Barriers to Nutrition in the Spinal Cord Injury Population

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Disclosure Statement

• I have no financial interest in any organization whose products or services are described, reviewed, evaluated, or compared in the presentation.
Objectives

• Participate in complementary medicine with the dietitian

• Participants will be able to:
  – identify the barriers to getting adequate nutrition in the SCI population
  – explain assessments that evaluate aspects of swallowing and nutrition
  – understand & discuss a decision making algorithm to account for multiple variables related to nutrition in this population.
Incidence of SCI

• Estimate of annual incidence of SCI, not including those who die at the scene of the accident, is approximately 40 cases per million population in the U. S. or approximately 12,000 new cases each year.
  – No overall incidence studies of SCI in the U.S. since the 1970's it is not known if incidence has changed in recent years.

http://www.fscip.org/facts.htm retrieved 7/29/10
Prevalence of SCI

- The number of people in the United States who are alive in 2008 who have SCI has been estimated to be approximately 259,000 persons, with a range of 229,000 to 306,000 persons.
  - Note: Incidence and prevalence statistics are estimates obtained from several studies.
  - These statistics are not derived from the National SCI Database.

http://www.fscip.org/facts.htm retrieved 7/29/10
Nutrition Concerns

• Cervical spinal cord injury
  – Acute incidence of dysphagia in 71-80% of cases
  – Incidence of non-oral nutrition is high, but with no clear numbers (Wolf and Meiners, 2003)
    • Allows for administration of medications
    • Allows for medical management of nutrition needs

• Thoracic spinal cord injury
  – Reduced energy requirements, but unlikely to have dysphagia
Role of the SLP

- Assessment and Treatment of Dysphagia
- Assessment and Treatment of Communication
- Cooperation and Multidisciplinary treatment with:
  - Pharmacy
  - Nursing
  - Respiratory Therapist
  - OT/PT
  - Physician(s)
Role of the Dietitian

- Nutrition Assessment
- Nutrition Diagnosis
- Nutrition Intervention
- Monitoring & Evaluation

www.eatright.org
Etiologies of Dysphagia in CSCI

- Cervical Spinal Cord Injury
- Vertebral Artery Injury (occlusion vs. dissection)
- CSCI with brainstem trauma
- Neck stabilization hardware (external/internal)
- Vocal cord injury/trauma
- Recurrent Laryngeal Nerve injury/trauma
- Tracheitis/tracheal stenosis/tracheomalacia/laryngeomalacia
- Medication effects
- Respiratory Insufficiency
Hardware Images

• Internal Hardware

Cage, Plates & Screws

• External Hardware

Philadelphia

Halo

Miami J

www.healthline.com

www.spineuniverse.com

www.progressiveoandp.com
## Possible Medication Effects

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>5. GI pain, upset, &amp;/or ulceration</td>
<td>13. Hunger or thirst</td>
<td>21. Hypokalemia</td>
</tr>
<tr>
<td>6. Anorexia</td>
<td>14. GI motility</td>
<td>22. Weakness or dizziness</td>
</tr>
<tr>
<td>7. Taste alterations</td>
<td>15. Ataxia</td>
<td>23. Bloating or flatulence</td>
</tr>
</tbody>
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[Image: TIRR Memorial Hermann Rehabilitation & Research logo]
CSCI Medications

- Alprazolam/Xanax$^{1,2,3,4,5,6,7,8}$
- Amitriptyline/Elavil$^{9,10,11,12}$
- Baclofen$^{1,2,4,7,9,22}$
- Ciprofloxacin/Cipro$^7$
- Cyclobenzaprine/Flexeril$^{2,3,4,5,8,9,22}$
- Diclofenac/Voltaren$^{1,2,3,4,5,7,9,16}$
- Docusate Sodium/Colace$^3$
- Famotidine/Pepcid$^{3,7,16}$
- Gabapentin/Neurontin$^{2,5,6,9,15}$
CSCI Medications

- Ibuprofen/Motrin\(^1,5,7\)
- Lasix\(^2,3,4,6,21,22,23\)
- Lisinopril\(^2,3,5,16,22,23\)
- Megace\(^2,13,22\)
- Metaprolol\(^2,3,4,8,17,22,23\)
- Methadone\(^2,4,8,9,16,22\)
- Mirazapine\(^4,8,9,13\)
- Omeprazole/Prilosec\(^3,4,5,16,22\)
- Oxybutynin/Ditropan\(^2,3,4,5,7,8,9,16,22\)
- Oxycodone\(^2,4,16,22\)
CSCI Medications

- Prednisone $^{13,20,24}$
- Promethazine/Phenergan$^{14}$
- Ranitidine/Zantac$^{3,9,16,17,18,19}$
- Sulfamethoxazole/Bactrim$^{7}$
- Vitamin C $^{2,3,16}$
- Warfarin/Coumadin
- Zinc $^{2,16}$
- Zofran

Sources:
2 www.drugs.com
Anterior Cervical Diskectomy & Fusion

2005 Medtronic Sofamor Danek
ACDF Surgery

2005 Medtronic Sofamor Danek
Complications of ACDF

- Hoarseness, Vocal fatigue, hypernasality
- Transient versus Chronic Dysphagia
- Reflux/globus sensation
- Edema
- Hematoma or Infection
- Poor positioning due to collars
- Bone graft dislodgement, rejection of hardware, or scar tissue
- Denervation

Clinical Evaluation at the Bedside

- Acute versus Rehab setting(s)
- Chart review with attention to site(s) of lesion
- Oral mechanism examination with cranial nerve implications
- Look at the “whole” patient
  - Secretions, breath support, and current airway
Instrumental Evaluations

- Modified Barium Swallow
- Fiberoptic Endoscopic Evaluation of Swallowing
- Manometry
- Upper GI**
- Gastric Emptying**
Esophageal Dysfunction in Cervical Spinal Cord Injury

• Defective UES relaxation in all CSCI patients examined (18/18)
• 2/5 patients had abnormal 24 hour pH studies
• Aspiration from below is often more dangerous than aspiration from above

Compensation vs. Rehabilitation

- Compensatory strategies provide an immediate but usually short lasting effect on the efficiency or safety of swallowing. They do not change the physiology of the swallow.

- Rehabilitation’s aim is to improve swallowing physiology by means of overt muscle use and training.

Compensatory Treatment Options

- Seated at a ___ degree angle with head neutral
- Supervision during all intake
- Sit up for 30 minutes following meals
- Take small bites and sips
- Double swallow
- No straws

- Change liquid viscosity
- No ice chips
- Crush medications with approval
- Cyclic Ingestion
- Check for pocketing
- 6 small meals per day
- Thermal stimulation
Rehabilitation Options

- Supraglottic Swallow-airway protection
- Super Supraglottic Swallow-airway protection
- Mendelsohn Maneuver-Laryngeal elevation & excursion
- Isometric/Isotonic Exercises-VF closure
- Masako Maneuver-tongue base retraction

Rehab Options

- Neurosensory Stimulation (pharyngeal expectoration)
- Modified Valsalva/Effortful Swallow-increase BOT movement
- 3 second prep (bolus organization)
- Bolus formation, manipulation, & propulsion exercises
- IOPI-tongue strengthening

Unlikely Options due to Neck Limitations

- Chin tuck
- Head turn
- Head tilt
- Shaker maneuver
- Neuromuscular Electrical Stimulation (NMES)∗
Hyperactive Gag

- Common in high cervical injuries
- ENT consult to rule out digestive reasons for the gag
- Consider a very small dose of a local anesthetic such as Chloraseptic to inhibit the afferent limb of the gag response

Per Dr. James Coyle, personal communication on 2/27/09 at 5:32PM via email
Subglottic Air Pressure & Swallowing

- Trach occlusion does not improve swallowing in all patients
  - i.e. closing the subglottic airway is not always sufficient to improve swallowing function
- Occlusion can restore upper airway sensation by creating a closed system
- It may also improve secretion management

Pulmonary Concerns

- Ventilation need based on level of injury
- Tracheostomy
- Pneumonia prior to or during admission
- Innervation of the diaphragm (phrenic nerve)
- Greater risk of atelectasis
- Anxiety related to respiration
- Ability to cough
Patient comments

- “You can keep those powdered eggs”
- “I wouldn’t feed this to my dog”
- “Have you tasted this?”
- “This stuff looks like the inside of a baby’s diaper”
Issues in Nutrition

- Dehydration
- Constipation/Impaction or Diarrhea
- Wounds
- Medications
- Appetite
- Pain
- Initial weight loss
- Post recovery weight gain

Increasing Hydration

- Free water flushes with TF?
- Access to bedside water pitcher?
- Total care vs independent feeders
- Fever?
- Wound?
- Diuretics?
- Air Fluidized mattress?
Changes in Digestion

• Delayed Gastric Emptying at T6 spinal cord injury and above

• High residuals on tube feedings possible
  – Hold tube feedings if two consecutive checks of residuals are more than 200ml

• At greater risk for reflux due to reduced or lack of tone in the UES and LES

GI Dysfunction (constipation)

**Oral Diet**
- Adding fiber rich foods to trays
- Increasing po fluids
- Adding fiber packets
- Medication management

**Tube Feeding**
- Change to higher fiber formula
- Increase free water flushes
- Medication management

Feeding assistance

- Independent vs Tray set up vs Total Care
  - Time commitment of staff
  - Consult to OT for adaptive feeding equipment evaluation
    - Cuff
    - Plate guards
    - Slings

http://www.rehabmart.com
Feeding assistance

Jose Regalado demonstrates use of a cuff.

Randy Childers demonstrates a sling.
Energy needs

- **Acute phase**
  - **Indirect calorimetry**: an estimation of energy expenditure via the measurement of oxygen consumption and carbon dioxide production
  - Decreases the likelihood of overfeeding
  - Cost savings benefit by avoiding unnecessary nutritional support

Portable indirect calorimetry

http://pmbcii.psy.cmu.edu/events/past_events/20070222/2007_02_22_jakicic_2.pdf
Hand held calorimeters

http://pmcii psy.cmu.edu/events/past_events/20070222/2007_02_22_jakicic_2.pdf
http://www.metabolismmatters.com
Energy needs

Acute phase and SCI…using predictive equations to estimate daily energy requirements

– **Harris Benedict equation** using admit weight and injury factor of 1.2 and an activity factor of 1.1

Harris Benedict Equation

*Cons
- Under-estimates calorie needs if muscular
- Overestimates needs if obese
- Based on data from 1919 in healthy, non-obese persons

*Pros
- Can be modified to include 10% for bed rest activity & 20% for injury factor
- Leads to strong correlation with actual measured values following modification
- Future use will depend on stability of modification across studies

Energy needs

• Rehab phase and SCI
  – Tetra/Quad: 22.7 calories per kg body weight
  – Para: 27.9 calories per kg body weight

* Patients with spinal cord injury have reduced metabolic activity due to denervated muscle

Energy needs

• For the ventilated SCI patient and using predictive equations
  – Ireton-Jones
  – Penn State
  – Swinamer

***Spasticity- Patients with higher tone need more Kcals

How do we know if we’re getting it right?

• Need valid weights and often to assess/reassess acute changes
  – Same scale
  – Same time of day
  – 1 blanket, 1 pillow on the bed if using bedscale
Tube feeding (TF) Issues

- TF formulation
  - Isotonic vs hypertonic formula
- Continuous vs gravity vs bolus feeding
- Nausea/vomiting
- Risk for sinus infection with Dobhoff/NG tube
  - Tubes should be changed q 30 days
- Head of bed needs to be 30 degrees
- PO diet and NG/NJ TF- pts may not eat much 20° discomfort
- Checking residuals
Tube Feeding Formulas

- Two largest brand names are Nestle & Abbott
- Formulas vary significantly in calories, nutrients, fiber, protein, dairy component, and gluten
## Skin Integrity

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<tr>
<th>Pressure Ulcer Stage</th>
<th>Protein</th>
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<tbody>
<tr>
<td>I</td>
<td>1.2-1.5 g/kg</td>
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<tr>
<td>II</td>
<td></td>
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<tr>
<td>III</td>
<td>1.5-2.0 g/kg</td>
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<tr>
<td>IV</td>
<td></td>
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<tr>
<td>Deep Tissue Injury</td>
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www/abbottnutrition.com
www.nestle-nutrition.com
www.prostat.com