Children often present with injury requiring sedation after eating. The issue of need for fasting has been controversial for some time. There is much disagreement between anesthesiologists and emergency physicians about need for fasting prior to sedation for emergency procedures. This expert lecturer will provide pros and cons for fasting prior to sedation and outline the latest evidence based guidelines.

OBJECTIVES

- Discuss the pros and cons of fasting prior to sedation for emergency procedures including realistic risks of not fasting
- Clarify use of fasting in emergency settings
- Outline the latest guidelines for use of fasting prior to sedation for children

3/25/2015
8:45 AM-9:15 AM
Grand Ballroom
WE-11

DISCLOSURES:
(+) No significant financial relationships to disclose
To Fast or Not to Fast: That is the Question
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Overview

• Making practical sense of fasting guidelines
• What is aspiration?
• What are the risk factors for aspiration?
• Are ASA or AAP fasting guidelines relevant to procedural sedation in the emergency department (ED)?
• What do the ED studies on fasting tell us?
• What are the most recent studies on fasting?
• What are the most recent techniques for accessing fasting status?
• Formulating a practical and evidence-based, individualized approach to fasting for procedural sedation
Aspiration

Definition

Inhalation of oropharyngeal or gastric contents into the larynx and lower respiratory tract

- Asymptomatic aspiration (“occult” or “silent”)
- Symptomatic aspiration

History

1862: First reported

1946: Pathophysiology identified (Mendelson)

- Instilled gastric aspirate into rabbit tracheas
- Noted histological changes in the lung consistent with chemical pneumonitis

Animal Models

Subsequent studies focused on determining:

- Minimum volume and pH of gastric contents necessary to produce aspiration pneumonitis

Animal models

- Instilled directly into the trachea
- 1974: Minimum of 0.4 cc/kg + pH <2.5 = fatal pneumonitis
- 1990: Minimum 0.8 cc/kg + pH <2.5 (Repeated 1974 experiment)
Pathophysiology

Reality differs from the animal models

- Regurgitation rather than direct instillation
  - Not all regurgitated fluid is aspirated
- Minimum regurgitated volume needed for aspiration pneumonitis to occur >>0.8 cc/kg

Historical Teaching

- Extent of pulmonary injury from aspiration is directly related to the volume of gastric contents and degree of acidity

Prevention Measures

Decrease volume

- Preoperative fasting
- Prokinetic agents to increase gastric motility

Alter gastric pH

- Antacids
- H2 blockers
- Proton pump inhibitors
**Changing Concepts on Aspiration Risk**

Recognition of silent aspiration

Further studies on gastric volume and pH

**Silent Aspiration**

Glottis is an imperfect barrier

- Nasopharyngeal secretions during normal sleep in healthy individuals
- Gastric contents during surgery
  - Tracer studies (6/734 with cuffed ETT, 25/300 with uncuffed ETT)

**Gastric Volume and pH**

Fasting greater than 2 hours after ingesting clear liquids does not significantly change gastric volume or pH when compared to a simple 2 hour fast

Gastric volumes and pH at the time of induction vary greatly, especially in children

Many patients, regardless of fasting length, exhibited gastric volumes and pH at levels considered to represent high aspiration risk

- >0.8cc/kg and pH <2.5

No data to support improved outcomes with antacids and other pharmacologic agents
Changing Concepts

Aspiration does not necessarily lead to aspiration syndrome

- Silent aspiration
  - Sleep
  - General anesthesia
- A 2 hour fast is sufficient for clear liquids

The threshold for gastric volume and pH leading to aspiration is probably considerably higher than originally thought.

Preventative measures to reduce the risk of aspiration (drugs to alter gastric pH, enhance lower esophageal sphincter tone, and gastric motility) are no longer routinely recommended.

The optimal duration of fasting from milk and solids is unknown

Aspiration pneumonitis in healthy patients from clear, non-particulate fluids is generally a self-limited disease without serious sequelae

Aspiration of acidic particulate fluid tends to result in greater pulmonary damage
ASA Guidelines

Clear Liquids

- Shortened fasting recommendations to 2 hours
- “Published evidence is silent on the relationship between fasting times, gastric volume, or gastric acidity and the risk of emesis/reflux or pulmonary aspiration in humans.”

Solid foods

- “There is insufficient published evidence to address the safety of any preoperative fasting period.”

Given the lack of relevant evidence upon which to base a guideline a consensus decision was made

- 2 hours fasting for clear liquids
- 6 hours fasting for milk and solids
**Aspiration Risk during GA**

Exceptionally rare

- Overall incidence of aspiration = 1:3,420 (pooled data)
- Aspiration mortality = 1:125,109 (pooled data)
- Litigation regarding aspiration <2% of 1,541 claims (ASA review of closed malpractice actions)

**Risk Factors for Aspiration**

- Airway manipulation
- Airway difficulties (laryngospasm, difficult intubation)
- Emergency surgery
- Advanced age (>70 years)
- Higher ASA physical status classification
- Conditions predisposing to GERD (esophageal disease, hiatal hernia, peptic ulcer disease, gastritis, bowel obstruction, ileus, elevated intracranial pressure)

**Aspiration Risk during procedural sedation**

- ~2/3 of aspirations with GA occurred during manipulation of the airway
- Most PSA patients are healthy (ASA I or II)
  - ~40% of patients undergoing GA have substantial underlying or critical illness (ASA III, IV)
  - Majority of PSA is performed on children and young adults, rather than elderly patients who are known to be at higher risk of aspiration during anesthesia
- Inhalational anesthetics are emetogenic, with N/V common during post-anesthesia recovery
- Procedural sedation procedures are much shorter than GA procedures
  - Anesthetic risk increases with the duration of the procedure
Summary of Aspiration Risk

- The aspiration risk during PSA is a fraction of that for GA, which is already exceptionally low
- Fasting exerts less of an impact upon aspiration risk during PSA than it does for GA
- More relevant than the extent of fasting are:
  - Training and preparedness of ED personnel (Cote)
  - Attentiveness of interactive monitoring
  - Identification of high risk patients
  - Promptness and quality of resuscitation if an adverse event should occur
- Aspiration during GA is rare and the risk during PSA can be reasonably assumed to be even more remote
- There is no literature basis for any specific fasting period for PSA
- Existing guidelines are of necessity arbitrary and based upon consensus opinion
- EPs should not take comfort, and therefore lower their vigilance, because the patient has been NPO for 2 or 3 or 4 hrs.
- All ED patients should be treated as if they have full stomachs as we just don’t know the risk
- Treat all patients as if they have full stomachs
- Maintain a continuous high level of vigilance
- Routinely screen for:
  - Patients with aspiration risk factors
  - Patients with potentially difficult airways
  - Think about GA for high risk patients, if necessary
Further Reading


Fasting for Procedural Sedation in the Emergency Department

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Department of Pediatrics, Harvard Medical School

Overview

• Make sense of fasting guidelines for the ED

• Formulate a practical, evidence-based approach
Making Sense of Fasting Guidelines

• What is the pathophysiology of aspiration?

• Are ASA/AAP fasting guidelines relevant to ED procedural sedation?

• Is the ACEP clinical policy helpful?

• What do the ED studies tell us?

• What do the latest studies show?

Overview

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### Making Sense of Fasting Guidelines

- **What is the pathophysiology of aspiration?**

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### Aspiration

- Inhalation of oropharyngeal or gastric contents into the larynx and lower respiratory tract

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Types of Aspiration

- Asymptomatic
  - +/- CXR
  - No clinical aspiration syndrome

- Symptomatic
  - + CXR
  - Clinical aspiration syndrome develops
    - Cough, dyspnea, bronchospasm, hypoxia

Asymptomatic Aspiration

- Glottis is an imperfect barrier
  - Aspiration without chemical pneumonitis
    - Silent or Occult

  - Nasopharyngeal secretions during normal sleep

  - Gastric contents during surgery
    - 6/734 with cuffed ETT
    - 25/300 with uncuffed ETT
A recent multicenter prospective survey of specialist pediatric centers in the UK revealed a very low incidence of perioperative pulmonary aspiration (1). A rate of 2 per 10,000 cases was found for elective work and 2.2 per 10,000 cases for nonelective work. There were no deaths in this series, and serious morbidity was observed in only five cases, all of whom survived after varying lengths of time in the intensive care unit (ICU).


Making Sense of Fasting Guidelines

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ASA/AAP Guidelines

- Elective surgery

- Clear Liquids
  - “Published evidence is silent on the relationship between fasting times, gastric volume, or gastric acidity and the risk of emesis/reflux or pulmonary aspiration in humans.”

- Solid foods
  - “There is insufficient published evidence to address the safety of any preoperative fasting period.”

- Consensus decision
  - 2 hr clear liquids
  - 6-8 hr solids

Making Sense of Fasting Guidelines

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- What do the latest studies show?
ACEP Clinical Policy ED PSA

**Level B recommendation**
Do not delay procedural sedation in adults or pediatrics in the ED based on fasting time. Preprocedural fasting for any duration has not demonstrated a reduction in the risk of emesis or aspiration when administering procedural sedation.

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Making Sense of Fasting Guidelines

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- **What do the ED studies tell us?**

- What do the latest studies show?
Emergency Medicine Studies

- Agrawal (2003)
  - 1014 patients
  - No relationship between fasting status and adverse events

- Treston (2004)
  - Ketamine, 257 patients
    - Fasting status not correlated with emesis rate

- Roback (2005)
  - 1555 patients
  - No relationship between fasting status and adverse events

- Babl (2005)
  - Nitrous, 218 patients
    - Emesis rate independent of fasting status

Making Sense of Fasting Guidelines

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Pediatric Sedation Research Consortium

- Prospective, observational study 2015

- 42 institutions
  - Large children’s hospitals
  - Small children’s hospitals within general hospital
  - General/community hospitals

- 139,000 procedural sedation encounters
  - Fasting status known for 108,000

Pediatric Sedation Research Consortium

- 10 symptomatic aspiration events
  - 1 per 13,914 encounters
    - Aspiration without admission: 8
    - Aspiration with admission: 2

- All patients NPO for solids for 6 hr
  - No relationship to fasting status for solids or liquids

- Fasting status not an independent predictor of major complications
Pediatric Sedation Research Consortium

- Factors related to major complications
  - ASA status 3 or 4
  - OSA
  - URI
  - Young age (< 6 mo)
  - Airway procedures
  - GI procedures

- Adherence to fasting guidelines does not protect patients from major complications

Risk Factors for Major Complications

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; 6 mo</td>
<td>4.23</td>
</tr>
<tr>
<td>ASA status 3 or 4</td>
<td>2.05</td>
</tr>
<tr>
<td>OSA</td>
<td>5.43</td>
</tr>
<tr>
<td>Upper respiratory infection</td>
<td>2.23</td>
</tr>
<tr>
<td>Airway procedure</td>
<td>9.66</td>
</tr>
<tr>
<td>GI procedure</td>
<td>2.71</td>
</tr>
</tbody>
</table>
This study shows that children presenting for elective outpatient surgery are suffering from a considerable amount of pre-operative discomfort because of excessive fasting. Strategies to guarantee minimal fasting at hospital admission are urgently needed.
This study demonstrated no difference in gastric emptying times when a modest amount of milk was added to tea. These findings suggest that it may be acceptable to allow patients to add a small quantity of milk to their tea or coffee and follow the same fasting restrictions applied to clear fluids.

• Gastric sonography is a valid and reliable method to assess gastric content and volume in adults.

• Sonographically measured gastric antral area in pediatric patients may be used to determine preoperative gastric volume and assist in the management of perioperative aspiration risk.
Gastric content and volume assessment is a new point-of-care ultrasound application that can help determine aspiration risk.

Gastric ultrasound can help clinicians individualize aspiration risk at the bedside and more appropriately guide anaesthetic management.

Overview

- Make sense of fasting guidelines for the ED
- Formulate a practical, evidence-based approach
Assess Risk

- How far from normal is this patient?
- What co-morbidities do they have?

- ASA status
- OSA
- ↑ airway reactivity
- Procedure type
- Young age

Assess Sedation Depth

- How deep is necessary to accomplish procedure?

- Will you be blunting protective airway reflexes?

- Do not take comfort, and therefore lower your vigilance, because the patient has been fasting for 2 or 3 or 4 hr
## Risk-Benefit Analysis

- Normal risk + elective procedure
  - Proceed

- Normal risk + urgent or emergent procedure
  - Proceed

- ↑ risk + elective procedure
  - Proceed
  - Wait or postpone

## Risk + Urgent or Emergent Procedure

- Plan carefully and proceed with vigilance
  - Preoxygenate
  - Capnography
  - Gastric sonography

- Consider strategies for decreasing sedation depth
  - Regional anesthesia
  - Reversible agents
  - Dissociative state

- Consider strategies for decreasing sedation time
  - One-arm-brain agents
  - Propofol, Ketamine