



# Anesthesia for Orthopedic surgery

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# Anesthesia of Orthopedic surgery

## Common Anesthetic Considerations

The common Anesthetic considerations for Orthopedic surgery may be related to:

1. **Trauma association**: some of orthopedic patients presence with other injuries due to trauma, and carry risks of emergency surgery (e.g. aspiration of gastric contents, internal bleeding).
2. **Musculoskeletal disease**, some patients have musculoskeletal disease need Orthopedic surgery e.g. rheumatoid arthritis RA, connective tissue diseases, muscular abnormalities

Patients with **rheumatoid arthritis (RA)** specifically require orthopedic surgery need special attention, because **RA** multisystem disease need **special considerations include:**

- A. Pulmonary system e.g. pulmonary fibrosis
- B. Cardiac system: - coronary artery disease. Myocarditis
- C. Musculoskeletal systems: - atlantooccipital subluxation
- D. Hematological system: -anemia, platelet dysfunction
- E. Endocrine system adrenocortical impairment

**Airway management in patients has RA** can be challenging in these patients **because RA** involvement of the **cervical spine and temporomandibular joints results in limited neck range of motion and mouth opening. Patients with RA on chronic steroid therapy** may require perioperative steroid replacement

**3-MH (malignant hyperthermia )** There is a higher than normal incidence of MH susceptibility in young patients with musculoskeletal abnormalities .

4 – **Risk of congenital malformations:** may be accompanied by other system involvement, in Orthopedic surgery and other injury e.g. cardiac lesions.

5 – **Hyperkalemia:** - there is a risk of massive hyperkalemia following Suxamethonium if neurological or muscle lesions are present.  
Hyperkalemia may lead to cardiac arrest

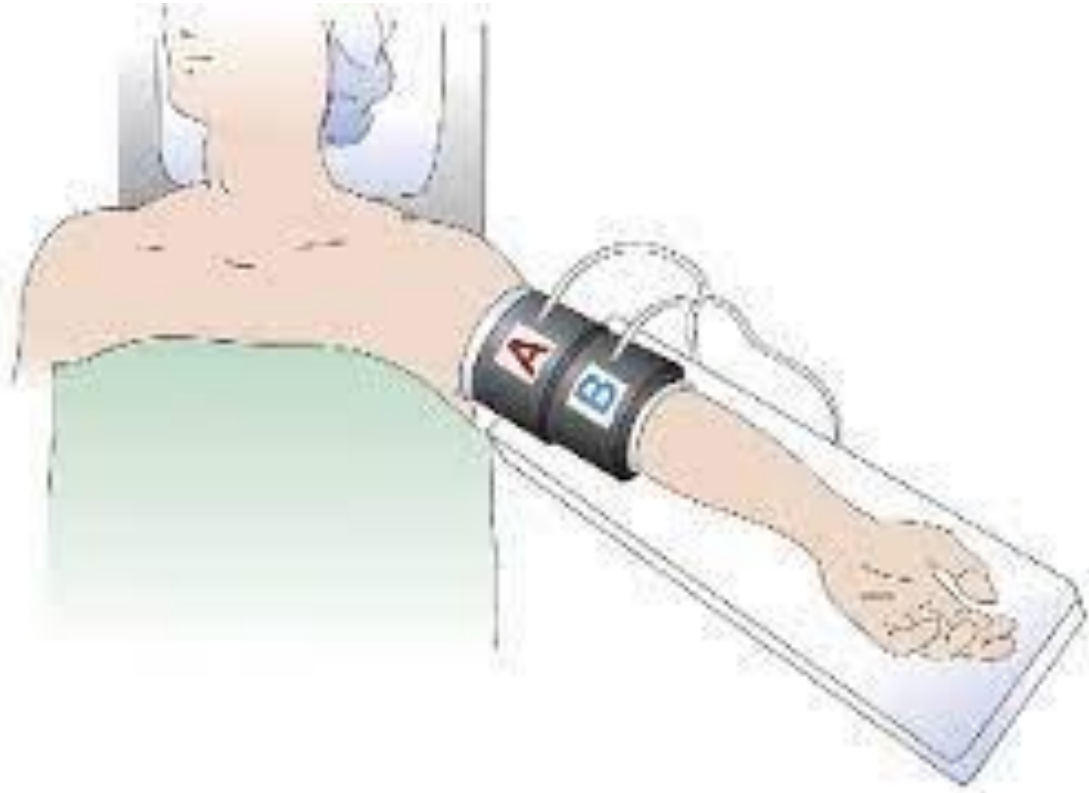
**5-Tourniquets use :** Use of a pneumatic tourniquet on an extremity creates a bloodless field and decrease blood loss during surgery.

The pressure in the arterial tourniquet should, in all cases, exceed arterial pressure. For the **lower limb**, this pressure is typically **300 mmHg** (or 150 mmHg above systolic arterial pressure) and for the **upper limb**, **250 mmHg** (or 100 mmHg above systolic arterial pressure)

The maximum period of safe ischemia is not known precisely. Lasting damage is unlikely if a tourniquet **time of 90 for upper limb and 120 minutes for lower limb is not exceeded.**

Tourniquet on **more than one limb** should **never be deflated (or inflated) simultaneously.**





**tourniquets Inflation can produce potential clinical problems including: -**

A- **Hemodynamic changes:** -

this is because of a **rapid shift of blood volume into the central circulation**. This is well tolerated in normal patients but in patients with noncompliant ventricles and diastolic dysfunction may be disaster.

B- **Tourniquets pain**, Tourniquet pain start gradually beginning approximately **1 h after** cuff inflation and becomes so severe over time which presented by Signs of progressive sympathetic activation include marked **hypertension, tachycardia, and diaphoresis**.

C- **Arterial Thromboembolism**, and pulmonary embolism. Tourniquet-by induced ischemia of a lower extremity may lead to the development of deep venous thrombosis.

D- **Muscle dysfunction:** - **Prolonged inflation (>2 h)** routinely leads to transient muscle dysfunction from ischemia and may produce rhabdomyolysis or permanent peripheral nerve damage. Tourniquet inflation has also been associated with increases in body temperature in pediatric patients undergoing lower extremity surgery.

## **6-bone cement:**

**Cement implantation syndrome** due to Systemic absorption of residual methyl methacrylate monomer can produce vasodilation and trigger platelet aggregation, microthrombus formation in the lungs, and cardiovascular instability.

The clinical manifestations of bone cement implantation syndrome include

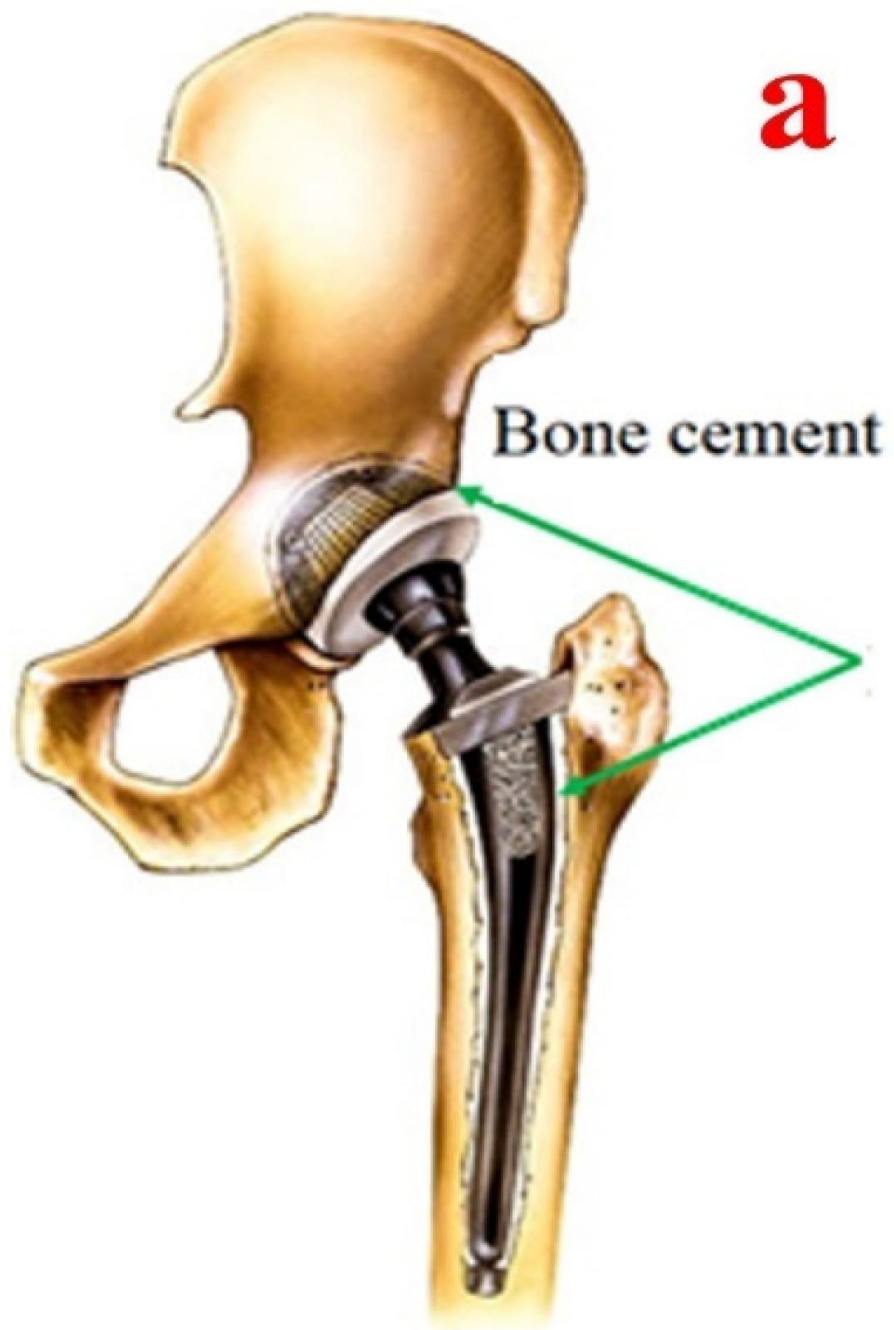
**A- Hypoxia** (increased pulmonary shunt),

**B- Hypotension,**

**C- Arrhythmias** (including heart block and sinus arrest),

**D- Pulmonary hypertension** (increased pulmonary vascular resistance), and decreased cardiac output





# **Treatment strategies for this complication include**

**A- Increasing inspired oxygen concentration prior to cementing,**

**B- Maintain euvolemia,**

**C- Creating a vent hole in the distal femur to relieve intramedullary pressure,**

**D- Using a femoral component that does not require cement**

## 8.DVT (deep venous thrombosis) and PE(pulmonary embolism)

are common, especially after hip surgery; and can cause morbidity and mortality following orthopedic operations on the pelvis and lower extremities.

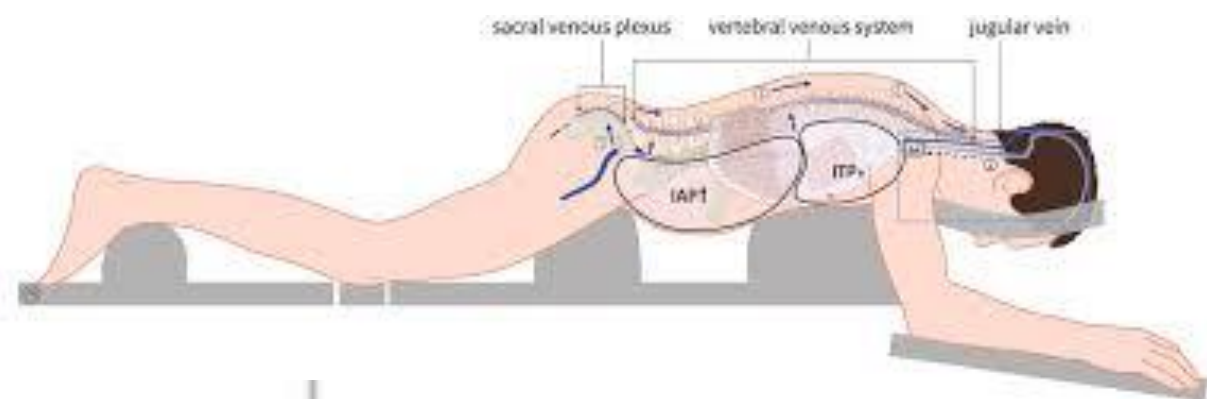
### Risk factors of DVT and PE include

- A. Obesity,
- B. Age greater than 60 years,
- C. Procedures lasting more than 30 min,
- D. Use of a tourniquet,
- E. Lower extremity fracture.
- F. Immobilization for more than 4 days

# Positioning

- ❑ Orthopedic surgery often requires the use of **unusual positions**, some of which carry risks of **nerve damage, soft tissue ischemia, electrical and thermal injury and joint pain**.
- ❑ Care must be taken in protecting areas at risk of injury.
- ❑ Forceful movement of the patient by the surgeon is often inevitable during orthopedic surgery.
- ❑ When such movement occurs, it is advisable to re-check the patient's position ensuring that soft tissues, nerves, eyes, airway connections and venous access are safe.
- ❑ Although some procedures may be performed under regional anesthesia alone, long operations may result in significant **discomfort related to posture**.

- ❑ Some positions adopted during orthopedic surgery are associated with **venous air embolism**, which occurs when **large veins are open to air**, particularly, when venous pressure is low.
- ❑ These postures include the **lateral position for hip surgery, the sitting position for shoulder surgery and the prone position for spinal surgery**







## Anesthesia for hip replacement

- ❑ performed **under general, spinal or epidural anesthesia**,
- ❑ and a **combination of techniques** is often used.
- ❑ **The advantages of regional techniques** include:
  - Reduced blood loss,
  - reducing the need for transfusion ·
  - Avoids effects of general anesthesia on pulmonary function
  - Avoid intubation ·
  - Good early postoperative analgesia ·
  - Reduced incidence of postoperative venous thrombosis and pulmonary embolism

The advantages of general anesthesia include: ·

- ❑ Easier for patients that cannot tolerate lying flat ·
- ❑ Safer in patients with **fixed output states like aortic stenosis**, where maintenance of normal sinus rhythm, heart rate and intravascular volume **is critical**.
- ❑ · Patient preference

## Spinal anesthesia

A simple THR is particularly amenable to spinal anesthesia and this can be supplemented with sedation or general anesthesia.

**Target-Controlled-Infusion (TCI)** propofol is useful sedation for the lateral position, using facemask supplemental oxygen.

**Intermittent doses of midazolam**, also can be used.

**For the supine position** in a patient who wishes to be asleep during surgery, consider an LMA with a light GA to maintain the airway.

**The addition of intrathecal opioid** helps cover the longer duration of surgery necessary for a more complex primary hip replacement.

It is a suitable technique for up to 3 hours of surgery. Alternatively, or for longer cases, **a combined spinal/epidural technique** can be used.

- **GA (rather than sedation)** may be combined with an epidural for any complex primary operation because of the prolonged surgical time.
- An LMA, or endotracheal tube and IPPV, may be considered.

### **Intraoperative**

- **Inserting a urinary catheter** will help to monitor fluid balance.
- Aim to maintain blood pressure at an **adequate level** based on preoperative readings. In elderly patients with vascular disease hypotension should be treated immediately.
- **intra-operative antibiotic** prophylaxis will be required.
- Ensure **adequate IV loading** prior to cementing of femoral component.
- **Hypotension can occur on pressurization** of the cement due to vasodilatation and direct myocardial depression from the monomer.
- The transient hypotension does not correlate with the level of

## Post operative

- ❑ The surgeon usually prefers the patients to be placed on their bed **in the supine position with the legs abducted** using a pillow to prevent dislocation of the prosthesis.
- ❑ Patients are usually **mobilized at 24-48 hours** and **simple IM/subcutaneous opioids with regular paracetamol or NSAIDs** are usually sufficient for postoperative analgesia in a simple THR.
- ❑ If an **epidural has been inserted, a postoperative infusion** can be used but needs to cease prior to mobilization.
- ❑ PCA is a suitable alternative if pain relief is needed for an extended period.





A photograph of a workspace featuring a laptop keyboard, a brown envelope, a white card with the words 'Thank you' in cursive, and a black pen.

*Thank you*