Postoperative outcomes after open splenectomy versus laparoscopic splenectomy in cirrhotic patients: a meta-analysis

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BACKGROUND: Laparoscopic splenectomy is considered the gold standard for resecting normal-to-moderately bigger spleens in benign conditions, and in addition could be tried for patients with malignant splenic disorders. However, the safety of laparoscopic splenectomy in patients with hypersplenism is not well-known. This study aimed to investigate the efficacy and safety of laparoscopic splenectomy for patients with hypersplenism secondary to liver cirrhosis by comparing with the open splenectomy.

DATA SOURCES: Several databases were searched to identify comparative studies fulfilling the predefined selection criteria from January 2000 to June 2015. The subsequent key words were utilized for browsing "laparoscopy" or "laparoscopic", "open", "splenectomy", and "liver cirrhosis". Studies evaluating laparoscopic and open splenectomy for patients with liver cirrhosis were incorporated. Two evaluators personally strained the title and abstract of each publication. Citations with contemplated compliance within our eligibility criteria underwent compressed review. Meta-analysis was carried out according to the recommendations of the Cochrane Collaboration software (review manager 5.1).

RESULTS: Seven studies containing 509 patients were included. Compared with the open splenectomy group, patients in the laparoscopic splenectomy group had significantly less intraoperative blood loss (MD=210.30; 95% CI: 11.28-409.32; *P*=0.04), longer operative time (MD=-31.58; 95% CI: -53.34--9.82; *P*=0.004), shorter duration of postoperative hospital stay (MD=3.41; 95% CI: 2.39-4.43; *P*<0.01), lower incidence of postoperative complications (RR=1.34; 95% CI: 0.88-2.01; *P*=0.17), and decreased liver damage [ALT (MD=8.52; 95% CI: 0.19- 16.85; *P*=0.05) and total bilirubin (MD=5.12; 95% CI: 0.37-9.87; *P*=0.03)].

CONCLUSION: Hypersplenism secondary to cirrhosis and portal hypertension should not be a contraindication for laparoscopic splenectomy.

(*Hepatobiliary Pancreat Dis Int 2016;15:14-20*)

KEY WORDS: open splenectomy; laparoscopic splenectomy; cirrhosis

Introduction

Since 1950, surgical splenectomy is common in practice for splenomegaly and hypersplenism.[1] However, open splenectomy (OS) is exceedingly intrusive, has more chance for intraoperative hemorrhage and postoperative pain, and cannot be performed if the patient has poor liver function.[1] Furthermore, OS has a substantial mortality in patients with poor liver function and related hypersplenism.[2]

Laparoscopic splenectomy (LS) was first used in 1997 and has been well acknowledged in patients with splenomegaly due to its promising clinical benefits.[3] Currently, LS is among the most *de facto* standard for removing typical to somewhat bigger spleens in benign conditions, and in addition could possibly be tried for patients with malignant splenic disorders. On the other hand, the security of LS in patients with hypersplenism is not well-known. Patel et al[4] investigated the feasibility of LS on patients with massive splenomegaly and found that although LS is feasible in patients with giant spleen, it is associated with longer median operating time, high con-

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doi: 10.1016/S1499-3872(16)60053-X
Published online January 7, 2016.

version rate, postoperative morbidity and median postoperative stay.[3] As a result of the collective experiences of laparoscopic surgeries and up to date advancements in operating equipments, specifically vessel sealing systems, laparoscopic approaches are progressively suggested for a variety of conditions which include patients with liver cirrhosis and portal hypertension.[5, 6] Tomikawa and colleagues[1] compared LS to partial splenic embolization and found that patients who had undergone LS had no significant complications, better liver function preservations, and higher platelet count, and LS did not impact the undergoing treatment. Reso and coworkers[7] demonstrated that after splenic artery embolization, hand-assisted LS or LS was safe, and there was no conversion to OS.

This analysis looked into the efficiency and safe practices of LS for patients with hypersplenism secondary to liver cirrhosis by evaluating together with the OS outcomes. The results of hematologic change, impairment of liver function, and perioperative data were discussed.

Methods

Literature search strategies and selection

An internet-based search along with a manual search was utilized to acquire suitable studies. Five electronic data sources were scrutinized for this analysis (PubMed, Springer, Cochrane Reviews, Ovid and Embase) from January 2000 to June 2015. The following key words were used: "laparoscopy" or "laparoscopic", "open", "splenectomy", and "liver cirrhosis". In case any meta-analysis or review was identified, a manual search of reference lists from these retrieved publications was performed.

Inclusion and exclusion criteria

Studies comparing laparoscopic and open splenectomy for patients with liver cirrhosis were included no matter whether they were randomized controlled trials or retrospective studies. The exclusion criteria were as follows: (1) it absolutely was unattainable to acquire the proper information through the published articles; (2) there were considerable convergence among authors, institutes, or patients in the literature; (3) the assessed outcomes were not obviously shown in the literature; and (4) long-term follow-up was not documented in articles as it had not been cited in the studies.

Study eligibility assessment

Two reviewers manually strained the publication title and summary for each publication. Details with considered conformity in the eligibility criteria went through compacted evaluation. If two reviewers identified a citation being most likely pertinent, we acquired the full-text article to get a complete evaluation. The two reviewers made a decision on the eligibility of incorporated publication's citations for a full-text evaluation in the filtering process. The dissimilarities were resolved by the authors. Once this failed to provide a firm conclusion, the senior author developed a very last judgment on the eligibility of the study.

Outcome of interest

The primary outcomes included duration of operative time in the two groups, intraoperative blood loss, spleen weight after the resection, and duration of hospital stay. Additionally, the outcome measures were overall postoperative complications, and the changes in biochemical parameters after the procedure.

Data analysis and statistical processing

Meta-analysis was performed in line with recommendations from the Cochrane Collaboration software (review manager 5.1). Statistical power analysis was performed by G*Power (Version 3.1). Heterogeneity with the research was evaluated at first employing a random-effects model. A $P<0.05$ was considered statistically significant. Continuous variables were determined by using mean difference (MD) as the summary statistics by the inverse-variance method. Odds ratio (OR) for dichotomous variables was analyzed by the Mantel-Haenszel method and equally was documented with 95% CI. MD and OR were regarded as $P<0.05$ if the 95% CI did not incorporate the value "1". Treatment group was described as the odds of an undesirable event transpiring in the LS group in comparison with the OS group, but MDs symbolized the variations in continuous variables between the two groups. Finally, publication bias was assessed by Begg's test and Egger's test.

Results

Literature selection

Fig. 1 illustrated the search process and results. A total of 231 articles matched our search key words, and another seventy articles were searched manually. A total of 261 articles remained after duplicates were removed. After carefully reading titles and abstracts of the rest, 65 full-text articles were included. Finally, 58 of the 65 papers were excluded because they lacked extractable data, had no proper arms to compare, were not suitable types of articles, or were not written in English. Only 7 studies met our inclusion criteria in the end.