Intractable Gastric Ulcer Disease

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SUNY Downstate Medical Center
February 13, 2009

3 ½ months…
107 days…
2,568 hours…
154,080 minutes…until graduation
Case Presentation

- 44 yo Female
  - Intractable peptic ulcer disease x 2yrs
  - Treated for H. pylori in the past
  - Gastric outlet obstruction
  - IVDA
  - reported 100 lb weight loss over 9 months

- PSH: Denied
- Meds: Methadone, prevacid
- Allergies: Codeine, ASA
- Social: previous cocaine and heroine abuse
- Endoscopies – stenosis at pyloris with scarring
Case Presentation

- T 98  BP 110/65  P 95
- Gen: AAOx3, thin, malnourished
- HEENT: no JVD
- CV: s1,s2, no murmurs
- Lungs: CTA b/l
- Abd: Soft, thin, nontender. No scars
- Ext: equal palpable pulses b/l, no edema
Case Presentation

10/06/08 -> OR
- Findings: large, thick stomach; scarring around pylorus/duodenum
- Truncal vagotomy
- Antrectomy
- Retrocolic loop gastrojejunostomy
Case Presentation

- POD #1 – severe pain
  - Methadone SQ, Fentanyl
- POD #3 – flatus
- POD #4 – NGT removed, started on post-gastrectomy diet
- POD #6 - abdominal distention, post-op ileus
  - Pain intermittent
- Started on TPN
- Refused Nasogastric tube
Case Presentation

- POD #11 – NGT inserted, yielding 600cc feculent material
- POD #12 – Re-Exploration
- Retrocolic loop gastrojejunostomy intact
- Entire small bowel herniated through transverse mesocolon posteriorly
- Mesentery, including root, herniated through defect
Case Presentation

- OR...(cont)
  - Small bowel edematous, venous congestion
  - Perforation of distal ileum -> SBR with anastomosis
  - Gastrojejunostomy revised to antecolic Roux-en-Y
  - Mesenteric defect closed

- Pt transferred to PACU on pressors, intubated
Hospital Course

- **POD #1**
  Levophed and vasopressin. Acidosis corrected
  Transfused 4 units pRBC, started on broad-spectrum Antibiotics, TPN

- **POD#2** – WBC 26,000 (from 11,000)
  Adequate urine output

- **POD#3**- weaned off pressors

- **POD#4**- WBC decreased to 11,000

- **POD#5**- Febrile to 102F

- **POD# 7**- foul smelling drainage from abdominal wound -> Succus

- **POD# 7**- Taken back to OR…
Hospital Course

- OR...(take 3)
  - Necrotic distal/terminal ileum at prior anastomosis site
  - Abdominal washout
  - Drainage with Malecot tubes x2 and Hemovac
  - Gastrojejunostomy anastomosis intact
Hospital Course

- POD # 1-20
  - Weaned from pressors
  - Extubated
  - Diet advanced
  - Drainage catheters removed
  - Physical therapy
  - c/o persistent abdominal and back pain
Hospital Course

- **POD # 21- 50**
  - Pain management
    - Weaned from methadone
  - Wound care for stage II sacral decubitus ulcer
  - Physical therapy
  - Rejected from outside facilities due to past drug history

- **POD # 69**
  - DVT left lower extremity – femoral -> popliteal veins
  - Started on anticoagulation
Hospital Course

- POD # 119...
  - Awaiting discharge home when able to ambulate independently...
History of Gastric Ulcer

- 350 B.C. – Diocles of Carystos described existence
- 131-201 A.D. – Celsus and Galen
- 1586 – Marcellus Donatus of Mantua – described at autopsy
- 1880 – Theodor Billroth – First distal gastrectomy and gastroduodenostomy
- 1885 – Billroth – First distal gastrectomy and gastrojejunostomy
History of Gastric Ulcer

- Pyloroplasty
  - Heineke (1886) and Mikulicz (1888)
  - Jaboulay (1892) gastroduodenostomy
  - Finney (1902)

- Subtotal Gastrectomy
  - Haberer and Finsterer (early 1900’s)

- Truncal vagotomy (Transthoracic)
  - Lester Dragsteadt and Owen (1953)

- Truncal vagotomy and hemigastrectomy
  - Farmer and Smithwick (1952)

- Truncal vagotomy and antrectomy
  - Edwards and Herrington (1953)

- Parietal cell vagotomy
  - Griffith and Harkins (1957)
History of Gastric Ulcer

- Medical Management
  - Prior to 1980’s – antacids
  - 1980’s – H₂ receptor antagonists
  - 1990’s – Proton pump inhibitors
  - Present –
    - *H. pylori* infection and peptic ulcer – PPI and eradication
    - NSAID-induced ulcer – stopping medication
History of Gastric Ulcer

- **Surgical Management**
  - Prior to 1940’s – Subtotal gastrectomy
  - 1940-1950’s – Vagotomy, antrectomy, pyloroplasty
  - 1960’s – Proximal gastric vagotomy
  - 1990’s – Laparoscopic vagotomy
  - Present – Life-threatening complications of PUD
    - Bleeding
    - Perforation
    - Obstruction
Anatomy of Stomach
Arterial and Venous Supply

- Left gastric artery
- Right gastroepiploic artery
- Left gastroepiploic artery
- Right gastric artery
- Short gastric arteries

- Left gastric (coronary) vein
- Right gastric vein
- Right gastroepiploic vein
- Left gastroepiploic vein
- Gastric lymphatics parallel the blood vessels
- Cardia + medial half of corpus ⇒ nodes along the left gastric & celiac axis
- Lesser curvature side of antrum ⇒ right gastric & pyloric nodes
- Greater curvature half of distal stomach ⇒ nodes along the right gastroepiploic chain
- Proximal greater curvature side of stomach ⇒ nodes along the left gastroepiploic or splenic hilum
- Nodes along greater & lesser curvatures ⇒ celiac nodal basin
Innervation

- Gastric secretory and motor function
- Intrinsic
  - Submucosal plexus (Meissner)
  - Myenteric plexus (Auerbach)
- Extrinsic parasympathetic innervation
  - Vagus nerve (Acetylcholine)
    - 75% of axons in vagal trunks are afferent
  - Nerves of Latarjet
  - “crow’s foot”
  - Criminal nerves of Grassi
Physiology of acid secretion

- 1 billion parietal cells
- Stimulation by gastrin, acetylcholine, and histamine
- Basal acid secretion
  2-5 mEq/hr
- Stimulated acid secretion
  15-25 mEq/hr
Evaluation of PUD

- Endoscopy
- Radiologic tests
  - Plain CXR
  - Double contrast upper GI series
  - CT scan
  - MRI
- EUS
- Tests for H. pylori
- Scintigraphy
Helicobacter pylori

- **Serologic**
  - Noninvasive
  - Sensitivity >80%, Specificity 90%

- **Urea breath test**
  - Confirmatory test after 4 weeks of therapy
  - Sensitivity and specificity 90-99%
  - Expensive

- **Histologic test**
  - Sensitivity 80-100%, specificity >95%

- **Rapid urease test**
  - Simple, invasive
  - Sensitivity 80-95%, specificity 95-100%
  - False negatives
Medical Management

- Stop smoking
- Avoid alcohol
- Avoid NSAIDS, Aspirin
- *H. pylori* (+) needs eradication
  - First line triple therapy -> PPI + clarithromycin + amoxicillin
  - Second line treatment -> PPI + bismuth salts + Metronidazole + tetracycline
- *H. pylori* (-)
  - H$_2$ receptor blocker
  - PPI
  - Sulcralfate
  - Antacids
Indications for Surgery

- Bleeding
- Perforation
- Obstruction
- Intractability
  - Definition uncertain
- Suspicion of malignancy
  - Failure of an ulcer to heal after 12 weeks of medical therapy
Goals of Surgery

- Permit ulcer healing
- Prevent or treat ulcer complications
- Address the underlying ulcer diathesis
- Minimize postoperative digestive sequela
Principles of Surgery

- Acid reduction
- Drainage
- Resection and reconstruction
- Omental patch
- Oversewing
Goals of Surgery

- Operation for duodenal ulcer
  - Sectioning the vagus (Vagotomy)
  - Eliminating hormonal stimulation from antrum (Antrectomy)
  - Decreasing the number of parietal cells (Gastric resection)
Vagotomy

- Eliminates direct cholinergic stimulation to acid secretion
- Makes parietal cells less responsive to histamine and gastrin
- Abolishes vagal stimulus for release of antral gastrin
  - Truncal
  - Selective
  - Highly selective (Parietal Cell)
Acid reduction—Vagotomy

- **Truncal**
  - Reduces basal acid output 80%
  - Reduces stimulated acid 50%
  - Abolishes receptive relaxation, Impairs trituration
  - Need drainage procedures
  - Post-vagotomy syndrome

- **Selective**
  - Preserves celiac and hepatic branches
  - Still requires drainage

- **Parietal cell (Highly selective)**
  - Denervates parietal cell mass
  - No need for drainage procedure
Resection

- Subtotal – Reduces basal acid secretion 75%, stimulated 50%
  - Emptying of solid and liquids more rapid
- Antrectomy + vagotomy - remove cholinergic and gastrin stimulus
  - Basal acid secretion abolished; stimulated acid decreased 80%
- Billroth I shows no functional difference compared to Billroth II
Highly Selective Vagotomy vs Antrectomy vs. Drainage

- Mortality and early morbidity highest for V+D, lowest for HSV
  - Avoids opening GI tract
- Incidence of side effects similar for TV+A or TV+D, but significantly lower for HSV
- Recurrence rates significantly lower for TV+A
- TV +D had higher recurrence rate and more unfavorable side effects
Comparative Analysis of Vagotomy and Drainage Versus Vagotomy and Resection Procedures for Bleeding Peptic Ulcer Disease: Results of 907 Patients from the Department of Veterans Affairs National Surgical Quality Improvement Program Database

Sebastian G de la Fuente, MD, Shukri F Khuri, MD, FACS, Tracy Schiffner, MS, William G Henderson, PhD, Christopher R Mantyh, MD, FACS, Theodore N Pappas, MD, FACS

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Vagotomy and drainage n = 518</th>
<th>Vagotomy and resection n = 389</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-d mortality rate</td>
<td>17.95%</td>
<td>17.22%</td>
<td>0.7753</td>
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<tr>
<td>30-d morbidity rate (1 or more complications excluding wounds)</td>
<td>52.51%</td>
<td>50.39%</td>
<td>0.5264</td>
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<tr>
<td>Surgical length of stay in d, mean ± SD</td>
<td>18.48 ± 18.08</td>
<td>20.20 ± 20.81</td>
<td>0.3208</td>
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<tr>
<td>Postoperative wound events</td>
<td></td>
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<tr>
<td>Superficial infection</td>
<td>5.98%</td>
<td>4.11%</td>
<td>0.2082</td>
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<tr>
<td>Dehiscence</td>
<td>5.60%</td>
<td>4.88%</td>
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<td>Deep wound infection</td>
<td>3.09%</td>
<td>6.17%</td>
<td>0.0253</td>
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<td>Postoperative respiratory events</td>
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<tr>
<td>Pneumonia</td>
<td>11.02%</td>
<td>5.93%</td>
<td>0.0089</td>
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<td>Unplanned intubation</td>
<td>10.23%</td>
<td>12.60%</td>
<td>0.2646</td>
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<tr>
<td>Pulmonary embolism*</td>
<td>0.97%</td>
<td>1.03%</td>
<td>1.0000  (Fisher’s exact 2-tail)</td>
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<tr>
<td>Failure to wean &gt; 48 hrs</td>
<td>24.71%</td>
<td>21.59%</td>
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<tr>
<td>Postoperative urinary tract events</td>
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<tr>
<td>Progressive renal insufficiency</td>
<td>2.90%</td>
<td>2.06%</td>
<td>0.4262</td>
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<tr>
<td>Acute renal failure</td>
<td>2.90%</td>
<td>4.37%</td>
<td>0.2336</td>
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<tr>
<td>Urinary tract infection</td>
<td>8.30%</td>
<td>7.71%</td>
<td>0.7469</td>
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<tr>
<td>Postoperative CNS events</td>
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<tr>
<td>CVA*</td>
<td>0.97%</td>
<td>0.77%</td>
<td>1.0000  (Fisher’s exact 2-tail)</td>
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<tr>
<td>Coma*</td>
<td>2.12%</td>
<td>1.03%</td>
<td>0.2933  (Fisher’s exact 2-tail)</td>
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<td>Peripheral nerve injury</td>
<td>0.97%</td>
<td>0.51%</td>
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<td>Postoperative cardiac events</td>
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<tr>
<td>Cardiac arrest</td>
<td>5.79%</td>
<td>7.46%</td>
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<td>Myocardial infarction</td>
<td>2.12%</td>
<td>0.51%</td>
<td>0.0436</td>
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<td>Other postoperative events</td>
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<tr>
<td>Bleeding &gt; 4 U</td>
<td>11.00%</td>
<td>11.83%</td>
<td>0.6996</td>
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<tr>
<td>Graft/prosthesis failure*</td>
<td>0.19%</td>
<td>0.26%</td>
<td>1.0000  (Fisher’s exact 2-tail)</td>
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<tr>
<td>Deep vein thrombosis/thrombophlebitis*</td>
<td>1.93%</td>
<td>1.03%</td>
<td>0.4154  (Fisher’s exact 2-tail)</td>
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<tr>
<td>Systemic sepsis</td>
<td>11.00%</td>
<td>10.54%</td>
<td>0.8237</td>
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*Analyzed with Fisher’s exact 2-tail test.
Gastric ulcer

www.downstatesurgery.org
## Post-Gastrectomy Syndromes

### Clinical Results of Surgery for Duodenal Ulcer

<table>
<thead>
<tr>
<th></th>
<th>Parietal Cell Vagotomy</th>
<th>Truncal Vagotomy and Pyloroplasty</th>
<th>Truncal Vagotomy and Antrectomy</th>
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<tbody>
<tr>
<td>Operative mortality rate (%)</td>
<td>0</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<tr>
<td>Ulcer recurrence rate (%)</td>
<td>5 15</td>
<td>5 15</td>
<td>&lt; 2</td>
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<td>Dumping (%)</td>
<td></td>
<td></td>
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<tr>
<td>Mild</td>
<td>&lt; 5</td>
<td>10</td>
<td>10-15</td>
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<tr>
<td>Severe</td>
<td>0</td>
<td>1</td>
<td>1-2</td>
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<tr>
<td>Diarrhea (%)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mild</td>
<td>&lt; 5</td>
<td>25</td>
<td>20</td>
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<tr>
<td>Severe</td>
<td>0</td>
<td>2</td>
<td>1-2</td>
</tr>
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</table>


- 754 patients undergoing LRYGB
  - 300 patients retrocolic technique
  - 454 patients antecolic technique
- 36 patients (4.7%) required exploration for obstruction
  - 28 (9.3%) retrocolic vs 8 (1.8%) antecolic
  - Internal hernia in 24 vs 3 patients
- Greater incidence of intestinal obstruction and internal hernia in retrocolic group
1990–2001 U.S. General Surgery Chief Resident
Gastric Surgery Operative Experience: Analysis of
Paradigm Shift

N. Joseph Espar, M.D., F.A.C.S., Evan S. Ong, M.D., W. Scott Helton, M.D., F.A.C.S.,
Lloyd M. Nyhus, M.D., F.A.C.S.

### Table 2. The reported U.S. surgical chief resident operative experience of each separate index case category performed for each year from 1990–2001

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<tbody>
<tr>
<td>Gastrostomy—open</td>
<td>2.2</td>
<td>1.9</td>
<td>2.1</td>
<td>2.1</td>
<td>1.7</td>
<td>1.5</td>
<td>1.5</td>
<td>1.6</td>
<td>1.6</td>
<td>1.3</td>
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<td>Gastrostomy—laparoscopic</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.3</td>
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<tr>
<td>Gastric resection—partial, open</td>
<td>3.4</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.1</td>
<td>3.3</td>
<td>2.9</td>
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<td>Gastric resection—partial,</td>
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<td>laparoscopic</td>
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<td>Gastric resection—total</td>
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<td>0.9</td>
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<td>0.8</td>
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<tr>
<td>Vagotomy—open</td>
<td>3</td>
<td>2.8</td>
<td>2.6</td>
<td>2.7</td>
<td>2.4</td>
<td>2.2</td>
<td>1.7</td>
<td>1.5</td>
<td>1.2</td>
<td>1</td>
<td>0.9</td>
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<tr>
<td>Vagotomy—laparoscopic</td>
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<td>0.1</td>
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<tr>
<td>Proximal vagotomy—open</td>
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<td>Proximal vagotomy—laparoscopic</td>
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<td>Repair of perforation—gastric disease</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
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<td>0.9</td>
<td>0.9</td>
<td>1</td>
<td>0.9</td>
<td>0.7</td>
<td>0.7</td>
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<td>Gastric reduction procedure</td>
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<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.9</td>
<td>1</td>
<td>1.1</td>
<td>1.2</td>
<td>1.9</td>
<td>2.3</td>
<td>2.8</td>
<td>3.8</td>
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</tbody>
</table>
Fig. 5. The average reported number of vagotomy procedures performed by U.S. surgical chief residents for each year from 1990–2001.

1) A 45 year-old man requires surgery for intractable duodenal ulcer. Which operation best prevents ulcer recurrence?

A) Subtotal gastrectomy
B) Truncal vagotomy and pyloroplasty
C) Truncal vagotomy and antrectomy
D) Selective vagotomy
E) Highly selective (Parietal cell) vagotomy
1) A 45 year-old man requires surgery for intractable duodenal ulcer. Which operation best prevents ulcer recurrence?

A) Subtotal gastrectomy
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E) Highly selective (Parietal cell) vagotony
2) Advanced gastric outlet obstruction is characterized by which one or more of the following metabolic abnormalities?

A) Hypochloremia and increased urinary chloride

B) Hypokalemia secondary to urinary potassium loss

C) Metabolic alkalosis with alkaline urine

D) Metabolic alkalosis with acid urine

E) Increased serum ionized calcium
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C) Metabolic alkalosis with alkaline urine
D) Metabolic alkalosis with acid urine
E) Increased serum ionized calcium
Questions

3) Which of the following statements is true regarding the surgical therapy of gastric ulcer?

A) A type I ulcer at the incisura is effectively treated by distal gastrectomy without vagotomy

B) A type I ulcer at the incisura is preferably treated by vagotomy and pyloroplasty

C) A type III pre-pyloric ulcer without obstruction is best treated by parietal cell vagotomy

D) Type II ulcers are best treated by subtotal gastrectomy without vagotomy

E) A type I ulcer on the lesser curve near the GE junction is best treated by total gastrectomy
Questions

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E) A type I ulcer on the lesser curve near the GE junction is best treated by total gastrectomy
4) Which of the following is true about the postoperative effects on gastric emptying?

A) Truncal vagotomy delays emptying of liquids
B) Truncal vagotomy accelerates emptying of solids
C) Parietal cell vagotomy does not affect gastric emptying
D) Pyloroplasty accelerates emptying of solids
E) Roux-en-Y gastrojejunostomy delays gastric emptying
Questions

4) Which of the following is true about the postoperative effects on gastric emptying?

A) Truncal vagotomy delays emptying of liquids
B) Truncal vagotomy accelerates emptying of solids
C) Parietal cell vagotomy does not affect gastric emptying
D) Pyloroplasty does not affect emptying of solids
E) Roux-en-Y gastrojejunostomy delays gastric emptying