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(CASE REPORT)

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First laparoscopic anatomical liver resection of segment 3 with Glissonean approach and negative fluorescent counterstaining in Georgia: A case report

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Abstract

Background: Laparoscopic liver resection (LLR) is a safely performed approach in referral centers. However, in many developing countries it is still not considered a routine procedure because of resourcefulness and lack of experience.

Newer techniques, like the Glissonean approach and use of Indocyanine Green (ICG), can be acquired thanks to training of liver surgeons in foreign referral tertiary centers. The purpose of the publication is to report the initial Georgian experience of LLR with Glissonean approach and intraoperative ICG.

Case presentation: A 37-year-old caucasian man with an 8-year history of chronic viral hepatitis B and subsequent liver cirrhosis, was operated on for a 6-cm HCC in segment 3. Laparoscopic segmentectomy was performed, by using extrafascial Glissonean approach for inflow control, and ICG for negative counterstaining. Operation duration was 150 min, estimated blood loss was about 60 ml. The patient was discharged from the hospital on a postoperative day 3 without notable complication.

Conclusion: A minimally invasive program comprehensive of anatomical LLR with Glissonean approach and intraoperative ICG can be carefully safely performed in Georgia, after appropriate training in referral centers.

Keywords: Laparoscopic liver resection; Anatomical liver resection; Hepatocellular carcinoma; Indocyanine green

1. Introduction

During the last two decades laparoscopic liver resection (LLR) became the common method for benign and malignant lesions of the liver. The procedure is complex, demanding significant financial resources and modern dedicated surgical equipment, as well as specific skills and dexterity of the liver surgeon. These factors are obstacles for the widespread use of the LLR in developing countries. No LLR was performed in Georgia before the reported case.

Since the first laparoscopic hepatectomy reported by Reich in 1991 [1], LLR has widely spread thanks to several reported benefits, such as shorter hospital stay, lower bleedings, lower liver decompensation rates [2], [3], [4], [5].

However its routine adoption requires mastery of liver and laparoscopic surgery, leading to a limitation to referral tertiary centers, as previously stated in the consensus meetings about LLR [6], [7], [8]. Furthermore, the long learning curve of such complex procedures may limit its worldwide introduction in practice [9], [10].

The principle of anatomical resection of the liver (AR) was first described by Makuuchi in 1985 [11]. HCC invades portal vein branches, which leads to the tumor spreading along the portal flow and satellite node development. Nowadays, this

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concept is routinely used in many centers. However, there is no consensus about the advantage of AR over the wedge resections [12].

Anatomical liver resection can be carried out also by laparoscopic approach, with some reported technical advantages for the Glissonean approach to the inflow control, as proposed by the Precision Anatomy for Minimally Invasive HBP Surgery [13], [14], [15]. However it is a challenging procedure, needing adequate skills.

In order to start a LLR program in Georgia, at the Aversi Clinic in Tbilisi, the surgical team underwent extensive minimally invasive HPB training in 2020 at a referral tertiary center in South Koreas (Seoul National University Bundang Hospital), under the guidance of prof. Ho-Seong Han [16].

After such training, our team started performing wedge LLR of peripheral lesions, with good results, moving them to major hepatectomies and anatomical LLR, with the aid of new technologies, like ICG (Figure 1). Anatomical liver resection of single segments with Glissonean approach can be still considered technically challenging procedures, in particular with few reports in literature when specifically dealing with segment 3 [17], [18].

In the presented paper, we summarize the intraoperative procedure and early postoperative outcomes of the first case of laparoscopic anatomical liver resection of segment 3 performed in the surgery department of the Aversi Clinic, with Glissonean approach and negative fluorescent counterstaining.

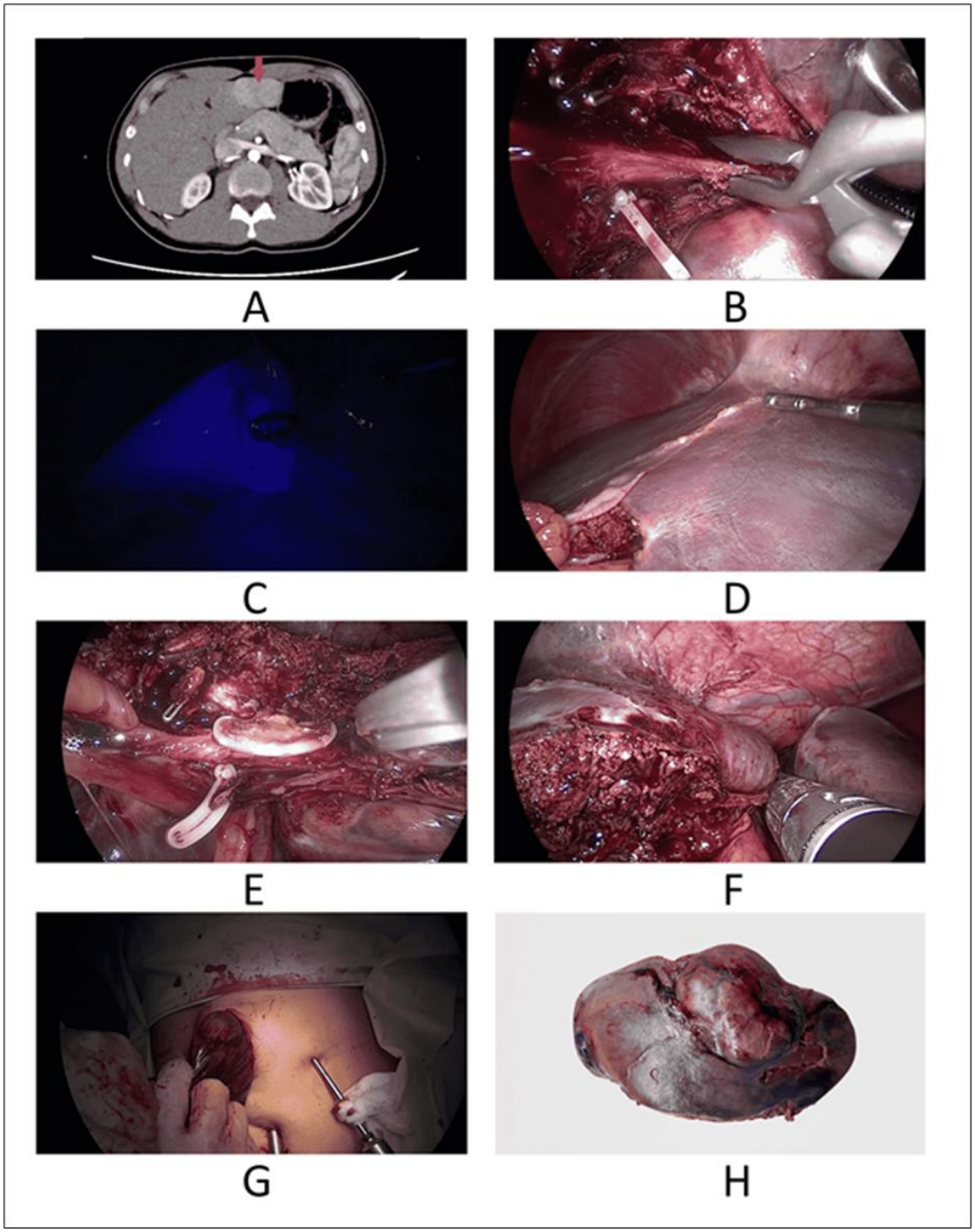
2. Case Presentation

A 37-year-old male with a history of HBV-related cirrhosis, was diagnosed with a 6-cm-sized HCC at segment 3 of the liver during ultrasound screening and surveillance. The patient was not symptomatic, in a good performance status, and cirrhosis was well compensated (A5 according to Child-Pugh score). The computed tomography (CT) scan is demonstrated on Figure 1A. After multidisciplinary discussion, according to international guidelines [19], the patient was scheduled for laparoscopic liver resection. We decided for a formal anatomical segmentectomy, in order to reach the best long term oncological outcomes, given the young age of the patient.

The patient was placed in lithotomy and left semi-decubitus position. The operator was working from the right side. The assistant was standing between the patient's legs. The supraumbilical Hasson technique was utilized to insert a high-definition laparoscope (Karl Storz, Germany) into the peritoneal cavity. Along the right subcostal line, two working trocars were placed. The trocar for the assistant was placed near the xiphoid process.

The falciform ligament was divided. The location of the lesion and relationship with major vascular structures were refined by intraoperative laparoscopic ultrasonography. The extrafascial glissonean approach was used to isolate the Glissonean pedicle of segment 3 from the liver tissue at the umbilical plate by blunt instrument (suction device). After exposure, the branch was temporarily clamped (Figure 1B) to check its blood-supplying area and to confirm the vascular anatomy. To highlight the demarcation line of the segment 3 edges, we decided to use negative fluorescence counterstaining. A dose of 3 mg of ICG (0.025 mg / kg) was intraoperatively injected [20]. Then the G3 was clamped, obtaining the negative staining of segment 3 borders (Figures 1C, 1D, 1E). Afterward, resection of hepatic parenchyma was performed with a laparoscopic cavitron ultrasonic surgical aspirator (CUSA) (Figure 1F). The vein branches were secured by using endoclips. At the end of resection, segment 3 was placed into a bag and removed through a suprapubic 4 cm incision (Figure 1G). Operation time was 150 min and estimated blood loss was about 60ml.

The patient didn't experience any postoperative complication, and he was discharged on a postoperative day 3. He is currently under surveillance.



A - Computer tomography: HCC lesion in sg3. B - Clamping G3 Glissonean pedicle. C - ICG demarcation. D - Visual demarcation. E - Transection of the G3 Glissonean pedicle. F - Parenchimal transection. G - Retrieval of sg3. H - Operative specimen.

Figure 1 Laparoscopic sg3 segmentectomy

3. Discussion

Herein, we reported the first case of LLR performed in Georgia – laparoscopic anatomical liver resection with Glissonean approach and negative fluorescent counterstaining.

LLR is a rapidly evolving approach that is performed for benign or malignant lesions. Advantages of laparoscopic hepatectomy are smaller incisions, less pain after procedure, shorter hospital stay, less hemotransfusion requirement, and less post-surgical morbidity as well as good cosmetics [2].

Laparoscopic resection of the segments (2, 3, 4b, 5, 6) is relatively easier than segments (1, 4a, 7, 8) [21]. Sectionectomy and hemihepatectomy are more complex procedures, which require dexterity, special skills, and technological equipment. Indeed, Vigano et al. [22] studied the learning curve of the LLR and concluded that 60 procedures must be done by a surgeon to reach a minimal conversion rate. Other authors agree that major hepatectomies must be started by surgeons after 60 minor hepatectomies [23], [24]. To this aim, our surgical team had the great possibility to train on LLR in South Korea (Seoul National University Bundang Hospital), under the guidance of prof. Ho-Seong Han. After one year of training, performed by already experienced surgeons for open liver resections, we started in 2021 a laparoscopy program at our center.

In minimally invasive liver surgery (MILS) the extrafascial Glissonean pedicle approach is a feasible and convenient technical maneuver. Dissection of the Glissonean pedicle from liver parenchyma allows to isolate the first, second, and third branches of Glissonean pedicle [25], [26], [27], [28]. 3D vision and clear visualization of the operating field with modern laparoscopic equipment allows precise dissection [3]. The safety and feasibility of MIALR was confirmed by the international study group of precision anatomy for minimally invasive hepato-biliary-pancreatic surgery (PAM-HBP) [29], [30].

Administration of the Indocyanine green (ICG) during liver transection by Takasaki technique allows to achieve the fluorescence demarcation of the transection line [31], [32], [33]. In case of the positive counterstaining, ICG is injected into the secondary or tertiary portal branch. Alternatively, intravenous ICG injection can be used to enable a negative contrast delineation (counterstaining) [34], [35], [36], [37]. After the isolation, transection and closure of the Glissonean pedicle, ICG is administered intravenously, which results in fluorescence of the liver remnant liver and a negative enhancement of the transection line.

In the reported case, the patient underwent a laparoscopic liver resection with negative counterstaining of the transection line. No complications were experienced, to testify that our program can aim for a safe and wide implementation. However, more experience could be needed for more challenging cases, and our outcomes will be analyzed routinely during this process. In case of need, or in case of newer procedures, our team can further train for shorter periods of time at referral centers.

4. Conclusion

Laparoscopic anatomical resection can be carefully performed in developing countries after adequate training. This technique has a stepwise learning curve process, and demands surgeons' dexterity as well as modern equipment, including high-definition scopes and ICG.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Ethical approval was obtained.

Statement of informed consent

Informed consent was obtained from the patient according to the Georgian legislation.

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