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The article entitled "Laparoscopic-assisted versus open ileocolic resection for Crohn's disease: a randomized trial" is another excellent and important study on laparoscopy for inflammatory bowel disease written by a renowned Dutch group of expert laparoscopic surgeons. This study represents the largest published multicenter prospective randomized trial to assess a homogeneous group of patients with terminal ileal Crohn's disease. The authors have included 2 very well-matched groups of patients and achieved quite admirable results including a conversion rate of 10%, an operative time of only 25 minutes longer than laparotomy (115 versus 90 minutes), and a morbidity of only 10% in the laparoscopic group. Indeed, they have shown several substantial advantages conferred by laparoscopic as compared with open surgery including a shorter hospital stay of 5 versus 7 days ( $P = 0.008$ ) and a reduced morbidity from 33% in the open group to 10% in the laparoscopic group ( $P = 0.028$ ).

Although they did not find improvement in initial quality of life parameters, they did find significant time effects on all scales of the Short Form-36 (SF-36) ( $P < 0.001$ ) and the Gastrointestinal Quality of Life Index score (GIQL) ( $P < 0.001$ ). Lastly, they revealed statistically significant costs savings by applying the laparoscopic approach, specifically a reduction in the median overall cost during the 3-month follow-up from €8196 (euros) in the open group to €6412 (euros) in the laparoscopic group ( $P = 0.042$ ).

I would like to highlight several of the results and discussion points in this manuscript. First, in terms of the technique, I have evolved over the last 15 years from a 4-port to a 3-port technique.<sup>1-4</sup> I use a slightly different port configuration than do Maartense and coworkers. Specifically, I use a 10-mm supraumbilical port and 2 additional 10 mm left-sided ports: one in the left paraumbilical region or left upper quadrant and one in the left lower quadrant. Although Maartense and colleagues also use the supraumbilical port, they favor a 10-mm right fossa port and a 5-mm suprapubic port.

These differences highlight the fact that port placement is merely an issue of personal preference, and the differences between us relative to the size and position of the ports are probably of little consequence and I do not believe play any significant difference in either the ability to accomplish the procedure or the subsequent result. What is important is that, in most patients, these operations can be performed with 3 ports: one for the camera, one for a grasper, and one for a dissecting instrument. Maartense and associates prefer the surgeon holding the camera in the left hand and the laparoscopic scissors in the right hand. I prefer having an assistant hold the camera while I use a 10-mm diameter Babcock grasping forceps and a 5-mm diameter ultrasonic scalpel or a 5-mm diameter bipolar coagulating and cutting device. The remaining technical facets of the procedure appear identical, including extracorporeal vascular ligation, bowel division, and anastomosis, although again I prefer a stapled side-to-side rather than a sutured end-to-side anastomosis.

I think that the difference for anastomosis is predicated on the findings of Kracht et al.<sup>5</sup> Kracht et al from the French Association for Surgical Research who published a prospective randomized multicenter trial that included 440 patients divided into 5 groups. Four types of hand-sewn ileocolic anastomoses were compared with stapled ileocolic anastomosis. Specifically, 84 patients underwent an end-to-end anastomosis with interrupted sutures, 77 patients underwent an end-to-end anastomosis with a continuous running suture, 82 patients underwent an end-to-side anastomosis with interrupted sutures, and 91 patients underwent an end-to-side anastomosis with continuous sutures. In all instances, polyglycolic derived suture was used. A total of 106 patients underwent a side-to-side anastomosis with a combination of the linear cutter and the stapling devices.

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This study revealed that the stapled ileocolic anastomosis was associated with a lower rate of anastomotic leakage (2.8%) than were all of the other techniques combined (8.3%). Accordingly, my anastomotic choice for all laparoscopic ileocolic resections is the stapled side-to-side anastomosis as advocated by Kracht et al.<sup>5</sup> Regardless of the approach of Maartense and coworkers or me, the extracorporeal facet is performed through a 4- to 5-cm vertical incision. Unlike Maartense and associates, I would not use a Pfannenstiel incision even in case of a larger mass to avoid potentially violating any future stoma site. Therefore, I would rather enlarge the midline incision from a 4- to 5-cm supraumbilical to an 8- to 10-cm midline periumbilical incision extending both above and below the umbilicus.

I am unsure as to why the authors found it necessary to use an incision from “the umbilicus to the pubic bone” in the “open surgical technique” group. As noted by the mean body mass index of 22.5 kg/m<sup>2</sup> in the open group (indeed, the maximum was only 29.4 kg/m<sup>2</sup>), I am not convinced that such a large midline incision was always mandatory. As has been shown by Milsom et al,<sup>6</sup> an “open” ileocolic resection can be performed through a 12.7-cm incision without the need for a xyphoid-to-pubic incision. I think that this trial could have been structured in perhaps a more fair comparison by using a shorter midline incision in the open group. Indeed, when using a “short midline” incision, similar results can be noted. One of our earlier published cohort studies<sup>7</sup> on laparoscopic treatment of terminal ileal Crohn's disease was a comparison of 48 patients who had undergone laparotomy with 26 who had undergone laparoscopic resection of terminal ileal Crohn's disease. There were no significant differences in age, gender, or duration of disease, but the hospital stay was reduced from a mean of 9.6 days in the laparotomy group to 7 days in the laparoscopy group. I find it fascinating that, almost one decade later, in the better-designed investigation of Maartense et al, the decrease in length of hospital stay was virtually identical (a 27% reduction in length of stay in our study versus a 28% reduction in length of stay in the Maartense et al study). Moreover, the rate of conversion in the 30 patients in the excellent publication by Maartense et al of 10% virtually mirrors our earlier published conversion rate of 11%.<sup>7</sup> In that study, we also noted a decrease in the duration of use of postoperative narcotics from 6.3 days in the laparotomy group to 3.1 days in the laparoscopy group. Other authors, including one of the senior authors of the Maartense et al study, Dr. W.A. Bemelman, has previously reported similar findings.<sup>8-11</sup> Indeed, in a prior publication from some of the authors of the current excellent study, the hospital stay after laparoscopic ileocolic resection was 5.7 days, which does indeed show excellent consistency over the last 6 years.<sup>8</sup> Huilgol et al<sup>12</sup> showed a similar reduction in hospital stay from 8.2 to 6.4 days when they compared 21 patients who underwent laparoscopic treatment to 19 who underwent laparotomy for Crohn's disease.

The reduction in morbidity has also been previously mentioned. Hong et al<sup>9</sup> compared 32 patients who underwent laparoscopic ileocolic resection to 29 who underwent laparotomy and, with a conversion rate of 12.5%, noted a reduc-

tion in morbidity from 24.1% in the open group to 9.4% in the laparoscopic group ( $P = 0.05$ ). Similarly, Msika et al<sup>13</sup> documented a significant decrease in morbidity from 18.5% in the open group to 9.5% in the laparoscopic group. Other studies have found comparative morbidity.<sup>8,12</sup> Bemelman et al<sup>8</sup> noted a trend toward improved morbidity in their earlier publication, which did not reach statistical significance from 14.6% in the open group to 10% in the laparoscopic group. This acceptably low morbidity rate has been demonstrated after laparoscopic surgery for inflammatory bowel disease,<sup>14</sup> even in the presence of fistulae.<sup>15</sup>

I think that the reason for the further decrease in hospital stay in the laparoscopic group from 7 days in our prior publication to 5.7 days in the Bemelman et al 2000 publication,<sup>8</sup> to 5 days in the current publication is a somewhat accelerated recovery protocol. As we have noted in 2 prior prospective randomized trials,<sup>16,17</sup> one of which was published in this journal,<sup>17</sup> We cumulatively enrolled 225 patients prospectively randomized between early oral intake and a standard postoperative regimen and found that approximately 89% of patients could tolerate earlier oral feeding, which resulted in a change in our management schema. Since that time, Andersen and Kehlet<sup>18</sup> and Senagore et al<sup>19</sup> have clearly demonstrated the safety, feasibility and economic benefits of these fast track procedures. Furthermore, laparoscopic colectomy is associated with a reduced length of ileus as compared with laparotomy.<sup>20</sup>

It is therefore interesting, but not surprising, to note that during the course of the study Maartense et al altered their practice to discontinue the nasogastric tube, not the morning after surgery, but instead to remove it at the end of the operation and immediately begin oral food intake. They have one of the best calculations for tolerance of oral fluid using an objective cutoff of 1 L of fluid. Like us, they use a patient-controlled analgesia pump rather than an epidural catheter. With this regimen, they noted a faster return to normal diet at a mean of 3.8 days after laparoscopy versus 5.0 days after open surgery ( $P = 0.003$ ), but in Table 3 they reveal 4 days in each of the 2 groups. However, hospital stay can be rapid in patients after laparotomy and can be delayed after laparoscopy, as noted by the shortest stay in the open group of 4 days versus the longest stay in the laparoscopic group of 13 days. This shorter stay in the open group was only one day longer than the shorter stay in the laparoscopic group, whereas the longest stay in the open group was actually 1 day longer than the longest stay in the laparoscopy group, showing that it is sometimes difficult to predict specific patients, although globally patients clearly recover better after laparoscopy. Even in patients who have had lower gastrointestinal fistulae, a mean postoperative stay of 6.1 (as low as 3) days has been noted.<sup>15</sup>

It is unfortunate that neither the SF-36 nor the GIQL study asks simple questions such as when the patient returned to “normal” activity or to work. Chen et al<sup>21</sup> compared 71 patients who underwent laparotomy to 71 patients who underwent laparoscopy; 23 patients in each group had Crohn's disease. Return to partial and full activity and time off of work were all significantly shorter in the laparoscopic group

(2.1 versus 4.4 weeks, 4.2 versus 10.5 weeks and 3.8 versus 7.5 weeks, respectively;  $P < 0.01$  for all). Subsequently, focusing only on patients with Crohn's disease, Alabaz et al<sup>7</sup> reported that 48 patients who underwent laparotomy and resection for terminal ileal Crohn's disease required 8.2 weeks to return to normal activity and 9.3 weeks to return to work, both of which were statistically significantly improved upon in the 26 patients who underwent laparoscopic resection. In that latter group, the return to normal activity was reduced to 3.7 weeks and to work to 4.4 weeks, both of which were significant ( $P < 0.05$ ). Quite simply, neither the SF-36 nor the GIQL indicator may be asking all the relevant questions. Thaler et al<sup>22</sup> also reported a significant quality of life reduction after both laparoscopic and open surgery.

The authors mention improved cosmesis, and they better than anyone are well equipped to comment upon the improved cosmesis. In one of their prior publications,<sup>23</sup> they compared 34 patients (mean of 32 years of age, range, 17–52 years), 11 of whom underwent an open ileocolic resection, 11 of whom had laparoscopic ileocolic resection, and 12 no resection. The patients were well-matched by Crohn's disease activity index, and they found that laparoscopy achieved significantly better scores for body image scale, cosmetic scale, and self-confidence after surgery. Only 3 of the 34 (8.8%) patients preferred open-surgery for cosmetic advantage and even with a hypothetical risk of ureteral injury, 5% during laparoscopy, 82% of patients preferred laparoscopy, and 75% of patients would pay out of pocket even if the only differences were cosmetic. Thus, although their justification for the Pfannenstiel incision is improved cosmesis, I would be reluctant to make any transverse incision in a patient who might at some point in the future require an ileostomy.

The last issue, which they address, is cost. A variety of findings have been reported relative to cost. In a prior study from my department,<sup>7</sup> the charges in the laparoscopic group of \$28,359 were less than the \$34,657 with the open group. Msika et al<sup>13</sup> showed a cost reduction from the open to the laparoscopic group as did Young-Fadok et al.<sup>11</sup> It is interesting how much cost and charges vary. For example, Msika et al<sup>13</sup> reported a decrease from \$9829 to \$6106 between the open and laparoscopic groups, whereas the beneficial cost of \$9895 in the laparoscopic group of Young-Fadok et al<sup>11</sup> was actually more than the open cost in the Msika et al study.<sup>13</sup> The laparotomy cost of \$13,068 in the Young-Fadok et al<sup>11</sup> study was dramatically more. Duepre et al<sup>24</sup> were able to show a savings even with an open cost of only \$2985 given the reduction to \$2547 in the laparoscopic group. The reason for the savings in median cost were related to readmissions and reoperations, which is a facet that has not been previously included in other cost analyses of laparoscopic treatment of terminal ileal Crohn's disease.

## CONCLUSION

Maartense et al have produced what I believe is, to date, the most elegant, best designed, and most convincing study comparing laparotomy to laparoscopy in patients with terminal ileal Crohn's disease. It has quite clearly and convincingly reinforced prior data showing reduced morbidity,

shorter hospital stay, and significantly lower costs with laparoscopy. Although they were unable to show quality of life improvements through either the SF-36 or GIQL questionnaires, they did cite several reasons including small sample size to make these figures significant.

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