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World Journal of Gastrointestinal Surgery (*World J Gastrointest Surg*, *WJGS*, online ISSN 1948-9366, DOI: 10.4240) is a peer-reviewed open access academic journal that aims to guide clinical practice and improve diagnostic and therapeutic skills of clinicians.

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We encourage authors to submit their manuscripts to *WJGS*. We will give priority to manuscripts that are supported by major national and international foundations and those that are of great basic and clinical significance.

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FIELD OF VISION

Primary colon resection or Hartmann's procedure in malignant left-sided large bowel obstruction? The use of stents as a bridge to surgery

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Abstract

There is still significant debate regarding the best surgical treatment for malignant left-sided large bowel obstruction. Primary resection and anastomosis offers the advantages of a definite procedure without need for further surgery. Its main disadvantages are related to the increased technical challenge and to the potential higher risk of anastomotic leakage that occurs in the emergency setting. Primary resection with end colostomy (Hartmann's procedure) is considered the safer option. Tan *et al* compared in a systematic review and meta-analysis the use of self-expanding metallic stents (SEMS) as a bridge to surgery *vs* emergency surgery in the management of acute malignant left-sided large bowel obstruction. The authors concluded that the technical and clinical success rates for stenting were lower than expected. SEMS was associated with a high incidence of clinical and silent perforation. Stenting instead of loop colostomy can be recommended only if the appropriate expertise is available in the hospital. The goal of stenting, a decrease of the stoma rate, may be advocated only if the complication rates of stenting are lower than those of stoma creation in the emergency situation. Until now, this was not demonstrated in a prospective randomized trial.

COMMENTARY ON HOT TOPICS

There is still significant debate regarding the best surgical treatment for malignant left-sided large bowel obstruction. In a multicenter German observation study, out of 15 911 patients with cancer of the left colon a total of 743 patients (4.7%) underwent emergency surgery, performed as a radical resection. In 57.9% (n = 430) a one-stage operation, in 11.7% (n = 87) a primary anastomosis with protective stoma, and in 30.4% (n = 226) Hartmann's procedure (HP) were performed[1]. The morbidity and hospital mortality rates (overall hospital mortality, 7.7%, n = 57) did not differ significantly between the groups. With comparable mortality, HP was recommended for high risk patients in the emergency situation. On the basis of a literature search, Trompetas[2] came to a similar conclusion: primary resection with end colostomy (HP) is considered the safest option in malignant left-sided colonic obstruction. The main advantages are that there is no risk of anastomotic dehiscence and the operation can be performed by less experienced and non-specialist surgeons. The main disadvantages of HP are the need for a second major operation to reverse the colostomy, and the fact that 40%-60% of patients do

not have their colostomy reversed, thereby significantly affecting their quality of life (QOL)[2]. The decision whether a one-stage procedure (resection and anastomosis) should be chosen or not, therefore mainly depends on the clinical assessment of the patient's condition. This is also demonstrated by a survey among members of the Society for Surgery of the Alimentary Tract, performed in the year 2001. With left-sided colonic emergencies in "high-risk" patients, most surgeons opted for a HP (88%) or a diverting colostomy (7%), but in "good-risk" patients 53% of the responders would have selected a one-stage procedure[3]. A Consensus Conference of the World Society of Emergency Surgery (WSES) and Peritoneum and Surgery (PnS) Society held in 2010, gave the following recommendations on management of obstructive left colon carcinoma: (1) HP should be preferred to loop colostomy (C) or loop ileostomy and subsequent resection (2 or 3 staged procedure), since C appears to be associated with longer overall hospital stay and need for multiple operations but not with a reduction in perioperative morbidity (Grade of recommendation 2B); and (2) HP offers no overall survival benefit compared to segmental colonic resection with primary anastomosis in obstructive left colon carcinoma (Grade of recommendation 2C+); HP should be considered in patients with high surgical risk (Grade of recommendation 2C)[4].

The choice of surgery also depends on the specialization of the surgeon. In a series of 336 emergency colorectal procedures performed in the United Kingdom for cancer and diverticular disease, a primary anastomosis was performed in 142 (64.3%) patients by colorectal surgeons and in 42 (36.5%) by non-colorectal surgeons. The overall morbidity and mortality rates were lower for colon and rectal surgeons (14.5% *vs* 24.3% and 10.4% *vs* 17.4%, respectively)[5].

Undisputed are the disadvantages of HP. Vermeulen *et al*[6] assessed the long-term QOL after emergency surgery for perforated diverticulitis in a cohort of 76 patients with HP and 53 patients with primary anastomosis. After 71 mo follow-up, 30 HP patients (39%) still had an end colostomy, but only two patients with primary anastomosis still had a loop ileostomy (4%). Survivors from acute perforated diverticulitis reported worse QOL compared to the Dutch population. QOL in patients who had undergone HP was lower compared to patients who underwent primary anastomosis, both from the patient's and a social perspective. After reversal of HP, this difference disappeared, but HP reversal was performed in only 61% of the patients. QOL in patients after perforated diverticulitis was mainly influenced by the presence of a stoma postoperatively.

The restoration of bowel continuity usually should take place 3 mo after HP. In practice, however, the patients have to live longer with the stoma. van de Wall *et al*[7] provided a systematic overview of 35 studies on HP reversal in 6249 patients. Diverticular disease in 67% and colorectal malignancies in 17% were the main indications for HP. The mean reversal rate after HP was 44%, and the mean time interval between HP and reversal was 7.5 mo.

Even though HP was preferred so far in high-risk patients, the results, nevertheless, are not convincing. Rather than to query in an acute situation whether a single-stage procedure is still acceptable or whether better HP should be carried out for malignant left-sided bowel obstruction, it should be tried to avoid the emergency surgery (including the stoma) in order to attain a risk reduction for the patient[8]. Stoma complications after emergency surgery are underestimated. In a prospective audit of the United Kingdom, a total of 3970 stomas were recorded, of which 1329 (34%) were identified as problematic within 3 wk of surgery[9]. Patients undergoing an emergency procedure were more likely to have a problematic stoma. Another audit, too, revealed emergency surgery as a significant risk factor for stoma complications after colorectal cancer surgery[10].

An at least theoretical approach to circumvent the emergency operation and its complications is the bridging of the obstruction with a stent. It allows after decompression of the left colon and mechanical bowel preparation scheduled surgery of the patient with a high rate of primary anastomoses[11-13].

In this context, I read the recent systematic review and meta-analysis published by Tan *et al*[14] with great interest and I strongly recommend it to readers.

It was the aim of this article to compare the use of self-expanding metallic stents (SEMS) as a bridge to surgery *vs* emergency surgery in the management of acute malignant left-sided large bowel obstruction. Four randomized clinical trials with 234 patients were identified. In terms of efficacy of SEMS placement, the technical and clinical success rates were 70.7 % and 69 % respectively. SEMS intervention resulted in significantly higher successful primary anastomosis [risk ratio (RR), 1.58] and lower overall stoma (RR, 0.71) rates. The clinical perforation rate was 6.9 (8 of 116) and the silent perforation rate 14% (11 of 77). There was no significant difference in anastomotic leak, 30-d reoperation, in-hospital mortality and surgical-site infections rates between stenting and emergency surgery. The authors concluded that the technical and clinical success rates for stenting were lower than expected. SEMS was associated with a high incidence of clinical and silent perforation. However, as a bridge to surgery, SEMS had higher successful primary anastomosis and lower overall stoma rates, with no significant difference in complications or mortality.

A Cochrane review published a few months earlier was more cautious with the recommendation of SEMS[15]. According to this evaluation the use of colonic stent in malignant colorectal obstruction seems to have no advantage over emergency surgery. The clinical success rate was statistically higher in emergency surgery group. The advantages of colorectal stent included shorter hospital stay and procedure time and less blood loss. However, due to the variability in the sample size and trial designs in the included studies, further randomised trials with bigger

sample size and well defined trial design are needed to achieve the robust evidence[15].

In the meantime a further small randomised trial has been published which cannot change this conclusion[16]. In this study 20 patients were randomized to stenting as a bridge to elective surgery and 19 patients to emergency surgery for left-sided malignant colonic obstruction. Technical stent failure occurred in five patients (25%). Two of 20 patients in the stenting group required defunctioning stomas compared to 6 of 19 in emergency surgery group. There was a trend towards lower morbidity and mortality in the stenting group, but the differences were not statistically significant.

The results of the Dutch Stent-in study illustrate the difficulties in interpreting the available data[17]. In this multicentre randomised trial 98 patients with acute left-sided malignant colonic obstruction were assigned to receive colonic stenting (n = 47) as a bridge to elective surgery or emergency surgery (n = 51). No difference was recorded between treatment groups in 30-d mortality, overall mortality, morbidity, and stoma rates during a 6-mo follow-up, and mean global health status did not differ between both interventions. However, the emergency surgery group had an increased stoma rate directly after initial intervention. These authors concluded that colonic stenting has no decisive clinical advantages to emergency surgery. It could be used as an alternative treatment in as yet undefined subsets of patients, although with caution because of concerns about tumour spread caused by perforations[17].

Finally, a meta-analysis should be mentioned which compared the outcomes of stent use as a bridge to surgery and emergency surgery in the management of obstructive colorectal cancer in 8 studies and included also the Chinese Biomedical Literature Database[18]. About 232 patients (38.6%) underwent stent insertion and 369 (61.4%) underwent emergency surgery. The primary anastomosis rate in the stent group was higher (RR, 1.62), and overall complications (RR, 0.42), including anastomotic leakage (RR, 0.31) were reduced by stent insertion. Nevertheless, also in this study, stent insertion before subsequent surgery had no effect on perioperative mortality and long-term survival.

Some authors[19] guessed that SEMS intervention in patients with acute colonic obstruction should be cost-effective since it allows single-stage surgery, a shorter stay in the intensive care unit, and shorter hospitalization in comparison to emergency surgery. A Canadian study based on a decision analytical model even suggested that the use of colonic stenting for patients with acute malignant colonic obstruction is less expensive than emergency resective surgery[20]. Whether this is so, in fact, cannot be confirmed and should be prospectively proven by true comparative studies.

Critically, it should be noted that in the few trials and small case series reported so far the patient should be transferred by means of stenting from an emergency situation to elective surgery. For this purpose, a loop colostomy is a simple alternative which can be performed in any hospital and by non-specialized surgeons. This procedure avoids the hazards that arise when inexperienced apply a SEMS. Stenting instead of loop colostomy can be recommended only if the appropriate expertise is available in the hospital. The Consensus Conference of the WSES and PnS Society, gave the recommendation that HP should be preferred to loop colostomy[4]. But in fact the basis of this recommendation is weak. So far, the sole randomized trial which compared emergency colostomy with acute resection could not demonstrate major disadvantages with colostomy, besides a longer hospital stay[21]. A Cochrane review which was worked out to answer the same question (primary or staged resection for obstruction from primary left colorectal carcinoma?) found that the limited number of identified trials together with their methodological weaknesses did not allow a reliable assessment of the role of either therapeutic strategy in the treatment of patients with bowel obstruction from colorectal carcinoma[22]. Therefore, the second goal of stenting, a decrease of the stoma rate, may be advocated only if the complication rates of stenting are lower than those of stoma creation in the emergency situation. Until now, this was not demonstrated in a prospective randomized trial.

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Primary liver transplantation *vs* liver resection followed by transplantation for transplantable hepatocellular carcinoma: Liver functional quality and tumor characteristics matter

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Abstract

Liver resection (LR) and primary liver transplantation (LT) are two potentially curative treatment modalities for patients with hepatocellular carcinoma (HCC). If an underlying chronic liver disease exists, however, making a decision on which method should be selected is difficult. If a patient has no chronic liver disease, LR may be the preferable option with salvage transplantation (ST) in mind in case of recurrence. Presence of a moderate-to-severe liver failure accompanying HCC usually warrants primary LT. The treatment of patients with HCC and early-stage chronic liver disease remains controversial. The advantages of "LR-followed-by-ST-if-needed" strategy include less complicated index operation, no need for immunosuppression, use of donor livers for other patients in today's organ shortage setting and comparable survival rates. However, primary LT has its own advantages as it also treats underlying chronic liver disease with carcinogenic potential, removes undetected tumor nodules and potentially eliminates need for a ST. An article recently published by Fuks *et al* in *Hepatology* offers an approach by which selecting between LR-followed-by-ST and immediate LT might be easier. Here we discuss the results of the aforementioned report in the light of currently available knowledge.

Key words: Hepatocellular carcinoma; Chronic liver disease; Liver transplantation; Liver resection; Salvage transplantation; Survival

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COMMENTARY ON HOT TOPICS

Liver transplantation (LT) remains the most effective treatment modality for patients with hepatocellular carcinoma (HCC) and underlying chronic liver disease provided that the procedure can be justified by a potentially curable tumor stage. In today's Model for End-Stage Liver Disease (MELD) based practice, Milan Criteria (MC) (one lesion < 5 cm or up to three lesions each < 3 cm with the disease confined to the liver) constitute the main parameter by which to predict patients who would benefit most from LT[1]. While the incidence of HCC is believed to have an increasing trend likely parallel to the increasing number of patients who have had a long lasting course of viral hepatitis infection[2], global donor organ shortage continues to be the most important issue for patients on wait lists as well as for health care providers in the field. This has led the surgery community to look at liver resec-

tion (LR) as a comparable alternative treatment. Patients could be treated by LR followed by the so-called "salvage transplantation" (ST) in cases of tumor recurrence or hepatic decompensation. This would also help the community and other transplant candidates to gain maximum possible benefit from organs of deceased donors. Indeed, thousands of patients have undergone LR as a result of the adoption of this policy over the last decade, and many of them survived subsequent LT. However, this strategy must be carefully evaluated, as there is no guarantee that every patient with HCC undergoing an initial LR with ST in mind will have recurrent disease within the indications of LT. ST may not be an option if: (1) the recurrence is beyond MC; or (2) the patient has developed contraindications to LT, such as advanced age or medical comorbidities. In addition to these factors, the technical challenges of LT will likely be increased in a patient having undergone previous hepatic resection due to scarring and vascularized adhesions.

Bridge therapy, defined as LR followed by a planned LT, regardless of whether the disease recurs, is another strategy to treat HCC. This approach significantly reduces the chance of progression while awaiting an appropriate organ; the strategy is considered to have become successful if a donor liver is offered by the organ allocation system before the patient drops off of the list due to non-transplantable disease recurrence. However, it has been reported that this approach may be associated with greater technical difficulty during transplantation[3,4], particularly if the hepatic hilum and the peri-caval area were dissected extensively during the preceding LR. One other downside to use of LR as bridge therapy is that, in the United States for example, resection of HCC removes the opportunity to use that tumor to gain extra MELD points as a "MELD exception".

For the aforementioned reasons, management of patients with chronic liver disease accompanied by transplantable HCC is an ongoing controversy, leading researchers to seek reliable measures by which to discriminate patients who would benefit from its initial LR from those patients for whom LT should be the first-line treatment.

HOT TOPIC ARTICLE

Fuks *et al*[5] recent study published in *Hepatology* in January 2012 may have the potential to provide a new insight into the issue. Looking to clarify this controversy, the authors compared the outcomes of patients (n = 138) who underwent LR for transplantable HCC within MC, considering ST in case of recurrence, with those of patients who were primarily listed to undergo LT (n = 191). They performed an intent-to-treat based analysis to reveal independent predictors of failure to receive timely ST after initial LT. Out of 138 patients who were supposed to undergo ST in case of recurrence, 26 were excluded because they either underwent LT before recurrence or were diagnosed with a different disease based on final histology. Thus, only 112 patients were planned for ST. Of these, 90 had recurrent disease, of which 30 (33%) did not receive ST because of a recurrence outside the MC. Of remaining 60 patients with recurrence within MC, 21 were not eligible to undergo a major transplant surgery, leaving only 39/90 patients (44%) successfully receiving ST. In the primary LT group, 163 patients underwent LT. After excluding early postoperative deaths and histological diagnoses other than HCC based on explant pathology, this group finally had 146 patients who received a successful LT for HCC. What we can conclude from the results are: (1) One fifth of patients in the initial LR group survived recurrence free. None of those patients required LT for any reason during follow-up; (2) While the median follow-up of whole study population was about 5 years, recurrences (if any) occurred usually much earlier. The median time to recurrence was around 16 mo and was similar in patients regardless of whether they had a recurrent disease within MC or outside MC; (3) The overall 1, 3 and 5-year survival in patients undergoing ST was 94%, 81% and 71%, respectively. The two most frequent reasons for not receiving a ST in within MC group were patient refusal (n = 10) and advanced age (n = 9); (4) In the group beyond MC, tumor > 5 cm, number of lesions > 3 and major vascular involvement were the most frequent contraindications for a ST, occurring in 8 patients each; (5) Multivariate analysis revealed five factors independently associated with recurrence beyond MC: microscopic vascular invasion, presence of satellite nodules, tumor size > 3 cm, poor tumoral differentiation, and existence of cirrhosis. The authors suggested that presence of $\geqslant$ 3 poor prognostic factors should warrant LT before recurrence; (6) ST strategy seemed to save 26 grafts which would otherwise have been used unnecessarily; and (7) However, as a result of this strategy, only 28% of patients included in intention-to-treat analysis and only 39% of patients with recurrence could receive ST, suggesting that primary LT rather than "LR followed by ST if needed" strategy should be the treatment of choice in most of patients with HCC and underlying chronic liver disease.

DISCUSSION

We believe that some important points should be taken into consideration when evaluating the results of this study. As the authors stated in part, a selection bias could not completely be eliminated in this study. All patients in the LR followed by ST group had quite good liver function as determined by having Child-Pugh class A disease and significantly lower mean MELD score (6.5 *vs* 19.8) compared to those in primary LT group. In addition, none of the patients in the earlier group had portal hypertension or reduced thrombocyte count. Moreover, the proportion of patients with Metavir score of F3 in that group was lower than that in the primary LT group. This data suggests that the severity of underlying liver disease was the main parameter to decide the surgical approach selected to manage patients. This kind of study design may be considered inevitable, however, for comparison

of LT with subsequent ST *vs* LT, as implemented by Facciuto *at al*[6] in their retrospective study. Similarly, the average Child-Pugh score and MELD score were lower in the primary LR subsequent ST group than in the primary LT group, though they did not include Child-Pugh class C patients in their analysis. Of 51 patients with HCC undergoing LR as initial treatment, 32 developed recurrence. However, 21 (66%) of those were not eligible to receive ST. Tumor size > 3 cm and high MELD score were shown to be independent risk factors indicating poor survival. There was no difference between the groups in 1- and 4-year overall survival. In a study by Shah *et al*[7], patients with Child-Pugh class A and B disease and HCC within MC were treated by either initial LR (n = 121) or listed for primary LT (n = 140). The drop-out rate in the primary LT group was 21.4% (30 patients). There was no information reporting the number of patients who could undergo ST due to recurrence in the LR group. The authors concluded that primary LT yields better overall survival compared to LR if waiting time from listing for LT was < 4 mo. Of note, histological examination of explants in the primary LT group revealed that 46% of patients actually had a disease outside MC. Margarit *et al*[8] reported that only 6 out of 18 patients with recurrence after LR were able to undergo ST during a 50-mo median follow-up.

Fuks *et al*[5] included only patients within MC. Despite adoption of these criteria by the United Network for Organ Sharing as well as by the majority of centers outside the United States as an integral part of liver allocation systems, some authors have reported that University of California San Francisco (UCSF) criteria (one tumor < 6.5 cm, maximum of 3 tumors with none > 4.5 cm, and cumulative tumor size < 8 cm) can also be used reliably and could yield a long-term outcome comparable to MC[9,10]. However, expanding the inclusion criteria beyond the UCSF model resulted in worse survival compared to meeting UCSF criteria[10,11]. It has to be highlighted that a tumor is likely to result in a drop-out from waiting lists as a waiting list death if it has aggressive histological and genetic features. Perhaps favorable outcomes yielded in patient groups within UCSF criteria result from a relatively good nature of histology despite the tumor size exceeding MC. We don't know what would have happened if Fuks *et al*[5] had included patients within UCSF criteria in LR and primary LT groups. Similarly, we do not have any information about how many of patients who had a recurrence beyond MC after initial LR (n = 30) met the UCSF criteria and what would have been the long-term results if those patients had undergone ST.

Another important point is that the study by Fuks *et al*[5] did not evaluate if it was possible to throw off an unnecessary LR by proceeding directly to LT in the presence of pejorative factors in patients with early stage chronic liver disease. While preoperative imaging by today's state of the art technology is the mainstay of decision making process when planning the treatment of malignant liver tumors, there may yet be valuable information obtained from histological evaluation of tissues taken by minimally invasive techniques. The main concern with regard to fine-needle aspiration cytology or core biopsy is that the intervention may cause significant bleeding and tumor seeding. Although much of the evidence is anecdotal, a few reports have suggested that fine needle aspiration cytology or core biopsy be avoided due to tumor seeding risk up to 5%[12-14]. The risks and benefits of preoperative biopsy may need to be reassessed in the future given newly recognized advantages attributed to histological evaluation. In fact, DuBay *et al*[15] recently proposed "Toronto Criteria" in which preoperative biopsy is used as a guide when deciding exclusion of patients beyond MC from wait list. They reported that outcomes comparable to those of patients meeting MC could be achieved if histological findings demonstrate well-differentiated carcinoma. Cillo *et al*[16] reported that tumor differentiation was one of the strongest predictors of biological aggressiveness and therefore recurrence, suggesting that preoperative detection of tumor grade would be of importance in deciding the type of treatment modality. In the study by Fuks *et al*[5], 30 patients treated with curative-intent LR failed to receive ST due to recurrence outside MC. If this result could have been predicted before LR, those patients likely would have undergone immediate LR. Nonetheless, it has to be stated that the nature of their study was not suitable for such an evaluation.

In light of these data, there should be little argument on treatment of patients with HCC who have no underlying chronic liver disease as well as for those who have severe accompanying cirrhosis. What remains controversial is how to manage the patient with HCC developed on a background of Child Pugh class A disease. In this context, we believe the conclusion drawn in the article by Fuks *et al*[5] should be paid attention. Primary LT may be a more logical modality as it has the capability of treating the disease while reducing the risk of recurrence by eliminating carcinogenic fibrotic liver tissue as well as the underlying condition. Some oncological parameters and unfavorable histological factors such as tumor size, microscopic invasion of vessels, presence of satellite nodules not detected by preoperative imaging, the real severity of cirrhosis, and differentiation of carcinoma should be taken into account if resection is to be selected as the first-line treatment. If a patient presents with tumor within MC, but histological factors, either by resection or biopsy, suggest recurrence may be more aggressive after LR and may ultimately exclude the option of ST, then LT should be the primary consideration.

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BRIEF ARTICLE

Outcomes of elective laparoscopic colorectal operations in octogenarians at a district general hospital in South East England

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Abstract

AIM: To assess the outcomes of laparoscopic colorectal cancer resection in the octogenarian population at our institution.

METHODS: Retrospective analysis of registry data accumulated prospectively were used in conjunction with the data obtained from patient notes to identify outcome data for octogenarians who had undergone elective laparoscopic colorectal cancer resection.

RESULTS: Laparoscopic colorectal cancer resections were performed in 68 octogenarians between 2003 and 2011 at our institution. Four operations (6%) were converted to an open technique. There were twelve cases of morbidity (18%) and two cases of mortality (3%). The overall median hospital stay was 8 d. The median time for a patient to be deemed surgically fit for discharge was 5 d reflecting a delay in provision of social care or stoma education.

CONCLUSION: Our results support the view that laparoscopic surgery in octogenarians is safe, feasible and with a reduced length of stay. This is well reflected in our results which are compatible with United Kingdom national figures.

Key words: Laparoscopic surgery; Colorectal disease; Octogenarian; Mortality; Morbidity

Fernandes R, Shaikh I, Doughan S. Outcomes of elective laparoscopic colorectal operations in octogenarians at a district general hospital in South East England. *World J Gastrointest Surg* 2013; 5(1): 9-11 Available from: URL: http://www.wjgnet.com/1948-9366/full/v5/i1/9.htm DOI: http://dx.doi.org/10.4240/wjgs.v5.i1.9

INTRODUCTION

It is well recognised that as a consequence of socioeconomic and healthcare factors, society is ageing and survival rates are rising. The ageing population can produce challenging clinical dilemmas with regard to appropriate management and in particular surgeons are often left with difficult decisions with regard to operative suitability. It has been reported that age alone, in the absence of other significant co-morbidities is not a prognostic factor in gastrointestinal surgery[1]. However, it is rare that such health is found amongst the octogenarian subgroup.

The rapid advancement of laparoscopic surgery has revolutionised colorectal surgery. Studies have shown that hospitalisation is shortened, post operative pain is reduced and post operative recovery is expedited[2,3]. Nevertheless, reservations about laparoscopic surgery in the elderly exist due to perceived longer operating times, and increased technical difficulty. Recent studies have demonstrated that laparoscopic colorectal surgery in octogenarians is safe, feasible, produces less blood loss and is associated with faster postoperative recovery[4-6]. Controversy

exists with regard to complication rates and overall operating time. Studies demonstrate that operating time is significantly shorter in open colorectal operations[5,6]. There was no statistically significant difference in post operative complications between open or laparoscopic cases. There is a marked variation between reported laparoscopic conversion rates to open surgery with figures ranging from 3%-25%[4,7]. One of the key findings on laparoscopic colorectal surgery in the octogenarian population is the consistent finding of shorter hospital stay[4,6,7].

Our institution is a district general hospital in South East England which has been undertaking laparoscopic colorectal resection since 2003. The study was designed to assess the outcomes of laparoscopic-assisted colorectal cancer resection in the octogenarian population at our institution.

MATERIALS AND METHODS

A prospective registry of all patients undergoing elective laparoscopic colorectal resection has been maintained at our institution since 2003. Demographics, Operative details and American Society of Anesthesiologists (ASA) grade are amongst the variables that are currently recorded. This list was utilised to identify patients > 80 years who had undergone laparoscopic colorectal resection. No patient was excluded. Patient notes were then reviewed to ascertain indication for surgery, intra-operative complications, conversion rate, post-operative complications, length of hospital stay and morbidity and mortality rates. Retrospective analysis of the accumulated prospectively collated registry data were used in conjunction with the data obtained from patient notes.

RESULTS

Laparoscopic colorectal resections were performed in 68 octogenarians between September 2003 and September 2011 at our institution. All cases were elective procedures.

The mean age was 84 years (range 80-91 years) and the male:female ratio was 31:37. Fifty-nine (87%) patients had an operation with a curative intent of malignancy. Other indications included diverticulosis in eight patients and rectal prolapse in one patient. Preoperative assessment revealed that the majority of patients (56%) were classified as American Society of ASA grade Ⅱ, whereas 34% and 10% of patients were classified as ASA grade Ⅲ and ASA grade Ⅳ respectively. Table 1 shows the types of resection performed in these 68 patients.

The operations took a mean operating time of 168 min (range 118-294 min). Of the 68 resections, four (6%) were converted to an open technique. Ureteric injury was the cause in two operations, dense adhesions and iatrogenic small bowel injury was another reason for conversion and the need for enbloc resection was the cause for the final conversion. There were no other intra-operative complications.

There were two cases of morality in our series this producing an overall mortality rate of 3%. The two cases of mortality were as a consequence of cardiovascular instability and severe respiratory sepsis. No association was found between mortality and the ASA grading in this series ($P = 0.52$, Fisher's exact test). Other postoperative morbidities are shown in Table 2. There were 12 postoperative complications giving an overall morbidity rate of 18%. The overall mean hospital stay was 11 d. However, the mean time for a patient to be deemed surgically fit for discharge was 6 d reflecting a delay in provision of social care or stoma education.

Table 1 Types of laparoscopic resection performed

Type of laparoscopic resection	No. of patients
Right or extended right hemicolectomy	13
Left hemicolectomy	8
Sigmoid colectomy	16
Anterior resection	18
Abdominoperineal resection	13
Total	68

Table 2 Postoperative complications

Complication	No. of patients
Chest infection	6
Collections/pelvic abscesses	2
Urinary infection	2
Ileus	2
Total	12

DISCUSSION

Minimally invasive surgery has been reported to produce faster recovery times, reduced post-operative pain and shortened hospital stay in comparison to open surgery[4,5]. Such advantages are especially beneficial for the elderly population in whom often other co-morbidities are found and may have less physiological reserve to cope with the stresses of surgery. However, in order to produce results which reflect these advantages, surgeons need to be well experienced in laparoscopic surgery so that operative progression is achieved and the operation is not unnecessarily prolonged.

There are numerous issues with making accurate comparisons with data for open colorectal resection in the octogenarian population. Obtaining a matched population retrospectively in whom open resection took place is difficult as there is usually a particular reason as to why the operation was not done laparoscopically. For example an en-bloc resection might have been required or anaesthetic concerns may have encouraged an open technique. Consequently, using this group for comparison would have resulted in bias as any difference in morbidity or mortality could have been attributed to increased technical difficulty or more fragile patient population. There have been several studies that have produced data for elective open colorectal procedures in octogenarians. However, many of the studies are prior to the widespread

use of laparoscopic surgery and are thus quite outdated. Isbister in 1997 reported results of 86 patients with a mortality of 11%, respiratory complications in 15% and urinary complications in 36%[8]. Vignali *et al*[5] conducted a case-matched control study in which the results of 61 patients who had undergone laparoscopic resection were compared to 61 patients undergoing open colorectal resection. There was no statistical difference in morbidity rates, 21.5% in the laparoscopic group and 31.1% in the open group. Two percent mortality was reported in the laparoscopic group. The mean hospital stay was 9.8 d in the laparoscopic group and 12.9 d in the open group. Our results are comparable in that our mortality rate is 3%, morbidity rate 18% and our mean hospital stay was 11 d.

Although respiratory complications seem to be consistently found in both laparoscopic and open patients we believe that our results are consistent with others in the literature in providing evidence that the risk of pulmonary complications is reduced by laparoscopic surgery perhaps reflecting the reduced post-operative pain.

In our study we found that although the mean length of hospital stay was 11 d, patients were surgically fit for discharge after a mean of 6 d. The discrepancy reflects time required for social planning or stoma education which is understandable in this patient population.

Our results, in combination with others in the literature provide further evidence to support the view that laparoscopic surgery is safe, feasible and more beneficial to the octogenarian population. In particular, shortened hospital stay and lower pulmonary complications are of especially pertinent. Our results also provide support for early involvement of stoma education and social provision planning.

COMMENTS

Background

It is a current approach in the oldest-old people dealing with the feasibility of laparoscopic colorectal surgery with acceptable results in this group of patients. Nevertheless there is still associated stigma attached to laparoscopic surgery in the octogenarian subgroup due to perceived increased risks.

Research frontiers

The rapid advancement of laparoscopic surgery has revolutionised colorectal cancer surgery. Nevertheless, reservations about laparoscopic surgery in the elderly exist due to perceived longer operating times and special positioning with consequent morbidity. This study was designed to assess the outcomes of laparoscopic colorectal cancer resection in the octogenarian population at the authors' institution.

Innovations and breakthroughs

In this study the authors found that although the mean length of hospital stay was 11 d, patients were surgically fit for discharge after a mean of 6 d. The discrepancy reflects time required for social planning or stoma education which is understandable in this patient population.

Peer review

It is a current approach in the oldest-old people dealing with the feasibility of laparoscopic colorectal surgery with acceptable results in this group of patients.

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16 **Pagedas AC**, inventor; Ancel Surgical R&D Inc., assignee. Flexible endoscopic grasping and cutting device and positioning tool assembly. United States patent US 20020103498. 2002 Aug 1

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Express *t* test as *t* (in italics), *F* test as *F* (in italics), chi square test as χ^2 (in Greek), related coefficient as *r* (in italics), degree of freedom as υ (in Greek), sample number as *n* (in italics), and probability as *P* (in italics).

Units

Use SI units. For example: body mass, m (B) = 78 kg; blood pressure, p (B) = 16.2/12.3 kPa; incubation time, t (incubation) = 96 h, blood glucose concentration, c (glucose) 6.4 ± 2.1 mmol/L; blood CEA mass concentration, p (CEA) = 8.6 24.5 μg/L; CO_2 volume fraction, 50 mL/L CO_2, not 5% CO_2; likewise for 40 g/L formaldehyde, not 10% formalin; and mass fraction, 8 ng/g, *etc*. Arabic numerals such as 23, 243, 641 should be read 23243641.

The format for how to accurately write common units and quantums can be found at: http://www.wjgnet.com/1948-9366/g_info_20100312191949.htm.

Abbreviations

Standard abbreviations should be defined in the abstract and on first mention in the text. In general, terms should not be abbreviated unless they are used repeatedly and the abbreviation is helpful to the reader. Permissible abbreviations are listed in Units, Symbols and Abbreviations: A Guide for Biological and Medical Editors and Authors (Ed. Baron DN, 1988) published by The Royal Society of Medicine, London. Certain commonly used abbreviations, such as DNA, RNA, HIV, LD50, PCR, HBV, ECG, WBC, RBC, CT, ESR, CSF, IgG, ELISA, PBS, ATP, EDTA, mAb, can be used directly without further explanation.

Italics

Quantities: *t* time or temperature, *c* concentration, *A* area, *l* length, *m* mass, *V* volume.

Genotypes: *gyrA*, *arg* 1, *c myc*, *c fos*, *etc*.

Restriction enzymes: *Eco*RI, *Hin*dI, *Bam*HI, *Kbo* I, *Kpn* I, *etc*.

Biology: *H. pylori*, *E coli*, *etc*.

Examples for paper writing

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