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SCIENTIFIC ARTICLE

# Use of ultrasound for gastric volume evaluation after ingestion of different volumes of isotonic solution☆

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**KEYWORDS**
Bronchoaspiration;
Gastric ultrasound;
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**Abstract**
*Background and objectives:* The current preoperative fasting guidelines allow fluid intake up to 2 h before surgery. The aim of this study was to evaluate the gastric volume of volunteers after an overnight fast and compare it with the gastric volume 2 h after ingestion of 200 and 500 mL of isotonic solution, by means of ultrasound assessment.
*Method:* Eighty volunteers underwent gastric ultrasound at three times: after 8 h of fasting; 2 h after ingestion of 200 mL isotonic saline, followed by the first scan; and on another day, 2 h after ingestion of 500 mL of the same solution after an overnight fast. The evaluation was quantitative (antrum area and gastric volume, and the ratio of participants' gastric volume/weight) and qualitative (absence or presence of gastric contents on right lateral decubitus and supine positions. A $p$-value < 0.05 was considered significant).
*Results:* There was no difference in quantitative variables at measurement times ($p > 0.05$). Five volunteers (6.25%) had a volume/weight over 1.5 mL kg$^{-1}$ at fasting and 2 h after ingestion of 200 mL and 6 (7.5%) after 500 mL. Qualitatively, the presence of gastric fluid occurred in more volunteers after fluid ingestion, especially 500 mL (18.7%), although not statistically significant.

☆ Study performed at the Hospital de Clínicas da Universidade Federal do Triângulo Mineiro (UFTM), Uberaba, MG, Brazil.

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*Conclusion:* Ultrasound assessment of gastric volume showed no significant difference, both qualitative and quantitative, 2 h after ingestion of 200 mL or 500 mL of isotonic solution compared to fasting, although gastric fluid content has been identified in more volunteers, especially after ingestion of 500 mL isotonic solution.


**PALAVRAS-CHAVE**
Broncoaspiração;
Ultrassonografia gástrica;
Jejum pré-operatório

**Uso da ultrassonografia para avaliação do volume gástrico após ingestão de diferentes volumes de solução isotônica**

**Resumo**
*Justificativa e objetivos:* As diretrizes recentes de jejum pré-operatório permitem a ingestão de líquidos até 2 horas antes da cirurgia. O objetivo do presente estudo foi, por meio de ultrassonografia gástrica, avaliar o volume gástrico de voluntários após jejum noturno e comparar com o volume gástrico duas horas após a ingestão de 200 e 500 ml de solução isotônica.
*Método:* Foram submetidos à ultrassonografia gástrica 80 voluntários em três momentos: após jejum de 8 horas; 2 horas após a ingestão de 200 ml de solução isotônica, seguida do primeiro exame; e, em outro dia, 2 horas após a ingestão de 500 ml da mesma solução, após jejum noturno. A avaliação foi quantitativa (área do antro e volume gástricos e relação volume gástrico/peso dos participantes) e qualitativa, pela ausência ou presença de conteúdo gástrico nas posições de decúbito lateral direito e supina. Foi considerado significante $p < 0,05$.
*Resultados:* Não houve diferença nas variáveis quantitativas nos três momentos estudados ($p > 0,05$). Cinco voluntários (6,25%) apresentaram um volume/peso superior a 1,5 ml.kg$^{-1}$ em jejum e 2 horas após a ingestão de 200 ml e seis (7,5%) após 500 ml. Qualitativamente, a presença de líquido gástrico ocorreu em mais voluntários após a ingestão de líquidos, principalmente de 500 ml (18,7%), embora sem significância estatística.
*Conclusão:* O volume gástrico pela ultrassonografia não apresenta diferença significativa tanto qualitativa quanto quantitativa, 2 horas após a ingestão de 200 ml ou de 500 ml de solução isotônica em comparação com o jejum, embora conteúdo líquido gástrico tenha sido identificado em mais voluntários, principalmente após a ingestão de 500 ml de solução isotônica.


## Introduction

Aspiration of gastric contents is a major cause of morbidity and mortality during general anesthesia, as well as in the intensive care unit.[1–3] The risk of mortality is up to 5% and it is involved in over 9% of all deaths related to anesthesia.[4,5] The presence of gastric contents at the time of anesthesia induction is an important risk factor for its occurrence, which makes the dietary restriction rule before anesthesia essential for patient safety. Although there is a controversy about the gastric residual volume, which is considered critical because this volume itself increases the risk of aspiration, studies have shown that healthy patients under fasting often have residual volume above 1.5 mL kg$^{-1}$ without significantly increased risk for aspiration.[6–8]

During the 1980s, a patient undergoing extended periods of fasting before elective procedures was a routine practice, which still remains in various institutions. The preoperative fasting recommendations have become increasingly more liberal, so that the current guidelines for preoperative fasting[9,10] encourage the ingestion of clear liquids in volumes from 100 mL to unlimited quantities for adults up to 2 h before surgery. This approach aims to reduce patient discomfort and hemodynamic complications during induction of anesthesia, which are often related to dehydration resulting from prolonged fasting.[11,12] The non-adherence to recommendations may reflect a medical preference or flaws in the guidelines themselves, such as not determining the allowed amount of liquid. The clinical access to the risk of aspiration is limited due to the lack of validated non-invasive tests to assess gastric contents. The increased use of portable ultrasound in surgical centers aroused interest in its use as a diagnostic method for gastric content evaluation. Studies have shown the feasibility of using ultrasound to evaluate the gastric content by measuring the antral cross-sectional area (ACSA).[13–17] Perlas et al.[15] reported an almost linear relationship between ACSA and gastric volume in healthy volunteers.

The aim of this study was to evaluate by ultrasound the gastric volume of healthy volunteers after an overnight fast and compare it with the gastric volume 2 h after the ingestion of isotonic solution in different volumes.