

Healing:

* Healing is initiated when inflammⁿ begins.

* occurs by one (or) combination of

(2) processes.

Regeneration

* injured tissue replaced by new tissue.

* depends on regenerative capacity of tissues.

Repair

* Replacement by "SCAR"

Tissues

(3) Types based on

Regenerative Capacity

LABILE TISSUES

STABLE TISSUES

PERMANENT - TISSUES

* continuously regenerate tissue

* presence of stem cells

eg:

i) small & large bowel.
(stem cells → mucosal crypts.)

ii) skin → stem cells in basal layer.

iii) Bone marrow

↳ Hematopoietic stem cells.

* are quiescent/stable but can reenter cell cycle.

eg: (after repair again enter quiescence)

(i) Regeneratⁿ of Liver after partial Resection.

by "COMPENSATORY HYPERPLASIA"

(ii) regeneratⁿ of prox. Tubular cells of kidney after

ATN

* Lacks significant regenerative potential

* eg: Myocardium skeletal m/s Neurons

after injury repaired by

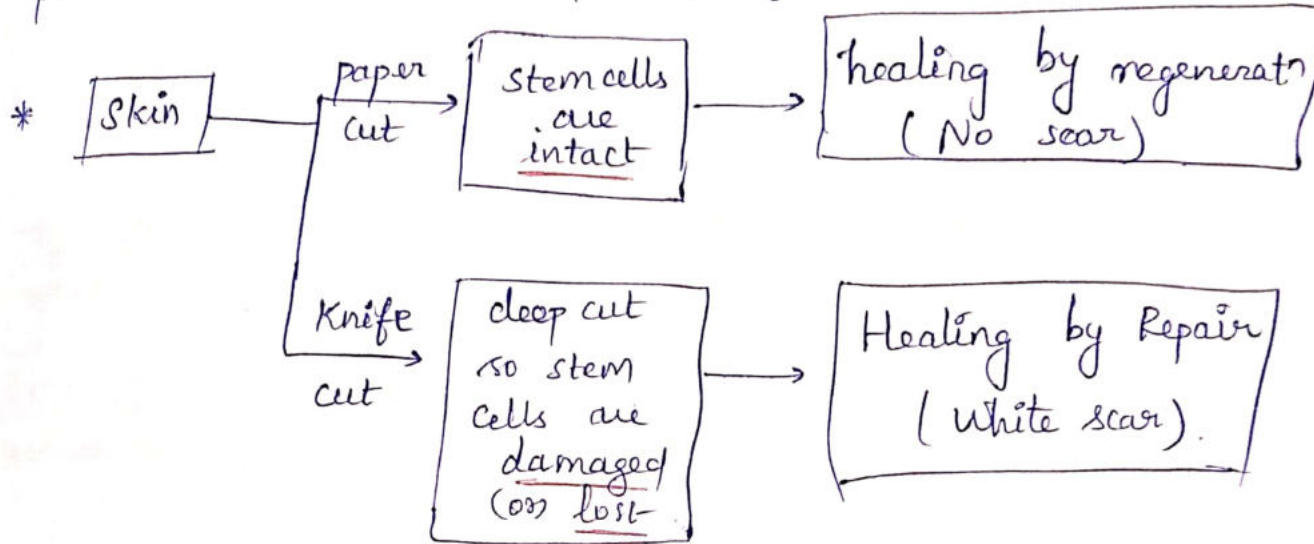
Fibrous scar

eg: after MI, myocardium repairs by white scar

* Marker for Hematopoietic S.C. of bone marrow
is **CD 34 +** (⊗ in BM Transplant).

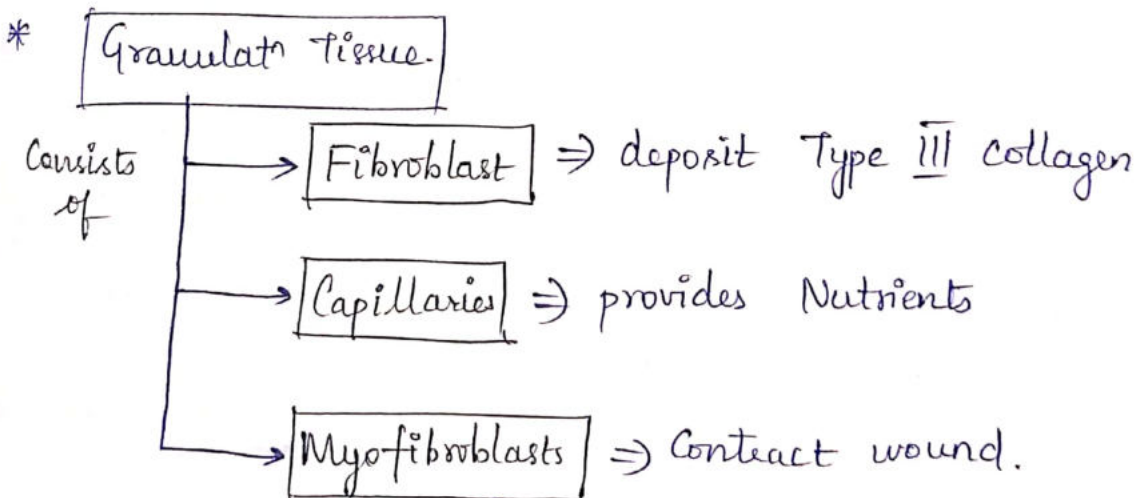
* Lungs → Type ② pneumocytes are S.C.

* severe ATN pts. are kept on Dialysis until.
prox. Tub. cells are ~~replaced~~ regenerated.



Repair/Scar formatn.

* Granulation Tissue is the initial phase of Repair.



→ Note: Myofibroblasts are responsible for wound "Contraction" in.

2° (secondary) Intention Healing.

Granulation Tissue

Scar

(Type III Collagen)

 $\xrightarrow[\text{(Zn)}]{\text{Collagenase}}$

(Type I collagen)

Note: Zn deficiency $\rightarrow$ leads to Abnormal Healing.

Types of collagen:

Type ①: BONE * High tensile strength

Type ②: Cartilage
(Cartilage).

Type ③ collagen: * found in tissues that stretch
* pliable

eg: * Blood v/s $\Rightarrow$ stretch

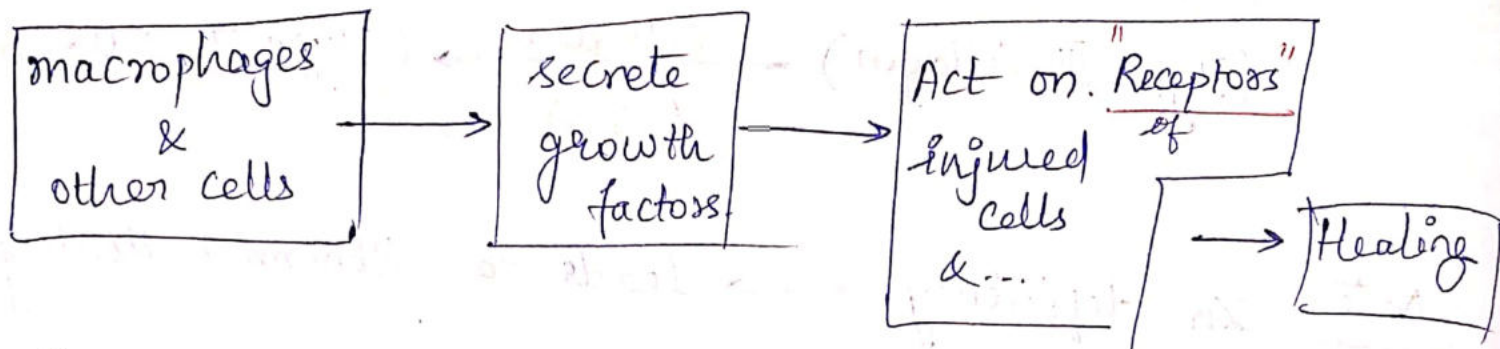
* Embryo $\Rightarrow$ continuously grow so stretch

* Granulation Tissue $\Rightarrow$ at the ^{initial} phase of scar, it needs to stretch

Type ④ collagen:

* predominant in Basement Membrane.

Mechanism of Healing: PARACRINE signaling



Eg:

Growth factors	Functions
1) TGF- α (Tissue Growth factor)	* epithelial & Fibroblast growth factor
2) TGF- β	* important Fibroblast growth factor * inhibits inflammation
3) PDGF (platelet Derived Growth Factor)	* endothelium, smooth m/s, fibroblast growth factor
4) FGF (Fibroblast Growth Factor)	* angiogenesis (known as although, Fibroblast growth factor) * skeletal development
5) VEGF (Vascular Endothelial Growth Factor)	angiogenesis.

1° (PRIMARY)
intention

* You got a cut wound.
↓
You go to the ER.
↓
Stitching. to
bring **wound EDGES** together
↓
minimal scar formatn

(OR)

2° (SECONDARY)
intention

wound edges are not
approximated.
↓
wound remains open
↓
granulation tissue fills
in the defect
↓
Big scar formatn
&
also contractn of wound
happens (due to **myofibroblast**)

Delayed wound healing:

(i) Infection:

continuous inflammation leads to delayed healing

(ii) Deficiency of

Vitamin C

* Hydroxylatn (-OH)
of residues is essential
for "CROSS LINKING"
b/n pro-collagen

Copper

* Req. as a
cofactor for
Lysyl oxidase

Zinc

* $\downarrow \oplus$
Collagenase
↓
Type ③ Collagen
Type ① Collagen

(iii) ^{other causes} of delayed wound healing are foreign body, ischemia, Diabetes, Malnutrition

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DEHISCENCE :

- * rupture of wound.
- * m/c seen after abdominal surgery.

Hypertrophic Scar:

- * excess production of scar localized to wound
- * characterized predominantly of "Type I collagen"
(Type III $\xrightarrow{\text{collagenase}}$ Type I).

Keloid:

- * excess productⁿ of scar out of proportion to the wound.
- * characterized by excess Type III collagen
- * affects earlobes, face, upper limb...

X ————— X