Aspiration Pneumonia and Dysphagia

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Most Frequent Solicitation

• Determine presence of aspiration
  • Determine if PO intake of food and/or medications is possible
    • Based on assumption
      • Nothing enters the mouth
      • Nothing can enter the lungs

• There is no pass/fail!
Aspiration and Dysphagia

• Conventional wisdom
• Aspiration of food and liquid causes pneumonia
• Assumption
  • Controlling aspiration controls pneumonia
• 95% increase in diagnostic coding of aspiration pneumonia
  • Suspected “upcoding” of Diagnosis Related Group
  • Greater reimbursement for DRG 79/80
    • “aspiration pneumonia”
  • Lower reimbursement for DRG 89/90
    • “pneumonia organism unspecified”
Langmore et al. 1998

• Odds Ratios for Aspiration Pneumonia
  • Dependent for feeding
  • Dependent for oral care
  • Number of decayed teeth
  • Tube feeding

• Dysphagia was an important risk for aspiration pneumonia
  • but generally not sufficient to cause pneumonia unless other risk factors were present
Dental Plaque

• One cubic millimeter of dental plaque contains about 100 million bacteria
• Oral bacterial load increases during intubation
• Higher dental plaque scores predict risk of pneumonia

Full diversity of oral flora is unknown

• Maybe unknowable
Secretory Immunoglobulins

• Heavy plasma proteins
  • Recognize pathogens
  • Bind with proteins in the pathogen
  • Kill it directly
  • Block and bundle toxins
Mucins

• “Slimy” stuff in mouth
  • Proteins
  • coats many epithelial surfaces
  • Secreted into saliva
  • Serves as a diffusion barrier against contact with noxious substances
  • Lubricates to minimize shear stresses
    • Super lubricant!
Association between dental plaque colonization and lower respiratory infection in elderly using molecular genotyping

49 Critically ill LTC residents requiring ICU

- Plaque index scores
- Quantitative cultures
- BAL on 14 patients who developed pneumonia
  - Respiratory pathogens compared genetically to plaques by pulse gel electrophoresis
El-Sohl et al. cont

• 28/49 (57%) had colonization of plaque with aerobic pathogens
  • Staphylococcus aureus (45%)
  • Gram-negative bacilli (42%)
  • Pseudomonas aeruginosa (13%)

• Isolates from BAL fluid
  • 9/13 matched genetically those recovered from corresponding dental plaques of 8 patients
Association Between Oral Biofilms and Periodontitis with Pneumonia

  • Pathogens causing nosocomial pneumonia are present in oral biofilms
  • Increased bacterial contamination of oral biofilms and severity of periodontitis are associated with an increased incidence of pneumonia
  • Interventions to decrease the amount of pathogenic bacteria found in oral biofilms and the severity of periodontitis result in a lower incidence of pneumonia

• Systemic Infection Post Stroke
• Biological mechanisms involved between oral conditions and respiratory diseases

• Four possible mechanisms
  • Oral pathogens directly aspirated into the lungs
  • Salivary enzymes associated with periodontal disease modify respiratory tract mucosal surfaces
  • Enzymes from periodontopathic bacteria destroy salivary film that protects against pathogenic bacteria
  • Cytokines
Oral pathogens directly aspirated into the lungs

- *Pseudomonas aeruginosa*
  - Opportunistic pathogen with ability to develop resistance to antibiotics
- Ventilator acquired pneumonia with *P. aeruginosa*
  - higher mortality compared with other pathogens
- Increased colonization of the oropharynx of patients with nasogastric tubes
Lung injury

• Direct destructive effects of the organism on the lung parenchyma
  • Apoptosis of bronchial epithelial cells
  • Exuberant host immune responses
Lung Injury

- **Salivary enzymes modify respiratory tract mucosal surfaces**
  - Promote adhesion and colonization by respiratory pathogens
    - Modification of the mucosal epithelium
    - Loss and removal of surface fibronectin by hydrolytic enzymes
      - Protein that covers the mucosa
        - Results in de-masking of surface receptors
      - Release of cytokines
  - Worse oral hygiene leads to higher enzymatic activity
    - Greater the possibility of mucosal changes
    - Increasing the adhesion and colonization by respiratory pathogens
Enzymes from periodontopathic bacteria destroy salivary film that protects against pathogenic bacteria

• reduce the ability of mucins to adhere to pathogens
• Pathogens are then free to adhere to mucosal receptors in the respiratory tract
• Fewer non-specific host defense mechanisms in high-risk individuals
Cytokines continually released from periodontal tissues

- Alters the respiratory epithelium
- Promotes colonization by respiratory pathogens
  - Dysregulation of adhesion receptor expression on the mucosal surfaces
  - Results in infection

- Odds Ratios for Aspiration Pneumonia
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Oral Care and Aspiration Pneumonia

• Oral and dental bacterial colonization
  • The major source of bacteria in aspiration pneumonia
Dental Plaque

- One cubic millimeter of dental plaque contains about 100 million bacteria
- Oral bacterial load increases during intubation
- Higher dental plaque scores predict risk of pneumonia


- 417 patients randomly assigned to one of two groups
  - Oral care group
  - No oral care group
Yoneyama et al. (2003)

• Oral Care Group
  • Nurses or caregivers cleaned the patients' teeth by toothbrush after each meal.
  • Swabbing with iodine was additionally used in some cases.
  • Dentists or dental hygienists provided professional care once a week.

• Significant decrease in:
  • Pneumonia
  • febrile days
  • death from pneumonia
Scannapieco, Paju and Bush
Annals of Periodontology, Vol 8, Number 1, 54-69 December 2003

• Review of periodontal disease and nosocomial pneumonia
  • 21 case control and cohort studies
  • 9 RTCs

• Oral colonization is associated with nosocomial pneumonia

• Oral interventions improving hygiene reduced incidence of nosocomial pneumonia by an average of 40%

- 134 Geriatric patients
  - Dentate patients with pneumonia
    - 27% of inpatients
    - 19% of LTC
  - Edentulous patients with pneumonia
    - 5%
Hand Dexterity and Oral Hygiene

  - 49 institutionalized participants
    - 29 dentate
    - 36 one complete denture
  - Poor hand function (Purdue Test of Dominant Hand Function)
    - Dentate
      - Correlated with significantly more dental plaque
    - Complete denture wearers
      - Correlated with significantly more denture plaque
Who Should Do It?

  • Costs are also high for:
    • Bathing
    • Toileting
    • Feeding
What About Aggressive Oral Hygiene?

  • *Health-care providers in residential homes give little assistance with tooth and denture cleaning*

  • *Even if training and education are provided!*

**Methods**

- Logistic regression model was used to assess contribution of intubation and aspiration pneumonia on poor outcome after adjusting for potential confounders.

**Results**

- 136 acute ischemic stroke patients
  - received endovascular treatment
    - 83 local sedation without intubation
    - 53 with intubation

- Aspiration pneumonia
  - Not intubated (14%)
  - Intubated (23%)
Hassan et al. (2012) cont.

- **Poor outcomes**
  - Non-intubated (55%)
  - Intubated (83%)
  - Poor outcome at discharge (OR 2.9, 95% CI 1.2–7.4) ($P = 0.0243$)
  - In-hospital mortality (OR 4.5, 95% CI 1.5–12.5) ($P = 0.0046$)

- **After adjusting for pneumonia**
  - Effect of intubation on poor outcome at discharge (OR 2.7, CI 1.1–7.1) ($P = 0.0006$)
  - In-hospital mortality (OR 4.4, CI 1.6–12.5) ($P = 0.00051$)

- **Conclusions**
  - Rate of death and disability appears to be high for intubated patients receiving endovascular treatment
  - This increased rate is not explained by higher rates of subsequent aspiration pneumonia

• High incidence of aspiration pneumonia in head and neck cancer populations treated with chemo-radiotherapy

• Investigated incidence and mortality of aspiration pneumonia
  • 324 consecutive patients treated with curative intended radiotherapy

• Data collection
  • Patient, tumor, treatment characteristics obtained from DAHANCA database
  • Hospital admissions obtained from National Patient Registry
  • National Registry of Causes of Death
Mortensen et al. (2013) cont.

• **Results**
  • Severe dysphagia in 32% of the 324 patients
    • 18 patients developed aspiration pneumonia in first year after radiotherapy
    • incidence rate of 29 (95% CI 17–46) per 1000 person-years
    • incidence proportion of 5.3% (95% CI 3.1–8.3%)
  • Significant risk factors
    • tube feeding
    • clinical stage
    • severity of dysphagia
    • response to treatment
    • 3/18 died of aspiration pneumonia

• **Conclusion.**
  • Dysphagia-related aspiration pneumonia is serious and potentially fatal
  • Occur less frequently than previously reported

**METHODS**

- Retrospective population study over 10 years of medical records
  - International Classification of Diseases, 9th Revision code 507.x
  - Physician chart review excluded patients with aspiration pneumonitis

- Aspiration pneumonia compared to community-acquired pneumonia
  - Compared CURB-65 predicted mortality with actual 30-day mortality
Lanspa et al. (2013) cont.

• RESULTS
  • Identified 628 patients with aspiration pneumonia
    • 30-day mortality of 21%
    • Aspiration pneumonia had more frequent inpatient admission (99% vs 58%)
    • Intensive care unit admission (38% vs 14%),
    • Higher Charlson comorbidity index (3 vs 1),
    • Higher prevalence of do not resuscitate/intubate orders (24% vs 11%)
    • CURB-65 predicted mortality poorly in aspiration pneumonia

• CONCLUSIONS
  • Patients with aspiration pneumonia are older, have more comorbidities and demonstrate higher mortality than CAP patients,
    • Even after adjustment for age and comorbidities

• Methods:
  • Endoscopic images at PEG placement were reviewed in 304 consecutive patients

• Results:
  • Age and aspiration pneumonia were correlated with advanced gastric atrophy
    • Age: (p 0.0005, OR 1.044)
    • Aspiration pneumonia: (p 0.037, OR 1.692)
  • Mortality 3 months post PEG
    • Dementia (p 0.007, OR 16.94)
    • Aspiration pneumonia (p 0.011, OR 29.17)
    • Low serum albumin (p 0.036, OR 0.16)

• Conclusion:
  • Patients with PEG and recurrent aspiration
  • Often have co-occurring advanced atrophy of gastric mucosa and mortality
  • Advanced atrophy of gastric mucosa possible risk factor of aspiration pneumonia in patients with PEG
Additional Articles of Interest

Aspiration Pneumonia


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Alternate Questions

What is the:

- Risk for poor outcome?
- Ability to maintain nutrition/hydration via oral feeding?
- Plan for management of safety and vitality?
- Means for improving physiology?
Alternate Questions

How can we:

• Plan/manage decline and compensation?
• Determine means for ensuring quality of life?
• *Literature Is Not Sufficiently Developed to Answer These Questions!*