



Comparison of Upper Midline Incision With and Without Laparoscopic Assistance for Living-Donor Right Hepatectomy

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ABSTRACT

Background. Since minimally invasive procedures for living-donor right hepatectomy (LDRH) became popular in recent years, several studies comparing the outcomes of donors undergoing an upper midline incision (UMI) under laparoscopic assistance for LDRH with those undergoing the traditional open LDRH have been published. However, there are very few comparative studies of outcomes for a UMI for LDRH with and without laparoscopic-assistance. We designed the present study to compare the benefits and shortcomings of a UMI for LDRH with and without laparoscopic assistance.

Methods. Forty-eight patients in our center were included in the study: group hybrid ($n = 28$) versus group UMI ($n = 20$). Their surgical outcomes, postoperative course, and cosmetic outcomes were studied from medical records.

Results. No differences existed between the 2 groups regarding their baseline characteristics except that group Hybrid had more donors with positive hepatitis B core antibody. No difference was observed in operative time, graft weight, warm ischemia time, blood loss, incision length, liver and coagulation function test results, postoperative complications, or cosmetic parameters. No deaths occurred in both groups. The length of postoperative hospital stay was similar for both groups, but the hospital cost was significantly lower for group UMI than for group hybrid ($6,906.7 \pm 777.4$ USD vs $7,643.3 \pm 918.6$ USD; $P = .005$).

Conclusions. An UMI without laparoscopic assistance can be considered as the first-line incision of choice for LDRH.

ADULT-TO-ADULT right-lobe living-donor liver transplantation (ARL-LDLT) has been widely accepted as an important treatment option for patients with end-stage liver disease. Donor safety is the highest priority in all living-donor organ transplantations. To maximally ensure donor safety, a bilateral rooftop incision with a vertical extension or a J-shaped incision with or without a left extension was used for living-donor right hepatectomy (LDRH) to gain adequate exposure in the beginning stage of ARL-LDLT [1,2]. With the innovations and refinements in surgical techniques of LDRH, concerns about the condition of living donors after surgery should be advocated for not only the physical well-being but also psychosocial well-being. As long as safety and efficiency are secured, regarding the incision, the shorter it is, the better.

Recently, minimally invasive approaches to LDRH have gradually aroused many liver transplant experts' interest and have been widely reported. The first laparoscopic living-donor left lateral segmentectomy was successfully performed in 2002, even though it was for pediatric living-donor liver transplantation [3]. In 2006, Koffron et al [4] reported the first case of a laparoscopic-assisted LDRH. Subsequently, this hybrid technique for LDRH with laparoscopic mobilization of the right hepatic lobe and a

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minilaparotomy for hilar and parenchymal dissection became popular in Korea and Japan [5,6]. However, this approach may be complex and expensive because it required the surgeon to be conversant with both living-donor hepatectomy and laparoscopic liver surgery and the additional expenditure for laparoscopic instruments. For that reasons, Kim et al [7], in 2009, introduced an upper midline incision (UMI) for LDRH without laparoscopic assistance. Subsequently, this approach was reported by Nagai et al [8] in 2012, which is also the only published study of comparison of a UMI for LDRH with (4 cases) and without (9 cases) laparoscopic assistance to date. However, that study was limited by its small sample size and absence of more detailed data and psychosocial analysis for living donors after hepatectomy.

In 2011, we first used a UMI for LDRH with laparoscopic assistance in mainland China. In 2013, LDRH began to be performed through a UMI without laparoscopic assistance in our center. In the present study, we review our experience with a UMI for LDRH without laparoscopic assistance and compare the outcomes of donors undergoing a UMI for LDRH without laparoscopic assistance and those with laparoscopic assistance.

METHODS

Donor Selection Criteria

In China, every recipient and his/her living donor must have the lineal or collateral blood relationship within 3 generations. The anatomy and volume of the liver were evaluated with the use of computerized tomography by means of 3-dimensional reconstructions and volumetry. The bile ducts were examined with the use of magnetic resonance imaging. We exclusively transplanted the right-lobe liver grafts without the middle hepatic vein (MHV). Generally, we required a graft-to-body weight ratio (GBWR) of $\geq 0.8\%$ for ARL-LDLT and a residual donor liver volume of $\geq 40\%$. All those considering living liver donation were formally evaluated at a multidisciplinary selection meeting and were considered to be acceptable donors on the basis of consensus. All donations were voluntary and altruistic in all cases, approved by the Ethics Committee of West China Hospital of Sichuan University and in accordance with the ethical guidelines of the Declaration of Helsinki.

Study Design

In our center, the UMI approach for LDRH with laparoscopic assistance (group Hybrid) was introduced in July 2011. A body mass index (BMI) of $>25 \text{ kg/m}^2$ was one of the exclusion criteria for this minimally invasive surgical approach. In June 2013, LDRH began to be performed through a UMI without laparoscopic assistance (group UMI). Similarly, a BMI of $\leq 25 \text{ kg/m}^2$ was an additional requirement for those donors. We designed the present study to compare the benefits and shortcomings of UMI for LDRH with and without laparoscopic assistance. All donors were monitored Through June 2014.

Outcomes Assessment

The surgical outcomes and postoperative course were studied from in-hospital and out-clinic medical records. The assessed donor

baseline characteristics included age, sex, body weight, height, BMI, vaccination against hepatitis B virus (HBV), and virus infection. The perioperative characteristics included operative time, length of incision, estimated blood loss, liver and coagulation function test results, postoperative length of hospital stay, in-hospital cost, and postoperative complications. Referencing Lee et al [9], a questionnaire concerning postoperative body image, cosmetic results, and self-confidence was required to be filled in during the out-clinic follow-up.

Surgical Procedures

The surgical technique of UMI for LDRH under laparoscopic assistance has been described in our previous study [10]. Here, we briefly describe a UMI for LDRH without laparoscopic assistance. The upper abdomen is opened through a UMI from xiphoid to 2–5 cm above the umbilicus, according to the shape of the abdominal cavity. After the round ligament and a part of the falciform ligament are incised in sequence, a wound protector is applied. The open incisional wound is retracted in a cephalic and anterior direction with a self-retaining retractor. After cholecystectomy, a tube is inserted into the common bile duct through the stump of the cystic duct to facilitate intraoperative cholangiography. Dissection of the hepatic hilum is then performed to isolate the right hepatic artery (RHA) and right portal vein (RPV). Temporary occlusion of RHA and RPV with bulldog clamps shows the demarcation line on the liver surface. Subsequently, perihepatic attachments are divided. The remaining falciform ligament is dissected to the suprahepatic inferior vena cava (IVC) to reveal the right hepatic vein (RHV) and MHV. Then the right coronary ligament and the right triangular ligament were incised step by step. The right adrenal gland is dissected off the liver if necessary. When completing the above steps, the right lobe can be retracted medially to the left side. The small hepatic vein branches between the liver and IVC, and the IVC ligament were divided easily. A 7-Fr Nelaton tube was inserted between the RHV and MHV to apply a hanging maneuver. The parenchymal dissection is usually performed with a cavitation ultrasonic surgical aspirator according to the demarcation line. After the bile duct, RHA, RPV, and RHV are divided in sequence, the graft can be removed. After the completion of hemostasis, a drainage tube is placed at the right subphrenic space.

Statistical Analysis

SPSS 17.0 statistical software (SPSS, Chicago, Illinois) was used to analyze the relevant data. Categorical data were presented as $n (\%)$ and compared with the use of Pearson chi-square or Fisher exact test. Continuous variables were expressed as mean \pm SD and analyzed with the use of t test. $P < .05$ was considered to be statistically significant.

RESULTS

Donor Baseline Characteristics

From July 2011 to May 2013, 28 consecutive living donors underwent LDRH through a UMI with laparoscopic assistance (group Hybrid) in our center. Since the surgical technique of UMI for LDRH without laparoscopic assistance began to be introduced in June 2013, 20 donors have undergone LDRH through UMI to date (group UMI). Table 1 compares donor baseline characteristics between group Hybrid and group UMI. No differences existed between donors in group Hybrid and group UMI regarding

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