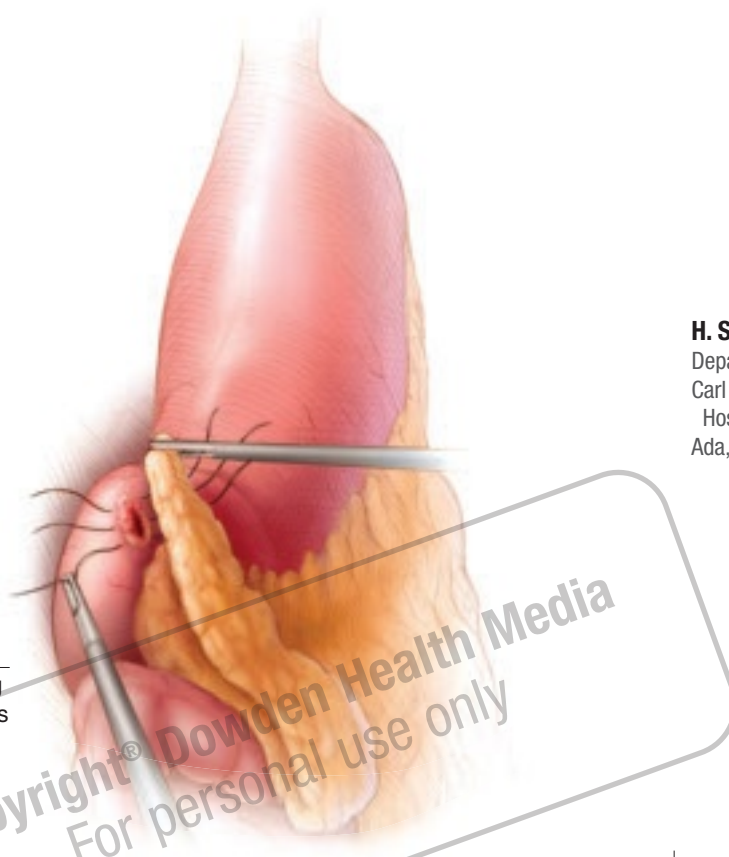


H. Slade Howell, MD
 Department of Surgery
 Carl Albert Indian Health Service
 Hospital
 Ada, OK

FIGURE 1
Graham patch

The Graham patch involves overlying the omental patch along the long axis of the duodenal perforation.

(Illustration by Molly Borman)



When repair is enough for perforated duodenal ulcer

Controversy surrounds the need for additional surgery. Here is a case for a less meddlesome approach.

Three decades of advances in the drug treatment of peptic ulcer disease (PUD) has led to less need for elective PUD surgery. However, the need for surgical treatment of emergency complications of PUD continues to be frequent, challenging, and at times controversial.

Unquestionably, the treatment of upper-GI bleeding associated with ulcer disease has dramatically improved thanks to advances in therapeutic endoscopy. Surgery has become a backup when endoscopy fails or only temporizes the bleeding.

Today gastric outlet obstruction is a rare event. Balloon dilatation is the preferred treatment when medical therapy

fails. The need for surgery can be rare.

A classic yet controversial approach

The classic operation for peptic duodenal perforation is the Graham patch closure (**FIGURE 1**).

Selectively, emergent surgical control of peptic ulcer bleeding and duodenal ulcer perforation has been combined or followed with a definitive acid-reducing procedure. However, this approach can be controversial and fraught with complications. This article examines the rationale of adding a definitive PUD procedure along with an update on the surgical repair of bleeding and perforation associated with PUD.

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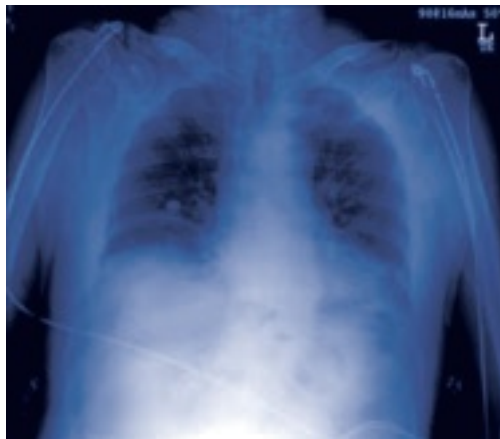
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FAST TRACK

The omentum has the ability to migrate to the inflammatory site for perforated duodenum and seal the perforation.

FIGURE 2
Free subdiaphragmatic air



The finding visible on upright film resulted from the perforated duodenal ulcer.

Case report: Free air on x-ray

A 48-year-old man reported to the emergency department with a 3-week history of nausea and vomiting associated with moderate intermittent epigastric abdominal pain. Laboratory reports included a white-cell count elevated to $20,000 \text{ } 10^3/\mu\text{L}$.

Abdominal and chest x-rays showed right subdiaphragmatic free air on upright films (FIGURE 2). Significant physical findings included abdominal tenderness only

in the right-lower quadrant.

Laparoscopy on the day of admission revealed omentum adherent to the anterior wall of the duodenal bulb (FIGURE 3A). Removing the omental attachment revealed an underlying perforation in the duodenum (FIGURE 3B). Abdominal exploration revealed no other pathology.

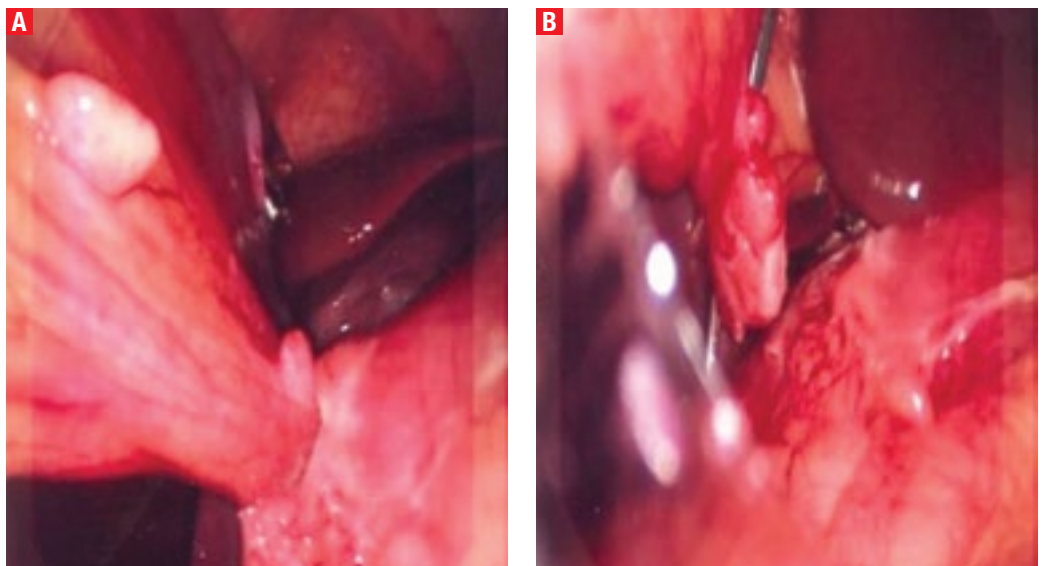
To complete the Graham patch repair, we sutured the omentum over the duodenal perforation, essentially reconstructing its closure. Eighteen months later, the patient had been back at work and doing well.

What causes PUD

Studies have documented an association with cigarette smoking (75%) and abuse of non-steroidal anti-inflammatory drugs (20%–30%) as the primary culprits of perforated duodenal ulcer.¹ Additional risk factors include advanced age, male gender, alcohol abuse, and medically debilitating comorbidities.^{2,3}

The role of *Helicobacter pylori* (HP) as a causative factor of duodenal perforation is less convincing.⁴ However, evidence has shown that eradicating HP following perforation reduces the risk of recurrence.

FIGURE 3
Operative findings



We found the omentum adherent to the anterior wall of the duodenal bulb (A). After we removed the omentum, the duodenal ulcer was visible (B).

How surgery evolved to today's operations

The surgical history of duodenal perforation repair dates to 1929, when C.J. Cellan-Jones in England treated 51 cases of perforated duodenal ulcer with a patch of omentum sutured over the perforation.¹⁵ He developed this technique because of the difficulty in approximating the friable inflamed duodenal tissue.

In 1937, Roscoe Graham of Toronto reported 51 cases treated with omental patch closure in essentially the same fashion.¹⁴ Dr Graham's only technical change was a transverse rather than longitudinal positioning of the omental patch along the long axis of the duodenal perforation, a modification thought to reduce the incidence of duodenal stenosis. Dr Graham also introduced these techniques:

- Resuscitating and warming the patient in preparation for surgery.
- Administering spinal rather than inhaled anesthesia.
- Avoiding suture tension when repairing the perforation.
- Omitting prophylactic drainage of the abdomen.

- Limiting the operation to repairing the perforation and avoiding "meddlesome" surgery, which in that day involved adding a gastroenterostomy.

From the lab of Lester Dragstedt in 1949 came the finding that vagotomy could reduce gastric acid, which paralleled a significant reduction in PUD.¹⁶ Advances in pyloroplasties followed to correct delayed gastric emptying, a side effect of vagotomy.

Resection of the gastric antrum combined with vagotomy followed as a superior drainage procedure, further reducing gastric acid by eliminating the stimulating effect of antrum-produced gastrin. However, antrectomy was linked to gastric bile reflux from conventional gastroenterostomies (Bilroth 1 and 2) and pyloroplasties.

This led to the Roux-en-Y gastroenterostomy, markedly reducing the gastric inflammatory effect of bile reflux. These elective procedures essentially ended with more advanced medical treatments.¹⁷

HSH

One study reported that eradicating HP reduced ulcer recurrence at a year following perforation from 38% to 5%.⁵

Is suture ligation needed?

Operations for PUD have evolved from a rudimentary version of the Graham patch to the highly selective vagotomy (**BOX**), which reduces gastric acid production but has little effect on GI motility.⁶

Surgical procedures for complications of PUD, although still common, are controversial. The incidence of duodenal perforation had not changed from 1979 to 2000.⁷ Most authors still advocate omental patch suture repair of perforated duodenal ulcer,⁸ although many prefer percutaneous drainage and antibiotics in high-risk patients.

Expedient suture ligation of uncon-

trolled bleeding from a peptic ulcer can be life-saving when medication and therapeutic endoscopy have failed.

Is a definitive PUD procedure indicated in addition to suture ligation of the bleeding ulcer or along with patch repair of the duodenal perforation? In the former involving upper gastrointestinal bleeding, the incidence of recurrent bleeding following ligation alone of the perforated ulcer carries a mortality around 30%.⁹

The risk of more surgery

In the case of bleeding peptic ulcer, in addition to suture ligation, the risk of a prolonged and more complicated definitive procedure is justified even though adding the definitive procedure may compound surgical complications.^{10,11}

Of course, the definitive additional

FAST TRACK

The Graham patch for closure of perforated duodenal ulcer was not first described by Roscoe Graham.

30 years ago, a new drug changed PUD treatment

Decades ago, surgery was the mainstay treatment of peptic ulcer disease. The operations were common, swift, and predictable, aided by advances in GI stapling devices.

This all changed 30 years ago. On January 1, 1979, the FDA approved cimetidine (Tagamet, Glaxo SmithKline, Philadelphia, PA), a histamine H₂ receptor antagonist that reduces gastric acid production.¹⁸

This was the first of a series of drugs for treating PUD. Soon H₂ blockers, proton-pump inhibitors, agents acting on the gastric mucosal barrier (sucralfate), and drugs that eradicate *Helicobacter pylori* (HP) followed.¹⁹ These medical advances shifted the elective treatment of PUD away from surgery.²⁰

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Repair of a perforated duodenum is sufficient; an additional procedure is “meddlesome”.

procedure needs to be tailored or even omitted depending on the patient's status. Authors have advocated a definitive procedure in addition to patch closure for the patient with a perforated duodenal ulcer and a history of ulcer disease.⁹

However, later reports from large patient series have shown single-digit recurrence rates following suture repair of the perforated duodenal ulcer alone.^{2,12} For example, a series at a Veterans Administration hospital reported a recurrence rate of 3% at 18 months following patch closure.²

Mortality from perforated duodenal ulcer has ranged from 8% to 50%.^{2,3} This high rate may be due to changing demographics as the disease is occurring in an older and more medically compromised population. Other risk factors have included symptoms lasting more than 24 hours and the addition of a definitive procedure.¹³

The compromised population surgeons deal with carry even higher risks.³ The addition of a definitive acid-reducing procedure following the repair of duodenal perforation seems to add to the risk of mortality and morbidity without appreciably improving the long-term outcome.

Patch closure alone is enough

Our case confirms the natural phenomenon of the omentum migrating to the inflamed

perforation and effectively sealing it. This seems to validate, along with recent literature, an observation Dr Graham made in 1937: Patch closure alone is enough for duodenal perforation in light of the low recurrence rate of PUD.¹⁴ ■

Disclosure

The author has no affiliations to disclose.

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