Plastic Surgery

Volume - 1

MARROW
Super Speciality

Instructions

- The notes must be used in conjunction with the Marrow SS Surgery videos and should not be considered standalone material.

Please note:

- The information in this book has been printed based on the transcript of the Marrow SS Surgery videos.
- The information contained in this book is for educational purposes only. The content provided is not intended to substitute for professional medical advice, diagnosis or treatment.
- This book cannot be sold separately. It has been made available to only select eligible users who have an active subscription to Marrow SS Surgery videos.
- The text, images, slides, and other materials used in this book have been contributed by the faculty, who are subject matter experts. We have merely reproduced them as video transcripts in this book.
- The notes have been consciously designed in a way that is concise and revisable. To ensure this, we have intentionally added only the most relevant modules and images that are needed for you.
- Reasonable care has been taken to ensure the accuracy of the information provided in this book. Neither the faculty nor Marrow takes any responsibility for any liability or damages resulting from applying the information provided in this book.
- This set contains notes of all main videos published in the app until August 2025. You can find notes for any additional videos published after this date within the app under the videos section.

// ME821-PPL

Contents

Volume - 1

General Principles of Plastic Surgery

1.	Skin and Skin Grafts	1
2.	Skin Substitutes and Wound Dressings	10
3.	General Principles of Flaps	16
4.	Flaps : Myocutaneous and Fasciocutaneous	31
5.	Wound Healing	45
6.	Bone Healing	56
7.	Nerve Repair	59
8.	Principles of Microvascular Surgery	67
9.	Principles of Tissue Expansion	75
10.	Burn Injuries I	81
11.	Burn Injuries II	91
12.	Post-Burn Reconstruction	106
13.	Scars and Management	120
14.	Tissue Engineering & Implants	124
15.	Local Anesthetics	134
16.	Lasers	143
17.	Transplantation Biology	151
18.	Radiation & Radiation Injury	156
19.	Instruments in Plastic Surgery	162

Oncoplastic Surgery

20.	Benign Pigmented Lesions of Skin	173
21.	Benign Non-Pigmented Lesions of Skin	183

22. Malignant Melanoma 194
23. BCC and SCC 203
24. Vascular Anomalies 208

Upper Limb

25. Anatomy and Biomechanics of The Hand 219
26. Radiology of Hand and Wrist 237
27. Tendon Injuries 243
28. Tenosynovitis 255
29. Nerve Injuries and Tendon Transfers 258
30. Radial Nerve Palsy 262
31. Ulnar Nerve Palsy 269
32. Median Nerve Palsy 280
33. Dupuytren's Contracture 291
34. Infections of The Hand 294
35. Wrist Injuries 301
36. Congenital Anomalies of The Hand 308
37. Soft Tissue Reconstruction of Hand 317

Volume - 2

Craniofacial and Cleft Surgery

38. Head & Neck Embryology 323
39. Cleft Lip & Palate 331
40. Craniofacial Clefts and Orbital Hypertelorism 348
41. Craniofacial Deformities and Tumors 358
42. Craniofacial Microsomia 368
43. Syndromic Craniosynostosis 379

44. Non-Syndromic Craniosynostosis & Deformational Plagiocephaly 385
45. Orthognathic Surgery 396
46. Acquired Lip and Cheek Deformities 401
47. Lip and Cheek Defects 413

Head and Neck

48. Facial Fractures I 421
49. Facial Fractures II 434
50. Reconstruction of Scalp, Forehead, Calvarium and Skull Base 454
51. Ear Deformities & Reconstruction 462
52. Reconstruction of The Eyelids and Canthoplasty 476
53. Forehead and Brow Rejuvenation 495
54. Facelift 501
55. Mangement of VPI 507
56. Nasal Reconstruction I 512
57. Nasal Reconstruction II 520
58. Head & Neck Cancer 525
59. Facial Paralysis 550
60. Oral and Mandibular Reconstruction 557

Trunk and Lower Extremities

61. Breast Reconstruction I 563
62. Breast Reconstruction II 569
63. Breast Cancer 576
64. Breast Augmentation 579
65. Breast Reduction 588
66. Gynecomastia 594
67. Abdominal Wall Reconstruction 598

68. Chest Wall Reconstruction 607
69. Genital Reconstruction 616
70. Lower Limb Reconstruction 626

Aesthetic Surgery

71. Body Contouring 640
72. Hair Transplant 655
73. Non Surgical Facial Rejuvenation 662

SKIN AND SKIN GRAFTS

----- Active space -----

Embryology & function of skin 00:00:37

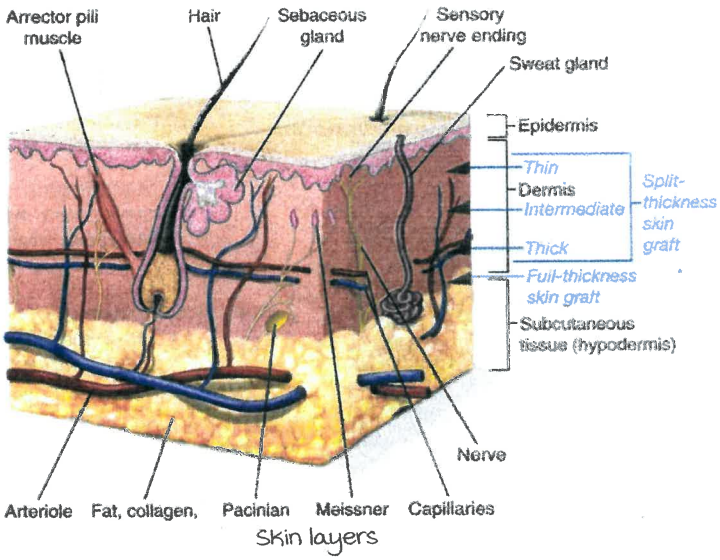
Overview :

- Largest organ (15% of adult body weight)
- Starts developing from 4th week IUL : Differentiates from ectoderm (Forms epidermis) & mesoderm (Forms dermis).
- Teeth & hair follicles, derived from skin (Ecto & mesoderm).
- Toe nails & finger nails also derived from skin (Ectoderm).
- Epidermal appendages : Hair follicles, sebaceous, sweat, apocrine glands.

Functions of skin :

- Physical protection.
- Protection against uv light.
- Protection against microbial invasion.
- Prevention of fluid loss.
- Regulation of temp.
- Sensation.
- Immunological surveillance.

Anatomy of skin 00:02:05



Skin layers

----- Active space -----

Epidermis :

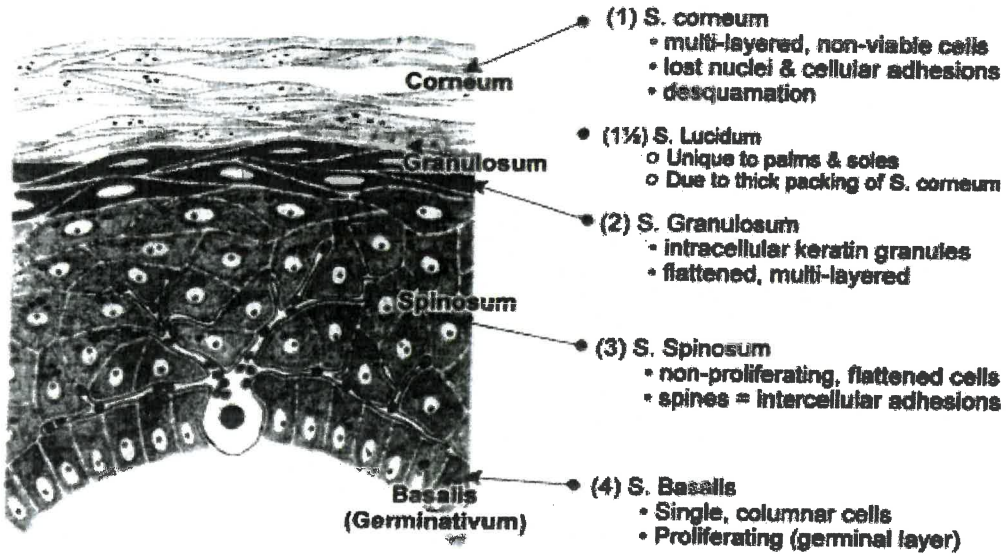
- Stratified squamous epithelium.
- Ectodermal in origin.
- Keratinocytes are predominant cells.
- Substratified into 5 layers

Varying thickness :

Average thickness : 100 micrometer.

Thickness in eyelid : 50micrometer but in palms & soles : Upto 1mm.

Layers of epidermis	
Stratum germinativum	• Actively proliferating layer. • Contains melanocytes. • Linked to basal lamina
Stratum spinosum	• Large Keratinocytes → Cytokeratin → Tonofibrils → Desmosomes. • Helps in adhesion. • Also called as prickle skin layer.
Stratum Granulosum	• Mature Keratinocytes containing Keratohyalin granules. • Protein synthesis site.
Stratum lucidum	• Only in palm and soles.
Stratum corneum	• Non-viable cells • Protection & insulation.



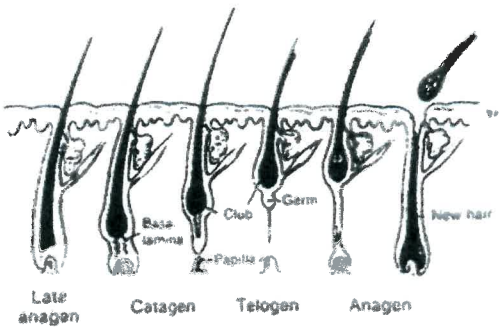
Skin layers

Dermis :

----- Active space -----

- 95% of skin thickness.
- Fibroblasts : Dominant cell type. Others : mast cells.
- Constituents :
  - Collagen TI (mature).
  - T3 (Immature).
  - Elastin.
- Ground substance :
  - Hyaluronic acid.
  - Dermatan Sulphate.
- Chondritin sulphate. Papillary dermis

Layers of dermis	
Papillary dermis	• Loosely arranged collagen fibers • Provides nutrients & heat exchange.
Reticular dermis	• Dense irregular collagen & dermal elastin.
2 horizontal plexuses of vessels connected by bridging vessels traverse the dermis.	



Growth phases

Appendages :

- Hair follicles :
  - Parts : Medulla, cortex, cuticle.
  - Inner root sheath (Superficial) Vs outer root sheath (Deep).
- Growth phases :
  - Anagen (Growing 90).
  - Catagen (Regressing 1-2%).
  - Telogen (Resting phase 10-12%).
- Glands :
  - Eccrine : Palm, sole, axilla (Absent in lips, penis, clitoris, labia minora, areola.
  - Apocrine : Axilla, eyelid (moll), groin, areola
  - Sebaceous : Produce sebum, present on the forehead, nose, cheek, mostly contain Keratin.

----- Active space -----

Skin graft basics

00:15:27

Definition :

Complete detachment of a portion of skin from a donor site I transferring to a host bed where a new blood supply is acquired.

History :

- Origin : India, approximately 3000 years ago for nasal reconstruction in tile maker caste.
- Reverdin 1869 : Pinch graft.
- Ollier 1869, Thiersch 1871 : Split thickness graft. Wolfe and Krausse: Full thickness graft.
- Sir Astley Cooper : In 1817, used skin graft to cover an amputated thumb.

Important aspects :

- Thickness varies region wise.
- Thickest : Trunk, palm, sole.
- Thinnest : Eyelids, postauricular.
- Children & elderly : Thin in general.
- Dermis thins after 4th-5th decade.
- Men have thicker skin.

Types of graft (As per donor)	
Autograft	Donor & recipient is same individual
Allograft	Donor & recipient is of same species
Xenograft	Donor & recipient is of different species
Isograft	Donor & recipient genetically identical (Twins)
As per skin thickness	
STSG	Epidermis with variable amount of dermis a.k.a partial thickness skin graft • Thin : 0.15 – 0.3mm • Intermediate : 0.3 – 0.45mm • Thick : 0.45 – 0.6mm
FTSG	Complete dermis included

Contraction of grafts

00:28:53

----- Active space -----

Graft contraction :

Primary contraction :

- At time of harvest.
- Elastin mediated more in FTSG (~40%).
- STSG-medium : 20%, thin : 10%.

Secondary contracture :

- During healing at wound bed.
- myofibroblast mediated.
- more in STSG,

Note :

In cases, requiring large areas to be grafted, STSG preferred as large amount of FTGS cannot be harvested. But in cosmetic cases, FTGS preferred as to avoid secondary contracture and thus disfigurement.

	Advantages	Disadvantages
STSG	• Graft take more reliable • Donor heals in 7-14 days	• more wound contraction • Does not grow • Not durable • Minimal hair growth/sweating
FTSG	• Less scar contraction • Grows with age • Better match • Hair and glands normal • Once innervated	• Graft take less reliable • Donor needs primary closure or • STSG

Recipient sites

00:35:51

Suitable and unsuitable sites :

Suitable sites :

Muscle, fascia, fat, periosteum, perichondrium, paratenon, granulation tissue.

Unsuitable sites :

Bare cortical bone/tendon/cartilage, irradiated tissue, necrotic or infected tissue.

----- Active space -----

Phases of graft take/ Revascularisation

00:38:45

Phases of graft take	
Imbibition	• 0–48 hrs. • Ischemic/anaerobic phase. • Nourishment by diffusion. • Graft appears edematous & white. • Keeps graft moist and capillaries patent. • Attachment by fibrin only.
Inoculation	• No more valid. • Kissing capillaries. • Unidirectional angiogenesis at fibrin interface. • 48 to 72 hours, microvascular growth of capillary-sized vessels (Averaging 10–11 mm in diameter). • Peak in vessel density : Day 7.
Revascularisation	• Angiogenesis established in conduits : 3 methods. – Inoculation, reangiogenesis, neovascularisation. • Lymphatic drainage established, edema resolved. • Graft appears pink. • Collagen links form between graft and bed. Mediated by mmp2.
Cellular hyperplasia	• After 1–2 weeks. Epidermis thickens 7–8 fold. • Scaling and crusting. • Returns to normal by 4 weeks.
Maturation/ Remodelling	• Occurs by interaction of graft & wound bed. 2° contraction is seen. • Pigmentation : FTSG better match, STSG may develop hyperpigmentatation, sun avoidance x 6 months. • Reinnervation : Starts in 4–5 weeks, complete by 12–24 months, FTSG > STSG. • Sequence of return of sensation : Pain → Light touch → Temperature. • Care regarding thermal injury necessary in early days as temperature sensation returns last.

Sites of harvest

00:47:57

----- Active space -----

STSG :

- Medial thigh as cosmetically less disfiguring.
- Buttocks.
- Scalp.
- Back.

FTG :

- Post auricular.
- Groin.
- Supra Clavicular area.
- Inner side of arm.

Graft harvesting

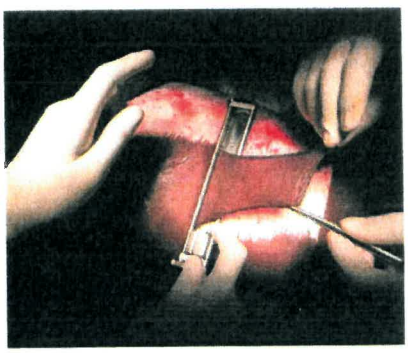
00:50:07

FTSG :

- Free hand scalpel.
- Template used.
- Planned oversized to accommodate primary contraction.
- Defat before placement.

STSG :

- Instruments.
- Handheld Knife : Humby, Goulian.
- Dermatome : Drum (Padgett, Reese air/electric powered
  Bleeding patterns).
- Tiny punctate bleed closely placed : Thin STSG.
- Widely spaced bigger bleeding points : Thick STSG.



STSG instruments

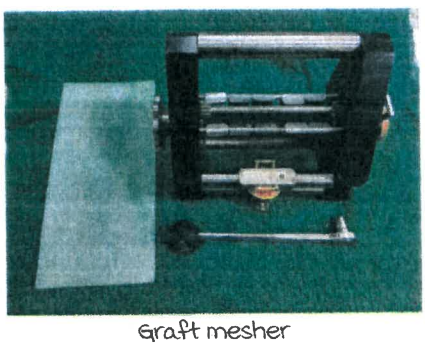
Graft expansion

00:54:19

Graft expansion techniques :

meshing :

- Manual or mesher.
- 1 : 1.5 = usual, 1 : 9 = maximum.
- Allows drainage of exudate & blood
- Cobble stone appearance.
- Significant contraction, so avoid using over joints.



Graft mesher

----- Active space -----

Pinch graft:

- Graft divided into tiny pieces.

Skin graft opened

Meek island grafting :

- Special dermatome and p refolded gauze used.
- Skin graft cut into pieces using cork plates & then rolled into a machine placing onto a prefolded gauge.
- On opening the gauge, islands of separated skin are present, which then placed on the wound surface cause skin regeneration in between.
- Expansion ratio 1:9.

Microskin grafting:

- Sheet graft minced with Tanner-Vandeput dermatome.
- Expansion ratio 1 : 10.

Intermingled transplantation :

- Autograft alternating with allograft.

Fixation of graft & Causes of graft failure

01:02:24

Causes :

- Hematoma (m/c).
- Infection (and m/c).
- Seroma.
- Movement.
- Excess pressure.
- Arterial insufficiency.
- Venous congestion.
- Lymphatic stasis.
- Upside down graft placement.
- Poor fixation.

Tie over dressings :

- Help immobile/fix the graft over the wound.
- Used commonly for mobile areas, facial wounds.

Donor site healing & dressings

01:08:15

----- Active space -----

Donor site healing :

FTSG :

- Primary closure.

STSG :

- Epithelial migration from appendages and edges.
- Starts in 24 hrs, complete in 7-10 days, not durable.
- Dermis does not regenerate.
- Serial STSG can be harvested from donor with thick dermis.

Donor site dressings :

- Open : Cheap, prolong healing, painful, infection risk.
- Semiopen : Scarlet red, Biobrane, Vaseline gauze, xerofoam.
- Semi-occlusive : Allevyn, Opsite, Tegaderm.
- Occlusive : Duoderm.
- Biologic :
  - Amniotic membrane.
  - Cultured cells.
  - Allograft.
  - Xenograft.
  - Skin substitutes.
- Allograft is revascularized before rejection, xenograft is rejected before revascularisation.

----- Active space -----

SKIN SUBSTITUTES AND WOUND DRESSINGS

Wound dressing 00:00:54

Ideal wound dressing :

- Protection of wound physically and microbiologically.
- Non toxic and non allergenic.
- Maintains humidity.
- Removes excess exudate.
- Allows gaseous exchange.
- Removes necrotic material.
- Promotes epithelialisation.
- Promotes granulation.
- Atraumatic application and removal.
- Inexpensive with long shelf life.

Classification of wound dressing :

Could be temporary or permanent.

Temporary biologic dressings :

- Organic.
- Synthetic.

Permanent biologic dressings :

- Autograft.
- Skin substitutes.

Synthetic :

Low adherent dressings :

- Tulles (Open weave soaked in paraffin).
- Textiles (mepitel).
- Perforated plastic films (Telfa).

Semipermeable films :

- Permeable to gas and vapour (Not to liquids and bacteria).
- Opsite and tegaderm with adhesive (Polyurethane).
- Omiderm is without adhesive.

----- Active space -----

Hydrogels :

- Insoluble polymers with 96% water.
- Donate water and keep wound moist (Natural autolysis).
- Aquaform, Intrasite.

Hydrocolloids :

- Sodium CMC, gelatin, elastomers.
- Forms a gel by absorption of wound exudate.
- Very commonly used hydrocolloid dressing : Aquacel.

Alginates :

- Derived from a brown seaweed.
- Absorbent.
- Disadvantage : Adhere on non exudative wound.

Synthetic foams :

- Polyurethane or silicone.
- Heavily exudative wound.

Negative pressure wound therapy :

- Acts by mechanotransduction.
- Decreases interstitial fluid content of wound.
- Promotes granulation tissue.
- Wound covered with open cell sponge, covered with a polyurethane adhesive film.
- Pressure : 120 mmHg for acute, 50 - 70 mmHg for chronic wounds.
- Intermittent suction.

Contra-indications :

- Malignancy.
- Untreated osteomyelitis.
- Fistulae.
- Necrotic tissue.
- Ischemic tissue.

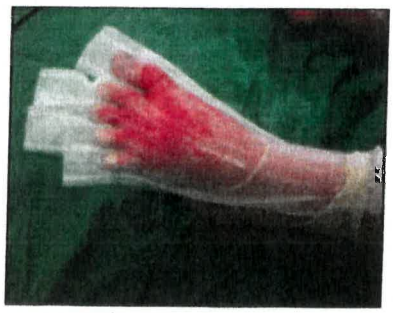
Organic wound dressing :

Allograft skin :

- Live related (Family members) : Banned in several countries.
- Live unrelated (Freshly harvested form donors) : Fresh cadavers.

----- Active space -----

- Cadaveric unrelated :
  - Glycerol preserved after freeze-drying.
  - Glycerol preservation at -80° C (may contain viable cells and can lead to rejection).
  - Irradiated.
  - Immunogenic.
- Alexander technique (Sandwich) → Widely meshed autograft and allograft placed above.
- Human amnion (Readily available).
- Porcine (Replacement every few days).



Biobrane bilaminate

Synthetic wound dressing :

Biobrane bilaminate :

- Semipermeable silicone sheet.
- Embedded in nylon fabric with porcine collagen.
- Acellular in nature.
- Provides good pain relief.
- Good temporising measure to allow early physiotherapy.
- Especially used in paediatric scalds, donor wounds.

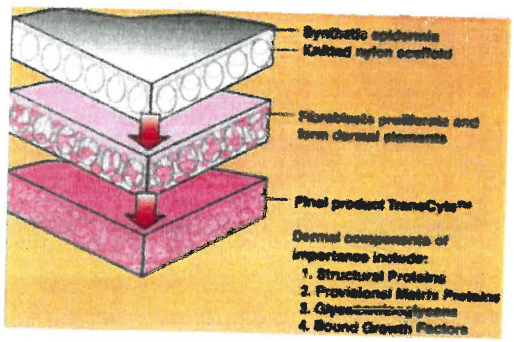
Biograne gloves

Biograne gloves :

- Advantages : Pain relief.
- No antibiotics : Chances of infection.

Transcyte :

- Polymer membrane with neonatal fibroblasts.
- Grown on a nylon mesh with porcine collagen and bounded to a thin layer of silicone.
- Fibroblasts secrete growth factors, collagen and proteins.
- Frozen for storage.
- Growth factors remain intact.
- Acellular in nature.



Transcyte

Skin substitute

00:18:17

----- Active space -----

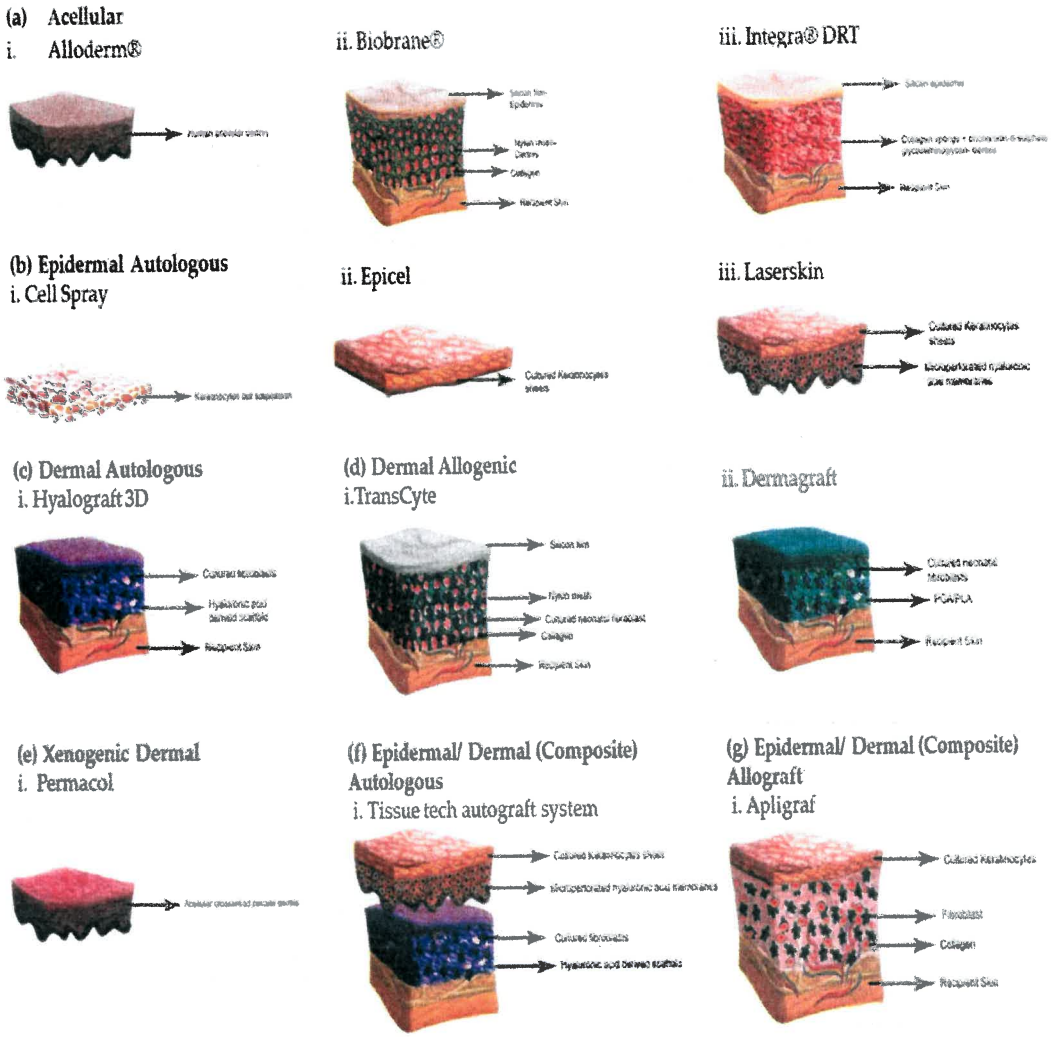
Ideal skin substitute :

- Permanent.
- No skin antigenicity.
- Tissue compatibility.
- Non toxic.
- Permeable to water vapour.
- Resistant to infection.
- Adherence to wound surface.
- Porosity.
- Malleable.
- Elastic.
- Structural stability.
- Smooth surface.
- Tensile strength.
- Ease of storage.
- Economical.
- Biodegradable.

Common skin substitutes :

Permanently incorporated :

- Integra.
- Matriderm.
- Dermagraft.
- Cultured epithelial autograft.



Skin substitutes

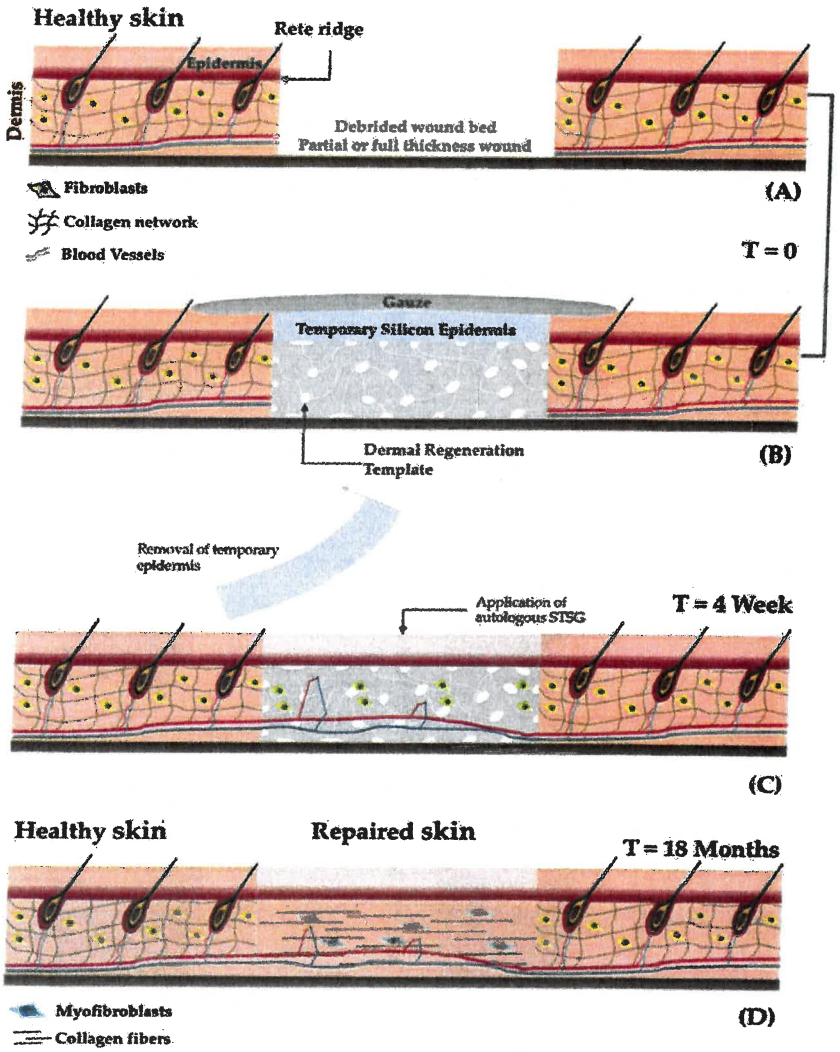
----- Active space -----

Integra :

- Silicone prevents moisture loss and granulation tissue formation on the surface.
- C6S elasticity, controls the degradation rate maintains and open pore structure.

Phases of healing :

- Imbibition (Fibrin mediated).
- Fibroblast migration :
  - Occurs by day 7.
  - Collagen production by 3 weeks.
- Neovascularistaion :
  - Occurs by day 12.
  - Remove superficial layer by day 28 & replaced with autologous epidermis.
- Remodelling.
- Used for challenging areas with NPWT.



Integra

----- Active space -----

Matriderm :

Single layer dermal template :

- Bovine dermal collagen.
- Bovine nuchal ligament elastin

Dermagraft :

- Neonatal foreskin fibroblasts.
- Seeded onto biodegradable PGA mesh.
- Fibroblasts are viable after thawing.

Cultured epidermal autograft :

- Keratinocytes cultured and sprayed.
- Risk of contracture.

Couno technique :

- CEA on allograft.
- Allograft is used till the cell is being cultured.
- After revascularisation, removal of epidermis.
- Spraying of CEA.