INCISIONAL HERNIA AFTER SURGERY FOR DIVERTICULAR DISEASE
Incizijska hernija nakon operacije zbog divertikularne bolesti

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Abstract
Background
Incisional hernia after open surgery is a well-known complication. A retrospective study was conducted to determine the incidence and predisposing factors of incisional hernia after colonic surgery for diverticular disease.

Methods
A retrospective cohort of 105 consecutive patients undergoing either laparoscopic or open surgery for complicated diverticulosis between January 2000 and December 2010 was identified. The influence of demographic data, surgical approach and timing for incisional hernia development were analysed. Statistical evaluation was performed using the chi-square test according to Pearson and Mann-Whitney test.

Results
In a group of 31 men and 74 women, with an average age of 67 years, incisional hernia developed in 27 patients (26%) at a mean follow-up of 5.5 years. Incisional hernia was found in two of 23 patients (9%) in the laparoscopic surgery group compared with 25 of 82 patients (30%) in the open surgery group (P = 0.03). We did not prove a higher risk for incisional hernia after acute surgery (P = 0.6). Significant demographic factor influencing incisional hernia incidence was female gender (P = 0.003), but not age (P = 0.43). Mean time to hernia occurrence was 1.5 years.

Conclusion
Laparoscopic surgery leads to a significantly lower incidence of incisional hernia compared to open surgical technique. Female gender represents a higher risk for incisional hernia than acute surgery or age. Because laparoscopy is more feasible as elective surgery, when speaking of incisional hernia, we should recommend sigmoid resections early, especially to women.

Keywords
diverticular disease, laparoscopy, open surgery, sigma resection, incisional hernia

Sažetak
Pozadina
Incizijska hernija nakon otvorene operacije dobro je poznata komplikacija. Napravljena je retrospektivna studija s ciljem utvrđivanja učestalosti i predodređujućih faktora incizijske hernije nakon operacije kolona zbog divertikularne bolesti.

Metode

Rezultati
U grupi od 31 muškarca i 74 žene, prosječne dobi 67 godina, incizijska hernija razvila se kod njih 27 (26%) u prosječnom vremenu praćenja od 5,5 godina. Incizijska hernija nađena je kod 23 pacijenta (9%) u grupi operiranoj laparoskopski u usporedbi s 25 od 82 pacijenta (30%) u grupi podvrgnuoj otvorenom zahvatu (P = 0,03). Nije dokazan veći rizik za incizijsku
hospital discharge, faster return to normal activity and postoperative pain, decreased morbidity, earlier colorectal resection has resulted in reduced experienced surgeon. In acute cases laparoscopy belongs to the hands of an experienced surgeon. Laparoscopy is surely suitable for elective surgery [8]. It could be helpful.

Diverticulitis, mainly Hinchey III and IV, is in the domain of surgical treatment [7]. Bleeding usually ceases spontaneously, while colonoscopy or angiography of surgical treatment [7]. Complicated diverticulitis Hinchey I could be handled exclusively in a conservative manner. Complicated diverticulitis Hinchey II may be drained under computed tomography (CT) control and so acute operation could be postponed to an elective one [5, 6]. Complicated diverticulitis Hinchey II may be drained under computed tomography (CT) control and so acute operation could be postponed to an elective one [5, 6]. Complicated diverticulitis Hinchey I could be handled exclusively in a conservative manner. Complicated diverticulitis Hinchey I could be handled exclusively in a conservative manner. Hinchey II may be drained under computed tomography (CT) control and so acute operation could be postponed to an elective one [5, 6]. Complicated diverticulitis, mainly Hinchey III and IV, is in the domain of surgical treatment [7]. Bleeding usually ceases spontaneously, while colonoscopy or angiography could be helpful.

Laparoscopy is surely suitable for elective surgery [8]. In acute cases laparoscopy belongs to the hands of an experienced surgeon. The introduction of minimally invasive surgery for colorectal resection has resulted in reduced postoperative pain, decreased morbidity, earlier hospital discharge, faster return to normal activity and better cosmetic results [9, 10], but usually longer operative time, higher cost or specific morbidity such as trocar-site complications [9]. There are conflicting results regarding possible benefits of laparoscopic surgery compared with open surgery with respect to the development of incisonal hernia [11, 12]. The main objective of this study was to compare the rates of incisonal hernia after laparoscopic and open colorectal surgery. Patients and methods

This was a retrospective study including a cohort of 105 consecutive patients who underwent either laparoscopic or open surgery for complicated diverticular disease between January 2000 and December 2010 in our hospital. We looked up the occurrence of symptomatic incisional hernia in the patient records. Incisional hernia was defined as a bulge visible and palpable at the site of abdominal incision when the patient was standing with spontaneous or pressure-induced protrusion of abdominal contents. Diagnosis was made on the basis of clinical or ultrasound examination. We considered the hernia as symptomatic when it was limiting the patient in everyday activities because of its size or painfulness. Other data recorded for each patient included age, gender, indications for surgery (acute or elective), year and type of performed procedure. Surgical technique

All interventions were performed by the same surgical team. We used open technique on 82 patients. In the years 2000 and 2001 we performed six myotomies from median laparotomy, but later this method was abandoned. We included these patients into the open surgery group too, because the approach through the abdominal wall was the same as in the primary resection or Hartmann’s procedure, which were used on other 76 patients. We used midline, transverse or oblique laparotomy. We started using laparoscopy more often only since 2005 and that is why the laparoscopically operated group is smaller (23 patients). We preferred laparoscopic sigmoid resection for elective surgery and we used it in acute ones in only four cases. We utilized four ports. Mobilization of the bowel and ligation of the vascular pedicle were performed intracorporeally. The specimen was removed through a midline incision approximately 5–8 cm long. Intraabdominal stapled anastomosis was performed in case of sigmoidectomy. For right hemicolecctiony, bowel anastomosis was performed extracorporeally. Right hemicolecctiony was indicated twice.

The decision on suitability for laparoscopic resection was made on a case-by-case basis by the operating surgeon.
Considered to increase the risk of incisional hernia are two years and 88.9% after five years [14]. Factors after the operation, 54.4% after 12 months, 74.8% after six months performed by Hoer et al. revealed that 31.5% of all 20% after a 10-year follow-up period [13]. A study major abdominal surgery with incidence rates of up to

Discussion

Table 1. Characteristics of groups operated on by using open and laparoscopic technique.

<table>
<thead>
<tr>
<th></th>
<th>Acute operation</th>
<th>Elective operation</th>
<th>Women</th>
<th>Men</th>
<th>Average age</th>
<th>Incisional hernia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>35</td>
<td>47</td>
<td>55 (67%)</td>
<td>27 (33%)</td>
<td>63</td>
<td>25</td>
</tr>
<tr>
<td>Laparoscopy</td>
<td>4</td>
<td>19</td>
<td>19 (83%)</td>
<td>4 (17%)</td>
<td>68</td>
<td>2</td>
</tr>
</tbody>
</table>

In group, women have a higher risk of incisional hernia (P = 0.003). We did not show age dependency. Lumley et al. [20] performed a study focused on intermediate and long-term outcomes following laparoscopic colorectal surgery. In this study on 181 patients, during a median follow-up period of six years, incisional hernia developed only in one case (0.5%). Regadas et al. [21] looked up complications of laparoscopic colorectal resection and found four cases (4%) of incisional hernia out of 92 patients. According to Laurent et al., laparoscopic approach significantly decreases the risk of long-term incisional hernia 13% vs. 30%, 335 patients were included in this study [22]. Lumley's study concentrated mainly on patients with colorectal cancer, while Regadas and Laurent included only patients with colorectal cancer.

A study performed by Garret et al. was aimed to evaluate the outcomes for 200 patients with diverticular disease who underwent elective laparoscopic sigmoid colectomy. They found incisional hernia in just three (1.5%) patients [10]. Ihedioha et al. dealt with a group of 95 patients with the same diagnosis. They did not find a statistically significant reduction of incisional hernia rates after laparoscopic colorectal resections (9%) when compared with open colorectal resection (16%) [12]. A French study was more concerned with short-term benefit of elective laparoscopic treatment of sigmoid diverticulitis, but the 2.5-year follow-up found no incisional hernia [9].

According to the conclusion of a Danish study performed on 201 patients, laparoscopic sigmoid resection leads to a significantly lower incidence of incisional hernia compared to open surgical technique, 3.4% vs. 14.7% [13]. A large American study on 716 patients established 2.4% of incisional hernias after laparoscopic compared with 12.9% after open bowel resection (P = 0.00002) [11]. The study included both patients who had small bowel resections and colorectal surgery.

So our results are consistent with most studies which prove the benefits of laparoscopy for colorectal resection in a long term perspective. Lower occurrence of incisional hernia in other studies compared to ours can be attributed to elective performances and that the specimen is not primarily infected in oncological...
indication. Another reason is our preferred use of midline incision for specimen extraction. Midline incision is associated with a higher incisional hernia rate as compared to transverse [15, 23], paramedian [24] or oblique incision [25].

Conclusion
Laparoscopic surgery leads to a significantly lower incidence of incisional hernia compared with open surgical technique. Female gender represents a higher risk for incisional hernia than acute surgery or age. Because laparoscopy is more feasible as elective surgery, when speaking of incisional hernia, we should recommend sigma resections early, especially to women.

References