

**Name of journal: World Journal of Gastroenterology**

**ESPS Manuscript NO: 18890**

**Columns: Topic Highlight**

## **Current Status and Perspectives in Split Liver Transplantation**

### **To the Editors and Reviewer**

Dear Sirs,

We appreciate the opportunity to revise our manuscript. We carefully considered your comments and thank you for taking the time and effort to provide such insightful guidance. We hope that the revised version of our paper will now be worthy of publication in the World Journal of Gastroenterology.

#### **Reviewer #3317039, comment 1**

The importance of the research lies in that split liver transplantation (SLT) for two adult recipients remains a challenging surgical procedure and outcomes have yet to improve. SLT has been to expand the existing deceased donor liver pool which their application efficiency is one of the best modes. The rates of patients for SLT and graft survival at one, five and ten years in adult recipients of split grafts are equivalent to those of whole organ recipients, which can significantly shorten the time of children and adults waiting for liver transplantation. Now the patients waiting for liver transplantation are the vast majority of adults, more than 90% of the waiting for death are also the adults. Therefore, SLT in two adult recipients must have been a full right of liver and and full left liver. The surgical techniques for recipients of split grafts have requirements of weight.

#### **Response:**

We thank the reviewer for this important comment. We have now added to the original manuscript - in the chapter "the split procedure: technical aspects and surgical refinements" - a brief description on recently published data on graft size issues in SLT for two adult recipients.

**Issues related to graft size are of paramount importance in partial liver transplantation and especially in A/A SLT. Generally speaking, an estimated GRWR of 0.8% or more is considered a reference in adult to adult LDLT (69). According to recently published data on a large cohort of A/A SLT from Taiwan, it is better to allocate split liver grafts to recipients with GRWR greater than 1% (36). In the authors' experience, a comparison of clinical profiles between recipients of RL grafts and LL grafts showed that low GRWR was the only significant difference for the LL graft recipients and the small-for-size syndrome was common when transplanting LL graft. Although SLT often lacks the pre-operative imaging essential for a liver volume estimation due to logistic and administrative limitations, a precise estimation of liver mass remains crucial. The same authors reported a simply and accurate method to evaluate liver mass using bedside liver ultrasonography and standard liver volumes as an alternative to measuring hemiliver graft sizes.**

#### **Reviewer #3317039, comment 2**

We suggest that the deceased donor liver should use technology from in situ splitting for liver transplantation as far as possible, because the splitting technology significantly shortened the time

in situ liver transplantation cold ischemia. The higher request for the surgical techniques, while the longer time probing, the more closely hospitals need to transplant team

**Response:**

We thank the reviewer for remarking on some important issues related to the in-situ splitting procedure. We have now made a special mention of the issues related to the two different options noting the advantages of the in situ technique. We have now added to the original manuscript - in the chapter “in situ versus ex vivo SLT” - some recently reported surgical refinements applied to the in situ procedure.

**Lee et al (36) recently described a modified in situ technique where the liver was split as much as possible during the donor operation but completed after perfusion with preservation solution. In the authors' practice, the bile ducts were divided before cold perfusion for a better understanding of the correct cut point while the parenchyma transection was completed quickly in situ with the liver surrounded by ice after procurement of thoracic organs in order to save time for other organ recovery teams.**

**Reviewer #3317039, comment 3**

It was especially worth recommending that the good splitting technology may be to maintain bilateral inferior vena cava for liver drainage.

**Response:**

We thank the reviewer for commenting on this surgical option. We have now reported in the original manuscript - in the chapter “the split procedure: technical aspects and surgical refinements” - the description of the surgical technique first described by Gundlach in 2000.

**Reviewer #3317039, comment 4**

There are higher requirements that the technology for splitting donor liver in the middle hepatic vein(the MHV) to full the right hemiliver (segments V-VIII) and full left hemiliver (segments II-IV) and the implanted surgery technology in which need to adopt iliac vein flap to repaired the splitted the MHV .

**Response:**

We thank the reviewer for this important comment as the inclusion of the MHV with one or other graft remains controversial. We have now added to the original manuscript - in the chapter “the split procedure: technical aspects and surgical refinements” - the description of this challenging surgical option first described by Boering et al. in 2005.

**In 2005, Boering et al (61) first described this challenging surgical option to optimize the outflow in both the full right and full left grafts in A/A SLT. They reported the first two livers split according to this new technique for ex vivo splitting. After dissection of the hilar structures and opening the vena cava in the midplane, the MHV was split in the middle from its orifice in the vena cava. After completion of the liver parenchyma transection, the two halves of the MHV were reconstructed using donor iliac vein patches.**

**Reviewer #3317039, comment 5**

Under the existing health resources status in our country, it is difficult to achieve the transplant center for SLT to build two liver transplant centers to the same time. Close cooperation among centers with adequate experience in split liver techniques is mandatory and should be encouraged

**Response:**

We thank the reviewer for highlighting this important issue related to cooperation among transplant centers. Our original manuscript already remarked that close cooperation among transplant centers is mandatory and should be encouraged - in the chapter “future perspectives”.

**Reviewer #3317039, comment 6**

The domestic and foreign experiences showed that SLT for the two adult recipients was feasible and made the same as the whole liver transplantation clinical curative effect. In our country at present, the high precision technical refinements and the complex liver anatomy for split liver transplantation made the small transplant centers difficult to achieve the standardized mode of splitting technology requirements. It was also difficult to share these complex resources in different liver transplantation centers.

**Response:**

We thank the reviewer for pointing out these important considerations. We already remarked - in the chapter “future perspectives” - that logistic and administrative limitations must be overcome. Dedicated resources and incentives must be made available to implement SLT programs worldwide.

**Reviewer #3317039, comment 7**

We should actively advocate that all donor livers should be taken into account as far as possible pairs application of splitting donor liver to alleviate the getting more and more shortage of resources in adult donor liver.

**Response:**

We completely agree with the reviewer and this was one of the aims of our manuscript.

The references and typesetting were corrected as requested.  
The format has been updated.

We thank the Editors and the Reviewer again for the kind consideration of our manuscript.

Sincerely yours,

Andrea Lauterio, M.D., F.E.B.S.

Transplant Center. Department of General Surgery & Abdominal Transplantation

Niguarda Cà Granda Hospital

Piazza Ospedale Maggiore 3, 20162 Milan, Italy.

e-mail: [andrea.lauterio@ospedaleniguarda.it](mailto:andrea.lauterio@ospedaleniguarda.it)