

Nil-by-Mouth Time

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The purpose of preoperative fasting is to achieve an empty stomach at the time of anesthesia induction. Several international associations have accordingly issued guidelines for preoperative fasting. The American Society of Anesthesiology (ASA) recommend fasting intervals of 6 hours for solids, 4 hours for breast milk and 2 hours for clear fluids, respectively.(1) The European Society of Anaesthesiology (ESA) and the Scandinavian guidelines follow the ASA recommendations but differ regarding infant formula where they recommend fasting for 4 – 6 h prior to surgery.(2,3) These current fasting guidelines all take into account the balance between the risk of pulmonary aspiration and the harmful effects of prolonged preoperative fasting. However, there is increased awareness among pediatric as well as general anesthesiologists that many patients suffer from prolonged duration of fasting. This may be harmful, especially in small children, but also in adults with a poor nutritional status. The latter has been emphasized within the Enhanced Recovery After Surgery (ERAS) concept. (4)In this presentation, I will examine the physiologic basis for fasting and the negative effects of prolonged fasting.(5)

Let's start with the concept of a strict association between fasting time and the risk of aspiration. An observational study using Magnetic Resonance Imaging (MRI) in children demonstrated that the stomach is not empty even after a prolonged fasting time.(6) This was corroborated by a recent ultrasound study in which 5 % of elective adult patients were found to have a gastric residual volume larger than expected.(7) Thus, the anesthesiologist must be aware of this variability and be prepared for the patient that vomits at induction, regardless of fasting time. Several conditions have been associated with an increased risk of pulmonary aspiration, such as a high ASA grade, emergency surgery, gastroesophageal reflux, dysphagia symptoms, gastrointestinal motility disorders, neuromuscular disorders, obesity and diabetes mellitus. These are all conditions that delay gastric emptying, increase regurgitation or impair protective airway reflexes.

However, the majority of patients behave according to the physiology of gastric emptying, of which we must have a thorough understanding. It is important to realize that solid food behaves fundamentally differently than clear fluids in the stomach. Aspiration of solid matter is also the main culprit when aspiration causes morbidity and mortality.

Gastric emptying of solids follow zero order kinetics after a lag phase of varying duration (often up to one hour). The caloric content of the ingested food is the main determinant of clearance, due to the fact that passage through the pylorus is strictly regulated by a feedback

mechanism, involving osmoreceptors in the duodenum. The six hour limit for solid food in the guidelines may seem rather blunt, since a very large meal will take longer than six hours, while e.g. a sandwich or a piece of fruit is likely to be cleared in less than four hours.

On the other hand, clear fluids are emptied according to first order kinetics, with a half-time of 10 -20 minutes.(8) This indicates that a limited volume of clear fluids is likely to be cleared from the stomach in considerably less than two hours. Furthermore, aspiration of clear fluids is unlikely to cause serious morbidity. However, estimation of gastric fluid clearance may also have to take into account the caloric content of the fluid, illustrated by a recent ultrasound study.(9)

Semisolids such as milk or milk-based products seem to form an intermediate position. Nevertheless, even the smallest amount of milk is regarded as a solid in the ASA guidelines. The reason is that milk proteins form a curd in the stomach and would accordingly be expected to follow zero-order kinetics. However, this applies to only a small portion of a milk-based product while the rest is clear fluid. Gastric emptying of a reasonable amount of milk-based product will therefore be completed within considerably less time than after the same amount of solids. Indeed, two recent studies confirm that as much as 300 mLs of milk takes less than four hours to pass through the stomach.(9,10) In the Scandinavian guidelines, the recommended fasting interval for milk-based formula is four hours. In Uppsala, Sweden, children are encouraged to eat milk-based products such as yoghurt, soup and formula until four hours before anesthesia. This practice has been in place since the year 2000, and was audited together with the free clear fluid regimen, showing no signs of increased risk of pulmonary aspiration or other complications.(11)

The research leading to the recommendation of a minimum of 2-hours fasting for clear fluids mainly focused on proving non-inferiority of this regimen compared to the traditional 'NPO after midnight'. What we now know about gastric emptying suggests that even shorter fasting intervals may be safe.(5) In accordance with the latter insight, several centers have adopted more liberal fasting regimens for clear liquids and/or a light breakfast of semi-solids. In Sweden and Australia, some pediatric hospitals allow children clear fluids until called to surgery (11,12) and in the UK, several centres are allowing clear fluids until 1 hour prior to anesthesia induction in line with a recent publication.(13) Importantly, the incidence of fasting more than six hours was significantly reduced.(14) Accordingly, the European Society for Paediatric Anaesthesia, together with the French and the British national paediatric anaesthesia societies, recently issued a joint consensus statement, stating that: "based on the current convincing evidence base, unless there is a clear contra-indication, it is safe and recommended for all children able to take clear fluids to be allowed and encouraged to have them up to one hour before general anaesthesia."(15)

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