of gadoxetate disodium and ICG in hepatocytes; therefore, there is a possibility that gadoxetate disodium-enhanced MR imaging could be the basis of a useful method for quantitative estimation of postoperative liver failure similar to ICG clearance but with anatomic delineation of hepatic function.

Recently, several studies reported that signal intensity of the liver in gadoxetate disodium-enhanced MR imaging could be useful in prediction of Posthepatectomy Liver Failure (PHLF). However, most of these methods lack appropriate correction for FRLV or the effect of contrast media existing in extracellular fluid space of the liver. On the other hand, Remnant Hepatocellular Uptake Index (rHUI) is a newly developed index for segmental liver reserve with appropriate correction for FRLV and the effect of contrast media existing in extracellular fluid space. rHUI can be obtained by following equation.

rHUI=rV(rL20/S20 - 1)

where, rV is volume of FRLV, rL20 and S20 are signal intensities of the future remnant liver and the spleen on MR images at 20 min after intravenous administration of gadoxetate disodium, respectively.

In this lecture, 1) the pharmacokinetics of gadoxetate disodium, 2) the correlation of gadoxetate disoium-enhanced MR imaging and ICG clearance test, and 3) the prediction of PHLF with use of rHUI will be described with some case presentations from our clinical experiences.

Symposium 2.
(Technical Review) Liver Transplantation

1. In Adult right liver LDLT
1) To do or not to do procure MHV considering donor and recipient safety

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Chong Woo Chu

1. In Adult right liver LDLT
2) Art in bench surgery for HV reconstruction

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Dong Jin Joo

Outflow obstructions are some of the most serious complications after liver transplantation, and they occur more frequently with living donor liver transplantation (LDLT) versus deceased donor liver transplantation because the anastomosis of the hepatic veins to the IVC is much narrower and more complicated than the anastomosis of the inferior vena cava (IVC) to the IVC, and the liver graft is enlarged because of regeneration after transplantation. Transplant surgeons have tried to prevent outflow obstructions in hepatic vein anastomoses by many procedures.

In the initial experience of LDLT, small-for-size problem after LDLT frequently occurred because there was no consideration of this venous outflow. These days, most of transplant surgeons do their bench work to solve the hepatic venous outflow problem with hepatic vein (HV) reconstruction. Various techniques were developed to reconstruct the middle hepatic vein (MHV) and to make out-

flows of MHV territories. Cryopreserved iliac artery or vein, autogenous vein such as great saphenous vein or gonadal vein, or artificial graft (PTFE) can be used for MHV reconstruction.

Preoperative design is very important in bench surgery. Transplant surgeon should consider anatomical structure of donor liver and graft, what kind of materials for reconstruction, and how anastomosis time can be reduced with the minimal number of anastomosis to make warm ischemic time short during the implant procedures. In addition, the effort to reduce the time in should be made, which is included in cold ischemia time.

A bench surgery begins from perfusion of a graft liver. Until the venous drainage is clear, perfusion solution should be infused into the graft portal vein in the cold bowl under 4℃. During the perfusion, the amount of drainage and diameter of V5, V8 and inferior hepatic vein (IHV) should be checked to determine the branch to reconstruct. In case of more than one IHV, common channel can be made in the bench surgery to make easy anastomosis in the implant procedures. When V5 and V8 are anastomosed to the reconstructed MHV, longitudinal slit incision can be done to make wide lumen for prevention of anastomotic stricture. RHV and MHV can be merged to common channel or not, which should be considered according to the condition of recipient's IVC or HV. Most important thing is that all procedures should be done in the bench surgery as many as possible to reduce warm ischemia time during the implantation procedures.

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1. In Adult right liver LDLT
3) Effective reconstruction of various HVs

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Reconstruction of the hepatic veins in the living donor liver transplantation (LDLT) using right liver graft is one of the critical operative procedures for the graft function and patient's survival. Disturbance of the graft's outflow can cause congestion of the liver graft and small-for-size syndrome.

Unlike to whole liver graft from a deceased donor, the partial liver graft from a living donor usually regenerate rapidly just after implantation. The graft can be double in size after regenerative process. The regeneration of the right livergraft could make graft displacement to the left side. In this process, the right hepatic vein (RHV) or the middle hepatic vein (MHV) could be obliterated by angulation or lateral stretching which cause sudden congestion or choking of the right liver graft. This congestion would accelerate graft enlargement which aggravates choking of the graft outflow. Once the right liver graft falls in vicious cycle of the outflow disturbance, the graft function can be rapidly shut down and threaten patient's life. So, the liver transplant surgeon should consider possible outflow obstruction by the liver regeneration process of the right liver graft,and the anastomosis of the hepatic veins should have sufficient luminal caliber could prevent the risk of venous obstruction by graft displacement.

Wide reconstruction of the hepatic vein is necessary

to keep favorable graft compliance and function. For this purpose, I believe that end-to-side anastomosis of the common graft outflow to recipient's vena cava would be more feasible than end-to-end anastomosis of reciprocal hepatic veins between graft and recipient. Because the intravenous pressure and flow of the hepatic vein is hugely dependent on the luminal caliber. (Intraluminal pressure is inversely proportional to 4th power of luminal radius, *Poiseuille's law*). Our experience of the outflow reconstruction using end-to-side anastomosis of the common outflow trunk of the right liver graft to the recipient's vena cava have shown no outflow disturbance for 140 consecutive LDLT using right lobe graft between 2006 and 2012.

In conclusion, the effective reconstruction of the hepatic vein in the right lobe LDLT can be established when the sufficient width of the outflow is made. And the maximal width of the outflow reconstruction can be done by end-to-side anastomosis of the common graft outflow to recipient's vena cava.

2. In Spilt LT; technical tips for best outcome of both adult and pediatric recipients
1) Bile duct division

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Tae-Yong Ha

2. In Spilt LT; technical tips for best outcome of both adult and pediatric recipients
2) Artery division

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Nam-Joon Yi

Split liver transplantation (SLT) offers the potential for expanding the deceased donor pool for adult recipients as well as pediatric recipients (Fig. 1). In general, livers are split into a left lateral section (LLS) graft for a child and a right liver graft including an ischemic segment 4 for an adult, and sometimes, into a left and right liver graft for two adult recipients. When considering advocacy of SLT, it is important to understand whether comparable outcomes can be achieved compared to the whole liver transplantation in an adult recipient who may get a right liver graft and compared to the living donor liver transplantation (LDLT) in a child or in an adult recipient who may get a left liver graft. In the respect of the outcome, surgical technique is much important as well as allocation regulation. In this review, I'd like to focus on technical view for better outcome of SLT, especially arterial division

Technical aspect

1. In situ vs. Ex vivo

The cold ischemic time is important especially in pediatric cases. In this reason in situ modified technique for procurement of the LLS is recently recommended. However, advances of surgical technique as well as understanding of anatomical variation have introduced ex vivo modified technique for procurement of the LLS in order to shorten the time of procurement.