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Review article

Simplified mini-review of management of recurrent leak after peptic ulcer perforation

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ABSTRACT

Despite the diminishing role of surgical management of peptic ulcer disease with the advent of effective medical anti-ulcer treatments i.e. H2 receptor blockers and proton pump inhibitors, peptic ulcer perforation is still a commonly encountered and serious life-threatening emergency associated with significant morbidity and mortality.

In the modern era, patients suffering from this complication are mostly middle-aged men, and showing rising trend towards increased age and comorbidities resulting in higher morbidity and mortality.

The current common practice in management is simple repair with omental patch. However, leakage after repair may occur and is associated with very high mortality.

Many risk factors have been investigated and incriminated in recurrence of leakage e.g. old age, associated comorbidities, pre-operative malnutrition and hypoalbuminemia, delayed presentation, presence of septic shock, extent of peritonitis, site and size of perforation.

Despite the numerous variable techniques and approaches of management that have been studied and tested for this condition, there is still paucity of consensus or unified protocols of management across surgical practice worldwide. In this review, we try to consolidate present evidence based publications into a simplified scheme of management.

Background

Surgical management of peptic ulcer was a mainstay practice in the past, which dwindled significantly with the advent of H2 receptor blockers and the following more effective proton pump inhibitors (PPIs). Still, peptic ulcer perforation is a very serious and commonly encountered life-threatening complication that usually requires immediate surgical management, and is associated with high morbidity and mortality. In the modern era, patients suffering from this complication were mostly middle-aged men, but today they are showing increased age and comorbidities resulting in higher morbidity and mortality^{1,2}.

The current common practice in management of peptic ulcer perforation is simple repair with omental patch as damage control, which may or may not be followed later by more definitive surgery if required. However, leakage after patch repair may occur in 4% of patients and is associated with very high mortality up to 27% of cases^{1,2}.

Many risk factors for leakage have been investigated like old age, associated comorbidities, pre-operative malnutrition and hypoalbuminemia, time of presentation, presence of septic shock, extent of peritonitis, site and size of perforation¹⁻³.

Diagnosis of recurrent leak

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Recurrent leak usually begins to manifest 5-7 days post-operatively, though it may be delayed further. It may present in classic manifestations i.e., abdominal pain, fever, tachycardia, discharge of bilious content in drain or may be through the wound⁴. However, it may be more insidious and suspected from radiological evidence of Para duodenal collection or purulent free fluid in the abdomen. It may be discovered in post-operative gastroenterography or gastroscope, or surgical re-exploration².

Bilirubin or amylase measurement in drain output could be done in doubtful cases. CT of the abdomen with oral contrast is recommended for more accurate assessment in stable patients⁴.

Management

Management of recurring leak must cover the following lines: (1) Resuscitation of the patient and management of sepsis, (2) drainage of fluid collections, (3) control of fistula with diversion of intestinal, biliary, and pancreatic fluid, and (4) optimization of nutrition and wound care⁴.

Stable patients with no diffuse peritonitis, intra-abdominal hemorrhage, major wound dehiscence, uncontrolled sepsis, clinical deterioration, shock or multiorgan failure can undergo conservative management for 6 weeks initially before decision to shift to surgical intervention or continue conservative management for 3-6 months⁴.

Parameters of stability are hemodynamic stability, absence of fever, elevated leukocytic count or other sepsis markers, stable Liver and kidney functions (prominently albumin level) and electrolyte balance, absence of evidence of intrabdominal collection or deteriorating wound condition and dehiscence, stable nutritional status.

Sepsis should be aggressively treated with the appropriate antibiotics. Broad spectrum coverage is done as well as culture and sensitivity from collections or infected discharge. percutaneous (radiology-guided) drainage of any intra-abdominal abscesses must be done if detected⁴.

Controlling fistula^{4,5}: In *Low-volume duodenal leak* (<200 mL/day), diverting output with an existing paraduodenal drain or placing new drains percutaneously is sufficient. Patients can be managed expectantly as long as their physiology allows. Successful spontaneous closure may ensue.

In *Moderate* (200 to 500 mL/day) or *high-volume* (>500 mL/day) duodenal leaks, the patency

of all existing tubes (the para duodenal drain, T-tube, and duodenostomy tube) should be confirmed. In prolonged high output other potential factors such as corticosteroid use and distal bowel obstruction should be excluded. Early postoperative percutaneous, transhepatic biliary diversion is recommended in such patients if possible. Somatostatin and its analogs decrease fistula output but have little effect on the rate of fistula closure

Optimizing nutrition^{4,5}: In patients who have a feeding jejunostomy tube, enteral nutrition is preferred to Total parenteral nutrition (TPN). however, in patients with a high-volume duodenal leak, it is reasonable to put patients on TPN for a short time to determine if ceasing enteral feeding would reduce or stop the duodenal leak. If not, enteral feeding should resume.

Unstable patients require urgent surgical management:

The general rules (Do's and Don'ts) of management^{4,5}:

- Avoid primary closure in defects > 2cm, bad tissue condition, hypoalbuminemia or hemodynamic instability.
- Avoid any anastomotic repair in haemodynamic instability / inotrope use. Loops can be closed and left blind until stabilization of the patient.
- Avoid creating a duodenal stump unless necessary. If so: drain the stump using a duodenostomy / double track drainage
- Always leave the patient with three tubes (with a possible addition of a fourth): (1) Gastrostomy/ duodenostomy (according to site of leakage – lateral or retrograde duodenostomy is better than end duodenostomy). (2) Feeding jejunostomy. (3) Paraduodenal drain: closed suction drain in dependent position is preferred. (4) Biliary drainage (T-tube) is added in patients who are at risk of high output duodenal fistula (large duodenal defect / difficult repair), with poor nutritional status or weight loss.
- Remember: You often regret not placing drains, but never regret placing them!
- All repairs or closures must be buttressed

Scheme of management

In Small defect <2cm, primary closure can be attempted. A primary repair should be buttressed

with either healthy, vascularized adjacent tissue e.g., the omentum “modified Graham’s patch”, serosal wall of jejunum “Thal patch”, or fibrin sealant ^{4,6}.

Suture type: most studies report using 2/0 silk sutures in interrupted full thickness bites in the healthy margin, underrunning the defect. Vicryl is also reported ^{4,6}.

In Large defects > 2cm or unhealthy/ bad conditions of local tissue, damage control measures are recommended ⁴⁻⁶:

- Duodenostomy / gastrostomy tube / double track drainage ± biliary diversion
- Paraduodenal drain
- Feeding jejunostomy tube
- Handling of the defect: closure over duodenostomy tube “end duodenostomy” Or (**better**) to use decompressive “lateral or retrograde duodenostomy” while the defect is repaired as best possible “primary repair, graham’s or Thal patch”

Double track drainage ⁴ is an alternative to duodenostomy, where simple loop anastomosis of the jejunum to the defect is done to drain the duodenum

Pyloric or duodenal exclusion is reserved for cases with large untenable repairs or where reconstruction / resection of the stomach is unavoidable ^{4,5}.

Complex definitive surgical reconstructions e.g., Roux en Y duodenojejunostomy should be reserved for stable patients with good nutritional index, general condition and local tissue condition ^{4,5}.

Post operative

Enteral feeding should be started as soon as possible after surgery. Stool passage is not required before initiating tube feeds and can start “trophic” tube feeding at a low rate as soon as resuscitation is complete ⁴.

PPI: Some studies show better efficacy of esomeprazole (Nexium) compared to pantoprazole or lansoprazole ⁷.

An upper gastrointestinal contrast study is done on the fifth postoperative day in patients with normal stomach and duodenum continuity (no exclusion). If no evidence of a duodenal leak → duodenostomy tube (DT) can be clamped.

No evidence of a leak two days after clamping → the para duodenal drains can be removed.

DTs are not removed until six to eight weeks after the surgery to ensure formation of a tract ⁴.

In patients with pyloric/ duodenal exclusion → contrast study via lateral or retrograde DT and/or computed tomography can be done alternatively ⁴.

Notes

Percutaneous biliary drainage (PTD) can be done post-operatively if needed or if T-tube placement intra-operatively was not feasible. However, it will be extremely difficult for the radiologist to cannulate the non-dilated biliary tract ⁴.

Likewise, DT and para duodenal tubes can be placed percutaneously under radiological guidance if needed or displaced post-operatively

Tubes that need to be available intra-operatively: T-tube, Malecot or other Pezzer-type tubes that can be used as gastrostomy/ duodenostomy, a combined gastric and jejunal tube (e.g., Moss tube) that may be used as both feeding jejunostomy and retrograde duodenostomy without the need for a second enterotomy ⁴.

Options to consider or research

- Gastrin level measurement in recurrent ulcer perforation or complications to exclude Zollinger-Ellison syndrome.
- Negative pressure assisted management of fistula with open abdomen ⁸.
- New generation PPI i.e., dexlansoprazole and whether I.V preparations can be available ^{9,10}.
- Endoscopic intervention or endoluminal vacuum therapy ⁴.

Technical clarifications

Graham’s patch (figure 1) means plugging the defect using a piece of omentum (NOT PRIMARY REPAIR). It can be done in two ways: (1) Multiple (three) interrupted full thickness sutures are passed across defect, the omentum patch is spread overlapping the defect margins all around, then the sutures are tied over the omentum to close the defect only tight enough to hold the patch in place ⁶.

(2) An alternative technique is to plug the defect from the inside i.e., push the tip of the nasogastric tube outside the defect, tie the omentum

to it then pull it inside the stomach / duodenum to plug the defect and tie the sutures over it ¹¹.

A disadvantage of Graham's patch is that it may lead later to gastric outlet stenosis or obstruction ⁶.

Modified Graham's patch (figure 2) is a modification of the above technique where the defect is repaired primarily then covered by the omental patch, and the tails of the tied sutures are tied over the omentum ⁶.

A debated disadvantage of this technique is the patch is not well abutting the repair with the knot in between forming a potential plane in between, thus negating the benefit of the patch reinforcement. A better modification may be to add further and wider interrupted sutures before closure of the defect, to be tied separately over the patch. Another practiced modification is to fix the patch over the repair with all around seromuscular sutures ⁶.

Essential conditions to apply Graham's or modified Graham's patch are that the omentum must be healthy, well vascularized, non-edematous, not under tension or weighing down on the repair site. It could be hitched by a stay suture to another structure to bear its weight to avoid pulling on the repair area.

Thal patch (figure 3) means closure of the defect or reinforcing the repair using the serosa of the jejunum

Pyloric / duodenal exclusion involves closing the pylorus with creating a gastrojejunal anastomosis for gastric drainage. It can be performed in several ways: (1) through gastrotomy along the greater curvature (or through the defect itself in case of gastric ulcers) through which the pylorus can be grasped and sutured closed with a nonabsorbable suture. The gastrotomy can then either be closed primarily or used to complete the gastrojejunostomy. (2) Using a noncutting stapler across the pylorus, although care must be taken to avoid misfire across the proximal duodenum ¹². If a cutting stapler is used, the stump should be buttressed and drained (see before).

Duodenostomy tube (DT) can be placed in multiple methods:

Figure 1: illustration of Graham's patch technique ⁶

(1) *End duodenostomy* ⁴ (figure 4) is when the tube is brought out through the duodenal defect which is closed around it. It's the least preferable technique (more prone to leakage, chronic duodenal fistula)

(2) *Decompressive DT* – either *lateral* or *retrograde* are preferred ⁴. Lateral DT is brought out separately through the lateral duodenal wall. Omentum may be used to enforce the opening to avoid leak around it (figure 5).

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Retrograde DT is inserted through the proximal jejunum and threaded proximally to reach the duodenum, which is the most preferred method by most surgeons.

Reconstruction techniques: Simple loop gastrojejunostomy is the preferred method when reconstruction is required in gastric ulcer cases ⁶. While in duodenal defects, **Roux-en-Y duodenojejunostomy** is the method of choice ⁴.

In simple loop gastrojejunostomy, its preferred that the afferent limb is on the right side and the efferent limb is on the left side (isoperistaltic) ⁶.

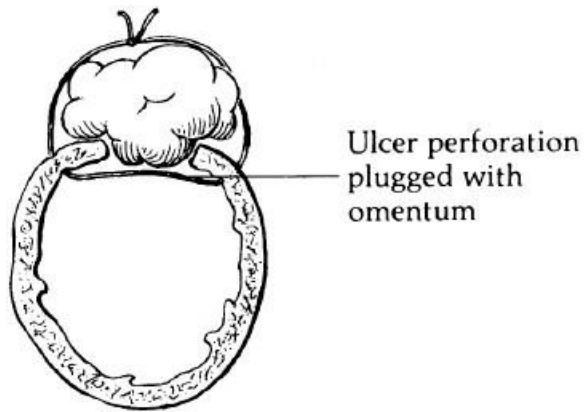


Figure 2: Modified Graham's patch technique 6

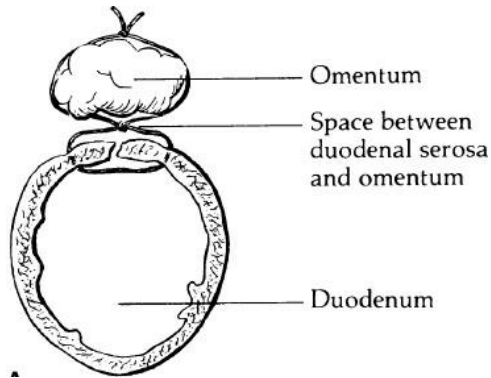


Figure 3: Thal patch technique for repair of duodenal leak 6

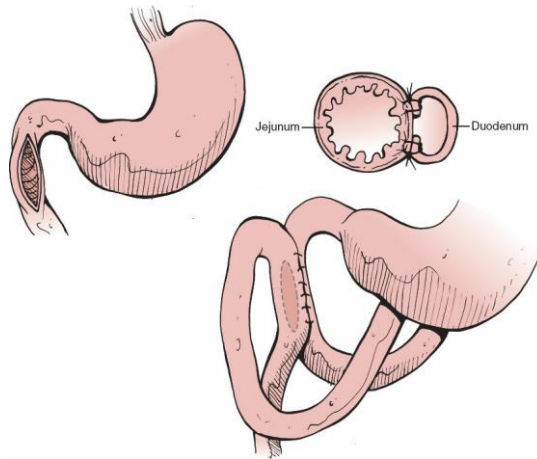
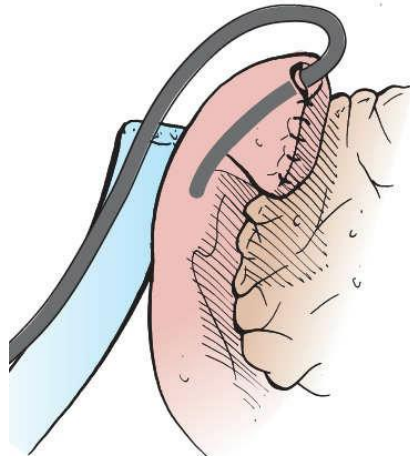
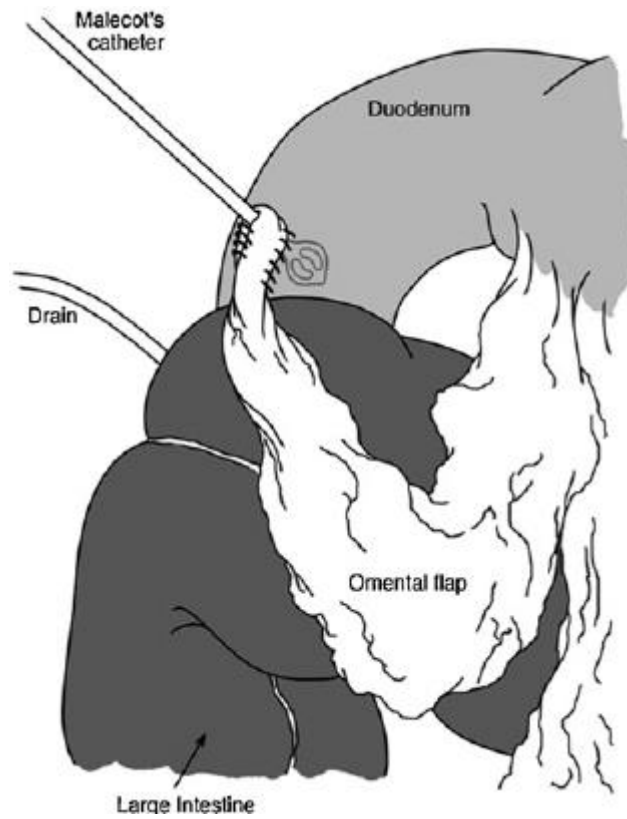


Figure 4: end duodenostomy⁶Figure 5: lateral duodenostomy with omental patch reinforcement¹³

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