



National Survey Regarding the Management of Difficult Bile Duct Stones in South Korea

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Background/Aims: This study aimed to investigate the patterns of preferred endoscopic procedure types and techniques for managing difficult common bile duct (CBD) stones in South Korea.

Methods: The Committee of Policy and Quality Management of Korean Pancreatobiliary Association (KPBA) conducted a survey containing 19 questions. Both paper and online surveys were carried out; with the paper survey being conducted during the 2019 Annual Congress of KPBA and the online survey being conducted through Google Forms from April 2020 to February 2021.

Results: The response rate was approximately 41.3% (86/208). Sixty-two (73.0%) worked at tertiary hospitals or academic medical centers, and 60 (69.7%) had more than 5 years of endoscopic retrograde cholangiopancreatography experience. The preferred size criteria for large CBD stones were 15 mm (40.6%), 20 mm (31.3%), and 30 mm (4.6%). For managing of large CBD stones, endoscopic papillary large balloon dilation after endoscopic sphincterotomy was the most preferred technique (74.4%). When performing procedures in those with bleeding diathesis, 64 (74.4%) respondents favored endoscopic papillary balloon dilation (EPBD) alone or EPBD with small endoscopic sphincterotomy. Fifty-five respondents (63.9%) preferred the double-guidewire technique when faced with difficult bile duct cannulation in patients with periampullary diverticulum. In surgically altered anatomies, cap-fitted forward viewing endoscopy (76.7%) and percutaneous transhepatic cholangioscopy (48.8%) were the preferred techniques for Billroth-II anastomosis and total gastrectomy with Roux-en-Y anastomosis, respectively.

Conclusions: Most respondents showed unifying trends for the management of difficult CBD stones. The current practice patterns could be used as basic data for clinical quality improvements in the management of difficult CBD stones. (*Gut Liver* 2023;17:475-481)

Key Words: Bile ducts; Gallstones; Endoscopy; Cholangiopancreatography endoscopic retrograde; Surveys and questionnaires

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INTRODUCTION

Since the introduction of endoscopic retrograde cholangiopancreatography (ERCP), the endoscopic approach has become the first treatment option for managing common bile duct (CBD) stones.¹ Most biliary stones can be successfully removed by therapeutic endoscopic techniques; endoscopic sphincterotomy (EST) and basket or balloon extraction. However, in about 10% to 15% of the cases, the extraction of bile duct stones could be difficult and eventually not possible only with the basic techniques.² These difficult situations for the management of biliary stones are usually referred to as “difficult” biliary stones. Thus, several rescue techniques and alternative approaches have been invented to handle these difficulties, such as peroral cholangioscopy (POC)-guided laser or electrohydraulic lithotripsy, endoscopic mechanical lithotripsy, or papillary large balloon dilation with/without sphincterotomy.²⁻⁷ However, there are limited data on clinical practice patterns for the management of difficult CBD stones; when and how to choose a rescue technique or alternative measure, and which largely depends on the operator’s experience, preferences, and the availability of the armaments. Therefore, this study aimed to investigate practice patterns and endoscopists’ preferences in terms of procedure types and techniques for managing difficult situations of bile duct stone clearance in South Korea.

MATERIALS AND METHODS

1. Survey development

This study was organized by the Korean Pancreatobiliary Association (KPBA). This questionnaire survey was comprised of three sections; (1) baseline and workplace characteristics, (2) preferred techniques for large CBD stones, and (3) preferred procedure types for surgically altered anatomies. Finally, 19 questionnaires regarding age, sex, specialty or subspecialty, types of hospital, availability of therapeutic armamentarium, and practice patterns regarding the choice of procedure types for surgical resection were included, which were invented by the Committee of Policy and Quality Management in KPBA (Supplementary). Both paper and online survey were conducted anonymously; a paper survey at 2019 Annual Congress of KPBA, and online survey through an online application of Google Forms, which was distributed to KPBA members from April 2020 to February 2021. Potential respondents were the advanced endoscopists who are currently performing ERCP in South Korea.

2. Statistical analysis

All analyses were performed with SPSS 24.0 (IBM Corp., Armonk, NY, USA). Continuous data were reported as mean with standard deviation or median with range. Categorical variables were presented as numbers or proportions.

RESULTS

1. Baseline and workplace characteristics of survey participants

A total of 86 doctors participated in this questionnaire-based survey. The response rate to this survey was 41.3% (86/208). Seventy-nine respondents (91.9%) were male and seven (8.1%) were female doctors. About a half (38/86 participants, 44.2%) were in their 40s. All the respondents majored in gastroenterology and there was no one who majored in other specialties including surgery. More than two-thirds (62/86 participants, 72%) worked at academic hospitals or tertiary hospitals. Regarding the experiences of ERCP procedures, 46.5% had been performing for more than 10 years, and 38.1% usually did more than 500 ERCP procedures on average a year (Table 1). As an alternative procedure of ERCP, endoscopic ultrasonography-guided

Table 1. Baseline and Workplace Characteristics of the Survey Respondents

Variable	No. [%]
Total number of participants	86 (100)
Male	79 (91.9)
Female	7 (8.1)
Age, yr	
31–40	22 (25.6)
41–50	38 (44.2)
51–60	23 (26.7)
>60	3 (3.4)
Specialty	
Gastroenterologist	86 (100)
Classification of affiliated medical institution	
Hospital	24 (28.0)
Academic hospital	15 (17.4)
Academic tertiary hospital	47 (54.6)
Experience in performing ERCP, yr	
<2	10 (11.2)
2 to <5	16 (18.6)
5 to <10	20 (23.2)
≥10	40 (46.5)
Average number of ERCP for 1 yr	
<100	5 (5.8)
100 to <300	22 (25.5)
300 to <500	26 (30.2)
500 to 1,000	24 (27.9)
≥1,000	9 (10.4)

ERCP, endoscopic retrograde cholangiopancreatography.

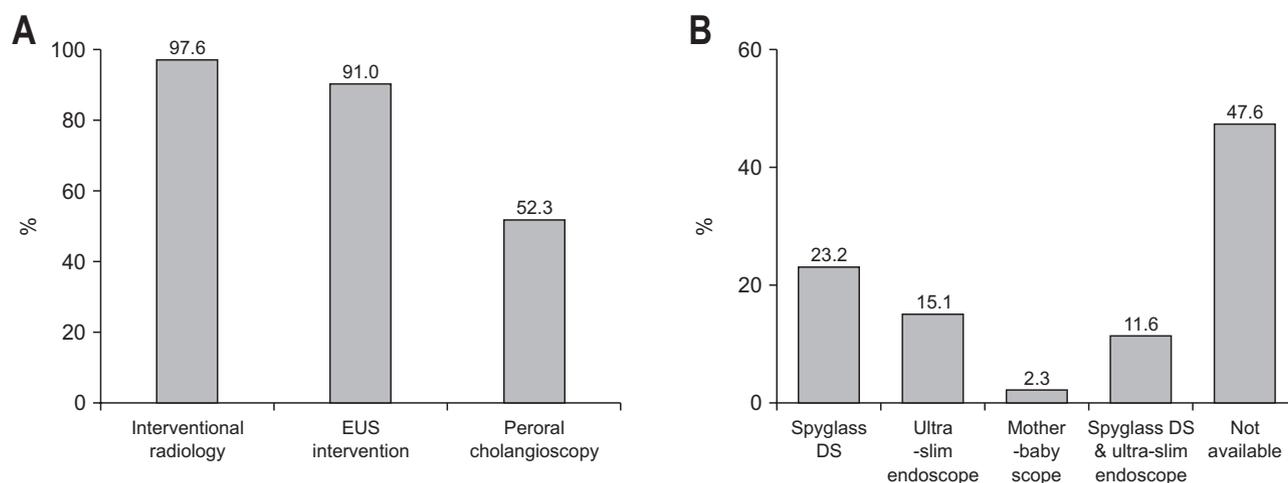


Fig. 1. Available therapeutic armamentaria. (A) Alternatives of endoscopic retrograde cholangiopancreatography. (B) Available types of peroral cholangioscopy.

EUS, endoscopic ultrasonography; DS, direct-visualization system.

intervention and percutaneous radiologic intervention were available in 78 (91%) and 84 (97.6%) at the responders' hospitals, respectively (Fig. 1A). However, POC was equipped with only about half (52.4%) of the respondents, including SpyGlass DS (23.2%), ultra-slim endoscopy (15.1%), mother-baby scope (2.3%), both of SpyGlass DS and ultra-slim endoscopy (11.6%) (Fig. 1B).

2. Preferred techniques for difficult CBD stones

The preferred size criteria of large CBD stones were 15 mm (40.6%), 20 mm (31.3%), and 30 mm (4.6%) (Fig. 2). About obtaining adequate exit for the bile duct clearance, 64 (74.4%) answered that they were doing endoscopic papillary large balloon dilation (EPLBD) after EST, which were followed by endoscopic papillary balloon dilation (EPBD) after EST (14/86, 16.27%). Thus, almost all (78/86, 90.7%) of the participants preferred the combination technique of sphincterotomy and balloon dilation for difficult CBD stones (Fig. 3A). Regarding the dilation diameter for performing EPLBD, 45 (52.3%) preferred to use a 13–15 mm-sized balloon and 27 (31.4%) preferred a 12 mm-sized balloon. However, only 11 (12.7%) preferred to use larger than 15 mm-sized balloons in diameter (Fig. 3B). Regarding the dilation duration for performing EPLBD, 43 (50%) preferred the duration of 1-minute dilation and 31 (36%) preferred the duration of only 30 seconds. However, only 12 (13.9%) preferred more than 2-minute dilation (Fig. 3C). In case of incomplete clearance of bile duct stones, temporary biliary stent placement (78%) was considered as the most preferred rescue measure in considering follow-up ERCPs. The other measures of second choice for the incomplete stone clearance were answered in the following order: POC with electrohydraulic lithotripsy (8/86, 9.3%),

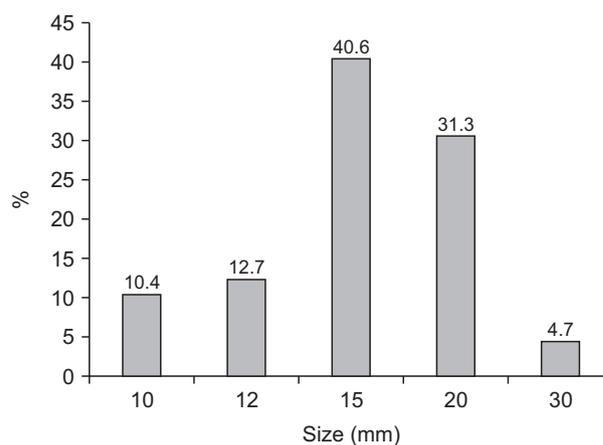


Fig. 2. The presumed size criteria for large common bile duct stones.

percutaneous transhepatic cholangioscopy (8/86, 9.3%), POC with laser lithotripsy (2/86, 2.3%) and extracorporeal shock wave lithotripsy (1/86, 1.1%) (Fig. 4). For the patients with bleeding diathesis, such as liver cirrhosis, end-stage renal disease or taking anti-thrombotic agents, 36 (41.8%) answered that they perform only EPBD without EST. The other alternatives were answered in the following order: EPBD after small EST (n=28, 32.5%), small EST only (n=14, 16.2%), only biliary stent placement for decompression (n=8, 9.3%).

3. Preferred procedure types for anatomical variations

For the patients with periampullary diverticulum, 55 of the 86 respondents (63.9%) preferred the double guidewire (DGW) technique to rescue the difficulties of selective bile duct cannulation, and precut sphincterotomy after

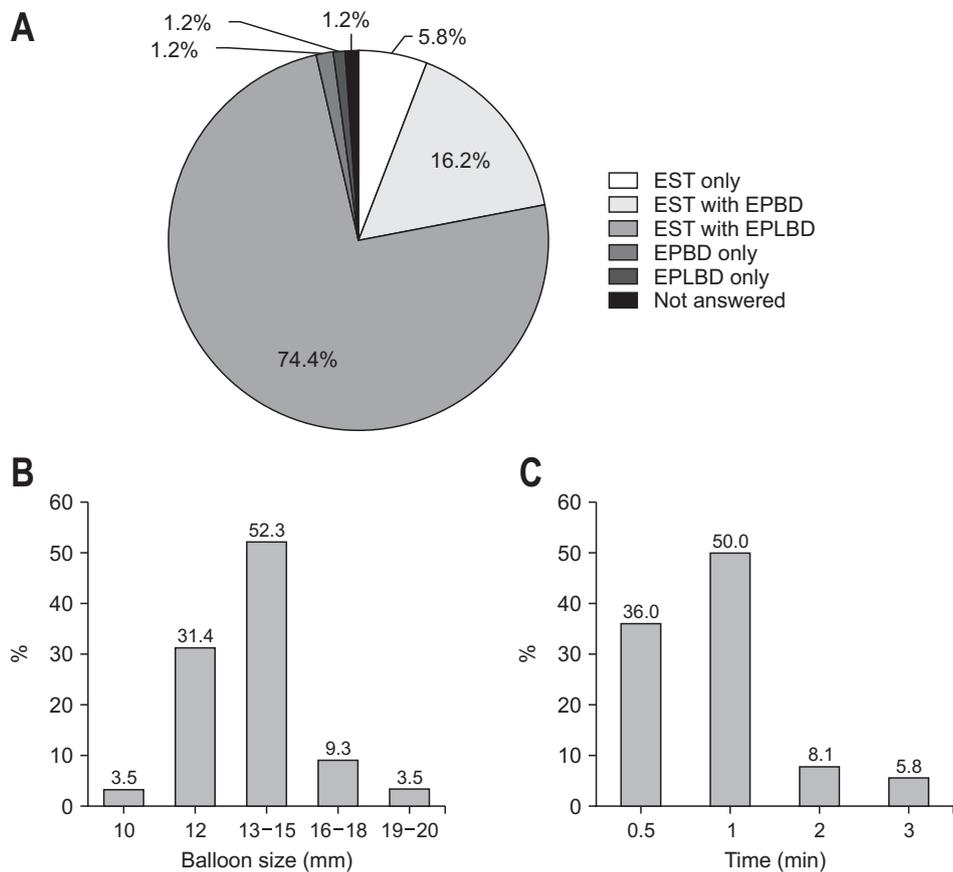


Fig. 3. Technical preferences. (A) Preferred techniques to ensure adequate opening of the ampullar orifice for large common bile duct stones. (B) Preferred balloon size for EPLBD. (C) Preferred dilation duration of EPLBD. EST, endoscopic sphincterotomy; EPBD, endoscopic papillary balloon dilation; EPLBD, endoscopic papillary large balloon dilation.

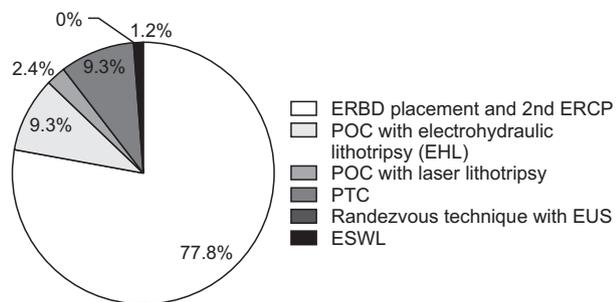


Fig. 4. Preferred rescue measures for the incomplete clearance of bile duct stones. ERBD, endoscopic retrograde biliary drainage; ERCP, endoscopic retrograde cholangiopancreatography; POC, peroral cholangioscopy; PTC, percutaneous transhepatic cholangioscopy; EUS, endoscopic ultrasonography; ESWL, extracorporeal shock wave lithotripsy.

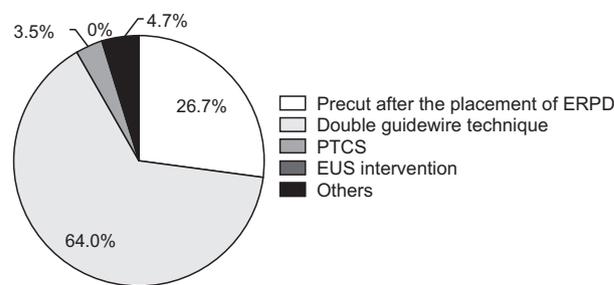


Fig. 5. Preferred selective biliary cannulation rescue techniques for patients with periampullary diverticulum. ERPD, endoscopic retrograde pancreatic drainage; PTCS, percutaneous transhepatic cholangioscopy; EUS, endoscopic ultrasonography.

pancreatic duct stent placement was the second as rescue techniques (Fig. 5). For the patients with Billroth-II anastomosis, cap-fitted forward endoscope (76.7%) was most frequently considered as an alternative to conventional side-view duodenoscope. However, 18.6% answered that they stuck to use the conventional duodenoscope as a first approach even in the situation of Billroth-II anastomosis. The other alternatives were cap-fitted pediatric colonoscopy and single balloon enteroscope. For the patients with

total gastrectomy with Roux-en-Y anastomosis, transhepatic cholangioscopy (48.8%) were most preferred (Fig. 6). In the situation of altered anatomy, EPBD was frequently considered as an alternative of standard EST. For the patients with altered anatomy, 38 (44.1%) answered that they perform only EPBD without EST. The other alternatives were answered in the following order: EPBD after small EST (n=28, 32.5%), small EST only (n=12, 12.7%), EPLBD after EST (n=4, 4.7%), and only EPLBD (n=4, 4.7%).

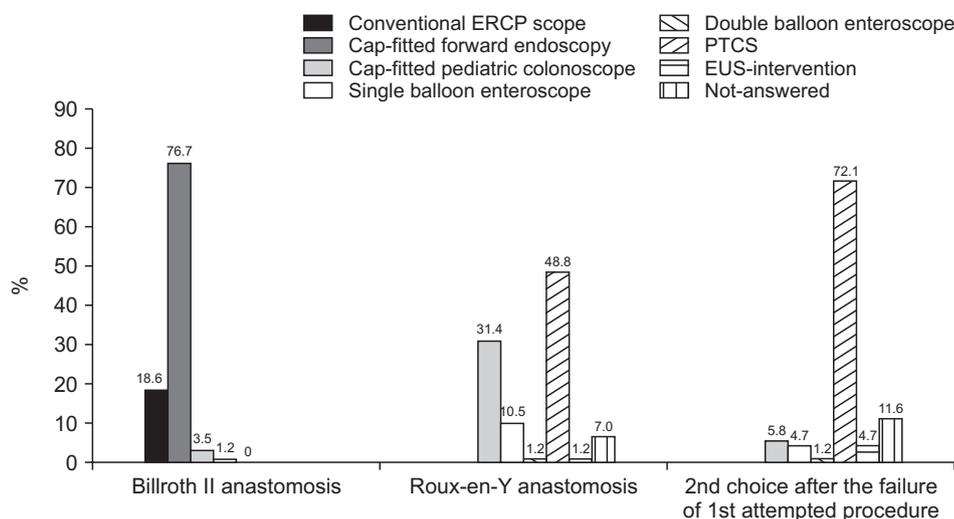


Fig. 6. Preferred endoscopy types for patients with surgically altered anatomy. ERCP, endoscopic retrograde cholangiography; PTCS, percutaneous transhepatic cholangioscopy; EUS, endoscopic ultrasonography.

DISCUSSION

In South Korea, the annual numbers of therapeutic ERCPs have consistently increased, and the extraction of CBD stones is the most common indication.⁸⁻¹⁰ Along with the increased volume of ERCPs, the cases of difficult CBD stones would have increased because approximately 10% to 15% of patients with biliary stones are known to have challenging situations to extract the biliary stones.^{2,11} Thus, the competence of dedicated techniques for ERCPs is an essential part as an advanced endoscopist. With the advances of various technical skills and instruments for therapeutic procedures, such as POC with laser lithotripsy, extracorporeal shock wave lithotripsy, and balloon enteroscope, it is vital to keep abreast of the novel approaches. Accordingly, it is important to know the current practice patterns regarding the management of difficult CBD stones as an initial step to guide future taskforce recommendations and performance metrics related to health-care quality improvement.

Difficult biliary stones are regarded as any clinical situations that biliary stones cannot be successfully extracted only with standard techniques. The difficulties are related to various factors: (1) stone-related factors, such as their large diameter, number, slippery shape, or location (intrahepatic or cystic duct) and (2) anatomy-related factors, such as periampullary diverticulum, acute angulation or stricture in the bile duct, and surgically altered anatomy of Roux-en-Y anastomosis or Billroth-II anastomosis.

For the extraction of CBD stones, the adequate opening of ampullary orifice is prerequisite and usually obtained by conventional EST. However, in case of difficult CBD stones, a larger opening of the orifice is necessary to facilitate the removal of large stones. Furthermore, novel techniques can be implemented with new instruments considering the 0

stone characteristics or bile duct configuration; otherwise, other rescue procedures such as interventional radiology or POC could be applied as an alternative of ERCP, which is also an important capability for the management of the difficult stones. Therefore, the best patient outcomes for biliary stone management can be ensured by the complex and multifaceted approaches.

Regarding the size criteria for large CBD stones, this survey revealed that 40% of respondents agreed with the 15 mm criteria, which is the size mostly cited in many literatures including 2019 ESGE guideline for CBD stones;¹² on the other hand, about 35% answered that the stones with more than 20 or 30 mm are considered large CBD stones. Interestingly, about 75% answered that the most preferred technique for gaining the adequate opening of ampullary orifice was “EPLBD after EST” which is firstly recommended technique by the ESGE 2019 guideline.¹² Regarding the details of EPLBD, a 13 to 15 mm-sized balloon and 1-minute duration were the most preferred. Particularly, regarding the rescue techniques for difficult biliary cannulation in patients with periampullary diverticulum, a considerable portion (63.9%) of the respondents preferred DGW technique although the DGW technique was reported to have a higher rate of post-ERCP pancreatitis.¹³ About a quarter (26.7%) of the respondents preferred wire-guided cannulation over a pancreatic stent after the stent placement on the pancreatic duct, which seems to be more reasonable because prophylactic pancreatic stenting especially after the DGW has been widely accepted to reduce the risk of post-ERCP pancreatitis.¹⁴

In case of incomplete clearance of bile duct stones, temporary biliary stent placement (78%) was considered as the most preferred rescue measure in considering follow-up ERCPs; however, cholangioscopy-assisted lithotripsy was considered in only about 10% of participants despite of

the high efficacy of POCs for the difficult biliary stones.¹⁵ This low preference can be attributed to the inadequate reimbursement for POCs, thereby causing the high medical cost of performing this procedure especially in South Korea.¹⁶ In addition, extracorporeal shock wave lithotripsy was rarely performed, and it may be attributed to the non-coverage for the purpose of biliary stone fragmentation by health-care insurance system in South Korea.

ERCPs in patients with surgically altered anatomy, such as Billroth-II anastomosis or Roux-en-Y reconstruction is well known for its technical challenges because of anatomical variabilities with long and tortuous afferent limb to reach the papilla. Even if successfully intubated, the inverted appearance of the papilla in endoscopic view is another hurdle to cannulate the bile duct, thereby leading to the difficulties for the management of biliary stones.¹⁷ A survey study from Japan society showed that balloon-assisted enteroscope was most frequently tried techniques both for Billroth and Roux-en-Y reconstruction.¹⁸ However, our study showed different results from the survey from Japan. For dealing with surgically altered anatomy, cap-fitted forward endoscope (77%) for Billroth-II anastomosis and percutaneous transhepatic cholangioscopy (48.8%) for Roux-en-Y anastomosis were the preferred techniques, respectively. Moreover, balloon-assisted enteroscopy was considered as low as about 1% for the first approach to deal with the surgically altered anatomy in South Korea.

This study is the first national survey to investigate the patterns of preferred endoscopic procedure types and techniques for managing difficult CBD stones in South Korea; however, there is a possibility of selection bias because the survey was only for the members of KPBA. Thereby, this survey showed about two-thirds of the respondents are highly experienced endoscopists who work at tertiary hospitals or academic hospitals with at least more than 5-year experience and more than 300 annual cases of ERCP. However, in South Korea, about 65% of the ERCP procedures are performed in at least higher setting of academic hospitals, which is demonstrated by a nationwide database study with Health Insurance Review & Assessment Service by KPBA in 2019,⁹ and the workplace setting of ERCPs is quite similar to our study results; thereby, the possibility of selection bias may not significant to hinder the representativeness of South Korea.

In conclusion, this study shows that most gastroenterologists who perform ERCP in South Korea have unifying trends for the management of difficult situations of bile duct clearance although the capability of dedicated armaments for POCs varies between each participant's hospital. The current practice patterns would be used as basic data for clinical quality improvement regarding the manage-

ment of difficult CBD stones.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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AUTHOR CONTRIBUTIONS

Study concept and design: Y.S.L., C.H.P. Data acquisition: Y.S.L. Data analysis and interpretation: Y.S.L., C.H.P. Drafting of the manuscript: Y.S.L., C.H.P. Critical revision of the manuscript for important intellectual content: K.B.C., C.H.P. Statistical analysis: Y.S.L. Obtained funding: K.B.C., C.H.P. Administrative, technical, or material support: T.J.J., W.H.P., D.W.A., K.H.C., B.K.S., T.J.S., S.H.M., E.S.L., J.M.L., S.B.Y., C.N.P., Y.N.L., J.S.P., S.W.P., D.W.L., H.K.C. Study supervision: C.H.P. Approval of final manuscript: all authors.

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SUPPLEMENTARY MATERIALS

Supplementary materials can be accessed at <https://doi.org/10.5009/gnl220117>.

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