Comparison of two surgical techniques for resection of uncomplicated sigmoid volvulus: Laparoscopy or open surgical approach?

S. Basato\textsuperscript{a,*}, S. Lin Sun Fui\textsuperscript{b}, K. Pautrat\textsuperscript{a}, C. Tresallet\textsuperscript{b}, M. Pocard\textsuperscript{a}

\textsuperscript{a} Service de Chirurgie Digestive et Cancérologique, Hôpital Lariboisière, AP–HP, Université Paris Diderot-Paris VII, Sorbonne Paris Cité, 2, rue Ambroise-Paré, 75010 Paris, France

\textsuperscript{b} Service de Chirurgie Générale, Viscérale, Endocrinienne, Hôpital de la Pitié-Salpêtrière, Université Pierre et Marie Curie-Paris VI, AP–HP, 47-83, boulevard de l’Hôpital, 75013 Paris, France

Available online 26 September 2014

Summary

Aim of the study: The optimal treatment for acute sigmoid volvulus has not been defined. Our aim was to compare the results of two techniques for the management of uncomplicated sigmoid volvulus coming from two separate surgical services, which had each chosen a different technique: open surgical versus laparoscopic.

Patients and methods: Patients with sigmoid volvulus who underwent a surgical resection with immediate anastomosis, either emergency or scheduled, were included. Risk of morbidity (Dindo-Clavien criteria) and mortality (criteria of the AFC-French Association of Surgery) were evaluated.

Results: Thirteen patients in the open surgical group were operated in a 10-year period and 17 patients in the laparoscopy group were operated on in a seven-year period. The mean age (57 years in both groups) and sex ratio (0.7 versus 0.6, respectively), and the length of hospital stay (18 versus 15 days, respectively) were comparable in the two groups. The open surgical procedure was performed urgently in 62% (\textit{n} = 8/13) versus 24% (\textit{n} = 4/17) in the laparoscopic group. The two groups were comparable in terms of risk factors for mortality by AFC score. The anastomotic leak rate was 8% (\textit{n} = 1/13) for the open surgical group versus 18% (\textit{n} = 3/17) for the laparoscopic group, while serious morbidity was 15% (\textit{n} = 2/13) versus 12% (\textit{n} = 2/17). No recurrence of volvulus was observed in the open group (mean follow-up of 26 months) versus 12% (\textit{n} = 2) in the laparoscopy group (mean follow-up of 32 months).

Conclusion: We did not find any significant difference between the two techniques. But the technical simplicity and the absence of recurrence in the open surgical group emphasize the importance of this technique.

© 2014 Elsevier Masson SAS. All rights reserved.

* Corresponding author.
E-mail address: silviabasato@inwind.it (S. Basato).

http://dx.doi.org/10.1016/j.jviscsurg.2014.09.002
1878-7886/© 2014 Elsevier Masson SAS. All rights reserved.
Sigmoid volvulus consists of torsion of the sigmoid colon around the axis of its sigmoid mesenteric causing colonic obstruction [1], with strangulation that can result in ischemic necrosis, perforation and death. High fiber diet, constipation and anatomical variations (megadocolic-sigmoid, narrow mesenteric insertion) appear to play a role in the development of this pathology. Sigmoid volvulus occurs commonly in Africa, Asia, Eastern Europe and South America [2, 3]. It is the cause of 20–50% of colonic obstructions in Africa [1, 4]. Although it occurs much less frequently in Western Europe, it is still the third leading cause of colonic obstruction for adults [5]. Volvulus occurs most commonly during the eighth decade and is equally distributed between the sexes [6]. In 25–35% of cases, patients are under care in psychiatric facilities, while 10–15% are residents of nursing homes [6] thus characterizing a population of frail patients who frequently need emergency colonic surgery.

For patients who present without signs of peritonitis and gangrene, an initial attempt at non-surgical treatment by enema, sigmoidoscopy, colonoscopy or insertion of a large caliber rectal tube is justified [7]. Colonoscopic or sigmoidoscopic decompression with or without rectal tube is the best initial treatment choice. It allows visual assessment of the viability of the mucosa, but is unsuccessful in nearly 30% of cases [8]. In any case, surgical treatment is the ultimate treatment following effective detorsion of the volvulus, if other treatments have failed, or when there are signs of peritonitis or colonic ischemia/necrosis, because mortality is higher mortality for recurrent volvulus [9].

If peritonitis or colonic necrosis is present, a Hartmann resection is usually performed. In contrast, resection with immediate anastomosis represents the ideal therapeutic choice for non-complicated volvulus after reduction and decompression [10]. However, the best surgical technique has not been defined and the low number of cases makes it difficult to perform a prospective comparative study. We decided to retrospectively compare two different treatment options.

The surgical service at the Pitié-Salpêtrière Hospital has opted for primary open surgical approach that allows the volvulus to be externalized and detorsed followed by resection and side-to-side staple anastomosis [11]. The surgical service at the Lariboisière Hospital has opted for an initial laparoscopic approach, reputed to cause less morbidity, with intracorporeal resection and stapled anastomosis. Our goal was to compare the risks of morbidity and mortality for the two techniques as well as their results with regard to the risk of recurrence in the medium term.

Patients and methods

We retrospectively collected pre-operative and post-operative demographics, clinical data, and risk factors for mortality (AFC criteria) [12], on all patients who had undergone surgical resection followed by immediate anastomosis for sigmoid volvulus, whether emergency or scheduled, over a 10-year period at La Pitié-Salpêtrière Hospital and over a 7-year period at Lariboisière Hospital. We defined a procedure as urgent if performed during hospitalization for an acute episode. The team at La Pitié opted for an initial open surgical approach consisting of externalization of the volvulus with resection and latero-lateral stapled anastomosis (Open Group) while the Lariboisière team used an initial laparoscopic approach with resection and stapled EEA anastomosis unless conversion was necessary (Laparoscopy Group). We compared these two surgical techniques through the evaluation of post-operative morbidity (Clavien-Dindo classification of surgical complications), the anastomotic leak rate, long-term complications, recurrence rate and mortality [13]. The Dindo-Clavien classification of complications allows analysis of even small numbers of patients because it is based on treatment need and disease-related organ dysfunction (Table 1).

For each patient in both groups, we assessed the mortality risk for colorectal surgery according to AFC criteria: age > 70 years, neurological co-morbidities, weight loss > 10%, emergency surgery. For patients with no risk factors the mortality risk is < 1%, versus 2% for one risk factor, 9% for two risk factors, 16% for three factors and 50% for patients with four risk factors [12]. To compare the two groups, we used the Chi² test; statistical significance was defined as a P value < 0.05.

Surgical technique

Open group: segmental resection of the sigmoid loop with stapled anastomosis via open laparotomy approach [11]

The patient is positioned supine. The operator stands on the left side with the first assistant facing him. The incision in the left iliac fossa is the mirror image of the classic McBurney muscle splitting incision. The external oblique fascia and internal oblique muscle are incised parallel with their fibers, and the peritoneum is incised between the rectus sheath and the internal oblique muscle. The redundant sigmoid loop is externalized and detorsed if necessary. The line of division of the sigmoid mesentery must lie above the level of the skin surface, to allow easy performance of the anastomosis. A stapled side-to-side colo-colic anastomosis (functional end-to-end) is performed. The insertion holes of the GIA stapler are resected with the specimen. The anastomosis is completed by application of a linear stapler. Hemostasis along the staple line is performed with 3-0 polyglactin (Vicryl) suture and the end of the side-to-side anastomosis is reinforced with two sero-muscular sutures. The mesocolic defect was not closed.

Laparoscopy group: laparoscopic approach with resection and stapled anastomosis

The patient is positioned supine with legs apart. The operator stands to the patient’s right with the first assistant on his/her left side. An open supraumbilical Hasson approach is used for insertion of the first laparoscopic trocar and two 5 mm trocars are placed in the right subcostal area and left iliac fossa with a 12 mm trocar in the right iliac fossa. The mesentery is divided after coagulation using an ultracision instrument out to the rectal wall at the sites chosen for transection. The rectum is divided using an Endo GIA stapler. The sigmoid mesocolon is divided with multiple applications of an ultracision instrument up to the colonic wall at the site chosen for proximal colonic division. The specimen is extracted through a small incision at McBurney’s point extending from one or the other side of the 12 mm trocar incision. The mesocolon is divided after ligation with 2-0 vicryl... A colotomy allows insertion of a circular stapler anvil. The proximal and distal colonic are returned to the abdominal cavity. After re-insufflation and final peritoneal lavage, the
Comparison of two surgical techniques

Table 1  Dindo-Clavien Classification for evaluation of post-operative complications [13].

<table>
<thead>
<tr>
<th>Classification of surgical complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
</tr>
<tr>
<td>Grade II</td>
</tr>
<tr>
<td>Grade III</td>
</tr>
<tr>
<td>Grade IIIa</td>
</tr>
<tr>
<td>Grade IIIb</td>
</tr>
<tr>
<td>Grade IV</td>
</tr>
<tr>
<td>Grade IVa</td>
</tr>
<tr>
<td>Grade IVb</td>
</tr>
<tr>
<td>Grade V</td>
</tr>
</tbody>
</table>

Results

Over 10 years at the Hospital de la Pitié-Salpêtrière and 7 years at the Lariboisière Hospital, 13 patients (Open group) versus 17 patients (Laparoscopy group), respectively, met the inclusion criteria. The average age (57 years in both groups), sex ratio (0.7 versus 0.6), and length of hospital stay (18 versus 15 days) were comparable. The operation was performed urgently in 62% of cases for the Open group (n = 8/13) versus 24% for the Laparoscopy group (n = 4/17), P < 0.05 (Table 2). The decision for emergency operation was motivated in most cases by early recurrence after non-surgical treatment. There was no evidence of bowel necrosis or fecal peritonitis intra-operatively.

The patients in the Open group were comparable to those in the Laparoscopy group in terms of AFC risk factors (Table 2). No mortality was observed within 30 days of surgery, but one patient in the Laparoscopy group died at five months from complications. This patient had three AFC risk factors.

The anastomotic leak rate was 8% (n = 1/13) for the Open group versus 18% (n = 3/17) for the laparoscopy group (P = 0.063). One patient from the Open and three patients from the laparoscopy group required re-intervention with performance of a Hartmann resection (P = ns). Serious morbidity (Stage IIIb, IV) occurred in 15% (n = 2/13) from the Open group, and 12% (n = 2/17) from the Laparoscopy group (Table 3). No significant difference in morbidity and mortality was observed.

Mean follow-up was 26 months in the Open group (range: 0–97 months), versus 32 months in the Laparoscopy group (range: 0–78 months). Three patients in the Laparoscopy group required hospitalization (for acute bowel obstruction in one and for recurrence in two 18% (n = 3/17)), versus none in the Open group.

Discussion

Endoscopic detorsion is the first-line treatment for uncomplicated sigmoid volvulus, but in the literature, it is only effective in 60–80% of cases and has a high recurrence rate [7]. Surgery is, in all cases, the radical and definitive treatment and should be considered following effective detorsion because there is a higher mortality in cases of recurrent volvulus [9,14]. Resection with anastomosis is the best therapeutic choice for non-complicated sigmoid volvulus but this technique is not standardized.

The comparison of these two techniques allowed us to present results that will perhaps help to guide our current choices.

No large series of surgery for sigmoid volvulus has been published, which limits an “evidence-based medicine” approach. The laparoscopic approach, however, could have potential benefits, since minimally invasive surgery is currently favored by most surgical teams for other forms of colorectal pathology due to proven benefits when compared to the laparotomy approach. A French multicenter study from nearly ten years ago evaluated morbidity and mortality

Table 2  Risk factors for patients in the two groups undergoing surgery for sigmoid volvulus according to the AFC classification [12].

<table>
<thead>
<tr>
<th>AFC risk criteria</th>
<th>Open group n = 13</th>
<th>Laparoscopic group n = 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>No criteria</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>1 criterion</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2 criteria</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3 criteria</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4 criteria</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3  Thirty-day post-operative morbidity/mortality according to the Dindo-Clavien classification [13].

<table>
<thead>
<tr>
<th>Dindo-Clavien criteria</th>
<th>Open group n = 13</th>
<th>Laparoscopic group n = 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Grade II</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Grade IIIa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade IIIb</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade IVa</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Grade IVb</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Grade V</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
in 1332 patients undergoing colonic resection for diverticular disease by laparotomy or laparoscopic approach. Morbidity was significantly higher following intervention by laparotomy and required longer hospital stay regardless of age [15]. Mortality of surgery for volvulus is linked to the clinical condition, and a recent American multicenter study reported a mortality of nearly 10%, including all cases [16]. In our study, no excess mortality was observed for cases operated laparoscopically using an analysis based on the AFI predictive criteria of morbidity and mortality.

A second reason to favor the laparoscopic option is that it offers the possibility of performing an extensive left colonic resection with optimal resection of the left mesocolon to minimize the risk of recurrent volvulus. Despite this theoretical advantage, several recurrences were observed in the Laparoscopic group. Operators have often struggled to obtain exposure due to the length and dilatation of the redundant sigmoid, which could lead to a poor assessment of the levels at which to divide the colon, leaving a greater length of colon than expected. The lack of adhesion formation associated with the laparoscopic approach may also predispose to an increased risk of recurrence.

The surgical team at La Pitié-Salpêtrière chose an initial open laparotomy approach to perform sigmoid resection with side-to-side stapled anastomosis to overcome the constraints of anastomosing colonic segments of incongruent diameter. A British team has already proposed an initial open approach for sigmoid resection with end-to-end stapled anastomosis for volvulus [17], and an American team has proposed a return to the original Hartmann approach [18]. This surgery has the obvious advantage of simplicity and, according to its promoters, allows an easier solution to address the size disparity between the upstream and downstream colonic segments. The risk of recurrent volvulus with this technique seems low compared to literature reports of 24–33% [19,20]. In light of these results, we consider the extremely low recurrence rate in our series to be excellent, regardless of the technique used.

However, our study has important limitations, especially a poor follow-up in an elderly and often bedridden population who may be lost to follow-up. A second limitation of our study is related to the small number of cases studied. However, if the results of one technique versus another had major advantages in terms of morbidity and mortality, the difference should be statistically evident by now. It would be useful to enlarge the study population to detect potential differences.

In conclusion, we did not find any differences between the two techniques in terms of hospital stay, anastomotic leak rate, need for re-operation, nor in terms of serious morbidity. We cannot currently propose specific recommendations. Surgery for sigmoid volvulus remains risky because of the general condition of the patients. The choice of technique is based on the experience of the operator and customary practice of the surgical service. Every surgeon should master both of these techniques. The open laparotomy route that we describe, in an era when most colorectal surgery is performed laparoscopically, should be considered on a case-by-case basis and may be the preferred surgical approach if failed laparoscopy requires conversion.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References