ANAESTHESIA FOR THE PATIENT WITH A FULL STOMACH

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One of the major risks posed by patients who have not been prepared for theatre is that they may not have an empty stomach. When consciousness is lost (as during induction of general anaesthesia) the patient with stomach contents may regurgitate gastric material via the oesophagus which may be aspirated into the lungs causing a severe pneumonitis (inflammation of the lungs) usually called "aspiration pneumonitis". This is especially severe, and often fatal, if the gastric contents are markedly acidic (pH < 2.5). As little as 30mls will cause a severe reaction. When solid foodstuffs are aspirated complete obstruction of the airway may occur.

Why do people regurgitate? Normally the specialised junction between the oesophagus and the stomach, the **oesphagogastric junction** (which may also be called the **cardia**) acts as a sphincter to prevent material returning to the oesophagus after entering the stomach. When the conscious level is

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depressed this junction works less efficiently and if the pressure within the stomach (the intragastric pressure) is greater than the closing pressure of the sphincter then regurgitation will occur. Note that regurgitation is different from vomiting. Vomiting is an **active** process and involves contraction of the abdominal muscles; regurgitation is **passive** involving smooth muscles only.

Normally patients are fasted for 2 hours after clear fluids and 6 hours following a meal before they are anaesthetised. This is to reduce the chance of any residual food remaining within the stomach. However these periods of fasting may not always guarantee an empty stomach. Patients who have been traumatised, or are suffering from intra-abdominal pathology, or who have had opioid drugs or are in labour do not empty their stomachs efficiently and should always be treated as if they have a full stomach.

The risk of regurgitation is greater if the intragastric pressure is increased by the presence of food or liquid within the stomach, the lithotomy position (legs up with patient on their back), obesity or an intra-abdominal swelling such as pregnancy after 24 weeks or ovarian masses.

Pregnancy further increases the risk of regurgitation as hormonal changes decrease the efficiency of the oesophagogastric junction. A hiatus hernia may render the oesophagogastric junction ineffective; patients with this condition will usually give a history of 'heartburn' or indigestion when they lie down.

The Anaesthetic Approach to the Patient with a Full Stomach.

Identify the patient at risk. Any patient who falls into any of the categories above should be treated as having a 'full stomach'.

Consider the operation planned and its urgency. If the operation can be delayed to allow the stomach to empty then this approach should be adopted. However the patient's life should not be put at risk by delaying urgent procedures. It should be remembered that some ill patients may be unable to empty their stomachs.

If possible reduce the volume, pressure and acidity of the stomach contents. Patients with a stomach full of liquid, such as those with bowel obstruction or who are drunk should have a large nasogastric tube passed prior to general anaesthesia. Often the patients will vomit during attempts at passing of a nasogatric tube. Remember that even after passing the tube the stomach is unlikely to be completely empty as nasogastric tubes are inefficient for removing liquids and useless for solids.

As discussed earlier certain elective patients, such as pregnant females in the third trimester, are at risk of acid aspiration despite being adequately fasted. This group of patients is best treated by decreasing the acidity and volume of gastric fluids by the use of ranitidine or cimetidine given 1 to 2 hours preoperatively. Unfortunately this is not adequate for emergencies who should also be given 30mls of sodium citrate immediately before induction of anaesthesia. Such techniques will raise the pH of the gastric fluid and make the consequences of aspiration less serious. Unfortunately not all anaesthetists have access to these drugs but most pharmacies can make up sodium citrate.

Consider the Best Form of Anaesthesia

Due to the risks associated with general anaesthesia the use of a local anaesthetic technique should be considered. This will avoid depressing the conscious level. Beware however of using deep sedation in combination with local anaesthesia. Some anaesthetists believe that ketamine protects the airway by preserving laryngeal reflexes - this is not true.

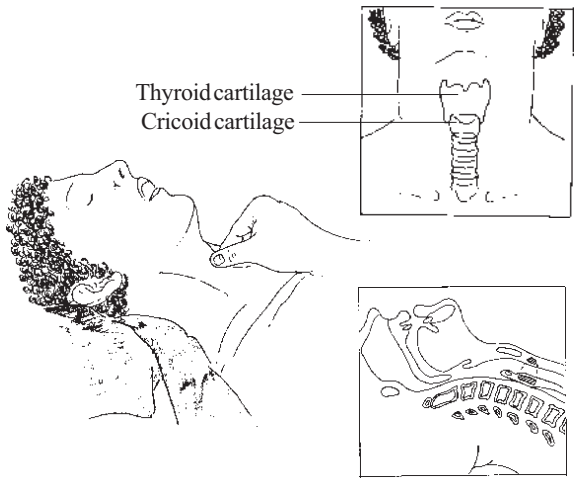
If general anaesthesia is required in a patient at risk of having a full stomach the airway should be protected by a cuffed endotracheal tube. (Under the age of 10 an uncuffed endotracheal tube should be used.) The safest technique for introducing an endotracheal tube in this situation is called a rapid sequence induction (RSI or crash induction) using **preoxygenation** and **cricoid pressure**.

Preoxygenation. Under normal circumstances the lungs contain a mixture of oxygen, nitrogen and carbon dioxide. At the end of expiration the volume of gas left in the lung (about 2 litres) is called the Functional Residual Capacity (FRC). This contains the oxygen reserve on which the patient depends when they are not breathing. Most of the gas in the lung is nitrogen which can be replaced with oxygen thereby increasing the oxygen reserve. The technique of replacing the nitrogen contained in the FRC with oxygen is called **preoxygenation** or **de-nitrogenation.** After 3 minutes of breathing 100%

oxygen most of the nitrogen has been replaced by oxygen.

Cricoid pressure. The cricoid is a ring shaped cartilage situated between the first tracheal ring and the thyroid cartilage. When firm backward pressure is applied to it, as shown in figure 1, the oesophagus is occluded preventing any regurgitated gastric fluid from entering the pharynx. It is completely reliable provided the pressure is put on the correct area. The backward pressure should be firm; if the equivalent pressure is applied to the bridge of the nose it feels uncomfortable.

Figure 1. Applying cricoid pressure



Technique of Rapid Sequence Induction

1. Prepare your equipment and drugs - where possible this should include all the apparatus listed in table 1. Check all the equipment carefully before starting and ensure that everything is to hand.

Table 1 - Equipment required for a crash induction.

Tilting trolley or operating table
Suction apparatus and tubing
Anaesthetic machine, source of oxygen, anaesthetic circuit and facemask
2 appropriately sized laryngoscopes
Correct size of endotracheal tube and one a size smaller
Endotracheal tube introducer, cuff syringe and connections to circuit
Range of oral airways
Anaesthesia drugs - induction agent, atropine and suxamethonium
A trained assistant

2. Consider whether a nasogastric tube should be passed.

3. Assess how difficult endotracheal intubation is likely to be. If you expect difficulties think again whether local anaesthetic could be used or consider an awake intubation.

4. Insert an intravenous cannula and demonstrate the position for cricoid pressure to your assistant.

5. **Preoxygenate** the patient. Using a Magill or other anaesthetic breathing circuit, turn the oxygen to 6 to 8 litres/minute and apply the facemask to the patient. Ensure that there is a good seal between the mask and the patient's face. Ask them to breathe oxygen for three minutes. Do not allow the patient to breathe even a single breath of air during this phase or else the preoxygenation will have to be repeated. This is due to the volume of nitrogen that is contained in a single breath of air.

6. Estimate the dose of induction agent which the patient will need (eg thiopentone 5mg/kg) and give this intravenously, immediately followed by suxamethonium 1.5mg/kg. As soon as consciousness is lost ask your assistant to apply cricoid pressure.

7. Keep the facemask in place but do not ventilate the patient manually as some of the oxygen may enter the stomach increasing the intragastric pressure. As soon as the suxamethonium is effective intubate the patient, inflate the endotracheal tube cuff and check the position of the tube by listening to the lungs with a stethoscope.

Note: if intubation is delayed for any reason, or the patient's colour deteriorates, manual inflation should be immediately carried out with cricoid pressure in place.

8. When you are satisfied that the tube is placed correctly, fix it and then instruct your assistant to release the cricoid pressure.

9. Proceed with the anaesthetic and surgery as planned. At the end of the surgery turn the patient on to their side and do not remove the endotracheal tube until the patient is fully awake and capable of protecting their own airway.

Difficulties with the Technique

1. Intubation is unexpectedly difficult. Ensure that the cricoid pressure is not pushing the larynx to one side. If it is, move the larynx and cricoid cartilage by moving your assistant's hand to the correct position. Do not release cricoid pressure. If the suxamethonium needs to be repeated remember to give atropine before the second dose to avoid bradycardia, and ventilate the patient gently to prevent hypoxia. Maintain cricoid pressure at all times. If intubation proves impossible then carry on as described under failed intubation.

2. No oxygen. Obviously no preoxygenation can take place but it is still possible to use cricoid pressure as discussed above. In this situation the patient will need to be gently ventilated with air to prevent hypoxia after apnoea develops.

3. No suxamethonium. The best option here is to induce the patient in a head down position on the left side using a inhalation (gas) induction with halothane or ether in oxygen or oxygen enriched air. Once the patient is deeply anaesthetised they may be intubated whilst still in the lateral position. Cricoid pressure is not necessary in this situation as any regurgitated material will automatically run out of the mouth.

4. Failed intubation. If intubation proves impossible then it is best to accept the situation and adopt an alternative anaesthetic technique instead of wasting time with repeated intubation attempts. The possible options are to continue with a mask anaesthetic (provided the airway is easy to maintain while keeping an cricoid pressure) or to wake the patient up after turning them on their side and head down and attempt the procedure under local anaesthetic. Alternatively the patient may be allowed to wake up and an awake tracheostomy or intubation performed. The best course will depend on the condition of the patient and their degree of fasting, the operation planned, the facilities and level of expertise available.

5. The cricoid cartilage is difficult to identify. Using firm pressure with your index finger follow a line down the front of the neck from the front of the mandible. The first 'solid' structure you meet is the hyoid bone, followed by the thyroid cartilage (Adam's apple) which is much more prominent in males. Immediately below this you will feel a gap between the cricoid and thyroid cartilages (the cricothyroid ligament) and then the cricoid cartilage. Encourage your assistants to practice finding the cricoid cartilage on other colleagues until they are confident. Non-skilled assistants can provide cricoid pressure if they receive adequate instruction, and the position of the cricoid ring is marked on the skin in ink before starting.

6. The patient regurgitates despite the application of cricoid pressure. If there is only a small quantity of fluid suck it out of the pharynx and intubate the patient. Use a suction catheter to aspirate the trachea after intubation. If there is copious fluid then the patient should be turned on to the side and placed head down to protect the airway. Suction the pharynx and then intubate the patient.

Note: When using small oxygen concentrators in association with drawover apparatus preoxygenation may be difficult as the machines can only provide 4 litres per minute of around 85 - 90% oxygen. When this mixture is used the patient will always entrain air into the drawover circuit making preoxygenation less efficient. One way round this is to fill a large plastic bag with 'oxygen' from the concentrator and use this as an oxygen reservoir during preoygenation. When used it should be attached to the inlet of the circuit. Remember to remove it before it empties completely.

Anticipated Difficult Intubation

Awake intubation. This technique can be used to place an endotracheal tube before inducing anaesthesia. It is useful for patients in whom you expect intubation may be difficult and in whom maintaining an airway under anaesthesia may become a problem.

The best technique uses a fibreoptic bronchoscope but these are rarely available. A simpler technique is to give the patient a drying premedication with intramuscular atropine and then

using some plain 2% lignocaine spray inside the mouth and then ask them to move the solution around the mouth. After a short time gently insert the laryngoscope as far as the patient will let you and spray some more lignocaine into the airway further down, then remove the scope. By repeating this manouvre you will soon see the epiglottis and cords and after spraying them well you be able to intubate the patient. Induce anaesthesia as soon as you have accomplished this. At all times be gentle and consider using sedation such as low dose diazepam and/or morphine to help you. Be careful however, not to depress respiration.