10.5005/jp-journals-10033-1202
REVIEW ARTICLE

The Impact of Obesity on Laparoscopic Colorectal Resection

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ABSTRACT

Purpose: A review article to assess the impact of obesity on laparoscopic colorectal resection.

Materials and methods: Relevant papers were searched using Medline, Embase, the Cochrane Central Register of Controlled Trials Clinical Trial. Government, National Research Register, by using the search terms 'laparoscopic colorectal surgery, obese, laparoscopy'.

Conclusion: Laparoscopic colorectal resection are feasible in obese patients. However, increased rates of conversion to laparotomy should be anticipated with increased length of hospitalization when compared to nonobese patients.

Keywords: Colorectal surgery, Laparoscopic colectomy, Obesity.

How to cite this article: Alhomoud H. The Impact of Obesity on Laparoscopic Colorectal Resection. World J Lap Surg 2013; 6(3):144-148.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

Obesity is defined as excessive enlargement of the body's total quantity of fat or excessive accumulation of body fat.[1] The rates of obesity are very high at present in Western countries. The rate has also increased gradually in Asian countries. However, the percentage of obese people in Asian population is lower than those in western populations.[2] Obesity relates to various diseases and maybe associated with increased risk of cancers.[3,4] In general surgery, it has been considered one of the risk factors.[5] In laparoscopic surgery, it has been considered that obesity may reduce technical feasibility, prolongation operative time and increasing operative blood loss and has been regarded as a relative contraindication factor for laparoscopic surgery.[6-8] Recently, with the improvement of laparoscopic technique and instruments, laparoscopic surgery has been proposed as a promising approach for obese patients. However, the outcome of laparoscopic colectomy in obese patients is controversial. Some investigators have suggested that laparoscopic colectomy for diverticular disease and colorectal cancer can be performed safely in obese patients.[9,10] While others have reported high rates of conversions and complications than in nonobese patients.[6,11]

The aim of this review article is to assess the impact of obesity on laparoscopic colorectal resection.

MATERIALS AND METHODS

A systematic search of the scientific literature was carried out using the Medline, Embase, the Cochrane Central Register of Controlled Trials Clinical Trials, National Research Register, The York (UK) Center for Reviews, American College of Physicians Journal Club, Australian Clinical Trials Registry, relevant online journals and the Internet for years 1983 to 2012 to obtain access to all publications, especially randomized controlled trials (RCTs), systemic reviews, and meta-analysis involving the impact of obesity on laparoscopic colorectal resection. Searches were conducted without language restriction. To avoid duplication of data, articles from the same unit or hospital were basically included only once if data was updated in a later publication. However, if surgical cases did not overlap among reports by even the same institute, these reports were all included. The search terms were: laparoscopic colectomy, obesity, laparoscopy, body mass index (BMI), laparoscopic colorectal surgery, obese. All available publications from the past 20 years, primarily from high-volume surgical centers, were considered.

RESULTS

A total of 33 studies were found,[6,9-25,27-40,43] including three matched case control studies[13,14,18] and one review article.[46] Among those, 17 were 'comparative studies'[6,9,12-25] (the total number patients n = 9231), which focused on the comparison of short-term outcomes in laparoscopic colorectal surgery between obese (the total number of patients n = 1,766) and nonobese (the total number of patients n = 7,465). These studies consisted of three matched case control studies and 14 case control studies. Remaining studies included 15 'noncomparative' ones[6,9,11,26-36] which examined the relation between BMI or body weight and short-term outcomes. Results of these studies showed that obesity often accompanied by pre-existing comorbidities and associated with longer operative times and higher rates of conversion to open procedures mainly because of the problem of exposure and difficulties in dissection. Although some studies showed obesity was associated with increased postoperative morbidity including cardiopulmonary and systemic complications, or ileus leading to longer hospital stay, there was no evidence about the negative impact of obesity on intraoperative blood loss, perioperative mortality, and reoperation rate. Whether obesity is a risk factor for

wound infection after laparoscopic colectomy remains unclear. Though sometimes in obese patients, additional number of ports were necessary to successfully complete the procedure laparoscopically, obesity did not influence the number of dissected lymph nodes in cancer surgery. The postoperative recovery of gastrointestinal function was similar between obese and nonobese patients.

DISCUSSION

There is sufficient evidence that obesity is often accompanied by pre-existing comorbidities,[6,12-14,16,18,24,25] increased operative times, and higher conversion rates mainly due to the problem of exposure and dissection difficulties.[6,9,15,16,18,20,21,24,30,31,33,37,42] Nevertheless, only limited studies[6,13,21,24] show that obesity increases postoperative morbidities including cardiopulmonary,[16,17] systemic complications,[17,24] or ileus,[6,13] which may also lead to longer hospital stay.[6,21]

Remarkably there is almost no evidence about the negative impact of obesity upon intraoperative blood loss, perioperative mortality rate, reoperation rate, and the postoperative recovery of gastrointestinal function in laparoscopic colorectal surgery.

An important drawback of performing laparoscopic surgery on obese patients is the difficulty in obtaining good exposure of the operation field (particularly at the base of the mesentery) associated with increased technical demands leading to longer operative time, increased number of ports, or higher rate of conversion to open procedure. These difficulties may be caused by the need to manipulate bulky mesentery, and maneuvering of instruments in a restricted working area.[6,9,13,36,41] Leroy et al,[10] on the basis of a retrospective analysis of 123 elective laparoscopic left colectomies, showed that obesity does not have an adverse impact on the technical difficulty and postoperative outcomes; surprisingly, hospital stay in obese patients was found to be shorter than in nonobese patients. These findings are important because they contradict the long-held perception that obesity is associated with increased surgical risk and sometimes negative impact on postoperative course. However, Sarli et al[44] pointed out that this message could be misleading and the explanation for the differing results may lie in the differing experience of surgeons. In addition, over the last decade, surgical instruments such as the laparoscope, energy/stapling devices,[41] 3-chip charge-coupled devices,[45] or high-definition television[46] have furthered evolved technologically, and these may also play a role in helping surgeons perform surgeries on obese patients.

One might expect increased postoperative morbidity in obese patients because they often have worse American Society of Anesthesiology (ASA) scores or more pre-existing comorbid illnesses including diabetes, hypertension, cardiovascular disease, and lipid disorder. However, among the eight comparative studies,[6,12-14,16,18,24,25] which showed significantly increased comorbidities in obese patients, only three studies[6,13,25] found increased morbidities. This is an important finding and a possible explanation for this result is that obese patients might have benefited from the laparoscopic approach itself, that is, minimally invasive surgery providing decreased pain, reduced pulmonary dysfunction, and less perioperative stress response.[47-50]

These results of the current review are supported by a large cohort of study (n = 6,336, including 808 obese patients),[51] which reported that the incidence of postoperative complications did not differ between obese and nonobese patients after elective general surgery (15.3 *vs* 16.0%, p = 0.26), although obese patients had more comorbidities. With the exception of the incidence of surgical site infections (4 *vs* 3%, p = 0.03), this finding held true for all types of complications and for patients with severe obesity (BMI > 35 kg/m^2). In the multivariate analysis, open surgery and ASA classification and type of surgery, and not obesity, were found to be independent risk factors for development of postoperative complications, suggesting that the laparoscopic approach reduces overall morbidities in general surgery independent of BMI. Furthermore, laparoscopic colectomy for obese patients has been supported by a case-matched comparative study with open colectomy conducted by Delaney et al[26] analyzing total 94 patients with BMI > 30 kg/m^2 who underwent laparoscopic colectomy. They reported that there were no statistically significant differences in the operative time, complication rate, readmission rate and reoperation rate. The direct costs between laparoscopic and open colectomy in obese patients were similar, with the hospital stay being significantly shorter after laparoscopic colectomy. In addition, although obesity was associated with a high conversion rate, outcomes in the converted cases was comparable to matched open cases. These results suggests that laparoscopic colorectal surgery can be performed safely in obese patients and offers the benefit of earlier postoperative recovery without increasing morbidities or costs compared with traditional open surgery.

In terms of oncological adequacy at resection, most studies[10,13,16,19,22] show that the number of harvested lymph nodes and resection margins are not affected by obesity. However, these studies analyzed only short term outcomes of laparoscopic colorectal surgery for obese patients. Because some previous studies[33,52,53] have shown that conversion to open procedure contributes to a negative impact on survival and disease recurrence in patients with colorectal cancer, it might be theoretically possible that

obesity influences the prognosis of these patients because of its association with an increased conversion rate. However, Singh et al[13] reported similar results about disease-free (91.9 *vs* 92.4%, p = 0.661) and overall survival (p = 0.565) at a median follow-up of 2 years in obese (n = 62) and nonobese (n = 172) patients undergoing laparoscopic colectomy for colorectal cancer. There are no other studies comparing tumor recurrence or long-term prognosis between obese and nonobese patients undergoing laparoscopic colorectal surgery for colorectal cancer.

Body mass index is a commonly used objective measure of body fat, with the global cutoff point for obesity proposed by the World Health Organization being BMI > 30 kg/m^2. Most of the studies[6,9,10,13,15,16,18-20,23,25] reviewed have used this cutoff measure to define obesity. However, the distribution of BMI has been found to differ among various ethnic groups. Moreover, a potential disadvantage of BMI is that the value does not consistently reflect body adipose tissue accumulation. In particular, Asian populations may have greater visceral adiposity, which might cause technical difficulty in laparoscopic operation despite the mean BMI being lower than in non-Asian populations.[2] Therefore, the classification of obesity by using the cutoff value of BMI suggested by the World Health Organization may underestimate the risk profile associated with visceral obesity.[2] Two Japanese groups,[21,24] by using visceral fat area measured by computed tomography as the definition of obesity, showed longer operative times and increased morbidity in visceral 'obese' patients, whereas there was no significant difference when they were classified by BMI. Another study[17] used the waist circumference (>85 cm in male or >90 cm in female) as the definition of obesity and identified significantly increased systematic complications in obese patients. However, because these reports used Japanese BMI classification of obesity (BMI > 25 kg/m^2),[54] their findings do not necessarily undermine the utility of BMI as an obesity criterion, which is easy to calculate. An appropriate definition of obesity should also probably include differences in ethnicity. This aspect also seems to be important to accurately evaluate the risk of obese patients in laparoscopic surgery.

CONCLUSION

Current evidence seems to suggest that laparoscopic colorectal surgery in obese patients is not associated with increased perioperative mortality, higher reoperation rate, or delayed postoperative recovery of gastrointestinal function. In addition, despite obesity often being accompanied by pre-existing comorbidities, very few studies show increased postoperative morbidity with longer hospital stay in obese patients. Although the laparoscopic approach may be associated with longer operative times and higher conversion rates in obese patients than in nonobese patients, it appears to be a safe and feasible option with no evidence for compromise in the treatment of disease.

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