Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Osteoporosis of skull Vertebral fractures	Pain		Skull x-ray Neck x-ray
RESP	Kyphosis	Dyspnea	Dowager's hump	Flow-volume loop ABG
ENDO	Parathyroid function Decreased in type I Increased in type II Calcium absorption decreased Metabolic disorders of vitamin D			Ca^{2+}
MS	Back pain Loss of height Spinal deformity Fractures	Acute back pain Remittance and recurrence until chronic	Dowager's hump Loss of height Multiple fractures	X-ray Vertebral bone density

Key References: O'Connor KM: Evaluation and treatment of osteoporosis, *Med Clin North Am* 100(4):807–826, 2016; Guay J, Parker MJ, Gajendragadkar PR, et al.: Anaesthesia for hip fracture surgery in adults, *Cochrane Database Syst Rev* 2:CD000521, 2016.

Perioperative Implications

Preoperative Preparation

- Move and position carefully owing to risk of bone fractures.
- Pulm function tests are indicated if kyphoscoliosis is present.
- Consider preop cervical x-rays if indicated by thorough evaluation of cervical spine. Document range of motion. Document any preop neurologic deficits.
- Detailed Hx to determine coexisting metabolic/endocrine disorders.

Monitoring

- Routine.
- Consider arterial line and frequent ABG if pulm disease or pneumonia is present.

Airway

- Cervical fractures may require neck stabilization and fiberoptic intubation.
- Acromegaly may occur with osteoporosis.

Musculoskeletal

- Vertebral collapse may make spinal/epidural anesthesia more difficult.

Anticipated Problems/Concerns

- Susceptible to fracture with routine positioning and moving.
- Restrictive lung disease if scoliosis is present may impair oxygenation.

Otitis Media

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Risk

- Age: Highest incidence occurs between 6–24 mo of age; incidence subsequently declines, except for an increase at the time of school entry (between 5–6 y of age).
- Day care attendance.
- Tobacco smoke and air pollution.
- Other factors: Poor social/economic conditions, cooler seasons (fall and winter), altered host defenses, and diseases with associated craniofacial abnormalities (cleft palate and Down syndrome).

Perioperative Risks

- Active or concurrent disease: Upper or lower respiratory infections, which may increase risk of airway reactivity, laryngospasm, bronchospasm, periop O_2 requirement, and postop mechanical ventilation
- Inherent risks of associated craniofacial abnormality may predispose to airway obstruction and/or difficult airway management
- N/V related to the infection, antibiotic therapy, and vestibular imbalance
- Chronic issues:
  - Chronic or recurrent OM can cause hearing loss (usually conductive) that may lead to problems in development of speech, language, and cognitive abilities in the child. In chronic/advanced disease, preop and postop communication may become impaired.
  - Rare but serious complications include mastoiditis, petrositis, labyrinthitis, meningitis, epidural abscess, brain abscess, lateral sinus thrombosis, cavernous sinus thrombosis, subdural empyema, and carotid artery thrombosis.
  - Pts with fever ≥38°C and/or concurrent disease, including upper and lower respiratory infections and associated challenges with general anesthesia/airway manipulation.
  - Pts with associated vestibular, balance, and motor dysfunctions.
  - Pts with adenotonsillar hypertrophy or craniofacial abnormality that may predispose to more severe airway obstruction and/or difficult airway management.

Overview

- AOM is a common infectious disease. It is defined by the presence of fluid in the middle air, accompanied by acute signs of illness, and signs or symptoms of middle ear inflammation, which is restlessness, pain, agitation, and decreased hearing in younger children.
- OME is defined by the presence of middle ear fluid without acute signs of illness or inflammation of the middle ear mucosa. OME may be caused by allergies but usually occurs after AOM. Chronic OME typically leads to a conductive hearing loss.
- OM is most prevalent in infancy, but it can occur at all ages.

Etiology

- Pathogenesis: ETD usually from nasal congestion associated with an upper respiratory infection or allergic rhinitis leads to negative pressure and accumulation of secretions in the middle ear. The middle ear secretions serve as a growth medium for viruses and bacteria that colonize the upper respiratory tract resulting in suppuration and clinical signs of OM.
- Most common bacterial pathogens in OM are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.
- Most common viral pathogens in OM are RSV, rhinoviruses, influenza viruses, and adenoviruses.

Usual Treatment

- Analgesics for the pain associated with swelling of the tympanic membrane (otalgia): Ibuprofen, acetaminophen, and auralgan (topical anesthetic drops)
- Antimicrobial therapy:
  - First-line therapy is amoxicillin (80–90 mg/kg orally per d divided into 2 doses). Others incl cephalosporins (cefuroxime, ceftriaxone), macrolides (erythromycin, azithromycin), and trimethoprim sulfa sulfamethoxazole.
  - Should be administered to any child younger than 6 mo.
  - Should be administered to children 6 mo to 2 y in whom the Dx of AOM is certain or if the Dx is uncertain but the illness is severe (moderate to severe otalgia or fever ≥39°C). If the Dx is uncertain and illness is not severe, the child may be observed without treatment with antibiotics.
  - Should be administered to pts older than 2 y if the Dx is certain and illness is severe. When the Dx is certain but illness is not severe, observation alone is an option.
- AOM usually resolves in 24–72 h with appropriate antimicrobial therapy; however, fluid may persist for weeks to months despite treatment. Placement of tympanostomy tubes is performed for pts with persistent middle ear effusion or severe and recurrent episodes of otitis media (>6 antibiotic courses/y). Adenoidectomy may be indicated in selected pts, and if chronic ETD is a major contributing factor.
- Prevention is an important management strategy for OM: Minimize risk factors (smaller day care groups and decrease smoke exposure), administer vaccines (influenza and pneumococcal), and encourage breastfeeding for at least 3 mo and ideally for 6 mo (diminishes colonization of the nasopharynx by bacterial pathogens and increased negative pressure in hypopharynx drain middle ear through ET).

Assessment Points

System	Effect	Assessment by Hx	PE	Test
GENERAL	Pt age varies	Childhood vs. adult Dx	Find comorbidities	As indicated
HEENT	Nasal secretions Middle ear fluid/drainage Hypertrophic tonsils and adenoids T&A	Allergy vs. infection Acute vs. chronic OM; ear pain and ear tugging OSA, mouth breathing, snoring	Clear vs. green mucus Fever vs. afebrile, inflamed tympanic membrane (red, opacified, bulging, and immotile) vs. fluid level Inspection	Eosinophil smear Tympanogram
RESP	Cough Laryngo-tracheomalacia Pneumonia	Dry vs. wet OSA/feeding difficulty Fever, cough, dyspnea	Upper vs. lower tract symptoms Retractions and stridor Fever, tachypnea, and crackles	Pulse ox Bronchoscopy Pulse oximetry, CXR, CBC
GI	NPO status and reflux Hx	Clear vs. fatty liquid	Tolerating clears; content	None
CNS	Developmental status Hearing (usually conductive loss) Complications of untreated OM (such as meningitis)	Developmental Hx Delayed speech and cognition Fever, headache, mental status changes, photophobia	Congenital anomalies Fever, Brudzinski and Kernig signs, and meningismus	Genetic testing, Audiometry MRI, lumbar puncture, cultures
DERM	Eczema	Allergy/steroid Hx	Allergic/nonallergic rash	Skin biopsy

Key References: Hoffmann KK, Thompson GK, Burke BL, et al.: Anesthetic complications of tympanostomy tube placement in children. *Arch Otolaryngol Head Neck Surg* 128(9):1040–1043, 2002; Bowatte G, Tham R, Allen KJ, et al.: Breastfeeding and childhood acute otitis media: a systematic review and meta-analysis. *Acta Paediatr* 104(Suppl 467):85–95, 2015.

Perioperative Implications

Preoperative Preparation

- Lower respiratory tract pathology or pneumonia may warrant further evaluation and case rescheduling; runny nose (rhinorrhea) is usually not an indication for case cancellation.
- Children: Avoid oral premed for myringotomy and PETs alone (short surgical time); consider parental presence for induction; allow comfort object in the OR; developmentally appropriate review of procedures; consider preop oral acetaminophen to give the analgesic regimen time to work.
- Adult: IV midazolam or fentanyl before induction; topical local anesthetic drops in ear may be indicated.

Monitoring

- Standard ASA monitors; skin temperature probe
- Precordial stethoscope very helpful

Airway

- Children: Inhalation induction and mask airway maintenance for straightforward cases.
- Adults: IV induction with mask airway or LMA maintenance.
- Oral and/or nasal airways as indicated.
- Preparation for intubation if obstruction is present or as the case direction changes.
- Maintenance.
- Volatile anesthetic in oxygen with NO usually sufficient.
  - 70/30 N_2O/O_2 plus 8% sevoflurane for induction, followed by 50/50 N_2O/O_2 plus 4% sevoflurane for maintenance until first tube in place.
  - Turn off anesthetics at second myringotomy to avoid prolonged anesthesia for short operation.
- Consideration of IV propofol infusion to maintain spontaneous ventilation if laryngoscopy/bronchoscopy is also planned.
- Otherwise as required for additional operative procedures after PETs are placed.

Extubation

- Routine precautions and criteria

Adjuvants

- Determined by the course and complexity of operation(s) to be performed
- PETs are frequently placed before other procedures (cleft lip/palate repair, auditory evoked potentials)

Postoperative Period

- Postop analgesia: Multimodal approach
  - Children: "Belly" analgesia first (bottle, cup, juice, comfort); consideration of nasal fentanyl and/or oral acetaminophen if rectal not given intraop
  - Adults: IV/oral analgesics as needed; antiemetic may be needed more so than in children
- Emergence delirium: Nasal or IV clonidine or dexmedetomidine (an option for children)
- Slow introduction of PO fluids; limited volume if possible
- Plans to reunite child with parent and/or proxy after pt is settled in the PACU

Anticipated Problems/Concerns

- Separation of child and parent and/or proxy: Have a guardian present for induction, oral midazolam if appropriate.
- Separation from child's comfort object: Label the object with pt's name.
- Charting vital signs and maintaining anesthesia record in a short case with much to do: An assistant or electronic medical record is helpful.
- Difficulty maintaining mask airway: Use LMA and ET intubation.
- Laryngospasm: Hold positive pressure, IM/IV succinylcholine and/or atropine, propofol if IV present, possible ET intubation
- Antibiotics: Start PIV if required.
- Ear drops applied by the surgeon: Can sting if the pH is basic.
- Unanticipated pathology includes cerumen impaction, cholesteatoma, other tumors, and ossicular dislocation.
- Excessive bleeding (ear canal trauma): Apply topical epinephrine.
- Small external ear canals: Change type of PE tube used.
- Unable to place PE tube because of prior scarring: Abandon the case.
- PE tube falls into middle ear space: Surgical retrieval is required

Pacemakers

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Risk

- In USA, over 3 million people have an implantable cardiac PM, and more than 400,000 PMs are implanted annually.
- In addition to a right atrial and right ventricular lead, some PM pts with cardiomyopathy also have left ventricular pacing capability via a transvenous coronary sinus or epicardial lead (this configuration is called CRT-P).
- Because all conventional ICDs provide antibradycardia pacing, that section of this book applies to these pts as well.*
- The incidence of pts with a PM or ICD (collectively called CIEDs) presenting for surgery is substantial.

Perioperative Risks

- Robust data are lacking; however, the presence of a PM might increase periop risk owing to
  - Associated medical problems.
  - Incorrect interpretation of device type (i.e., confusing a PM for an ICD) or events (i.e., pseudomalfunction).
  - Inappropriate periop management, especially for the pacing-dependent pt.
  - Lack of familiarity with new technology, such as LCP.

*MAGNET CAUTION: A magnet will never change the pacing mode or create asynchronous pacing in an ICD. Only ICDs from ELA (Sorin) will change the pacing rate (to 90 bpm if the battery is OK) upon magnet placement. For many ICDs (Boston Scientific and St Jude Medical),† the magnet switch can be programmed "OFF." Only ICDs from Boston Scientific and its previous companies emit ongoing tones that identify correct placement of a magnet (except subcutaneous ICDs, which only emit a tone for 1 min following magnet application). Some older ICDs from Boston Scientific (with the "GDT" or "CPI" x-ray code) can undergo permanent disabling of tachy therapy by magnet placement. Boston Scientific owns the Guidant and CPI brands, and St Jude Medical owns the Pacesetter brand.