# Osteoarthritis

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## Risk

- Most common type of arthritis with significant disease burden.
- Globally, affects 9.6% of men and 18% of women ≥60 y old and is ranked as top 11th cause of disability (global years lived with disability).
- Common presentations are pain, stiffness, and limitation of movement.
- Most commonly affected joints are the knees (41%), hips (19%), small hand joints (30%), and facet joints in the spine.

## Perioperative Risks

- Associated conditions: Obesity, DM, hypothyroidism, hyperparathyroidism, and gout
- Concomitant medication: Acetaminophen, NSAIDs, COX-2 inhibitors, and intraarticular steroid injections
- Airway: Rarely affected (neck or jaw)

## Worry About

- Obesity and geriatric population
- Positioning concerns due to joint pain and stiffness
- Possible associated metabolic conditions (DM and hypothyroidism) or sleep apnea
- Adverse effects of medications: NSAIDs: Platelet function; effect on cardiovascular, renal, and GI systems. Steroid injections: HPA and immunity suppression, hyperglycemia, hypertension, myopathy, osteoporosis. Acetaminophen: Liver function. Opioids: Daily analgesic requirements may need to be escalated throughout periop treatment

## Overview

- Pathologic features of OA: Focal areas of damage to the articular cartilage, new bone formation at the joint margins (osteophytes), changes in the subchondral bone (subchondral cysts), variable degrees of synovitis, and thickening of the joint capsule
- Radiologic features of OA: Joint-space narrowing, osteophytes, subchondral cysts, intra-articular osseous bodies, and subchondral bone collapse (late finding)
- Risk factors: Age, female sex, obesity, trauma, and high-impact activities/sports

## Etiology

- Autosomal dominant in some with co-segregation of OA with a mutation in type II procollagen gene

## Usual Treatment

- Conservative therapy: Weight loss; PT; exercise and lifestyle change to maintain function and mobility; analgesics (acetaminophen and NSAIDs)
- Injections: Intra-articular steroid or viscosupplement injections
- Arthroscopic surgery; joint preserving (osteotomy/resurfacing) or replacement surgery

## Assessment Points

| System | Effect | Assessment by Hx | PE | Test |
|---|---|---|---|---|
| HEENT | Rare C-spine involvement | Pain | Neck ROM | Usually not needed<br>C-spine x-rays |
| CV | Age-related changes | Exercise tolerance may be limited by joint changes | HR and tolerance to two-flight stair climb | ECG<br>CXR<br>ECHO |
| RESP | Sleep apnea | Daytime somnolence and morning headache | | Sleep study |
| GI | Sensitivity to NSAIDs | Gastric upset | | |
| ENDO | Associated diabetes | | | FBS |
| CNS | Age-related changes | TIAs or stroke | | |
| MS | Multiple joint involvement | Joint pain | Joint ROM | |
| RENAL | Age-related changes | | | Cr |

**Key References:** National Clinical Guideline Centre (UK): *Osteoarthritis: care and management in adults.* Clinical Guideline CG177, United Kingdom, 2014, Commissioned by the National Institute for Health and Care Excellence; Zhang Y, Jordan JM: Epidemiology of osteoarthritis, *Clin Geriatr Med* 26(3):355–369, 2010.

## Perioperative Implications

### Preoperative Preparation

- Common surgical procedures: Arthroscopy and arthroplasty
- IV access, airway management, and neuraxial anesthesia: May be difficult
- Checking platelet function
- Consideration of regional anesthetic techniques
- Evaluation for periop steroid supplementation in pts who have received multiple steroid injections recently

### Monitoring

- Routine

### Airway

- Assess neck ROM.

### Induction

- Age-related considerations: elderly pts may have slow circulation times, CV disease, and fluctuations in BP.

### Maintenance

- Position with consideration of other joint involvement.

### Extubation

- No special considerations

### Adjuvants

- Elderly pts may be more sensitive to opioids; NSAIDs may be contraindicated.

### Postoperative Period

- Consider continuous regional technique with local anesthetic and/or opioids for pain management.

## Anticipated Problems/Concerns

- Usually neck and airway normal
- Concomitant risk factors, especially obesity and aging
- Often involving several joints with pain and decreased ROM
- Regional anesthesia preferable over general anesthesia

# Osteogenesis Imperfecta

Klaus Morales dos Santos

## Risk

- Incidence: OI occurs in 1:10,000-20,000 live births.

## Perioperative Risks

- Owing to the fragility of bones, caution is needed in positioning or transporting these pts.
- Excessive neck extension may lead to fracture.
- Scoliosis may cause difficulty with regional anesthesia.
- High risk for difficult intubation.
- Temperature control; tendency toward hyperthermia due to a hypermetabolic state.
- Cardiac events (pts may have cardiac abnormalities).
- Consider advanced monitoring in case of cardiac lesions (valvulopathy).
- Coagulopathy may be present owing to reduced collagen-induced platelet aggregation.

## Worry About

- Difficult mask ventilation due to bone deformities
- Difficult intubation
- Temperature regulation
- Positioning and monitoring

## Overview

- Inherited disease of connective tissue with tendency to bone fractures
- Brittle teeth (dentinogenesis imperfecta), blue sclerae, progressive deafness
- Bone fragility leading to major complications

## Etiology

- There are now 10 types of OI; most are due to a dominant mutation in one of the two genes encoding collagen type 1 (*COL1A1* and *COL 1A2*).
- Most cases are genetically heterozygous.
- There are mild and severe forms; type II is incompatible with life.

## Assessment Points

| System | Effect | Assessment by Hx | PE | Test |
|---|---|---|---|---|
| HEENT | Atlantooccipital dislocation<br>Dentinogenesis imperfecta | Bone fragility | Abnormal oral cavity | Cervical x-ray |
| CV | Valvulopathies | SOB, cyanosis | Murmur, gallop | ECHO |
| RESP/GI | Restrictive pulm disorders | | Dyspnea, thoracic deformities | CXR<br>Spirometry |
| MS | Scoliosis<br>Thoracic deformities | | | |
| CNS | Growth retardation | | | |

**Key References:** Oakley I, Reece LP: Anesthetic implications for the patient with osteogenesis imperfecta, *AANA J* 78(1):47–53, 2010; Libman RH: Anesthetic considerations for the patient with osteogenesis imperfecta, *Clin Orthop Relat Res* 159:123–125, 1981.

## Perioperative Implications

**Preoperative Preparation**
- Difficult airway management
- Peripheral IV lines difficult to place

**Monitoring**
- Avoid noninvasive BP monitoring because of the risk of fractures.
- Pay particular attention to temperature control and neuromuscular blockade.
- Avoid fast-acting relaxants; fasciculation can lead to bone fractures.
- Continuous temperature monitoring is mandatory under general anesthesia.

**Airway**
- LMA available.
- Fiberoptic bronchoscope ready to use before induction.
- A wide assortment of laryngoscope blades and ETTs should be available

**Preinduction/Induction**
- Sedation in a monitored setting.
- Rigid control of temperature.

**Maintenance**
- Monitor neuromuscular blockade.

**Extubation**
- Pt should preferably be extubated awake.

## Anticipated Problems/Concerns
- Heart disease may be present, mainly valvulopathies; refer to cardiac assessment before inducing anesthesia.
- Airway management may be difficult.
- Repeated visits to the OR are frequent; try to avoid latex contact to prevent allergy.
- Avoid anesthesia in the ambulatory setting.

# Osteoporosis

David B. Albert | Lee A. Fleisher

## Risk
- Most common metabolic bone disease in USA
- All elderly pts of European descent considered at risk
- Non-Hispanic white women and Asian women at highest risk
- Estimate is that over 200 million people worldwide are at risk. Approximately 30% of all postmenopausal women in USA and Europe have osteoporosis.
- At least 40% of these women and 15–30% of men will sustain one or more fragility fractures in their remaining lifetimes.
- Female incidence >male incidence: 3:1.
- Postmenopausal women with small frames and low weight especially vulnerable.
- Risk factors for osteoporosis, such as advanced age and reduced bone density, have been established by virtue of their direct and strong relationship to the incidence of fractures; however, many other factors have been considered risk factors based on their relationship to bone density value as a surrogate indicator of osteoporosis. Risk factors include advanced age, female sex, white or Asian ethnicity, family Hx of osteoporosis, body weight less than 127 lb, amenorrhea, late menarche, early menopause, nulliparity, physical inactivity, alcohol and tobacco use, androgen or estrogen deficiency, and calcium deficiency.
- Secondary osteoporosis is attributable to diseases (hyperparathyroidism, rheumatoid arthritis, sarcoidosis, thalassemia, idiopathic scoliosis, multiple myeloma, thyrotoxicosis) and drugs (lithium, anticonvulsants, excessive alcohol use, excessive thyroxine, prolonged unfractionated heparin use [>6 mo of >15,000 IU/d], glucocorticoids, cytotoxic drugs).

## Perioperative Risks
- Pneumonia
- Coexisting metabolic or endocrine disorders
- Fractures

## Worry About
- Positioning because of increased risk of bone fractures
- Vertebral fractures: Vertebral compression fractures associated with increased morbidity/mortality.
- Hip fractures: Significantly increased risk of morbidity/mortality in first year after fracture; men more vulnerable than women
- Pulm function/restrictive disease, especially if kyphosis present

## Overview
- Osteoporosis is a systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue with a consequent increase in bone fragility.
- Imbalance between bone resorption and formation causes loss of bone substance, resulting in bone fractures.
- Most common fracture sites: Vertebral body, neck of femur, distal radius, proximal humerus, pelvis.
- 1.5 million fractures due to osteoporosis occur each y: Spine (700,000), hip (300,000), wrist (200,000).
- Women who have sustained a hip fracture have a 10–20% higher mortality than would be expected for their age.
- Severe kyphosis common.
- Type I (postmenopausal) osteoporosis: Women 15–20 y after menopause; vertebral and Colles' fractures most common.
- Type II (age-related) osteoporosis: Men and women ≥70 y; hip and vertebral fractures most common; also pelvis, humerus, and femur.
- Biphasic pattern of bone loss:
  - Slow phase occurs in both sexes beginning at age 40 y; 0.6–1% per y affecting cortical and trabecular bone.
  - Accelerated phase in women after menopause; 2–3% per y affecting cortical bone; 4–6% per y for trabecular bone.

## Etiology
- Insufficient accumulation of bone mass during skeletal growth.
- Age-related factors: Decreased bone formation at cellular level begins in the fourth decade and becomes more severe with age. Age-related increase in parathyroid function with age-related decrease in calcium absorption.
- Menopause: Accelerated phase of bone loss results from estrogen deficiency.
- Sporadic factors: Twofold increased risk with cigarette smoking and high alcohol consumption.

## Treatment
- Vitamin D and calcium.
- SERMs: Raloxifene.
- Bisphosphonates: Alendronate, risedronate.
- Human recombinant PTH: Teriparatide.
- Calcitonin.
- Discontinue glucocorticoid (if osteoporosis due to chronic use).
- Surgical stabilization of fractures: Kyphoplasty/vertebroplasty for spinal fractures; ORIF for fractures of the hip or wrist.