controversial topics in surgery

Splenic flexure mobilisation for anterior resection performed for sigmoid and rectal cancer

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Standard text books support the concept of routine splenic flexure mobilisation for anterior resection performed for sigmoid and rectal cancer. But dogma is not necessarily evidence-based, and Kennedy and Jenkins argue convincingly that selective splenic flexure mobilisation with preservation of the left colic artery is necessary in only a minority of selected cases where tension is a problem. There are two issues – oncological and the impact on anastomotic dehiscence.

It is generally accepted that preservation of the left colic artery (splenic flexure not mobilised) does not compromise oncological outcome. Prognosis is unaffected by the level of inferior mesenteric artery ligation.

Vascularity after inferior mesenteric artery division, with or without left colic artery preservation, and the level of colon used for anastomosis is contentious. Dehiscence is the end-point. Finan believes that routine mobilisation of the splenic flexure for all anterior resections for cancer should be the norm, to avoid anastomosing thickened sigmoid colon and especially to achieve a

safe ultra-low anastomosis without tension. He implies that any compromise, using the sigmoid to anastomose, with preservation of the left colic artery, increases the risk of dehiscence, on the grounds that the limiting factor for length, and therefore anastomotic tension, is the inverted left colic artery. There is reasonable evidence that division of the inferior mesenteric artery results in partial sigmoid ischaemia, but preservation of the left colic artery may overcome this; the literature remains unclear. Low leak rates are certainly possible after high anterior resection with preservation of the left colic artery. More contentious is whether low leak rates can be achieved after TME and colopouch–anal anastomosis, especially with the extra length of colon needed to construct a colopouch.

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The case against mandatory mobilisation of the splenic flexure in left colonic and rectal malignancy

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Traditional teaching in colorectal cancer surgery is that splenic flexure mobilisation accompanied by ligation of the inferior mesenteric artery at its origin are mandatory to achieve a satisfactory outcome, judged not only in the short-term by patient recovery but also in the long-term by oncological results. As with all aspects of surgery, the logic behind this teaching needs re-appraisal in the cold light of evidence rather than being obscured by the shadows of prejudice and tradition.

The issues for debate are, first whether ligation of the inferior mesenteric artery at its origin, flush on the aorta, improves cancer outcomes, thus decreasing local or distant recurrence? Second, is splenic flexure mobilisation necessary to ensure a well-vascularised anastomosis without tension?

We examine these points with reference to the facts underpinning the debate.

Does inferior mesenteric artery origin ligation improve prognosis?

In some of the largest reports to date, there is no evidence that high ligation confers an oncological advantage. Pezim and Nicholls¹ analysed 567 Dukes' C patients treated at St Mark's Hospital, reporting no improvement in survival with proximal ligation. Surtees *et al.*² reported 250 patients from the same institution, 60% of whom had undergone inferior mesenteric artery ligation above the ascending left colic artery. Despite rigorous analysis using different staging systems,

Table 1 Crude anastomotic leak rates between high and low anterior resections and results where straight colo-anal anastomoses and colonic pouches have been used after low anterior resection

Study	High anterior	Low anterior	
Matthiessen <i>et al.</i> (2004) ¹⁰	4%		24%
Law & Chu (2004) ¹¹	1.3%		8.1%
Platell <i>et al.</i> (2006) ¹²	2.4%		6.9%
Katory <i>et al.</i> (2008) ⁴	0.7%		–
		Straight colorectal anastomosis	Colonic pouch
*Heriot <i>et al.</i> (2006) ¹³	–	13.6%	9.2% (NS)
Jeyarajah <i>et al.</i> (2008) ¹⁴	–	–	7.9%

*Meta-analysis; NS, not significant.

there was no reduction in local recurrence or metastases. Does this mean that the number of patients who underwent a more extensive nodal dissection in the high-ligation group was too small to reveal a significant difference, or that removing involved nodes in this site has little influence on outcome? The answer is unknown, but the degree of nodal involvement is more likely to predict future distant recurrence than being a common cause of local recurrence. This issue is confounded by the fact that even before 1980, when chemotherapy use was rare, approximately 20% of Dukes' C2 patients survived 5 years, suggesting the host response must control residual disease in some people.⁵

Is it possible to undertake left colonic resection routinely without splenic flexure mobilisation?

Despite many contrary views, this approach has been successfully employed in a large proportion of patients. Katory *et al.*⁴ reported results in 707 consecutive patients undergoing high anterior resection – defined by anastomosis above the peritoneal reflection. High ligation was undertaken in all with flexure mobilisation in only 25%. Comparison of the groups found no significant difference in anastomotic leakage, wound infection, mortality or disease-free survival. The report comes from Singapore where body mass index and distance between the costal margin and pelvis might be less than in a Western population. Notwithstanding this, the procedure was also undertaken through a left iliac fossa skin crease incision in two-thirds of patients and the authors emphasised the benefit this confers on short-term recovery. If one is dubious that this is reproducible in the Western population then evidence is readily available from Dublin.⁵ Splenic flexure mobilisation was only necessary in 26 of 100 consecutive patients undergoing rectal cancer resection (10 of 42 [24%] undergoing high anterior resection and 16 of 58 [28%] undergoing TME)

meaning that most operations were achieved through an infra-umbilical incision. No significant increase in short-term complications was noted but there was a 47 min reduction in mean operative duration. In the majority of patients, the inferior mesenteric artery was ligated distal to the ascending left colic artery after a careful lymph node dissection had been performed up the origin of the inferior mesenteric artery. A tension-free anastomosis was performed ensuring visible pulsation at the proximal anastomotic segment.

Is there a preferred site for anastomosis to the rectum?

Karanja *et al.*⁶ reported 219 patients undergoing low anterior resection for cancer with splenic flexure mobilisation in all cases. A significant increase in leakage occurred if the anastomosis was made to the rectum using sigmoid colon, but no increase in leakage if the ascending left colic artery was preserved. Another method of looking at this is the measurement of vascularity during surgery using tissue oxygen tension or laser Doppler techniques.^{7,8} There is a suggestion of decreased vascularity in the descending colon but there is no clear guidance regarding the optimal proximal site for anastomosis. Hallbook *et al.*⁸ demonstrated in 30 patients that the side of the bowel 8 cm above the cut proximal end has a better blood supply than the cut end. The authors felt this supported the use of a side-to-end technique and hence colonic pouches, but did not comment on a difference in flow depending on whether the ascending left colic artery was preserved. Hall *et al.*⁷ demonstrated that sigmoid colon tissue oxygen tension decreased following inferior mesenteric artery origin ligation in an elegant study involving 62 patients. With ascending left colic artery preservation, there was no significant decrease in tissue oxygen. The authors urged caution when interpreting the study owing to the small numbers in each group. Despite

extensive research, there is unfortunately still no intra-operative method that reliably predicts the likelihood of anastomotic ischaemia.

Table 1 broadly considers recent data relating to crude anastomotic leak rates between high and low anterior resections and compares results where straight colo-anal anastomoses and colonic pouches have been used after low anterior resection. Variability in reported leak rates is evident and it is clear that the level and type of anastomosis represent only part of the reason for an anastomotic leak.

The advent of laparoscopic surgery

With sufficient experience, all the manoeuvres undertaken in open surgery can be performed laparoscopically, except in ~10% of the population. The view afforded laparoscopically is superior to open surgery and splenic flexure mobilisation combined with ligation of the inferior mesenteric artery at any point along it, are usually reasonably straightforward: we routinely preserve the inferior mesenteric artery and IMV during colectomy for benign disease, in order to maintain rectal blood supply.

We mobilise the splenic flexure, if necessary, to achieve a well-vascularised anastomosis without tension. This is more likely to be the case in TME than with sigmoid colectomy or high anterior resection. Whenever possible, we would preserve the ascending left colic artery in order to avoid the necessity for splenic flexure mobilisation; however, we aim to take the origin of the inferior mesenteric artery when nodal disease is predicted on computed tomography scan, seems to be visible, or in poorly differentiated tumours. During the last 24 months, we have performed 110 left-sided resections for cancer (in 105 elective patients: one open, 84 laparoscopic-assisted, 20 converted). Using the strategy above, the high tie node has been involved on only six occasions and in only two of these patients was the ascending left colic artery preserved. Re-assuringly, splenic flexure mobilisation has not yet resulted in splenic injury during the authors' last 14 years of laparoscopic colorectal surgery practice. However, in one patient the arcade of Riolan was damaged during dissection of dense adhesions between the descending and transverse colon, resulting in a permanent Hartmann's procedure. This approach is supported by data from Kanemitsu *et al.*⁹ who identified positive nodes above the ascending left colic artery in only 20 of 1188 (1.7%) consecutive patients undergoing resection of sigmoid or rectal cancer.

Conclusions

Common sense and good technique are more important than an assertive approach when deciding whether the splenic flexure needs to be mobilised during anterior resection. Most

experienced surgeons will know that tumour location and patient anatomy play a major role in deciding whether the splenic flexure needs to be mobilised, be that at open or laparoscopic surgery for colorectal cancer. Mobilisation of the splenic flexure is merely one of the techniques available to obtain adequate length for anastomosis but has little direct effect on blood supply. We impress upon readers that the classic principles of avoiding tension and maintaining a good blood supply are more important than dogma regarding technique.

We propose that mandatory splenic flexure mobilisation is without merit or is without significant foundation in evidence. A selective approach to mobilisation is most likely to benefit patients.

References

1. Pezim ME, Nicholls RJ. Survival after high or low ligation of the inferior mesenteric artery during curative surgery for rectal cancer. *Ann Surg* 1984; **200**: 729–33.
2. Surtees P, Ritchie JK, Phillips RK. High versus low ligation of the inferior mesenteric artery in rectal cancer. *Br J Surg* 1990; **77**: 618–21.
3. Phillips RK, Hittinger R, Blesovsky L, Fry JS, Fielding LP. Large bowel cancer: surgical pathology and its relationship to survival. *Br J Surg* 1984; **71**: 604–10.
4. Katory M, Tang CL, Koh WL, Fook-Chong SM, Loi TT, Ooi BS *et al.* A 6-year review of surgical morbidity and oncological outcome after high anterior resection for colorectal malignancy with and without splenic flexure mobilization. *Colorectal Dis* 2008; **10**: 165–9.
5. Brennan DJ, Moynagh M, Brannigan AE, Gleeson F, Rowland M, O'Connell PR. Routine mobilization of the splenic flexure is not necessary during anterior resection for rectal cancer. *Dis Colon Rectum* 2007; **50**: 302–7.
6. Karanjia ND, Corder AP, Bearn P, Heald RJ. Leakage from stapled low anastomosis after total mesorectal excision for carcinoma of the rectum. *Br J Surg* 1994; **81**: 1224–6.
7. Hall NR, Finan PJ, Stephenson BM, Lowndes RH, Young HL. High tie of the inferior mesenteric artery in distal colorectal resections – a safe vascular procedure. *Int J Colorectal Dis* 1995; **10**: 29–32.
8. Hallbook O, Johansson K, Sjodahl R. Laser Doppler blood flow measurement in rectal resection for carcinoma – comparison between the straight and colonic J pouch reconstruction. *Br J Surg* 1996; **83**: 389–92.
9. Kanemitsu Y, Hirai T, Komori K, Kato T. Survival benefit of high ligation of the inferior mesenteric artery in sigmoid colon or rectal cancer surgery. *Br J Surg* 2006; **93**: 609–15.
10. Matthiessen P, Hallbook O, Andersson M, Rutegard J, Sjodahl R. Risk factors for anastomotic leakage after anterior resection of the rectum. *Colorectal Dis* 2004; **6**: 462–9.
11. Law WL, Chu KW. Anterior resection for rectal cancer with mesorectal excision; a prospective study evaluation of 622 patients. *Ann Surg* 2004; **240**: 260–8.
12. Platell C, Barwood N, Dorfmann G, Makin G. The incidence of anastomotic leaks in patients undergoing colorectal surgery. *Colorectal Dis* 2007; **9**: 71–9.
13. Heriot AG, Tekkis PP, Constantinides V, Paraskevas P, Nicholls RJ, Darzi A *et al.* Meta-analysis of colonic reservoirs versus straight colo-anal anastomosis after anterior resection. *Br J Surg* 2006; **93**: 19–32.
14. Jeyarajah S, Sutton C, Miller A, Hemingway D. Colo-anal pouches: lessons from a prospective audit. *Colorectal Dis* 2008; **10**: 599–604.

Why I (nearly) always mobilise the splenic flexure in rectal cancer surgery

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In these days of evidence-based medicine, it is a pleasure to be asked to write on a subject where one can air one's personal prejudices in public, secure in the knowledge that the level of evidence is almost non-existent. To the five levels of evidence, well known to all, Schein¹ added a further three: level 6, 'In my personal series of x patients (never published) there were no complications'; level 7, 'I remember that case'; and level 8, 'This is the way I do it and it is best' I shall leave the reader to judge which of these three applies to my practice.

I should state at the outset, I do not like leaks (nor do my patients), do not like to see an anastomosis under tension and do not particularly like the sigmoid colon which is so often diseased and thickened. A well-vascularised, compliant segment of descending colon, anastomosed to the distal rectum or anorectal junction and under no tension has to be the goal in restorative surgery. Low colorectal anastomoses do seem to have a higher reported leak rate in the literature with lack of tension and adequate vascularity being the major determinants of success. Rullier and colleagues² reported a 6-fold increase in the leak rate for anastomoses fashioned below 5 cm from the anal verge, and similar results have been reported by others.³ The height of the anastomosis has been identified as an independent risk factor for leakage in a large prospective study⁴ and within a multivariate analysis of significant risk factors.⁵ In stating that I 'nearly' always mobilise the splenic flexure in rectal cancer surgery, it is not necessary when the proximal colon has to reach the abdominal wall rather than the pelvic floor (APER or Hartmann's procedure); however, in the remaining cases, I would contest that the additional time spent in the left upper quadrant is time well spent.

Surgery for rectal cancer aims to cure the disease whilst endeavouring to achieve a good functional outcome. For tumours of the mid- and lower-third of the rectum, total mesorectal excision and an anastomosis low in the pelvis is now standard practice. The functional results can be variable and depend on the integrity of the anal sphincter complex and the compliance of the 'neorectum'. The symptoms of faecal urgency, clustering of stools and frank incontinence are termed the anterior resection syndrome and have led to an increasing tendency to fashion a colonic pouch. Although such pouches are not large (2 × 5 cm), adequate length of proximal colon is necessary to achieve a safe procedure and obtain the gains that are evident in the literature.⁶

If one accepts the premise that the sigmoid colon is not to be used in a restorative resection, there is little need for the

inferior mesenteric artery whose main function is to supply the sigmoid and rectum. Although there has been discussion in the past over 'low versus high' ligation of the vessel, it seems that there is little oncological reason for flush ligation of the vessel although the preserved ascending branch of the left colic artery may well become a limiting factor when the adequately mobilised left colon is taken into the pelvis. My impression (there we go again with levels 6–8 evidence) is that tension often resides within the mesentery rather than the colon itself. If the ascending branch of the left colic, now very much a descending branch, is divided, then the vascularity of the colon will be dependent on the marginal vessel and Arcade of Riolan. Studies of the vascularity of the proximal colon following division of the inferior mesenteric artery, whether by laser Doppler assessment⁷ or tissue oximetry,⁸ would again suggest that particular attention has to be paid to tension within the remaining colon.

Brennan and colleagues⁹ recently reported the selective use of splenic flexure mobilisation and, in reporting excellent results from a single centre, claimed that there was a saving of 40 min in the group who did not undergo the additional procedure. On reading their methodology, the inferior mesenteric was divided distal to the ascending branch of the left colic and the colon was divided in the mid-sigmoid. As already mentioned, and probably confirmed by this study, if the sigmoid colon is sacrificed then splenic flexure mobilisation is necessary. Perhaps discussion on splenic flexure mobilisation will centre on one's like or dislike of the sigmoid colon!

Mobilisation of the flexure does indeed carry a small risk of damage to the spleen but this is often a capsular tear from adhesions from the colon and seldom results in splenectomy. On encountering bleeding from the spleen, it is usually possible to leave the area packed away whilst the operation proceeds and direct one's conservative approach to the area some hours later.

For those who favour the principle of mobilisation of the flexure and may be learning the procedure, I hope the editor of the series might allow just a few thoughts and tips. In mobilising the left colon, this should continue until the inferior mesenteric vein is seen from the left. There is a useful plane between the IMV anteriorly and the gonadal vessels posteriorly and that is the place to stay. The white line lateral to the colon, and where dissection often commences, can lead into the perinephric fat or even behind the left kidney. A conscious effort has to be made to keep the dissection in front at this stage. If, on delivering the colon into the

wound, the base of the mesentery is 'splayed out', further mobilisation is possible and necessary. For the high splenic flexure, the distal transverse colon can be taken off the greater omentum early in the mobilisation and dissection can proceed from both directions.

Full mobilisation of the splenic flexure and use of the descending colon for the anastomosis is certainly one way to achieve a successful restorative resection. I would be the last to claim that it is the only way to perform the procedure but it has stood me in reasonably good stead for the past 22 years (and surveillance colonoscopy is a dream)!

References

1. Schein M. Surgical management of intra-abdominal infection: is there any evidence? *Langenbeck's Arch Surg* 2002; **387**: 1–7.
2. Rullier E, Laurent C, Garrelon JL, Michel P, Saric J, Parneix M. Risk factors for anastomotic leakage after resection of rectal cancer. *Br J Surg* 1998; **85**: 355–8.
3. Vignali A, Fazio VW, Lavery IC, Milsom JW, Church JM, Hull TL *et al*. Factors associated with the occurrence of leaks in stapled rectal anastomoses: a review of 1,014 patients. *J Am Coll Surg* 1997; **185**: 105–13.
4. Yeh CY, Changchien CR, Wang JY, Chen JS, Chen HH, Chiang JM *et al*. Pelvic drainage and other risk factors for leakage after anterior resection in rectal cancer patients. A prospective study of 978 patients. *Ann Surg* 2005; **241**: 9–13.
5. Jestin P, Pahlman L, Gunnarson U. Risk factors for anastomotic leakage after rectal cancer surgery: a case-control study. *Colorectal Dis* 2008 doi: 10.1111/j.1463-1318.2007.01466.x.
6. Fazio VW, Zutshi M, Remzi FH, Parc Y, Ruppert R, Fürst A *et al*. A randomized multicenter trial to compare long-term functional outcome, quality of life, and complications of surgical procedures for low rectal cancers. *Ann Surg* 2007; **246**: 481–90.
7. Seike K, Koda K, Saito N, Oda K, Kosugi C, Shimizu K *et al*. Laser Doppler assessment of the influence of division at the root of the inferior mesenteric artery on anastomotic blood flow in rectosigmoid cancer surgery. *Int J Colorectal Dis* 2007; **22**: 689–97.
8. Hall NR, Finan PJ, Stephenson BM, Lowndes RH, Young HL. High tie of the inferior mesenteric artery in distal colorectal resections – a safe vascular procedure. *Int J Colorectal Dis* 1995; **10**: 29–32.
9. Brennan DJ, Moynagh M, Brannigan AE, Gleeson F, Rowland M, O'Connell PR. Routine mobilisation of the splenic flexure is not necessary during anterior resection for rectal cancer. *Dis Colon Rectum* 2007; **50**: 302–7.

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