NPO GUIDELINES: WHAT, HOW MUCH AND WHY

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Outline

• History of NPO guidelines
• Current ASA NPO guidelines
• Controversial cases
## History of aspiration during anesthesia

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1853</td>
<td>Soldier in Burma had vomited during surgery for a gunshot wound to the thigh. Autopsy showed that trachea was “filled with vomited matters.”</td>
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<td>1862</td>
<td>1st detailed description of death during anesthesia from inhalation of gastric contents.</td>
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<td>1940</td>
<td>Charles Hall describes 15 cases of aspiration in an obstetrics patient. 5 of the 15 patients died.</td>
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<td>1945</td>
<td>Curtis Mendelson describes 66 cases of aspiration of stomach contents out of 44,016 obstetric cases.</td>
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Mendelson Syndrome

- In addition to the case series, Mendelson conducted research on adult rabbits to define Mendelson Syndrome

- 2 distinct Syndromes
  - Aspiration of solid material
  - Aspiration of liquid material

- Recommendations to prevent aspiration
  - NPO
  - Regional vs General Anesthesia
  - Alkalinising the stomach contents
  - Competent administration of Anesthesia
  - Adequate equipment
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| 1847 | • 1st book on anesthesia did not mention fasting  
      • Fasting was to minimize unpleasantness of emesis |
| 1883 | • Sir Joseph Lister published fasting guidelines  
      • Distinguished between solid meals and liquid |
| 1947 | • *Synopsis of Anaesthesia* advocated for no food within 6hrs of anesthesia |
| 1960 | • NPO after midnight  
      • Children NPO solid and milk for 6 hrs, liquids for 2 hrs (Cohen 1970) |
| 1985 | • Roger Maltby, Univ of Calgary performed RCTs to determine RGV  
      • Reduction if RGV in drinking groups versus fasted groups |
| 1990 | • ASA NPO guidelines |
What is the amount of gastric contents that increases the risk of aspiration?

A. 40 ml/kg
B. >25 ml
C. 0.4 ml/kg
D. >1000 ml
E. unknown
Critical gastric volume

- Studies in Rhesus monkeys led to the statement that
  - 0.4ml/kg or >25ml of gastric juice with pH <2.5 places patients at risk
- 0.4 ml/kg acid was instilled directly into the right mainstem bronchus of the monkey
  - The monkeys had neither vomited or regurgitated

Critical gastric volume

- Gastric fluid exceeded 25ml with pH <2.5 in 40-80% of healthy patients who fasted for at least 8 hours.

- Human stomach is very distensible and can accommodate up to 1000 ml before intragastric pressure increases.

- 1986 Plourde and Hardy demonstrated in cats that GFV > 21ml/kg was required to produce regurgitation while under ketamine anesthesia.
Pulmonary Aspiration

- 1985-1992 215,488 General Anesthetics were reviewed
- Pulmonary aspiration
  - Bilious secretions or solid matter in tracheobronchial tree
  - Presence of new infiltrate on post op CXR
- ASA 1 & 2 Elective surgeries
  - 1/8000
- ASA 4 & 5 Emergency surgeries
  - 1/343
- ~ 75-80% occur during induction
- Mortality was 1/71,829

ASA Guidelines for Preoperative Fasting

• Revised 2011
• Intended patient population for these guidelines are limited to healthy patients of all ages undergoing elective procedures
• Not intended for women in labor
• Intended for general anesthesia, regional anesthesia, or sedation/analgesia (MAC)
• Following guidelines does not guarantee complete gastric emptying
ASA Guidelines for Preoperative Fasting

• Clear liquids 2 hours
  • Examples water, fruit juices without pulp, carbonated beverages, clear tea, and black coffee
  • No alcohol
  • Volume is less important than type
  • ****does not address jello****

• Breast milk 4 hours
• Infant formula 6 hours
• Light meal and nonhuman milk 6 hours
• Fried or fatty foods 8 hours

  ***No routine use of pharmacologic interventions***
How many hours are required for NPO status requiring PO contrast for CT scan?

A. 2 hours
B. 4 hours
C. 6 hours
D. 8 hours
E. negligible
1988 National Survey to Radiologists

• 68% of all CT scans involved sedated children and PO contrast

• Responsible sedation provider
  • 47% Radiologist
  • 37% Primary Care physician
  • 3% Anesthesiologist

• Time between contrast and scan was <1 hour, mean 39 minutes

• Oral chloral hydrate was most common sedative used

PO Contrast: Current Practices and Controversies

- Goal is to obtain CT scan within 1 hour of contrast
- Emptying of clear liquids is proportional to the volume present
- Small bowel transit time
  - As fast as 15 minutes
  - Average 84 minutes
  - 83% is < 120 minutes

Mahmoud M, McAuliffe J, Donnelly L. Administration of enteric contrast material before abdominal CT in children: current practices and controversies. Pediatric Radiology 2011; 41: 409-412
Gastric emptying time of PO Contrast

- 101 patients, 3.1-17.9 years of age
- Contrast enhanced abdominal CT
  - Acute appendicitis n=90
  - Abdominal trauma n=10
  - Suspected ileus n=1
- <40kg 500ml of contrast
- >40kg 750ml of contrast
- Senior radiologist reviewed scans to estimate gastric emptying times (GET)
  - Kaplan-Meier method was used to determine GET

Gastric emptying time of PO Contrast

- Results of OCM in stomach
  - 75% at 48 +/- 5.2 minutes
  - 50% at 74 +/- 7.5 minutes
  - 25% at 135 +/- 32.5 minutes
- Mean time to drink OCM
  - 105.1 +/- 27.9 minutes
- Conclusion
  - Advocate waiting minimum 3 hours after ingestion of OCM and GA
How many hours are required to meet NPO status for chewing gum?

A. 2 hours
B. 4 hours
C. 6 hours
D. 8 hours
E. negligible
Gum chewing during fasting

- Gum chewing is known to increase salivary production
  - Inc salivary output ~10x within 1 minute of chewing
  - Salivary production has a higher pH, typically reaching levels of >7
- Increase of salivary production does not appear to be different between sugar and sugar free gum
- Advocate for gum chewing to reduce anxiety and discomfort, if age appropriate
  - Remove gum before sedations/anesthesia
- Potential vehicle for drug administration

Poulton TJ. Gum chewing during pre-anesthetic fasting. Pediatric Anesthesia 2012; 22:288-296
Gum and NPO

• 2006, RCT
• 45 children, 5-17 years old
• 1 piece of gum to chew 30 minutes before induction of anesthesia

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<thead>
<tr>
<th>Groups</th>
<th>Gastric fluid volume</th>
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<tr>
<td>Control</td>
<td>0.35 ml/kg</td>
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<tr>
<td>Sugarless gum</td>
<td>0.69 ml/kg</td>
</tr>
<tr>
<td>Sugared gum</td>
<td>0.88 ml/kg</td>
</tr>
</tbody>
</table>

How many hours are required to meet NPO status after Apple juice with Thick-It?

A. 2 hours
B. 4 hours
C. 6 hours
D. 8 hours
E. negligible
How many hours are required to meet NPO status for store bought jello?

A. 2 hours  
B. 4 hours  
C. 6 hours  
D. 8 hours  
E. negligible
How many hours are required to meet NPO status for jello made at home from a box?

A. 2 hours
B. 4 hours
C. 6 hours
D. 8 hours
E. negligible
How many hours are required to meet NPO status for hard candy?

A. 2 hours
B. 4 hours
C. 6 hours
D. 8 hours
E. negligible
How many hours are required to meet NPO status for teaspoon of apple sauce to take seizure meds?

A. 2 hours  
B. 4 hours  
C. 6 hours  
D. 8 hours  
E. negligible
Parent’s compliance with NPO orders

- 120 Parents completed a survey after day op surgery

Reasons for fasting

- Aspiration
- N & V
- Efficacy of Anesthesia
- Other

Parent’s compliance with NPO orders