

Assessment of duodenal circular drainage in treatment of superior mesenteric artery syndrome

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Abstract

AIM: To assess the clinical value of duodenal circular drainage for superior mesenteric artery syndrome (SMAS).

METHODS: Forty-seven cases of SMAS were treated with duodenal circular drainage from 1959 to 2001. Clinical data were analyzed retrospectively.

RESULTS: In this group, good effects were achieved in 39 cases treated with duodenal circular drainage after 2-15 years of follow-up. The other eight cases were first treated with anterior repositioning of the duodenum (two cases), duodenojejunostomy (five cases), subtotal gastrectomy and Billroth II gastrojejunostomy (one case), but vomiting was not relieved until duodenal circular drainage was performed again. A follow-up study of 8-10 years revealed satisfactory results in these eight patients.

CONCLUSION: In SMAS, if the reversed peristalsis is strong and continuous, and vomiting occurs frequently, the symptom can not be relieved even if the obstruction of duodenum is removed surgically. The key treatment is the relief of reversed peristalsis. The duodenal circular drainage can resolve the drainage direction of duodenal content, thus relieving the symptom of vomiting.

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Key words: Duodenum; Superior mesenteric artery syndrome; Circular drainage operation

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INTRODUCTION

The pathogenesis of superior mesenteric artery syndrome (SAMS) is so complicated^[1-3] that there are different operations for treating SAMS^[4-7], such as ligament of Treitz amputation, gastrojejunostomy, subtotal gastrectomy and Billroth II gastrojejunostomy, duodenojejunostomy, anterior reposition of the duodenum, duodenal circular drainage operation, *etc*^[8-10]. The last one of all these procedures is suitable for the patients who have failed in other operations or have stronger and continuous reversed peristalsis^[11]. Among a total of 108 patients with SAMS who received operations, 47 patients were treated with duodenal circular drainage from 1959 to 2001 in the Second Affiliated Hospital of Harbin Medical University.

MATERIALS AND METHODS

Patients

This study included 28 men and 19 women, aged from 16 to 50 years (average 29), including 38 patients aged 16-35 years. The clinical course of the diseases lasted 2-11 years, averaging 3.5 years.

Clinical characteristics

The onset of SAMS was slow in all 47 patients. The symptoms were upper abdomen expanding, dull and bursting pain. The pain may present in upper abdomen, upper left or right of umbilicus and right hypochondrium, which was not relieved after body position change. The vomiting could be triggered by eating and drinking. Body position change (knee-chest position) did not make any difference. The vomit contained bile-stained material and no dejection smell. Six patients were misdiagnosed as having obstruction of pylorus (five patients were misdiagnosed by other hospitals) and 14 patients had ejecting vomiting. Three patients were misdiagnosed as having gastric cancer because of severe dehydration and disorder of electrolyte induced by a high frequency of vomiting.

All patients suffered from severe dehydration, disorder of electrolyte and loss of weight. The patients weighed from 45-53 kg in 28 men and 40-42 kg in 19 women. The patients' upper abdomen was distended and lower abdomen was plainness. There were no abdominal muscle guarding and obviously tenderness, but shaping of the stomach and succussion splash occasionally. There was no change of borhorygmus.

Laboratory examination

Obvious expansion in stomach, and descending and



Figure 1 Barium X ray study in duodenal circular drainage operation.

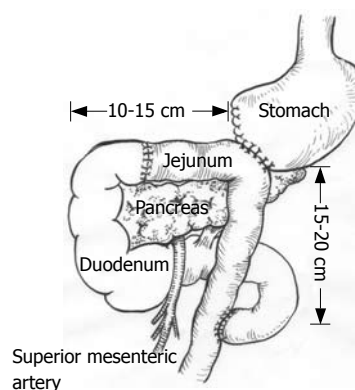


Figure 2 Duodenal circular drainage operation.

transverse portion of duodenum were found in all the patients in barium X-ray study. The barium was delayed in the ascending portion of duodenum which looked like pen trace (Figure 1). The reversed peristalsis of duodenum was much stronger than direct peristalsis. It looked like the movement of pendulum, and barium could reverse to stomach. If the patients were put in prone position, a smaller portion of barium could go through the obstructive site and enter into jejunum. Five patients had histories of peptic ulcer at the same time. Duodenum expanded obviously, reaching 7.5 cm-8 cm in diameter, in 26 patients with SMAS.

Duodenum air charge test in operation

A total of 108 SMAS patients received duodenum air charge test in operation. After interdiction duodenum with an elastic tourniquet, about 200-400 mL air was injected into the proximal duodenum. The diameter of duodenum expanded to 5.5 cm-6.0 cm was considered as light expansion, 6.5 cm-7.0 cm as moderate expansion, and 8 cm or broader as severe expansion. In our group, the duodenum expanded to 8 cm in 47 patients.

Operation

All the 47 patients received duodenal circular drainage operation finally. Two patients received anterior reposition of the duodenum and gastrojejunostomy and five patients underwent duodenojejunostomy before receiving this operation. Vomiting was not alleviated after these procedures in these patients, and they received duodenal circular drainage operation 3-6 mo after the first surgery. One patient suffered from duodenal partial obstruction after subtotal gastrectomy and Billroth II gastrojejunostomy, which induced obstructive jaundice and suppurative cholangitis because the bilious and pancreatic liquid can not be drained easily. The reason was that when duodenal nub was closed, a bowel segment was formed between duodenal nub and the position compressed by the duodenum. The patient was cured after duodenal circular drainage operation two mo after the first operation.

Operational methods

Under epidural anesthesia or general anesthesia with tracheal intubation, midline incisions were made in upper abdomen in all patients. We performed duodenum air charge test first. If the duodenum was distended and

widened obviously to 8 cm or wider, distal stomach should be resected, and if the patients had gastric ulcer, subtotal gastrectomy should be performed. Afterwards the jejunum should be cut off 10 cm-15 cm from ligament of Treitz (sometimes 20 cm according to blood vessel supply). Distal jejunum was drawn through mesentery of transverse colon and was retrocolically anastomosed end to end with duodenal cap. Half length stomach (about 5 cm) was anastomosed to jejunum end to side 10 cm-15 cm from the jejunum-duodenal cap anastomosis. Finally proximal jejunum was anastomosed with distal jejunum end to side 15 cm-20 cm below the gastrojejunostomized stoma. The incision was stitched after washing of abdominal cavity (Figure 2).

RESULTS

All 47 received gastroenteric X-ray test (60-100 mL of 76% meglumine diatrizoate injection or 200 mL barium was taken orally). Contrast agent could pass the gastroenteroanastomosed stoma and jejunal-jejunostomized stoma successfully. No stricture of anastomotic stoma was found in our group. The contrast agent was refluxed to the end to end duodenal cap anastomosis in 6 patients. Meglumine diatrizoate injection (76%) was administered in 2 cases after 10 min. Barium was influxed to the jejunum, and some was refluxed to the end to end duodenal cap anastomosis, and partly refluxed to stomach. Six patients had bile refluxed gastritis 20-25 d after operation. The symptom disappeared after one month treatment with pectous bismuth and domperidone. The contrast agent was administered to the jejunum and no reflux was found in barium X-ray study in other patients. Reverse peristalsis disappeared in all patients finally.

All patients were released from symptoms in our group 10-15 d after operation. All patients had a good status in a follow-up study of 2-15 years. The ratio of follow-up was 100%, including 47 cases followed within two years. No abdominal expanding, pain and vomiting occurred. The weight increased by 8 kg in 25 patients, 5 kg in 15 patients and 7 kg in 3 patients. Gastroenteric barium X-ray studies showed no stricture in two anastomosed stomas and no contrast agent reflux was observed in these cases (Figure 3). Thirty-eight (80.9%) patients were followed in the third year and no abdominal pain or expanding and vomiting were found and appetite all became normal, with weights



Figure 3 Barium X ray study after duodenal circular drainage operation.

of 60-64 kg in male patients and 46-51 kg in female. In 21 patients who received ultrasonic examination, no obvious expansion was found in duodenum, the diameter of duodenum being 3 cm-5 cm. Eighteen (38.3%) patients have been followed up to the present. Eight patients had received other operations before the duodenal circular drainage operation. A follow-up study of 8-10 years revealed good effects in these patients. No abdominal pain, expansion, and vomiting were found in all the 18 patients and all with normal appetite. Gastroenteric barium X-ray study showed no stricture and ulcer in two anastomosed stomas and no contrast agent reflux was observed in these cases. The weight was 60-64 kg in male patients and 45-51 kg in female. No obvious expansion was found in duodenum in the 18 patients, the diameter of duodenum being 4-5 cm^[12-14].

DISCUSSION

Theoretic basis and indications for duodenal circular drainage operation

The movements of duodenum are complicated and the most important movements are reversed peristalsis and direct peristalsis^[15-18]. The direct peristalsis is greater than reversed peristalsis under normal circumstances. Complete or partial obstruction could be induced when the ascending portion of duodenum was compressed by superior mesenteric artery^[19-22]. The reversed peristalsis is greater than the direct peristalsis, which is the most important reason inducing opening of pyloric duct^[23,24]. The patients may suffer from frequent vomiting in such situation^[25-27]. If reversed peristalsis exists continually and chronically, the reversed peristalsis will be hardly eliminated. Releasing from obstruction by operation can not alleviate clinical symptoms because the strongly reversed peristalsis still exists. Therefore, emphasis should be laid on eliminating the reversed peristalsis to alleviate frequent vomiting. Duodenojejunostomy is commonly used but can not stop the vomiting while duodenal circular drainage operation can manage the drainage direction of duodenal contents. When duodenum takes peristalsis directly, the duodenal contents could only partly enter into jejunum through anastomosis of proximal and distal jejunum. When the strongly reversed peristalsis with the duodenal contents could come into jejunum completely

through anastomosis of distal jejunum and duodenal cap, the vomiting is eliminated completely^[28-30].

Indications for duodenal circular drainage are as follows: (a) the history of the disease is up to 2 years, especially 5 years; (b) frequent vomiting, no obvious abdominal pain but marked abdominal distention after eating. The pain may be alleviated after vomiting; (c) the vomiting can not be alleviated by changing body position (prostrate position after eating), it may result from chronic reversed peristalsis; (d) the descending and transverse portion of duodenum is markedly expanded and show strong and frequent reversed peristalsis in barium X-ray test, pyloric duct is opened, the stomach is expanded and atonic; (e) the cavity of duodenum was expanded to 8 cm or more in air charge test, and the pressure of duodenum is 15-17 cm H₂O; and (f) the patients are not cured after duodenojejunostomy and anterior reposition of the duodenum. Duodenal circular drainage should conform to the indications above. If the patients do not meet with these indications, duodenal circular drainage can induce disorder of duodenal function.

Assessment of duodenal circular drainage

Duodenal circular drainage can eliminate frequent vomiting induced by chronic reversed peristalsis in SMAS. The ulcer focus and most of gastric body can be resected (gastrojejunostomy similar to Billroth II) if the patients suffer from the ulcer intercurrently. The operation also can eliminate blind end between anastomosis and obstructive site after duodenojejunostomy and can not induce blind loop syndrome. No ulcer or stricture of anastomosis occurred in our group.

There are still several disadvantages of duodenal circular drainage operation. The operation is complicated as compared with duodenojejunostomy, and the patients may suffer from more damages as a result of the operation; small stomach syndrome and anemia can be induced by resection of most gastric body; the mucous membrane of alimentary tract can not be nourished by gastrin after resection of gastric antrum; and bilious reflux gastritis may occur after resection of sphincter of pylorus. A few patients had bilious reflux gastritis in our group and recovered within one month.

COMMENTS

Background

Superior mesenteric artery syndrome (SMAS) is an uncommon disease which can result in postprandial epigastric pain, nausea, vomiting, anorexia and weight loss. The pathogenesis of SMAS is ascribed to compression of the third part of the duodenum in the angle between the aorta and the superior mesenteric artery. If conservative management fails, surgical options should be applied.

Research frontiers

Conservative therapy with nutritional supplementation is the initial treatment, and surgery is reserved for those who do not respond to medical therapy. The main character of the SMAS is that the reversed peristalsis is greater than the direct peristalsis, which is the most important reason inducing the symptoms. If reversed peristalsis exists continually and chronically, the reversed peristalsis will be hardly eliminated. Only releasing from obstruction by operation can not alleviate clinical symptoms because the strong reversed peristalsis still exists. Therefore, emphasis should be laid on eliminating reversed peristalsis to alleviate frequent vomiting.

Related publications

Surgical options include open or laparoscopic duodenojejunostomy or ligament of Treitz amputation, gastrojejunostomy, subtotal gastrectomy and Billroth II gastrojejunostomy, duodenojejunostomy, anterior reposition of the duodenum, duodenal circular drainage operation, and so on. SMAS is associated with a wide range of predisposing conditions and surgical procedures, more studies are needed to better define the optimal treatment for this disease.

Innovations and breakthroughs

We and many other authors had performed other operations for SMAS. However, some patients showed bad results, especially those with stronger reversed peristalsis. So we designed the operation of duodenal circular drainage. In practice, the operation achieved good results in most patients. All patients showed good status during a follow-up study of 2-15 years.

Applications

Forty-seven cases of SMAS were treated with duodenal circular drainage operation from 1959 to 2001 and had good effects after 2-15 years of follow-up.

Terminology

Duodenal circular drainage: A kind of operation we designed to treat SMAS. The distal jejunum is retrocolically anastomosed with duodenal cap end to end. Half length stomach is anastomosed to jejunum end to side 10 cm-15 cm from the jejunum-duodenal cap anastomosis. Proximal jejunum was anastomosed with distal jejunum end to side 15 cm-20 cm below the gastrojejunostomized stoma.

Peer review

The manuscript evaluates the clinical value of duodenal circular drainage operation for superior mesenteric artery syndrome. The method is simple and correct. Discussion is well organized and conclusions are valuable.

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