

Peer Review File

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Reviewer A

Comment 1:

- The study is well-designed, and the manuscript is well-written.
- The clinical utility of the study is not very clear, which is typical for most translational studies. However, it is a good step forward in planning for the hepatectomy resection margin based on preoperative CT to decrease post-operative complications.

Reply 1:

Thank you for your appreciation of this work. We are planning to conduct further research on pre-operative virtual hepatectomy based on 3DVT to avoid remnant liver ischemia/congestion area and then reduce the incidence of post-operative complications and PHLF.

Comment 2:

- As mentioned in the study limitations, one should expect inevitable degree of discordance between the planned and actual resection margin, which I would expect to have a learning curve parallel to the degree of collaboration between radiologists and surgeons.

Reply 2:

Thank you for your understanding and advice. The discordance between the planned and actual resection margin is inevitable. However, this study showed a good correlation between the predicted volume of resected liver and the volume of resected liver measured by Archimedes water-displacement method ($R^2 = 0.989$, $P < 0.0001$; Supplementary Figure 1). Nevertheless, we agree that the discordance may still exist between radiologist and surgeons because there is no anatomical landmark within the liver, so visualization of liver segments by ICG retention may help us to minimize the discordance.

Changes in the Text:

We added the following text to “Discussion” section (see Page 19, line 1-4).

Nevertheless, the discordance may still exist between radiologist and surgeons because there is no anatomical landmark within the liver, so visualization of liver segments by indocyanine green retention may help us to minimize the discordance.

Reviewer B

The paper shows a retrospective analysis of patients that underwent hepatectomy. Three

contrast-enhanced CT scans were analyzed: the pre-hepatectomy scan, the 1-week post-hepatectomy scan, and the 4-week post-hepatectomy scan. Using three-dimensional visualization technologies, the remnant liver ischemia (RLI) and remnant liver congestion (RLC) were estimated (i.e., eRLI and eRLC) with the pre-hepatectomy scan. With the 1-week post-hepatectomy and 4-week post-hepatectomy CT scans, the remnant liver hypoperfusion was measured. According to the results, eRLI could be a good predictor of post-hepatectomy liver failure and eRLC could be a good predictor of remnant liver hypoperfusion and postoperative complications. To sum up, this strategy could help assess better the patients that are going to receive hepatectomy.

The manuscript is clearly written, the topic covered in the study is well posed in the Introduction section, Methods are described in sufficient detail, and most of the Results are adequately compared to the published literature in the Discussion section.

I think that the article can be published after addressing some major and minor comments listed below.

Major comments:

The hepatic blood supply comes from the hepatic artery and the portal vein and is drained through the hepatic vein. In this study, the authors have not considered the hepatic artery, which accounts for approximately 25% of liver parenchyma feeding and almost exclusive feeding of hepatic tumors [1]. The hepatic vasculature is also related with the biliary tract, through many collateral arteries feeding the biliary tract and ducts [2].

Comment 1:

- Why was the hepatic artery not considered in the study? I believe that at least a sentence should be included in the manuscript, to explain why the hepatic artery is not considered in the study.

Reply 1:

We thank the reviewer for these constructive comments related to hepatic artery blood supply. As commented by the reviewer, around 25% blood supply for liver parenchyma is from hepatic artery, which may lead to the inaccurate prediction of remnant liver ischemia if we only consider portal veins. We may work with the technical provider to develop new algorithm by calculating hepatic artery feeding area and perform further analysis in the next research.

Changes in the text:

We have added a sentence in the Discussion as following (see Page 19, line 6-10).

Only considering blood supply from portal vein in this study is because of the limit in 3D reconstruction technique. However, hepatic artery is an additional source of blood

supply to liver parenchyma, which may contribute to development of remnant liver ischemia. Not considering arterial supply may lead to a miscalculation of estimated remnant liver ischemia.

Comment 2:

- Page 4, lines 19-20: “RLC had better diagnostic significance than RLI in predicting remnant liver hypoperfusion”. Page 15, lines 1-3: “Compared with patients without remnant liver hypoperfusion, those with remnant liver hypoperfusion were associated with more presence of eRLC (79% vs. 42%, $P < 0.001$), but not eRLI (53% vs. 49%, $P = 0.680$).” Therefore, 53% of patient with remnant liver hypoperfusion presented eRLI, and 49% of the patient without remnant liver hypoperfusion presented eRLI. Could these be because of the hepatic artery feeding of the volume of eRLI?

Reply 2:

We agree that postoperative remnant liver hypoperfusion being not associated with eRLI is, to a certain extent, because of not considering the blood supply from hepatic artery. The actual pathway of hepatic artery may be different from that of portal vein due to anatomical variation. Therefore, remnant liver parenchyma with eRLI may still have supply from hepatic artery, leading to the absence of remnant liver hypoperfusion postoperatively.

Changes in the text:

We added the following text to “Discussion” section (see Page 19, line 6-10).

Only considering blood supply from portal vein in this study is because of the limit in 3D reconstruction technique. However, hepatic artery is an additional source of blood supply to liver parenchyma, which may contribute to development of remnant liver ischemia. Not considering arterial supply may lead to a miscalculation of estimated remnant liver ischemia.

Minor comments:

Comment 3:

- A section with all the abbreviations (RLC, RLI, PHLF, SLV, etc.) would be helpful for the reader.

Reply 3:

Thank you for this helpful advice which would improve the readability of this article. We will add a section with all the abbreviations in the end of manuscript.

Changes in the text:

We added the following table into the end of manuscript (see Page 30-31).

Table 2. Abbreviations in this study

Abbreviation	Definition
ALT	Alanine aminotransferase
ALB	Albumin
AST	Aspartate aminotransferase
ALPPS	Associating liver partition and portal vein ligation for staged hepatectomy
CLRM	Colorectal liver metastases
CT	Computed tomography
eFRL	Estimated future remnant liver volume
eRLC	Estimated hepatic-vein-based RLC
eRLI	Estimated portal-vein-based RLI
HBV	Hepatitis B virus
HCC	Hepatocellular carcinoma
ICC	Intrahepatic cholangiocarcinoma
LS	Liver stiffness
PVE	Portal vein embolization
PHLF	Post-hepatectomy liver failure
POW1	Postoperative week 1
POW4	Postoperative week 4
PT	Prothrombin time
ROC	Receiver operating characteristic curve
RLC	Remnant liver congestion
RLI	Remnant liver ischemia
SLV	Standardized liver volume
ISGLS	The International Study Group of Liver Surgery
3DVT	Three-dimensional visualization technology
TLV	Total liver volume

Comment 4:

- Page 8, line 10: Please add “that” or “who” after the word “patients”.

Reply 4:

Thank you for your correction. We will modify our text as advised.

Changes in the text:

Page 7, line 10: patients who received portal vein embolization...”.

Comment 5:

- Page 10, line 6: Please add the name of the software package used for 3D reconstruction, before (Yorktal Digital Medical...).

Reply 5:

Thank you for your correction. We will modify our text as advised.

Changes in the text:

Page 9, line 5-6: The 3D reconstruction was performed with the abdominal CT image post-processing software (Shenzhen Yorktal Digital Medical Imaging Technology Co. Ltd., China) using the preoperative, POW1 and POW4 CT scan data (~~Yorktal Digital Medical Imaging Technology Co. Ltd., China~~).

Comment 6:

- Page 12, line 4: SPSS and R should both include (Company, Country).

Reply 6:

Thank you. We will include the company and country of SPSS and R as advised.

Changes in the text

Page 11, line 6-7: Statistical analyses were performed using SPSS Version 25.0 (IBM Corp., Armonk, N.Y., USA) and R version 3.5.2 (R Core Team, Vienna, Austria).

Comment 7:

- Page 19, line 2: Please write “were” instead of “was”.

Reply 7:

Thank you. We will correct our text as advised.

Changes in the text:

Page 18, line 2: The present study showed that LS > 11.75 kPa and lower eFRL/SLV ~~was~~ were independent risk factors for PHLF.

Comment 8:

- Page 20, line 6: Did you mean “preservation” instead of “reservation”? I might be wrong.

Reply 8:

Thank you for your question. What we want to mean is “preservation” instead of “reservation” as you pointed out. We are sorry for making such a mistake.

Changes in the text:

Page 19, line 16: The present study suggested that ~~reservation~~ preservation of the hepatic vein...”.

References:

1. Breedis, C., and Young, G. (1954) The blood supply of neoplasms in the liver. Am. J. Pathol., 30 (5), 969–985.
2. Ramesh Babu, C.S., and Sharma, M. (2014) Biliary tract anatomy and its relationship

