Repair of duodenal fistula with rectus abdominis musculo-peritoneal (RAMP) flap

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Technique

Large duodenal defects/fistulae are difficult to repair, due to complex duodenal anatomy. Musculo-epithelial flaps are conventionally used for reconstruction of large soft tissue defects. We report the clinical use of rectus abdominis musculo-peritoneal (RAMP) flap for repair of duodenal fistulae. Methods: Eight patients with duodenal fistulae underwent repair using right RAMP flap, based on the position of the superior epigastric artery. Feeding jejunostomy was done routinely to start early enteral feeding. Results: Duodenal fistulae healed within 3-5 days in all the cases except one, in whom bile continued to leak for 30 days. One patient died within 12 hours of second surgery. Superficial wound infection was a common (n=3) cause of morbidity. Conclusion: RAMP flap for closure of duodenal defect is a simple, technically easy and dependable procedure, which can be performed quickly in critically ill patients. It can be used for repair of large duodenal defects with friable edges when omentum is not available or when other conventional methods are impractical. [Indian J Gastroenterol 2004;23:143-144]

Key words: Duodenal ulcer surgery

Large defects in the duodenal wall caused by trauma, giant perforation and duodenal fistulae are challenging problems. These defects are technically difficult to repair due to the duodenum’s complex anatomy and marginal blood supply shared with the pancreas. High intraluminal pressure, tendency of the mucosa to extrude through the suture line, and autodigestive enzymes of the pancreas and bile add to the risk of breakdown of suture line. Rectus abdominis musculo-cutaneous flap is a popular procedure for breast reconstruction and repair of chest wall defects. This is the first report of clinical use of rectus abdominis musculo-peritoneal (RAMP) flap for the repair of duodenal fistulae.

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Using Graham’s omentopexy, but duodenal fistula developed within 48-72 hours postoperatively.

Patients were re-explored through the same incision within 48 hours of detection of leakage, and duodenal fistula was located. Right RAMP flap, based on superior epigastric artery, of sufficient length to reach easily up to the fistula, was harvested from the peritoneal surface. The peritoneal island was planned slightly bigger than the defect in the duodenum. An oval incision was made in the peritoneum and muscle was isolated from the ventral surface, just above the level of umbilicus. The flap containing the muscle covered with peritoneal island was sutured to edges of the fistula with interrupted Vicryl 2-0. The resultant defect in the posterior rectus sheath was closed primarily with Prolene 1-0. Feeding jejunostomy was added routinely to start early enteral feeding. A tube drain was kept next to the closure and brought out of the right flank, and abdomen was closed in layers.

Postoperatively, parameters of sepsis-induced multiple organ failure and amount of bilious discharge through the right flank drain were looked for. Healing was defined as cessation of bilious fluid in the drain. All patients were followed up for at least 6 months, to look for incisional hernia and gastric outlet obstruction.

Results

Duodenal fistulae healed within 3-5 days in all cases except one, in whom bile continued to leak for 30 days. One patient died within 12 hours of second surgery; death was secondary to pre-existing sepsis-induced multi-organ failure syndrome. Superficial wound infection was a common (n=3) cause of morbidity. Complete wound dehiscence (burst abdomen) was seen in one patient, and incisional hernia from the laparotomy incision was seen after 6 months in another patient. None of the patients had gastric outlet obstruction.

Discussion

Conventional wisdom dictates that healthy vascularized tissue should be incorporated in the repair of any defect with tissue loss or with friable edges. This is reflected in the wide range of operations available for the repair of large duodenal wall defect, ranging from closure by omental implantation or patch, falciform ligament, jejunal
serosal patch technique, or Roux-en-Y duodenal-jejuno-
ostomy. Other options are excision or diverticulization 
of duodenum, including partial gastrectomy or gastric 
dissociation and rarely pancreatico-duodenal resection. 
A majority of duodenal defects are best closed by an 
omentum or plug, but in a re-do operation omentum 
may not be available, and in a seriously ill patient 
it is not advisable to perform time-consuming surgical 
procedures like partial gastrectomy, serosal patching, or 
Roux-en-Y duodenal-jejunoanostomy.

Experimental studies using musculo-epithelial flap 
in animals for closure of duodenal defects have shown 
that there is early digestion of epithelium in the flap, 
with re-epithelialization from the edges of the defect 
and metaplastic adaptation of epithelium into neomucosa 
by 8-12 weeks. There may be some contraction 
of the defect but not enough to compromise the lumen 
of the duodenum. Rectus abdominis has a constant 
and reliable vascular pedicle, making it a popular and 
versatile flap. As the pedicle of a superiorly based flap 
enters high up in the abdomen, there is no risk of bowel 
loop twisting around this flap and causing obstruction; an 
inferiorly based flap is avoided for this reason. There is 
no additional weakness of the anterior abdominal wall 
because only a small portion of the posterior rectus 
sheet is taken, which is closed primarily.

Our department deals with about 90-110 peptic 
perforations every year. Our policy of dealing with a 
leaked repair was using an omental plug when healthy 
omentum is available or using a jejunal serosal patch 
repair when healthy omentum is not available. Dissecting 
out the jejunum in the presence of adhesions present 
at re-laparotomy is difficult. During the period of this 
study, 16 of 188 perforations repaired leaked; 8 of these 
were managed by using an omental plug as healthy 
omentum was available and 8 were managed by RAMP 
because healthy omentum was not available and adhesions 
presented the use of jejunal serosal patch repair. We 
have successfully used right RAMP flap for surgical 
closure of duodenal fistulae in 8 patients; however, 
in case a right para-median incision was used in the 
earlier exploration, left RAMP can be used.

One of our earlier patients had delayed healing 
with leakage of bile lasting 30 days; this could be 
attributed to suture technique error, as the right upper corner 
stitch is difficult to apply. Learning from this, we switched 
successfully to using the “parachuting” technique for 
applying the flap to the duodenal defect.

At first glance, our results (mortality in 1/8, superf-
ficial wound infection in 3, complete wound dehiscence 
in 1, and incisional hernia in 1) may appear suboptimal; 
but, it reflects the poor general condition of the 
patients undergoing a second major operation after sur-
viving a duodenal perforation closure. It is worthwhile 
mentioning that due to infrastructural and financial 
constraints these patients were managed in general 
surgical wards without the benefit of ventilatory sup-
port or total parenteral nutrition.

In conclusion, RAMP flap can withstand the dig-
estic activity of the duodenal contents and encourages 
healing due to its good blood supply. Using RAMP 
flap for closure of duodenal defect is a technically easy 
and dependable procedure, which can be performed 
quickly in critically ill patients. The prime indication 
for this operation would be large duodenal defect with 
fragile edges when omentum is not available or when 
other conventional methods are impractical due to ad-
hesions or poor general condition of the patients.

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Received December 11, 2003. Received in final revised form 
March 29, 2004. Accepted April 18, 2004