

Orthopedic Surgery

Surgical Techniques and Considerations



Lesson Objectives:

1. Identify major bones of the body
2. Discuss specific types of instruments used in orthopedic surgery
3. Explain the uses of common orthopedic implants and hardware
4. Discuss basic techniques used in fracture reduction and fixation

Orthopedic Surgery

Overview

- Specializes in connective tissues.
- Treats bone, joint, ligament, tendon, and muscle issues.
- Focuses on restoring function and alleviating pain.

Surgical Approach

- Organized by anatomical location.
- Includes bone and soft tissue repair.

Instrumentation and Implants

- Proficiency relies on understanding tools and implants.
- Principles akin to carpentry and engineering.
- Reliance on proprietary orthopedic systems.

Anatomy

Bones and their structure

Bone tissue

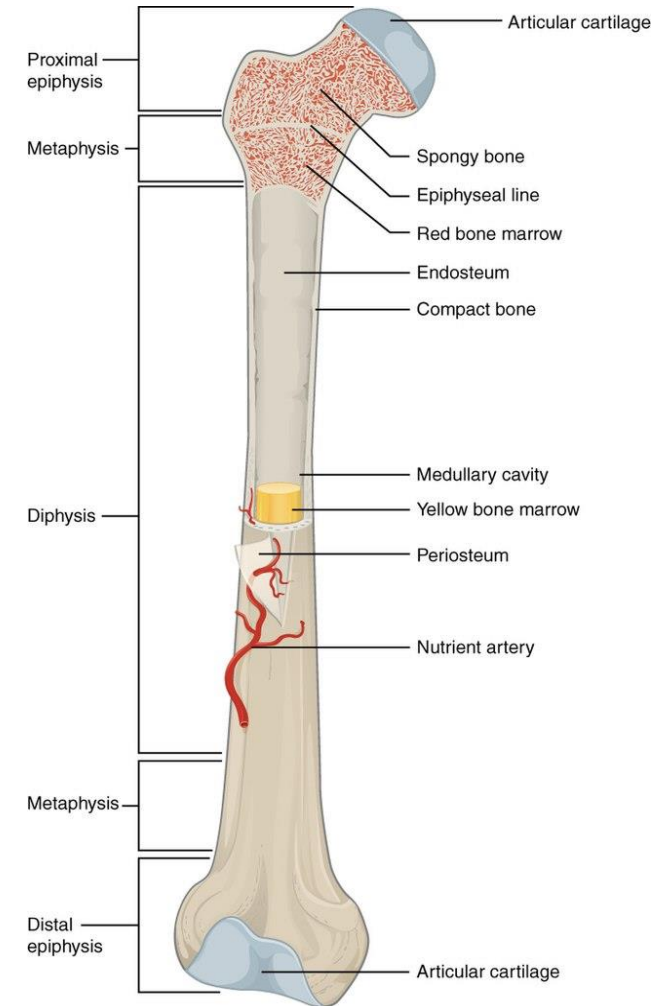
Joints

Synarthrosis

Amphiarthrosis

Synovial or diarthrosis

Tendons, ligaments, and muscles



Characteristics of Bones

- ❑ Living tissue
- ❑ Provide form and structure to the human body
- ❑ Actively involved in maintenance of homeostasis

Characteristics of bone types

Bone type	example	characteristics
▪ Flat	Skull, shoulder blades, ribs, sternum, pelvic bones	▪ Like plates of armor, flat bones protect soft tissues of the brain and organs in the thorax
▪ Long	Arms and legs	▪ Like steel beams, these weight-bearing bones provide structural support
▪ Short	Wrists, ankles	▪ Short bones look like blocks and allow a wider range of movement than larger bones
▪ Irregular	Vertebral column, kneecaps	▪ Irregular bones have a variety of shapes and usually have projections that muscles, tendons, and ligaments can attach to.

Bones and Their Structure

- **Axial Skeleton:** Cranium, facial bones, ear bones, spinal column, sternum, and ribs.
- **Cranium:** Eight bones connected by sutures, with fontanelles allowing flexibility.
- **Facial Bones:** Complex structure forming nasal sinus, orbit, and jaw.
- **Vertebral Column:** 24 vertebrae, sacrum, coccyx.
- **Appendicular Skeleton:** Upper and lower extremities, pelvic girdle.

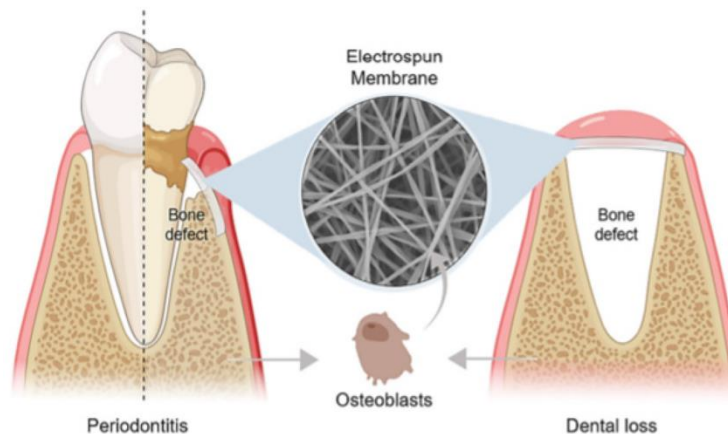
Anatomical Structures

Bone Tissue

- **Cortical Bone:** Dense, found in shafts of long bones.
- **Cancellous Bone:** Softer, found in ends of long bones, ribs, cranium, and scapula.

Bone Membranes

- **Periosteum:** Tough membrane covering bones, containing osteoblasts.
- **Endosteum:** Lines inner channels of long bones, fills interstitial spaces.



Anatomical Structures (contd.)

Bone Structure and Shape

- **Long Bones:** Diaphysis, epiphyses, medullary canal.
- **Short, Irregular, and Flat Bones:** Wrist, ankle, vertebrae, cranial bones.
- **Landmarks:** Projections, ridges, important for attachment and identification.

Joint Structure

- **Joint Capsule:** Surrounds joint, contains synovial membrane producing synovial fluid.
- **Articular Surfaces:** Covered with cartilage, aiding smooth movement.

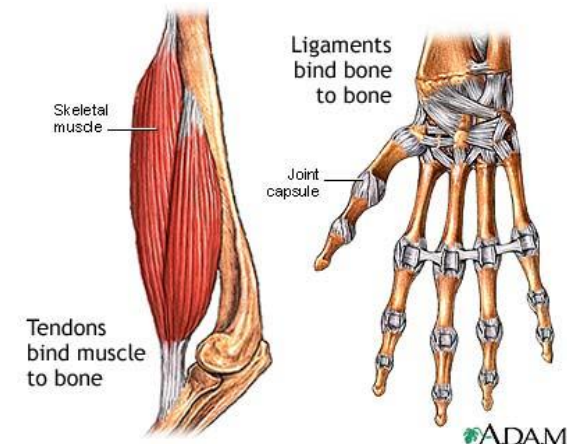
Anatomical Structures (contd.)

Joint Mobility

- **Range of Motion:** Described anatomically, manipulated within normal range.
- **Types of Joints:** Hinge, saddle, gliding, ball-and-socket, pivot, condyloid.
- **Precision in Terminology:** Crucial for surgery to prevent injury.

Tendons, Ligaments, Muscles

- **Tendons:** Fibrous cords or sheets, attach muscle to bone.
- **Ligaments:** Connect bones, stabilize joints.



Watch the "Joints: Structures and Types OF Motion" Video

Joints: Structure and Types of Motion Video

types of joints by structure

synovial joints



Joints: Structure and Types of Motion Video

Summary of Video:

- By function:
 - Synarthroses (Immovable)
 - Amphiarthroses (Slightly Moveable)
 - Diarthroses (Freely Movable)
- By Structure:
 - Fibrous (tend to be immovable)
 - Synovial (tend to be freely movable)
 - Cartilaginous (exhibit a range of mobilities)

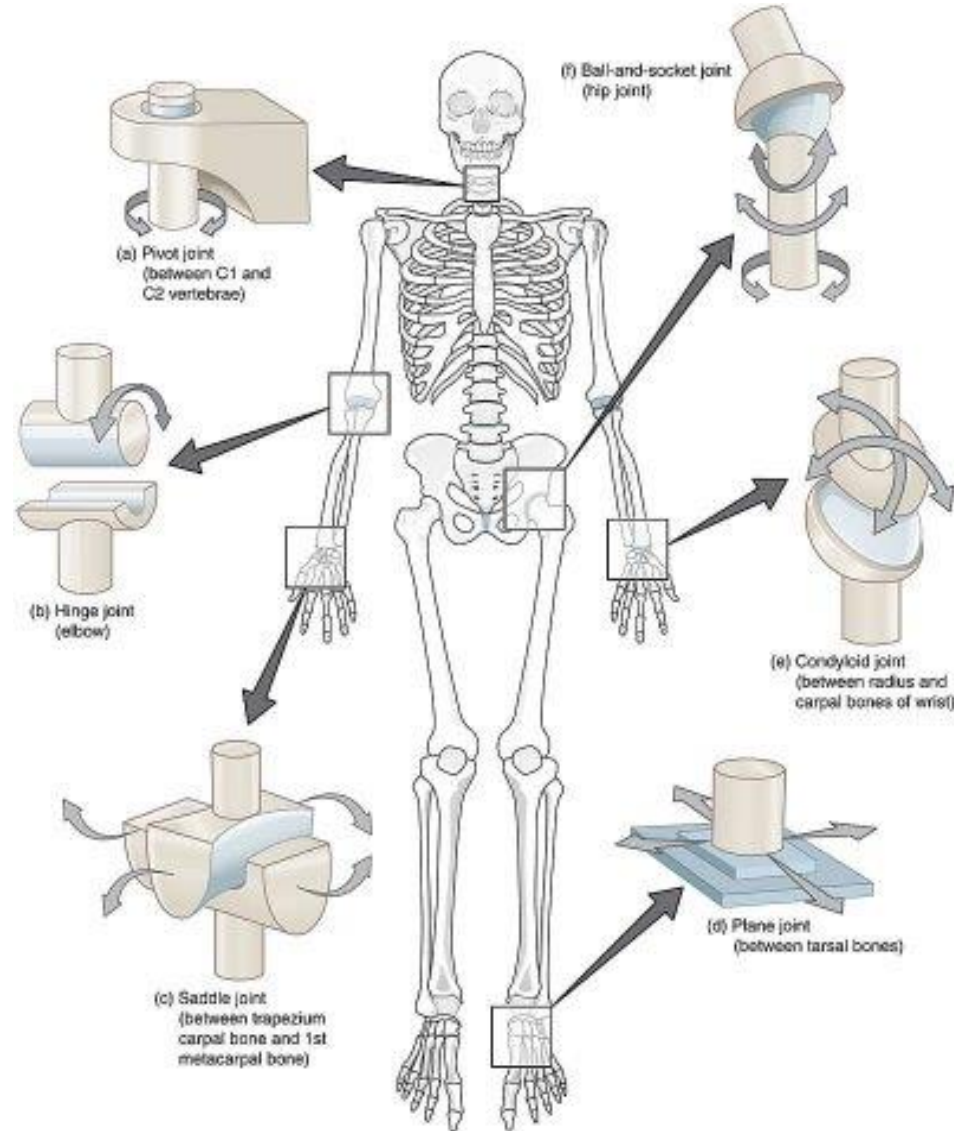
Skeletal Functions

- ☐ Skeleton functions
 - ☐ Provides a framework to support the body
 - ☐ Serves as points of attachment for muscles
 - ☐ Protects some internal organs from injury
 - ☐ Serves as a source of red blood cells
 - ☐ Serves as a storage site and source of calcium

Types of Joints

- ☐ Types of joints
 - ☐ Immovable
 - ☐ Slightly Movable
 - ☐ Freely Movable
 - ☐ Ball-and-Socket
 - ☐ Condylod
 - ☐ Gliding
 - ☐ Hinge and pivot
 - ☐ Saddle

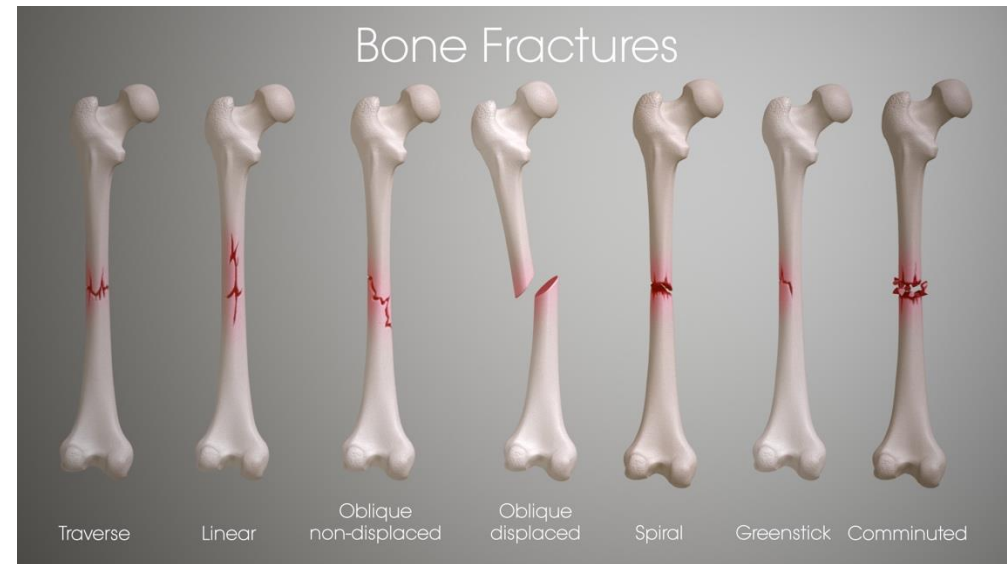
Joint Mobility



Orthopaedic Pathology

- Name of the bone and location
- Pattern of fracture
 - Transverse
 - Oblique
 - Spiral
 - Impacted
 - Comminuted
 - Open fracture
 - Greenstick
 - Depressed
 - Pathological

- Level of comminution
- Displacement
- Pathological origin



Watch the "Factures" Video

Fractures Video

- [Click Here](#) to watch the video!

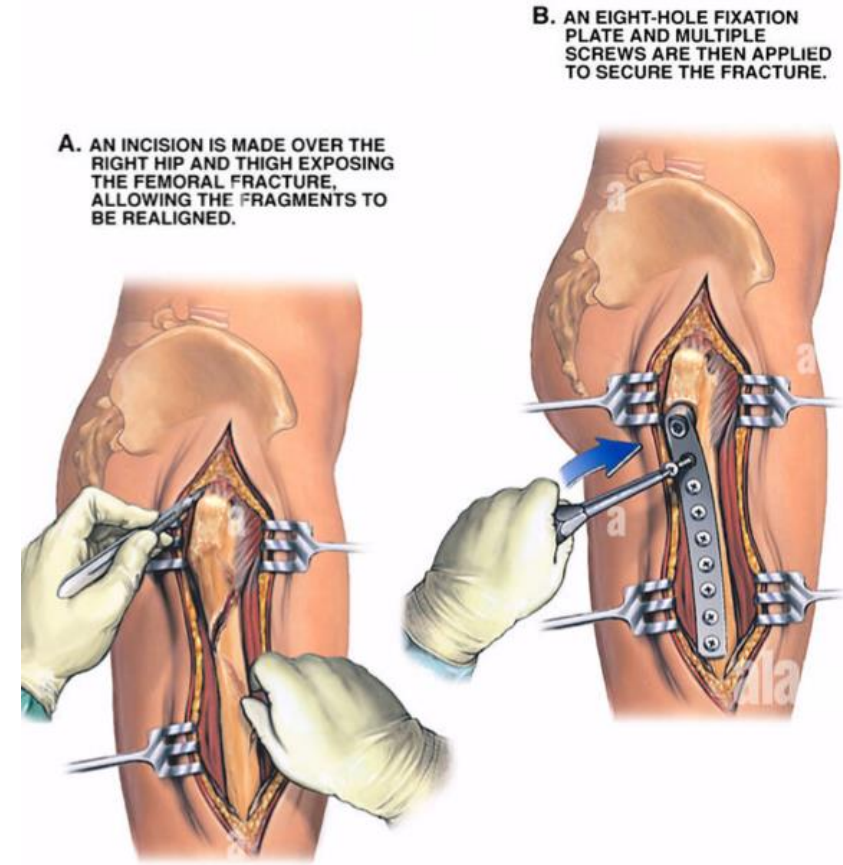
Fractures Video

Summary of Video:

- Types of Fractures
- Growth Plate injury can prevent growth in children

Fracture Repair - Reduction

- Bringing the bone fragments into anatomical alignment
- **Types of reduction**
 - Open reduction (OR): Performed using a surgical incision
 - Closed reduction (CR): Performed by the manipulation of the bone or with an external traction device that pulls the bone fragments into position; no incision is made in the skin



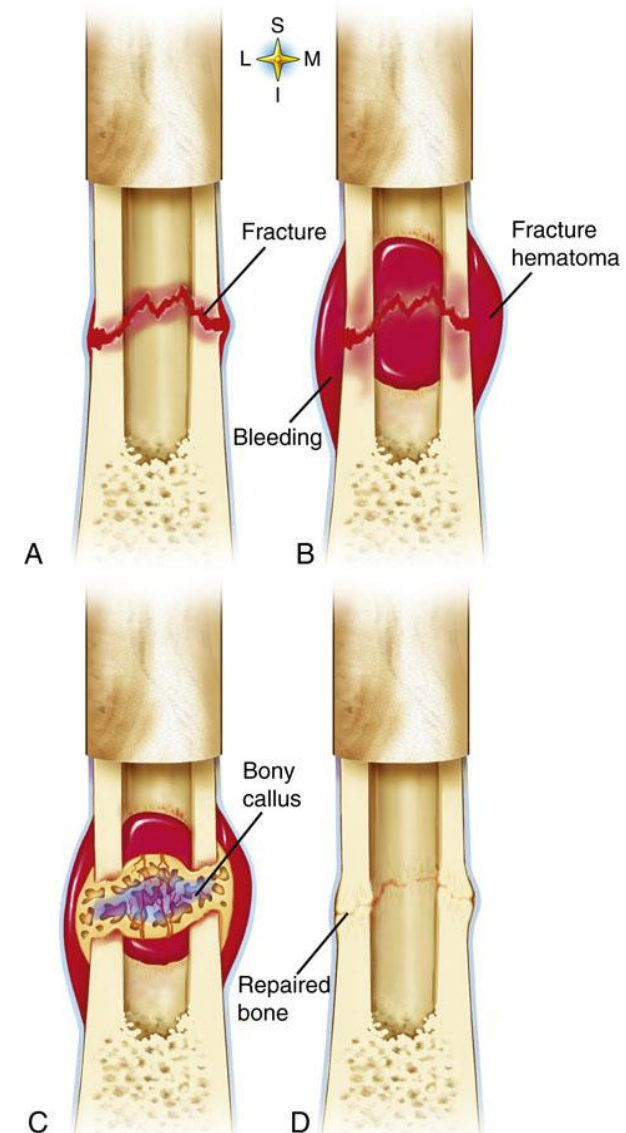
Fracture Repair - Fixation

- Mechanical or structural method used to hold bone fragments together
- **Types of fixation**
 - Internal fixation
 - External fixation
- **Surgical fixation options**
 - Open reduction internal fixation
 - Open reduction external fixation
 - Closed reduction external fixation
 - Closed reduction internal fixation

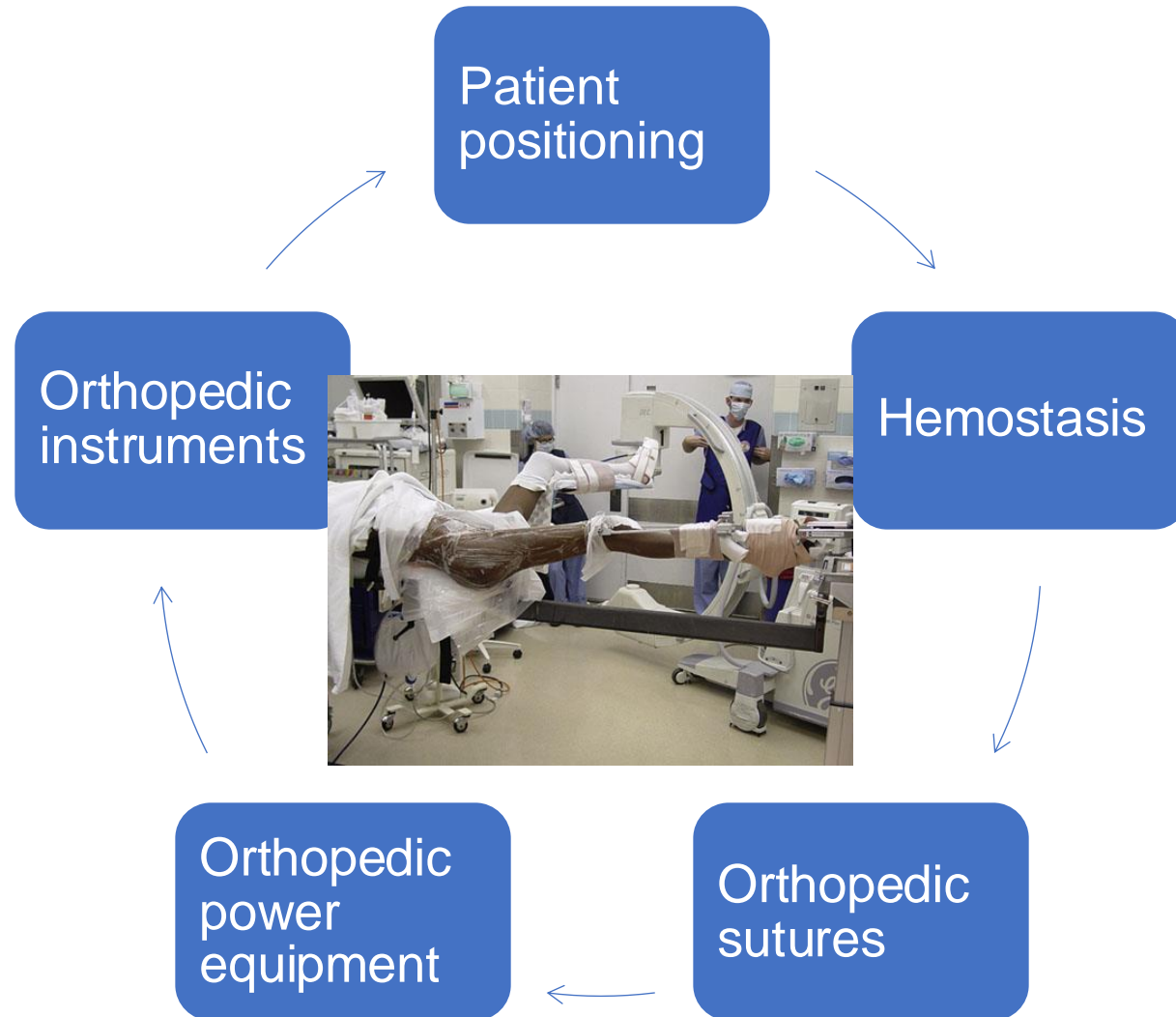


Physiology of Bone Healing

- Bone healing parallels soft tissue repair but slower.
- Full function return may take 6+ months, especially in weight-bearing bones.
- Phases: Inflammatory, reparative, remodeling.
- Healing affected by individual's health.



Case Planning



Power Instruments

- Drill attachments
- Burr
- Chuck
- Depth gauge
- Drill bit
- Drill guide
- Reamer
- Shaver
- Tip
- Types of saws
- Reciprocating saw
- Sagittal saw
- Oscillating saw



Implants

- Pins and bolts
- Nails and rods
- Wires and cables
- Plates and screws
- Screws

Sterilization Method	Mechanism To Denature DNA	Advantages	Disadvantages	Indicated Materials
Autoclaving	High-pressure steam (121°C)	Efficient Accessible	High temperature	Metals Ceramics
Gamma Irradiation	Radiation	Efficient Penetrating	Exposure to radiation	Metals Ceramics Polymers
E-beam Irradiation	Accelerated electrons	Efficient Surface treatment only	Exposure to radiation Limited penetration	Metals Ceramics Polymers
Ethylene Oxide (EIO) Gas	Alkylating agent	No damage from radiation Surface treatment	Special packaging required Duration	Metals Ceramics Polymers
Gas Plasma	Plasma chemistry	Low temperature No damage from radiation Surface treatment	Limited penetration Special packaging required	Metals Ceramics Polymers

Joint Replacement Implants

- Joint Replacement Implants are made of the following materials
 - Metals
 - Cobalt-chromium-molybdenum
 - Titanium-aluminum-vanadium
 - Pure titanium
 - Tantalum
 - Polyethylene
 - Ceramic

Watch the "Total Knee Replacement" Video

Total Knee Replacement Video



Total Knee Replacement Video

- **Summary of Video:**
 - Guides placed, Removal of Tibial and Femoral Head
 - Implant Sizing
 - Final Implant

Bone Grafts and Bone Substitutes

- Bone transplantation is usually performed using a segment of the patient's own bone (autograft) or cadaver bone (allograft)
- **Traditional Method:**
 - Bone graft harvested from iliac crest, tibia, or rib.
 - Commonly from iliac crest via linear incision and chisel.
 - Resulting bone slices shaped with bone rongeur.
- **Reamer Irrigator Aspirator (RIA) Method:**
 - RIA device reams, irrigates, and aspirates medullary canal contents.
 - Procedure involves guidewire insertion, RIA insertion under fluoroscopy.

Arthroscopic Surgery

Minimally invasive surgery (MIS) for joint procedures.

Used for diagnostics, soft tissue repair, and reconstruction.

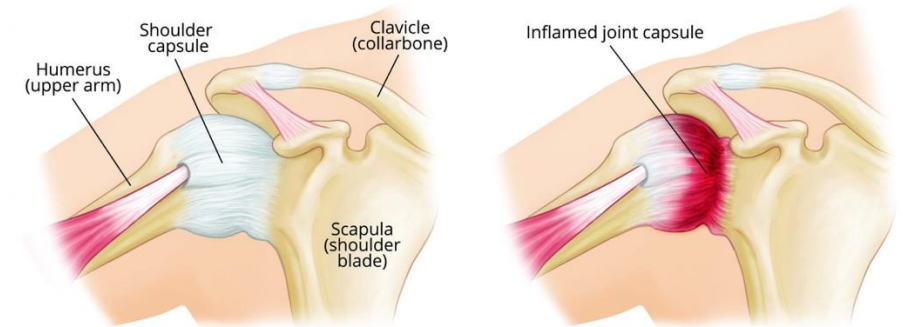
Can perform most open soft tissue procedures arthroscopically.

Instruments

- Variety of instruments resembling those used in open procedures.
- Basic instruments include arthroscopes, probes, knives, motorized cutter/shaver, and radiofrequency instruments.
- Scissors, basket forceps, suction punch, probe, grasping forceps, knife blades, shaving instruments.

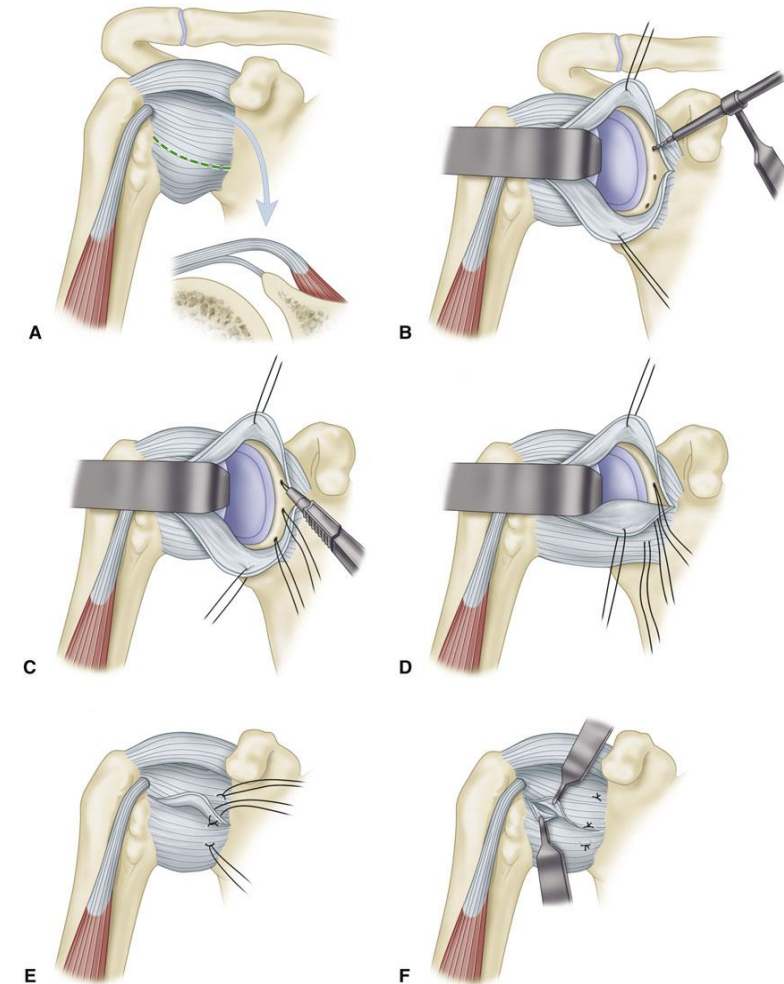
Joint Distension

- Necessary for shoulder and knee arthroscopy.
- Saline or lactated Ringer solution used.
- Maintains operative field visibility and flushes debris and blood.
- Acts as tamponade to control bleeding.
- Circulator adjusts fluid inflow to match outflow.



Surgical Procedures

- Surgical Procedures of the following can be conducted:
 - Shoulder
 - Forearm
 - Wrist and hand
 - Hip
 - Fracture of the pelvis
 - Intramedullary femoral nailing
 - Knee
 - Foot



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Read **Chapter 29** from your E-Book to pass the upcoming quiz from **Surgical Technology - Elsevier eBook on VitalSource, 8th Edition**.

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Thank you!

Get ready for your quiz and rest of the activities now. Best of luck!



Congratulations!

Lesson 29 is complete.