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Real-Time 3D Imaging of Post-Transplant Biliary Stricture: A Novel Application of Existing Technology

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Complex biliary strictures in living-related liver transplant biliary strictures are challenging to manage and remain a major cause of morbidity and mortality (1). Anastomotic strictures can be found in up to 19% of patients, particularly in patients who undergo living donor liver transplantation (2). These are challenging to manage endoscopically, particularly in the setting of multiple ductal anastomoses. Even after successful endoscopic intervention, recurrence of the stricture is seen in 30% of patients (3) necessitating repeat interventions.

One of the challenges of endoscopic retrograde (ERCP) is the projection of a 3D structure on a flat fluoroscopy detector, with the limitation of overlapping biliary systems not visualized distinctly. This problem is heightened in living-related liver transplant strictures where the dual anastomosis necessitates selective biliary cannulation for stricture evaluation and therapy.

3D fluoroscopy is a new technique that has seen use primarily in the orthopedic, spinal, and neurosurgical fields (4). Its advantage lies in the ability to provide real-time 3D imaging that can aid in visualization of structures that may be difficult to appreciate from 2D projection imaging alone. We report the first use of a hybrid mobile 2D/3D C-arm system in ERCP for the navigation of difficult biliary anastomotic strictures.



Figure 1. Fluoroscopic image of the living donor liver transplant biliary anastomosis during endoscopic retrograde.

A 68-year-old woman who previously underwent a living donor liver transplant 2 years earlier for cryptogenic liver cirrhosis with hepatocellular carcinoma. Biliary duct-to-duct anastomosis had been performed with the donor's 3-mm right posterior biliary duct to the recipient's right hepatic duct, and the donor's 2-mm right anterior biliary duct to the recipient's left hepatic duct. Postoperatively, the patient developed an early biliary leak that subsequently led to biliary anastomotic strictures involving both her right posterior and anterior sectoral ducts, requiring recurrent endoscopic intervention, biliary dilatation, and stenting. She underwent routine 3-monthly stent exchanges prophylactically to reduce the risk of stent occlusion and cholangitis. However, liver regeneration and hypertrophy made cannulation of the anterior sectoral duct challenging, and each endoscopic session required a prolonged procedure time of >1 hour.

Routine ERCP was performed for the patient under general anesthesia. Her existing biliary stents were removed. Balloon catheter cannulation allowed for engagement of her right posterior system, and a cholangiogram again demonstrated anastomotic strictures of her right anterior and posterior ducts (Figure 1). 3D spin fluoroscopy was then performed. 3D image reconstruction of her biliary system (Figure 2) enabled accurate visualization of her biliary anatomy and assisted with forward planning. Her right anterior system was then accessed with ease, after which biliary dilatation and double pigtail plastic stent insertion were successfully accomplished.

This is a novel application of this technology for biliary tree visualization.

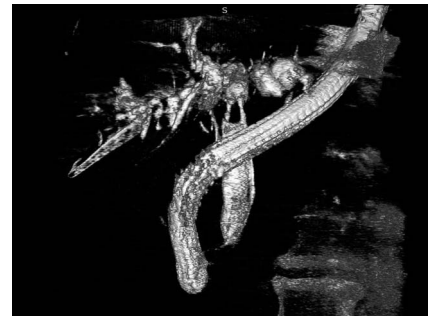


Figure 2. 3D image of the biliary tree for visualization of complex biliary stricture anatomy.

Although this does not replace high-quality preprocedure imaging and planning, augmenting conventional 2D fluoroscopy with 3D imaging helps visualization of complex biliary anatomy at the time of the procedure. This will be a useful tool to add to the existing armamentarium for management of difficult biliary strictures. Further research is required to determine its cost-effectiveness and the extent of its utility (see Video 1, Supplementary Digital Content 1, <http://links.lww.com/AJG/C27>).

CONFLICTS OF INTEREST

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Social Determinants of Health in Inflammatory Bowel Diseases: Barriers and Opportunities

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We read the recent article by Bernstein et al. (1) with great interest. They highlight how low socioeconomic status is associated with worse outcomes in persons with inflammatory bowel diseases (IBDs) even in a universal health care model (1). The authors have used excellent surrogates to identify both community- and individual-level determinants of health. Studies have confirmed that data related to the Social Determinants of Health (SDoH) can give us a complete understanding of a patient's life circumstances. We propose that these data support the future collection of prospective data to assess the impact of SDoH in adults.

Community-level determinants such as poverty, unemployment, and pollution rate, at a population level, are easy to gather from the census bureau. Data on individual-level determinants, such as education level, employment status, and housing situation, are much harder to collect. Significant barriers to collecting this data include lack of incentives for practices, lack of disease-specific tools, and data integration into Electronic Medical Record (2). This individual-level data can change quickly as personal financial or

social situation changes and can be very actionable.

IBD is often diagnosed during the most economically productive years of adulthood, such that nearly a third of costs stem from indirect sources such as lost productivity. The objective financial burden of IBD care is well documented (3,4). Patients with IBD incur higher costs because of both treatment-specific and disease-specific features compared with those without IBD (4). The downstream impact of financial toxicity is bound to affect other social determinants such as housing, food insecurity, and transportation.

The American Medical Association's 2021 medical decision-making grid for outpatient/office evaluation and management services recognizes SDoH as a factor for determining the level of medical decision-making. This provides an opportunity for gastroenterology practices to make a financial case to dedicate resources toward assessing SDoH. Initiatives to collect data related to determinants can involve questionnaires administered by medical assistants or self-reported data allowing physicians to focus on the results of the collected data (2).

There are multiple instruments available to assess SDoH, such as Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences (PRA-PARE) and Health-Related Social Needs Screening Tool (5). There is no standard tool tailored for patients with IBD, which provides another opportunity for future research into creating validated tools for patients with IBD.

Future studies collecting prospective data on the impact of interventions to address SDoH will help provide more robust evidence that social interventions can lead to better clinical outcomes in patients with IBD. Such evidence can help advocate for allocation of resources toward strategies to address and improve these determinants such as referring patients to community services and tracking the results of these referrals.

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Alarming Trends in Opioid Use Among Patients With GERD

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The recently reported study by LeBrett et al. highlighted the important issue of chronic opioid use among patients with gastrointestinal disorders (1). Using cross-sectional, national data, they observed that approximately 10% of patients visiting a physician for a gastrointestinal condition were in receipt of a prescription for an opioid agent. We share their concern about the high prevalence of opioid use among patients with gastrointestinal disorders and the increasing rates of opioid prescription that they documented. Here, we report some related findings from our own study.