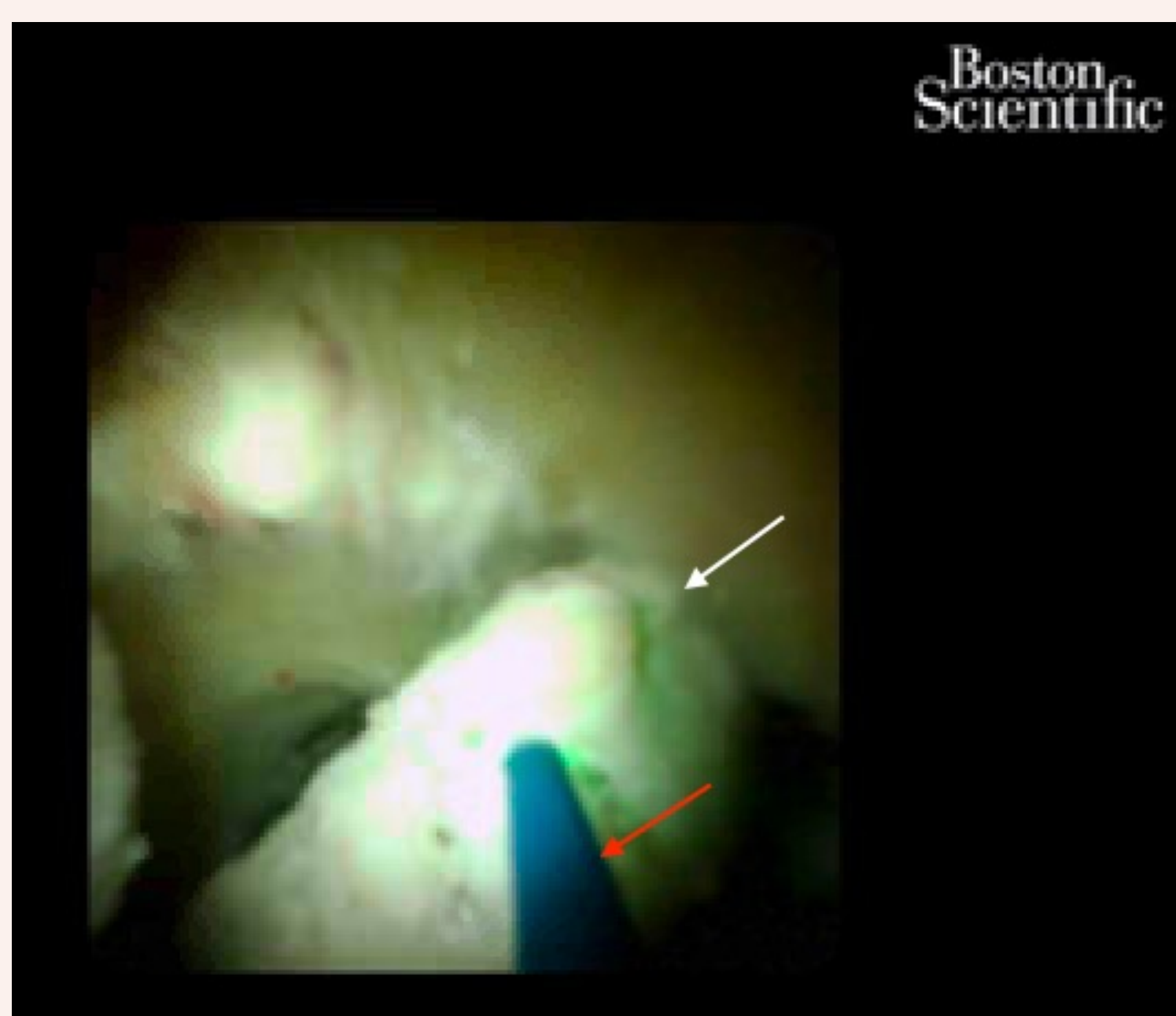


## Abstract

Per-oral pancreatoscopy-guided laser lithotripsy (POP-LL) is safe and effective in the fragmentation of difficult pancreatic duct (PD) stones, especially in the setting of multiple PD stones and/or previously failed endoscopic retrograde cholangiopancreatography (ERCP) with balloon extraction. We present a case of PD stones with multiple unsuccessful ERCPs that was later successfully managed by POP-LL in one session. In addition, we review and compare the possible techniques available for PD stone fragmentation.

## Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) with sphincterotomy and balloon/basket extraction is the first line management for symptomatic pancreatic duct (PD) stones. The risk of stone extraction failure via ERCP increases with PD stones that are >10mm, impacted, multiple stones or in a complicated location [1]. With difficult PD stones, fragmentation prior to extraction may be required. Stone fragmentation can be accomplished through extracorporeal shock wave lithotripsy (ESWL), per-oral pancreatoscopy (POP) laser lithotripsy (LL) and POP- electrohydraulic lithotripsy (EHL). We report a case of difficult PD stones successfully managed by POP-LL holmium laser.



**Figure 1.** Laser lithotripsy with holmium laser being applied through the catheter (red arrow) to the PD stone (white arrow).

## Case Presentation

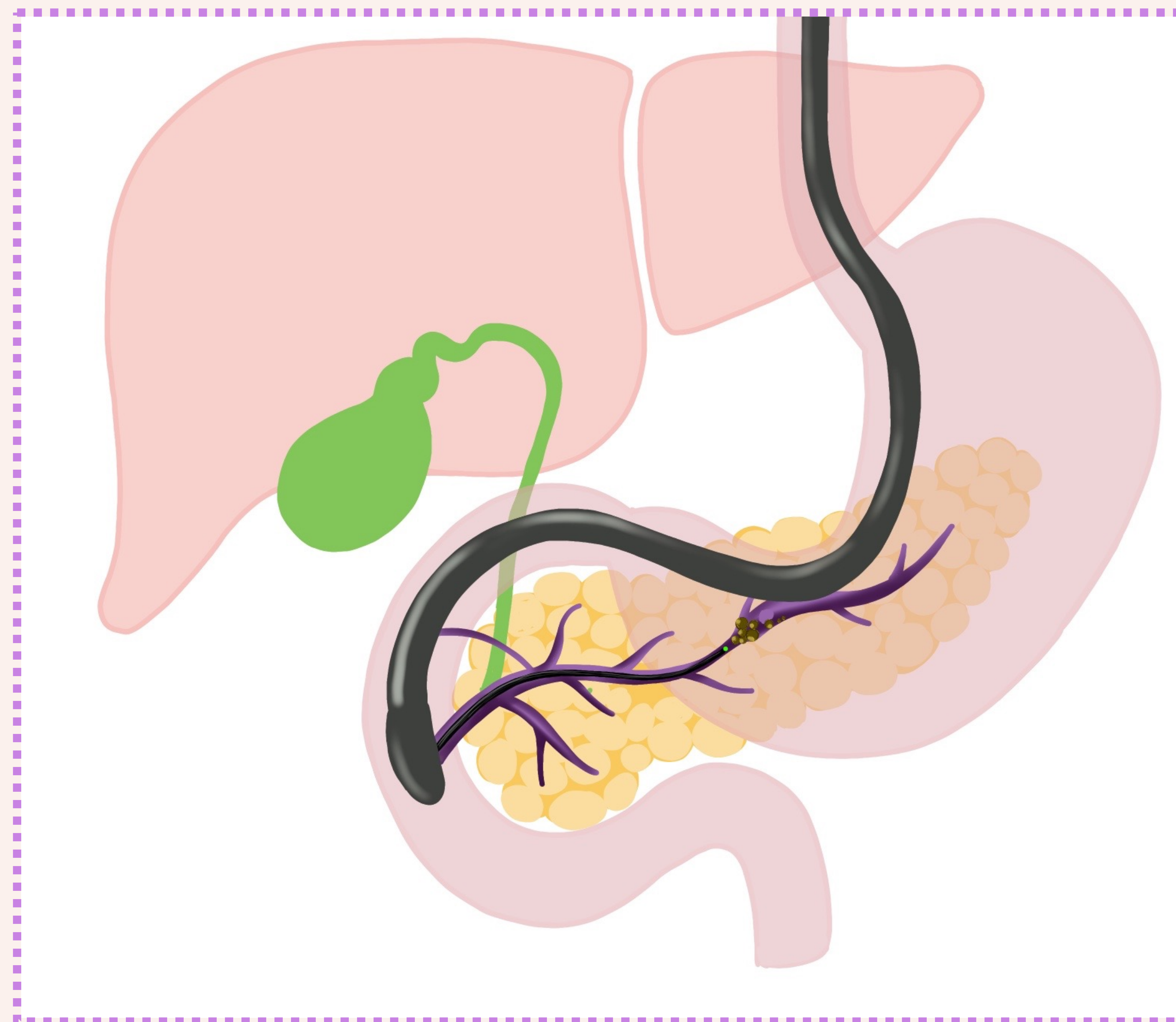
A 48-year-old man with advanced primary sclerosing cholangitis (PSC) with percutaneous biliary drainage and chronic pancreatitis (CP) presented with jaundice, right upper quadrant (RUQ) and midepigastic (MEG) abdominal pain and pruritus. Laboratory findings were significant for elevated aspartate transaminase (AST) 113 U/L, alanine transaminase (ALT) 145 U/L, alkaline phosphatase (AP) 1,222 U/L and a total bilirubin of 11.6 mg/dL. Initial magnetic resonance imaging (MRI) revealed atrophy of the pancreatic body and tail with dilation of the main pancreatic duct with side branch ectasia and intraductal calculi. Endoscopic ultrasound (EUS) revealed diffuse pancreatic parenchymal calcifications but no intraductal shadowing stones were visualized. His abdominal pain subsided, and jaundice and pruritus were managed via percutaneous transhepatic biliary drainage exchange.

5 months later, the patient returned with complaints of colicky, intermittent RUQ and MEG abdominal pain and jaundice. The percutaneous biliary drain had been successfully exchanged at 3-month intervals and liver enzymes had remained unchanged. Due to recurrent symptoms, he underwent repeat EUS and ERCP which revealed the ventral pancreatic duct in the head of the pancreas filled with numerous stones. The ventral PD was swept with a 9 mm balloon and 1 stone was removed with at least 2 additional PD stones that could not be removed; a plastic stent was placed in the PD and the patient was discharge home with close follow-up.

A planned repeat ERCP was performed 2 weeks later with stent removal and balloon extraction of a few small stones and debris from the PD. The ventral duct was then explored under pancreatoscopy using Spyglass, revealing multiple stones in the head and neck of the pancreas. Due to the number and difficulty in removing these stones, lithotripsy was then accomplished using a Holmium laser. No immediate nor distant post-ERCP complications were encountered. A 1-week follow up revealed resolution of abdominal pain.

## Discussion

The patient in our case had recurrent abdominal pain caused by pancreatic duct stones resulting in pancreatic outflow obstruction. Both attempts using ERCP with balloon sweeping were unsuccessful in complete stone extraction leading to the use of POP Spyglass with laser lithotripsy for the management of the multiple remaining stones. Direct visualization of the PD with technology like Spyglass, has shown to reduce the risk of duct injury, allows the visualization of stones that may have been missed previously, and permits confirmation of clearance of the PD. As seen in this case, POP allowed for visualization of PD stones that could not be accessed through ERCP management and used in conjunction with laser lithotripsy, the PD stones were successfully and safely fragmented. POP-LL has been shown to successfully fragment difficult to manage PD stones, as evidenced in this case and other studies, and should be considered as a useful alternative in the management of numerous PD stones and/or multiple unsuccessful ERCP attempts.



## Key Points

- POP allows for visualization of PD stones that cannot be accessed through ERCP management.
- Laser lithotripsy has shown to successfully and safely fragment PD stones.
- POP-LL should be considered as a useful alternative in the management of numerous PD stones and/or in the setting of multiple unsuccessful ERCP attempts.

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## References

1. National Pancreas Foundation -. 2022. Chronic Pancreatitis - National Pancreas Foundation. [online]
2. Saghir, S., Mashiana, H., Mohan, B., Dhindsa, B., Dhaliwal, A., Chandan, S., Bhogal, N., Bhat, I., Singh, S. and Adler, D., 2020. Efficacy of pancreatoscopy for pancreatic duct stones: A systematic review and meta-analysis.
3. Sharzehi, K., 2019. Management of Pancreatic Duct Stones. Current Gastroenterology Reports, 21(11).
4. Alatawi, A., Leblanc, S., Vienne, A., Pratico, C., Gaudric, M., Duchmann, J., Boyer, J., Mangialavori, L., Chaussade, S. and Prat, F., 2013. Pancreatoscopy-guided intracorporeal laser lithotripsy for difficult pancreatic duct stones: a case series with prospective follow-up (with video). Gastrointestinal Endoscopy, 78(1), pp.179-183.
5. Gardner TB, Adler DG, Forsmark CE, Sauer BG, Taylor JR, Whitcomb DC. ACG Clinical Guideline: Chronic Pancreatitis. Am J Gastroenterol. 2020;115:322-339.
6. Yang, T., Ma, Z., Xu, B., Sun, W., Meng, H., Liu, D., Zhou, B. and Song, Z., 2019. Clinical role of frequency-doubled double-pulse neodymium YAG laser lithotripsy for removal of difficult biliary stones in laparoscopic common bile duct exploration.
7. Dumonceau JM, Delhaye M, Tringali A, Arvanitakis M, Sanchez-Yague A, Vaysse T, Aithal GP, Anderloni A, Bruno M, Cantú P, Devière J, Domínguez-Muñoz JE, Lekkerkerker S, Poley JW, Ramchandani M, Reddy N, van Hooft JE. Endoscopic treatment of chronic pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline - Updated August 2018. Endoscopy. 2019;51:179-193.
8. Maydeo, A., Kwek, B., Bhandari, S., Bapat, M. and Dhir, V., 2011. Single-operator cholangioscopy-guided laser lithotripsy in patients with difficult biliary and pancreatic ductal stones (with videos). Gastrointestinal Endoscopy, 74(6), pp.1308-1314.
9. McCarty, T., Sobani, Z. and Rustagi, T., 2020. Per-oral pancreatoscopy with intraductal lithotripsy for difficult pancreatic duct stones: a systematic review and meta-analysis. Endoscopy International Open, 08(10), pp.E1460-E1470.