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# Symptomatic duodenal Crohn's disease: Is strictureplasty the right choice?

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**Abstract**

Primary duodenal localization of Crohn's disease (CD) is rare. Medical therapy can control symptoms, but surgery is required when progressive obstructive symptoms occur. Surgical options include bypass, resection, or strictureplasty, but it is still not clear which should be the treatment of choice. Reviewing the medical records of 1253 patients undergoing surgery for CD between January 1986 and December 2011 at the Digestive Surgery Unit of the Department of Clinical Physiopathology of the University of Florence, 10 patients (6 males and 4 females) underwent operations for duodenal CD. Four patients had only a duodenal localization, 6 patients had synchronous involvement of other intestinal tracts. Strictures were distributed in all the duodenal portions: in 7 patients there were single lesions, in 3 patients there were multiple lesions. Eight patients were treated with strictureplasty: 5 with the Heineke–Mikulicz technique, 2 with Jaboulay, and 1 with a pedunculated jejunal patch. Two patients were treated with resection: one with a B2 gastro-duodenal resection, and 1 with a duodenal–jejunal resection and an end to side duodeno-jejunal anastomosis. Follow up of the patients was from 2 to 18 years. No recurrence of duodenal CD was observed in the 2 patients treated with resection, while 2 of the 8 patients treated with strictureplasty had a recurrence. In our experience, strictureplasty is indicated when less than 2 strictures are present in the 2nd or 3rd duodenal portion. In cases with multiple strictures localized in the 1st or the distal duodenal portion, resection is preferable.


## 1. Introduction

Primary duodenal localization of Crohn's disease (CD) is rare if compared with small bowel or large bowel localization.[1] The incidence of duodenal involvement of CD varies from 0.5 to 4.0% of all the patients affected by CD, but most duodenal

*Abbreviations:* CD, Crohn's Disease; TPN, Total parenteral nutrition; H–M, Heinecke–Mikulicz; SSIS, side-to-side isoperistaltic strictureplasty; UGI, Upper gastro-intestinal; PPI, Proton-Pump Inhibitors.

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lesions are asymptomatic and incidentally discovered during gastroduodenoscopy.[2,3] Symptoms of duodenal CD, such as epigastric pain, nausea, vomiting, and progressive weight loss, happen only when there are severe strictures of the duodenal wall. In the majority of the patients, other intestinal sites affected by CD are evident at the time of diagnosis, or will occur some years later. Medical therapy can control symptoms, but surgery is required in more than one-third of the affected patients. The most frequent indications for surgery are progressive obstructive symptoms.[2] Surgical options include bypass, resection, or strictureplasty.[4,5] It is not clear which of these should be the treatment of choice: bypass is a relatively simple method, but there are concerns for peptic ulcer or persistence of the disease in the excluded duodenum; resection may be difficult, with a risk of complications such as pancreatitis or lesions of the papilla of Vater; strictureplasty can preserve the activity or promote recurrence of stricture or gastric inertia. We have revised our experience with duodenal CD over the past 25 years: patients were prevalently treated with strictureplasty. This study presents the immediate and long-term results.

## 2. Methods

A retrospective review was conducted on the medical records of 1253 patients undergoing surgery for Crohn's disease between January 1986 and December 2011 at the Surgery Unit of the Department of Clinical Physiopathology of the University of Florence. The data were collected from chart records and operating room registers. In the chart records we observed: gender, age, familiarity, smokers/non-smokers, duodenal location as initial or metacronous, symptoms, extra-intestinal manifestations of CD, anemia, weight loss, malnutrition, pre/post-operative medical therapy, pre/post-operative artificial nutrition, indications for surgery, postoperative mortality, morbidity rates, and long-term recurrence. In the operating room registers we observed: localization and morphology of the disease, and type of surgery, especially the number and types of strictureplasties performed. The patients were followed up periodically, by means of laboratory and/or instrumental exams, when necessary.

### 2.1. Patients

Ten patients (6 males and 4 females, with an age at surgery ranging from 18 to 49 years, 35 years as mean) underwent operations for duodenal CD. No familiarity of CD was recorded. Five patients were smokers. All the patients complained of epigastric pain, vomiting, and progressive obstruction. Six patients showed signs of severe malnutrition, such as hypoalbuminemia, hypo-pre-albuminemia, and lymphocitemia ($<1000$). Four patients were affected by hyposideremic anemia. The symptoms were refractory to several attempts of medical therapy: 1 patient was treated with 5-ASA only, 3 patients were treated with steroids, 3 with steroids plus 5-ASA, 2 with steroids plus Azathioprine, and 1 with steroids, Azathioprine, and Thalidomide. When signs of malnutrition were found, 6 of the patients were treated before the operation with a TPN for a period of time ranging from 5 to 8 days.

Seven patients had a duodenal localization as the first manifestation of CD. One of them had been treated in another center, 17 years before, for a diffused duodenal–jejunal and ileal CD with a Heineke–Mikulicz (H–M) strictureplasty on the 2nd portion of the duodenum, a duodeno jejunal bypass for multiple stenoses in jejunum, and an ileo-cecal resection. This patient was hospitalized for recurrent strictures of the 3rd and 4th duodenal portion. Three patients had duodenal CD after prior operations for colonic (2) or ileal (1) CD.

### 2.2. Surgical technique

At surgery, a complete kocherization of the duodenum was employed in order to assess the strictures by visual inspection and palpation. A section of the Treitz's ligament and intestinal derotation were utilized for better exposure of the lesions, especially when the 3rd or 4th portion was affected. At initial intestinal opening, a 16 mm diameter marble was introduced in the intestinal lumen and pushed through the bowel to test any possible further stricture. When lesions appeared near the pylorus, or in case of multiple strictures of the distal part of the duodenum and the first jejunal loop, a resection was the treatment of choice. Strictureplasty was preferred when the local situation enabled its implementation. The type of strictureplasty was selected according to the length of the stricture. In case of short strictures, an H–M was performed (Fig. 1); in case of long strictures, a Finney, Jaboulay, or Roux en-Y technique was preferred.

A nasogastric tube was introduced through the strictureplasty of the duodenum and placed in the jejunum for duodenal decompression during the first 24/48 h, and for enteral nutrition, subsequently.

### 2.3. Type and site of the lesions

At surgery, 4 patients had only duodenal disease, whereas 6 patients had synchronous involvement of other portions of the intestinal tract: jejunum in 4 patients, ileum in 1 patient, and jejunum–ileum in 1 patient.

The strictures were distributed in all of the duodenal portions: in 7 patients there was a single lesion (1st portion: 2 patients, 2nd portion: 2 patients, 3rd portion: 2 patients, 4th portion: 1 patient), in 3 patients there were multiple lesions (3rd and 4th in 2 patients, 1st, 2nd and 3rd in 1 patient). The length of the single duodenal strictures ranged from 3 to 6 cm (mean 3.7 cm), whereas the length of the multiple duodenal strictures ranged from 1 to 10 cm (mean 5.6 cm).

No signs of fistula or abscess were recorded at the duodenal site. Surgery was indicated in 1 patient for a suspected biliary fistula. During the operative evaluation, the fistula was not detected, but a patulous Vater papilla, simulating a fistulous tract, was found.

## 3. Results

### 3.1. Type of surgery

Eight patients were treated with one or more strictureplasties, and 2 patients with resection. The patients prevalently affected

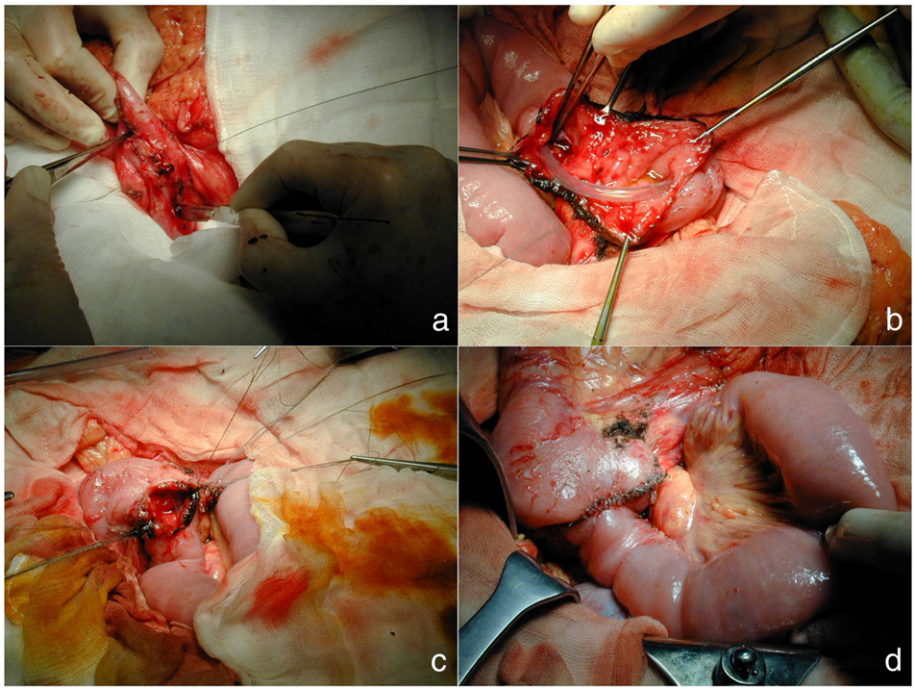


**Figure 1** Intraoperative view of the duodenum stricture sited in the middle duodenal portion before (a) and after a longitudinal duodenal opening (b). A strictureplasty according to H–M technique was performed (c, d).

by a stricture in the 2nd or 3rd duodenal portion were treated with strictureplasty: 5 with H–M technique, 2 with Jaboulay technique, and one with a pedunculated jejunal patch because of the multiple strictures (1st, 2nd and 3rd portion of duodenum) whose total length was 6 cm (Fig. 2). One patient who had the stricture in the 1st portion (length 4 cm) was treated with a B2 gastro-duodenal resection, 1 patient who had the stricture in the 3rd–4th portion of duodenum (10 cm) and proximal tract of jejunum (20 cm) was treated with a duodenal–jejunal resection and an end to side duodeno-jejunal anastomosis.

Five patients had synchronous CD lesions, four in the jejunum and one in the terminal ileum. All these lesions required surgery: jejunal strictures were treated with strictureplasties, the ileal strictures with resection.

### 3.2. Post-operative outcome

Following surgery, 6 patients were treated with TPN, 2 with enteral nutrition, and 2 with both enteral and TPN. Neither post-operative mortality nor surgical complications were

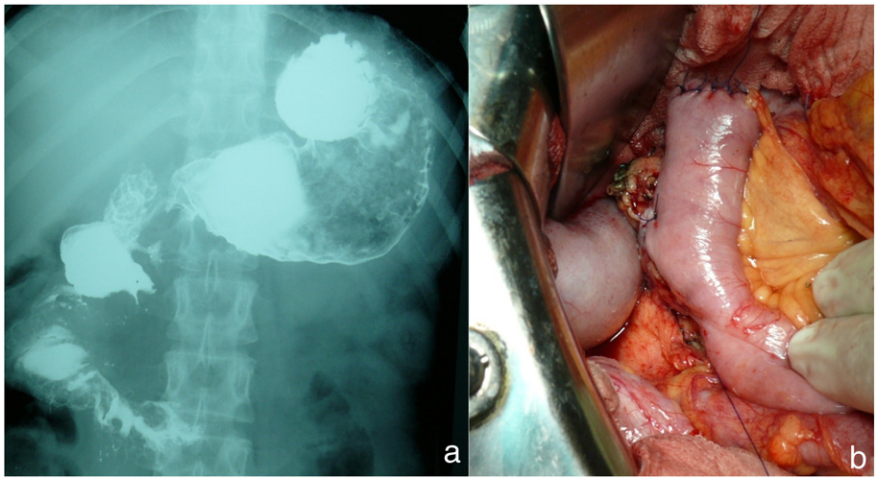


**Figure 2** Multiple duodenal strictures in the 1st, 2nd and 3rd portion of duodenum are visible at gastro-duodenal follow-through contrast X-ray (a). After longitudinally opening of the duodenum for 6 cm, a pedunculated jejunal patch strictureplasty was performed (b).

found in any of the patients. Post-operative hospital stay was 7 days on average (range 6–11).

### 3.3. Follow-up

Patients were followed up for a period ranging from 2 to 18 years (mean 11 years). All patients reported improvement of their symptoms. Seven out of 10 patients were submitted to medical treatment for prevention of CD recurrence (cycles of budesonide in 4 and 5-ASA in 3 patients). Five patients had no recurrence of CD, 3 had recurrence of CD elsewhere (one patient in the ileum, treated with Finney's strictureplasty; one patient with a left colon recurrence was treated with left hemicolectomy; one patient with recurrence in the jejunum was treated with an H–M strictureplasty). No recurrence of CD was observed in the 2 patients treated with resection, whereas 2 out of the 8 patients treated with strictureplasty had a recurrence.

One of the 2 patients had a recurrence at the site of the prior Heineke–Mikulicz strictureplasty two years later. He was treated with a new strictureplasty, utilizing a pedunculated jejunal loop. The intra-operative biopsy of the stricture, which was found to be negative at frozen examination, resulted to be a cancer at the final pathological examination. Therefore, after 2 months, he was treated with a duodenopancreatectomy. The clinical condition progressively deteriorated and the patient died after 15 months. This case was previously referred.[6]

The other patient was treated at first with an H–M strictureplasty for a 3 cm stenosis of the 2nd portion of duodenum and then with a Michelassi strictureplasty for multiple 36-cm jejunal stenoses. After 9 months, this patient had obstructive symptoms of the upper digestive tract. A UGI endoscopy was performed, which showed recurrent ulcers at the pylorus, 1st and 2nd duodenal portions, and at the beginning of the prior SSIS. At reoperation, a critical stricture at the beginning of the prior SSIS was discovered and treated with an H–M strictureplasty. After 2 years, due to persistent ulcerations, intestinal transit disorder caused by thickening of the third duodenal portion, and anemia which did not respond to medical therapy including infliximab, we performed a duodenal–jejunal resection including the previous strictureplasties. Histological examination confirmed the presence of chronic active inflammation of the mucosa, focally ulcerative, with occasional architectural alterations of the epithelium. Currently, the patient has neither more obstructive symptoms nor anemia. The patient's post-operative symptoms were due both to the persistence of inflammation activity and to gastro-duodenal inertia.

None of the 7 patients with less than 2 duodenal–jejunal strictures had recurrences; 2 of the 3 patients with more than 2 duodenal jejunal strictures had a recurrence.

## 4. Discussion

The duodenal CD strictures are usually short and surrounded by granular, nodular and ulcerated mucosa. More than one stricture may be found in the duodenum: in 12% of the patients observed at the Cleveland Clinic,[7] and in 30% of our cases. All duodenal sites may be involved: 1) the proximal duodenum, usually as continuity with pyloric and antrum lesions; 2) the 2nd or 3rd duodenal portions, usually as a single stricture; and 3) the distal duodenum, usually in association with several strictures of the proximal jejunal loops. According to our experience, the 3rd duodenal portion was more affected than the others, as it was seen in half of the patients observed. A duodenal fistula or perforation arising from primary intrinsic duodenal CD seems to be missing in literature.[8] Conversely, a duodenal fistula may be the consequence of CD in other sites (colonic or ileal) when the phlogosis involves the duodenal wall. The presence of aerobilia or filling of the biliary or pancreatic ducts with contrast medium at imaging examinations can be due to an incontinence of Oddi's sphincter, and not to a sign of fistulization, as we have observed in one of the our patients.

A combined medical treatment with proton-pump inhibitors (PPI) and anti-inflammatory/immunosuppressive drugs is useful at initial symptoms, and anecdotal successful treatment with antiTNF$\alpha$ drugs has been reported. The main indication for surgery is the persistence of obstructive symptoms together with progressive weight loss and signs of malnutrition. Less frequently, severe gastrointestinal bleeding or acute pancreatitis can indicate surgery.[9] Endoscopic dilatation of the duodenal stricture may be considered an alternative to surgery. Matsui et al. reported 5 patients with successful endoscopic balloon dilatation.[10] In several of these patients, recurrent obstructive symptoms required repetition of the balloon treatment. Like in other CD strictures, strictures suitable for dilatation are single, short, and moderately thick.[11]

There are several surgical options, i.e. duodenal or gastro-duodenal resection, gastro-enteric or duodenal enteric bypass, or strictureplasty[3,7,12–15] (Table 1). The choice between these types of surgery is related to the site, number, length, type of inflammatory pattern, and the concomitant Crohnian gastric or jejunal lesions. In literature, resections were associated to a high rate of severe morbidity: duodenal fistula, common duct transection, bleeding, or abscess.[4] We observed a satisfactory outcome for resection in a few selected patients with strictures of the proximal duodenal portion, associated to antral gastric CD, or for strictures of the distal duodenal portion associated to jejunal strictures. Therefore the procedure which has been most frequently employed for duodenal CD, especially if localized in the middle portion of duodenum, is the gastro-jejunal bypass. An alternative type of bypass can be a duodenal–jejunal bypass or a gastro-duodenal bypass. Complete relief of upper gastrointestinal symptoms after surgery is observed; most patients remain symptom-free for a long period of time. Nevertheless, the procedure involves major complications during the immediate follow up in a considerable percentage of cases.[12,13] Almost 20% of the patients have difficulties in regaining intestinal function, and need a prolonged period of TPN.[7]

In recent years, relatively few experiences with strictureplasty were reported for the treatment of CD duodenal strictures. Theoretical advantages of strictureplasty versus bypass are: preservation of duodenal transit and, consequently, less likelihood of having dumping syndrome, and less risk of peptic ulcer and biliary reflux gastritis, especially if the pylorus is preserved. Furthermore, vagotomy has not been commonly used, or was used less frequently, than in bypass procedure.[7]

**Table 1** Summary of duodenal Crohn's disease surgical treatment studies.

| Study (year) | Period of study | No. of patients | Type of surgery | Post-operative complications (no. of patients) | Recurrence (no. of patients) | Mean follow-up (mo) |
|---|---|---|---|---|---|---|
| Alexander-Williams and Haynes (1985)[15] | 1985 | 5 | Strictureplasty | 0 | N/A | 6 |
| Poggioli et al. (1997)[3] | 1978–93 | 3 | Strictureplasty | 2 | N/A | N/A |
| | | 2 | Roux-en-Y | 0 | N/A | 30 |
| Eisenberger et al. (1998)[14] | 1997–98 | 1 | Strictureplasty | 0 | 0 | 9 |
| Yamamoto et al. (1999)[12] | 1974–97 | 13 | Strictureplasty | 6 | 6 | 143 |
| | | 13 | By-pass | 4 | 6 | 192 |
| Worsey et al. (1999)[7] | 1980–97 | 13 | Strictureplasty | 2 | 1 | 42 |
| | | 21 | By-pass | 2 | 1 | 96 |
| Takesue et al. (2000)[16] | 1999 | 2 | Strictureplasty | 0 | N/A | 32 |
| Shapiro et al. (2008)[13] | 1995–06 | 2 | Strictureplasty | 1 | 0 | 85 |
| | | 24 | By-pass | 6 | 2 | 56 |
| Tonelli et al. | 1986–11 | 8 | Strictureplasty | 0 | 2 | 132 |
| | | 2 | Resection | 0 | 0 | |

N/A: not available.

Usually, selective criteria have been adopted for indicating strictureplasty: according to the experience of Birmingham University, only 50% of duodenal CDs were treated with strictureplasty,[12] whereas according to the Cleveland Clinic only 35% were.[7] The type of strictureplasty most frequently employed is the H–M, given that the stricture is seldom longer than 5 cm. Failure of this procedure was frequently observed in the Birmingham experience, due to postoperative complications or re-strictures.[12] These authors exclusively adopted an H–M technique. However, other authors[7,13,16] consider strictureplasty a safe and effective operation for duodenal CD. The latter authors frequently or exclusively employed a Finney type of strictureplasty. A metanalysis of 506 patients who underwent 1825 strictureplasties for small bowel CD showed that Finney strictureplasty involves significantly less recurrences and lower reoperation rates compared to H–M strictureplasty.[17] Our experience showed that strictureplasty is a safe procedure without post-operative complications. We noticed that an accurate complete mobilization of the duodenum is an important step of the procedure, as it allows sutures without tension. In this context, intestinal derotation can be useful either for avoiding tension of the suture, or for a better exposure of the duodenum. Moreover, maintaining a nose-duodenal tube for several days can decompress the duodenum and prevent leakage. Although we prevalently adopted the H–M technique, re-strictures were reported in only two patients, both affected by multiple strictures. Treatment of multiple strictures by strictureplasty can expose the patient to anemia, gastro-duodenal inertia, and major risk of re-stricture. Conversely, the two patients operated with a duodenal–jejunal resection had an uneventful postoperative outcome, and complete resolution of the symptoms. Therefore, in case of more than 2 duodenal strictures, a resection should be preferred.

Patients with CD also have an increased risk of developing carcinoma, because prolonged inflammation of the small bowel may predispose the development of dysplasia and, subsequently, cancer. Diagnosis of malignant transformation of inflammatory lesions can be difficult, even though the site of the stricture can easily be reached endoscopically. For these reasons, it is challenging to macroscopically define whether a stricture is inflammatory or neoplastic. Few cases are reported about this; biopsies in the strictureplasty site must be performed every time a masked thickening of the involved wall is found.[6]

In conclusion, our experience points out that strictureplasty may preferably be used in the presence of less than 2 strictures preferentially localized in the 2nd and 3rd portion of the duodenum. In cases with multiple strictures, especially if localized in the distal portion of duodenum, patients treated with strictureplasty have a higher risk of persistence of symptoms or recurrence of stricture, and may respond better to resection. Complete kocherization and intestinal derotation facilitate sutures without tension and prevent postoperative complications. Recurrence in other portions of the intestinal tract is frequent.

## Conflict of Interest

Authors certify that there is no actual or potential conflict of interest in relation to this article and they state that there are no financial interests or connections, direct or indirect, or other situations that might raise the question of bias in the work reported or the conclusions, implications, or opinions stated – including pertinent commercial or other sources of funding for the individual author(s) or for the associated department(s) or organization(s), personal relationships, or direct academic competition.

## Authors' contribution

All authors contributed equally to this work: G.A. and A.F. collected the data, G.A., F.B. and A.S. analyzed data, G.A., F.B., A.S. and F.T. wrote the manuscript and F.T. supervised all the manuscript, F.G. revised the manuscript.

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