درمان های ترمیمی در سوختگی ها

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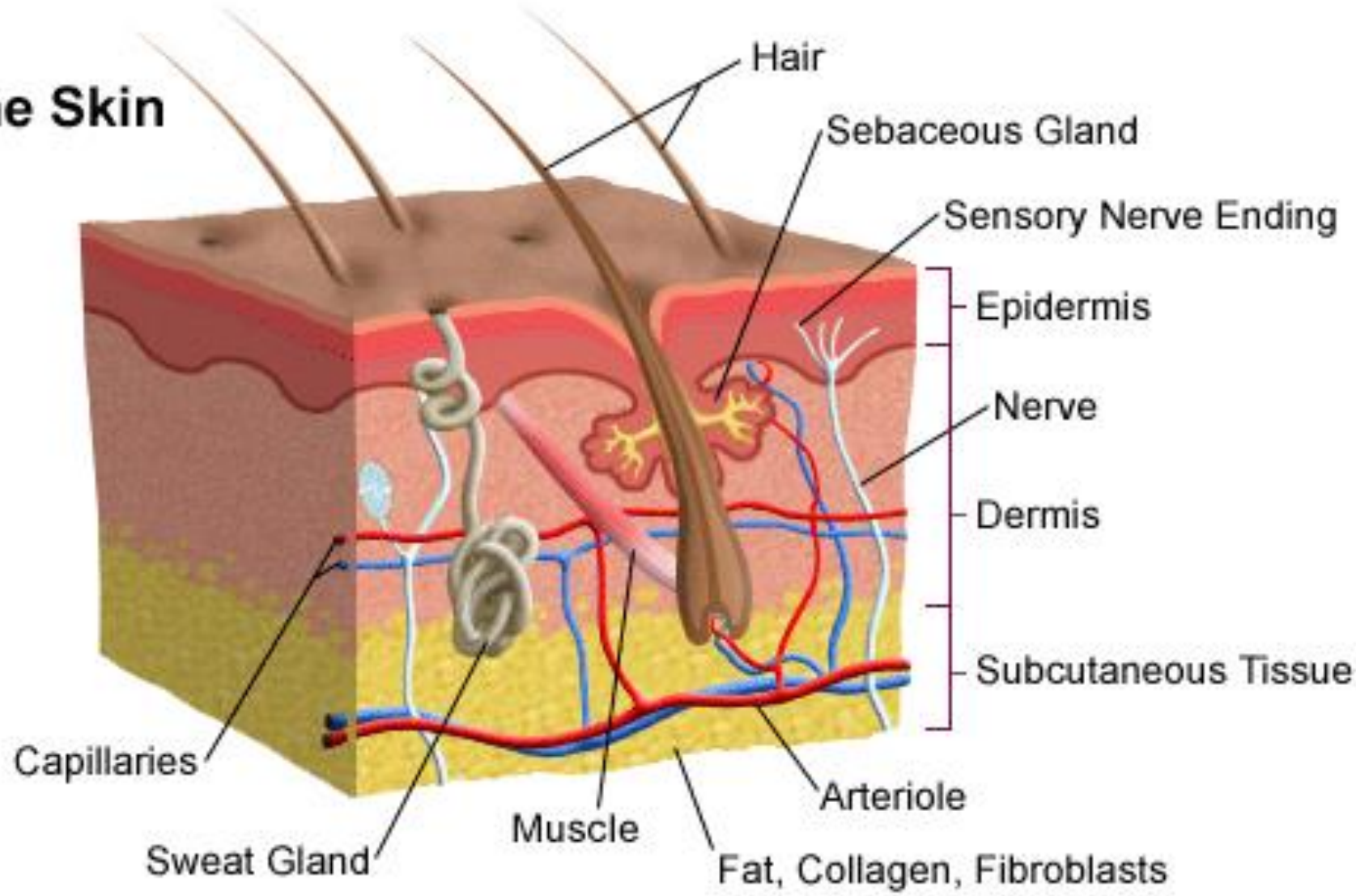
متخصص جراحی
فوق تخصص جراحی پلاستیک، ترمیمی و سوختگی
دانشگاه علوم پزشکی اراک

The Skin


Hair
Sebaceous Gland
Sensory Nerve Ending
Epidermis
Nerve
Dermis
Subcutaneous Tissue
Capillaries
Sweat Gland
Muscle
Arteriole
Fat, Collagen, Fibroblasts

First degree burn

- Involves only the epidermis
- Tissue will blanch with pressure
- Tissue is erythematous and often painful
- Involves minimal tissue damage
- Sunburn

Second degree burn

- Referred to as partial-thickness burns
- Involve the epidermis and portions of the dermis
- Often involve other structures such as sweat glands, hair follicles, etc.
- Blisters and very painful
- Edema and decreased blood flow in tissue can convert to a full-thickness burn

Third degree burn

- Referred to as full-thickness burns
- Charred skin or translucent white color
- Coagulated vessels visible
- Area insensate – patient still c/o pain from surrounding second degree burn area
- Complete destruction of tissue and structures

Fourth degree burn

- Involves subcutaneous tissue, tendons and bone

- The skin represents approximately 8% of our total bodyweight, with a surface area of 1.2–2.2 m2.
- The skin is0.5–4.0 mm thick and covers the entire external surface of the body,

Epidermis

- Skin has a complex three-dimensional structure characterizedby two overlapping layers, the epidermis and the dermis
- Epidermis is the outer or upper layer of skin, which isa thin, semitransparent, water-impermeable tissue, consistingprimarily of keratinocytes. These cells form a multilayered keratinized epithelium, similar to a wall ofBricks
- Also contained within the epidermis are melanocytes, Langerhans cells, Merkel cells, and sensitive nerves.
- Around 10% of the epidermal cells are represented by melanocytes, which derive from the neural crest

- The dermis is a tough fibrous layer that provides the
- mechanical features of the skin. It is composed primarily
- of collagens, glycosaminoglycans, and elastins. Skin
- grafts without the dermis result in a closed but often
- unstable skin

Glandular structures

- Sabaceous glands are small saccular structures residingthroughout the dermis, but are more common in thickerareas.
- Hair folliclescontain multipotent stem cells that are activated upon
- the start of a new hair cycle and upon wounding toprovide cells for hair follicle and epidermal regeneration.

Skin grafting

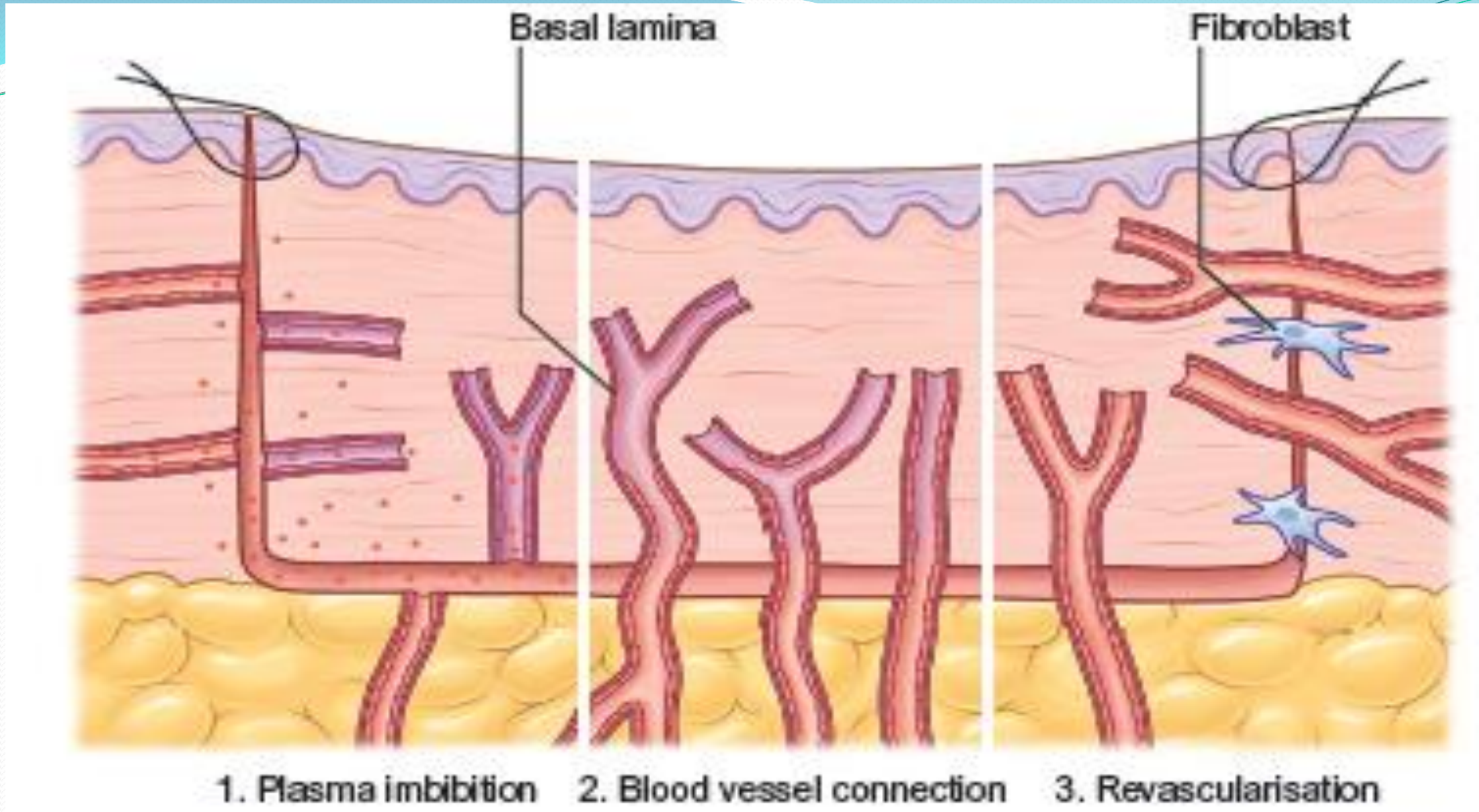
- Skin grafting is the transfer of autologous skin cells left
- in anatomic order but without an intact blood supply.
- Therefore time and the recipient surrounding conditions
- limit the vitality

Three phases of skin graft;

- (1) serum imbibition;
- (2) revascularization;
- (3) maturation

Serum imbibition

- In the first days, before the graft revascularizes, oxygenand nutrients diffusing through the plasma between the graft and the wound bed will nourish the skin graft
- “plasmatic circulation “serum imbibition,”
- as fibrinogen changes into fibrin that fixes the skin graft on to the
- wound bed in the absence of real plasmatic flow.
- that skin grafts gain up to 40%of their initial weight within the first 24 hours after grafting
- and then this gain is reduced to 5% at 1 week postgrafting.


Basal lamina
Fibroblast
1. Plasma imbibition
2. Blood vessel connection
3. Revascularisation

Revascularization

- anastomosis,
- neovascularization,
- endothelial cell ingrowth

- Anastomosis is the process ofreconnection between the blood vessels in the recipient
- site wound bed and the graft.
- Neovascularization is characterized by new vessel ingrowth from the recipient
- site into the skin graft.
- The last mechanism describesendothelial cell proliferation and sliding from the recipient
- site, utilizing pre-existing vascular basal lamina as a structure, while in the graft endothelial cells graduallydegenerate.
- The process of revascularization begins as early as24–48 hours after grafting

that vessel ingrowth appears in the periphery
of the graft (following blood vessel regression in the
graft) from day 3 until day 21

Maturation

- Once the skin graft is completely integrated, the samegraft and surrounding tissues remodel and contract,similar to the last phase of wound healing after re-epithelialization is complete.
- Skin grafts take at leastı year to complete maturation, with the extension of this
- process continuing for several years in burn victims and
- children.
- Scars from skin grafts can continue to improve
- for a number of years, often making prolonged conservative
- therapy worth considering

- *Skin appendages and functional structures*Hair follicles, sweat glands, and dermal nerves can often be transferred within thick, STSGs and fullthickness
- skin grafts
- Thin STSGs will not allow the transfer of hair or other adnexal glands, as the
- regenerating bulb is not harvested.
- Hair regrowth can occur in STSGs but, due to the shallow depth of harvest,
- Full-thickness and composite grafts will show hair regrowth 2–3 months after grafting.

- patients report abnormal sensation, including
- hypersensitivity and pain, up to 1 year result is not completely normal.
- sweat glands will reactivatetheir function up to 3 months after grafting. For this
- reason, moisturizing of the skin graft is advised for atleast 3 months to avoid dryness.
- Full-thickness skin grafts include skin appendagesthat can survive and be functional at the recipient side,while STSGs do not contain the deep structure skinappendages and remain without glandular function orhair growth.

Graft type	Graft origin: donor and recipient of:
Autograft	Same subject
Homograft	
Isograft	Same species Different subject Same genetic background
Allograft	Different subjects Same species
Hetero- or xenograft	Different subjects but same species

(Revised from Andreassi A, Bilenchi B, Biagioli M, et al. Classification and pathophysiology of skin grafts. Clin Dermatol 2005, 23.)

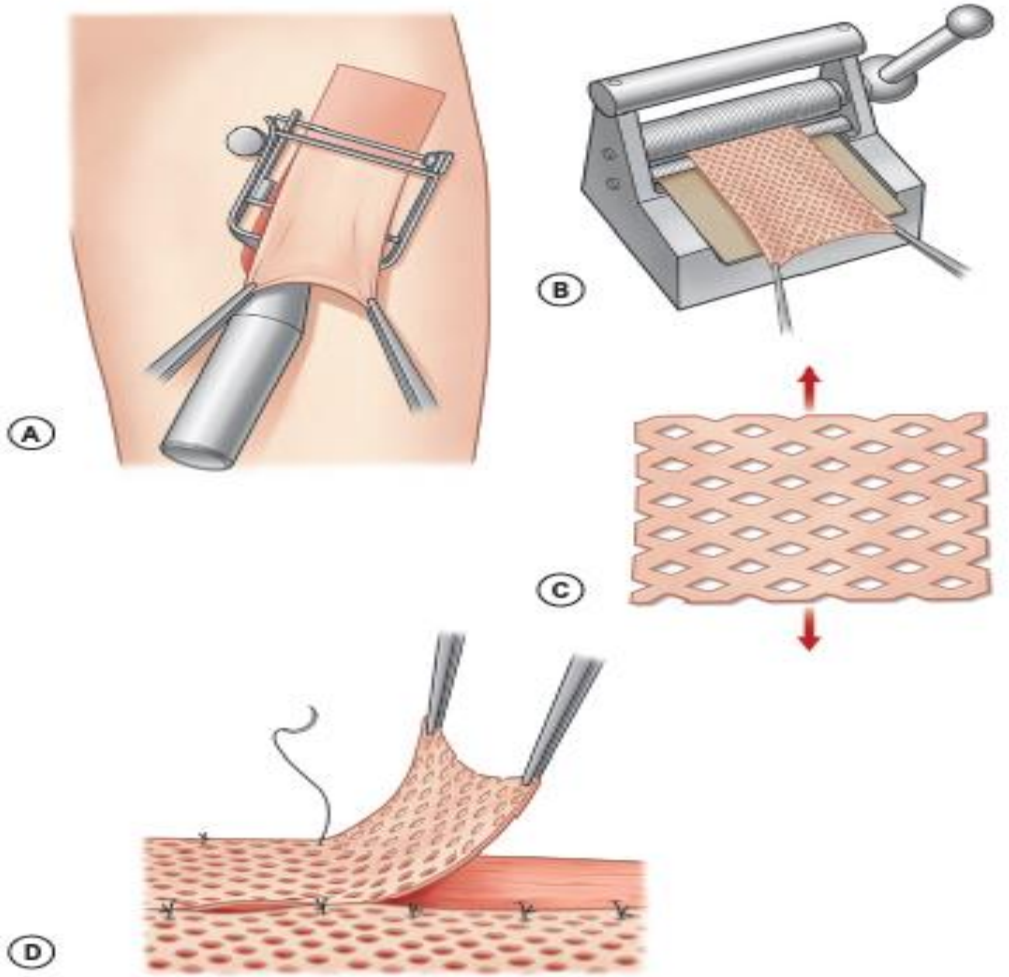
Classified skin grafts,

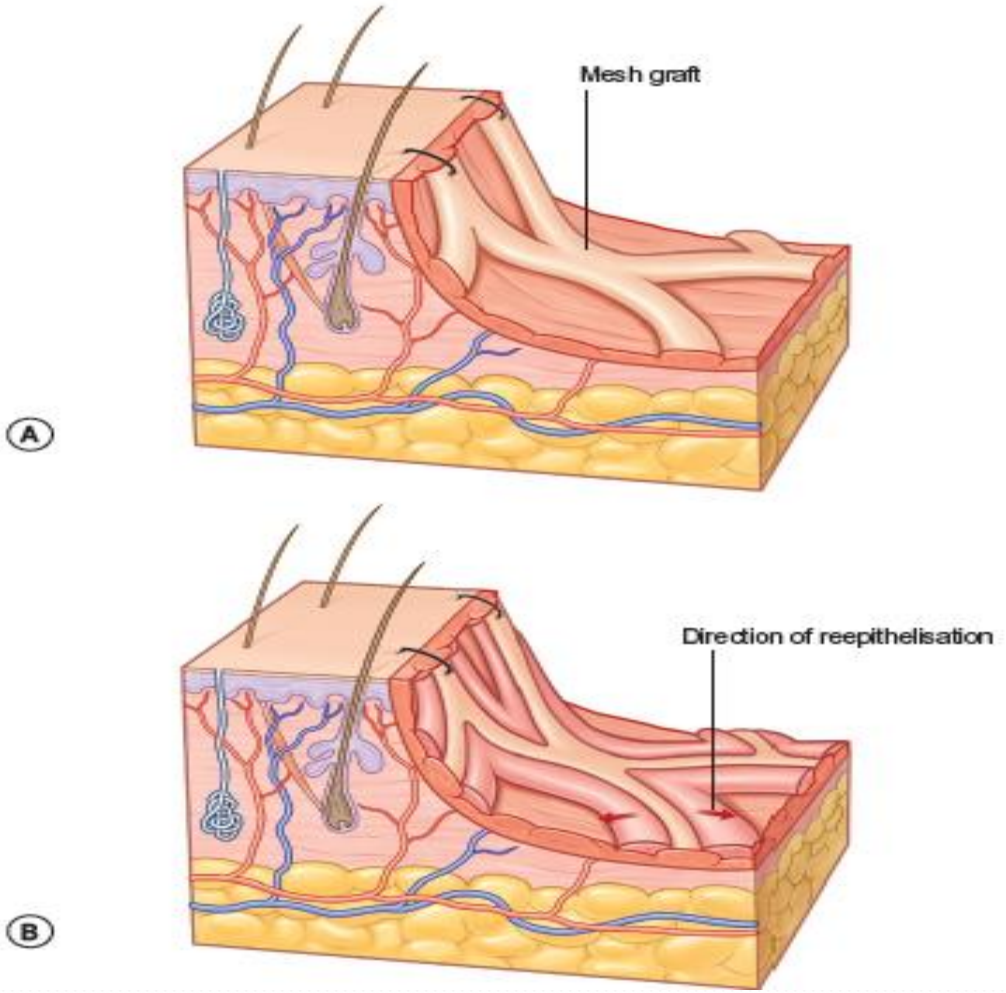
- thin (0.15–0.3 mm, Thiersch–Ollier),
- intermediate(0.3–0.45 mm, Blair–Brown),
- d thick (0.45–0.6 mm,Padgett).
- Skin grafts thicker than 0.6 mm usually correspondto full-thickness skin grafts and are calledWolfe–Krause grafts

	Indications	Advantages	Disadvantages
Thin STSG	Debrided burn wounds Chronic wounds with less vascularized wound beds Exposed flap areas Acute well-vascularized wounds	Fast donor site re-epithelialization Multiple possibilities to reharvest the same area Good graft take	Contraction of the skin graft Graft quality limited because of minimal dermal thickness
Thick STSG	Same indications as thin STSG	Less secondary graft contraction compared to thin STSG Graft more stable because of thicker dermal layer Good graft take	Slower donor site re-epithelialization
FTSG	Reconstruction of functional areas such as in the face or hand Noninfected, well-vascularized wound beds	Minimal to no secondary graft contraction Excellent skin quality, stability Hair regrowth and skin appendage function	Limited availability Nontake risk is higher in a less vascularized wound bed

Meshed skin graft

- STSGs can be enlarged up to six times their original size.
- Enlargement of the graft can vary from just a few manually
- applied perforations


A
B
C
D


Mesh graft
A
Direction of reepithelisation
B

Composite graft

- Composite grafts include a layer of subcutaneous fat
- tissue under the dermal and epidermal layer

First dressing change

- More commonly the dressings are taken off for the first time 5–10 days after grafting

Table 17.3 Permanent and temporary dermal and epidermal skin substitutes

Origin	Dermal	Epidermal	Mixed
Permanent			
Autograft	Fibroblast culture	Keratinocyte culture Skin graft	
Allograft	Human cadaver dermis (Alloderm)		
Synthetic	Integra Matriderm		
Temporary			
Mixed	Dermagraf (polyglactin mesh + human fibroblasts)		Apligraft (bovine collagen matrix + neonatal human fibroblasts and keratinocytes)
Temporary			
Xenograft	Xenoderm (porcine-derived acellular dermis) Mediskin (porcine-derived acellular dermis) Strattice (porcine-derived acellular dermis)		

Integra

- dermal substitute is a synthetic skin replacement used to recoIntegra™ dermal substitute is a two layered commercial product. The dermal layer consists of a regular matrix of bovine (cow) derived collagen fibres (with a very specific pore size) and chondroitin-6-sulphate. A silicone sheet forms the surface layer, acting as a replacement for the skin's "barrier function" during the first weeks after grafting with Integra™ dermal substitute.nstruct wounds

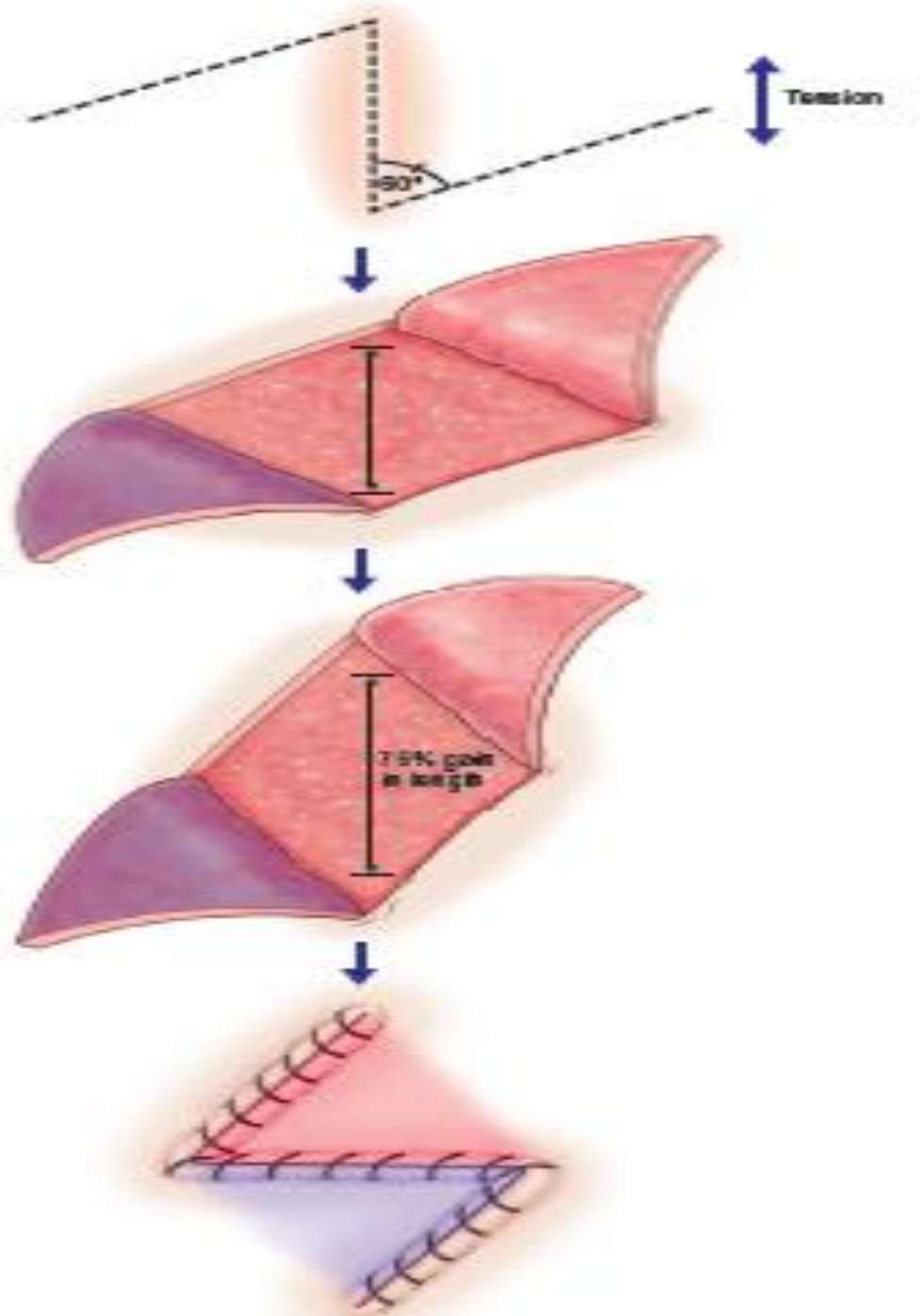
Z-plasty

- This technique is the basis of the surgical treatment of burns
- sequelae. Z-plasty is feasible in the presence of surrounding
- healthy tissue

Angle of lateral limb of Z-plasty	Theoretical gain in length of central limb (%)
30	25
45	50
60	75
75	100
90	120

Box 16.3 The four fundamental functions of Z-plasty

1. To lengthen a scar
2. To break up a straight line
3. To move tissues from one area to another
4. To obliterate or create a web or cleft


Tension
60°

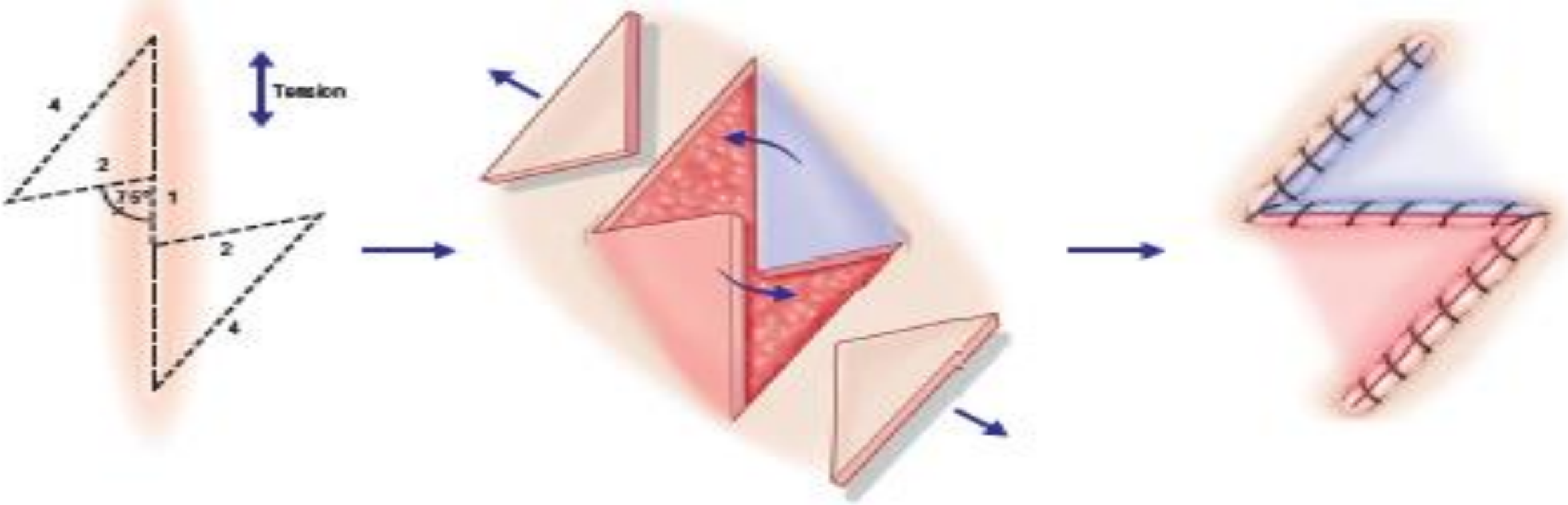
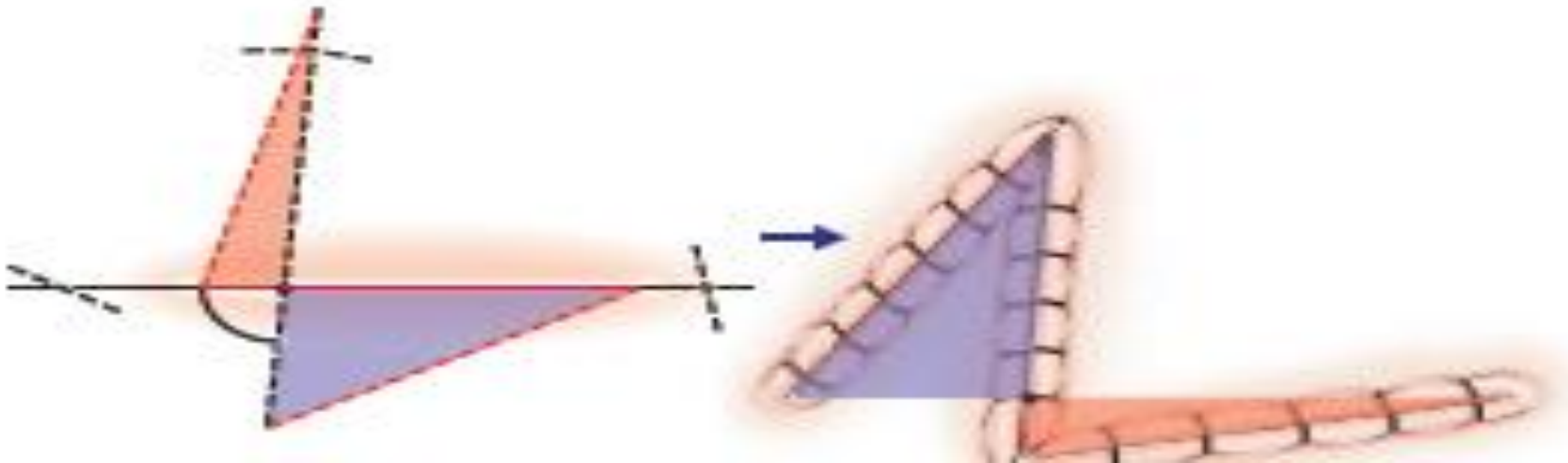
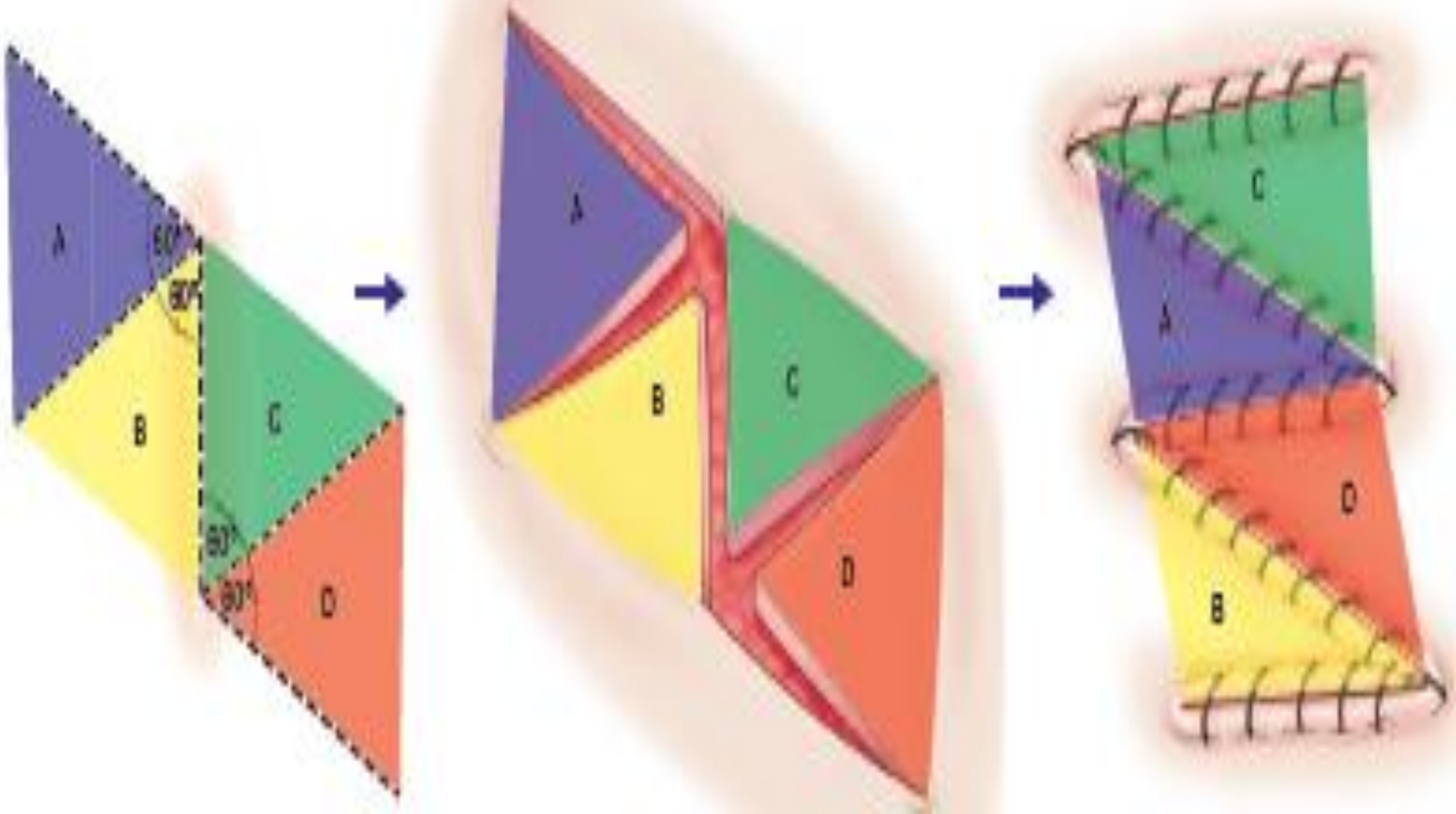
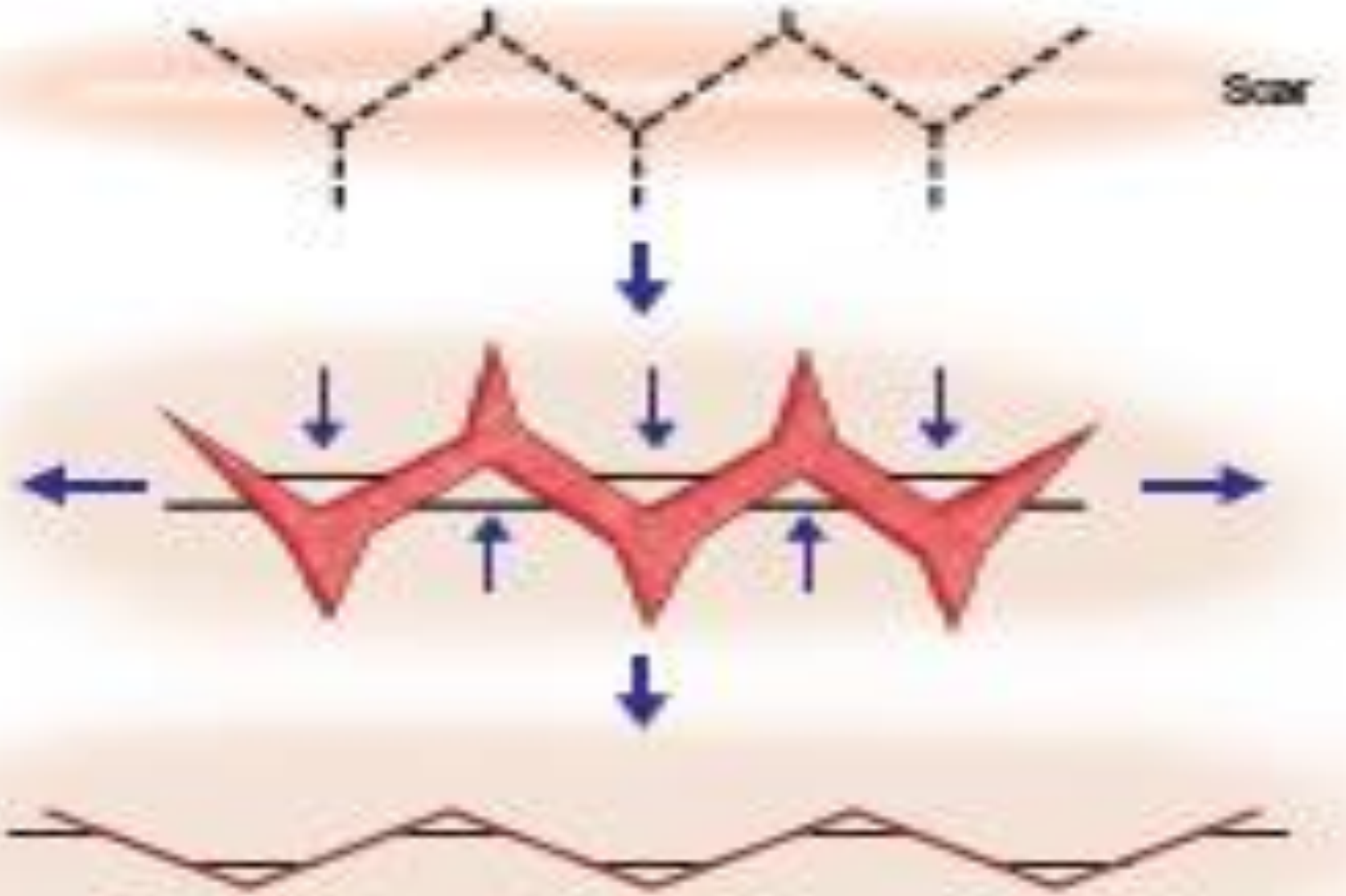


Fig. 16.9 Planimetric Z-plasty




A
B
C
D
60°
60°
60°
60°


Scar


A
B


A


B


A


B


C

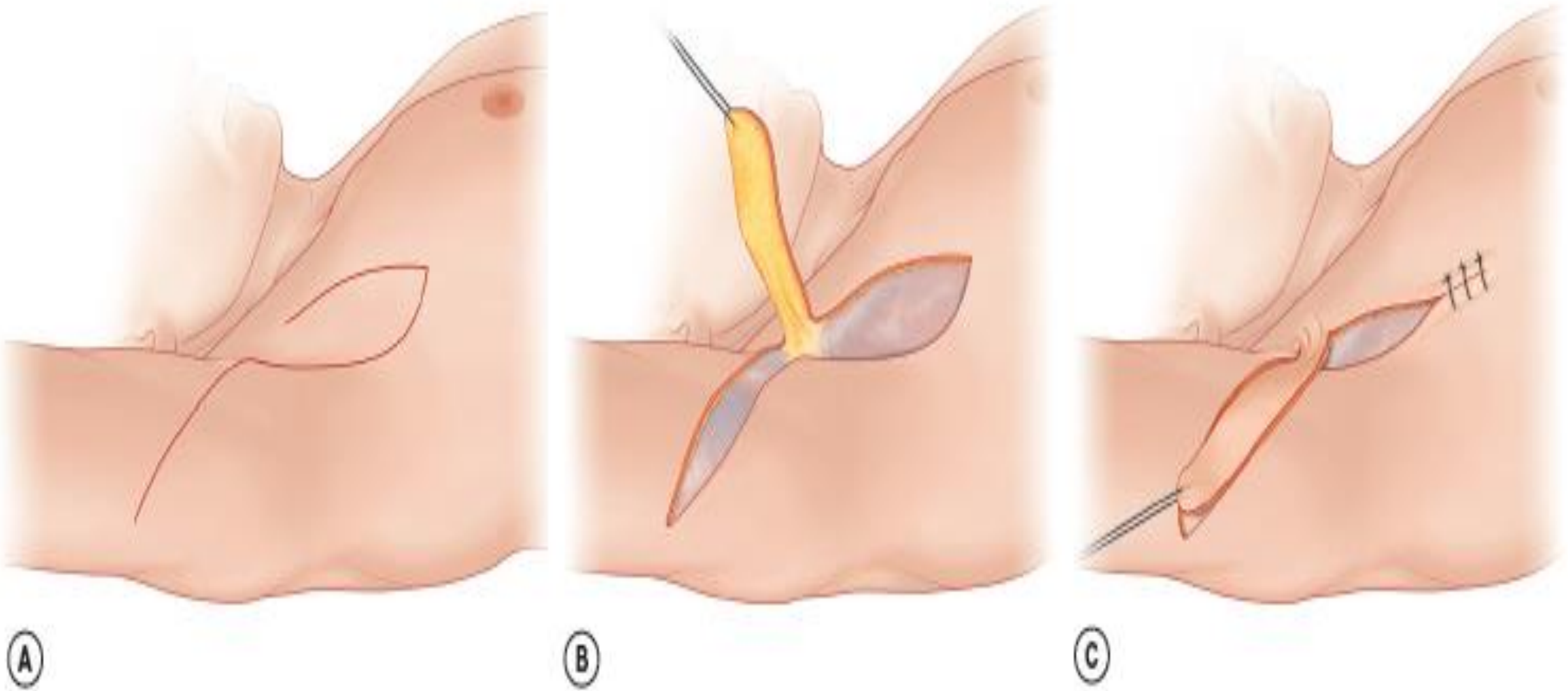

D

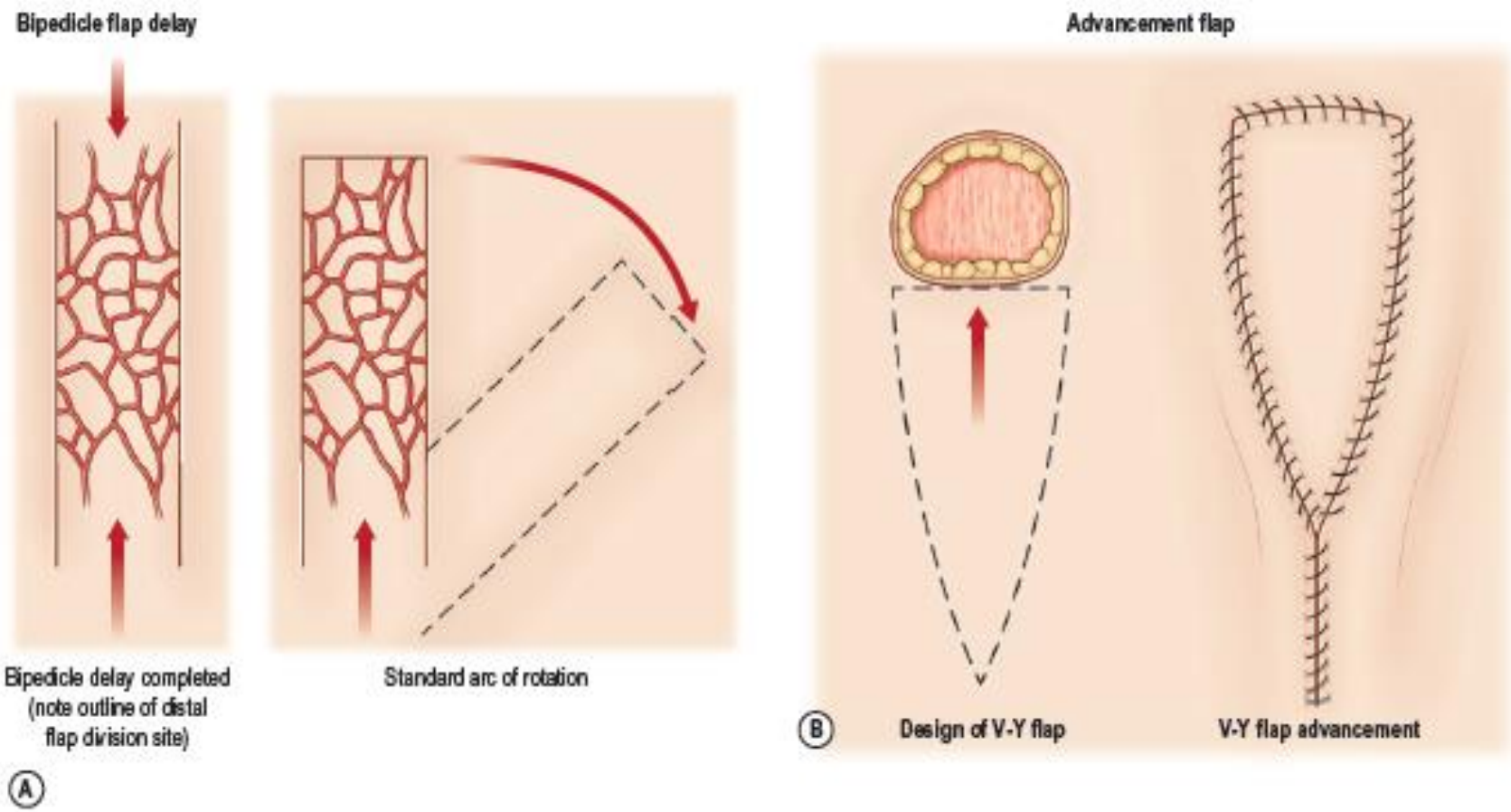
Dermal substitutes (INTEGRA®) in the surgical treatment of sequelae

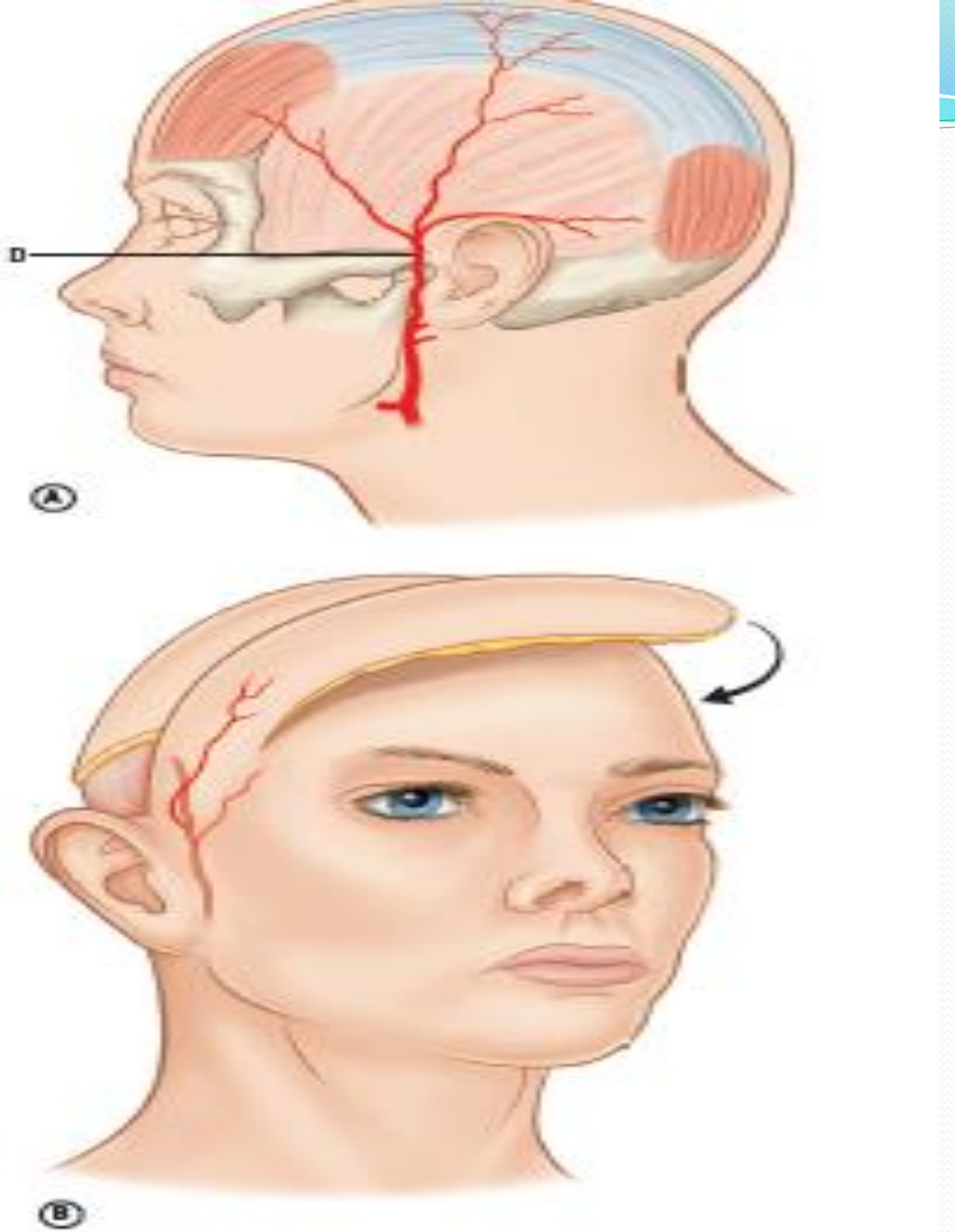
- Integra stabilizes after about 21–28 days (it is wrong, in our view, to speak of grafting, since we are considering an acellular matrix). The newly formed tissue is therefore well vascularized and ready to receive a free skin graft (but not full-thickness).

Flaps

- Numerous rotation flaps ***(Fig. 19.13)*** are described in all treatises
- on plastic surgery,

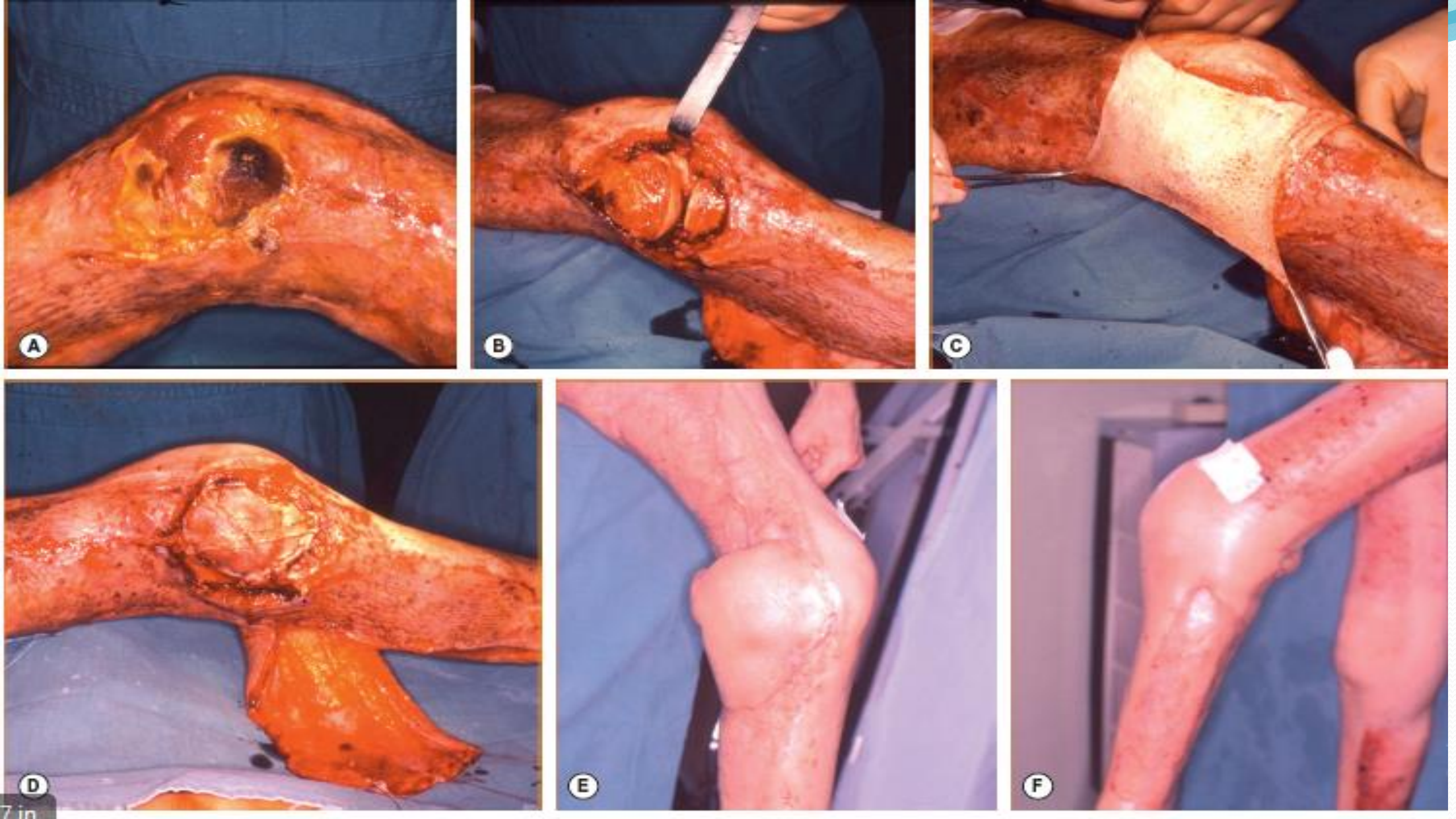

A
B
C


Bipedicle flap delay
Bipedicle delay completed (note outline of distal flap division site)
Standard arc of rotation
A
Advancement flap
Design of V-Y flap
V-Y flap advancement
B
Rotation flap
Rotation
Inset
C


D
A
B

Fasciocutaneous and myocutaneous flaps

- Reconstructive surgery of the limbs involves extensive use of
- *fasciocutaneous* and *myocutaneous rotation flaps*, which successfully
- cover full-thickness loss of substance, especially at elbow
- and knee joint level and the proximal third and middle limb


A
B
C
D
E
F


B


a
b
c
d
Day 8
Day 14
Day 21
7-day post-
e
f
g


A


B

Skin expansion

- The principle for the use of skin expansion lies in the positive response of live dermal tissue when it is subjected to mechanical stimulation.

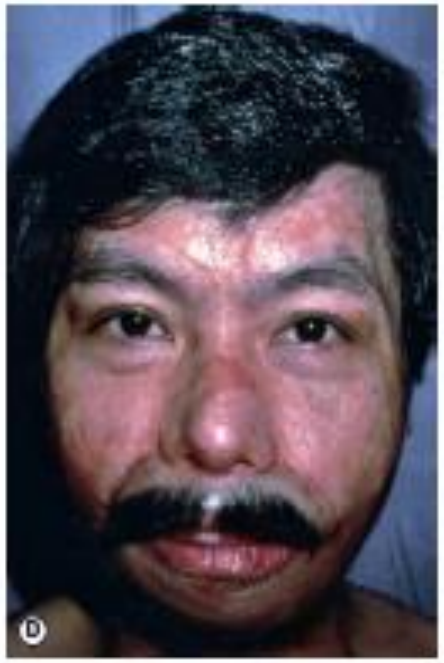


Fig. 27.9 **(A)** Young man who sustained extensive burns over the face, but in whom the neck was largely spared. **(B)** Bilateral large expanders were placed in the neck and the entire neck and upper chest were expanded dramatically. **(C)** The area of burned skin over the lower face was excised and the neck flap advanced superiorly. The capsule was secured firmly to the muscle on the lateral commissures to minimize later distortion of the mouth. **(D)** The patient 2 years later. The upper lip has been reconstructed as an aesthetic unit from hair-bearing, temporoparietal flaps.

Free flap

- The use of free flaps in the reconstruction of extremities with
- severe burns is infrequent in routine clinical practice. Severely
- burned patients do not usually have many adequate donor
- sites for microvascular flaps.


A
B
C
D
E
F

Lipofilling

- The technique of liposculpture, originally created for aesthetic purposes, now plays a primary role in the treatment of areas of scarring.
- The quality of the scar has improved in terms of texture, color, and elasticity


A
B

Laser

- The face and neck region can be regarded as “socializing”
- anatomical areas which are usually exposed, enablingpeople to communicate and play their role in society.

The *vascular laser*, such as the Nd:YAG 1064, is indicated in areas of scarring which are immature and have a particularly strong vascular component. The reduction in the blood supply induces an involution of the scar tissue treated.

The *fractional laser* (*ablative and nonablative*) plays an important role in the remodelling of fibrotic scar tissue

- *IPL* and *Q-switched lasers* act on hyperpigmentation and discoloring in certain areas of scarring

Table 19.2 Laser in scar treatment

Nd:YAG 1064	Scars immature, with vesseels
IPL	Hyperpigmentation Scar with vessels
Fractional laser	
Ablative	Mature scars with heterogeneous surface
Nonablative	Mature scars, fibrotic, thick