What to eat, What to drink and Managing the balance with HPN and SBS
Speakers and Contact Info

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What to eat?
Diet and SBS

The Standard American Diet

• High sugar, high fat
• Can you imagine eating this way if you have SBS?
• Likely to cause increased output
So how do we tip the scales so there is increased absorption and decreased output?
Diet Modification: The Foundation of Therapy

- Nutrition prescription must be based on the remnant GI anatomy to enhance absorption
- Most potent stimulus to intestinal adaptation
# Comparison of Two Nutrition Prescriptions

<table>
<thead>
<tr>
<th></th>
<th>Colon</th>
<th>No Colon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>50-60% of total calories</td>
<td>40-50% of total calories</td>
</tr>
<tr>
<td></td>
<td>(limit simple sugars)</td>
<td>(restrict simple sugars)</td>
</tr>
<tr>
<td>Protein</td>
<td>20-30% of total calories</td>
<td>20-30% of total calories</td>
</tr>
<tr>
<td>Fat</td>
<td>20-30% of total calories</td>
<td>30-40% of total calories</td>
</tr>
<tr>
<td></td>
<td>(primarily essential fats)</td>
<td>(primarily essential fats)</td>
</tr>
<tr>
<td>Soluble Fiber</td>
<td>5-10 grams / day</td>
<td>5-10 grams / day</td>
</tr>
<tr>
<td></td>
<td>(if stool output is &gt; 3L/day)</td>
<td>(if stool output is &gt; 3L/day)</td>
</tr>
<tr>
<td>Meals</td>
<td>5-6 meals per day</td>
<td>4-6 meals per day</td>
</tr>
<tr>
<td>Oxalates</td>
<td>Limit intake</td>
<td>---</td>
</tr>
<tr>
<td>Fluid</td>
<td>Isotonic fluids or Hypo-osmolar fluids</td>
<td>Isotonic, high sodium oral rehydration solution</td>
</tr>
</tbody>
</table>
LIMIT

- Sugar
- Candy
- Cakes, cookies, pies
- Regular soda pop
- Sweet tea
- Jelly, jam, syrup
- Ice cream, sherbet
- Sorbet

INCLUDE

- Pasta
- Potato
- Breads
- Cereals
- Whole grains as tolerated
- Fruits and vegetables as tolerated

Adding a little sweetness to your diet

Non-nutritive Sweeteners: YES

- Acesulfame K (Sunett®, Sweet & Safe, Sweet One®)
- Aspartame (Nutrasweet®, Sugar Twin®, Equal®)
- Neotame (used by manufacturers in combination with other nutritive and non-nutritive sweeteners to enhance the flavor of food and beverages)
- Saccharin (Sweet’N Low® and Sweet Twin)
- Stevia-based sweeteners (Truvia®, Pure Via®)
- Sucralose (Splenda®)

Sugar Alcohols: LIMIT

- These are designed to be malabsorbed and therefore cause uncomfortable side effects like abdominal pain, gas, bloating and diarrhea.
- Sugar alcohols can be found in the ingredient list on food labels as sorbitol, mannitol, xylitol.
Biological value (BV) of protein

Protein

<table>
<thead>
<tr>
<th>Protein</th>
<th>BV*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whey Protein, Whole Soy Bean</td>
<td>96</td>
</tr>
<tr>
<td>Human milk</td>
<td>95</td>
</tr>
<tr>
<td>Chicken egg</td>
<td>94</td>
</tr>
<tr>
<td>Soybean milk</td>
<td>91</td>
</tr>
<tr>
<td>Cow’s milk</td>
<td>90</td>
</tr>
<tr>
<td>Cheese</td>
<td>84</td>
</tr>
<tr>
<td>Quinoa, rice</td>
<td>83</td>
</tr>
<tr>
<td>Fish</td>
<td>76</td>
</tr>
<tr>
<td>Beef</td>
<td>74</td>
</tr>
<tr>
<td>Soybean curd (tofu)</td>
<td>64</td>
</tr>
</tbody>
</table>

*percent nitrogen incorporated
<table>
<thead>
<tr>
<th>Essential Fatty Acids: alpha-linolenic acid (ALA) and linoleic acid (LA)</th>
<th>Nonessential Fats (saturated fats)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola oil</td>
<td>Butter</td>
</tr>
<tr>
<td>Cold water fish (salmon, trout, mackerel, sardines)</td>
<td>Cocoa butter</td>
</tr>
<tr>
<td>Corn oil</td>
<td>Coconut oil</td>
</tr>
<tr>
<td>Flaxseed oil</td>
<td>Palm oil</td>
</tr>
<tr>
<td>Grapeseed oil</td>
<td>Peanut oil</td>
</tr>
<tr>
<td>Mayonnaise</td>
<td>Red meat</td>
</tr>
<tr>
<td>Olive oil</td>
<td>Whole milk and cheeses</td>
</tr>
<tr>
<td>Safflower oil</td>
<td></td>
</tr>
<tr>
<td>Soybean oil</td>
<td></td>
</tr>
<tr>
<td>Sunflower oil</td>
<td></td>
</tr>
</tbody>
</table>
### Types of Fiber

<table>
<thead>
<tr>
<th>Choose</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soluble Fiber</strong></td>
<td><strong>Insoluble Fiber</strong></td>
</tr>
<tr>
<td>Oatmeal cereals and breads</td>
<td>Whole wheat cereals and breads</td>
</tr>
<tr>
<td>Oatbran cereals and breads</td>
<td>Wheat bran cereals and breads</td>
</tr>
<tr>
<td>Apple (without skin), applesauce, banana, orange, grapefruit, tangerine without seeds, strawberries as tolerated</td>
<td>Grapes, blueberries, cherries, rhubarb, figs, blackberries, raspberries</td>
</tr>
<tr>
<td>Cooked, peeled and/or seedless vegetables such as carrots, butternut squash, asparagus tips, canned green beans</td>
<td>Corn, celery, cucumber, mushroom, cauliflower, lettuce, cabbage, peppers, eggplant, broccoli &amp; asparagus stems, spinach, turnip greens, kale, Brussels sprouts</td>
</tr>
<tr>
<td>Refried low-fat beans, shelled beans (i.e., garbanzo beans, black beans)</td>
<td>Nuts, large seeds (pumpkin, sunflower), lentils, peas</td>
</tr>
</tbody>
</table>
Types of foods and the way the food is consumed affects absorption…
2400 kcal, 50% CHO, 20% Protein, 30% Fat

**Breakfast**
- 1 cup oatmeal
- 2 oz lactose-free milk
- 1 egg
- 1 English muffin
- 2 tsp margarine
- 1 tsp diet jelly
- 4 oz coffee

**Morning Snack**
- 1 bagel w/½ oz cheese
- 1 tsp margarine
- 1 small banana
- 4 oz water

**Breakfast**
- 8 oz orange juice
- 1 cheese and fruit-filled Danish

Byrne et al., NCP 15:309, 2000
2400 kcal, 50% CHO, 20% Protein, 30% Fat

Lunch
- 3 oz baked ham
- ½ cup cooked rice
- ½ cup carrots
- 2 small dinner rolls
- 2 tsp margarine
- 4 oz water or diet soda

Lunch
- 1 thin slice cheese pizza
- 12 oz regular soda

Byrne et al., NCP 15:309, 2000
2400 kcal, 50% CHO, 20% Protein, 30% Fat

Dinner
• 4 oz roasted chicken
• 1 large baked potato
• 2 dinner rolls
• 2 tsp margarine
• 4 oz water or diet soda

Evening Snack
• 1 roast beef sandwich
• 2 slices bread, 1 oz meat, 1 tsp mayo
• 1 tsp mustard
• 1 oz pretzels
• 4 oz water or diet soda

Dinner
• 12 oz T-bone steak
• 1 large baked potato
• 1 cup spinach
• 12 oz beer

Evening Snack
• 3-4 cups popcorn
• 1 cup raspberry sorbet
• 12 oz diet soda

Byrne et al., NCP 15:309, 2000
Putting it all together…

• Plan a balanced diet
• Include complex carbohydrates, proteins and fat (especially essential fat) at each meal
• Limit or avoid simple sugars
• Distribute the food throughout the day
• Chew foods well
• Use salt liberally especially if your colon is in circuit
• And most importantly, enjoy meals with family and friends!
What to drink?
How to Treat Dehydration

Avoid drinking oral fluids in a rapid manner. Although your body requires more fluid when you are dehydrated and you will feel thirstier, drinking oral fluids quickly will typically worsen circumstances by causing increased stool output and possibly vomiting.

Consult with your health professional as soon as you have identified the signs and symptoms of dehydration, to develop the best treatment plan, which may include additional IV or enteral fluid (oral and/or via a feeding tube).

PREVENTION is the best treatment—let’s learn how!
Preventing Dehydration

**Choose Your Fluid**
Choose an appropriate oral fluid tailored to your bowel function and anatomy in order to best manage your fluid balance.

**Drink Enough Fluids**
Drink an appropriate volume of fluid slowly throughout the day to meet both your baseline needs and to cover your losses.

**Supplement Your Fluids**
The fluids used to provide hydration are based on the type of fluids and electrolytes being excreted from the body. In some cases electrolytes may need to be added to these fluids. This should be discussed with your healthcare team prior to adding electrolytes to your fluids. To further understand let’s talk about osmolarity.
Osmolarity

Osmolarity is the number of osmoles (the number of particles) per liter of solution (i.e., the concentration).

The more particles there are, the higher the osmolarity or concentration.
# Types of Fluids

<table>
<thead>
<tr>
<th>Hyper-Osmolar</th>
<th>Hypo-Osmolar</th>
<th>Iso-Osmolar</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Contain many particles of glucose and little to no sodium</td>
<td>• Contain few to no particles of glucose and sodium (not concentrated)</td>
<td>• Contain sodium, potassium, and glucose in same concentration as blood and extracellular fluid</td>
</tr>
<tr>
<td>• Cause fluid to be pulled into the intestinal tract to dilute the concentration of the drink, causing watery diarrhea</td>
<td>• Are not always absorbed entirely, known as free fluids</td>
<td>• Will not cause fluid to shift into the GI tract</td>
</tr>
<tr>
<td>• Juice, soda, smoothies</td>
<td>• Water, decaffeinated, and sugar-free beverages</td>
<td>• Oral rehydration solution (CeraLyte®, Pedialyte®, Gatorade®)</td>
</tr>
</tbody>
</table>

Fluid Comparison

The normal osmolarity of blood plasma is 275–295 mOsm/L.

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Osmolarity*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prune juice</td>
<td>1265</td>
</tr>
<tr>
<td>Grape juice</td>
<td>863</td>
</tr>
<tr>
<td>Apple juice</td>
<td>680</td>
</tr>
<tr>
<td>Orange juice</td>
<td>614</td>
</tr>
<tr>
<td>Regular soda</td>
<td>550–700</td>
</tr>
<tr>
<td>Popsicle</td>
<td>720</td>
</tr>
<tr>
<td>Jell-O®</td>
<td>730</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Osmolarity*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet soda</td>
<td>0</td>
</tr>
<tr>
<td>Water</td>
<td>0–18</td>
</tr>
<tr>
<td>Tea</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Osmolarity*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORS salts</td>
<td>300</td>
</tr>
<tr>
<td>CeraLyte®</td>
<td>220–260</td>
</tr>
<tr>
<td>Pedialyte®</td>
<td>250</td>
</tr>
<tr>
<td>Gatorade®</td>
<td>330–380</td>
</tr>
</tbody>
</table>

* (mOsm/L)

Examples of ORS

Commercial Products

• Cera-Lyte® 90
• DripDrop®
• Pedialyte®
• Rehydralyte®
• WHO Packet (Jianas Brothers)
• WHO Reduced-Osmolarity Packet (TriOral®)

Home-made recipes

• Gatorade G2®:
  – 4 cups of Gatorade G2®
  – ½ teaspoon table salt

• Fruit juice based:
  – ¾ cup fruit juice
  – 3 ¼ water
  – ¾ teaspoon table salt
Managing the balance!
Managing the balance with HPN
Managing the balance with HPN

• Oral/Enteral
  – Oral vitamin/mineral supplementation on off days?
    • Absorptive capacity?
  – Oral Rehydration solutions
    • Sodium with a small amount of carbohydrate
    • Additional electrolytes?
  – Diet – Modify for malabsorption
    • Calories/fat, carb/protein

• Parenteral
  – Daily multi-vitamin/minerals in HPN
  – Nutrition v IVF
    • Daily vs fewer days?
    • Challenging electrolytes?

Monitor: 1) calorie count? 2) fluid status – urine output, color 3) extra calories? 4) other output – ostomy, GI?
Do the best you can!!
Conclusion

“Takeaway” message

- Diet is the foundation of therapy for SBS
- Fluid and nutrient absorption can be enhanced when oral intake is based on the GI anatomy