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**SUMMARY AND CONCLUSIONS**

## Summary

In part one of this thesis, general aspects of laparoscopic surgery concerning the safe and efficient establishment of the pneumoperitoneum, the effect of laparoscopic adhesiolysis and analgesia requirement after bowel surgery are evaluated. The second part evaluates the feasibility and advisability of laparoscopic surgery in inflammatory bowel disease and familial adenomatous polyposis.

Ideally, the first trocar is inserted safely in an open manner without the need of stay sutures or sutures to seal the abdominal cavity. A prototype of a new trocar for the installation of the pneumoperitoneum, named TrocDoc, has been designed at our institution. In **chapter 2**, a randomised study was conducted to compare three techniques of establishment of pneumoperitoneum for efficacy namely the Veress needle/first trocar, the Hasson and the TrocDoc trocar. Total time and number of actions were assessed with time motion analysis. Total time was shortest using the TrocDoc trocar compared to the Veress needle/first trocar and the Hasson trocar (138 seconds  $\pm$  58 versus 237 seconds  $\pm$  56 versus 350 seconds  $\pm$  103, respectively). Number of actions needed, were lowest for the Veress needle/first trocar combination (22  $\pm$  7), followed by the TrocDoc trocar (32  $\pm$  12) and the Hasson trocar (53  $\pm$  17). Potentially, the TrocDoc trocar might replace the two alternatives because of its efficient, open and therefore safe introduction.

Laparoscopic adhesiolysis may reduce recurrent and "de novo" adhesions and chronic abdominal pain. The aim of the study, described in **chapter 3**, was to evaluate pain and quality of life in 22 patients after laparoscopic adhesiolysis for chronic abdominal pain. Patients filled in a set of validated questionnaires evaluating pain and quality of life pre- and post-operatively until a two year- follow up. At two years, 10 out of 22 patients treated were considered successful. In these patients, a significant increase in quality of life on the scales of physical-, social- and emotional function and less pain was noticed. Laparoscopic adhesiolysis in patients with chronic abdominal pain due to adhesions was effective in only 45 % of the patients. These results indicated that laparoscopic adhesiolysis should be applied with caution.

It is suggested that smaller surgical trauma, as is the case in laparoscopic surgery, is associated with less postoperative pain and analgesia. However, whether it is the incision itself or the extension of the resection that contributes to postoperative pain is still under investigation. Pain is a subjective feeling, which makes comparison between groups difficult. Valid comparison of the amount of postoperative analgesia needed can only be done if the subjective pain score is comparable between groups. In **chapter 4**, morphine requirement after surgical trauma in terms of length of the

incision and extent of bowel resection was investigated. With the use of a patient controlled anaesthesia pump (PCA) the amount of morphine needed was registered. Subjective feeling between patients in the total group with either a large (>8cm) or small incision ( $\leq 8$ cm) showed comparable scores, reflecting sufficient analgesia. The highest morphine dose used was observed in the first 24 hours postoperatively. No differences were found in morphine requirement in patients with a large or small incision. In patients with an extensive resection, significantly more morphine was needed compared to patients with resection of a shorter bowel segment. Since the patients with an incision length of  $\leq 8$  cm included virtually all laparoscopic patients, the presumed benefit of laparoscopic surgery with respect to postoperative pain is overstated when compared to conventional surgery.

Laparoscopic surgery in Crohn's disease can be demanding due to inflammatory adhesions, masses and unsuspected fistulae or abscesses. In **chapter 5**, the feasibility of 30 consecutive patients who had a laparoscopically-assisted ileocolic resection was compared to 48 patients who had a standard open ileocolic resection. Two patients in the laparoscopic group were converted to an open procedure. The operation time was significantly longer in the laparoscopic group compared to the open group. Postoperative morbidity did not differ between groups; 14.6 % in the open group compared to 10 % in the laparoscopic group. Patients in the laparoscopic group were discharged 4 days earlier. In the course of time, duration of operation in the laparoscopic group decreased with 13% and postoperative complications decreased with 15%. Laparoscopic ileocelectomy demonstrated to be as feasible and safe as open surgery with the advantage of an earlier discharge.

Proctocolectomy with ileal pouch anal anastomosis is a preferred surgical option for patients with ulcerative colitis and familial adenomatous polyposis. At the time of operation, the disease is not active in most of the patients with ulcerative colitis. In familial adenomatous polyposis, resection is generally prophylactic. These patients, in particular, could benefit from laparoscopic surgery. **Chapter 6** evaluates laparoscopically facilitated and hand-assisted one- and two-stage proctocolectomy with ileal pouch anal anastomosis, and compared the results with the standard open procedure to determine feasibility. The operation time in the one- stage laparoscopically-assisted proctocolectomy and ileal pouch anal anastomosis is reduced significantly when using the hand-assisted approach compared to the facilitated approach (228 minutes (175-315 minutes) versus 333 minutes (260-360 minutes) ( $p < 0.01$ ), respectively). With the use of a hand port, the operation time is reduced from 2.5- to 1.5 times as long as the time needed for the standard procedure. Postoperative morbidity between laparoscopically-assisted and open one- stage proctocolectomy and ileal pouch anal anastomosis, was similar between both groups (24 % versus 26 %, respectively).

respectively). Completion proctectomy and ileal pouch anal anastomosis via the Pfannenstiel incision took 30 minutes longer when compared to the standard procedure. There were no conversions and no complications after completion proctectomy and ileal pouch anal anastomosis *via* the Pfannenstiel incision. From this study we may conclude that the laparoscopically-assisted one-and two-stage proctocolectomy and ileal pouch anal anastomosis is feasible and advisable. With the use of a hand port, the operation time is acceptable and the morbidity was comparable to the standard procedure.

Severe colitis is a life-threatening complication of ulcerative colitis and emergency colectomy is mandatory. A laparoscopic approach in patients with severe colitis is very demanding due to the potentially high risk of iatrogenic perforation and bleeding because of increased bowel friability and hypervascularity. In **chapter 7**, feasibility of emergency laparoscopically-assisted colectomy in patients with severe colitis was assessed and was compared with patients who had an open colectomy. Ten patients had a laparoscopically-assisted colectomy and 32 patients had an open colectomy. In none of the laparoscopic patients conversion was needed. There were no significant differences between the laparoscopic- and open- group in both minor complications (10% versus 25 %;  $p=0.41$ ) and major complications (30% versus 28 %). Despite the similar oral intake, patients in the laparoscopic group were discharged three days earlier. In a logistic regression analysis, age above 40 years showed to have a significant impact on hospital stay. Laparoscopically-assisted emergency colectomy is feasible, however, a prospective study with sufficient power is needed to confirm these results.

Reduced operative trauma is known to be associated with decreased attenuation of immune defence mechanisms. In **chapter 8**, a randomised study was conducted analysing pre- and post-operative IL-6, CRP levels and expression of the antigen presenting molecule HLA-DR on peripheral blood mononuclear cells in patients after laparoscopic versus conventional bowel resection. In both groups, the operation had a significant impact on the immune response. Overall, there was a trend towards less immune suppression in the laparoscopic group, reflected in lower IL-6 - and CRP levels, and higher expression of HLA-DR on monocytes at day 1 postoperatively. No differences were noticed in the percentages of lymphocytes expressing HLA-DR. It is concluded that no differences were observed between the laparoscopically-assisted and open bowel resection with respect to the immune response.

Not only cure of the disease or increased survival, but also enhancement of quality of life is an important endpoint of outcome to consider in medical care. From the surgeon's point of view laparoscopic surgery is associated with a better cosmetic result

compared to open surgery. Whether quality of life, cosmetic result and body image differ in patients after laparoscopic or open ileocolic resection for Crohn's disease was evaluated in **chapter 9**. It was also evaluated if patients were motivated to accept a higher risk for a postoperative complication or to pay an additional fee for the laparoscopic procedure. Quality of life was evaluated with a validated questionnaire. Body image and cosmesis were evaluated with the Body Image Questionnaire. Quality of life did not differ between patients who had a laparoscopic ileocolic resection, open resection, or patients with Crohn's disease without a resection. Patients after laparoscopic resection had a significantly higher cosmetic score compared to patients after open surgery, but a similar body image score. Sixty-two percent of all patients would accept a higher risk for a complication, 75% was prepared to pay an additional fee and 84 % of the patients without a resection preferred a laparoscopic operation. From this study it is concluded that from the patient's point of view laparoscopic surgery is associated with better cosmesis and that patients are willing to take a higher risk of complications or pay an additional fee to have a laparoscopic operation.

In **chapter 10**, 16 patients who had a laparoscopic proctocolectomy and ileal pouch anal anastomosis were matched with 19 patients who had a conventional procedure to evaluate quality of life, functional outcome, body image and cosmesis. Thirty-two patients agreed to fill in a set of questionnaires. Patients in the laparoscopic group had a higher score of satisfaction with their cosmetic result of the scar, compared to the open group. Quality of life, functional outcome and body image did not differ between groups. In conclusion, satisfaction with the cosmetic result of the scar is the only short- and long-term advantage of the laparoscopic approach in patients undergoing proctocolectomy.

### **General conclusions**

Laparoscopically-assisted ileocolic resection and proctocolectomy with ileal pouch anal anastomosis has been proven to be feasible and safe in centres specialised in the treatment of inflammatory bowel disease and familial adenomatous polyposis. A few advantages previously found in laparoscopic cholecystectomy, could not be sustained in laparoscopic bowel surgery. Despite a longer operation time, the laparoscopic bowel resection was associated with an earlier recovery and patients were discharged earlier when compared to the open procedure.

Due to the increased operation time and the use of disposable instruments, the extra costs for laparoscopic operation is approximately 1800,- Euro. Cost effectiveness can therefore be achieved, considering that the patient operated *via* the laparoscopic technique is discharged two days earlier, which was the case in the present non-randomised studies.

Postoperative pain score, immune response, functional outcome, quality of life and body image were comparable in patients after laparoscopic and open bowel resection. It is not surprising that patients who had a laparoscopically-assisted operations were much more satisfied with the cosmetic result of the operation, compared to the open approach. From these findings it can be concluded that one of the main advantages of the laparoscopic approach on the long term in patients with inflammatory bowel disease and familial adenomatous polyposis is the satisfaction with the cosmetic result of the scar.