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Recurrent Symptomatic Biliary Obstruction due to Duodenobiliary Reflux of Food: A Largely Unknown Complication of Endoscopic Biliary Sphincterotomy

A single-center case series including the results of surgical therapy

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ABSTRACT

Background and Study Aims Biliary obstruction caused by food is a little known and rarely reported long-term complication of endoscopic sphincterotomy (ES). This retrospective study aimed to characterize patients diagnosed with this condition between 2012 and 2025 and to assess the outcomes of surgical therapy.

Patients and Methods Patients were selected who were diagnosed with symptomatic duodenobiliary reflux of food (DBR-F) after earlier ES and who all underwent hepaticojejunostomy with partial resection or ligation of the common bile duct (CBD). DBR-F was diagnosed by pathologic examination of material extracted from the CBD during episodes of biliary obstruction. Data were assessed retrospectively using the hospital electronic patient record system. Long-term outcomes and satisfaction with treatment were also evaluated using a questionnaire.

Results We identified 12 patients who had undergone multiple ERCPs for "stone" or "sludge" removal (presurgery median 9, IQR 7.3–10) with microscopic proof of DBR-F. Patients presented with (episodic) abdominal pain, often associated with cholangitis. Liver abscesses were diagnosed in two cases. The median diagnostic delay was 3.3 years. Medical (antibiotics, ursodeoxycholic acid) and endoscopic (repeat sphincterotomy, stenting) treatment were ineffective. Surgical complications were observed in 4/12 (33%) patients. Long-term patient satisfaction after surgery was excellent in 9/10 evaluable patients.

Conclusions This single-center series suggests that DBR-F is a long-term complication of ES that must be more prevalent than is suggested by anecdotal literature. This diagnosis should be considered when patients present with recurrent "stones" or "sludge" after previous ES. In selected patients with recurrent significant symptoms associated with DBR-F, surgical therapy is an effective option.

Keywords duodenobiliary reflux, complication of endoscopic sphincterotomy, biliary stones, cholangitis, hepaticojejunostomy

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Introduction

Endoscopic Retrograde Cholangio-Pancreatography (ERCP) with endoscopic sphincterotomy (ES) is an established treatment modality for bile duct stones. A vast amount of literature is available on pancreatitis, bleeding, perforation, and infection as the main early complications of ES. A well-documented long-term complication of ES is stenosis of the ampullary orifice, with a reported incidence ranging from 0.5% to 3.9%.[1,2] Other long-term clinically manifest complications have been less well defined. Following the ES biliary sphincter function being permanently lost, it results in the absence of a biliary-duodenal pressure gradient, a 50–70% prevalence of duodenobiliary reflux (DBR), aerobilia and biliary colonization with mainly enteric bacteria, and chronic inflammatory ductal changes.[3–7] It is widely assumed that these sequelae are subclinical in the large majority of patients. Herein we report an additional and largely unknown long-term complication of ES: recurrent symptomatic biliary obstruction due to DBR with passage of food into the biliary tree (DBR-F).

Patients/Material and Methods

Patient selection

At Erasmus MC, from January 2012 to January 2025, a database was maintained of patients who following previous ES presented with symptoms of biliary obstruction caused by food-containing material.

For this study, we selected those individuals who fulfilled the following criteria: ERCP performed at the time of symptomatic biliary obstruction showing (pathology proven) stone or sludge material containing food constituents in the CBD, for which surgical treatment was ultimately instituted. Patients with DBR-F experiencing only mild and/or infrequent symptoms, patients with hepatobiliary comorbidities in whom the significance of DBR-F was uncertain, and patients carrying a high operative risk were excluded. In order to identify additional cases, all patients who underwent a hepaticojejunostomy at Erasmus MC during the study period were retrospectively reviewed.

Data Collection

Demographic and clinical data were retrieved from the hospital electronic patient record system and categorized and analyzed using SPSS software. In the context of this retrospective study, the follow-up started at the time DBR-F was diagnosed and ended at the time of last patient contact in December 2024 or January 2025. Additionally, data on the long-term course and patient satisfaction with surgical treatment were collected using a standardized set of questions, primarily by telephone interview. The diameter of the CBD was calculated by taking the average of three separate measurements at the midpoint of the duct using cholangiographic images obtained during the ERCP revealing intraductal food components.

Diagnosis of duodenobiliary reflux of food

In patients with DBR-F (**Figs. 1** and **2**), material removed from the biliary tree using a balloon or Dormia basket typically does not resemble (semi-)solid gallstones, but is usually fragile, soft, irregularly shaped and yellow to greenish in color. More rarely, greyish clay-like material is retrieved. To be able to collect the often fragmented or even crumbly material, multiple particles were aspirated through the endoscope and collected using a polyp trap system. The strainer tray of this device was rinsed in a jar containing a fixative and the specimen was sent for pathology. In a number of patients, large fragments were also collected using a Roth net. Microscopy showed vegetable or more rarely muscle fibers, together with variable presence of amorphous, often patchy bilirubin-stained debris, bacteria, glycoproteins, and lipid material. Occasionally, macroscopic and/or microscopic examination shows larger vegetable particles, pits, or seeds.

Surgical Procedure

The surgical procedure aimed at preventing ascending cholangitis and upward movement of material in the CBD. Either through

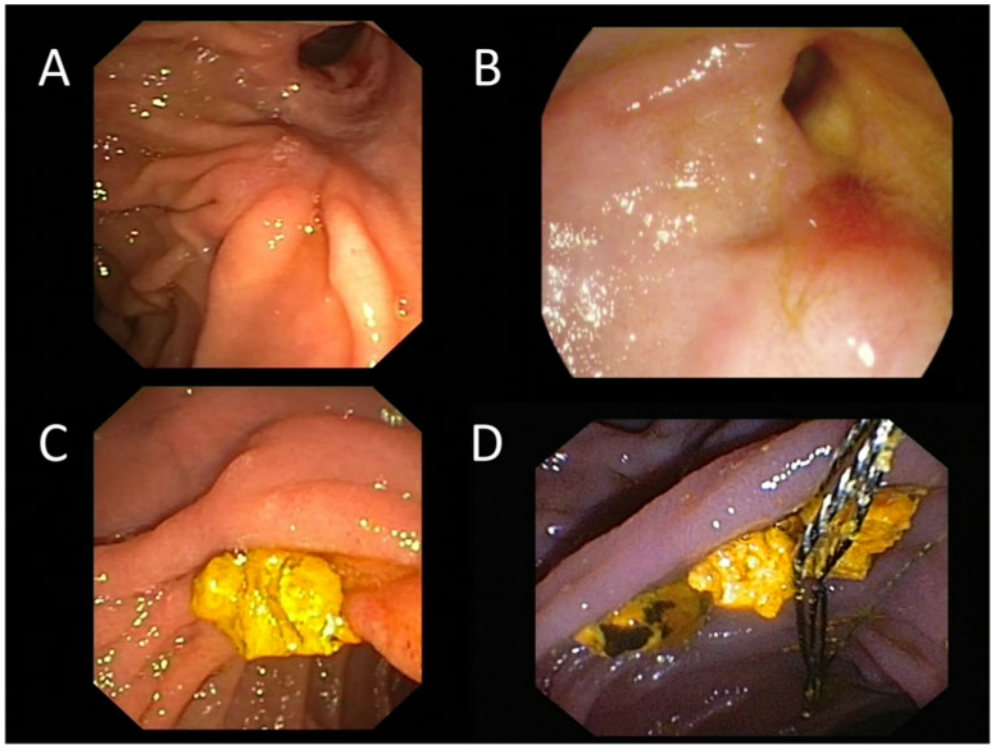

Fig. 1 (**A**, **B**) Wide biliary orifices after previous endoscopic sphincterotomy and removal of biliary stones. (**C**, **D**) Material removed from the common bile duct. Microscopy showed vegetable fibers.

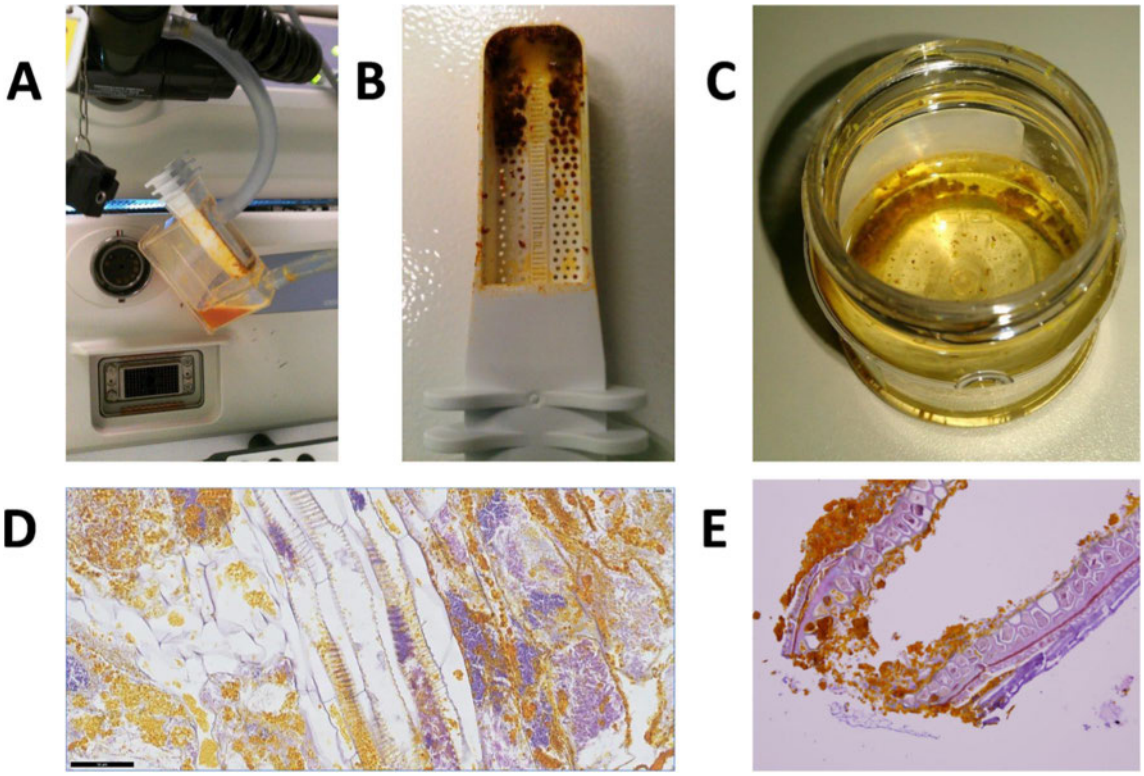

Fig. 2 Sampling and microscopic examination of biliary material using a polyp-trap device. (**A**) Polyp-trap device with bile-colored duodenal aspirate. (**B**, **C**) Strainer tray and specimen container with crumbly material. (**D**) Microscopy showing large vegetable fiber. (**E**) Vegetable fibers with debris and bacteria.

the open or robotic approach, a partial resection or ligation of the CBD was performed, followed by a Roux-en-Y hepaticojejunostomy.

The study was approved by the Medical Ethics Committee Erasmus MC, and oral and written informed consent was obtained from all but one patient.

Results

Clinical Characteristics

During the period January 1, 2008 till January 1, 2025, DBR-F was diagnosed in 21 patients. Among this cohort, 2 patients had only mild or infrequent symptoms and were followed up elsewhere, 3 carried a high operative risk in combination with clinical uncertainty with respect to the significance of DBR-F because of concurrent portal vein thrombosis with probable portal biliopathy, and in 4 the operative risk was considered to be too high because of serious comorbidities. The remaining 12 patients were included in the study (**Table 1**). In 1 patient, DBR-F was diagnosed based on macroscopic identification of seeds removed from the CBD. The median follow-up time was 9.7 (IQR 5.9–13.7) years and varied from 2 to 16 years. Complete data were available except for 1 patient who was no longer alive at the time of the study. All patients had a history of prior cholecystectomy for gallstone disease and ES for removal of duct stones, and all had a dilated CBD.

Clinical Course and Management

The median interval between ES and the onset of symptoms attributable to DBR-F was 2.2 (IQR 1.0–7.6) years and varied from 4 months to 22 years. The median interval between the first ERCP for DBR-F related symptoms and diagnosis of DBR-F—the diagnostic delay—was 3.3 (IQR 2.1–6.6) years and varied from 0.1 to 12 years (**Fig. 3**). All patients experienced recurrent upper abdominal pain, and in 8/12 associated with at least one episode of cholangitis; 2 were treated for liver abscesses. In all cases, repeated ERCPs were performed, with more than five procedures performed in 9/12 cases and eight or more procedures in 5/12 cases. The findings of the repeated ERCPs were inconsistent, and they varied within individuals from complete absence to extensive presence of intraductal material, even when the ERCPs were performed within several weeks or months. With the aim of improving biliary flow, re-sphincterotomy or balloon dilatation of the distal CBD had been performed in 7 and 1 cases, respectively. In addition to short-term antibiotic courses for cholangitis (8/12 patients), 3 received maintenance antibiotic therapy for prevention of cholangitis, in 2 complicated by the emergence of antibiotic resistance. Ten patients were administered long-term ursodeoxycholic acid. With the aim of preventing upward passage of duodenal contents into the biliary system and to maintain biliary flow, 2–3 plastic double pig-tail or conventional straight plastic biliary stents were placed for varying lengths of time in 4 patients. Despite these endoscopic and medical interventions,

Table 1 Clinical characteristics.

	Study cohort
	n=12
Age at diagnosis DBR-F, years, median (IQR)	60.9 (58-66)
Male, n (%)	6 (50%)
Follow-up duration, years, median (IQR)	9.7 (5.9 – 13.7)
Concurrent hepatobiliary disorders (n%)	0 (0%)
DBR-F related symptoms and complications, n(%)	
Recurrent upper abdominal pain	12 (100%)
Cholangitis	8 (66.7%)
Liver abscess(es)*	2 (16.7%)
Interval ES – 1st ERCP for DBR-F symptoms, years, median (IQR)	2.2 (1.0-7.6)
Interval ES – diagnosis DBR-F, years, median (IQR)	9.1 (3.3-10.3)
ERCPs until diagnosis DBR-F, n, median (IQR)**	7.5 (5.5-9.5)
Diagnostic delay, years, median (IQR)***	3.3 (2.1-6.6)
Common Bile Duct diameter at diagnosis, mm, median (IQR)	11.3 (9.2-12.6)

*both also cholangitis episodes
** ERPCs for DBR-F related symptoms/complications
***interval 1st ERCP for DBR-F symptoms and DBR-F diagnosis
DBR-F: duodeno-biliary reflux of food. IQR: interquartile range.
ES: endoscopic sphincterotomy

none demonstrated consistent or sustained clinical benefit over the long term.

Surgical Treatment

Surgical treatment was performed after a median interval of 9.5 (IQR 3.4–16.4) months following DBR-F diagnosis (**Table 2**). The median follow-up time after surgery was 8.9 (IQR 4.5–12.5) years. Until surgery, half of the patients had undergone a total of 10–13 ERCPs for recurrent biliary obstruction. During the postoperative follow-up, 3/12 patients underwent a total of 6 ERCPs for management of postoperative complications. The median number of ERCPs decreased from 9.5 (IQR 7.3–10) preoperatively to 0 (IQR 0.5) postoperatively.

One or more short- or long-term surgical complications were observed in 4 patients. In one case, ligation of the CBD was incomplete. Life-threatening cholangitis due to massive biliary food impaction necessitated repeated surgery. Nevertheless, episodes of cholangitis recurred, and another surgical revision took place to lengthen the Roux limb. In another case, ligation of the CBD was not complete as well, resulting in re-operation with re-transection of the CBD. In both cases, the later course was uncomplicated, and patients are symptom-free for, respectively, more than 2 and 11 years. During the postoperative course, 1 patient developed two Klebsiella liver abscesses, and 1 patient had 3 episodes of bacteremia 2–4 years after surgery. In both cases, an underlying biliary cause was not identified.

Long-term Outcomes and Patient Satisfaction

Long-term postoperative satisfaction could be assessed in 10/12 (83%) patients after a median of 8.9 years. Nine patients were symptom-free and expressed high satisfaction with the treatment, although 1 of them continued to experience occasional mild abdominal pain. One patient reported some dissatisfaction considering serious postoperative complications he had experienced.

Discussion

Here we describe a series of 12 patients who, following ES, developed biliary obstruction caused by food impaction after highly variable and often prolonged intervals. ERCP invariably showed wide biliary orifices and CBD dilatation. Usually, there was a long delay between the first symptoms and diagnosis. Patients required frequent hospitalization and multiple diagnostic and therapeutic procedures, in particular ERCPs, for removal of

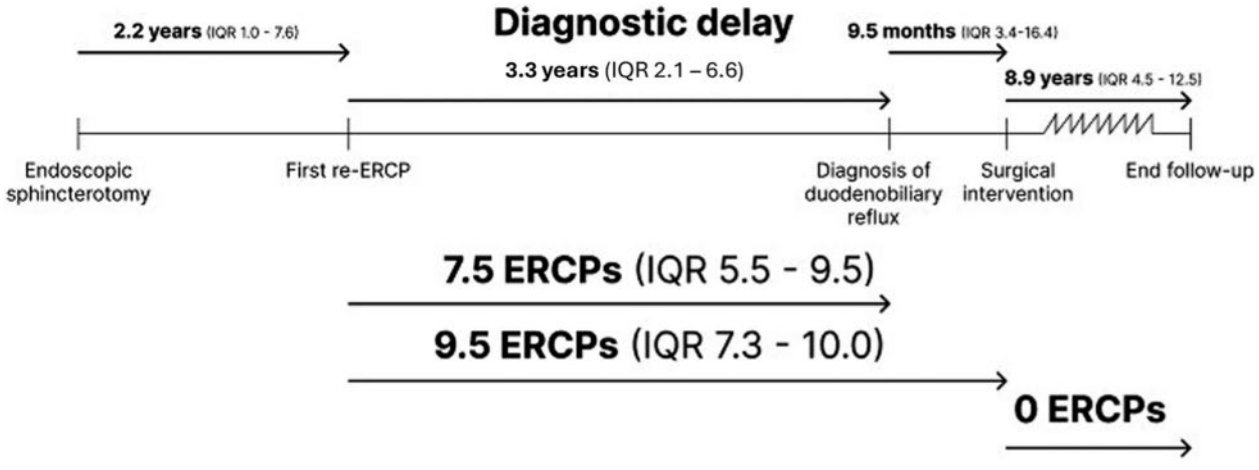

Fig. 3 Timelines (medians and IQR's), diagnostic delay, and number of ERCP's in our patient cohort.

Table 2 Surgical therapy for duodeno-biliary reflux of food.

	Study cohort
	n=12
Age at surgery, years, median (IQR)	61.9 (58.8-66.8)
Interval diagnosis – surgery, months, median (IQR)	9.5 (3.4-16.4)
ERCPs until surgery, n, median (IQR)	9.5 (7.3-10.0)
Postoperative stay, days, median (IQR)	7.0 (6.0-8.8)
Follow-up duration after surgery, years, median (IQR)	8.9 (4.5-12.5)
Medical treatment before surgery, n (%)	
maintenance antibiotic treatment	3 (25%)
ursodeoxycholic acid	10 (83.3%)
re-sphincterotomy/balloon dilatation/biliary stent	10/13 (77%)
Surgical complications, n (%)	
insufficient ligation common bile duct**	2 (16.7%)
stenosis hepatico-jejunostomy anastomosis***	1 (8.3%)
incisional hernia	2 (16.7%)
Long-term clinical course, n (%)	
occasional upper abdominal pain	1 (8.3%)
liver abscess (2 years after surgery)	1 (8.3%)
bacteriaemia (3 episodes)	1 (8.3%)
Satisfaction with surgery (questionnaire), n (%)****	
symptom-free	9 (90%)
high level of satisfaction with surgical treatment	9 (90%)

*ERCPs for DBR-F related symptoms/complications
**recurrent biliary obstruction and cholangitis requiring re-operation
***requiring 3x endoscopic balloon dilatation
****not available for two patients
DBR-F: duodeno-biliary reflux of food. IQR: interquartile range.

recurrent "stones" or "sludge." In addition to short- and long-term antibiotic and bile acid treatments, re-sphincterotomy and biliary stenting were often performed. The chronic and unpredictable nature of the symptoms profoundly impacted patient's quality of life, leaving some housebound, unable to work, or psychologically distressed. Although surgical treatment was accompanied by complications, the long-term results were excellent. Complete, or near complete, symptom resolution and high satisfaction with treatment were reported by all evaluable patients.

DBR is a well-described consequence of biliary–duodenal barrier disruption, particularly after endoscopic interventions such as sphincterotomy or stent placement. Loss of barrier function after placement of biliary metal stents invariably results in DBR.[8,9] Studies showing intraluminal food constituents in 39–100% of removed plastic stents attribute to the widely accepted view that DBR-F plays a major pathophysiological role in stent clogging.[10,11] A barium contrast study, already reported in 1984, showed a 65% prevalence of DBR after ES, however without clinical sequelae.[4] The scarce literature on symptomatic DBR-F after ES suggests that this is an extremely rare event. In a first report by Szanto et al. in 1994 a patient presented with abdominal pain 1 year after ES.[12] After extension of a slightly narrowed papillary orifice, material was removed from the CBD. Macroscopic and microscopic investigations revealed tomato skins. Four comparable cases were reported until 2006.[13–15] To our knowledge, no further cases have been formally documented, and strikingly, there are no published cohort studies describing the long-term clinical course or management of patients with symptomatic DBR-F. This lack of data is notable, particularly given the potential for significant morbidity associated with this condition.

With a 12-23% incidence in several large series, recurrent stone formation after ES with complete ductal clearance is far from rare.[16–19] A high risk for repeated stone recurrences after a first recurrence has been documented by several investigators, a finding in line with the high recurrence rate in our cohort.[18,20,21] Recurrent stones are typically brown, soft, and tend to fragment easily. Biliary infection and stasis are considered dominant etiological factors. A plethora of risk factors have been reported such as CBD diameter >15 mm, biliary strictures, papillary stenosis, and periampullary diverticula.[18] We propose that DBR-F should be sincerely considered when, after previous ES/ductal clearance, patients present with recurrent "biliary stones," particularly when this is a repeating problem. In our cohort, the food-derived material was initially misclassified as typical biliary stones or sludge. Given these findings, the term "food-containing material" may be more appropriate in such cases.

We recommend that a definitive diagnosis of DBR-F should be based on microscopic examination of material removed from the biliary tree when patients present with obstructive symptoms. Although radiologic, scintigraphic and other diagnostic modalities may demonstrate DBR, this phenomenon is common after ES and rarely results in food-based obstruction, highlighting the need for objective histologic confirmation. False-negative results may occur due to sampling limitations, low fiber intake, or spontaneous passage of obstructing material before the ERCP. A number of patients in our series had obvious symptoms of biliary obstruction and repeatedly negative ERCPs, but were later found to have massive biliary food impaction. This also explains the observation of post-ES cholangitis without radiologic evidence of biliary obstruction ("cholangitis sine materia").[1,19] Hence, it seems that in patients with DBR, material including food constituents may intermittently move in and out of the biliary tree, and that the decisive factor determining the development and severity of obstructive symptoms is their persistent intraductal presence. This material may also function as a nidus for further sludge formation with deposition of bilirubin, lipid material, and bacterial growth and give rise to progressive obstruction and cholangitis. Currently, we have no clue as to why ductal clearance of food might be impaired in only a subset of DBR cases, and further studies would be useful to gain insight into potential underlying biliary motility disorders.

Management of patients with symptomatic DBR-F is challenging. Our data show that in selected cases, surgical treatment is effective, although surgery might be associated with complications. In two cases, inadvertent failure to sufficiently ligate the CBD occurred. Luckily, this complication is preventable. Our data

suggest that transection of the CBD by stapling should be preferred to suture ligation. The chronic dilated and thickened CBD might contribute to insufficient ligation by suture. Surgery may be contraindicated in patients with multiple comorbidities or a hostile abdomen, and therefore alternative treatment modalities are needed. In theory, a liquid diet could be effective, but this is not a feasible permanent solution. We found that the insertion of plastic biliary stents to decrease the size of the biliary orifice was cumbersome and ineffective, but stent therapy was not investigated systematically or according to a rigid protocol. Recently preliminary attempts were reported to restore sphincter of Oddi function and prevent DBR by endoscopic papilloplasty using clips.[22,23] As discussed, theoretically, this approach could prove counter-productive as impaired biliary outflow seems of fundamental pathophysiologic importance. On the other hand, our data also clearly indicate that attempts to facilitate biliary outflow by enlarging the biliary orifice are futile. An interesting possibility could be to employ anti-reflux self-expandable metal stents, but the tendency of stents to dislocate in the absence of biliary stenosis constitutes an important limitation.[24]

Our study has the disadvantage of a retrospective analysis. Assessing the severity and frequency of DBR-F related symptoms in more detail was therefore not achievable. We also deliberately studied a homogenous but therefore selected group of patients. It is important to realize that our data concern only part of the DBR-F spectrum, namely patients with severe recurrent problems who were considered suitable for surgery. This study did not include a comparator group. We cannot determine which clinical or anatomic factors could specifically be associated with DBR-F. To better identify possible risk factors, natural history, and optimal treatment strategies, it would be important to compare cases with and without DBR-F, preferably in large cohorts of patients with post-ES recurrent biliary stones. Strong aspects of our analysis include the novel perspective on recurrent post-ES stones, the strict selection criteria including pathology proven, symptomatic DBR-F and the substantial pre- and post-surgery follow-up time.

In summary, DBR-F is a poorly recognized long-term complication of ES that can lead to significant and recurrent biliary obstruction. Our single-center series suggest that this complication must be more prevalent than is reflected in the current anecdotal literature. The diagnostic delay in our series was extremely long, even up to 12 years, highlighting the need to consider DBR-F in all patients presenting with recurrent biliary obstruction after previous ductal stone clearance. Hepaticojejunostomy combined with partial resection or ligation of the CBD proved effective, but should only be considered in cases with severe symptoms of recurrent obstruction and an acceptable operative risk. Currently, no effective alternative treatment modalities have been identified.

Abbreviations

ES	endoscopic sphincterotomy
DBR	duodenobiliary reflux
DBR-F	duodenobiliary reflux of food
CBD	common bile duct
ERCP	Endoscopic Retrograde Cholangio-Pancreatography
IQR	Interquartile Range

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Statements and Additional Information

Conflict of Interest The authors declare that they have no conflict of interest.

Contributors' Statement H.R.B.: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Writing—original draft, Writing—review & editing. I.N.L.: Formal analysis, Investigation, Project administration, Software, Writing—original draft, Writing—review & editing. M.L.C.: Data curation, Investigation, Methodology, Validation, Writing—original draft, Writing—review & editing. W.J.L.: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Supervision, Validation, Writing—original draft, Writing—review & editing.

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