The Whipple Gone Bad:  
A Case Study

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Overview

- Introduction
- The Whipple Procedure
- Nutrition Assessment
- Follow-up
Introduction
Introduction

- Patient Background
  - 62 y.o. white male
  - Married, lives with his wife
  - Never smoked
  - Moderate drinker
  - Daughter is an EMT and actively involved in care
Introduction

- Primary Medical Diagnosis
  - Cholangiocarcinoma of the common bile duct, staged T3, N0
- Admitted for
  - Whipple procedure (pancreaticoduodenectomy) and cholecystectomy on 02/09/2012
Patient History

- Past Medical History
  - HTN, GERD, Depression, rectal cancer

- Past Surgical History
  - Resection of rectal cancer May 2007
    - Colostomy
  - Small bowel obstruction May 2007
    - Drainage of pelvic abscess
  - Colostomy takedown November 2007
Picture of Cholangiocarcinoma
The Whipple Procedure
History of the Whipple

• The 1\textsuperscript{st} successful pancreaticoduodenectomy (PD) procedure was performed by Kausch as a 2-stage operation in 1912
• “Whipple” is derived from Dr. Allen OldfatherWhipple
  • Reported his procedures in 1935
• It was Traverso & Longmire who described a pylorus-preserving modification (PPPD) in 1973

• PD: pancreaticoduodenectomy-original Whipple procedure
• PPPD: pylorus preserving pancreaticoduodenectomy
Let the Whipple Begin

- In the Whipple operation the head of the pancreas, a portion of the bile duct, the gallbladder and the duodenum is removed. Occasionally a portion of the stomach may also be removed. After removal of these structures the remaining pancreas, bile duct and the intestine is sutured back into the intestine to direct the gastrointestinal secretions back into the gut.
Whipple Indications

- Pancreatic ductal adenocarcinoma
- Pancreatic islet cell carcinoma
- Malignant intraductal papillary-mucinous neoplasm
- Ampullary carcinoma
- **Distal common bile duct (CBD) carcinoma** (cholangiocarcinoma)
- Benign periampullary neoplasm not amenable to local resection with ampullectomy
- Duodenal neoplasm
- Trauma (rare)
Whipple Contraindications

- The tumor is unresectable if:
  - The tumor encases the celiac axis or superior mesenteric artery (SMA) (>180 degree involvement)
  - Thrombosis of the portal vein (PV), the superior mesenteric vein (SMV) or the superior mesenteric portal vein (SMPV)
  - Extra regional lymph node metastasis is detected
  - Distant metastatic disease is detected
PD vs. PPPD

- PPPD preserves blood supply to the proximal duodenum
- PPPD patients have a much higher incidence of delayed gastric emptying vs. PD patients
- Lack of statistical difference with regard to patient morbidity, mortality, and survival after the PD & PPPD
Portion Removed

Atlas of Gastrointestinal Surgery: Pancreas
http://www.bcdecker.com/SampleOfChapter/1550092707.pdf
End-to-side hepaticejunostomy

End-to-side duodenojejunostomy

End-to-side pancreaticojejunostomy
End to Side Anastomosis

Atlas of Gastrointestinal Surgery: Pancreas
http://www.bcedecker.com/SampleOfChapter/1550092707.pdf
Standard MNT after a Whipple

• Take prescribed amount of pancreatic enzyme replacement with all meals and snacks
• Potential J-tube insertion to help maintain and restore optimal nutrition
• Slowly advance diet
• Avoid, high fat, greasy or fried foods
• Increase intake of nutrient rich foods
• Eat 5-6 small meals and snacks daily
• Drink at least 8 cups of fluid each day
• Take small sips of liquids with meals
  • Drink liquids 1 hour before or 1 hour after meals
• Drink beverages that contain calories, nutrients and protein
• Avoid alcoholic beverages
• Avoid eating concentrated simple sugars
Nutrition Assessment
Nutrition Assessment

• **Food/Nutrition Related History**
  • Food and nutrient intake: PTA was not taking any nutritional supplements, but attempted increasing fruits and vegetables.
  • Medication/herbal supplement intake: multiple medications over the course of pt’s hospital stay.
  • Knowledge/beliefs/attitudes about food and behavior: afraid to eat.
  • Physical activity: very active before diagnosis-walking, weight training, etc.
  • Nutrition quality of life: poor prognosis d/t diagnosis and surgery.
  • Pt reports ~10 lb weight loss over the last two months with decreased appetite and increased jaundice.
# Medications

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>INDICATION</th>
<th>INTERACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOVENOX</td>
<td>Anticoagulant</td>
<td>Not w/ pork allergy, caution w/ ↓ renal fxn</td>
</tr>
<tr>
<td>Famotidine (PEPCID)</td>
<td>GERD</td>
<td>↓ Fe &amp; Vit B12 abs. Mg or Al/Mg antacids ↓ drug abs.</td>
</tr>
<tr>
<td>Humalog (prn)</td>
<td>High blood sugar</td>
<td>↑ wt gain</td>
</tr>
<tr>
<td>ZOFRAN</td>
<td>Antiemetic/ Antinausea</td>
<td>-</td>
</tr>
<tr>
<td>ZOSYN</td>
<td>Antibiotic</td>
<td>Anorexia, dry mouth, taste changes, N/V, gastric distress, diarrhea</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>Antibiotic</td>
<td>Avoid grapefruit related citrus, Anorexia, ↑ gastric motility, N/V, diarrhea, abdominal cramps</td>
</tr>
</tbody>
</table>
### Medications continued

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>INDICATION</th>
<th>INTERACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ducusate Na liquid</td>
<td>Laxative</td>
<td>Alters intestinal absorption of water &amp; electrolytes</td>
</tr>
<tr>
<td>Liquid Tylenol</td>
<td>Pain management</td>
<td>Can cause diarrhea in tube fed patients</td>
</tr>
<tr>
<td>K and Na Phosphatates</td>
<td>Urinary acidifier</td>
<td>Avoid Ca, Vit D supplements or salt subs. Caution with K supplements. High oxalate and phytate foods ↓ absorption</td>
</tr>
<tr>
<td>Nexium</td>
<td>Anti-secretory and reduction of gastric acid</td>
<td>May reduce absorption of Fe and B12</td>
</tr>
<tr>
<td>Dilaudid (hydromorphone)</td>
<td>Pain management</td>
<td>Constipation, N/V, other opioids and sedatives can cause resp. depression that can result in death</td>
</tr>
<tr>
<td>oxycodone</td>
<td>Pain management</td>
<td>Dry mouth, gastritis, N/V, constipation</td>
</tr>
</tbody>
</table>
Nutrition Assessment

- Anthropometric Measurements
  - Ht: 167.6 cm (66’)
  - Wt: 72.8 kg-standing (2/09) (160 lb)
  - BMI: 25.9 kg/m²
  - IBW: 64.5 kg (113%) (142 lb)
Weight History

Weight Trends

Weight (kg)

Weight

2/8/2012: 73.2
2/10/2012: 81.6
2/12/2012: 79.9
2/14/2012: 80.3
2/16/2012: 78.3
2/18/2012: 78.3
2/20/2012: 80.3
2/22/2012: 67.4
2/24/2012: 64
2/26/2012: 66
2/28/2012: 66
3/1/2012: 67.4
3/3/2012: 64
3/5/2012: 65.2
3/7/2012: 65.8
3/9/2012: 66
3/11/2012: 67.4
3/13/2012: 67.4
3/15/2012: 68
3/17/2012: 68
3/19/2012: 68
3/21/2012: 68
3/23/2012: 68
3/25/2012: 68
3/27/2012: 68
3/29/2012: 68
3/31/2012: 68
4/2/2012: 68
4/4/2012: 68
4/6/2012: 68
4/8/2012: 68
4/10/2012: 68
## Nutrition Assessment

- **Biochemical Data**

<table>
<thead>
<tr>
<th></th>
<th>Ref Range</th>
<th>2/15/2012</th>
<th>2/16/2012</th>
<th>3/2/2012</th>
<th>3/6/2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>60-99 mg/dL</td>
<td>104</td>
<td>108</td>
<td>117</td>
<td>115</td>
</tr>
<tr>
<td>BUN</td>
<td>6-20 mg/dL</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.70-1.30 mg/dL</td>
<td>0.74</td>
<td>0.72</td>
<td>0.62</td>
<td><strong>0.66 (L)</strong></td>
</tr>
<tr>
<td>Albumin</td>
<td>3.5-4.7 g/dL</td>
<td><strong>2.0 (L)</strong></td>
<td><strong>2.0 (L)</strong></td>
<td>1.8</td>
<td><strong>1.9 (L)</strong></td>
</tr>
<tr>
<td>Calcium</td>
<td>8.6-10.2 mg/dL</td>
<td><strong>7.5 (L)</strong></td>
<td><strong>7.9 (L)</strong></td>
<td>8.1</td>
<td><strong>8.3 (L)</strong></td>
</tr>
<tr>
<td>Phosphorus</td>
<td>2.4-4.7 mg/dL</td>
<td>3.3</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>134-143 mmol/L</td>
<td>140</td>
<td>139</td>
<td>135</td>
<td>136</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.4-5.0 mmol/L</td>
<td>3.5</td>
<td><strong>3.1 (L)</strong></td>
<td>3.7</td>
<td>3.9</td>
</tr>
<tr>
<td>Chloride</td>
<td>97-108 mmol/L</td>
<td>101</td>
<td>101</td>
<td>102</td>
<td>102</td>
</tr>
</tbody>
</table>
Nutrition Assessment

- Nutrition Focused Physical Exam-completed (3/02)
  - **Orbital fat pads:** dark circles and mildly depressed
  - **Triceps skin fold:** loss of thickness when pinched and was not easy to roll between fingers. Pt reports feeling like he had lost fat stores.
  - **Temporal muscle:** slight to moderate depression, visible
  - **Interosseous muscle:** slightly depressed with loose skin
  - **Clavicle:** pronounced, mild to moderate protrusion, but not severe
  - **Fluid accumulation:** no sign of pitting or swelling
<table>
<thead>
<tr>
<th>ADULT MALNUTRITION RATING FORM</th>
<th>262 Other Severe PCM</th>
<th>Unspecified</th>
<th>263 Other and Protein/Calorie</th>
<th>Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACUTE ILLNESS OR INJURY</strong></td>
<td><strong>CHRONIC ILLNESS OR INJURY</strong></td>
<td><strong>MARKERS OF SEVERE MALNUTRITION IN THE CONTEXT OF SOCIAL OR ENVIRONMENTAL CIRCUMSTANCES</strong></td>
<td><strong>NON-SEVERE MALNUTRITION IN CONTEXT OF ACUTE ILLNESS OR INJURY</strong></td>
<td><strong>NON-SEVERE MALNUTRITION IN CONTEXT OF CHRONIC ILLNESS</strong></td>
</tr>
<tr>
<td>Rate of weight loss:</td>
<td>Rate of weight loss:</td>
<td>Rate of Weight Loss:</td>
<td>Rate of Weight Loss:</td>
<td>Rate of Weight Loss:</td>
</tr>
<tr>
<td>&gt;1-2% in 1 week</td>
<td>&gt;5% in 1 month</td>
<td>&gt;7.5% in 1 month</td>
<td>1-2% in 1 week</td>
<td>&gt;5% in 1 month</td>
</tr>
<tr>
<td>&gt;5% in 1 month</td>
<td>&gt;5% in 1 month</td>
<td>&gt;7.5% in 3 months</td>
<td>5% in 1 month</td>
<td>&gt;7.5% in 3 months</td>
</tr>
<tr>
<td>&gt;7.5% in 3 months</td>
<td>&gt;10% in 6 months</td>
<td>&gt;10% in 6 months</td>
<td>7.5% in 3 months</td>
<td>10% in 6 months</td>
</tr>
<tr>
<td>&gt;20% in 12 months</td>
<td>&gt;20% in 12 months</td>
<td>&gt;20% in 12 months</td>
<td>20% in 12 months</td>
<td>&gt;20% in 12 months</td>
</tr>
<tr>
<td><strong>Energy intake compared to requirement:</strong></td>
<td>Energy intake compared to requirement:</td>
<td>Energy intake compared to requirement:</td>
<td>Energy intake compared to requirement:</td>
<td>Energy intake compared to requirement:</td>
</tr>
<tr>
<td>≤ 50% energy intake compared to energy requirement for ≥ 5 days</td>
<td>≤ 75% energy intake compared to energy requirement for ≥ 1 month</td>
<td>≤ 50% energy intake compared to energy requirement for ≥ 1 month or more</td>
<td>&lt; 75% energy intake compared to energy requirement for ≥ 1 month</td>
<td>&lt; 75% energy intake compared to energy requirement for ≥ 3 month</td>
</tr>
<tr>
<td><strong>Body fat stores:</strong></td>
<td><strong>Body fat stores:</strong></td>
<td><strong>Body fat stores:</strong></td>
<td><strong>Body Fat stores:</strong></td>
<td><strong>Body Fat stores:</strong></td>
</tr>
<tr>
<td>Moderate depletion</td>
<td>Severe depletion</td>
<td>Moderate depletion</td>
<td>Mild depletion</td>
<td>Mild depletion</td>
</tr>
<tr>
<td><strong>Muscle mass:</strong></td>
<td><strong>Muscle mass:</strong></td>
<td><strong>Muscle mass:</strong></td>
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<td>Severe depletion</td>
<td>Moderate depletion</td>
<td>Mild depletion</td>
<td>Mild depletion</td>
</tr>
<tr>
<td><strong>Reduced grip strength:</strong></td>
<td><strong>Reduced grip strength:</strong></td>
<td><strong>Reduced grip strength:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>age and gender</td>
<td>age and gender</td>
<td>age and gender</td>
<td>age and gender</td>
<td>age and gender</td>
</tr>
<tr>
<td><strong>Fluid accumulation:</strong></td>
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<td><strong>Fluid Accumulation:</strong></td>
<td><strong>Fluid Accumulation:</strong></td>
</tr>
<tr>
<td>Moderate to Severe (2-3+ edema/anasarca/ascites)</td>
<td>Severe (≥ 3+ edema/anasarca/ascites)</td>
<td>Severe (≥ 3+ edema/anasarca/ascites)</td>
<td>Mild</td>
<td>Mild</td>
</tr>
<tr>
<td><em>(Energy requirement is estimated using recognized best practice calculations or measured by indirect calorimetry.)</em></td>
<td><em>(Energy requirement is estimated using recognized best practice calculations or measured by indirect calorimetry.)</em></td>
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</tr>
</tbody>
</table>
Nutrition Diagnosis

- Pt with inadequate protein energy intake (NI -5.3) r/t altered GI function (NC-1.4) d/t Whipple procedure AEB NPO status for several days, recent adv to CL diet and need for enteral nutrition support.
Hospital Course

- (2/09) Whipple procedure and cholecystectomy
- (2/10) Initial consult for TF Rx
- (2/15) My first visit with patient, TF not initiated yet
- (2/16) Verbal consult for TF Rx
- (2/17) Tube feeding initiated
- (2/18) Back to OR for a pancreatic anastomosis leak s/p reopen of recent laparotomy, drainage of pancreatic leak, washout, and fascial closure.
- Transferred to the ICU
Where the Whipple Went Bad

Completed anastomosis

Stent

Atlas of Gastrointestinal Surgery: Pancreas
http://www.bcdecker.com/SampleOfChapter/1550092707.pdf
Hospital Course continued

- (2/19) TPN initiated
- (2/20) TPN and trophic TF
- (2/27) TPN d/c’d and TF at goal rate
- (3/02) Recommended changing tube feed. Provided diet education to patient.
- (3/06) Saw patient again and provided cyclic TF Rx
- (3/09) Pt d/c’d home
## Estimated Nutrition Needs

<table>
<thead>
<tr>
<th>KCALS</th>
<th>PROTEIN</th>
<th>FLUID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1820-2184 kcals</td>
<td>25-30 kcals/kg</td>
<td>97-129 gm</td>
</tr>
</tbody>
</table>

Using the OHSU suggested guidelines
Nutrition Assessment

- **Interventions**
  - (2/15)-HD #6: on CL diet
    - Rec ADAT to Regular
    - Encourage PO intake as tolerated
    - Offer EnLive (CL Supplement) prn, while pt on clears
  - (2/16)-HD #7: on FL diet
    - Offer Boost Plus prn
    - Provided TF Rx Jevity 1.2 (standard formula with fiber)
      - To meet 100% of needs: Jevity 1.2 @ 65 mL/hr (providing 1872 kcals, 87 gm of protein and 1279 mL free H2O)
      - To meet 50-75% of needs: Jevity 1.2 @ 65 mL/hr x 14 hrs (providing 1092 kcals, 51 gm protein, and 746 mL free H2O)
Nutrition Assessment

- **Interventions continued**
  - During ICU stay patient was seen by another RD
    - (2/20) TPN was initiated (2/19) and trophic TF
      - TPN to provide 20 kcal/kg, 1.6 gm pro/kg, no lipids in volume of 1440mL/day
      - Trophic TF of Peptamen AF @ 10mL/hr
        (providing 288 kcals, 18 gm protein and 194 ml free H2O)
    - (2/22) RD consulted for TF goal rate
      - TF Rx: Peptamen AF @ 65 mL/hr
        (providing 1872 kcal, 119 gm protein and 1265 mL free H2O)
    - (2/27) TPN d/c’d and pt tol TF at goal rate
Nutrition Assessment

- **Interventions continued**

  - **(3/02)-HD #22:**
    - Rec change TF to Replete (high protein w/out fiber)
    - Continuous: @ 80 mL/hr (providing 1920 kcals, 121 gm protein and 1613 mL free H2O)
    - Cyclic: @ 100mL/hr x 14 hrs (providing 1400 kcals, 88gm protein and 1176 mL free H2O)
    - Rec increasing H2O flush to 150 mL x 5 for hydration
    - Rec Nancy’s Kefir 80 mL TID for probiotic Rx
    - Continue to monitor TF tolerance, volume, labs, bowel and fluid status
Interventions continued

(3/06)-HD #26:

- Team had not changed to what we recommended
- Increase rate to meet 100% of patients needs
  - Replete cyclic TF Rx: @ 115 mL/hr x 16 hrs (providing 1840 kcals, 116 gm protein and 1546 mL free H2O)
  - Peptamen cyclic TF Rx: @ 115 mL/hr x 14 hrs (providing 1932 kcals, 122 gm protein and 1304 mL free H2O)
- Rec increasing H2O flush to 150 mL x 5 for hydration
- Rec continue Nancy’s Kefir 80 mL TID for probiotic Rx
Goals

- **Short Term:**
  - Be able to tolerate at least a clear liquid diet
  - Continue to tolerate TF at goal

- **Long Term:**
  - Resume a regular diet
  - Maintain weight and nutrition status
Future Plans

• Considering chemotherapy
  • Small survival advantage when used

• Recent check-up notes
  • Tests to evaluate if cancer has progressed or metastasized
References


DISCUSSION