
Benefits of Laparoscopy in Elderly Patients Requiring Major Liver Resection



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- BACKGROUND:** Although recent reports have suggested the potential advantages of laparoscopy in patients undergoing major hepatectomy, the benefits of this approach in elderly patients remain unclear. This study aimed to compare the short-term outcomes of laparoscopic major hepatectomy (LMH) and open major hepatectomy (OMH) in elderly patients.
- STUDY DESIGN:** All patients aged 55 years and older undergoing laparoscopic LMH between 2000 and 2013 at 2 centers were retrospectively analyzed and divided into 3 groups (group 1: 55 to 64 years old; group 2: 65 to 74 years old; and group 3: 75 years and older). Risk factors for postoperative complications were determined on multivariable analysis in the overall LMH population and in each LMH group. Outcomes of LMH patients were compared with those of patients of similar age undergoing OMH at another center after propensity score matching.
- RESULTS:** Laparoscopic major hepatectomy was performed in 174 patients, including 72 (41.4%) in group 1, 67 (38.5%) in group 2, and 35 (20.1%) in group 3. On multivariable analysis, diabetes (odds ratio [OR] = 2.349; 95% CI, 1.251–2.674; $p = 0.047$), American Society of Anesthesiologists status (OR = 2.881; 95% CI, 2.193–3.71; $p = 0.017$), cirrhosis (OR = 1.426; 95% CI, 1.092–2.025; $p = 0.043$), right-sided resection (OR = 2.001; 95% CI, 1.492–2.563; $p = 0.037$), conversion (OR = 1.950; 95% CI, 1.331–2.545; $p = 0.024$), and intraoperative transfusion (OR = 2.338, 95% CI, 1.738–2.701, $p = 0.032$) were associated with increased risk of postoperative complications in the whole LMH population. After propensity score matching, laparoscopy was associated with significantly decreased rates of pulmonary complications and shorter hospital stays in all groups, decreased rates of overall complications in group 2 and group 3, and decreased rates of postoperative confusion in group 3.
- CONCLUSIONS:** The current study supports the benefits of laparoscopy in decreasing postoperative complications in elderly patients requiring major hepatectomy. (*J Am Coll Surg* 2016;222:174–184. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)
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During the past several decades, the continuous increase in life expectancy in developed countries has resulted in a higher proportion of elderly patients requiring surgery.¹

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In liver surgery, advances in surgical technique and perioperative care have led to extensions of the indications for resection, especially to older patients requiring major hepatectomy for malignant disease.² It has been suggested that postoperative liver function after major hepatectomy in selected elderly patients was similar to that of younger patients.³ However, because elderly patients also present more frequently with comorbidities, particularly cardiovascular and pulmonary diseases⁴ as well as underlying parenchymal disease,² a trend in the stabilization of postoperative mortality and morbidity² has been observed recently. Although it is now accepted that open major hepatectomies (OMHs) are feasible with acceptable morbidity in this group of patients,^{5–7} any measure toward the improvement of operative outcomes for elderly patients would be valuable.

Abbreviations and Acronyms

ASA = American Society of Anesthesiologists
LMH = laparoscopic major hepatectomy
OMH = open major hepatectomy
OR = odds ratio

The indications and results of laparoscopic liver resection have evolved considerably in the past several years^{8,9} and refinements in laparoscopic tools and surgical skills have allowed more complex laparoscopic hepatic resections,^{10,11} including laparoscopic major hepatectomies (LMHs).^{12,13} In this setting, several studies have now reported that LMHs were associated with decreased rates of major¹⁴ and pulmonary¹⁵ postoperative complications, diminished blood loss,¹⁴ and shorter hospital stay¹⁴ compared with OMHs, and have respected fundamental oncologic principles at the same time.¹⁶

To date, only a few studies have focused on the potential benefits of laparoscopy in elderly patients requiring liver resection.^{17,18} However, no study has yet specifically focused on the results of LMH and OMH in this group of patients. In this setting, the objective of this multi-institutional study was to compare the short-term outcomes of LMH and OMH in elderly patients with similar preoperative characteristics using propensity score matching.

METHODS

The study included all patients aged 55 years and older undergoing fully laparoscopic major (≥ 3 contiguous Couinaud segments¹⁹) right or left liver resection at Institut Mutualiste Montsouris (center 1) from 2000 to 2013 and at Hôpital Saint-Antoine (center 2) from 2009 to 2013, as well as all patients undergoing OMH at Hôpital Beaujon (center 3) from 2000 to 2013. No patient underwent a planned “hand-assisted” or “hybrid” approach. For center 2, the first LMHs were performed in 2007, but the relocation of the surgical team to another hospital in 2009 prevented collection of data before 2009. In center 3, no patient underwent LMH during the study period. Collected data were retrieved from prospectively maintained databases. This study was approved by the local IRB in each center.

Preoperative evaluation

For all patients, preoperative investigations included complete blood and liver function tests, physical examination, assessment of comorbidities, and routine cardiopulmonary evaluation. Pulmonary comorbidity was defined as chronic and severe limitation of mobility (ie, obstructive,

restrictive, and vascular) and inability to perform household chores, and cardiovascular comorbidity was defined as symptomatic coronary heart disease with New York Heart Association stage 2 and 3 clinical limitations or MI during the previous 6 months. An echocardiogram and lung function test was performed if necessary for patients with high index of suspicion of occult cardiopulmonary disease. Chronic kidney disease was defined as either kidney damage or a decreased glomerular filtration rate of <60 mL/min/1.73 m² for ≥ 3 months. Surgical risk was assessed using the criteria of the American Society of Anesthesiologists (ASA) and liver resection was contraindicated for patients with a score >3 . Specific geriatric evaluation for patients aged 75 years and older was not routinely performed.

Surgical technique**Laparoscopy group**

All procedures were performed by at least one senior surgeon as described previously.^{16,20} Liver transection was performed under low (<5 mmHg) central venous pressure.²¹ Briefly, LMH was performed using 5 or 6 ports, depending on the surgical procedure and operator preference. Laparoscopic ultrasonography was routinely used to guide the resection. The operative technique was similar to open surgery: isolation and division of hepatic inflow, absence of mobilization of the liver before transection, and subsequent transection of liver parenchyma. Clamping of the hepatic inflow pedicle was not routinely performed, and the Pringle maneuver was used in case of bleeding only. Energy sources and parenchymal division techniques varied throughout the study period. During the early years, tissue dissection and hemostasis were performed using ultrasonic dissector or scalpel, and bipolar forceps provided retraction and hemostasis. In more recent years, the harmonic scalpel (primarily SonoSurg; Olympus and, more recently, Harmonic; Ethicon EndoSurgery, Inc or Thunderbeat; Olympus) was used frequently, especially for transection of superficial parenchyma. When parenchyma transection reached the hilar plate, segment I was divided along the right aspect of the IVC to allow the dissection of both the right bile duct and hilar plate, which were then taped, closed using either a large secured clip or a stapler, and finally cut. At the end of parenchymal transection, the hepatic outflow was divided with an endoscopic vascular stapler. The resected specimen was finally mobilized, placed in a plastic bag, and removed, without fragmentation, preferentially through a 5 to 8 cm suprapubic incision without muscle section. This incision was immediately closed and the abdomen reinsufflated to confirm hemostasis and absence of bile leaks. Methylene blue or air injection

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