controversial topics in surgery

Resection of rectal cancer; laparoscopy or open surgery?

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Entering a new decade, it is apparent that the open versus minimally invasive debate is not dead! Marsden and Parvaiz present compelling data from randomised controlled trials which attest to the feasibility and safety of laparoscopic rectal cancer resection.

Brendan Moran, far from being a dinosaur, argues that case selection is all important, that there is a case for 'reconnaissance' laparoscopy prior to resection to assess which operative route is best for the individual patient and he emphasises the

craft difference in operating in the narrow pelvis of the male. Some of the 'ward' benefits of laparoscopic resection can be reproduced by enhanced recovery protocols.

Both authors acknowledge the pivotal role of high intensity training for this surgery: should rectal resection (by whosoever route) be undertaken in high intensity volume units?

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The case for laparoscopic resection

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The development of laparoscopic surgery has provided a major opportunity to improve the management of colorectal cancer. Early doubts over oncological safety have been quashed in numerous randomised control trials (RCTs) which have shown that laparoscopic resection is associated with better short-term outcomes without oncological compromise.¹⁻⁴ However, many who might accept that laparoscopic resection may be appropriate and optimal for colonic carcinoma still have reservations regarding its use for rectal cancer and question whether an oncologically sound total mesorectal excision (TME) is feasible laparoscopically.

When considering laparoscopic TME for rectal cancer the following questions arise:

1. Is it possible to carry out an oncologically sound laparoscopic TME?
2. Does laparoscopic TME offer additional benefits?
3. What are the technical challenges in laparoscopic TME?

4. Is high-quality laparoscopic TME generalisable through training or is it likely to be confined to specialist centres?

Laparoscopic TME offers better short-term outcomes without oncological compromise when compared to open TME

Advances in instrumentation and imaging technology coupled with increased surgical skill, training and experience have led to several successful reports of laparoscopic resection for rectal cancer with TME and increasing evidence that this is appropriate.⁵⁻¹²

Clinical and short-term results of the larger randomised and non-randomised studies comparing laparoscopic with open rectal resections are shown in Table 1. Operative blood loss, duration of ileus and length of hospital stay are significantly reduced in most studies. Operating times are significantly longer. Complication rates are not increased.

Table 1 Clinical/short-term outcomes for laparoscopic versus open rectal resection

Study	MRC CLASICC Trial (RCT) 2005 ^{1,2}		Lujan (RCT) ⁵ 2009		Laurent ⁷ (NRCT) 2009		Braga (RCT) ⁸ 2007		Zhou (RCT) 2004 ⁹		Law (NRCT) 2006 ¹¹		Portsmouth (unpublished)	
	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open
Sample size	253	128	101	103	238	233	83	85	82	89	98	167	106	62
Conversion rate (%)	34	–	7.9	–	15.1	–	7.2	–	?	–	12.2	–	3.8	–
Mean operative time (min)	(180) (incl. colons)	135	194	173	–	–	262	209	120	106	200	127	240	–
				(<i>P</i> = 0.02)				(<i>P</i> < 0.001)				(<i>P</i> < 0.001)		–
Mean operative blood loss (ml)	–	–	128	234	–	–	213	396	20	92	200	250	20	–
				(<i>P</i> < 0.001)				(<i>P</i> < 0.001)		(<i>P</i> = 0.027)		(<i>P</i> = 0.027)		–
Return to bowel function (days)	5	6	–	–	–	–	3.7	5	1.5	2.7	2	3	–	–
								(<i>P</i> < 0.001)		(<i>P</i> = 0.009)		(<i>P</i> < 0.001)		–
Length of stay (days)	11	13	8.2	9.9	9	16	10	13.6	8.1	13.3	7	8	5	11
						(<i>P</i> < 0.001)		(<i>P</i> = 0.004)		(<i>P</i> = 0.001)		(<i>P</i> < 0.001)		(<i>P</i> < 0.05)
Mortality (%)	(4)	(5)	1.9	2.9	0.8	2.6	1.2	1.2	0	0	1	2.4	0.9	0
	(incl. colons)													
Overall morbidity (%)	40	37	33.7	33	32	37.7	28.9	40	6.1	12.4	25.5	29.3	24	–
									(<i>P</i> = 0.016)					
Anastomotic leak rate (%)	10	7	6	12	5	6.4	9.6	10.6	1.2	3.4	1	3	1	6
Reoperation rate (%)	–	–	7.9	9.7	–	–	7.2	12.9	–	–	–	–	2	8

RCT, randomised controlled trial; NRCT, non-randomised controlled trial.

Table 2 Oncological/long-term outcomes for laparoscopic versus open rectal resection

Study	MRC CLASICC Trial (RCT) 2005 ^{1,2}		Lujan (RCT) ⁶ 2009		Laurent ⁷ (NRCT) 2009		Braga (RCT) ⁸ 2007		Bretagnol (NRCT) 2005 ¹⁰		Law (NRCT) 2006 ¹¹		Morino (NRCT) 2005 ¹²		Portsmouth (unpublished)	
	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open
Sample size	253	128	101	103	238	233	83	85	144	144	98	167	98	93	106	62
CRM involvement < 1 mm (%)	16	14	4	2.9	7	6	1	2	6	6	3.1	4.8	–	–	2	7
RO resection rate (%)	–	–	–	–	92	94.8	–	–	93	90	–	–	–	–	98	93
LN yield (median)	(12)	(13.5)	13.6	11.6	–	–	12.7	13.6	10	12	10	11	12	10	11	12
	(incl. colons)		$(P = 0.026)$		$(P = 0.03)$		$(P = 0.03)$		$(P = 0.03)$		$(P = 0.038)$		$(P = 0.038)$		$(P = 0.038)$	
Local recurrence rate (%)	7.8	7	4.8	5.3	3.9	5.5	4	5.2	1.4	–	3.3	4.9	3.2	12.6	–	–
	(3-yr)		(5-yr)		(5-yr)		(3-yr)				(3-yr)					
Cancer-free survival rate (%)	70.9	70.4	84.8	81	82	79	Same	Same	77	Same	Same	Same	65.4	58.9	–	–
	(3-yr)		(5-yr)		(5-yr)		(5-yr)	(5-yr)	(3-yr)	(3-yr)	(3-yr)	(3-yr)	(5-yr)	(5-yr)		
Overall survival rate (%)	74.6	66.7	72.1	75.3	83	72	Same	Same	89	Same	Same	Same	80	68.9	–	–
	(3-yr)		(5-yr)		(5-yr)	$(P = 0.003)$	(5-yr)	(5-yr)	(3-yr)	(3-yr)	(3-yr)	(3-yr)	(5-yr)	(5-yr)		
Length of follow-up (months)	36.8	36.8	32.8	34.1	52	52	54.2	54.2	18	18	21.2	21.2	46.3	49.7	–	–

RCT, randomised controlled trial; NRCT, non-randomised controlled trial.

Same = values not given in publication, but statement made that there were no significant differences for this factor.

One RCT showed a significant reduction in complications in the laparoscopic group, although the total number of complications recorded is remarkably low.⁹

Numerous clinical series and RCTs have shown that laparoscopic TME is oncologically equivalent to open TME with regard to short-term outcomes and long-term survival (Tables 1 and 2). Two studies have shown improved long-term outcomes, overall 5-year survival and local recurrence rate in laparoscopic patients.^{7,12} Improved results compared with open surgery may be due to technological advances, coupled with improving techniques and increasing experience of surgeons, leading to a better quality of the dissection. In addition, laparoscopy induces lesser physiological and immunological insults which may contribute to better long-term oncological outcomes.⁴

Bretagnol *et al.*¹⁰ reported a prospective series of 144 laparoscopic TMEs with low colorectal or colo-anal anastomosis for mid and low rectal cancers of stage T3N1 or less. Their conversion rate was 14%. Clear distal and circumferential margins were achieved in 98% and 94%, respectively. Two patients developed local recurrence and the 3-year overall and disease-free survival rates were 89% and 77%, respectively.

Zhou *et al.*⁹ reported a complication rate of 6.1%, anastomotic leakage rate of 1.2%, mean operative blood loss of 20 ml, and mean operating time of 120 min following laparoscopic anterior resection for rectal cancer with TME.

Lujan *et al.*⁶ reported a RCT in 204 patients with mid and low rectal cancers. Patients in the laparoscopic group had earlier return of gut function and shorter hospital stay at mean of 2.8 days and 8.2 days, respectively. There were fewer anastomotic leaks in the laparoscopic group, CRM positivity was 4%, 5-year local recurrence was 4.8%, disease-free survival was 84.8% and overall survival 72.1%.

The CLASICC trial provided detailed subgroup analysis of short- and long-term outcomes of patients with rectal cancer.^{1,2} In total, 242 laparoscopic rectal resections were performed, of which 129 included TME. This trial has been criticised for high conversion rates of 34% and for high rates of circumferential resection margin (CRM) positivity of 16%. The high conversion rate and CRM involvement reported in this trial have not been seen in the majority of other laparoscopic rectal resection series, with conversion rates generally ranging between 4–15% (Table 1). A subsequent 3-year update of this trial revealed equivalent oncological and quality-of-life outcomes for the laparoscopic and open groups (overall survival 74.6% laparoscopic and 66.7% open; $P = 0.17$). In addition, the trend toward increased CRM positivity seen in the laparoscopic group did not result in an increased rate of local recurrence (7.8% laparoscopic and 7.0% open; $P = 0.70$). The inclusion criteria for this trial were for the operating surgeons to have performed over 20 laparoscopic resections before submitting

patients into the trial. It is possible that the outcomes could be better for surgeons with more experience in laparoscopic rectal cancer surgery.

Laurent *et al.*⁷ reported 238 laparoscopic TMEs with 5-year follow-up (median follow-up 52 months). More than 80% of their rectal resections were for mid and low tumours. All patients were treated with curative intent. Their conversion rate was 15%. The local recurrence rate was 3.8% in laparoscopic completed and no worse (3.5%) in laparoscopic converted cases, both these figures being lower than the 5.5% observed for their open TMEs.

A recent systematic review and meta-analysis comparing short- and medium-term outcomes of over 1400 laparoscopic versus 1755 open TMEs concluded that there were no oncological differences between laparoscopic and open resections for treatment of primary rectal cancer.⁵

Technical issues related to laparoscopic TME surgery

Obesity, the male pelvis, pre-operative long course chemoradiotherapy, and locally advanced tumours all increase the difficulty of laparoscopic TME.¹⁵ Almost all such patients can have a laparoscopic TME but it is advisable that such patients are avoided during the early stages of the laparoscopic TME learning curve.

Cross stapling the rectum is more difficult to achieve laparoscopically than in open surgery due to the limited angulation of available staplers. Multiple firings of the cross-stapler may increase the risk of anastomotic leakage, although this has not been the case in a number of other studies (Table 1).¹⁴ It may be necessary to employ special techniques to ensure adequate clearance and safe anastomosis for very low rectal cancers. These include: (i) perineal pressure to render the lowest part of the rectum more accessible for staple-transection; (ii) dissection into the pelvic funnel in the intersphincteric plane to allow the somewhat oblique staple line to clear the low neoplasm adequately; and (iii) transanal division of the rectum and hand-sutured colo-anal anastomosis.

Training in laparoscopic TME surgery

The object of training is to produce surgeons who can reliably reproduce an oncologically sound rectal resection with TME. Laparoscopic TME requires advanced laparoscopic skills with colonic resections, a secure grounding in conventional TME techniques and a preceptored training programme in laparoscopic TME. Training is likely to be most appropriately centred on those units with a track record of training in laparoscopic colorectal surgery and established oncological excellence in laparoscopic TME surgery.

It is, therefore, recommended that, initially, laparoscopic management of rectal cancer should be concentrated in

specialist centres. The introduction of a laparoscopic TME training programme is likely to make it generalised and more widely accepted.

Conclusions

Laparoscopic rectal resection with TME is safe and confers all the benefits of laparoscopic colonic surgery. With improvement in techniques, better instrumentation and increasing experience, the quality of the TME and the oncological results will continue to improve. However, it is a challenging procedure to learn, requiring a stringent training programme as with the introduction of open TME. With appropriate training, laparoscopic TME is likely to become the gold standard for rectal cancer resection.

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The case for open surgery – let common sense prevail

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The on-going epidemic towards ‘all things laparoscopic’ continues to gain momentum and undoubtedly my colleagues will misquote a previous paper where laparoscopic colorectal cancer surgery was described as ‘a hammer looking for a nail’.¹ They will claim that all who challenge laparoscopic rectal resectional surgery are dinosaurs and will marvel at the achievements of expensive modern technology in highly selected cases where the ‘gold standard’ has always been ‘as good as’ open surgery. Recent technological advances, practical technical suggestions and educational initiatives have moved the concept of ‘colons

through keyholes’ to being possible in a proportion of the easiest cases. But is the possible sensible when cost, and limitation of resources, remain an issue in many healthcare systems and where additional equipment costs are difficult to justify even with prolonged torturing of the economic data?

There is little doubt that minimal access surgery is beneficial for some and aspects have been incorporated in open surgery enhanced recovery programmes.² Additionally, a skilful laparoscopic resection may further enhance recovery with a potential for reduction in other long-term com-

plications such as postoperative adhesions or incisional hernia.

However, the acquisition of knowledge and training, and the ability to operate, depend on the three main senses of sight, hearing and touch and requires a sensible balance to optimise outcomes. A further vital, completely under-rated and difficult to measure, 'sense' for a surgeon is 'common sense', something which all surgeons feel they possess in abundance! However, for humans in general, the least common sense is 'common sense' with a danger that over indulgence in technology could induce a 'common sense' deficiency.

Rectal cancer surgery – is the possible sensible?

Rectal cancer, as defined by a tumour with its lower edge within 15 cm of the anal verge, accounts for 30% of colorectal cancers and poses particular problems with access, restoration of intestinal continuity and a high risk of local recurrence. Unquestionably, the popularisation of the concept of total mesorectal excision (TME) has been the major advance in the management of rectal cancer in the last 50 years.³ As a consequence, TME has been widely accepted as the gold standard in the management of rectal cancer.^{4,5} TME educational programmes in Sweden and Norway have been shown markedly to reduce local recurrence, improve survival, and reduce the permanent stoma rate.⁶⁻⁹ More recently, results of the MRC-CR07 study outlined the beneficial effects of an optimal plane of surgical resection in reducing local recurrence.¹⁰ A simple method of assessing gross specimen quality in three categories correlated with local recurrence rates and this has been proposed as an excellent audit quality tool.¹⁰

Where is the role for the laparoscope in this context? There is an increasing tendency to extrapolate evidence erroneously from laparoscopic colon cancer surgery as directly applicable to rectal cancer.

It is clear that rectal cancer surgery must incorporate the principles of TME but concerns have been voiced as to the ability and safety of laparoscopic TME.¹¹ The initial reports of the MRC CLASICC trial¹¹ suggested that laparoscopic colon surgery might be beneficial for selected patients provided conversion was not required. However, an increase in circumferential margin positivity, and conversion rates, was noted in the subset with rectal cancer.¹¹

A recent trial of laparoscopic versus open TME for mid and low rectal cancer attempted to address this and indeed reported equivalent outcomes.¹² In total, 204 of 235 patients with mid and low rectal cancer were randomised. The conclusion was that: 'laparoscopic rectal cancer surgery has a similar complication rate to open surgery with less blood loss, rapid intestinal recovery, shorter hospital stay and no compromise of oncological outcomes'.¹² The significantly

longer operating time and probable increased costs were not alluded to. But what were the great benefits reported and where is the gain? Is return to oral diet 0.8 days sooner (mean 2.8 days versus 2.6 days) or length of stay 1.7 days less (mean of 9.9 days versus 8.2 days) of any significance whatsoever when most people only get cancer once in a life-time and any possible compromise in outcome would not be traded for such miniscule benefits?

All sensible surgeons agree that selection is essential with difficult cases undergoing open surgery. The recent publication of the German LAPCON II trial whereby all cases enrolled had initial laparoscopy, prior to randomisation, to ensure that laparoscopic resection was safe and feasible is informative.¹⁵ In total, 765 patients with cancer of the colon or upper rectum were considered for the trial. Approximately 10% were excluded prior to laparoscopy, mainly due to advanced disease considered unsafe or unsuitable, and a further 30% excluded at diagnostic laparoscopy resulting in about 60% considered for randomisation. Needless to say, the 40% more complex cases underwent open resection together with half the randomised group. The outcomes in the 472 randomised cases were similar to previous reports^{12,15} with an increased operative time and a reduction in hospital stay from a median of 10 to 12 days in the laparoscopic group.¹⁵

Laparoscopic colorectal surgery is here to stay, as whole governments are swayed by the putative benefits, usually 'sold' as exaggerated reductions in hospital stay. Rectal cancer is more complex and attempts at laparoscopic excision can only be practised on a solid platform of open surgical training, fine-tuning of skills and instruments, and careful selection of appropriate cases with a willingness to readily convert to gold standard open surgery.

I have seen no reports of what I stated might be very convincing, namely that 'the operation was technically too difficult by the open approach and we had to close the wound and complete the case laparoscopically'.¹

Of course, all who practise laparoscopic surgery will state that they find it easier to operate via the enhanced vision and increasingly sophisticated equipment now available at huge expense, to the chosen few. Proponents will argue that it could be oncologically better but, if so, why do they all exclude the more advanced cases, emergency cases and also report conversion for operative difficulty or unexpected findings?¹¹⁻¹⁵

As surgeons, we need to refrain from continuously striving for a 'triumph of technique over common sense'. Laparoscopic rectal cancer surgery is possible in many, may be beneficial for some and is constantly developing, albeit at an ever increasing technological cost. Let us hope that the possible is sensible and that all who practise surgery retain some 'common sense'! A low peri-operative morbidity and mortality, safe restoration of continuity and optimal

oncological resection should remain the over-riding concerns in rectal cancer. Careful selection, with on-going analysis of laparoscopic rectal cancer surgery by specimen audit and long-term follow-up is mandatory so that the possible is indeed sensible.

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