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Lecture title: Orthopedics & Fractures
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Internal fixation

- Internal fixation is the surgical implantation of mechanical devices inside the animal's body.

Advantages of Internal fixation

1) Internal fixation allows precise alignment and rigid stabilization.
2) Internal fixation methods promote direct bone healing by minimizing interfragmentary motion, reducing the formation of excessive callus and ensuring proper osteosynthesis.
3) Early mobilization and Weight bearing – internal implants provide sufficient stability to enable early limb use, reducing joint stiffness and muscle atrophy.
4) Effective Management of Complex Fractures – It is the preferred choice for comminuted, intra-articular, and segmental fractures, where external coaptation may not provide adequate stabilization.
5) Internal fixation provides prolonged stability, allowing for controlled bone remodeling and preventing malunion, delayed union, or nonunion complications.

Disadvantages of Internal fixation

1) Risk of Infection – Surgical procedures carry a risk of infection.
2) Surgical Risks – Complications like nerve damage, blood vessel injury.
3) Implant Failure – Screws, plates, or rods may break or loosen, requiring additional surgery.
4) Some implants may need to be removed later, leading to another surgery.
5) Expensive – Internal fixation procedures are often costly due to surgery, implants, and hospital stays.

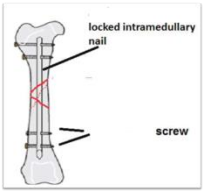
Types of internal fixation

1) **Locked Intramedullary Nail**
2) **Intramedullary Pins (Stein-mann pins)**
3) **K-wire (Kirschner wires).**
4) **Orthopedic wire**

5) **Bone Plates.**
6) **Bone Screws.**

Locked intramedullary nail

1) Is a stainless steel nail that is placed within the medullary cavity and is locked to the bone by screws that cross the bone and pass through holes in the nail.
2) Locked intramedullary nails are suitable for the stabilization of selected fractures of the humerus, femur, and tibia.
3) They resist bending forces in all directions because of their large diameter and central location. Also prevent rotation force.



Intramedullary pins

1) Intramedullary pins often termed Stein-mann pins are round stainless steel rods ranging from 2.0 to 5.0 mm.
2) Intramedullary pins are frequently placed within the medullary cavity to treatment shaft fractures. Also for repairing the epiphyseal; metaphyseal fractures; as well as intramedullary pins can be used as crossed pins.
3) They usually have a point at both ends, but are also available with only a single point.
4) A pin that is approximately 70% of the diameter of the medullary canal is considered optimal.
5) Intra medullary pins will not prevent rotation of a fracture. Therefore using adjunct fixation, such as cerclage wires or an external skeletal fixator is necessary where an intramedullary pin is used.
6) The insertion of intramedullary pins and locked intramedullary nail either by Normograde approach (from the proximal end of the bone) or Retrograde approach (from the site of fracture).

Kirschner wire (K-wire)

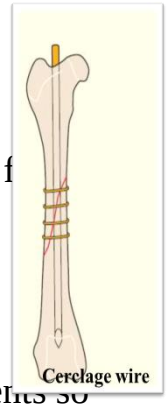
1) K-wire is a thin, smooth, or threaded stainless steel wire, with a small diameter ranged from 0.8 to 2.0 mm.
2) They are available with points at both ends or just at one end.
3) A K-wire can be placed through the skin for ease of later removal.
4) K-wires can be used as crossed pins for the repair of physeal fractures.

Orthopedic wire

- Orthopedic wire implants are indicated for a wide range of orthopedic trauma applications. It can be used either as an independent device for fracture fixation or in combination with other fixation systems.

Types of orthopedic wire:

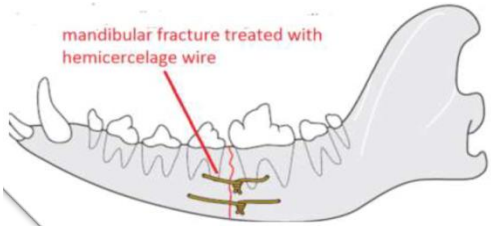
Cerclage wire



1) It is used for treatment a long oblique or spiral fracture.
2) At least two cerclage wires should be used to effectively counter bending f
3) Cerclage wires are always used with additional fixation such as an intramedullary pin, external skeletal fixator, or plate.

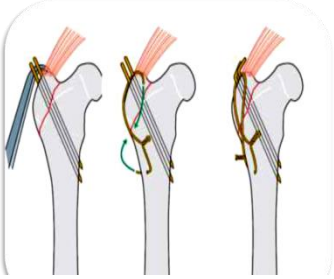
Hemicerclage wire

1) The wire is passed through holes drilled in the proximal and distal fragments so that, when the wire is tightened, the fragments are held in alignment.
2) They are only appropriate for simple fracture in the flat, non-weight bearing bones. Such as mandibular and maxillary fractures.



Tension band wire

1) Tension band wire can be effectively used with the pin technique for stabilizing Avulsion fragments.
2) The fragment is initially stabilized using either two or more pins or K-wires or a screw, to protect these implants from the bending forces exerted by the pull of the attached ligaments or tendons, a wire is placed to oppose the tensile forces.



Bone screws

- **Bone screws are used to** Immobilize fractured bone or Fixing a fracture immobilization device such as a plate and nail.
- Classification of bone screws: Bone screws are classified based on several criteria, including their design, function, and material.

Bone Plates

- Bone Plates is one of the strongest and most effective methods of fixing a fracture.
- It made from stainless steel or titanium, it come in various sizes and shapes, and each can be used in several different ways.

Advantage of bone plates

1) Maintain reduction
2) Preservation of blood supply
3) Stability under load
4) Useful in poor quality bone.

The Bone Plate classified according to their functions in to:

1. **Compression bone plates:** It is used to stabilize fractures by applying dynamic compression across the fracture site.
2. **Neutralization bone plates:** Protect fracture from normal bending, rotation, and axial loading forces. This technique is commonly used in long bone fractures, allowing for better alignment and faster recovery.
3. **Buttress bone plates:** It is commonly used in metaphyseal fractures, where the bone structure is weaker and prone to axial loading.
4. **Bridging bone plate:** It is used in fractures where the bone fragments are not directly reconstructed. Used in comminuted fractures where direct fixation is difficult.