

# Impact of obesity on complications after laparoscopic liver resection

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## INTRODUCTION

Obesity is a major public health problem in Western countries, and it is a well-known cause of multiple comorbidities (1). Moreover, it is presumably associated with an increased risk of complications after surgery. Although numerous studies have investigated the effects of obesity on surgical outcomes, there is still no consensus on the topic (2, 3).

With an increasing application of minimally invasive surgery for benign and malignant lesions of the liver, the results of laparoscopic liver resection (LLR) in obese patients are of great interest. In a recent systematic review, Kwan et al. studied the impact of body mass index (BMI) on surgical outcomes in LLR. Most of the studies included showed no significant difference in intra- and postoperative complications between different BMI groups. The authors concluded that current evidence shows LLR in obese patients is safe, however further studies are still needed (4).

Intrinsically we feel that surgery on obese patients poses a greater challenge for the surgeon during the operation, as well as for the patient on his path to recovery. Thus, with this study we aimed to objectively evaluate the impact of obesity on intra- and postoperative outcomes after LLR, in order to better understand this growing health problem in the setting of our surgical patients.

## MATERIALS AND METHODS

All 225 consecutive patients undergoing LLR from the year 2008 to 2023 were retrospectively analysed. Patients were categorized into three groups based on their BMI: normal weight (18,5–24,9 kg/m<sup>2</sup>), overweight (25–29,9 kg/m<sup>2</sup>) and obese ( $\geq 30$  kg/m<sup>2</sup>). The groups were then compared in terms of preoperative data as well as intra- and postoperative outcomes. We performed multivariate analysis using linear regression to predict intraoperative blood loss and operative time.

## RESULTS

Despite higher rates of associated comorbidities in the obese patients, there were no significant differences in intraoperative blood loss, damage to surrounding structures, the rate of conversion or operative time between all three BMI groups (Table 1 and 2). Moreover, there were no significant differences in overall morbidity (33,3% vs. 27,8% vs. 26,8%,  $p = 0,676$ ), as well as major morbidity (15,9% vs. 12,2% vs. 12,2%,  $p = 0,746$ ) or mortality rates (1,4% vs. 1,6% vs. 0%,  $p = 0,703$ ) (Table 3). Multivariate linear regression analysis has not shown BMI to be a predictive variable on intraoperative blood loss and operative time.

## DISCUSSION

Few decades ago, obesity was generally considered a contraindication for laparoscopic surgery due to asso-

ciated technical difficulties. To date, quite a few studies have examined the relationship between BMI and peri-operative outcomes in LLR; yet there is still a significant degree of heterogeneity and applicability to the Western population is questionable (4). Overall, surgical outcomes do not seem to be overwhelmingly worse in obese patients, but some newer studies put the negative impact of obesity on LLR back into question (5,6). On the contrary to our clinical suspicion, our data showed that, when compared to normal

weight group, obese and overweight patients have similar rates of intraoperative and postoperative complications. It might be that the reason why the distinct negative correlation between BMI and perioperative outcomes can't be shown, is that BMI has a non-specific role as an anthropometric measure of obesity. This questions if maybe other measures for body fat composition would be more accurate at determining outcomes after LLR (7).

Table 1. Preoperative characteristics in the three groups

Variable	Normal weight (n = 69; 30,7%)	Overweight (n = 115; 51,1%)	Obese (n = 41; 18,2%)	P-value
Age	62,17 ± 14,123	63,48 ± 12,445	60,05 ± 10,416	0,324
Male sex	36 (52,2%)	73 (63,5%)	30 (73,2%)	0,078
ASA 3 or 4	17 (24,6%)	27 (23,5%)	22 (53,7%)	< 0,001
Comorbidities present	39 (56,5%)	78 (67,8%)	36 (87,8%)	0,003
Number of comorbidities	1,06 ± 1,235	1,30 ± 1,237	2,07 ± 1,439	< 0,001
AH	21 (30,4%)	57 (49,6%)	15 (36,6)	0,031
Diabetes	8 (11,6%)	24 (20,9%)	13 (31,7%)	0,037
Malign tumour	49 (71%)	87 (75,7%)	30 (73,2%)	0,783
Size of the largest tumour	3,8 (1-16; 4)	4,6 (0,2-18,5; 3,3)	4,2 (0,2-22; 3,0)	0,720
Proximity to IVC	13 (18,8%)	21 (18,3%)	8 (19,5%)	0,984

ASA, American Society of Anaesthesia; AH, arterial hypertension; IVC, inferior vena cava

Table 2. Intraoperative outcomes in the three groups

Variable	Normal weight (n = 69)	Overweight (n = 115)	Obese (n = 41)	P-value
Operative time (min)	160 (25-360; 95)	160 (30-450; 90)	160 (20-360; 85)	0,341
Intraoperative complication	13 (18,8%)	20 (17,4%)	9 (22,0%)	0,812
Blood loss > 775mL	3 (4,3%)	7 (6,1%)	5 (12,2%)	0,263
Damage to surrounding structures	1 (1,4%)	2 (1,7%)	0	0,703
Conversion	10 (14,5%)	14 (12,2%)	7 (17,1%)	0,721

Table 3. Postoperative outcomes in the three groups

Variable	Normal weight (n = 69)	Overweight (n = 115)	Obese (n = 41)	P-value
Morbidity (CD 1-5)	23 (33,3%)	32 (27,8%)	11 (26,8%)	0,676
Morbidity (CD ≥ 3)	11 (15,9%)	14 (12,2%)	5 (12,2%)	0,746
Mortality	1 (1,4%)	2 (1,7%)	0	0,703
LOS	6 (2–52; 6)	6 (2–79;3)	5 (2–42; 4)	0,732
Readmission rate	4 (5,8%)	7 (6,1%)	1 (2,4%)	0,657
Steatosis <sup>a</sup> , b	7 (10,1%)	23 (20,0%)	19 (46,3%)	<0,001
Cirrhosis <sup>b</sup>	11 (15,9%)	22 (19,1%)	12 (29,3%)	0,227

CD, Clavien-Dindo; LOS, length of stay. <sup>b</sup>confirmed by pathohistological examination

## CONCLUSIONS

General surgeons will encounter more overweight and obese patients in the future; therefore, it is important to fully understand the effect of elevated BMI on the outcomes of these patients. Our results suggest that with proper patient selection LLR in obese patients can be undertaken and performed as safely as in normal weight patients with the same risk of intra- and postoperative complications.

## References

1. Andolfi C, Fisichella PM. Epidemiology of Obesity and Associated Comorbidities. <https://home.liebertpub.com/lap>. Mary Ann Liebert, Inc. 140 Huguenot Street, 3rd Floor New Rochelle, NY 10801 USA ; 2018 Aug 1;28(8):919–24.
2. Bamgbade OA, Rutter TW, Nafiu OO, Dorje P. Postoperative complications in obese and nonobese patients. *World J Surg.* World J Surg; 2007 Mar;31(3):556–60.
3. Tjeertes EEKM, Hoeks SSE, Beks SBJC, Valentijn TTM, Hoofwijk AAGM, Stolker RJRJ. Obesity - a risk factor for postoperative complications in general surgery? *BMC Anesthesiol.* BioMed Central Ltd; 2015 Jul 31;15(1):1–7.
4. Kwan B, Waters PS, Keogh C, Cavallucci DJ, O'Rourke N, Bryant RD. Body mass index and surgical outcomes in laparoscopic liver resections: a systematic review. *ANZ J Surg.* ANZ J Surg; 2021 Nov 1;91(11):2296–307.
5. Chua DW, Syn N, Koh YX, Teo JY, Cheow PC, Chung AYW, et al. Association of standardized liver volume and body mass index with outcomes of minimally invasive liver resections. *Surg Endosc.* Surg Endosc; 2023 Jan 1;37(1):456–65.
6. Zimmitti G, Sijberden JP, Osei-Bordom D, Russolillo N, Aghayan D, Lanari J, et al. Indications, trends, and perioperative outcomes of minimally invasive and open liver surgery in non-obese and obese patients: An international multi-centre propensity score matched retrospective cohort study of 9963 patients. *Int J Surg.* Int J Surg; 2022 Nov 1;107.
7. Ratti F, D'Alessandro V, Cipriani F, Giannone F, Catena M, Aldrighetti L. Influence of body habitus on feasibility and outcome of laparoscopic liver resections: a prospective study. *J Hepatobiliary Pancreat Sci.* J Hepatobiliary Pancreat Sci; 2016 Jun 1;23(6):373–81.