Editorial

Examining outcomes for laparoscopic *vs.* open colonic resections in middle volume hospitals: comparative outcomes that need cautious interpretation

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Laparoscopy, in one form or another has been a technique used in surgery for over 100 years (1). Its progression and refinement over the decades, since its rudimentary start has resulted in the widespread use of the technique in developed countries. The first laparoscopically assisted colonic resection was performed in 1991 (2) and yet only 20 years later a third of all colonic resections in the USA were performed in this manner (3). Initial caution led, at least in the UK to the guidance (4) in the year 2000 that colonic resections for cancer only be performed within RCTs—preliminary results were encouraging with reports of reduced morbidity and pain post-operatively (5,6). Not all surgeons were convinced, however with concerns raised regarding involved margins, lymph node harvesting and post-site recurrence (7,8). It was not until the publication of studies demonstrating comparable long-term survival data (9,10) that the majority of surgeons endorsed the technique ultimately leading to the rapid expansion in the field.

It was thus we read with interest the paper by Nakao *et al.*, which examined the outcomes of patients undergoing laparoscopic and open colorectal surgery in rural, middle volume centres in Japan. The inverse relationship that exists between hospital volume and mortality (11) is well known and dependent on multiple variables. The authors do not, however compare their outcomes with higher volume centres in Japan, choosing rather to compare outcomes with propensity matched open cases within similar volume centres. The important aspect of course, is not the rural location, nor indeed the number of laparoscopic cases performed in each hospital, but crucially the experience of and the number of cases performed by each surgeon/year. As with all technical procedures there is a learning curve with greater experience leading to enhanced performance and better outcomes. In surgery, the clinical relevance of this is obvious and was aptly highlighted by an inquiry in 2006 by the UK General Medical Council into the Bristol Paediatric Surgical Unit concluding that patients should not be independently operated on by surgeons in the early stage of their learning curve (12). The authors have rightly highlighted that their study fails to take into account the operative experience of the surgeons and this remains the principal drawback to this otherwise well designed study. Without the breakdown of cases performed per surgeon the relevance of the "middle volume" relates to the post-operative care of patients and the experience of the hospital staff in dealing with and recognising complications arising from such operations.

It is important to discuss certain aspects of the methodology to correctly judge their conclusions. The distinction between Stage 2 & 3 colorectal cancers is often difficult and heavily reliant on lymph node involvement. The harvesting of 12 lymph nodes has widely been accepted as the minimum number required to achieve representative sampling (13), yet in the matched outcomes presented in the second table of the paper by Nakao *et al.*, it would appear the authors have included patients with inadequate sampling thereby compromising accurate staging leading to selection bias. Given that staging is one of their cross-matching

covariates, this in turn could result in the mismatching of patients.

The authors have clearly stated that patients who required adjuvant chemotherapy were managed in accordance with JSCCR guidelines, but were not matched for adjuvant chemotherapy. Whilst including adjuvant therapy as a covariate would reduce the bias in patient selection, these guidelines (14) were drawn up to standardise treatment strategies between Institutions and can therefore be assumed that patients matched for age/stage/co-morbidities were at least offered similar therapies. An area for clarification by the Authors would be those patients with ano-rectal cancers, who received neo-adjuvant chemo-radiotherapy as this was not included or discussed.

The propensity score matching (PSM) method is itself a widely used technique, but one not without flaws and indeed argued by many that it should not be used at all (15). It primarily aims to reduce the imbalances or confounding factors between two observational groups in a similar fashion to randomising patients prospectively. The difference is that, in true randomisation all possible confounders (both measured and unmeasured) are balanced evenly between the groups thereby rendering the treatment group independent of the covariate, which enhances the "effect of treatment" estimation. With PSM, matching is achieved through the balancing of covariates on average, therefore two matched individuals may have identical propensity scores, but their covariates may differ which can in turn increase imbalance. With respect to the paper by Nakao *et al.* this could mean that two individuals could be matched despite undergoing resection of different parts of the colon or have different pathological staging. Alternative matching techniques (16) are often preferred as all covariates are matched evenly leading to a more reliable estimation of effect.

Retrospective articles are limited in that they consistently underestimate post-operative complications (17) and it is not surprising given the variability in recording of events or indeed the interpretation. As such it is difficult to draw any meaningful conclusions from the short-term outcomes data presented here other than post-operative length of stay and 30-day mortality. It would be normal procedure to include the re-operation rate for a study such as this and it is unclear why the authors have failed to do this. The reduced length of stay post-operatively is clearly in favour of the laparoscopic approach, which is unsurprising given the lower incidence of post-operative ileus, previously shown in other articles (18).

The benefit of the retrospective approach taken here is that longer term outcomes can be measured with relative ease. The incidence of incisional herniation would have been a useful addition to this study, given the morbidity and re-operative rate associated. The laparoscopic approach has a significantly reduced incidence of incisional herniation (19) and subsequent occurrence of small bowel obstruction compared with open and is an important factor to be considered. It is unsurprising that there is no significant difference between disease free survival (DFS) and overall survival (OS) given that these are determined principally by the pathological staging of the cancer. The operative technique whereby the tumour is removed, be it open or laparoscopic, should not impact on this so long as the margins are clear and the number of lymph nodes harvested is equivalent. The incidence of port-site recurrence and recurrence in a mid-line laparotomy wounds have both been shown to be around 1% (20).

To conclude, the answer as to whether laparoscopic outcomes are equivalent to open outcomes for colorectal resections in middle volume Institutions would appear to be a yes—taking into consideration the caveats regarding methodology mentioned earlier. An improved analysis would be to compare laparoscopic outcomes between middle and high volume surgeons and relate these to their open counterparts in a randomised prospective setting. Given the geography of Japan this is unlikely to be feasible and therefore Nakao *et al.* should be congratulated on their contribution to this important area.

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