Anaesthesia for geriatrics

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مادة التخدير/ المرحلة الثالثة

Key concepts

Age **is not** a contraindication for surgery.

- - ↑ Morbidity & mortality = ↓ physiological reserve.
- - Requires understanding of changes in:
  - - Anatomy 🧍‍♂️
  - - Physiology ❤️
  - - Pharmacokinetics 💉
  - - Pharmacodynamics 💊

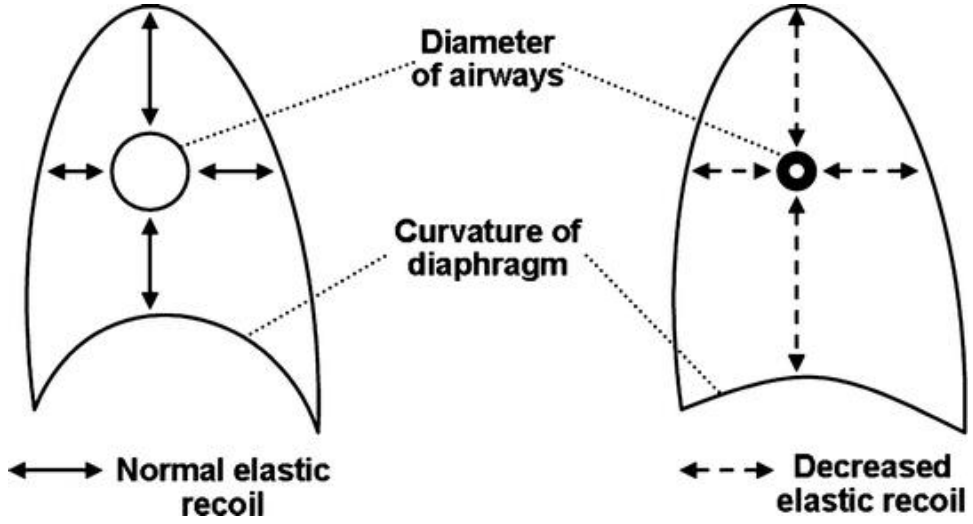
Key concepts

- The incidence of **perioperative complications** is much **higher** in elderly patients due to reduced **functional reserve** and a **high incidence of co-morbidity**
- Ageing is a process where progressive cell loss occurs.

Similarities with Infants

Parameter | **Effect** |

- ↓ HR response | Poor compensation for hypoxia/hypotension
- ↓ Lung compliance | Reduced respiratory reserve
- ↓ PaO_2 | ↓ Oxygen reserve
- ↓ Cough reflex | Aspiration risk
- ↓ Renal function | Delayed drug clearance
- ↑ Hypothermia | Impaired thermoregulation



Alterations in Organ Function

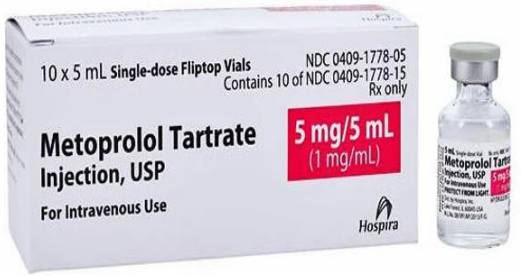
Reduction in **cardiovascular**, **pulmonary**, **renal** and **central nervous system** function may be the most important determinants of outcome from surgical procedures under general or regional anaesthesia.

❖**Cardiovascular system**

- **Ischaemic heart disease** is common in affluent societies= reduced cardiac output.
- In contrast, **valvular heart disease** secondary to **rheumatic fever** is more commonly seen in developing countries.
- Over **50**% of patients will have **mitral valve disease.**

Alterations in Organ Function

- Because the reduced cardiac output in heart disease, both the **kidneys** and **brain** are prone to perioperative ischaemia.
- The physiological response to **cardiovascular stressors** (such as hypovolemia) may be **blunted** due to reduced **baroreceptor** sensitivity and autonomic function.
- This lack of compensation may be significant if the patient is taking medication such as **betablockers** or **ACE inhibitors**.
- **Atrial fibrillation** (**AF**) in the elderly population is common.
- The fast ventricular rate in AF leads to reduced cardiac output
- Preoperatively, a patient in AF should ideally be cardioverted, or controlled to <100/minute.



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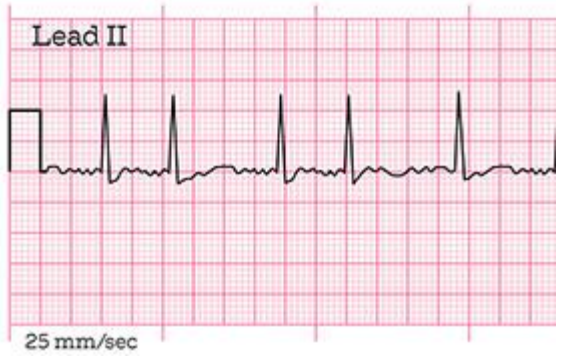
zofenopril
perindopril
trandolapril
captopril
enalapril
lisinopril



Alterations in Organ Function

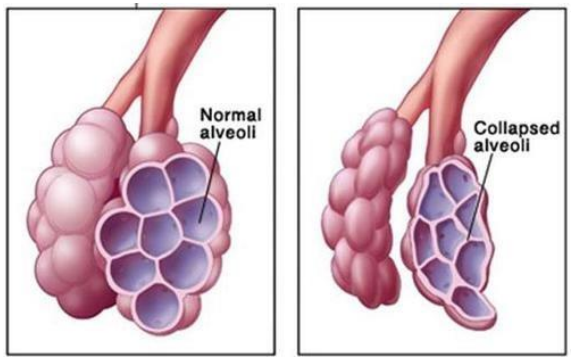
Respiratory system

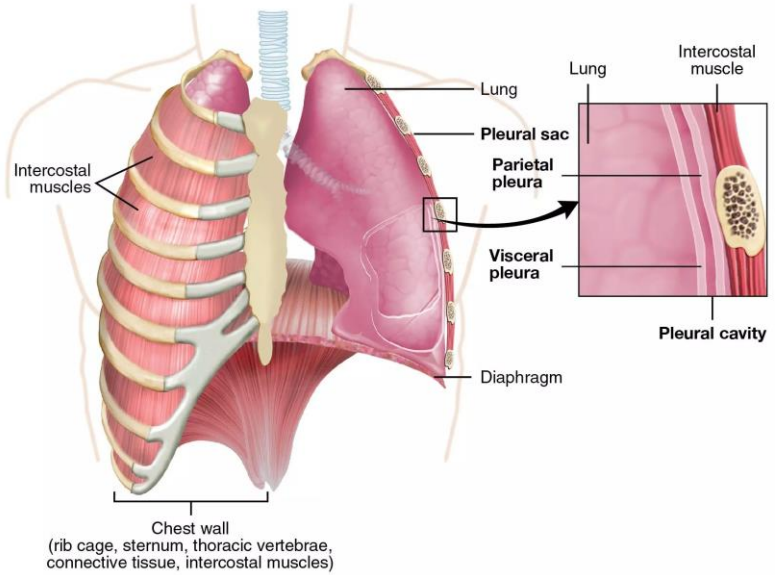
- ↓ **Pulmonary elasticity**, → alveolar overdistention, airway collapse.
- ↓ **lung compliance**
- ↓ **chest wall compliance**,
- ↓ **total lung capacity** (**TLC**)
- ↑ **functional residual capacity** (**FRC**)
- ↑ closing capacity (**CC**) with age, and may become greater than the FRC - this occurs in the supine position at 44 years of age and in the upright position at 66 years.
- ↑ RV, FRC
- **The end result of these changes is**

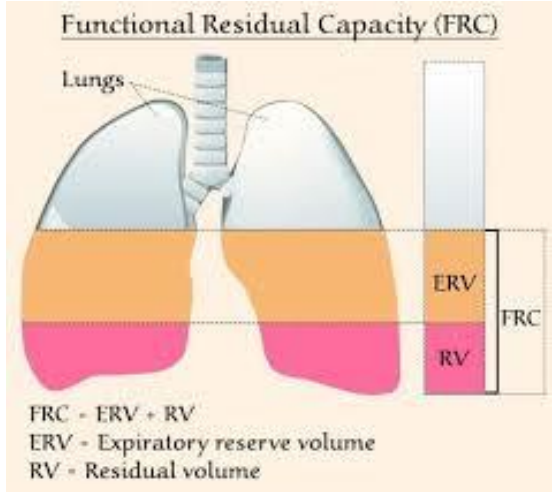
✓airways collapse,

✓VQ mismatch and

✓hypoxaemia.



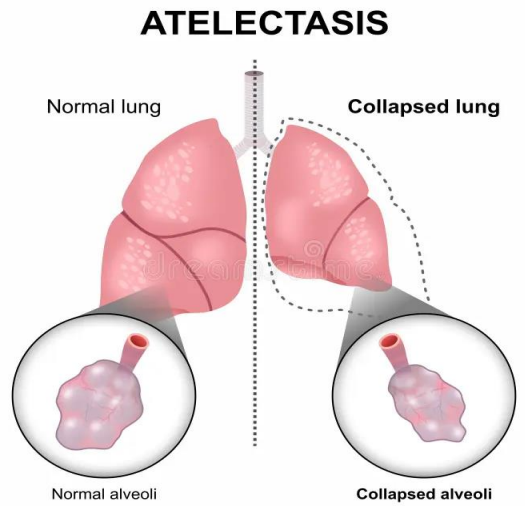


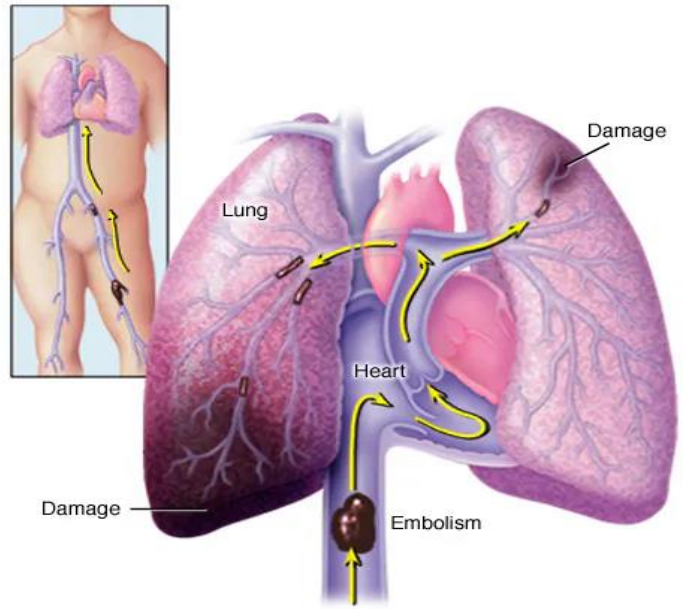


Alterations in Organ Function

Respiratory system

- ↓ The efficiency of gas exchange
- ↓ PaO2 with age although PaCO2 remains constant.
- **Atelectasis**, **pulmonary embolism** and **chest infections** are all more common in elderly patients, particularly following **abdominal** or **thoracic** surgery.
- **Early mobilisation** and good **analgesia** following abdominal surgery help **reduce** lung atelectasis and collapse.
- 🩺 **Prevention:**
- - Longer preoxygenation.
- - Higher FiO_2, use of PEEP.
- - Pulmonary toilet & early mobilization.





Alterations in Organ Function

❖Renal system

- ↓ Glomerular filtration.
- ↓ Clearance of renally excreted drugs
- Fluid balance is more critical (as responses to both fluid loading and dehydration are impaired).
- Renal function may deteriorate rapidly in hypovolaemic patients.
- Close monitoring of hourly urine output after major surgery should be routine.
- “Normal” serum creatinine ≠ normal renal function.
- mpaired Na^+ & water handling → dehydration or overload.

Alterations in Organ Function

❖Nervous system

- An age-related decline in central nervous system (CNS) function is common.
- As a result, **confusion** is more common, both pre and post-operatively.
- ↓ Brain mass, CBF, neurotransmitters.
- ↓ MAC, ↑ neuraxial spread/duration.
- **Delirium & POCD** common.

🚫 Avoid: Benzodiazepines, meperidine, anticholinergics.

Alterations in Organ Function

Metabolic & Endocrine

- - ↓ Basal metabolic.
- - ↓ Heat production, ↑ loss → hypothermia risk ❄ .
- - The incidence of **diabetes** is increased (15% >70 y = diabetes mellitus)
- - ↓ β-adrenergic response.

Hepatic & Nutritional Function

- ↓ Liver mass/blood flow → ↓ metabolism.
- - ↓ Albumin → ↑ free drug fraction.
- - ↓ Pseudocholinesterase in older men.

BODY COMPARTMENTS

- Loss of skeletal muscle(↓in lean body mass)
- ↓TBW due to ↓ in intracellular water
- ↑ in percentage of body fat

Alterations in Organ Function

❖Pharmacology

- ***Pharmacokinetics*** may be altered, with **reduced hepatic and renal blood flow and a reduction in total body water**. Plasma proteins are often reduced, resulting in reduced protein binding of drugs and metabolites, thereby increasing free drug levels and possible toxic effects.
- ***Pharmacodynamics*** may also be altered, with increased sensitivity to many agents, especially CNS depressants.
- Minimum alveolar concentration (**MAC**) decreases steadily with age.
- Long-term medication should usually be continued throughout the hospital stay.

❖Musculoskeletal

Arthritis usually affect the elderly.

Osteoporosis and ligament laxity makes epidurals and spinals technically difficult; in addition, the patient is prone to fractures or dislocation of joints (including the cervical spine) while anaesthetised.

PREOPERATIVE PREPARATION

- **Assessment**

✓ **A full history** and thorough **clinical assessment** is required.

✓ An **ECG** is required for all patients.

✓ A **chest X-ray** should be arranged for patients with known malignancy or possible tuberculosis, and for anyone with symptomatic cardiovascular or respiratory disease.

✓ Note the level of cognitive function.

✓ Assessment of **exercise tolerance** and functional ability is important.

✓ The American Society of Anaesthesiologists (**ASA**) score should be recorded - it remains a good predictor of outcome in the elderly

Resuscitation/optimisation pre-operatively

- ✓ **Dehydration** is common.
- ✓ Preoptimisation enhance the oxygen delivery to the tissues during the perioperative period, by using **fluid therapy**, **oxygen** and possibly **inotropic agents**.

- **PERIOPERATIVE CARE**

  In general the full range of anaesthetic drugs and techniques used for young, fit adults may be used in elderly patients, within the limitations of their physiology.

  Modification of the techniques, and particularly drug doses, may be required.

Resuscitation/optimization pre-operatively

- **Induction of anaesthesia**

↑ Arm-brain circulation time

↓ induction agent dose requirements.

✓Titrate drugs slowly against effect,

✓inject into a running intravenous infusion.

✓**Thiopentone** or **propofol** are both useful but should be given slowly to avoid overdose.

✓An induction dose of propofol may result in hypotension and require a vasopressor.

✓ Avoid **ketamine** in the presence of cardiac disease as the tachycardia and hypertension that may result can increase myocardial oxygen consumption and precipitate ischaemia.

✓However, ketamine's hallucinogenic effects are not as marked in the elderly, and that it remains a very safe and effective analgesic, anaesthetic and sedative.

Maintenance of anaesthesia

- **Maintenance of anaesthesia** with **inhalational agents** is a suitable technique for elderly patients.
- **Fluid management**
  Careful peri-operative fluid balance is mandatory in the elderly.
- Always consider measuring the **CVP** with large fluid shifts.
- Excess fluids in an elderly patient, can cause **pulmonary oedema**.
- Conversely, dehydration in the elderly can precipitate **renal failure.**

POSTOPERATIVE CARE

Oxygen therapy

- It is good practice to prescribe **post-operative oxygen therapy for all elderly** patients, and especially following abdominal or thoracic surgery.
- Nasal cannulae are often better tolerated than facemasks.

High dependency care

High dependency care or **intensive care** facilities may improve the long-term outcome of elderly patients, especially those undergoing urgent or emergency surgery.

Analgesia

Consider prescribing a regular simple analgesic such as paracetamol, and use **NSAID's** with caution; the **complications** of NSAIDs, including renal impairment and peptic ulceration, are more prevalent in older patients.

Regional techniques or an IV opioid infusion (with appropriate close supervision) may be the most appropriate method of pain relief.

THANK YOU