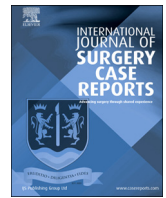




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A novel anatomic variation of the intrahepatic biliary tree in live liver donor surgery: A case report

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ABSTRACT

INTRODUCTION: Anatomic variations of the biliary tree are common, making precise anatomic evaluation important before hepatobiliary surgery.**PRESENTATION OF CASE:** A 52-year-old woman with no medical history was admitted to our hospital for a live-liver donation to her husband. During her evaluation, magnetic resonance cholangiopancreatography (MRCP) revealed a previously unknown anatomic variation in her biliary system. Segment 2 of the bile duct (B2) independently drained into the posterior branch and formed a common channel (B2+posterior) before joining the anterior branch. Then, bile duct segments 3 and 4 (B3+4) drained into this B2+posterior+anterior channel to form a common hepatic duct. The computerized overlay features shown by MRCP and three-dimensional computed tomography clarified this anatomic variation. A right lobe donor graft was then obtained successfully, with intraoperative cholangiography confirming that the donated graft had two bile duct orifices (i.e., posterior and anterior branches). We thus avoided surgical missteps that would have disallowed bile drainage of B2 and B3+4 into the common hepatic duct.**DISCUSSION:** Precise evaluation is mandatory for hepatobiliary surgical planning to rule out, or discover, challenging bile duct anatomy.**CONCLUSION:** Preoperative computerized overlay visualization of MRCP and computed tomography allowed definition of a previously unknown biliary tree variation.© 2021 The Author(s). Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

With the many reports of bile duct anatomic variation, preoperative imaging evaluation of the biliary system is becoming commonplace. Such evaluation—e.g., endoscopic retrograde cholangiography or magnetic resonance cholangiopancreatography (MRCP)—is extremely important to avoid biliary injury during hepatobiliary surgery and postoperative biliary complications.

The present report describes a novel anatomic variation in the biliary tree of a live-liver donor. Precise image analysis helped accomplish successful donor hepatectomy and implantation in the recipient.

This case report has been reported in line with the SCARE 2020 criteria [1].

2. Presentation of case

A 52-year-old healthy woman, who had no medical history, was admitted to our hospital as a live-liver donor for her husband. She underwent dynamic computed tomography (CT) and MRCP as part of the standard live-liver donor evaluation of the liver and biliary system. Dynamic CT scan showed normal hepatic vascular anatomy of both extrahepatic and intrahepatic tributaries. Based on the estimated liver volume, a right lobe graft was deemed preferable. The bile duct evaluation by MRCP, however, showed a previously unknown variation. That is, the left-side bile ducts joined the right-side bile duct separately. Segment 2 of the bile duct (B2) independently drained into the posterior branch, forming a common channel (B2+posterior), before joining the anterior branch. Finally, after addition of the anterior branch, bile duct segments 3 and 4 (B3+4) drained into the conglomerate B2+posterior+anterior common channel to form the common hepatic duct (Fig. 1A). The computerized overlay visualization of MRCP and three-dimensional CT vascular images helped to clarify this anatomic variation (Fig. 1B).

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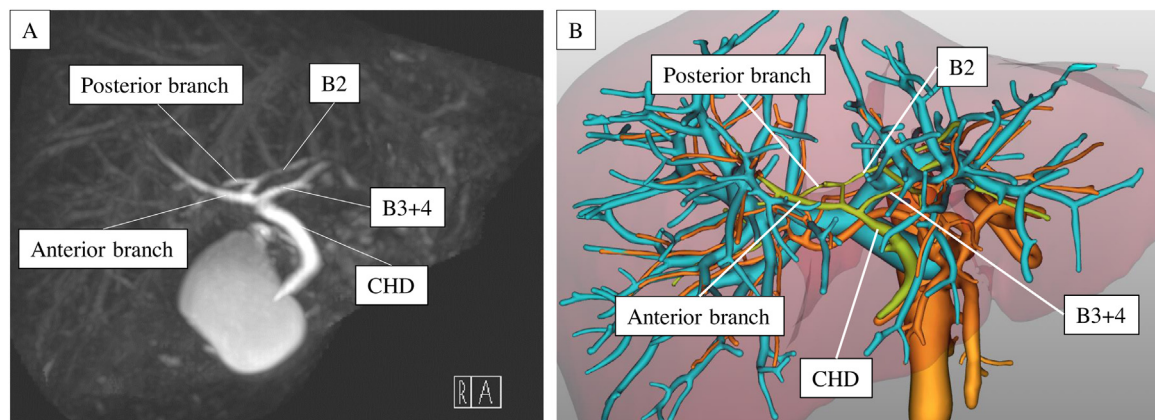


Fig. 1. (A) Magnetic resonance cholangiopancreatography (MRCP) shows the posterior (B2, B3+4) and anterior branches of the biliary system. (B) The computerized overlay visualization of MRCP and computed tomography, including the portal system (blue), hepatic arteries (orange), and biliary system (green). CHD, common hepatic duct.

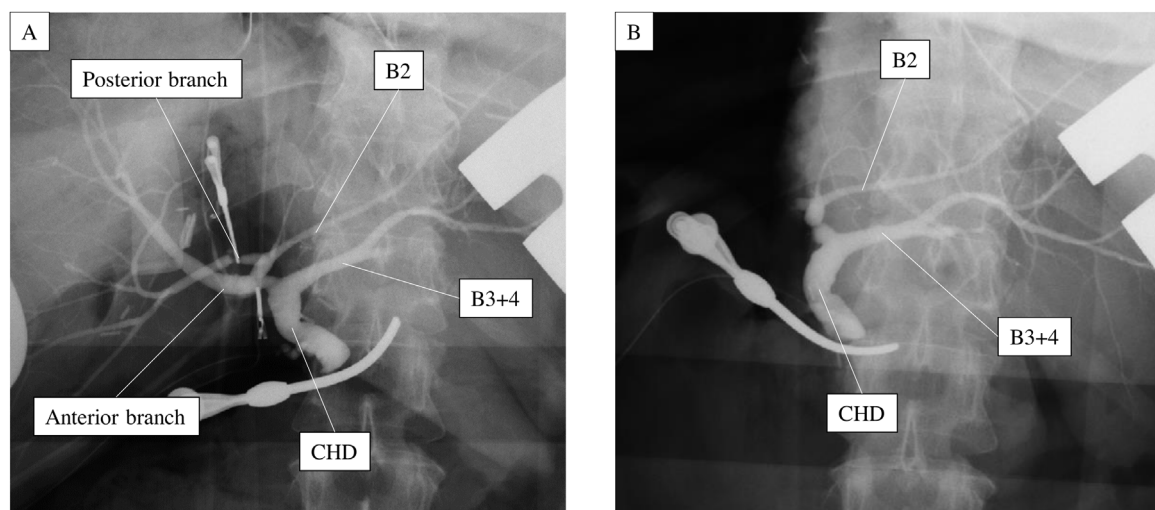


Fig. 2. Intraoperative cholangiography findings. (A) During hepatic parenchymal dissection. (B) After procuring the right lobe graft. CHD, common hepatic duct.

The donor then successfully donated her right lobe graft, with intraoperative cholangiography confirming the preoperative findings (Fig. 2A). That is, her right lobe graft had two bile duct orifices: a posterior branch and an anterior branch. Most importantly, the preoperative imaging revealed the anatomic variation, allowing us to avoid surgical missteps that would have injured the donor's remnant bile ducts of B2 and B3+4 into the common hepatic duct (Fig. 2B). The donor was discharged 14 days after her liver donation surgery without complications.

3. Discussion

The anatomic biliary tree variations were reported to be found in approximately 30%–60% [2,3], and until now, numerous numbers of rare anatomic variations of the biliary tree have been reported [4–8]. Therefore, precise preoperative evaluation of the biliary tree anatomy is extremely important to avoid intraoperative and postoperative complications associated with hepatobiliary surgery, including live-liver donor surgery.

We have searched and found no other reports of the variation pattern seen in our case. Iida et al. [9] reported a somewhat similar variation, although in that report segment B2 joined the anterior branch first, followed by the B2+anterior common channel and finally the posterior branch. Also in that case, B3 separately drained into this B2+anterior+posterior bile duct to form a common hepatic

duct. The variation in our case differed from the one they described. In our case, bile ducts in the dorsal part of the liver (B2 and posterior) joined first, followed by bile ducts in the ventral part of the liver (anterior and B3+4), draining into the dorsal common channel.

The computerized overlay visualization of MRCP and three-dimensional CT provided a clear anatomic picture that allowed us to devise a precise operative strategy for live-liver donation in terms of the anatomic relation between the vascular and biliary structures.

4. Conclusion

We presented a hitherto unknown anatomic variation of the biliary tree. Our case showed that precise evaluation helps with surgical planning and performing a safe operation even in the presence of such a challenging bile duct anatomic variation.

Declaration of competing interest

All authors declare no conflict of interest.

Funding

All authors have no funding of research.

Ethical approval

This study is exempt from ethnical approval in our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Masato Shizuku is primary authors of this case report.

Yasuhiro Ogura was the attending doctor and edited and supervised the writing of this case report. Nobuhiko Kurata, Kanta Jobara and Atsushi Yoshizawa contributed to the patient care and participated the revision of this paper.

Registration of research studies

Not applicable.

Guarantor

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Provenance and peer review

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