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Effects of Short Preoperative Fasting vs Long Preoperative Fasting in Pediatric Patients

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Abstract
Preoperative fasting in pediatric patients is a traditional practice that has come under critical review in recent years. Recent studies question the effectiveness of prolonged fasting, particularly regarding the intake of clear fluids. This narrative review examines the current evidence on the clinical consequences of excessive fasting, including its metabolic, psychological, and anesthetic implications, and reviews recommendations from international scientific societies. Findings support more flexible fasting protocols tailored to pediatric patients, emphasizing evidence-based practice and child-centered care. The importance of updating institutional guidelines and promoting education among healthcare professionals and families is highlighted.

Keywords: Gastric emptying, pediatrics, anesthesia

Introduction

Preoperative fasting is the prescribed period before a procedure requiring anesthesia during which patients are not allowed oral intake of liquids or solids, with the aim of reducing the risk of pulmonary aspiration of gastric contents during anesthetic induction.[1]

According to the WHO, more than 234 million surgical procedures are performed worldwide each year on patients of all ages.[2] This data emphasizes the need for current knowledge and updated evidence related to pediatric preoperative fasting.

Preoperative fasting is considered standard practice for anesthesia providers because it is tailored to the population they serve. This can cause debate, particularly among pediatric anesthesiologists. Understanding the different stages in pediatrics is essential for determining the appropriate fasting duration, as the physiological and psychological conditions of a newborn differ significantly from those of an adolescent; although they are classified within the same age group, they are at opposite ends of that spectrum.[3]

Traditional "nothing by mouth after midnight" fasting can increase gastric volume, lower pH, and elevate stress and anxiety, according to physiological and metabolic research. Short preoperative fasting involves reducing the time food and liquids are withheld before surgery. It permits clear liquids up to 2 hours before the procedure.[4,5] For meat, fried, and fatty foods, the minimum fasting times are typically 8 hours in countries like Canada and Australia. In Europe, the minimum fasting period for solid foods is 6 hours, and this may also be acceptable in other regions if the meal is light. Research indicates that longer fasting periods, such as 6 or 8 hours for solid foods, are unnecessary for clear liquids, which are usually cleared within 2 hours.[6]

Most current literature focuses on adolescent and adult patients, overlooking other pediatric populations. It is important to address the implications of preoperative fasting, including its duration and its physical and psychological effects, particularly in pediatric populations. The objective of this review is to understand the current state of science regarding the effects of preoperative fasting duration in pediatric patients.

Search Methodology

A bibliographic search was conducted in the PubMed database using MeSH descriptors and free terms: ("Preoperative Care"[Mesh] OR "preoperative fasting") AND ("Pediatrics"[Mesh] OR "pediatric patients" OR "children") AND ("Anesthesia, General"[Mesh] OR "pediatric anesthesia") AND ("Gastric Emptying"[Mesh] OR "gastric volume") AND ("clear fluids" OR "short fasting" OR "long fasting"). The last search update was conducted on April 15, 2025. The search included articles published between January 2018 and April 2025, with no restrictions on study design, provided they addressed preoperative fasting in the pediatric population in an anesthetic context. Studies in English and Spanish were included, and reviews, clinical guidelines, observational studies, and clinical trials were selected.

An updated bibliographic search was conducted in the PubMed and Scopus databases between January 2018 and April 2025. MeSH terms and keywords in both English and Spanish related to preoperative fasting, clear fluids, gastric emptying, and pediatric anesthesia were used. Studies conducted in pediatric populations that compare the effects of short versus prolonged fasting in a preoperative context were prioritized. Relevant original articles, systematic reviews, and clinical guidelines were selected, excluding studies focused solely on adults or outside the surgical field.

Preoperative Fasting History

The concept of preoperative fasting began in the mid-19th century as a way to prevent vomiting caused by chloroform anesthesia. In 1855, Dr. John Snow outlined the first guidelines for "Nil per Os" (nothing by mouth) before chloroform use. The British surgeon Joseph Lister wrote in 1883 about the importance of avoiding solid food in the stomach when administering chloroform, though he suggested drinking a cup of tea or broth two hours before the procedure. In 1946, Curtis Mendelson published a study of 66 cases of broncho-aspiration in obstetric patients who received ether general anesthesia. This research highlighted the need for fasting to prevent lung aspiration, leading to stricter fasting protocols.[7,8]

In 1999, the American Society of Anesthesiologists (ASA) published the first guideline, allowing clear liquids up to 2 hours before surgery and light solid foods up to 6 hours before the

procedure. These recommendations are based on scientific evidence indicating that prolonged fasting does not necessarily result in an empty stomach and can cause significant dehydration and discomfort in patients.[9] The second revision was in 2011, where more specific recommendations for different types of liquids and foods were added. It reaffirmed the need to consume clear liquids 2 hours before surgery, noting that breast milk could be consumed up to 4 hours prior.[10]

The evidence indicated that giving clear liquids to children before surgery did not significantly affect gastric volume or pH. The risk of aspiration or regurgitation was very low. In the 2015 update to the preoperative fasting guidelines, a detailed review of the evidence was conducted to inform recommendations for the pediatric population. The 2015 guidelines compared published regimens worldwide, based on age and type of food, with similar guidelines.[11]

In 2016*, the Argentine Journal of Anesthesiology* published guidelines from the Association of Anesthesia, Analgesia, and Resuscitation of Buenos Aires on perioperative fasting for adult and pediatric patients undergoing elective procedures. It compiled a series of recommendations on preoperative fasting, based on the latest evidence, to serve as a framework for updating current guidelines. Extensive physiological and metabolic studies have shown that prolonged fasting results in increased gastric content, lower gastric pH, hypoglycemia, dehydration, and heightened stress and anxiety.[4]
The 2017 update emphasized patient well-being and the intake of clear fluids 2 hours before surgery, but added the additional goal of reducing preoperative thirst and anxiety.[12] A 2023 update revealed new evidence on the safety of clear fluids, which has been incorporated. Additionally, guidelines for patients with obesity and diabetes were included, suggesting a more individualized approach tailored to their conditions.[13]

In 2011, the European Society of Anaesthesiology (ESA) guidelines for managing preoperative fasting established that clear fluids could be safely administered to patients with altered gastric emptying. The rationale for this practice was based on fasting studies, although these studies were insufficient to provide compelling evidence linking gastric emptying to certain comorbidities. For the 2017 guidelines, risk factors for broncho-aspiration included age, sex, and physical status. In the 2023 update, other factors that could increase the risk of broncho-aspiration were highlighted, including gastric surgery, opioid use, and intestinal obstruction.[19]

In Spain, a review of the updates to the guidelines was conducted, as well as the current guidelines for controversial patients such as infants. Currently, evidence-based fasting guidelines have been introduced to minimize patient discomfort (eg, hunger, thirst) and to reduce the risk of perioperative aspiration. However, many patients undergoing scheduled surgery still experience uncomfortable preoperative periods due to excessive fasting times.[14]

Physiological Aspects of Gastric Emptying

The stomach is the section of the gastrointestinal tract where the main processes of secretion and digestion start; however, the most crucial function of the stomach in digestive physiology is driven by gastric motor activity (GMA). Normal GMA is regulated by various external and internal stimuli. The primary external control comes from vagal innervation; although most vagal efferents to the stomach are excitatory, some vagal nerve endings generate

inhibitory signals via neurotransmitters such as nitric oxide and vasoactive intestinal peptide (VIP).[15] Internal stimuli originate from the enteric nervous system and are vital in coordinating gastric motor function with more distant parts of the digestive tract, especially during the interdigestive period. GMA, and thus gastric emptying, can be influenced at different levels and for various reasons, leading to a range of clinical and paraclinical disorders, collectively known as 'gastroparesis'. Gastric emptying results from the interaction between forces that promote food movement through the stomach—such as the tone of the fundus, the peristalsis of the antrum, and the coordination between the antrum, duodenum, and pylorus—and mechanisms that oppose exit, including pyloric motility patterns and small intestine activity.[16]

Results

Original studies, systematic reviews, and clinical guidelines were identified assessing the impact of preoperative fasting duration in pediatric populations. Overall, the evidence gathered concentrated on three main areas: *anesthetic safety, physiological/metabolic effects, and patient well-being*.

Regarding *anesthetic safety*, the reviewed studies consistently reported a very low incidence of pulmonary aspiration in pediatric patients—estimated at 3–4 cases per 10,000 surgeries—without a significant increase in adverse events associated with shorter fasting protocols.[18] Gastric ultrasound demonstrated that gastric emptying after the intake of clear fluids was achieved within 1 to 2 hours in most patients, including infants.[23-27]

Physiological and metabolic effects of prolonged fasting were associated with intraoperative hypoglycemia, with incidences as high as 26.2% in some reports (30), as well as increased residual gastric volume and decreased gastric pH.[4,11] These findings challenge the assumption that longer fasting ensures an empty stomach. In contrast, shorter fasting intervals have been shown to improve glycemic stability without increasing the risk of aspiration.[21,22]

In terms of *patient well-being*, several studies have documented that extended fasting periods are associated with greater thirst, hunger, irritability, and preoperative anxiety.[4,21] Conversely, more liberal protocols (1–2 h for clear fluids, 4 h for breast milk, and 6 h for light solids) were associated with reduced discomfort and better cooperation from children during the perioperative period.[19,26]

Finally, the international guidelines reviewed revealed heterogeneity in recommendations. The American Society of Anesthesiologists continues to endorse a 2-hour fasting period for clear fluids [20], whereas the European Society of Anaesthesiology and the Canadian and British societies have reduced this interval to 1 hour in healthy pediatric patients.[19] Nevertheless, adherence to these recommendations in clinical practice remains suboptimal, with actual fasting times frequently reported as considerably longer, ranging from 6 to 15 hours for clear fluids.[21-28] The findings support implementing shorter, individualized fasting policies tailored to age, type of intake, and the clinical condition of pediatric patients, while prioritizing both safety and child-centered care.

Discussion

Until a few years ago, the "gold standard" for fasting was 6-4-2.[17] This was the case to prevent events such as aspiration pneumonia. Bronchial aspiration was a rare event, affecting only 3 or 4 patients per 10,000. Furthermore, it was even less common to cause significant damage in pediatric patients. On the other hand, pediatric patients undergoing elective surgery experienced gastric emptying of clear liquids within 30 minutes, with no change in gastric pH until 1 hour after water intake, and this was not influenced by age.[18]

6-4-2 Protocol[17]

6 hours: solid foods, non-human milk, infant formula, and fatty meals

4 hours: breast milk

2 hours: clear liquids, including water, breast milk (per some guidelines), pulp-free juice, clear tea, and carbohydrate drinks

For the reasons stated above, the European Society of Pediatric Anesthesia, the Canadian Anesthesiology Society, the New Zealand College of Anaesthetists, and the Association of Anaesthetists of Great Britain have recommended reducing the fasting time for clear liquids from 2 hours to 1 hour, which applies to all ages.[19]

In contrast, the 2023 ASA update emphasized that there was insufficient evidence regarding the risk-benefit ratio to recommend a 1-hour clear-liquid fast for pediatric patients prior to the procedure, compared with the 2-hour guidelines.[22] The strength of the evidence was low, with no clear differences reported in thirst, hunger, incidence of aspiration or regurgitation, or changes in gastric pH. Gastric volume results were inconsistent. According to ASA recommendations, pediatric studies were limited, underpowered to detect rare risks, and clinically controversial.[20] Nevertheless, shortened clear-liquid fasting (~1 h) was safe, did not increase aspiration risk, and improved comfort and physiology in children, even when carbohydrate intake was allowed.

Gastric ultrasound has played an important role in ensuring the safety of children as they transition to on-demand feeding practices.[23] thanks to ultrasound, studies have been conducted to associate residual gastric volume with the stomach's cross-sectional area and diameter, resulting in the finding that 72% of patients who have ingested clear liquids have 100% gastric emptying after 2 hours, compared with patients who had undergone prolonged fasting. These patients who consume clear liquids less than 2 hours prior experience an approximate salivary secretion volume of up to 1 mL/kg/h and gastric secretion of 0.6 mL/kg/h, which is well below the "at-risk stomach" threshold, for which gastric secretion should be estimated at 1.5 mL/kg/h.[24,25]

Many of the authors consulted in this review discuss accelerated gastric emptying in infants aged 0 to 6 months; however, the study did not include infants and states that patients who were administered pulp-free apple juice had faster gastric emptying than those who were administered other beverages.[26] Other studies have assessed the reduction of residual gastric volume in pediatric patients using endoscopy.[17] They indicate that they did not find a correlation between the fasting time for clear liquids and gastric volume, according to weight in kilograms, nor between the fasting time for clear liquids and residual pH.

A 2023 study[27] aimed to verify, using ultrasound, whether 1 hour of fasting from clear liquids in the pediatric population is sufficient to achieve an empty stomach before anesthesia. This study was conducted on children aged between 11 months and 16 years. One hour after

consuming a non-carbonated sports drink (3mL/kg), the antral cavity was measured, concluding that 1 hour of fasting under these conditions is sufficient to meet the criteria for an empty stomach.

One key study[28] linked prolonged preoperative fasting to hypoglycemia in pediatric anesthesia, reporting excessive fasting times beyond recommendations, an incidence of hypoglycemia of 26.2%, and fasts of >6 h for breast milk, 13 h for solid food, and 5–12 h for clear liquids. The authors recommended local protocols, adherence mechanisms, perioperative glucose monitoring, and revising the practice of "nil per os after midnight."

Conclusions

Pediatric patients (ASA I) undergoing elective minor-to-moderate procedures can safely fast for shorter periods on clear fluids, which offers metabolic benefits, reduces discomfort, and improves cooperation without increasing the risk of pulmonary aspiration. Gastric ultrasound provides an objective means of assessing gastric emptying, thereby supporting these protocols. However, fasting from solids should follow existing guidelines, usually six hours for light meals. Larger, well-designed trials are necessary to address study variability and improve recommendations. Consistent with patient-centered care principles, the preoperative fasting plan should be tailored to each pediatric patient's needs while staying within established safety and effectiveness guidelines.

Competing interests

The authors declare that they have no competing interests

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