#### **School of Medical and Allied Science**

Course Code : BPTH3001 Course Name: Orthopaedics

### Fracture healing

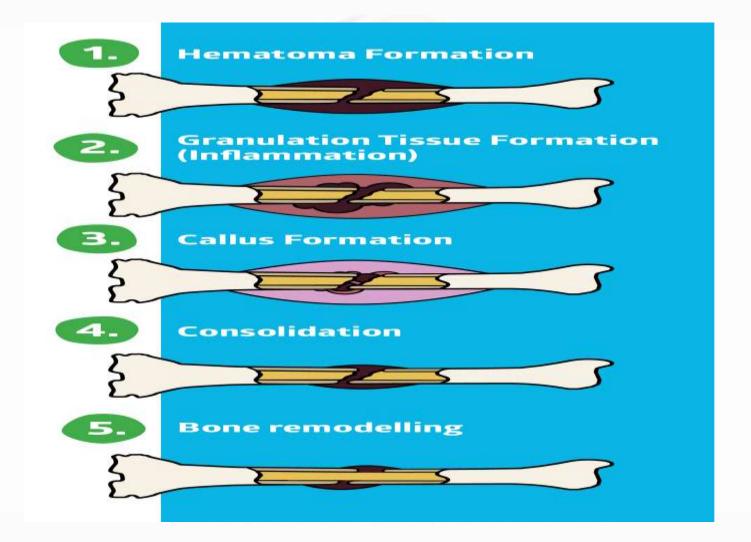
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#### Disclaimer

All the content material provided here is only for teaching purpose.

### Fracture Healing

- Healing of fractures is in many steps.
- Fracture begins to heal as soon as the bone is broken, and through a continuous series.
- Steps of healing of cortical bone(FROST, 1989) :
- 1.Stage of haematoma
- 2. Stage of granulation tissue
- 3.Stage of callus
- 4. Stage of remodelling (formerly called consolidation)
- 5. Stage of modelling (formerly called remodelling)



### 1.Stage of Haematoma

- Lasts up to 7 days.
- When the bone is fractured, blood leaks out through torn vessels in the bone and forms a haemtoma between and around the fracture.
- The periosteum and local soft tissues are stripped from the fracture ends, results in ischaemic necrosis of the fracture ends over a variable length, usually only a few mm.
- Due to deprived blood supply some osteocytes die whereas some are sensitised to respond subsequently by differentiating into daughter cells, which contribute to the healing process later on.

### Stage of granulation tissue

- Lasts for about 2-3 weeks.
- The sensitised daughter cells produce cells which differentiate and organise to provide blood vessels, fibroblasts, osteoclasts etc.
- Collectively they form granulation tissue in the space between fracture fragments.
- This loose fibrous mesh serves as a framework for the ingrowth of fibroblasts and new capillaries.



### 3. Stage of Callus

- Lasts for about 4-12 weeks.
- In this stage the granulation tissues differentiate further and creates osteoblasts.
- These cells lay down an intercellular matrix which soon becomes impregnated (Soak) with calcium salts, and results in callus formation (woven bone).
- Callus is first sign of union visible in X-ray.



### 4. Stage of remodelling

- Woven bone is replaced by mature bone.
- It is a slow process and takes from 1-2 years.
- 5. **Stage of modelling:** Bone is gradually strengthened.
- Shapening of cortices occurs at the endosteal and perioseal surfaces
- The major stimulus to this process comes from the weight bearing stressesand the muscle forces when the person resumes activity.

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### Healing of Cancellous bones

- Follows a different pattern
- The bone one is of uniform spongy texture and has no medullary cavity.
- Union can occur directly between the bony trabeculae.
- Subsequent to haematoma and granulation formation, mature osteoblasts lay down woven bone in the intercellular matrix, and the two fragments unite.

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### Primary and Secondary fracture healing

- **Primary fracture healing occurs where fracture haematoma has been distributed, as in fracture treated operatively.**
- The bone heal directly, without callus formation, and it is therefore difficult to evaluate union on X-rays.
- Secondary fracture healing Occurs in fractures where fracture hematoma is not disturbed. As in cases treated non operatively.
- There is healing with callus formation, can be evaluated on X-rays.

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### Factors affecting fracture healing

- Age of the patient
- Type of bone
- Pattern of fracture
- Disturbed patho-anatomy
- Type of reduction
- Immobilisation
- Open fractures
- Compression of fracture site

#### References

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- https://www.betterbones.com/fractures-and-healing/speed-up-fracture-healing
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