International Journal of Surgery 34 (2016) 116–121

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original Research

Laparoscopic azygoportal disconnection with and without splenectomy for portal hypertension

Dou-Sheng Bai [a, 1], Jian-Jun Qian [a, 1], Ping Chen [a, 1], Bing-Lan Xia [b], Sheng-Jie Jin [a], Si-Qin Zuo [a], Guo-Qing Jiang [a, *]

[a] Department of Hepatobiliary Surgery, Clinical Medical College of Yangzhou University, 98 West Nantong Rd, Yangzhou, Jiangsu 225000, China
[b] Department of Ultrasound, Clinical Medical College of Yangzhou University, 98 West Nantong Rd, Yangzhou, Jiangsu 225000, China

HIGHLIGHTS

- Laparoscopic splenectomy (LS) is not necessary in cirrhotic patients with hypersplenism and a platelet count of $\geq 50 \times 10^9$/L.
- Laparoscopic azygoportal disconnection (LD) is safe and effective for treating EGVB secondary to portal hypertension.
- LD is associated with a lower risk of portal vein system thrombosis, a faster recovery, and unaffected immune function.

ARTICLE INFO

Article history:
Received 3 June 2016
Received in revised form
6 August 2016
Accepted 17 August 2016
Available online 25 August 2016

Keywords:
Portal hypertension
Liver cirrhosis
Laparoscopy
Splenectomy
Azygoportal disconnection

ABSTRACT

Introduction: Laparoscopic splenectomy and azygoportal disconnection (LSD) has been reported to be safe, feasible, and minimally invasive for cirrhotic patients with portal hypertension. There is still controversy as to whether it is necessary to perform synchronous splenectomy for patients with moderate hypersplenism who undergo azygoportal disconnection for esophagogastric variceal hemorrhage (EGVB).
Methods: We retrospectively evaluated the outcomes in 51 cirrhotic patients with EGVB and moderate hypersplenism (PLT $\geq 50 \times 10^9$/L) who underwent LSD (n = 28) or laparoscopic azygoportal disconnection (LD) (n = 23) between January 2014 and October 2015. Their demographic, intraoperative, and postoperative variables were compared.
Results: LSD and LD were successful in all the patients. When compared with LSD, LD had a significantly shorter operation time, less intraoperative blood loss, shorter postoperative hospital stay, fewer days of postoperative body temperature >38.0 °C, lower rate of fever postoperatively, and lower C-reactive protein concentration and procalcitonin concentration on postoperative day (POD) 7 (all $P < 0.05$). The incidences of portal vein system thrombosis in the LD group on PODs 7, 30, and 90 were significantly lower than those in the LSD group at all the time points (all $P < 0.05$). According to the postoperative serum proportions of $CD4^+$ and $CD8^+$ and the CD4+/CD8+ ratio (all $P < 0.05$), the LSD group had significantly lower immune function than the LD group on POD 90.
Conclusions: LD is safe and effective for EGVB with moderate hypersplenism secondary to portal hypertension in selected patients.

1. Introduction

A large number of patients in China suffer from portal hypertension due to cirrhosis because of the high incidence of chronic hepatitis B and C. Esophagogastric variceal hemorrhage (EGVB) secondary to portal hypertension is a serious life-threatening complication. These patients usually suffer simultaneously from secondary hypersplenism due to portal hypertension. In Asia, open splenectomy and azygoportal disconnection (OSD) have been widely used in surgical treatment of cirrhotic patients with EGVB and secondary hypersplenism.

Cirrhotic patients with portal hypertension have different levels of hypersplenism. It is severe in some and moderate in others. It is difficult to know whether it is necessary to perform synchronous splenectomy for all patients with hypersplenism who undergo

* Corresponding author.
E-mail address: jgqing2003@hotmail.com (G.-Q. Jiang).
[1] Dou-Sheng Bai, Jian-Jun Qian, and Ping Chen contributed equally to the work.

http://dx.doi.org/10.1016/j.ijsu.2016.08.519
1743-9191/

azygoportal disconnection for EGVB. Among those whose spleens have been removed, there are some who do not require removal. Furthermore, the spleen is thought to be central in regulating the immune system, and removal may result in immunocompromisation [1]. Splenectomy not only may lead to additional surgical trauma, it can also cause complications such as bacterial infections [1,2], portal vein system thrombosis (PVST) [3–5], and pancreatic fistulas [3,4].

Endoscopic variceal ligation (EVL) and injection sclerotherapy are the preferred hemostatic methods, with bleeding control rates of 89.7% and 87.5%, respectively [6,7]. None of the patients included in this study underwent transjugular intrahepatic portosystemic shunt (TIPS) or liver transplantation. TIPS is generally used to treat portal hypertension, especially as a bridge to transplantation. Although TIPS can effectively reduce portal pressure to prevent recurrent EGVB, it may cause hepatic dysfunction due to radical portal diversion. It has also been associated with a high rate of stent blockage [8,9] as well as clinically significant EGVB [10] and portosystemic encephalopathy. It must be remembered that China has a shortage of liver donors.

This study aimed to investigate whether simultaneous laparoscopic splenectomy (LS) is necessary in cirrhotic patients with hypersplenism and a platelet (PLT) count of $\geq 50 \times 10^9$/L when laparoscopic azygoportal disconnection (LD) is being performed in cirrhotic patients with EGVB due to portal hypertension.

2. Materials and methods

2.1. Patients

From January 2014 to October 2015, 51 cirrhotic patients with EGVB and secondary hypersplenism successfully underwent LD with LS (Fig. 1) or without LS (Fig. 2) in our department, as previously reported [11]. Patients were included if they were 18–75 years of age, had been diagnosed with cirrhosis of any etiology, had Child–Pugh A or B liver function, had a history of EGVB and secondary hypersplenism with a PLT count between 50×10^9/L and 100×10^9/L, did not have PVST as shown by ultrasonographic evaluation on admission to this study, and successfully underwent laparoscopic surgery without conversion to laparotomy.

Patients were excluded if they had hepatocellular carcinoma or any other malignancy; a hypercoagulable state other than that related to liver disease; were being treated with oral contraceptives, anticoagulation agents, or antiplatelet agents; recently had peptic ulcer disease; had uncontrolled hypertension, a history of hemorrhagic stroke, or human immunodeficiency virus infection; and/or were pregnant.

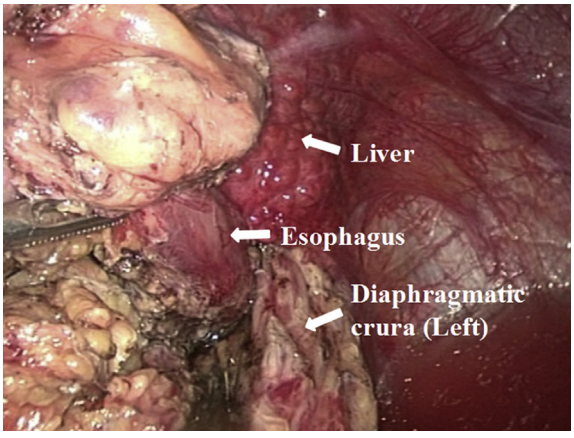

Fig. 1. Laparoscopic azygoportal disconnection with splenectomy.

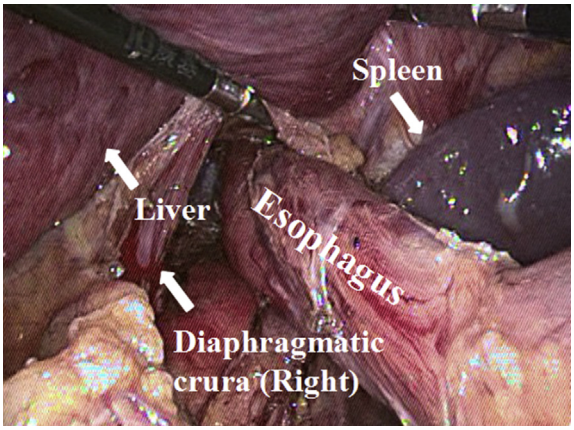

Fig. 2. Laparoscopic azygoportal disconnection without splenectomy.

In our department, the treatment strategy for patients with EGVB secondary to portal hypertension was a sequential therapy process as follows. The first treatment for emergency EGVB was EVL or injection sclerotherapy. When the patients' condition became stable, laparoscopic azygoportal disconnection with or without splenectomy was performed.

Before the operation, all patients were informed that laparoscopic azygoportal disconnection with or without splenectomy was still in the experimental stage. This explanation included descriptions of the advantages and disadvantages of laparoscopic azygoportal disconnection with or without splenectomy. The surgical procedure selected was based on the patient's choice, with 28 patients selecting LD with LS (LSD) and 23 selecting LD without LS. Patients in the LSD group received prophylactic anticoagulation therapy as follows: beginning on postoperative day (POD) 3, each patient ingested 100-mg enteric-coated aspirin tablets (Bayer, Leverkusen, Germany) once daily for 1 year and underwent subcutaneous injection of 4100 IU of low-molecular-weight heparin (CS Bio, Hebei, China) once daily for 5 days and administration of 25 mg of oral dipyridamole (Henan Furen, Henan, China) three times daily for 3 months. Patients in the LD group were not given any prophylactic anticoagulation therapy. All patients provided written informed consent. The Ethics Committee of the Clinical Medical College of Yangzhou University approved the study.

Retrospective analysis of preoperative data included patient's age and sex, etiology of cirrhosis, Child–Pugh classification, PLT count, D-dimer concentration, international normalized ratio (INR), liver and renal function, serum proportion [lymphocyte (Ly) percentage] of helper/inducer T cells ($CD4^+$), serum proportion of cytotoxic/suppressor T cells ($CD8^+$), CD4+/CD8+ Ly ratio, longitudinal diameter of spleen, portal vein diameter, and velocity of portal blood flow. Intraoperative data included operation time, estimated intraoperative blood loss, and volume of intraoperative blood transfused. Postoperative data included body temperature; routine blood cell counts; liver and renal function; C-reactive protein (CRP) and procalcitonin (PCT) levels; serum proportions of $CD4^+$ and $CD8^+$; CD4+/CD8+ ratio, and occurrence of PVST, as monitored by Doppler ultrasonography screening, on PODs 7, 30, and 90.

We performed flow cytometric Ly phenotyping using the Simultest IMK-Lymphocyte kit (Becton Dickinson, Franklin Lakes, NJ, USA). Simultest IMK-Lymphocyte contains two-color reagents for direct immunofluorescence that makes it easier to count peripheral leukocyte subsets in whole blood after erythrocyte lysis. Simultest IMK-Lymphocyte allows counting of helper/inducer T cells ($CD4^+$) and cytotoxic/suppressor T cells ($CD8^+$) from which the