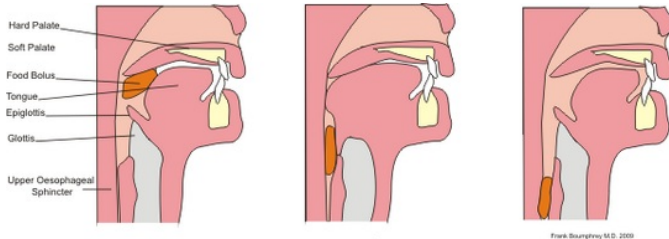


Aspiration

Aspiration is defined as inhaling a foreign body or fluid into the lower respiratory tract. This is most often gastric contents or a foreign body. In obstetrics, the aspiration of amniotic fluid or meconium by the newborn.



Swallowing - Topography of the upper respiratory and swallowing tracts

Predisposition

- Disorders of consciousness (coma, intoxication);
- general anesthesia (especially introduction and withdrawal from anesthesia) and sedation;
- alcoholism;
- tracheostomy;
- endotracheal intubation
- hiatal hernias, esophageal diseases, decreased lower esophageal sphincter tonus (Benzodiazepines, Opiates, Hypnotics, Vagolytics);
- upper airway stenosis.

Patophysiology

- The consequences of aspiration and the resulting clinical pictures can be divided into three groups:
 - aspiration of acidic gastric contents;
 - solid body aspiration;
 - aspiration of bacterial contaminated material.

Aspiration of an inert body or particle

- Solids, blood clots, food residues;
- occurs immediate airway obstruction (partial or complete), atelectasis and reflective bronchospasm.

Symptoms

- Dyspnoea, tachypnoea, respiratory stridor;
- laryngospasm, bronchospasm, cough;
- chest pain, hemoptoe.

Auscultation

- Lateral differences (weakened breathing), in- or expiratory wheezing (if spasm persists even after airway lavage → suspicion of more foreign bodies).

X-ray image

- Finding a foreign body if it is large enough with X-ray contrast;
- emphysematous changes (valve mechanism) or atelectasis.

Blood gas analysis

- Decrease in p_aO_2 and increase in p_aCO_2

Therapy

- O_2 ;
- upside-down positioning, foreign body digital removal attempt, direct laryngoscopy, rigid bronchoscopy, Heimlich maneuver;
- endotracheal suction and endobronchial lavage, in the case of small particles we can aspirate using fibrobronchoscopy, larger bodies bronchoscopy with a rigid bronchoscope;
- thoracotomy.

Acidic stomach contents

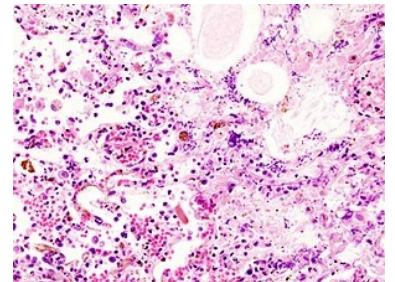
Synonyms

- Mendelson's syndrome

Symptoms

- dyspnoea, tachypnoea, cough;
- anxiety, fear;
- laryngospasm, bronchospasm, cyanosis, foamy sputum;
- tachycardia, pressure drop, shock.

Complications



Aspiration pneumonia in a patient with neurological degenerative disease, parenchymal necrosis and aspirate particles are seen. Stained with hematoxylin-eosin.

- ARDS (approximately 22% of patients);
- secondary infections;
- SIRS, MOF.

Pathophysiology, process

- **Chemical-toxic phase**
 - in 5 seconds the aspirate enters the central airways;
 - in 15 seconds it is neutralized in the lungs;
 - airway epithelial necrosis - desquamation of the superficial epithelial layer, complete loss of epithelialization in 6 hours, regeneration in 3 days, complete regeneration in 7 days;
 - second type pneumocytes degenerate within 4 hours after aspiration → increased pulmonary permeability and pulmonary edema.
- **Inflationary phase**
 - acidity-induced proinflammatory changes - cytokines , TNF α , IL-8 → inflammatory reaction → increased permeability → pulmonary edema.

Auscultation

- rhonchi, whistles, squeaks.

X-ray image

- diffuse infiltration of affected areas, atelectasis;
- we scan immediately after aspiration and then 4 hours later (even in an asymptomatic patient) - the first changes recognizable on an X-ray may occur 4-8 hours after aspiration.

Pulmonary function, blood gas analysis

- decrease in p_aO₂ and increase or also decrease in p_aCO₂, decrease in lung compliance , increase in lung resistance, initially respiratory alkalosis later turns into metabolic acidosis, increase in respiratory work;
- decrease in blood pressure, increase in pulmonary arterial pressure.

Therapy

- oropharyngeal suction, endotracheal suction (aspirate analysis - volume, pH, chemical analysis, microbiological examination), upside down position, we do not attempt edobronchial lavage or neutralization;
- O₂ supply (mask, CPAP), endotracheal intubation and artificial lung ventilation with PEEP, humidified air and inhalation therapy, patient positioning;
- fibrobronchoscopy (within one hour of aspiration) - confirmation of the diagnosis, estimation of damage, suction of solids, atelectasis;
- circulatory stabilization - volume therapy, careful catecholamine therapy;
- lungs - use of bronchodilators (β_2 sympathomimetics, theophylline);
- physiotherapy (breathing training);
- ATB - Cephalosporins of the 2nd generation + Metronidazole , alternative: aminopenicillins + lactamase β inhibitor
- Ambroxol in high doses (surfactant and mucus production), surfactant application (locally bronchoscopically, systemically).

Bacteria-contaminated material

Symptoms

- dyspnoea, tachypnoea;
- bronchospasm;
- later symptoms of pneumonia : fever, productive cough.

Auscultation

- rhonchi, whistles.

X-ray image

- infiltrates in the affected areas of the lungs.

Pulmonary function, blood gas analysis

- decrease in p_aO₂ and increase or also decrease in p_aCO₂, decrease in lung compliance, increase in lung resistance, metabolic acidosis;
- purulent, smelly tracheal secretion;
- decrease in blood pressure, increase in pulmonary arterial pressure.

Therapy

- endotracheal aspiration, fibrobronchoscopy;
- ATB prophylaxis of pneumonia - use of ATB according to the expected spectrum in infected material (Ileus, G negative intestinal flora);
 - typical agents: *Bacteroides* , anaerobic Streptococci > 80%, Staphylococci , Pneumococci , Klebsiella , Fusobacteria
 - ATB: eg Cefoxitin + Clindamycin or Imipenem (+ Gentamicin) or Cefoxitin + Gentamicin.

Incidence of aspiration in anesthesia and intensive care

- On average 1.4-6.5 : 10000.
- The lowest risk of aspiration is in planned procedures in children older than one year and patients of groups ASA I and II (ASA = American Society of Anesthesiology).
- In infants, patients in groups ASA IV and V, patients undergoing caesarean section and emergency procedures, the risk is ten times higher.
- The highest risk of aspiration is in urgent intubations 375 : 10000.^[1]
- Only about one third of all cases are aspiration symptomatic - requires artificial lung ventilation > 24 hours.^[2]
- The greatest risk of aspiration is at the beginning of anesthesia, about 56% of aspirations are at the beginning of anesthesia, during anesthesia about 20% and when exiting anesthesia the incidence also reaches about 20%.

Prevention

Non-pharmacological

- we perform for all patients undergoing the planned operation;
- includes preoperative fasting:
 - do not eat any solid food for at least 6 hours before the operation;
 - no consumption of pure fluids (water) for at least two hours preoperatively;
 - in infants, the last breast-feeding within four hours before surgery;
 - if the patient is not fasting, we only perform life-saving surgery using the "crush intubation" technique.^[1]

Pharmacological

- use if known risk factors - smoking, gastroesophageal reflux, lower esophageal sphincter disorders, caffeine, body mass index over 30, pregnancy, trauma, shock;
 - increasing the pH of the stomach contents;
 - approximately 10–20 minutes before the operation, we give a solution of sodium citrate (in pregnant women undergoing a caesarean section);
 - histamine H₂ blockers 2 in the evening and in the morning 2-3 hours before surgery - ranitidine, cimetidine;
 - proton pump inhibitors omeprazole, pantoprazole;
 - accelerating the emptying of gastric contents;
 - metoclopramide - 30 minutes before surgery.
-

Links

Related articles

- Aspiration pneumonia

External links

- Aspiration (English wikipedia) (<https://en.wikipedia.org/wiki/Aspiration>)

References

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