

**NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE**

**LAPAROSCOPIC SURGERY FOR COLORECTAL CANCER**

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# 1 Improvements in clinical outcomes following laparoscopic colorectal surgery

## 1:1 Short term outcomes

There is abundant evidence from both small and large randomised trials<sup>(1,2)</sup> that laparoscopic colorectal resection improves outcomes, when compared to conventional open colorectal surgery. There is evidence to show reduced post-operative pain, pulmonary complications, blood loss, blood transfusion, infection (in particular wound infections), post-operative immunosuppression and the pathophysiological response to stress. Post-operative hospital stay is a reliable surrogate marker of recovery from surgery and randomised studies demonstrate a significant reduction in hospital stay. The 5 largest studies to date that have examined oncological outcomes<sup>(3-7)</sup> following laparoscopic colorectal cancer surgery have randomised over 3,500 patients and demonstrated a reduction in hospital stay of up to 3 days. Although these studies report a reduced post-operative hospital stay, they also have high conversion rates to open surgery (11-25%). The conversion rates are high compared to single figure conversion rates which would now be expected (see section 3.1). This represents a historic learning curve as the studies were started in the mid 1990's when few people could achieve what would now be regarded as optimal in laparoscopic colorectal surgery.

## 1:2 Medium term outcomes

Following open surgery, a proportion of patients will require further hospital admissions and in a number of cases re-operation to relieve a small bowel obstruction secondary to adhesions (adhesions develop following surgery in which the small bowel may become attached to the abdominal wall or intra-abdominal contents). It is clear that laparoscopic surgery results in fewer post-operative adhesions which translates into a reduction in adhesion obstruction<sup>(8)</sup>. In addition, open colorectal surgery has a significant wound infection rate, as bacteria may contaminate the abdominal wound. Wound infection contributes to the development of incisional hernias and it is estimated that up to 10% of patients after open colorectal surgery will develop an incisional hernia, a considerable proportion requiring surgical repair. The laparoscopic technique for colorectal surgery has been shown to reduce the chance of wound infection, the resulting incisional hernias<sup>(8)</sup>, the necessity for further surgery and the potential for subsequent morbidity consequent on hernia repair.

## 1:3 Oncological outcomes

In the largest randomised studies examining oncological outcomes following laparoscopic and open colorectal surgery, no significant difference has been detected, to date, in overall survival<sup>(3-6)</sup>. The study from Barcelona reported an improvement in cancer related survival for stage III cancer and was also the study with the lowest conversion rate of 11%, and therefore likely to have the best laparoscopic results. There are some logical reasons why laparoscopic surgery should confer an improvement in oncological outcome, mainly related to immunosuppression. In 1985, perioperative transfusion was identified as an independent risk factor worsening long term outcome, resulting from cell mediated immunosuppression associated with transfusion<sup>(9)</sup>. An extensive review of the immunological effects of laparoscopic surgery<sup>(10)</sup> has concluded that the systemic stress response, as judged by the level of cytokines and acute phase proteins, is significantly less robust after open procedures. In addition, there seems to be less impairment of cell mediated immunity and better preservation of delayed-type hypersensitivity responses and T-cell proliferation after laparoscopic surgery. Modulation of tumour growth-stimulatory factors following open surgery has been

identified as samples from patients undergoing open surgery stimulate tumour growth when compared to preoperative testing from the same patient, or samples from comparable laparoscopic patients. It therefore seems likely that surgical trauma results in adverse alterations in immune function and the majority of the available data suggests that minimally invasive procedures have less effect than comparable open surgery. There is conflicting data in this field and this may relate to the differences in variations that occur in both laparoscopic and open surgery between patients and the different animal models that have been used to study the subject. Further research is needed but it should certainly be considered possible that laparoscopic surgery has a beneficial effect in colorectal cancer.

## **2 The scope of laparoscopic colorectal resection in cancer**

### 2:1 Elective Surgery

There has been considerable debate regarding the proportion of colorectal cancers that are suitable for laparoscopic resection. In Britain, approximately 20% of colorectal cancer patients will present as an emergency and in this situation laparoscopic surgery is contraindicated if tumours are obstructed, perforated or irresectable. With the uptake of screening, it is likely that the percentage of emergency presentations will reduce further. Despite the extensive publications on laparoscopic colorectal surgery, figures on the proportion of patients suitable for laparoscopic resection are rarely seen. Within Yeovil during the 40 months commencing January 2002, 125 patients presented to RHK for elective colorectal resection. 10 patients were considered unsuitable for laparoscopic surgery, 8 of whom had long course pre-operative chemoradiotherapy for large or fixed rectosigmoid tumours. The other 115 (92%) were suitable for laparoscopic resection and only 6% required conversion to open surgery - even when conversion occurs many patients may derive benefit from the laparoscopic technique as the final incision will often be smaller than after open surgery. These figures reflect training and experience in the laparoscopic technique, the surgeon involved having commenced laparoscopic colorectal resection in 1994. The figures should be regarded as reproducible within a large proportion of the surgical community once appropriate training in laparoscopic colorectal surgery has been undertaken.

### 2:2 Emergency presentation

There are occasions when patients will be suitable for laparoscopic resection following emergency admission. Some people may present with colorectal cancer who are not obstructed and do not have peritonitis, and a proportion are suitable for resection on a scheduled operating list. In addition, obstructed patients are increasingly being stented to relieve the obstruction and then laparoscopic resection is undertaken, when appropriate, approximately 2 weeks post-stenting.

### **3 Economic considerations in laparoscopic colorectal surgery**

#### **3:1 Theatre costs**

There have been 2 detailed case-matched studies comparing the financial consequences of laparoscopic or open colorectal resection, the first for diverticular disease and the second which includes some cancer patients<sup>(11,12)</sup>. In addition, the Swedish patients in the COLOR trial<sup>(13)</sup> and the 60 patients in the Yeovil Enhanced Recovery Trial have also undergone a detailed Health Economics analysis<sup>(14)</sup>.

In general theatre costs are higher for laparoscopic than open surgery due to an increase in the use of disposable equipment and an increase in the length of operation. The most accurate research probably comes from randomised studies in which there was approximately £900 more spent on laparoscopic than open procedures<sup>(14)</sup>. A reduction in operating time is seen with experience<sup>(15)</sup> and it is expected that operative duration of open and laparoscopic interventions will become identical, in line with the experience of other minimally invasive procedures. Although the use of disposable equipment is currently essential and costly, with increasing sales it is likely that these costs will reduce considerably. It is currently estimated that laparoscopic colorectal resection of cancer occurs in only 5% (personal communication J Stamatakis), of the total population of the United Kingdom, the potential for increase in surgery and subsequent reduction in disposable costs is therefore considerable.

#### **3:2 Hospital stay**

The case-matched studies report that length of stay is considerably reduced after laparoscopic surgery<sup>(11,12)</sup>. The randomised study from Yeovil<sup>(14)</sup> also reported a reduced median length of stay but the Swedish randomised data<sup>(13)</sup> did not, possibly as a result of their higher conversion rate. Post-operative stay has to be considered in the light of other developments that are occurring simultaneously. In 2000, Kehlet's group in Copenhagen published hospital stays of 3 days for both open and laparoscopic colorectal surgery, achieved as a result of instituting an Enhanced Recovery Programme<sup>(16,17)</sup>. This programme, also known as Fast Track surgery, improves outcome as a result of optimising pre-operative preparation, surgery, anaesthesia, post-operative pain management and post-operative care: a programme of multi-modal rehabilitation. Kehlet postulated that one would not maximise the potential improvement in recovery following laparoscopic surgery without an Enhanced Recovery Programme, and pointed out that laparoscopic surgery had not been compared to open surgery which was optimised using an Enhanced Recovery Programme. In view of that, two randomised trials have been undertaken comparing laparoscopic and open colorectal resection for cancer within an Enhanced Recovery Programme<sup>(14,18)</sup>. The randomised trial recently published by Kehlet did not show a significant reduction in hospital stay associated with laparoscopic surgery, whereas that from Yeovil did demonstrate a 3 day reduction in hospital stay associated with both colonic and rectal surgery. Re-admission rates in the Copenhagen patients were high at 20% and 28% respectively for laparoscopic and open groups, whereas re-admission rates in Yeovil were significantly decreased for the laparoscopic group, 5% versus 27% for open surgery. It is our view that even when open colorectal resection is optimised within an Enhanced Recovery Programme, laparoscopic surgery will improve outcome as a result of reduced complications and re-admission rates, a decrease in hospital stay and reduction in cost. Further studies are necessary to confirm this conclusion.

## **4 Developing laparoscopic colorectal surgery**

### **4:1 Future Developments and potential implications for the NHS**

Bearing in mind that hospital stay following elective open colorectal resection is currently 10-14 days, it is likely that the use of laparoscopic colorectal surgery within an Enhanced Recovery Programme will reduce hospital stay by approximately 7 days. If one assumes 35,000 people in the United Kingdom develop colorectal cancer per year and 28,000 undergo surgery, 21,000 of these will have an elective operation. The Yeovil data would suggest that laparoscopic resection can be attempted in approximately 92% and conversion to open surgery occurs in approximately 6% of the latter group. The maximum bed savings would therefore be approximately 18,000 weeks (136,000 days) per year. In addition, the quality of recovery for each patient would be considerably improved. Similar benefits would be available in approximately 7,000 colorectal resections per year which are undertaken for benign disease. Although these changes will take some time to achieve, the pressure on hospital beds is likely to increase in coming years and will impact on treatment times and waiting lists unless these potential bed savings can be realised.

### **4:2 Surgical Training**

It is clear that with increasing clinical experience, operating times for minimal access colorectal resection will come down and conversion rates will decrease to single figures. One of the concerns in the development of this technique has been the identification that patients converted to open surgery seem to do worse than patients whose treatment is undertaken through a conventional open technique. This may be because patients who require conversion have more advanced disease or co-morbidity and outcomes are inevitably likely to be worse. Alternatively, it may be that during the learning curve, the use of a laparoscopic technique confers a disadvantage to certain patients. Because of these concerns, there has been a concerted effort to develop training in laparoscopic colorectal surgery. The Association of Laparoscopic Surgery of Great Britain and Ireland and the Association of Coloproctology of Great Britain and Ireland have developed a preceptorship programme which allows other consultant surgeons to learn the technique safely. This programme incorporates extensive teaching in laparoscopic colorectal surgery for both surgeons and the theatre nursing team, as well as a period of preceptorship when a less experienced consultant will be assisted in the surgical procedure by a preceptor (details available at [www.alsgbi.org.uk](http://www.alsgbi.org.uk)). In addition to this programme, practical teaching is made available in certain animal laboratories based in continental Europe and using training modules. As a result of this, it is expected that the current relatively low proportion of laparoscopic colorectal operations can be increased safely within the United Kingdom.

## **5 Conclusions**

Colorectal surgery is on the threshold of exciting and fundamental change as there is evidence that laparoscopic colorectal resection of cancer improves clinical outcomes when compared to the traditional open technique. It is also possible that it may improve cancer cure rates when further research is available. There is evidence that the laparoscopic technique reduces hospital stay

considerably, resulting in a cost saving to the NHS and release of much needed beds. Although there has been limited use of the technique to date it is applicable in up to 90% of elective colorectal cancer surgery with the training programme that has been established.

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