

May 25, 2015

Dear Editor,

Please find enclosed the edited manuscript in Word format (file name: 17934-edited.doc).

Title: Application of a Three-dimensional Reconstruction Method for the Surgical Treatment of Hepatic Alveolar Echinococcosis

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The manuscript has been improved according to the suggestions of reviewers:

1 Format has been updated

2 Revision has been made according to the suggestions of the reviewer

Reviewer 1

Comments 1

When examining figure 2A, the method used by the authors to calculate the future remnant liver remains unclear. The liver seems to have a rigid cut surface which the authors use to calculate volumes, without paying attention to liver segments which will not be vascularized after virtual hepatectomy. The reviewer recommends that authors should attempt to provide a more precise explanation concerning their method for volumetric estimation.

Reply 1

In this study, real-time data, including the remaining liver volumes in all patients were calculated by measurement tools in IQQA-Liver, this process based on the recognition of the software automatically. The liver was divided into several hepatic parenchymal regions or sub-regions perfused by major blood vessels, including hepatic and portal veins, to illustrate the spatial morphology of each segment of the liver. (we have explained in the method of manuscript).

Comments 2

There is no data concerning the amount of time spent to treat the image and produce the 3D model.

Reply 2

CT data in DICOM format for all 59 patients of group A were imported into 3D reconstruction software. This software recognized the liver and reconstructs the spatial structure of blood vessels automatically, this process needs about 1-2 minutes.

Comments 3

There is no information concerning the "Manual correction" mentioned by the authors.

Reply 3

In this study, after the automatic reconstruction, 2D and 3D images were compared using verification tools of the software, which revealed that the anatomic relationship among the lesions and hepatic blood vessels in the 3D reconstruction was consistent with the 2D image, this process make the results of 3D models more precise. (we have explained in the method of manuscript)

Comments 4

The concept of vascular invasion is unclear.

Reply 4

For the judgement of vascular invasion, we observed if there are filling defect in the lumen of vascular from the 2D images firstly, then measured if the vascular was surrounded by liver lesions with $\geq 180^\circ$ or not in the 3D models, when that is $\geq 180^\circ$, we highly consider that the vascular was affected by the lesion. The vessels in the lesions may not reserve.

Comments 5

The relationship between estimated resection liver volumes and the sheer graft weight is unclear. How could the authors calculate it?

Reply 5

Individualized virtual surgery of the liver was designed based on the reconstructed 3D model for a radical resection of the lesion and maximal retention of normal liver tissue. The remaining liver volume was calculated. A surgical plan was finalized after optimizing the surgical resection planes. The weight of the remaining liver was measured after resection was completed.

Comments 6

There are no details on the surgical technique, especially regarding tools used for hepatectomy, hemostasis, and so on.

Reply 6

In our study, the parenchymal transection in all patients was performed using a CUSA ultrasonic scalpel along the resection line designed during pre-operative virtual surgery.

Comments 7

The Dindo-Clavien classification is mandatory in order to understand the impact of postoperative complications on morbidity.

Reply 7

To be honest, we didn't use the Dindo-Clavien classification to understand the impact of postoperative complications on morbidity, that is unfortunately for our study, and we will pay attention to this in our further studies, and thanks for your remind.

Reviewer 2

Comments 1

Author should describe the details about how to divide the patients into two groups.

Reply 1

Before the operation, all patients were informed the details of the different kinds of hepatectomy and the risks and complications of surgery. Various alternative treatment modalities were also discussed with the patients. Finally, each patient chose whether to have liver resection based on 3D reconstruction technique or not.

Comments 2

Authors described that Positional relationships between lesions and the hepatic vein, portal vein, and bile duct were defined. In patients with normal biliary tree, the intrahepatic bile duct could not be visualized well on CT images, especially 3D images. How did they evaluate the bile duct?

Reply 2

For the reconstruction of biliary duct we can use MRI data in DICOM format, the method as same as the CT data.

Comments 3

3D images might be more useful for inexperienced liver surgeons. How is the surgeon's experience?

Reply 3

The system takes CT and MR images as input, and provides automated 3D segmentation of tumor, liver, liver lobes, as well as vascular and ductal structures. Upon physicians' confirmation or local adjustment of such segmentation results, quantitative measurements in terms of the anatomy volume and 3D spatial relationship may be derived to support physician's assessment in addition to 3D visualization. The system further provides "virtual knife" tools for physicians to define target resection/remnant volume, or define vascular branches for local territorial analysis. The 3D reconstruction software can provide comprehensive and precise anatomic information for the liver. Several clinical studies have shown that, for complex space-occupying hepatic lesions, application of preoperative 3D reconstruction technology can improve the success and feasibility of procedures, as well as reduce the prevalence of procedure-related complications. The 3D reconstruction system allows surgeons to perform virtual surgeries on the 3D model of a liver, which maximizes the human-computer interaction in the course of medical treatment. The process is extremely helpful for surgeons to fully understand the specific details about key parts 3D reconstruction to obtain objective and intuitive information about the parasite.

3 References and typesetting were corrected

Thank you again for publishing our manuscript in the *World Journal of Gastroenterology*.

Sincerely yours,



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