

Magnetic resonance cholangiopancreatography in assessing living liver donors biliary anatomy: opportunities and challenges

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To the editor:

Although it is questionable whether Magnetic Resonance Cholangiopancreatography (MRCP) should be considered the new standard of reference in biliary imaging (1), state-of-the-art MRCP provides panoramic images with high spatial and temporal resolution, leading to successful applications in different clinical settings (2). As a consequence, MRCP has gained acceptance as the most reliable alternative to direct cholangiography in depicting the biliary system (2). Hence, we read with great interest the paper by Ragab *et al.*, “Correlation between 3D-MRCP and intra-operative findings in right liver donors”, in this first issue of Hepatobiliary Surgery and Nutrition. Pre-operative definition of biliary anatomy in living liver transplant donors exemplifies advantages and challenges related to the use of MRCP in clinical practice. As Ragab *et al.* emphasized, biliary variants are numerous and occur frequently, being associated with surgical technical challenges and an increased risk of postoperative complications in both the donor and recipient (3). In accordance with these Authors, we believe that isolated literature results in favour of endoscopic retrograde cholangiography (ERC) (4) should not encourage its use in the scenario of liver donor liver transplantation (LDLT). MRCP is safe, repeatable and reproducible (5), and has been shown to be highly accurate in identifying biliary abnormalities noninvasively. On the contrary, ERC is associated with radiation exposure and quantifiable morbidity, making at risk of severe complications otherwise healthy liver donors (3).

Ragab *et al.* used T2-weighted, volumetric MRCP

in their study. It should be pointed that the choice of the examination technique is more than a secondary issue, because it deeply influences image quality (i.e., available diagnostic information). Conventional Turbo Spin Echo (TSE)-based, T2-weighted MRCP enables, without i.v. contrast administration, the representation of hyperintense pancreaticobiliary system over a low-signal background. The two-dimensional variant (usually with a single-shot fast spin echo sequence; 2D SSFSE) is rapidly acquired during few and short breath-holds for each thick slab, thus reducing the effect of respiratory artefacts on image quality. On the current standard of 1.5 T magnets, the trade-off is represented by lower signal-to-noise ratio and spatial resolution, i.e., reduced capability to depict subtle anatomic details (2), unless higher magnetic field strength is used (3.0 T) (6). Since volumetric (3D) MRCP is respiratory-triggered, it provides numerous thin slices of the biliary tree as a base for multiplanar reformations and 3D reconstructions. Increased acquisition time (about 3-4 minutes) can be translated in higher spatial resolution, i.e., sharper anatomic details. However, slow and rhythmic free respiration is a pre-requisite for having a good examination (7). There is paucity of literature comparing the above approaches (8), and the choice between them usually depends on institutional preferences and expertise. In both cases, MRCP represents intrahepatic biliary anatomy in its physiological state, without administration of contrast medium. Thus, inadequate representation of normally-distended bile ducts has been described (3).

An increasing amount of evidence suggests that T1-weighted MRCP after i.v. administration of hepatospecific contrast agents (gadobenate dimeglumine and gadoxetic acid) has the potential to complement conventional MRCP by increasing bile ducts conspicuity over liver parenchyma (9) and visualization of bile ducts (8), especially right duct variants (3). Whether contrast-enhanced MRCP might replace the conventional technique (10) is a matter of debate. Rather, it should be emphasized that magnetic resonance imaging (MRI) with MRCP has the potential to provide an “all-in-one” approach to evaluate liver parenchyma as well as biliary and vascular anatomy within a unique examination session (11,12).

According to Ragab *et al.* in this issue of the journal, the sensitivity for normal and variant biliary anatomy is of 100% and 67% only, respectively. Sensitivity for biliary abnormalities in living liver donors ranges from 50% (13) up to 100% (14) in literature. Such discrepancies might be related to a variety of factors, including radiologists' expertise in abdominal imaging, technical choices or reduced biliary conspicuity in normal subjects, as discussed above. However, it has been shown that inaccurate assessment of biliary anatomy by MRCP would not increase the rate of biliary complications after transplantation (13). One might argue that the use of MRCP is cost-ineffective in this clinical setting. Although (to our knowledge) specific studies on this topic lack, we believe—in accordance with Ragab *et al.*—that the amount of evidence is in favour of performing preoperative imaging. In our experience, a whole MRI examination including MRCP has the potential to adequately screen donors and selecting best candidates, as well as to reliably exclude biliary variants. Although not strictly indispensable, MRCP is useful also in the preoperative planning by providing a panoramic and detailed road-map for the surgeons. In this light, the cost-effectiveness of MRCP should be thought in association with intraoperative cholangiography (IOC) as the natural complement of biliary evaluation. Of note, IOC should be always performed during hepatectomy for LDLT, since most studies analyzing radiological methods of biliary visualization finally compare with intraoperative findings (15).

In conclusion, we believe that the paper by Ragab *et al.* emphasizes all the opportunities and challenges related to the use of MRCP in the setting of LDLT. Ideally, the surgeon should be fully aware of the potential and limitations of different MRCP techniques, whereas the radiologist should know “what to look for” according to

surgical needs and how to maximize the informative content of an examination. In our opinion, close collaboration between surgeons and radiologist has the potential to emphasize opportunities and face challenges confidently.

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References

1. Shanmugam V, Beattie GC, Yule SR, et al. Is magnetic resonance cholangiopancreatography the new gold standard in biliary imaging? *Br J Radiol* 2005;78:888-93.
2. Hyodo T, Kumano S, Kushihata F, et al. CT and MR cholangiography: advantages and pitfalls in perioperative evaluation of biliary tree. *Br J Radiol* 2012;85:887-96.
3. Lee VS, Krinsky GA, Nazzaro CA, et al. Defining intrahepatic biliary anatomy in living liver transplant donor candidates at mangafodipir trisodium-enhanced MR cholangiography versus conventional T2-weighted MR cholangiography. *Radiology* 2004;233:659-66.
4. Wietzke-Braun P, Braun F, Muller D, et al. Adult-to-adult right lobe living donor liver transplantation: comparison of endoscopic retrograde cholangiography with standard T2-weighted magnetic resonance cholangiography for evaluation of donor biliary anatomy. *World J Gastroenterol* 2006;12:5820-5.
5. Sirvanci M, Duran C, Ozturk E, et al. The value of magnetic resonance cholangiography in the preoperative assessment of living liver donors. *Clin Imaging* 2007;31:401-5.
6. Kim SY, Byun JH, Lee SS, et al. Biliary tract depiction in living potential liver donors: intraindividual comparison of MR cholangiography at 3.0 and 1.5 T. *Radiology* 2010;254:469-78.
7. Basaran C, Agildere AM, Donmez FY, et al. MR cholangiopancreatography with T2-weighted prospective acquisition correction turbo spin-echo sequence of the biliary anatomy of potential living liver transplant donors. *AJR Am J Roentgenol* 2008;190:1527-33.
8. Lim JS, Kim MJ, Myoung S, et al. MR cholangiography for evaluation of hilar branching anatomy in transplantation of the right hepatic lobe from a living donor. *AJR Am J Roentgenol* 2008;191:537-45.
9. Chiang HJ, Hsu HW, Chen PC, et al. Magnetic resonance cholangiography in living donor liver transplantation: comparison of preenhanced and post-gadolinium-

- enhanced methods. *Transplant Proc* 2012;44:324-7.
10. An SK, Lee JM, Suh KS, et al. Gadobenate dimeglumine-enhanced liver MRI as the sole preoperative imaging technique: a prospective study of living liver donors. *AJR Am J Roentgenol* 2006;187:1223-33.
 11. Mangold S, Bretschneider C, Fenchel M, et al. MRI for evaluation of potential living liver donors: a new approach including contrast-enhanced magnetic resonance cholangiography. *Abdom Imaging* 2012;37:244-51.
 12. Lee MS, Lee JY, Kim SH, et al. Gadoteric acid disodium-enhanced magnetic resonance imaging for biliary and vascular evaluations in preoperative living liver donors: comparison with gadobenate dimeglumine-enhanced MRI. *J Magn Reson Imaging* 2011;33:149-59.
 13. Xu X, Wei X, Ling Q, et al. Inaccurate preoperative imaging assessment on biliary anatomy not increases biliary complications after living donor liver transplantation. *Eur J Radiol* 2012;81:e457-60.
 14. Kashyap R, Bozorgzadeh A, Abt P, et al. Stratifying risk of biliary complications in adult living donor liver transplantation by magnetic resonance cholangiography. *Transplantation* 2008;85:1569-72.
 15. Wang SF, Huang ZY, Chen XP. Biliary complications after living donor liver transplantation. *Liver Transpl* 2011;17:1127-36.

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