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## Strictureplasty for Small Bowel Stenosis in Crohn's Disease

**Summary.** Strictureplasty, nearly 10 years surgical aid to Crohn's disease, sets out to increase the lumen of small bowel strictures by a plastic operation avoiding resection. The purpose of this conservative operation is to improve the quality of the patient's life with the smallest loss of bowel, respecting the idea that surgery cannot cure radically Crohn's disease because of its progressing and recurrence. Following the earlier doubts, the results of the literature are beyond all expectations and the operation is becoming popular everywhere. The author's experience includes 8 patients (range 29 to 49 years) with obstructive symptoms and weight loss from 2 to 15 months (mean 5 months). For 6 patients it was the second operation. Twenty-nine strictureplasties were performed, all with Heinecke-Miculicz technique. In 5 patients small bowel resection was associated. The results confirm the strength of strictureplasty. There was no operative deaths. Early postoperative complications occurred in 2 out of 10 operations and included a wound infection and a prolonged ileus. The patients were followed up for 6 to 56 months after operations (mean 25 months). No cases of restrictures were observed. All patients reported relief of symptoms and weight gain.

(Key Words: Small bowel · Crohn's disease · Stenosis · Strictureplasty)

### Die Strikturoplastik in der Behandlung von Dünndarmstenosen bei Morbus Crohn

**Zusammenfassung.** Die Strikturoplastik wird seit zehn Jahren beim Morbus Crohn angewendet mit dem Ziel, das stenotische Darmlumen zu erweitern und eine Resektion zu vermeiden. Aufgrund der Rezidivrate und Progressivität des Morbus Crohn kann nicht immer eine radikale chirurgische Therapie erfolgen. Die Idee dieses konservativen Eingriffs ist daher, durch minimalen Verlust von Darm die Lebensqualität zu verbessern. Die Erfahrung der Autoren umfaßt acht Patienten (29 bis 49 Jahre) mit Ileussyndromatik und Gewichtsverlust seit zwei bis 15 Monaten (Mittelwert fünf Monate). Bei sechs Patienten war die Strikturoplastik die zweite Operation. 29 Strikturoplastiken mit Heinecke-Mikulicz-Technik wurden durchgeführt; bei fünf Patienten erfolgte auch eine Darmresektion. Die Resultate bestätigen die Wirksamkeit der Strikturoplastik. Die operative Mortalität war gleich Null. Bei zwei von zehn Operationen traten frühe postoperative Komplikationen auf: eine Wundinfektion und ein verlängerter postoperativer Ileus. Die Patienten wurden zwischen sechs und 56 Monate nachbeobachtet (Mittelwert 25 Monate). Es wurden keine Strikturrezidive festgestellt. Bei allen Patienten wurden eine Besserung der Symptome und Gewichtszunahme beobachtet.

(Schlüsselwörter: Dünndarm · Morbus Crohn · Stenose · Strikturoplastik)

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Since first description in 1932, Crohn's disease has been constantly reviewed in the light of new results obtained from biological knowledge of the disease and therapeutic experience gained from the results.

Therefore a radical change has taken place in surgical approach to Crohn's disease: from the "oncologic type" with widened resection including the lymph gland stations with the aim at curing the disease to "minimal surgery", which – although more conservative – would allow the patient a good quality of life with little or no risk.

This change in interpreting Crohn's disease was born from the demonstration that the disease is spread throughout the intestine and therefore the idea of radical surgery cannot be considered. "Crohn's disease is a panenteritis with multifocal potentiality."

This definition doesn't only confirm the concept that the disease occurs in whole intestine but also underlines the fact that it is dynamic in the sense that 3 types of lesions coexist: acute, healing and organized. The coexistence of such a large range of lesions with different anatomical and pathological characteristics is fundamental in the clinical aspect of this enteritis, that is like a relapsing chronic phlogosis.

Moreover, another paramount fact, explaining the change in the surgical approach, is the observation that

Number of patients	8
Age	
Median	35
Range	29–49 years
Male:female	5:3
Duration of Crohn's disease	
Median	6 years
Range	1–16 years
Previous small bowel ileocolic resection	6 patients (75%)
Prednisone	
No	5
Yes	3
Preoperative weight loss	3 (37.5%) median 5 kg
Parenteral nutrition	2 (25%)
Symptoms of present disease	Colicky abdominal pain, postprandial pain, abdominal distension
Duration	2–15 months (average 5 months)

Table 1. Patients characteristics.

clinical history of the disease is characterised by a weakening of the aggressiveness about 10 years after its first occurrence.

For this reasons surgery, unable to achieve the "radical method" which was believed to be correct owing to the biological characteristics of the disease, must aim at achieving a satisfying quality of life.

When the developing lesions consolidate themselves in tracts more or less extended across the small bowel and become real stenosis, the clinical picture of the patient changes into a subocclusive one with relapsing abdominal colics, weight loss, etc. At this point surgical operation is inevitable: the subocclusive symptomatology is in about one third of indications leading to surgery. In such cases the type of intervention chosen is excision of the stenotic tract by means of resection, whose maximum distance, according to the consolidated conservative method, must not exceed 10 cm from the macroscopically evident lesions (minimal resection).

Nevertheless, in the case of multiple stenosis extending over long intestinal tracts, especially in the most operated on patients, the price could be unacceptable for the excessive reduction of the intestinal surface and the probable onset of the serious syndrome caused by the shortening of the bowel. When more than 70% of the small bowel is removed malabsorption disorders occur, which are of such a severity as to compromise the vital function of the patient. In addition it must be remembered that patient affected by Crohn's disease already has a malabsorption disorder, inherent in the disease which remarkably reduces the minimal index of 70%. And for this reason the intervention of strictureplasty has recently been proposed [9] which we could define as "minimal surgery". The aim of the intervention intended by the authors is to overcome the obstacle created by the stenosis by performing plastic surgery on the fibrotic tract which doesn't sacrifice even a centimeter of the length of the bowel.

Sites of localizations	Number of patients
Duodenum	1
Jejunum	2
Ileum with large bowel disease	1
Ileum with anastomotic disease	2
Ileum alone	2

Table 2. Patterns of small bowel Crohn's disease.



Sites	Number of patients
Duodenum	1
Jejunum	11
Ileum	15
Anastomotic (prior ileocolic anastomosis)	2

Table 3. Sites of strictureplasty.

There were many unknown factors at the beginning, e.g. the hold of the stitches on a diseased tissue on the relapsing of the stenosis, but the results seem surprisingly good.

### Patients and Methods

Our experience is made up of 8 patients (5 males, 3 females; age 29 to 49 years). All patients, affected by Crohn's disease during a range of 1 to 16 years, were suffering for some time (average 5 months, range 2 to 15 months) from successive subocclusive crisis with significant weight loss.

In 6 cases it was the second operation (resections extending more or less of small bowel in 5 cases, of colon in 1 case). Three out of 8 patients were treated

with steroids and mesalazine at the time of operation (Table 1).

All patients were investigated by small bowel enemas with evidence of different location of the disease in the small bowel (Table 2).

We performed 29 strictureplasties, all according the Heinecke-Mikulicz technique. The suture in an extramucous single layer was performed with Vycril 3/0, with non absorbable stitches. In 5 patients intestinal loop resections were carried out (1 previous transverse-ileum anastomosis, 4 jejunum resection) (Table 3).

### Results

We have not recorded any case of perioperative mortality. Immediately postoperative 2 minor complications arose: 1 linked to wound infection, 1 to the prolonged ileus (Table 4).

Regarding the long-term results, all patients except 2 assessed after surgery relief of obstructive symptoms (follow-up on average 25 months, range 6 to 56 months).

A radiographic postoperative small bowel enema, carried out on all the patients during the course of the fol-

Type of complications	Present series (n = 8)	Others (n = 240)
Motility	0 (0%)	0 (0%)
Perioperative hemorrhage	0 (0%)	7 (2.9%)
Fistula/abscess	0 (0%)	17 (7%)
Prolonged ileus	1 (12.5%)	8 (3.3%)
Reoperation for septic complications	0 (0%)	8 (3.3%)
Woundinfection	1 (12.5%)	25 (10.4%)

Table 4. Complications after strictureplasty. Early postoperative results (0 to 30 days).

	Present series (n = 8)	Others (n = 240)
Number of strictureplasties	29	859
Median follow-up	6–56 months (median 25 months)	6–84 months (median 36 months)
Symptomatic recurrence	2 (25%)	69 (30%)
Medical treatment	2 (25%)	36 (15.4%)
Symptomatic resticture of strictureplasty sites	–	3.9%

Table 5. Outcome after strictureplasty. Long-term results.



low-up, did not show restenosis of the plastic surgery confirming the clinical data.

A clinical relapse in other parts of the bowel revealed in 2 patients within 30 and 36 months postoperatively, but the treatment needed was only medical (Table 5).

## Discussion

In 1932 Crohn affirmed that surgery could cure the disease by widened intestinal resections. Later, beginning in the 50's, owing to the high perioperative mortality and morbidity rate the intestinal bypass technique was used more frequently. Since the 70's another change has taken place owing to the following problems:

1. High incidence of local septic complications due to setting of the bypass in the tract of the bowel where disease was present;
2. high risk of carcinoma owing to the same reason;
3. high rate of relapses if compared to resection techniques;
4. significant decrease in the perioperative mortality rate after intestinal resection [2, 3].

Nevertheless, starting to use resection surgery again has raised many controversies concerning the extent of resection because in the meantime the general attitude towards the disease has changed. It is believed that surgery neither cures nor changes the biological aggressiveness of the disease. In fact an immediate favorable clinical response was observed that does not exclude the progression of the disease since the relapses and the necessity of a second intervention fluctuate with a frequency that varies from 40% to 70% of the cases.

Moreover the conviction of many authors to perform resections only on the tracts of the bowel unaffected by macroscopic lesions clashes on the one hand with the objective anatomic and pathological finding of the presence of microscopic lesions in apparently normal positions and on the other hand with the surgical finding of relapses in patients already operated on independently of the presence of microscopic lesions on the margin of the resection. Finally, the presence of micro- and macroscopic alterations on the line of the section do not unfavourably influence the prognosis. The rather obvious conclusion is that extension of the resection on the macroscopically healthy bowel does not at all alter the eventual occurrence of complications and/or relapses [2, 4, 11].

It must still be said that the relapse concerning the pre-anastomotic has an incidence ranging from 6% to 17% a year and therefore it must be considered as an unavoidable eventuality.

The fact of having often to reoperate in patients already treated faces the surgeon with a difficult choice between the necessity of an "efficient" treatment and the risk of not being able to preserve a sufficient bowel tract in order to maintain an adequate intestinal absorption (short bowel disease).

Such considerations have limited surgery to cases of necessity (55 to 85% of all cases!) and have lent towards an attitude as conservative as possible making use of minimal resections, mini bypass and strictureplasty [10].

The strictureplasty intervention, used as a therapeutic measure to cure stenosis caused by intestinal tuberculosis [7], without doubt borrowed from the pylorus-plasty technique, has been used in a routine manner since 1979 for treatment of selected patients suffering from segmentary enteritis with short multiple stenotic tracts of the small bowel, even though its use was first reported in a patient with Crohn's disease in 1961 [9].

The fundamental concept of this surgical technique is to succeed in widening the diameter of the lumen of the bowel in the stenotic tract thus avoiding resection. In order to obtain this result 2 principal methods have been experimented, even with many varying techniques regarding the type and number of suture layers, which have been now asserted in practice.

The first technique, according to Heinecke-Mikulicz (Figure 1), foresees the longitudinal incision of the thickness of the intestinal wall on the antimesenteric margin of the fibrous stenotic tract, which usually is relatively less affected by mucous ulcers, and the successive transverse suture of the margins. This technique is used for stenosis of a length ranging between about 1 and 10 cm. An extension of the incision of the apparently healthy tissues on both sides for at least 1 to 2 cm or a longer length is believed useful [1, 3, 4].

The suture is performed in single layers in order to avoid the narrowing of the intestinal calibre as much as possible.

The second technique, according to Finney (Figure 2), is used instead for stenotic tracts of a length >10 cm. The



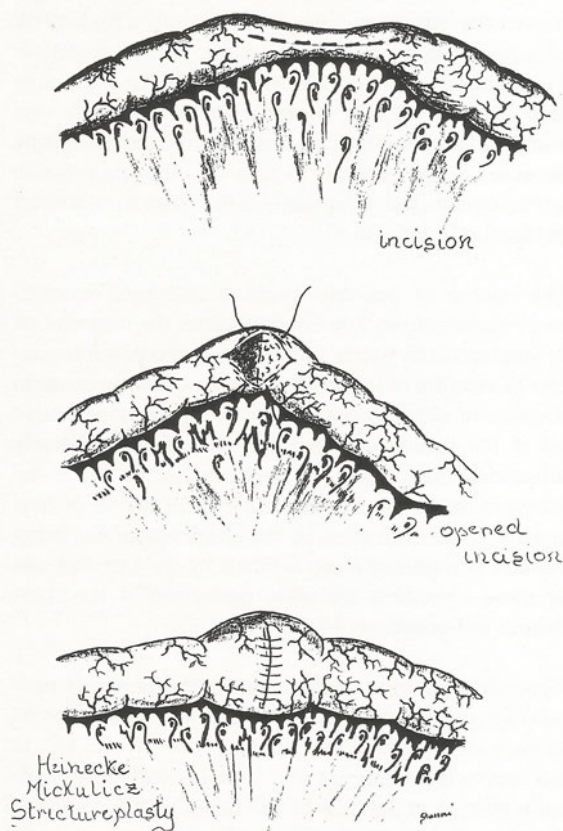


Figure 1. Surgical technique according to Heinecke-Mikulicz.

bowel is opened as in the method described above and successively refolded on itself to almost form a J-pouch, proceeding then as performing a latero-lateral anastomosis, first to the suture of the posterior wall and then to the anterior wall. The sutures can be performed manually or by linear suture machine type GIA, even if not everybody agrees with the use of the GIA.

Strictureplasty is performed in the following cases: symptomatic intestinal stenosis (intestinal obstruction, persistent pain, weight loss) which is unresponsive to medical therapy especially if short and isolated but which affects, at various distances within itself, an extended tract of the small bowel; in patients already undergone more or less wide resections; when single lesions occur in relatively quiescent disease conditions with limited intestinal involvement [3, 5, 12].

Even if the lesions like those just described, and that is to say segmentary and spread throughout the small bowel, are present in about 23% of the patients affected by

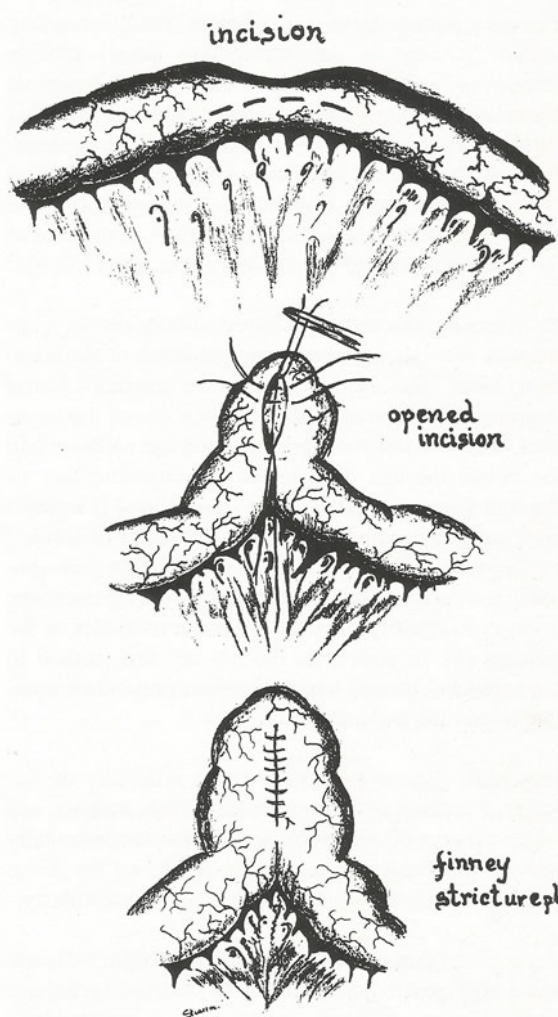


Figure 2. Surgical technique according to Finney.

Crohn's disease, strictureplasty interventions carried out on patients with Crohn's disease do not exceed 9% of all the interventions. This verifies itself because not all stenoses are symptomatic and this concept is therefore fundamental in the treatment of segmentary enteritis.

Strictureplasty cannot substitute resective surgery in the treatment of Crohn's disease in an active phase with phlegmonous inflammation or in the case of perforation and periintestinal abscesses. The very near stenoses or in close proximity to resections, the stenoses associated with entero-enteric or enterocutaneous fistula or in an intense activity phase of the disease are not considered, however, to be a contraindication any more [2, 3].



The early postoperative complications usually occurring within 30 days of the intervention mainly include enteric or enterocutaneous fistulae, intraabdominal abscesses, bleedings and dehiscence of the suture. This latter occurrence is mostly a consequence of unidentified low stenosis and therefore untreated. In this case an obstacle remaining in the intestinal passage will cause rising of tension at the level of the sutures in the sites of the strictureplasty with its possible dehiscence [4, 6, 8].

To overcome this difficulty many authors advise, apart from an accurate inspection and palpation of the intestinal loops, the use of catheter or another similar instrument in order to evaluate the calibre of the intestinal lumen. After having introduced the catheter into the bowel through the sites of the strictureplasty or through a "service enterotomy", the balloon is inflated with air or water until it reaches a diameter of about 2 cm, a stenosis becomes symptomatic if the measurement is inferior to this, and then draw along the loops in order to identify possible unknown obstacles in the passage [8]. In effect, we did not use this method in our series but instead based ourselves only on an accurate inspection and palpation.

Important clinical evaluation about reliability of this surgical technique we get from british authors and wider surveys of American authors that fundamentally provide agreeable and reassuring results on the therapeutic value obviously symptomatic of strictureplasty.

Ascertained that a subject affected by Crohn's disease has a high possibility of having to undergo successive surgical interventions, the percentage of reintervention does not seem to be substantially different in patients undergoing strictureplasty compared to patients undergoing large intestinal resection. Moreover, for a period of 5 years, it has been demonstrated by controlled studies that stenotic sites treated with strictureplasty resulted in having, percental substantially the same free interval from disease as apparently healthy sites left in place after a traditional resection [13, 15].

The persistence of tract affected by the disease does not in fact have any influence in unleashing the onset of early relapses in sites of intervention. Nevertheless, the problem of a correct setting regarding the genesis of postoperative complications remains particularly complex in as much as it is difficult to attribute them to the type of intervention or more probably to the clinical advancement of the disease, although being widely

proven that structureplasty does not imply a higher risk of complications compared to the classic resection. The re-onset of the preoperative symptoms some time after the intervention is rarely attributable with certainty to late complication linked to the strictureplasty because in a general picture of the progressive advancement and relapsing of the disease a correct evaluation is difficult.

The causes of possible symptomatological reoccurrence starting from 2 to 6 months after the intervention of strictureplasty can in fact be due to the possible genesis of stenosis or in more rare cases, of perforations in the sites of strictureplasty previously performed, above all if the suture line included bowel tracts acutely affected by the disease but they can also be due to the progression of the disease with the formation of new stenosis. The evaluation of the efficiency of the intervention is rendered more difficult by the fact that one or more resections are often performed at the same time as strictureplasty [4, 8].

Generally following treatment with structureplasty periods of symptomatological remission are obtained on an average of 3 years with a maximum of 6 years [4]. In our survey 6 patients out of 8 were in symptomatological remission at the time of follow-up with a minimum duration of observation of 6 months and a maximum of 4 years 8 months. In the other 2 patients a reoccurrence of the symptomatology which can be related to the rekindling of the disease was observed within 30 and 36 months, respectively, of the intervention.

Kendall et al. [8] present, in their experience, a high number of symptomatic patients between 2 and 12 months after the intervention of strictureplasty contradicting the results of other authors [2, 5, 6]. They attribute this difference in this series of patients treated, for the most part affected by Crohn's disease in an active phase, and to the very high number of strictureplasties performed on everyone of them.

Of course the nutritional state seems to have some importance too: a major incidence of complications has been revealed by many authors in subjects with albuminemia inferior to 30 g/l [3, 4, 14] and weight loss >20% caused by malnutrition. Moreover, the existence of 2 kinds of Crohn's disease is possible, as supported by some authors: the first defined as "aggressive" which would seriously reveal itself in exacerbated clinical pictures with a very frequent incidence of fistulae and abscesses and that



therefore would have a higher relapse index with a high number of postoperative complications even following the intervention of strictureplasty, and the second defined as "mild" and characterised by a modest clinical course and a better response to treatments.

This hypothesis, based on clinical data and evaluation of the free interval between the initial and successive intervention in the various forms of the disease, has been retaken into account by Sayfan et al. [13] who have reached the conviction of the existence of these 2 different kinds of Crohn's disease based on the observation of 2 principle peaks of reintervention, due to the rise in complications, between 40 and 110 months after strictureplasty and/or intestinal resection to correlate with the different aggressiveness of the disease.

The young age, the ileocolic and ileum localizations and the extension of the disease beyond the ileorectal anastomosis are other risk factors.

The formation of new stenoses or stenoses in the sites of strictureplasty does not, however, limit the possibility of reintervention with new strictureplasties even if some authors have indicated a low incidence number of narrowing stenotic sites already treated [4, 12]. When the symptomatology reoccurs it is advisable to intervene first with a pharmacological therapy (sulphasalazine, mesalazine, steroids, azathioprine, 6-mercaptopurine) which in about 15% of the cases dominates the clinical picture, and then, if necessary, following with a new surgical treatment.

Two of our patients in symptomatological resumption were immediately inserted as in the therapeutical protocol with mesalazine and steroids and at the present state, after 42 and 56 months, respectively since the operation, they are asymptomatic. Aspecific complications can nevertheless be due to adhesion syndromes with occlusion pictures.

## Conclusions

Crohn's disease, recurrent and progressive, after a certain number of years tends to weaken its aggressiveness and therefore the activity of the disease diminishes. For this reason we need to remember that in spite of the worries concerning the relapses and postoperative recurrence, the aim of surgery is to treat a complication and to weaken the symptoms which inabilite the

patients. The main role of Crohn's surgery must be to improve the quality of life of these patients; and if it is still valid today as Crohn said more than 60 years ago that "the treatment of the disease will be only empirical, palliative, and supportive", this concept also being reiterated by Shorb (1990) "the postoperative result appears remarkably better if the intervention is considered palliative in an exhaustibly progressive disease", then it is equally true when Alexander-Williams affirms "the choice of the type of intervention must be guided more by experience than by rigid schemes".

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