DR ANDREW ATTARD MONTALTO, DR ADRIENNE ZERAFA SIMLER,
DR LEON VALLETTA, DR ANNE MARIE CAMILLERI PODESTA'

Fasted, Not Parched: An Update on Pre-operative Liquid Fasting

ABSTRACT

Pre-operative fasting is essential in decreasing the risk of aspiration of gastric contents during sedation or general anaesthesia. However, there is an increasing body of evidence that prolonged liquid fasting has harms of its own and confers no appreciable benefit when compared to more liberal liquid fasting strategies. In anticipation of the new adult peri-operative fasting guideline from the European Society of Anaesthesia & Intensive Care, expected in Q1 of 2025, we explore the historical context of "Nil by mouth from midnight" as well as recent updates on pre-operative liquid fasting and gastric physiology.

KEYWORDS

Peri-operative medicine, Fasting, Liquid Fasting, Pulmonary Aspiration, Nil by mouth

INTRODUCTION

In Q1 of 2025, the European Society of Anaesthesia & Intensive Care (ESAIC) will release an updated guideline on peri-operative fasting in adults.[1] In the context of this new guideline, we are providing a summary of the recent developments in the world of peri-operative fasting to help educate the local medical community and encourage them to read this new guideline when it is published.

The risk of aspiration of gastric contents into the lungs during induction or emergence of anaesthesia has long been acknowledged. It was initially and most prominently described in a retrospective study by the American obstetrician Curtis L Mendelson in 1946, who described 66 cases of aspiration of gastric contents during obstetric anaesthesia in 44,016 women. He termed this "Mendelson Syndrome". Mendelson went on to recommend pre-operative fasting, making no distinction between liquids and solids.[2] Together with this study and other studies which falsely suggested that the risk of pulmonary aspiration increased when a gastric volume of 0.4ml/kg was present[3,4] (a gastric volume present in 40-80% of healthy patients fasting for at least 8 hours[3]), the concept of nil by mouth (NBM) from midnight for elective surgery became standard.

More recent studies have highlighted that liquids and solids have different gastric emptying times.[5] ESAIC's 2011 guidelines suggest that patients should drink clear fluids up to 2 hours before elective surgery, while fasting for solids should be 6 hours before surgery.[6]

REVIEW OF LOCAL PRACTICES

The local guidelines at Mater Dei Hospital (MDH), last updated in 2009, recommend that morning elective patients can drink water until 5:30 a.m.[7] Despite these guidelines being over 10 years old, adherence has been lacking. In June 2024, we carried out a cross-sectional study in the main operating theatres at Mater Dei Hospital asking 61 adult patients undergoing elective surgery their liquid and solid fasting times. Patients were randomly chosen from operating theatre holding bays in Mater Dei Hospital over a single day. Their average fluid fasting time was 10.7 hours and the average solids fasting time was 16.7 hours. This is unsurprising given that most patients locally are still given the advice of "NBM from midnight". Of note is the fact that the majority of elective surgical lists at Mater Dei Hospital start at 8:30 a.m.

One of the main concerns of ESAIC's upcoming peri-operative fasting guideline is the potential for harm from prolonged liquid fasting. Apart from the easily anticipated increase in patient distress and thirst from prolonged liquid fasting, there is an increasing body of evidence of other harms.[5] Patients undergoing prolonged liquid fasting (more than 2 hours) are more likely to experience worse peri-operative glycaemic control, increased post-operative nausea and vomiting, and higher rates of post-operative delirium.[8] One study showed that dehydrated elderly patients undergoing hip fracture surgery had an almost four times higher rate of pulmonary and cardiovascular complications than

PATIENTS UNDERGOING PROLONGED LIQUID FASTING (MORE THAN 2 HOURS) ARE MORE LIKELY TO EXPERIENCE WORSE PERI-OPERATIVE GLYCAEMIC CONTROL, INCREASED POST-OPERATIVE NAUSEA AND VOMITING, AND HIGHER RATES OF POST-OPERATIVE DELIRIUM

their euvolemic counterparts.[9] There are various studies comparing prolonged liquid fasting (more than 2 hours) with oral carbohydrate loading with up to 400 ml of a low-calorie clear fluid at 2 hours before surgery. These studies have shown that prolonged liquid fasting confers no improvement in gastric emptying or in decreasing gastric volumes.[5,10,11] Furthermore, prolonged liquid fasting groups have shown, to varying degrees, an increased insulin resistance, increased inflammatory markers, worse post-operative cardiac function, longer hospital stay, and increased patient discomfort.[5,10-12]

Clear fluids pass quickly through the stomach. After consuming 500ml of water, the stomach is typically empty within 20 minutes.[5,13] Low-calorie clear fluids (30kcal/100ml) (which may serve as a pre-operative oral carbohydrate load) take slightly longer, with a 600ml bolus leaving the stomach in 30-40 minutes.[14] Even in patients with risk factors for delayed gastric emptying (gastroparesis or those on drugs like GLP-1 agonists such as semaglutide), gastric emptying of clear fluids (but not solids) remains rapid, similar to healthy individuals.[5]

Previously, a gastric volume of 0.4ml/kg was thought to increase the risk of pulmonary aspiration, but more recent studies suggest a cut-off volume of 1.5ml/kg.[15] This value still falls on the upper end of normal gastric volumes in healthy fasted patients. There is no definitive evidence of the gastric volume required to increase the risk of aspiration in humans;[15] studies here would be impossible due to ethical concerns. Animal studies suggest the risk may rise at much higher gastric volumes (8ml/kg), making the 1.5ml/kg threshold a conservative estimate.[5,15]

So what are the new ESAIC guidelines likely to suggest? The preliminary recommendations were presented during the Euroanaesthesia congress in Munich in June 2024 and stated that:

- Preoperative fasting for clear fluids should be approximately 2 hours - fasting for more than 2 hours may be harmful and should be avoided
- Patients should be encouraged to consume carbohydrate-containing clear liquids until approximately 2 hours before the procedure
- Patients who have eaten heavy meals rich in fat and protein need to fast for 8 hours, not 6 hours
- Clinicians may consider not postponing or cancelling a procedure based solely on the intake of clear liquids less than 2 hours preoperatively
- Postoperative liquids and diet should be resumed as soon as clinically feasible after the procedure, unless specifically contraindicated
- Need for better education on the harms of prolonged liquid fasting
- Implementation of systems to reduce fasting times in hospitals.

While reducing fasting times is a challenging issue due to the complexity of hospital peri-operative systems, there are solutions. For example, updating the local guidelines at MDH, adhering to surgical schedules, and splitting patients into morning and afternoon groups to allow for light meals could help.

Stakeholders, including medical staff, nurses, GPs, and patients, must be educated and coordinated. Some centres in the United Kingdom & Ireland use "sip-till-send" policies,[16] allowing patients to drink water until they go to surgery, which could be beneficial.

CONCLUSION

Although the local guidelines at MDH recommend that morning elective patients can drink water until 5:30 a.m., current practices, usually revolving around 'NBM from midnight' are too conservative. They are leading to patients undergoing prolonged liquid fasting and may be harmful.

Further work is being done locally and on a European level to tackle the issue of prolonged pre-operative liquid fasting. MDH is leading an international cross-sectional study on pre-operative liquid fasting times, and the release of new ESAIC guidelines will be followed by an educational campaign. On the 21st and 22nd of February 2025, the Association of Anaesthesiologists of Malta will be hosting an international conference titled "Focus on the High-Risk Patient: Anaesthetic, Intensive Care and Pain Perspectives". Professor Frederico Bilotta, the head of the ESAIC taskforce on perioperative fasting in adults, and Dr Anne Marie Camilleri Podesta, a local anaesthesia consultant who is a member of the same task force, will be presenting the newly published perioperative fasting guidelines.

ACKNOWLEDGEMENTS

Thanks go to the CEO of Mater Dei Hospital as well as Dr Carmel Abela (chairperson of the Department of Anaesthesia, Intensive Care & Pain Medicine) for their approval of the cross-sectional fasting study carried out in June 2024, as well as the international cross-sectional fasting study currently being carried out.

COMPETING INTERESTS & FUNDING STATEMENTS

None of the authors have received funding for this article.

Dr Anne Marie Camilleri Podesta is one of the authors of the upcoming European Society of Anaesthesia & Intensive Care guideline for peri-operative fasting in adults.

No other competing interests are declared.

REFERENCES

1. News from the ESAIC Guideline Task Force on Perioperative Fasting in Adults. ESAIC. 2024 [cited 2024 Oct 21]. Available from: https://esaic.org/news-from-the-esaic-guideline-task-force-on-perioperative-fasting-in-adults/
2. Mendelson CL. The Aspiration of Stomach Contents into the Lungs During Obstetric Anesthesia. Anesthesiology 1946;7(6):694–5.
3. Maltby JR. Fasting from midnight – the history behind the dogma. Best Pract Res Clin Anaesthesiol 2006;20(3):363–78.
4. Roberts RB, Shirley MA. Reducing the Risk of Acid Aspiration During Cesarean Section. Anesth Analg 1974;53(6):859.
5. Rüggeberg A, Meybohm P, Nickel EA. Preoperative fasting and the risk of pulmonary aspiration - a narrative review of historical concepts, physiological effects, and new perspectives. BJA Open 2024;10:100282.
6. Smith I, Kranke P, Murat I, et al. Perioperative fasting in adults and children: guidelines from the European Society of Anaesthesiology. Eur J Anaesthesiol 2011;28(8):556.
7. Department of Anaesthesia, Intensive Care & Pain Medicine. Guidelines for Pre-Operative Fasting (ACC/01Guide/2009v01.0). Mater Dei Hospital. 2009 [cited 2024 Oct 21]. Available from: https://govmt.sharepoint.com/sites/cpgmdh/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2Fcpgmdh%2FShared%20Documents%2FAnaesthesia%2FGuidelines%2Facc01guide2009v01%2E0%5FPre%20Op%20fasting%2Epdf&parent=%2Fsites%2Fcpgmdh%2FShared%20Documents%2FAnaesthesia%2FGuidelines
8. Radtke FM, Franck M, MacGuill M, et al. Duration of fluid fasting and choice of analgesic are modifiable factors for early postoperative delirium. Eur J Anaesthesiol 2010;27(5):411–6.
9. Ylinenvaara S, Elisson O, Berg K, Zdolsek J, Krook H, Hahn R. Preoperative urine-specific gravity and the incidence of complications after hip fracture surgery: A prospective, observational study. Eur J Anaesthesiol 2013;31.
10. Kaška M, Grosmanová T, Havel E, et al. The impact and safety of preoperative oral or intravenous carbohydrate administration versus fasting in colorectal surgery – a randomized controlled trial. Wien Klin Wochenschr 2010;122(1):23–30.
11. Rizvanović N, Nesek Adam V, ćaušević S, et al. A randomised controlled study of preoperative oral carbohydrate loading versus fasting in patients undergoing colorectal surgery. Int J Colorectal Dis 2019;34(9):1551–61.
12. Cheng PL, Loh EW, Chen JT, et al. Effects of preoperative oral carbohydrate on postoperative discomfort in patients undergoing elective surgery: a meta-analysis of randomized controlled trials. Langenbecks Arch Surg 2021;406(4):993–1005.
13. Okabe T, Terashima H, Sakamoto A. Determinants of liquid gastric emptying: comparisons between milk and isocalorically adjusted clear fluids. Br J Anaesth 2015;114(1):77–82.
14. Leiper JB. Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans. Nutr Rev 2015;73(suppl_2):57–72.
15. Van de Putte P, Perlas A. The link between gastric volume and aspiration risk. In search of the Holy Grail? Anaesthesia 2018;73(3):274–9.
16. Curran CS, Betts A, Featherstone M, et al. Implementing a 'Sip Til Send' policy at a large tertiary referral centre: a quality improvement project. BJA Open 2024;12:100331.