



Case Reports

Biliary Dyskinesia with Reduced Gallbladder Ejection Fraction: A Diagnostic and Therapeutic Shift in Management

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Journal of Brown Hospital Medicine

Vol. 4, Issue 1, 2025

Article Information

Keywords: Functional gastrointestinal disorders, Biliary dyskinesia, Sphincter of Oddi, Milwaukee classification, Rome IV

<https://doi.org/10.56305/001c.127836>

Submitted: November 21, 2024 EST

Accepted: December 23, 2024 EST

Published: January 01, 2025 EST

Abstract

Reduced gallbladder ejection fraction (GBEF) with normal laboratory tests and no gallstones on ultrasound can be attributed to conditions such as biliary dyskinesia, chronic acalculous cholecystitis, cystic duct syndrome, sphincter of Oddi dysfunction, and subclinical biliary stricture. We present a case of a patient with chronic right upper quadrant pain, diagnosed with reduced GBEF, normal labs, and no gallstones. The patient's symptoms resolved after endoscopic retrograde cholangiopancreatography and sphincterotomy, revealing a mild, non-obstructive stricture in the middle third of the common bile duct. This case underscores the importance of considering ERCP and sphincterotomy as diagnostic and therapeutic options before opting for cholecystectomy in patients with reduced GBEF and normal lab results, potentially avoiding unnecessary surgical interventions.

BACKGROUND

Biliary dyskinesia (BD) is a functional disorder of gallbladder dysmotility characterized by biliary pain in the absence of gallstones on ultrasound, and a reduced gallbladder ejection fraction (GBEF), typically <35%, as seen on hepatobiliary scintigraphy (HIDA scan) with cholecystokinin (CCK).¹ Laparoscopic cholecystectomy is widely considered the standard treatment for BD due to greater rates of symptomatic relief as compared to non-operative management.² Furthermore, there is limited evidence in the literature regarding the efficacy of non-operative management, due in part to physician and patient bias favoring laparoscopic cholecystectomy as the established standard of treatment.^{2,3} We present a case of biliary pain in the absence of radiographic evidence of cholelithiasis, with a reduced GBEF that was managed with endoscopic retrograde cholangiopancreatography (ERCP) and sphincterotomy as opposed to the traditional laparoscopic cholecystectomy.

CASE PRESENTATION

A 63-year-old woman with a history of gastroesophageal reflux disease (GERD) was referred for post-prandial right upper quadrant (RUQ) abdominal pain associated with nausea and vomiting. She had experienced generalized abdominal pain for a year, which was recently localized to the RUQ, presenting as sharp, waxing and wan-

ing pain, that occasionally radiated to the back. Proton pump inhibitors (PPI's) had provided no relief. Extensive workup, including CT Abdomen, capsule endoscopy, and esophagogastroduodenoscopy (EGD), was unremarkable. She denied weight loss, fevers, and changes in bowel habits, and had no family history of gastrointestinal neoplasms or liver disease. She also denied history of alcohol use or smoking. Physical examination revealed a soft, non-tender, non-distended abdomen without masses or hepatosplenomegaly.

All laboratory tests, including a comprehensive metabolic panel, liver function tests, complete blood count, lipase, and INR, were within normal limits. Given her persistent biliary symptoms without any physical or laboratory abnormalities, HIDA scan with CCK was performed, showing partial emptying of the gallbladder and a low GBEF of 17%, with reflux of activity back into the gallbladder suggestive of BD, SOD, or subclinical biliary stricture at this point ([Figures 1A-1C](#)). The patient underwent ERCP with biliary cannulation and sphincterotomy, revealing a mild stricture in the middle third of the common bile duct. At a two-month follow-up, her abdominal pain had resolved. A repeat HIDA scan with CCK showed normal gallbladder contraction and a GBEF of 76% ([Figures 2A-2C](#)). At a six-month follow-up, the patient reported no recurrence of symptoms.

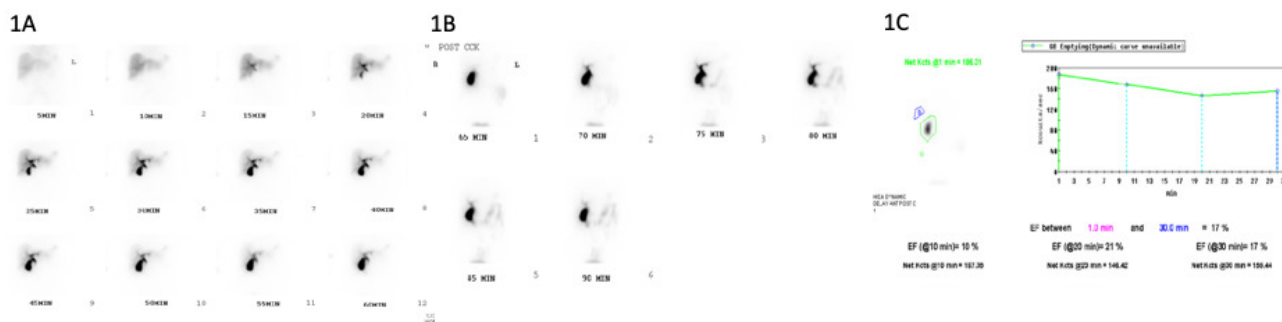


Fig. 1A, 1B and 1C. Pre-sphincterotomy CCK HIDA. Pre-CCK images demonstrated a distended gallbladder without biliary to bowel excretion (1A). After CCK administration, there is a prominent common bile duct but poor emptying of the gallbladder (1B). Quantitative analysis shows markedly decreased GBEF with biphasic emptying pattern (1C). Findings are suspicious for SOD.

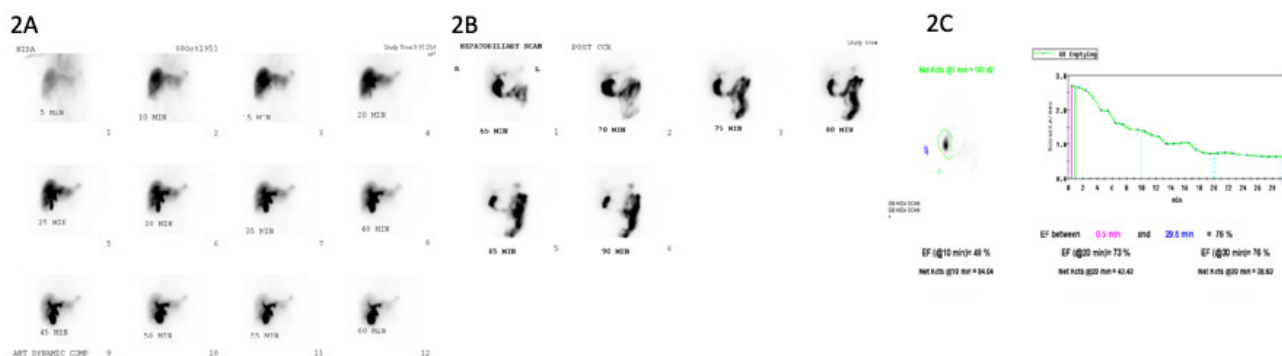


Fig. 2A, 2B and 2C. Post-sphincterotomy CCK HIDA. Although there was delayed radiotracer excretion prior to CCK (2A), emptying of the gallbladder was significantly improved with a GBEF of 76% (2B). There was a resolution of the previously seen biphasic emptying pattern (2C).

DISCUSSION

Reduced GBEF with normal lab values and no gallstones on ultrasound can result from conditions like BD, chronic acalculous cholecystitis, cystic duct syndrome, sphincter of Oddi dysfunction (SOD), and subclinical biliary stricture.⁴⁻⁶ BD is a group of functional disorders of the biliary tree, comprised of two disorders, gallbladder dysfunction (GBD) and SOD according to the Rome III classification.^{4,5} The diagnostic criteria for BD have been controversial, but most experts agree that it is diagnosed based on the presence of biliary symptoms without gallstones and evidence of reduced GBEF.^{4,7} HIDA scans with CCK are often used to quantify bile excretion from the gallbladder, measured as the GBEF.^{4,8} Reduced GBEF, however, is also observed in conditions like hyperglycemia and other gastrointestinal disorders, raising questions about its reliability as a definitive diagnostic feature.⁹ Additionally, impaired GBEF, defined as a GBEF of <35%, can be found in 20% of healthy controls.⁹ Therefore, BD is primarily a clinical diagnosis associated with a radiologic finding rather than an absolute indication for gallbladder removal. Despite this, the number of elective biliary surgeries increased significantly with the introduction of laparoscopic cholecystectomy. Prior to 2000, BD accounted for approximately 4-15% of gallblad-

der surgeries, but in the last decade, 26-38% of cholecystectomies were performed for BD.⁹ Studies have shown mixed outcomes with inconsistent relief of symptoms postoperatively.^{4,8,10} Although the diagnostic and therapeutic approach to BD remains unclear, cholecystectomy is still the mainstay of treatment.⁷

The Milwaukee classification has been generally accepted as the classification system for SOD, and the classification helps to identify which patients will benefit from ERCP and sphincter intervention.^{11,12} The modified Milwaukee classification divides SOD into three types: type I with both biochemical abnormalities and ductal dilatation, type II with either biochemical abnormalities or ductal dilatation, and type III with only symptoms and no objective findings.^{12,13} When SOD is suspected in patients with BD and a reduced GBEF indicating bile flow obstruction, ERCP with sphincterotomy should be considered to relieve the obstruction instead of cholecystectomy. Our patient presented with symptoms suggestive of a broad differential diagnosis, including subclinical biliary stricture, SOD, and BD. Despite extensive workup and conservative management, her symptoms persisted without a definitive diagnosis or relief. A HIDA scan with CCK was performed, revealing a biphasic emptying pattern of the gallbladder and a reduced GBEF (Figure 1C).

A biphasic emptying pattern in the gallbladder refers to a situation where the gallbladder exhibits two distinct phases of contraction and bile release. Typically, this pattern may indicate underlying abnormalities in the gallbladder's motility or the biliary system. The two phases can include: an initial rapid emptying phase, which might involve a prompt release of bile into the biliary tree following stimulation, such as after the administration of a CCK analog during a HIDA scan, and a secondary prolonged emptying or stasis phase, which may show either a delayed, prolonged emptying or a period of stasis where the gallbladder fails to completely empty. This can suggest issues like increased resistance in the biliary ducts, functional biliary disorders like BD, or the presence of a partial obstruction, such as a subclinical stricture or SOD.

In this case, the biphasic emptying pattern suggested an obstruction or increased flow resistance, possibly due to subclinical stricture, SOD, or other underlying conditions. Although the exact etiology remained unclear, these findings warranted further investigation. The patient underwent ERCP with sphincterotomy, which resulted in the resolution of her symptoms. As seen in [Figure 2C](#), she had complete recovery of GBEF after the sphincterotomy and resolution of the biphasic emptying pattern.

In summary, we present a novel case of a patient with persistent biliary pain, normal laboratory results, and reduced GBEF with a biphasic emptying pattern observed on the HIDA scan with CCK. This pattern suggested the presence of an obstruction or increased flow resistance, potentially due to subclinical stricture, SOD, or BD. The patient's symptoms completely resolved following ERCP and sphincterotomy. The purpose of our case report is to highlight an alternative diagnostic and therapeutic approach for patients presenting with similar symptoms and findings. Traditionally, such cases often lead to cholecystectomy, despite the lack of gallstones. Our findings suggest that ERCP and sphincterotomy can not only provide significant symptomatic relief, but also improve

objective measures such as GBEF, potentially avoiding unnecessary surgical interventions. This approach represents a significant shift in managing patients with reduced GBEF and normal lab results. By emphasizing the importance of considering ERCP and sphincterotomy prior to opting for cholecystectomy, our study introduces a less invasive, yet highly effective treatment option. Moreover, collaboration with nuclear radiologists to analyze HIDA scan features can enhance diagnostic accuracy and guide appropriate treatment strategies, ultimately improving patient outcomes.

Author Contributions

All authors have reviewed the final manuscript prior to submission. All the authors have contributed significantly to the manuscript, per the International Committee of Medical Journal Editors criteria of authorship.

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Disclosures/Conflicts of Interest

The authors declare they have no conflicts of interest

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