要勤奮努力

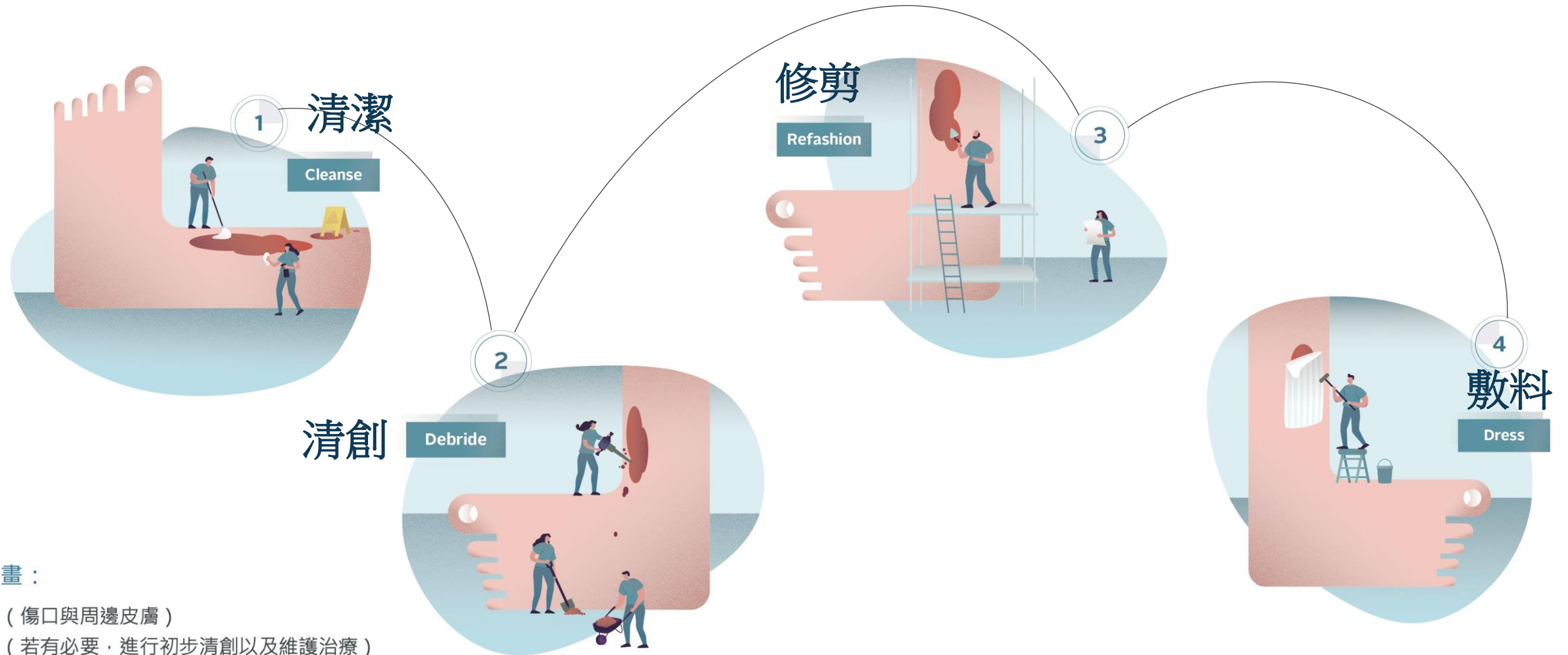


Biofilm is Associated with Wound Chronicity

- 使用抗生素治療局部或全身性感染後, 一旦停藥, 會又再復發
- 具有抗生素治療失敗病史或是持續性發生感染
- 傷口有大量滲出液
- 新生肉芽組織品質差
- 表面具易移除**不透明薄膜**
- 就算是高度懷疑已感染但即便是培養也是**陰性反應**



Wound Hygiene 傷口衛生



四步驟計畫：

1. 清潔 (傷口與周邊皮膚)
2. 清創 (若有必要，進行初步清創以及維護治療)
3. 重塑 (傷口邊緣)
4. 敷料 (傷口做生物膜為標的之處置 (或抗生物膜療法) 與預防處理)

傷口護理的概念，促進困難癒合傷口之癒合

A set of four steps that should be carried out **at every dressing change until the wound has fully healed**

Moisture

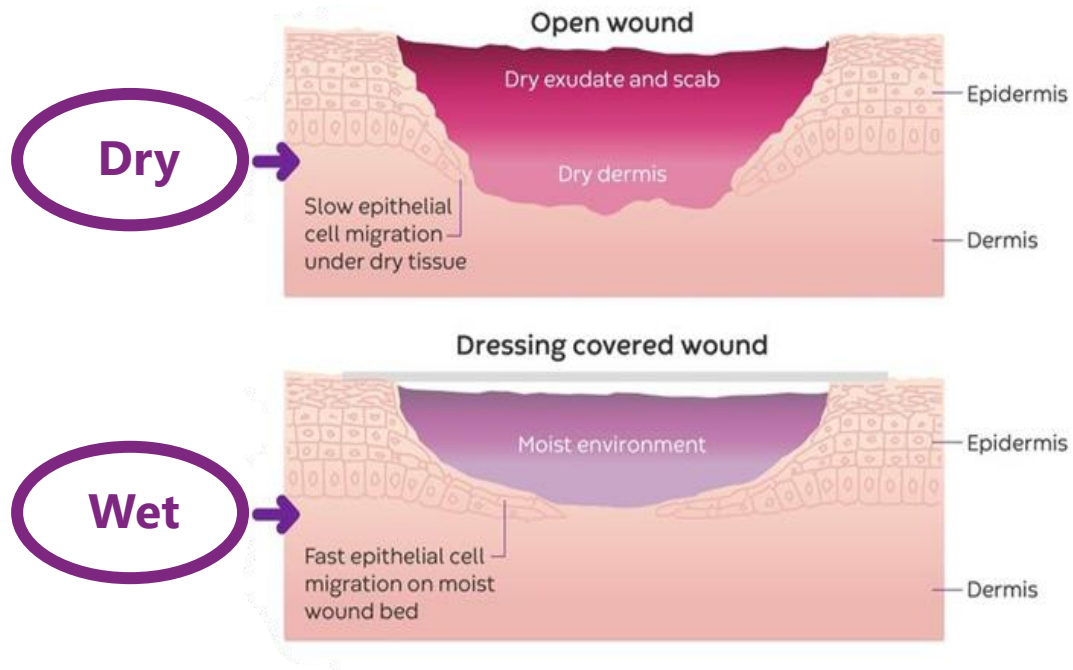


Table 1. Benefits of moist wound healing

Faster wound healing ^{26,85,86}

Promote epithelialisation rate ^{26,87-93}

Promote dermal/wound bed healing responses, e.g., cell proliferation, extracellular matrix synthesis ^{51,93-100}

Reduces scarring ¹⁰¹⁻¹⁰⁶

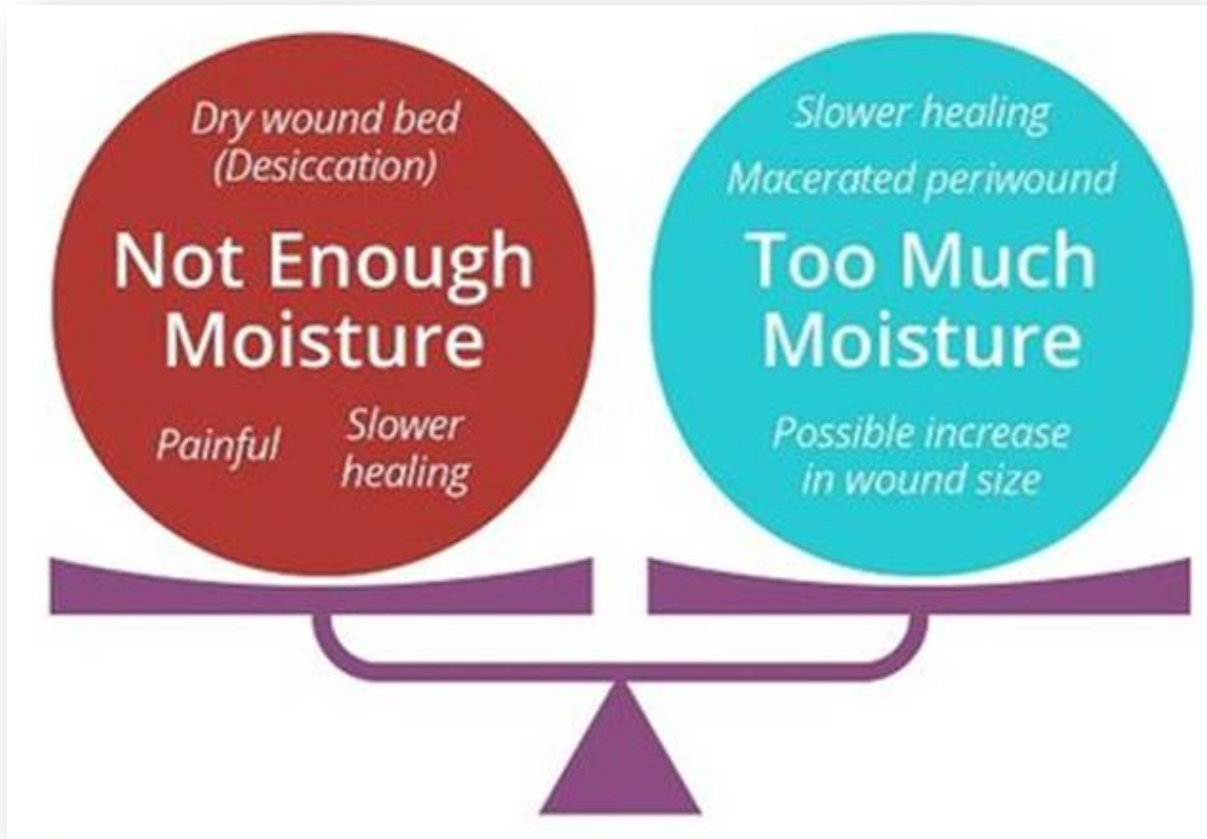
Retention of growth factors at wound site ^{51,53,96,107-109}

Lower wound infection rates ³³⁻³⁵

Reduces pain perception ¹¹⁰⁻¹¹⁵

Enhances autolytic debridement ^{116,117}

Moisture





Wound Dressing And Its Role In Wound Care

護理師過勞又低薪爆出走潮！「薪情差」全是健保的錯？

顏睿陞 張志炆、劉彥萱

2023年10月31日

疫後護理人力荒遲遲未解，讓護理人員出走的原因，除了醫院工作採「三班制」，使得日夜顛倒生活作息大亂之外，主要原因就是薪水太低，雖然衛福部近日宣布將補助醫院護理師「夜班費」，但大多護理表示不認同，認為只提供夜班護理師津貼，將造成白班人力短缺，盼政府改善的是整體的薪資環境。



圖 / TVBS

萬芳醫院護理師朱儀臻：「阿嬤我們來吃藥了喔。」

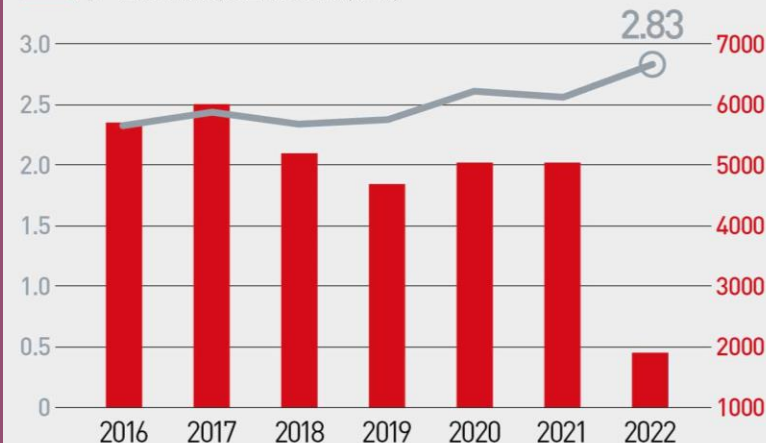
在萬芳醫院內科病房工作的朱儀臻，擁有12年的護理師經驗，從一早替病人發藥，量血壓協助醫師查房，還有龐大的行政工作，責任重壓力大，每日工時超過八小時是常態，

護理人力短缺

? 供給不足

護理師成長趨緩，每年超過2萬人離開

— 護理師公會當年退會人數(萬人)
— 淨增加執業會員數(人)



註：護理人員法第10條規定，護理人員非加入所在地護理人員公會，不得執業
資料來源：中華民國護理師護士公會全聯會

護理科系招不滿，註冊率掉到八成

近6學年度護理科系平均註冊率(%)



註：包含大學、四技、二技、專科護理科系 資料來源：教育部

? 供給不足

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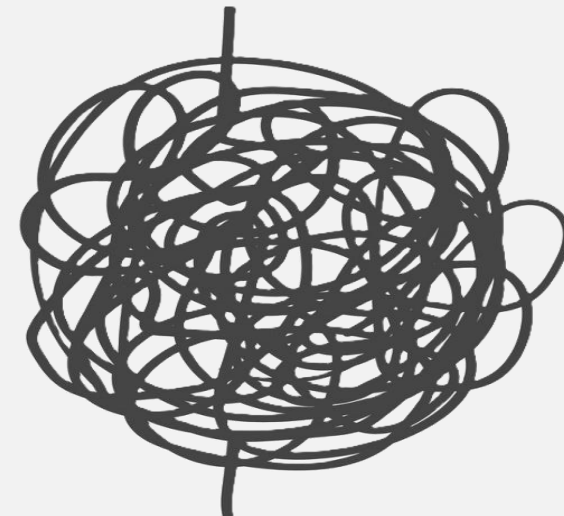
天下雜誌
CommonWealth
Magazine

護理人力短缺

Complex



Simple



Dressing and Wound Care Pain

——只有傷過痛過

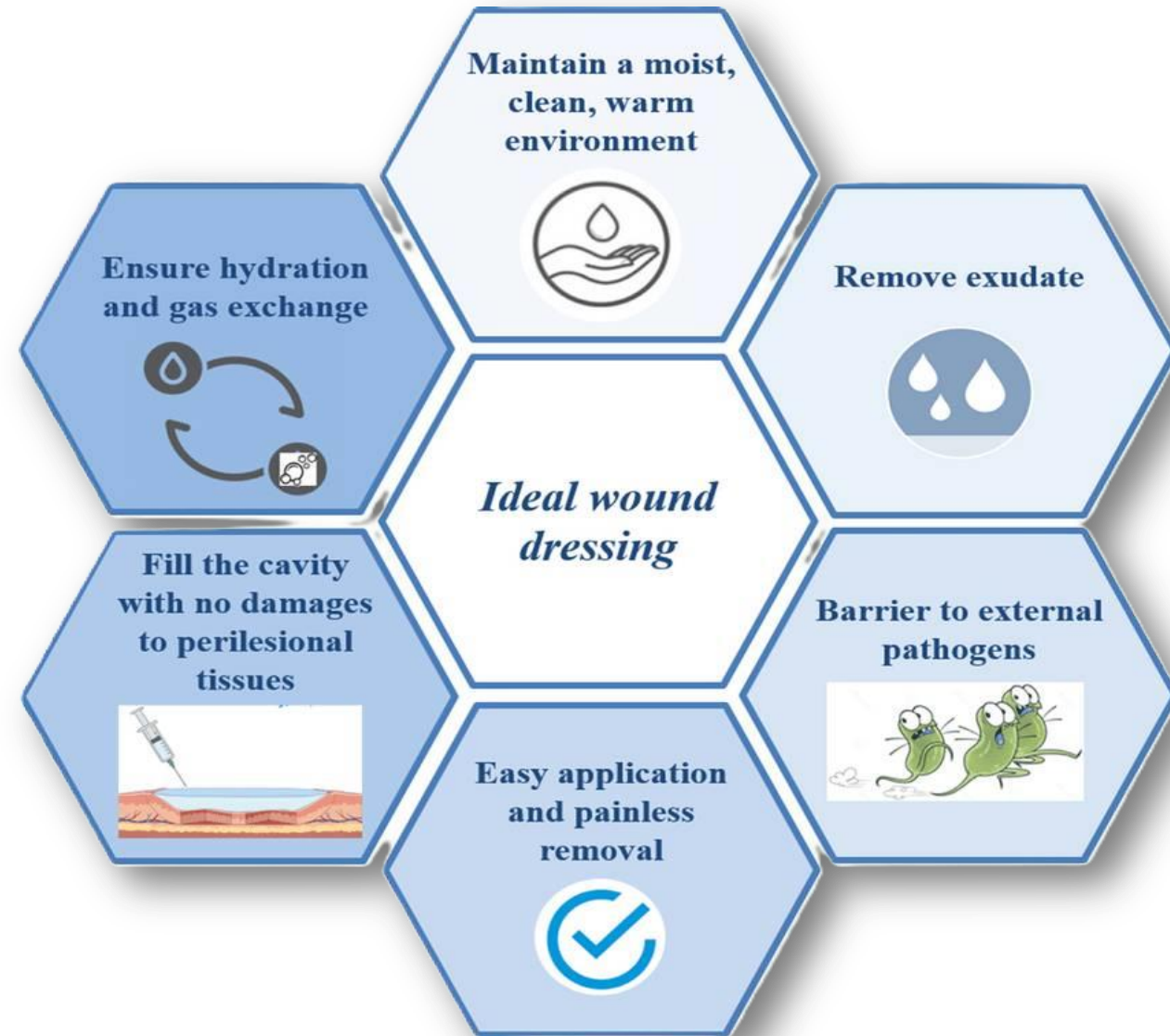
傷口換藥之主要步驟為移除敷料、清潔或灌洗傷口、填塞、覆蓋以及固定敷料。紗布敷料於吸收滲液後乾燥硬化、易沾黏於傷口，此外新生肉芽組織亦可能長入敷料之網狀間隙致敷料沾黏於傷口。移除敷料時，如用力移除沾黏於傷口的敷料，可能產生剪力致組織受損引發疼痛。研究顯示：在臨床人員的換藥經驗中，病患於移除敷料時最痛，敷料黏附於傷口是導致換藥時傷口疼痛之最主要因素，而紗布是在換藥時最常造成疼痛的傷口敷料（Kammerlander & Eberlein, 2002; Moffatt, Franks, & Hollinworth, 2003）。

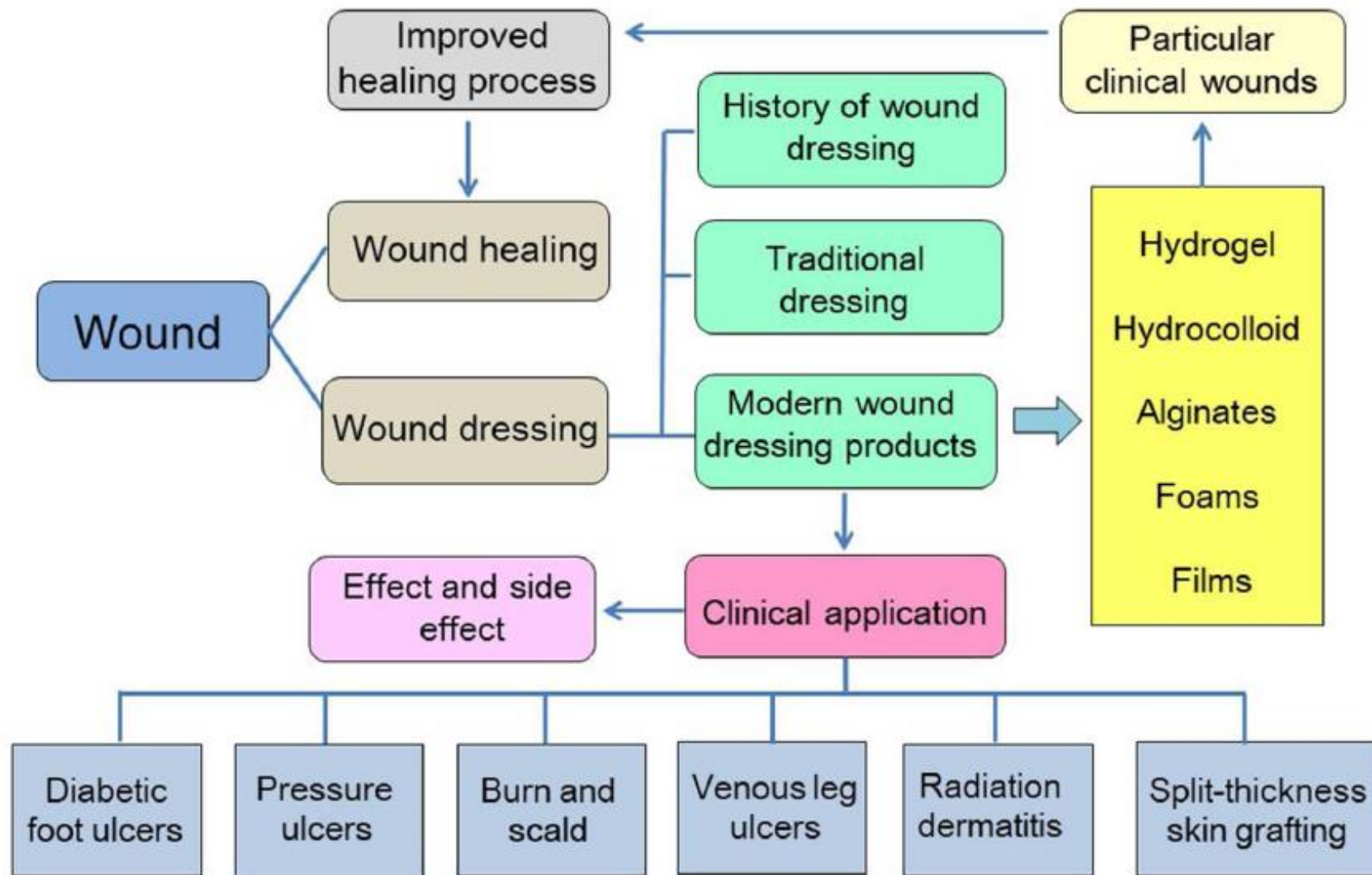


Ideal Wound Dressing

Turner's criteria:

1. It should be non-adherent to wound bed.
2. It should be impermeable to bacteria.
3. It should maintain moist wound environment.
4. It should be absorbent.
5. It should be non toxic, non allergenic.
6. It should require minimal change of dressings.
7. It should be cost-effective with long self-life.
8. It should be easy to apply and remove.





SCHEME 1 | Schematic depiction of the content of this article.



滲液量



壞死組織

- ✓ 提供濕潤
- ✓ 傷口清創
- ✓ 去除痂皮



- Hydrogel
- Hydrocolloid
- HydroClean

傷口感染

DESIRED CLINICAL OUTCOMES

- ✓ 抑制細菌
- ✓ 滲液處理
- ✓ 預防浸潤
- ✓ 減少味道



- Foam
- Superabsorbent
- NPWT
- Alginate/ Hydrofiber

黃色腐肉

- ✓ 滲液處理
- ✓ 預防浸潤
- ✓ 提供自體清創



肉芽增生

- ✓ 促進上皮增生
- ✓ 預防浸潤



- Foam
- Alginate/Hydrofiber
- NPWT
- Collagen based

上皮移行

- ✓ 保護傷口床及周圍皮膚
- ✓ 提供適合的濕潤，促進癒合



- Hydrogel
- Hydrocolloid
- Collagen based
- Film

Hydrogel

- Moisturizing
- Remove necrotic tissue
- Fit to dead space
- Need 2nd dressing



"健鑫" 含銀凝膠傷口敷料(30ppm)

Hydrogel

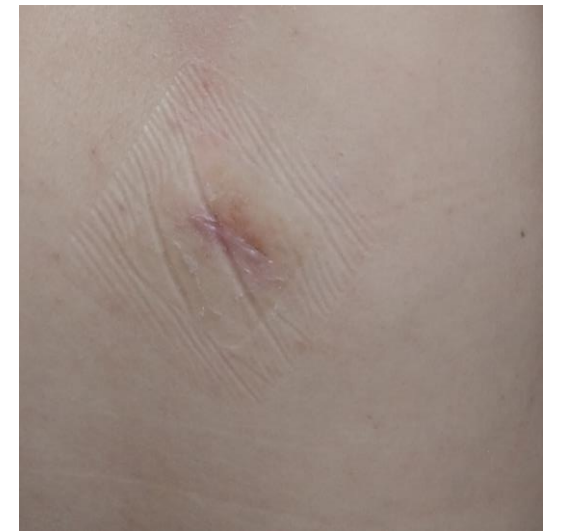
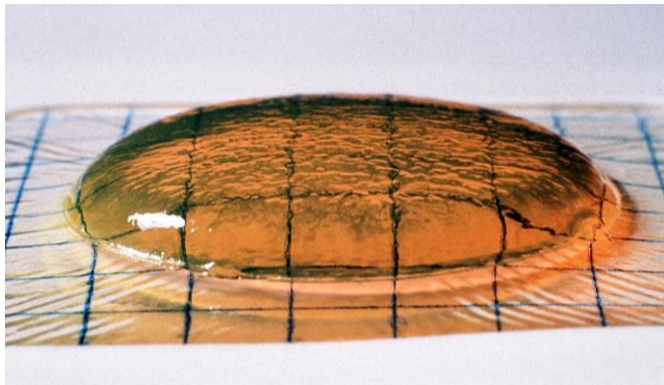
- 69 y/o, Woman , DM, Burn injury , poor wound healing for one month

Rx: Duoderm gel +Foam



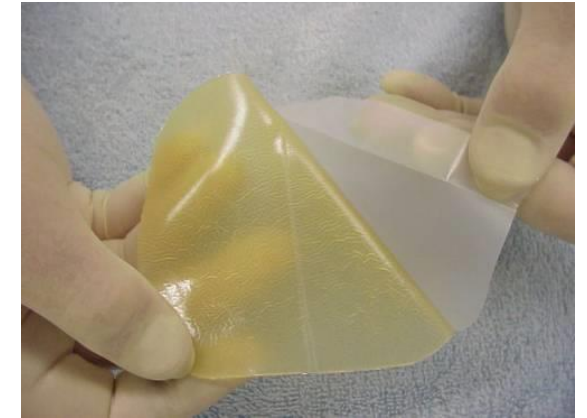
Hydrogel

- Moisturizing
- Mild compression



Hydrocolloid

- Hydrogel mixed with synthetic rubber and sticky materials
- Moderate exudate absorption
- Low adhesive, less pain
- Provide moisture environment



Hydrocolloid



受傷「貼人工皮」竟潰爛！醫曝「NG處置」：抹雙氧水更母湯



真的是這樣嗎



ETtoday新聞雲

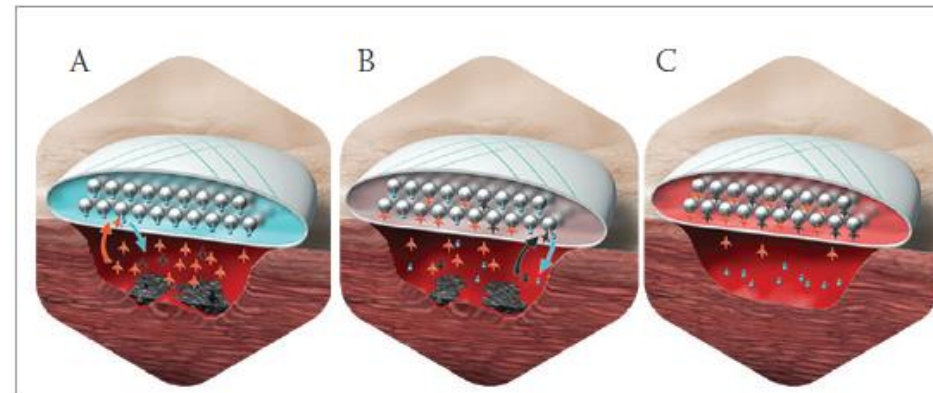
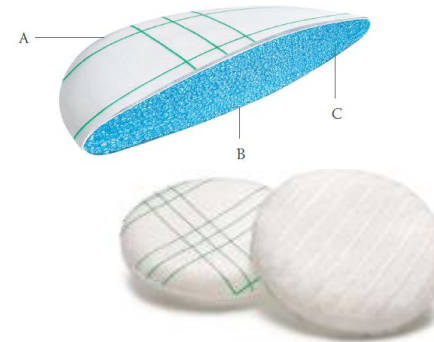
▲三種不同傷口處置方式比較圖。(圖 / 亞大醫院提供)

Hydro-Responsive

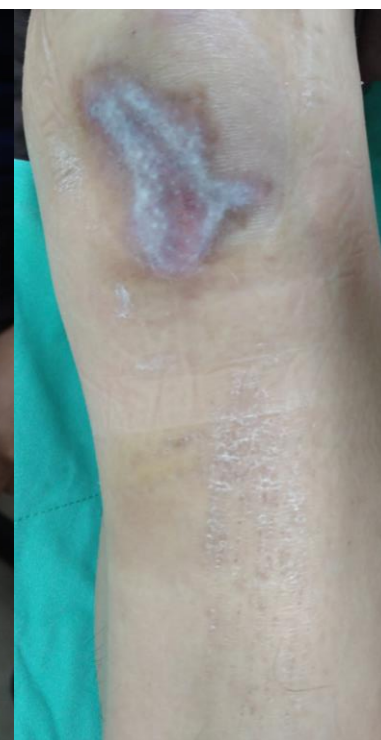
- Superabsorbent polyacrylate (SAP) wound dressing+ PHMB + Ringer's solution
- Soften necrotic tissue/ slough
- Donate moisture and absorb exudate
- Effective method for promoting autolytic debridement, wound cleansing, wound progression to healing

Table 1. Summary of how the hydro-responsive dressing has evolved from 1995 to date

Product	TenderWet®	TenderWet 24	HydroClean	HydroClean plus
Pre-moistened SAP			Yes	Yes
PHMB included				Yes
Duration of use (h)	12	24	24	72
On the market	1995	1999	2004	2011
Notes	Now discontinued	Now discontinued	Unavailable in the UK	Currently available in the UK



HydroClean



HydroClean

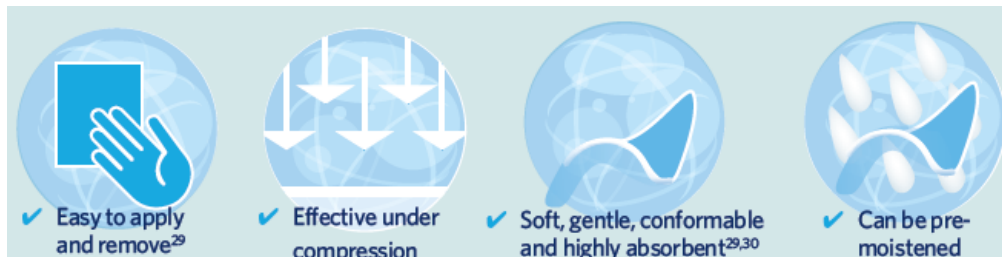


HydroClean

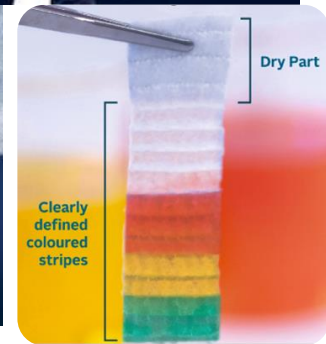


Alginate/Hydrofiber

- Excellent exudate absorption
- Hydrofiber: Lock in technique
- Can cut, fit to shape
- Easy apply and remove



Hydrofiber® Technology at work



Hydrofiber

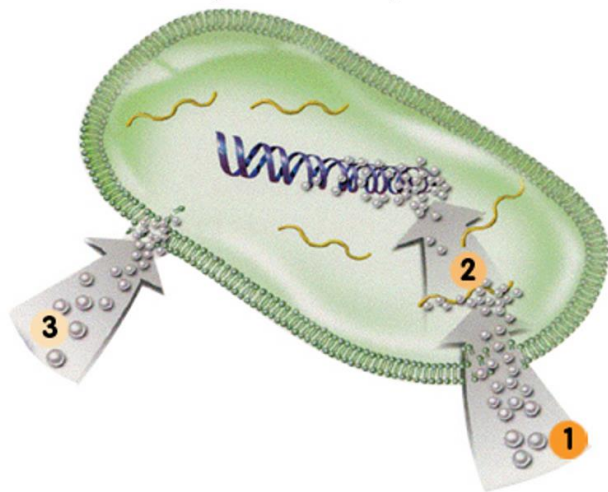


Hydrofiber + Ag⁺



Ag⁺

- 1.inhibiting cellular respiration
- 2.denaturing nucleic acid
- 3. altering cellular membrane permeability



0.135% w/w

BECl

Benzethonium
chloride(四級銨)

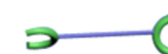


- 介面活性劑,會改變生物膜的通透性,破壞生物膜,幫助銀離子達到殺菌功效



0.39% w/w

EDTA



- EDTA 是一種金屬螯合劑,會幫助銀離子從敷料更有效率移動殺死細菌



1.2%

Ionic Silver



- 能殺死游離的或是由biofilm分泌出來的細菌
- 避免biofilm再生

Aquacel Ag⁺ Extra

58 y/o M Scald burn , 2nd degree ,
3% TBSA



Post OP 4 days
1st dressing change
Aquacel Ag plus



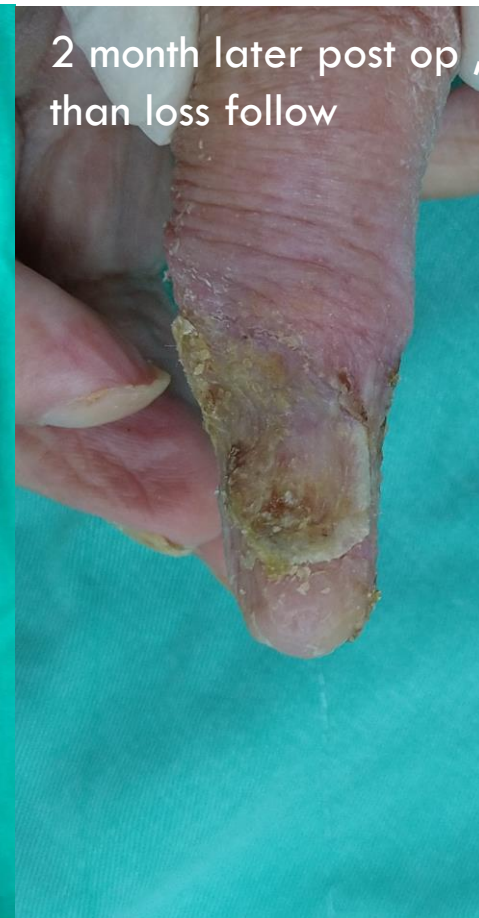
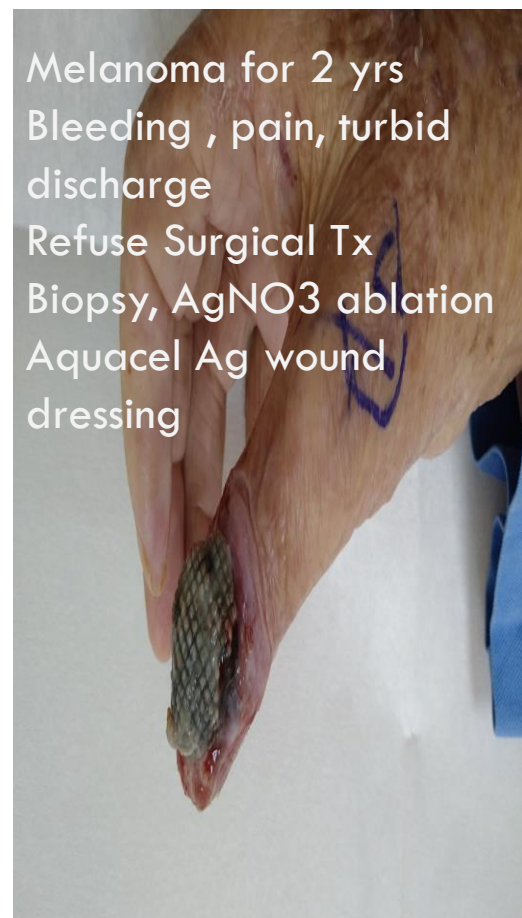
Post OP 8 days
2nd dressing change
Aquacel Ag plus



Post OP 19 days
3rd dressing change
Aquacel Ag plus

Aquacel Ag⁺ Extra

83 y/o M Melanoma on thumb, right
W/C: pseudomonas a.



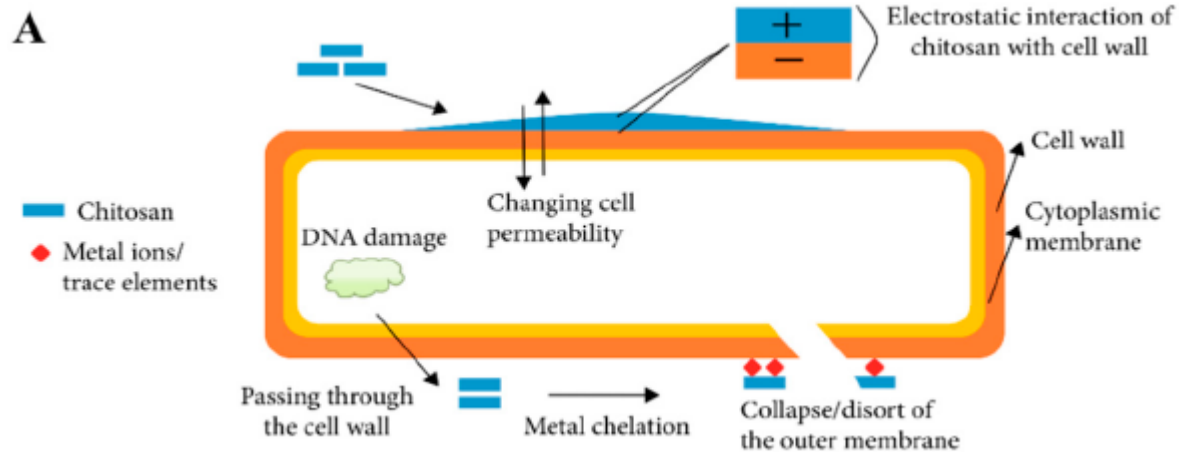
Chitosan

- Moderate exudate absorb
- Antibacterial
- Hemostasis
- Electric chemotaxis



安適康快寧紗布

康力得幾丁聚醣傷口敷料



antibacterial mechanism of chitosan



Hydrocolloid + Hydrofiber

- Moderate to high exudate absorption
- Adhesive
- Provide moisture environment



Foam

- Low to high exudate
- Moist wound environment
- Reduce over/hyper-granulation
- Provide environment for epithelial maturation
- Acute or Chronic wounds



不沾黏傷口 維持濕潤環境 舒適.透氣.低敏

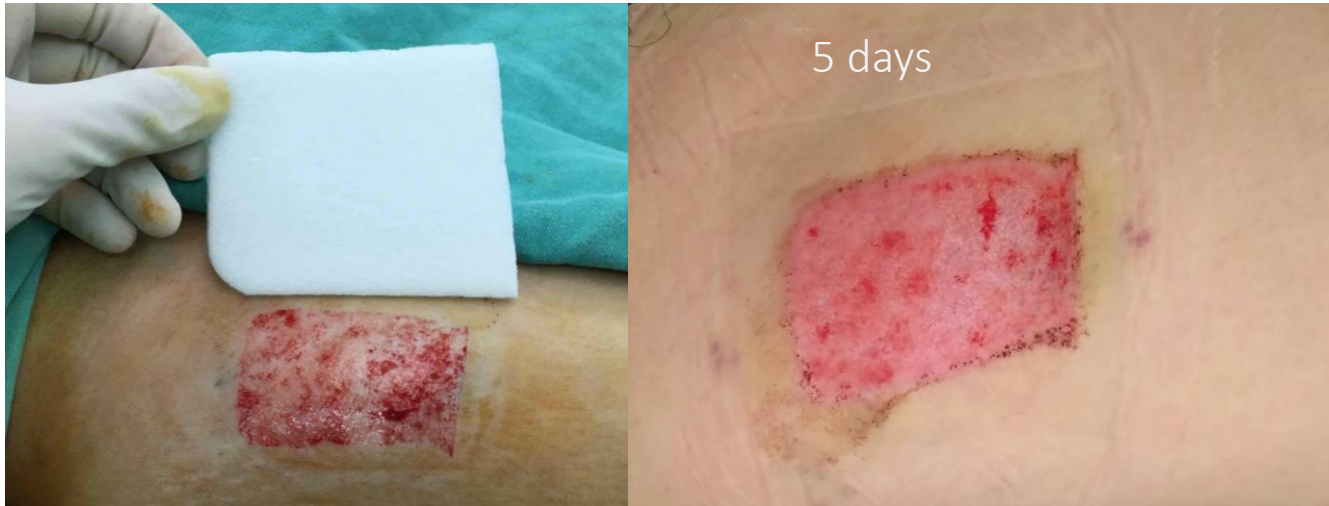
Foam

Case Left: 66y/o woman, MVC, residual skin defect, right leg
Case Right: 31 y/o female military officer , 3rd degree contact burn, right leg



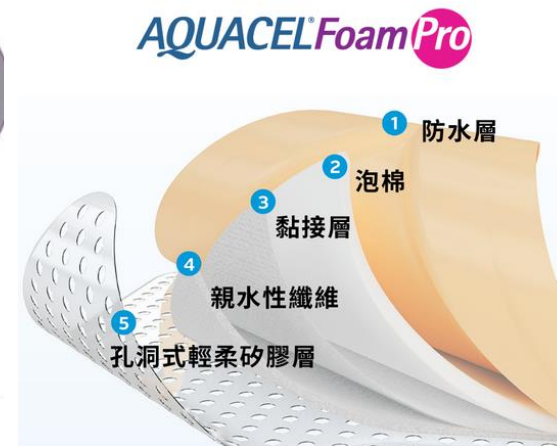
Foam

Case Left: 68 y/o woman , STSG donor site
Case Right: post surgical wound on thumbs c

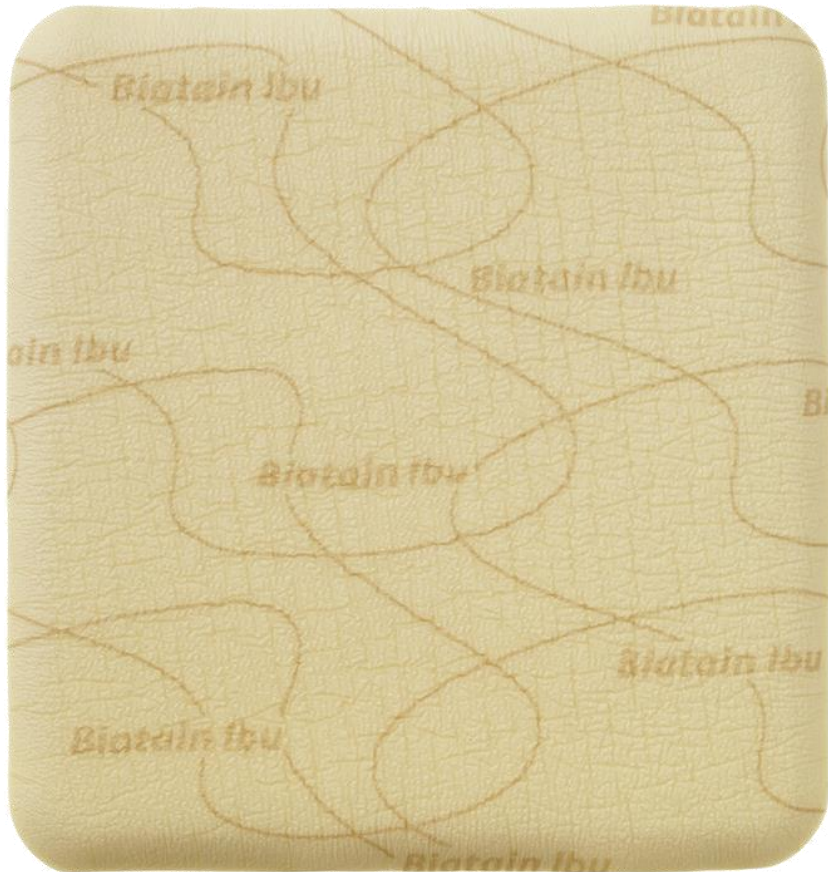


Foam + Silicone

- Water proof
- Reduce pain when remove
- Promote wound epithelialization



Foam + Ibuprofen



- ibuprofen concentration: 0.5 mg/cm²
- 10cmx10cm → 50mg, released between 1 and 7 days
- maximum daily oral dose of 1200 mg

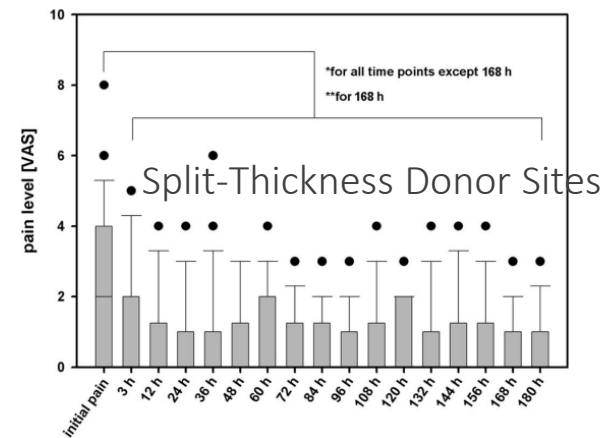
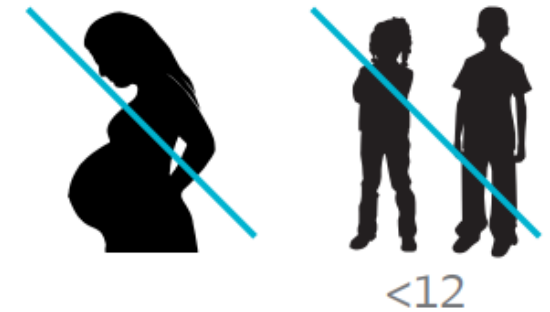
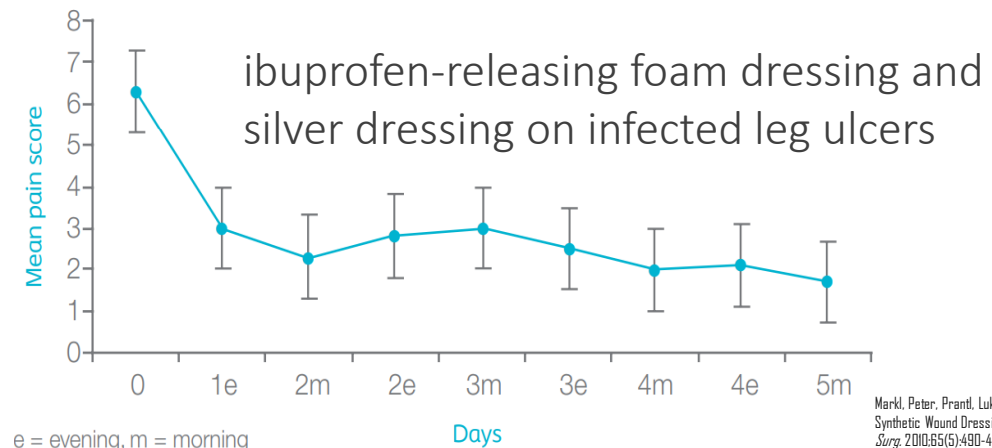


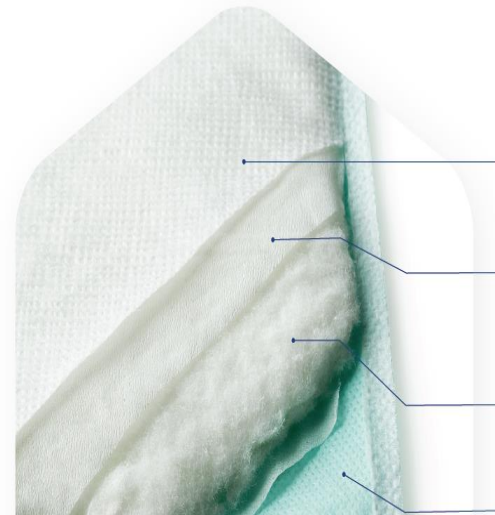
FIGURE 3. Pain score during a 7-day treatment period with Biatain-Ibu evaluated with VAS.

Figure 1 – Mean pain score for persistent pain.



Superabsorbent

- Highly exudate management
- Non-adherent



1. Soft wound contact layer – Ensures fast transfer of exudate into the dressing and prevents from adhering to the wound.^{1,2}
2. Diffusion layer – Offers a homogeneous distribution of the exudate into the superabsorbent core for optimized fluid handling.¹
3. Superabsorbent core – Absorbs and traps fluid safely, even under pressure. It further offers soft padding effect.¹
4. Green water repellent outer layer –

Zetuvit® Plus

2months



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borders so no additional materials are required to secure the dressing. Dressing changes can be carried out atraumatically and almost painlessly.

Protective sheets



媽咪愛

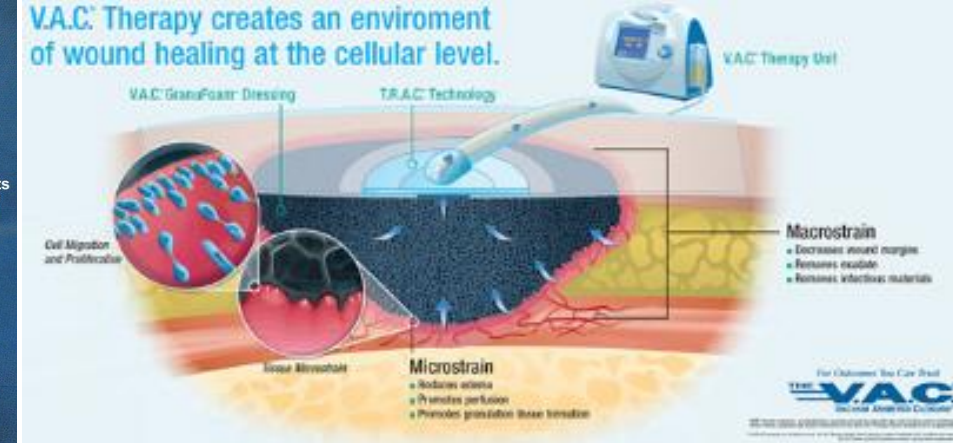
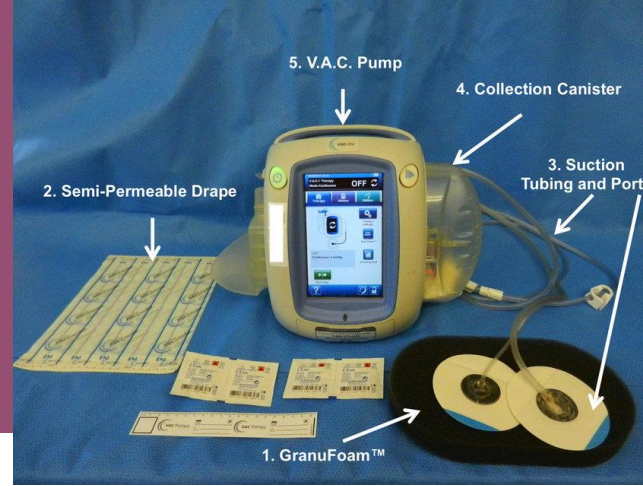
Superabsorbent

Case Left: 21 y/o man , major trauma, sacral pressure sore
Case Right: 14 y/o boy, scald burn , 2nd degree , Superabsorbent



Negative Pressure

- Moderate to High exudate
- Decrease in wound edema
- Drawing the wound edges together
- Microdeformations of the wound surface
- Increase angiogenesis, granulation tissue formation



Negative Pressure



Negative Pressure ---Modified



Collagen

- Hemostasis
- Moist wound
- Reduce pain
- Promote wound healing
- Reduce scar

The Process of Acellular Dermal Matrix Bio-integration

1. 0 TO 3 DAYS

The acellular dermal matrix/host interface is characterized by robust inflammation

2. 10 TO 14 DAYS

Increased oxygen consumption and neo-angiogenesis in the matrix border zone

3. >21 DAYS

Vascular and inflammatory cell penetration into the center of the matrix

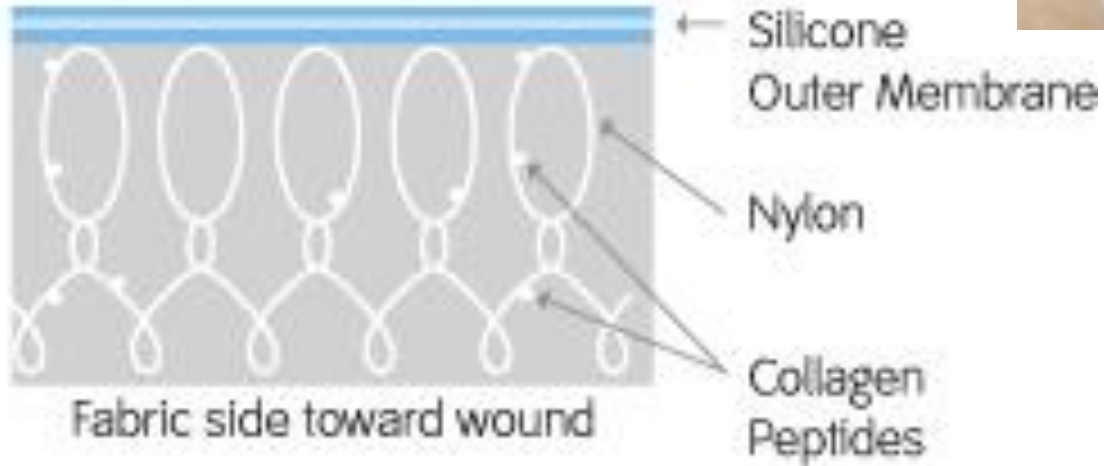
DeGeorge BR Jr (2017) Plast Reconstr Surg



Biobrane



BIOBRANE (temporary wound dressing)



Collagen



Collagen

42y/o F, IV extravasation wound for one month



Collagen

25 y/o lady, MVC, deep abrasion wounds
with tendon exposure

Collagen + PRP



ABColla[®] Collagen Matrix
亞比斯.可拉膠原蛋白敷料



Collagen

40 y/o, M, DM, Crushing injury



ABColla[®] Collagen Matrix
亞比斯.可拉膠原蛋白敷料



Collagen

60 y/o, F, DM, Crushing injury with
hematoma and skin necrosis

癒立安® 膠原蛋白傷口敷料

HealiAid® Collagen Wound Dressing

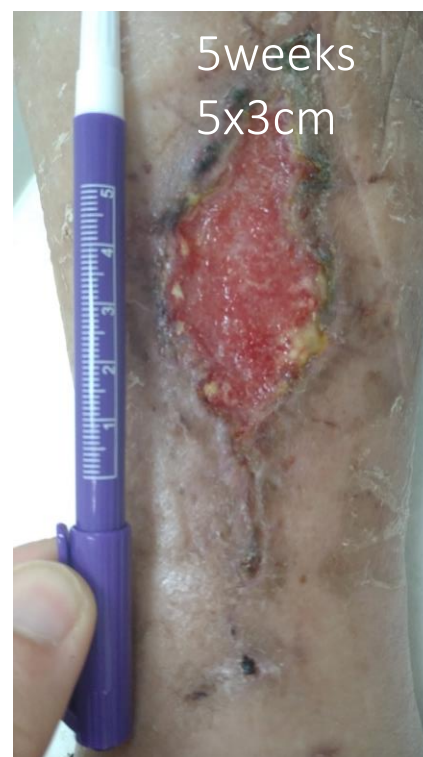


Collagen

60 y/o, F, DM, Crushing injury with
hematoma and skin necrosis

癒立安® 膠原蛋白傷口敷料

HealiAid® Collagen Wound Dressing



Collagen

Case : 56 y/o DM foot, smoker, toe
amputation and fasciotomy
Collagen + Aquacel Ag⁺ extra



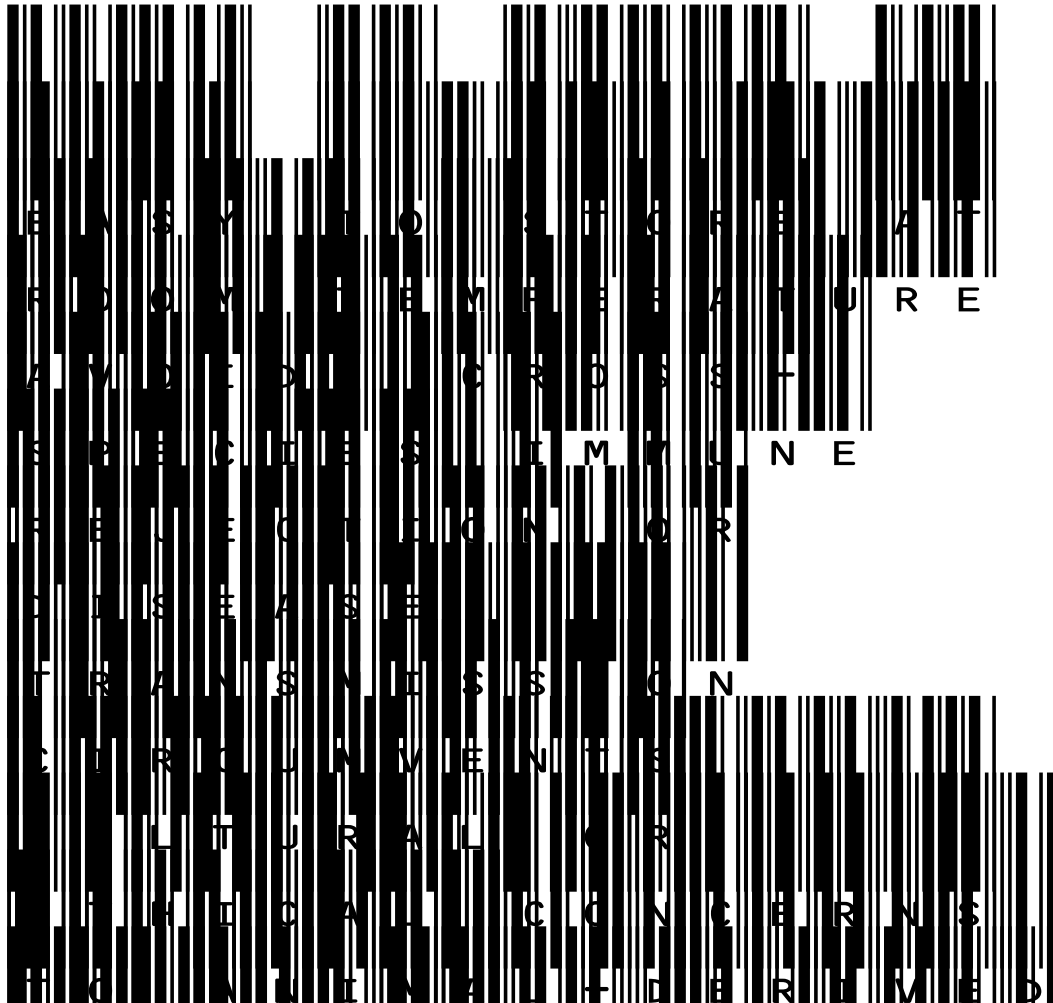
Collagen

Case : 56 y/o DM foot, smoker, toe
amputation and fasciotomy
Collagen + Aquacel Ag⁺ extra



Synthetic Skin substitutes

NovoSorb®BTM (biodegradable polyurethane)



NovoSorb®
BTM



Sealing membrane

A temporary, non-biodegradable layer closes the wound, limiting moisture loss, while also serving as a barrier to outside bacteria^{2,3}.

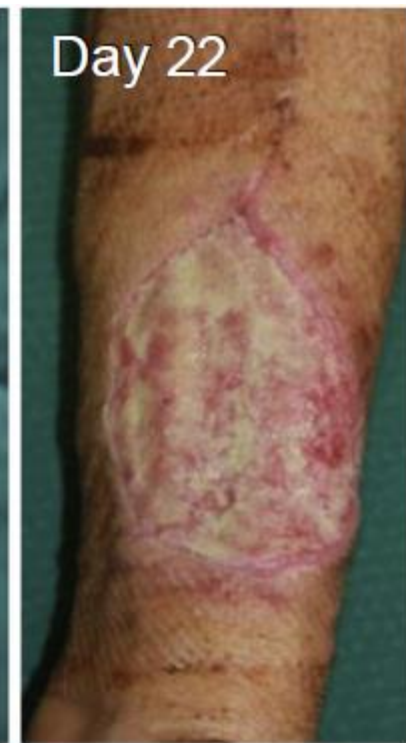
Adhesive

NovoSorb matrix

A 2mm bioabsorbable open cell matrix allows for the infiltration of cellular materials and serves as a matrix to aid in the reconstruction of the deeper layers (dermis) of the skin⁴.

BTM

Forearm flap
Donor site



Synthetic Skin substitutes

52y/o F , open fracture of tibia and
fibula, type I s/p ORIF with soft tissue
necrosis and infection

NovoSorb®
BTM Biodegradable
Temporising Matrix



Synthetic Skin substitutes

19 y/o M , MVC, Crushin injury with soft
tissue necrosis and tendon exposure



Electric Modulator

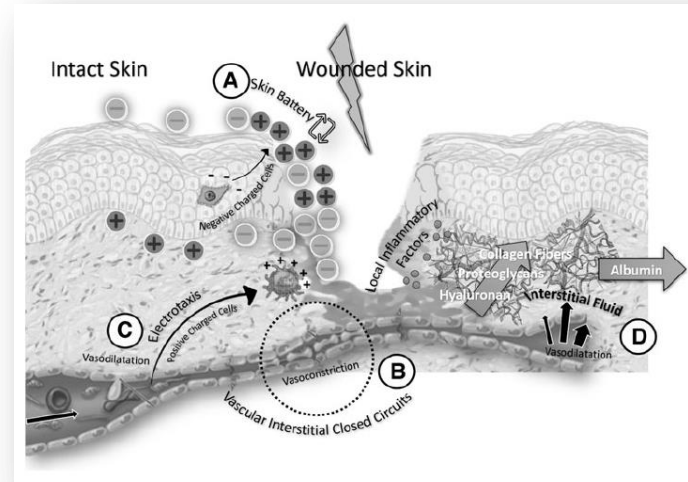
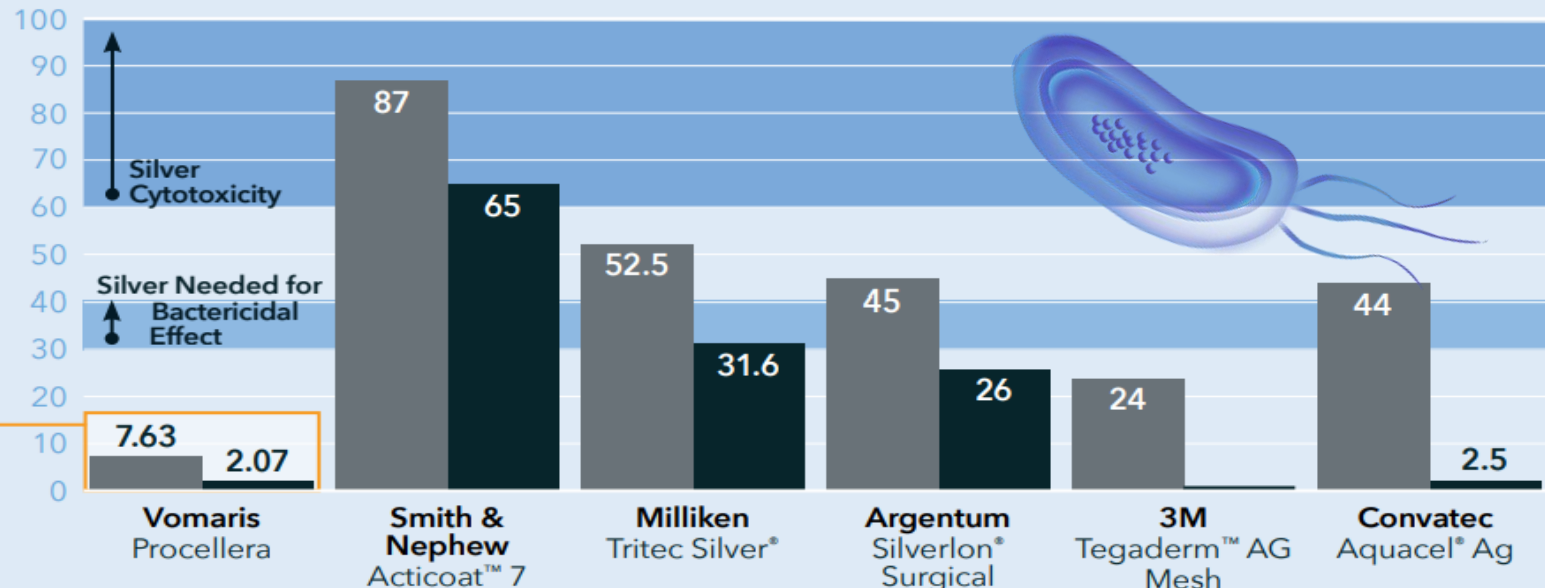
--- Procellera™



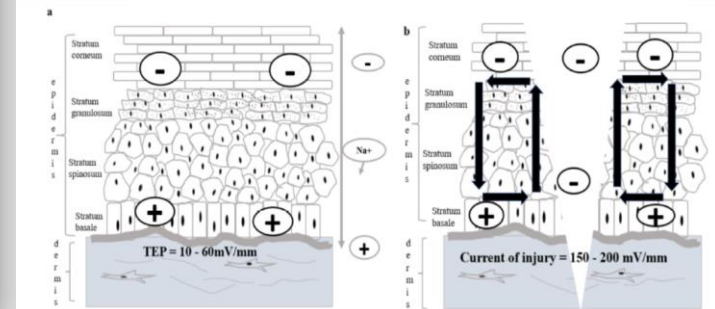
Procellera™ with V.Dox™ Technology uses electricity to kill microbes, not high-volume silver ion release, in contrast to top silver dressings on the market.^{4,7}

DAY 1
DAY 7

Silver Ion Release (PPM, day 1 and day 7 in SWF + BSA)



Epithelial Electric Potential Difference (transepithelial potential (TEP))
上皮層膜電位差



- Microcell
- a moist en
- Stimulate antimicrob

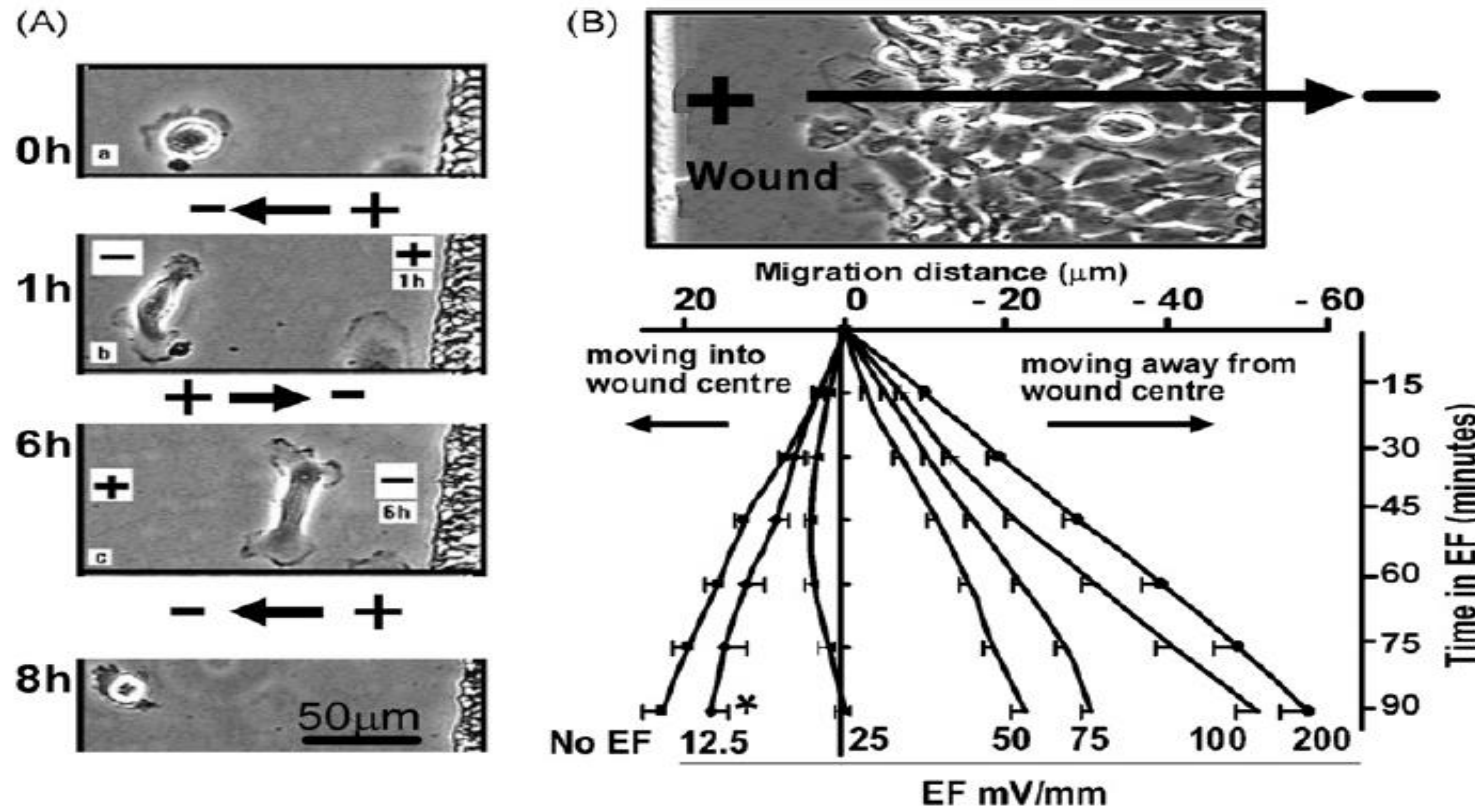


Fig. 4. Electric signals are an overriding guidance cue for directional cell migration in wound healing. (A) Electric fields guide migration of corneal epithelial cells. Reversal of the polarity of an applied electric field (150 mV/mm) reverses the direction of migration. The cell before exposure to the field (0 h), is flattened and rounded. After 1 h of exposure to an electric field with the indicated polarity, the cell moves toward the negative pole. Then the field is reversed and further 6 h later, the cell moves to the right. After a further 8 h with reversed polarity again the cell has reversed its direction and moves in the direction of the new cathode. (B) In monolayer wound healing, cells migrate directionally into the wound. When an electric field is applied with polarity against the default healing direction (upper panel), that is against contact inhibition release, wound void, population pressure, mechanical forces at the wound edge, and chemical gradients, the cells migrate away from the wounds, resulting in wound enlargement toward the cathode at the right. The cells do so ignoring other directional signals. Quantitative analysis demonstrated that the overriding effect happens between the field strength of 25–50 mV/mm (from [23]).
video: <http://www.nature.com/nature/journal/v442/n7101/extra/nature04925-s2.mov>.

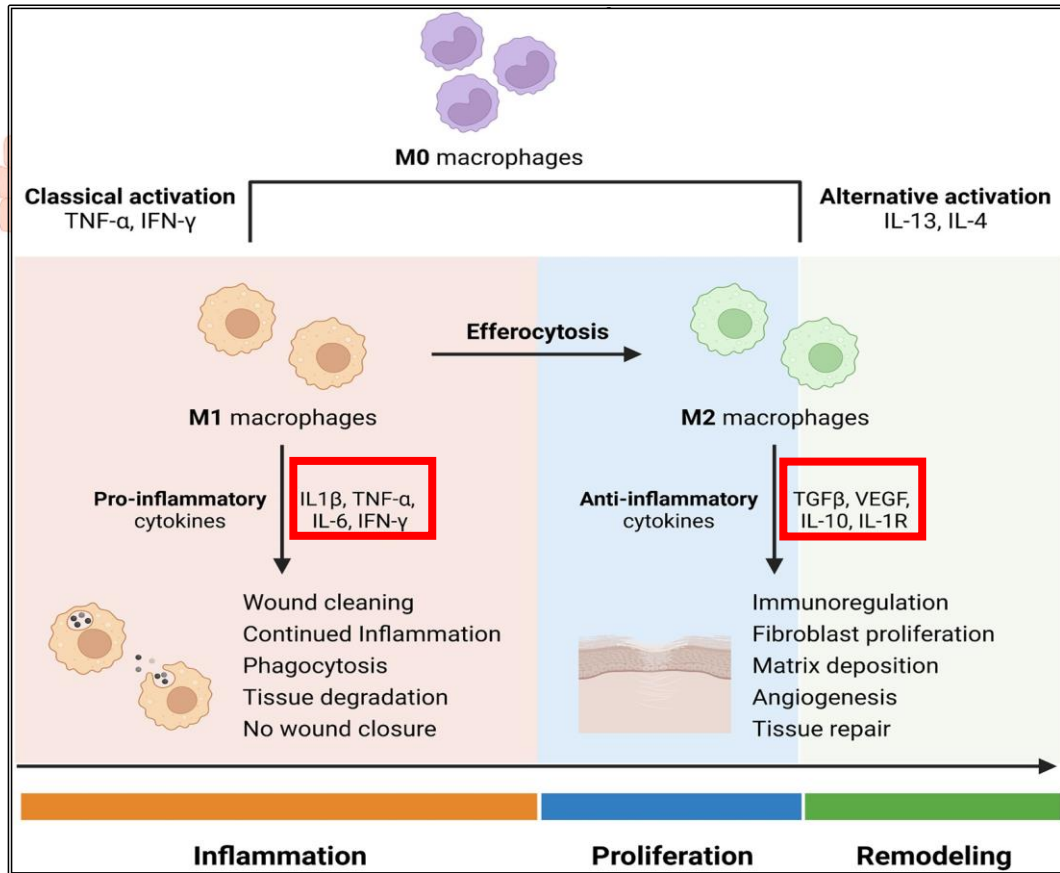
Epithelial Electric Potential Difference (transepithelial potential (TEP)) 上皮層膜電位差

Electric Modulator

Crushing injury with open dislocation of 1st toe and skin defect



Immune Modulator



含1.25%到手香萃取物
(PA-F4, 0.25%)與積雪草
萃取物(S1, 1%)乳膏外觀
為黃綠色至淡綠色，供局
部使用

衛部藥製字第**060827**號
新加坡藥證證號**SIN16683P**
馬來西亞藥證證號**MAL23076025B**
2023/08/01 健保給付



Seed of Glycine Max(L.) Merr.
Extract & Aqua (大豆萃取液))
86.25 %

衛部醫器製字第**006946**號





速必一健保給付規範

2023/08/01 健保給付

- 1 **科別限定：**整形外科或皮膚科。
- 2 **病患限制：**糖尿病足部 Wagner grade 2 級潰瘍，清創後最大傷口面積 $\leq 5 \text{ cm}^2$ ，且符合以下所有條件：
 - (1) 傷口深及肌肉層且經抗生素藥膏或燙傷藥膏治療及使用傷口敷料 12 週後，傷口癒合面積 $< 50\%$ 。
 - (2) $\text{HbA}_{1c} < 8.5\%$ 、 $\text{albumin} \geq 3.0 \text{ g/dL}$ 。
 - (3) 治療前 ABI (Ankle Brachial Index) ≥ 0.9 。
- 3 每年限申請 1 次，每次申請 2 支，每次處方限 1 支。
- 4 **排除條件：**
 - (1) 急性發炎感染不穩定之傷口。
 - (2) 周邊動脈阻塞 (PAD) 病人，未施行經皮血管擴張術 (PTA) 治療者。
- 5 需經事前審查核准後使用；應檢附 HbA_{1c} 、 albumin 、ABI 資料及相隔 12 週以上清創前後照片。
- 6 再次申請時除前條所需資料外，需加附前次治療後該傷口完全癒合照片。

Fespixon

63y/o man , DM(HbA1c 6.6; Alb: 3.2),
Foot ulcer infection

Aquacel Ag Plus+ Foam ; Combine with
HBOT(10sessions)/ offloading shoes



Fespixon

69y/o man , DM(HbA1c 6.6; Alb: 3.2),
PAOD with toe gangrene infection

Aquacel Ag Plus , Combine with HBOT(10sessions)



Senile Skin Tear

Case : 70 y/o woman, scooter , senile skin degloving



Atrauman® Ag

赫曼含銀軟膏敷料



含金屬銀
有效抗菌

含三酸甘
油酯

不含凡士
林、石蠟

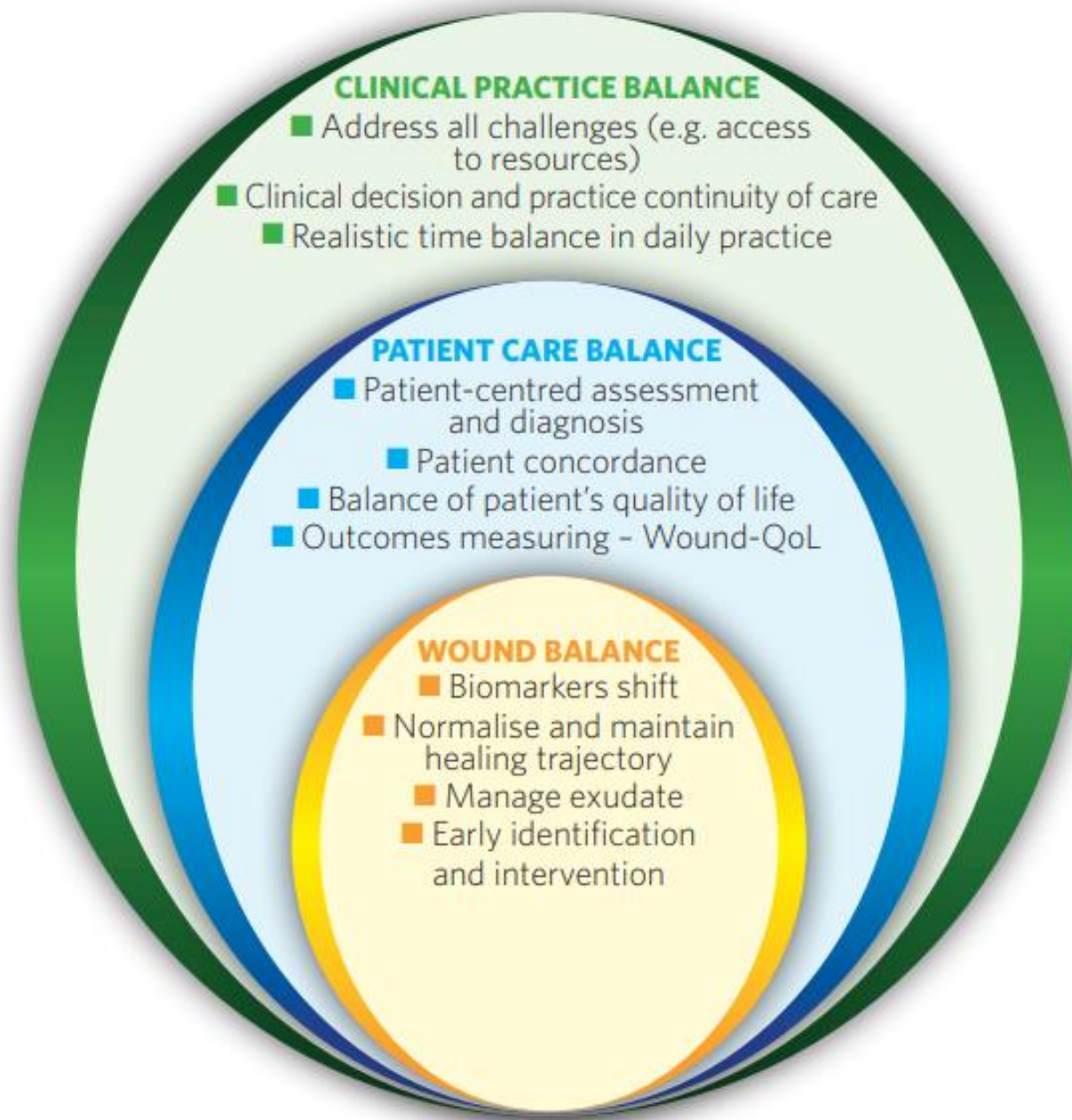
Senile Skin Tear

Case : 72 y/o woman, falling down,
senile skin degloving

Atrauman® Ag

赫曼含銀軟膏敷料





The wound balance concept

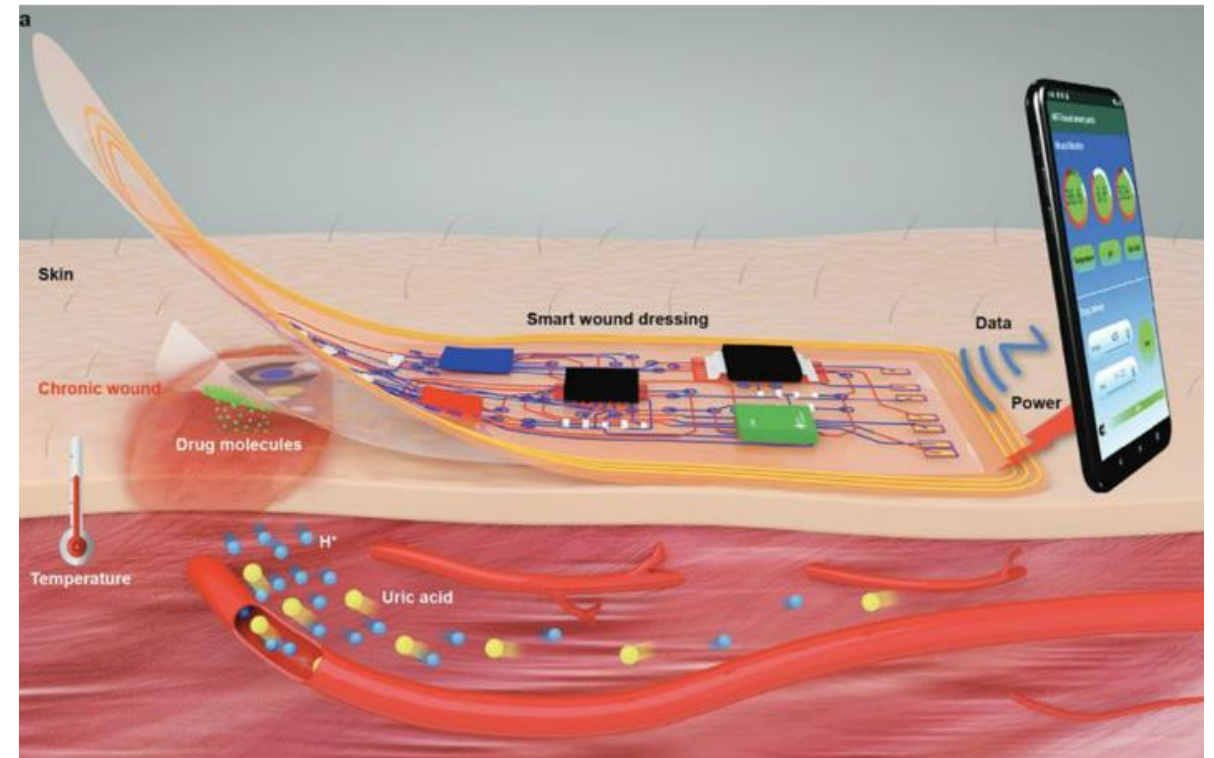
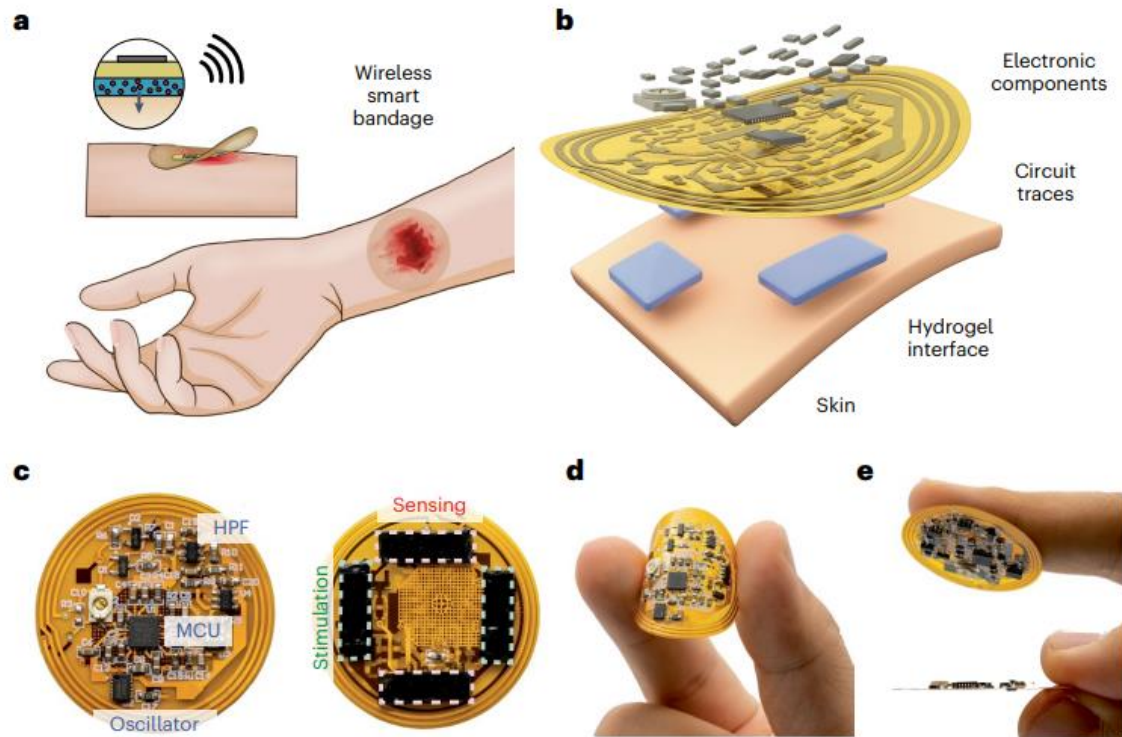
Choose Mr. Right



Choose Mr. Right



The Future



Take Home Message

1. Wound hygiene concept
2. Wound balance concept
3. Choosing the right dressing