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## Transient venous air embolism after ERCP: worrisome or not?

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retropneumoperitoneum

### Abstract

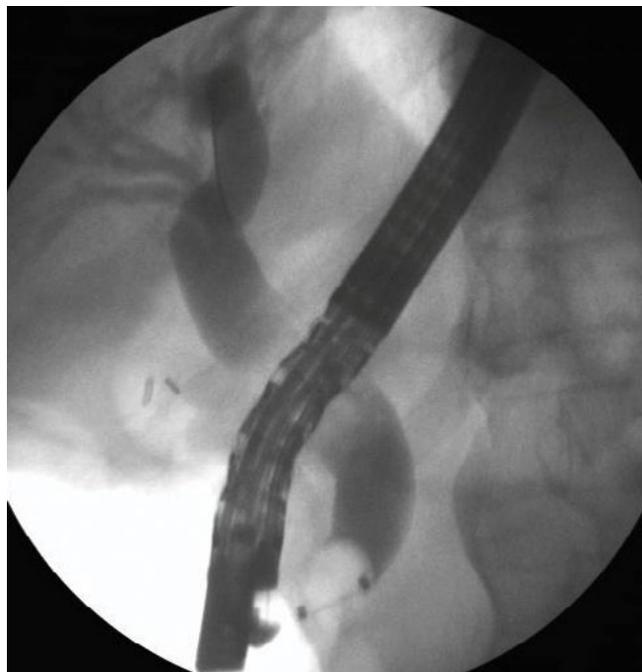
The paper describes the occurrence of a rare complication – portal and systemic venous air embolism – after endoscopic retrograde cholangiopancreatography, related to the endoscopic procedure. It can be associated with the more frequently encountered post-endoscopic retrograde cholangiopancreatography complications pancreatitis or cholangitis. However, it can also be noted with perforation. The presented case suggests that in the clinical context an early abdominal ultrasound examination confirming hepatic portal venous gas and/or systemic venous air embolism could be useful for the diagnosis of post-endoscopic retrograde cholangiopancreatography retroduodenal perforation, and thus highlights the need for a high index of suspicion should this occurrence be noted post-procedurally, in order to ensure the best care of patients.

A 77-year-old man was admitted for endoscopic treatment of common bile duct stones with no signs of cholangitis, after laparoscopic cholecystectomy was performed uneventfully in another hospital. At endoscopic retrograde cholangiopancreatography (ERCP) performed with CO<sub>2</sub> insufflation under deep sedation, the bile duct was easily cannulated using the standard sphincterotome-guidewire technique. The cholangiogram revealed two 8-mm stones (Fig. 1), and subsequently a 10-mm sphincterotomy was performed with minimal bleeding, followed by stone removal with an 11.5-mm extraction balloon. Control passage showed a clear bile duct with no apparent signs of intra-procedural adverse events (Fig. 2).

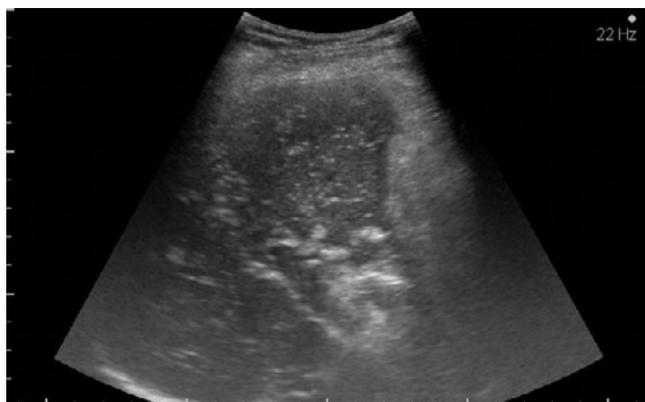
A few hours after the procedure the patient developed progressive upper abdominal pain, vomiting, and became hypotensive and tachycardic with poor response to i.v. fluids. The 6-hour post-procedural laboratory studies showed an increased lipase level (193 U/L, normal <60) and a minimal inflammatory response (leukocytosis 14,470/μL, C-reactive protein 14.8 mg/L vs. 10.7 pre-procedurally), raising the initial diagnostic suspicion of post-procedural acute pancreatitis. The abdominal ultrasound performed 12 hours after the procedure for persistent symptoms revealed small echogenic particles floating within the portal vein and the inferior vena cava, which were also noted in the liver parenchyma (Video 1 – available at [www.jul-trason.pl](http://www.jul-trason.pl), Fig. 3).



**Fig. 1.** Initial cholangiogram revealing two 8 mm stones in the common bile duct



**Fig. 2.** Control cholangiogram at the end of the ERCP procedure confirming stone clearance. No obvious radiologic signs of perforation were seen by the examiner



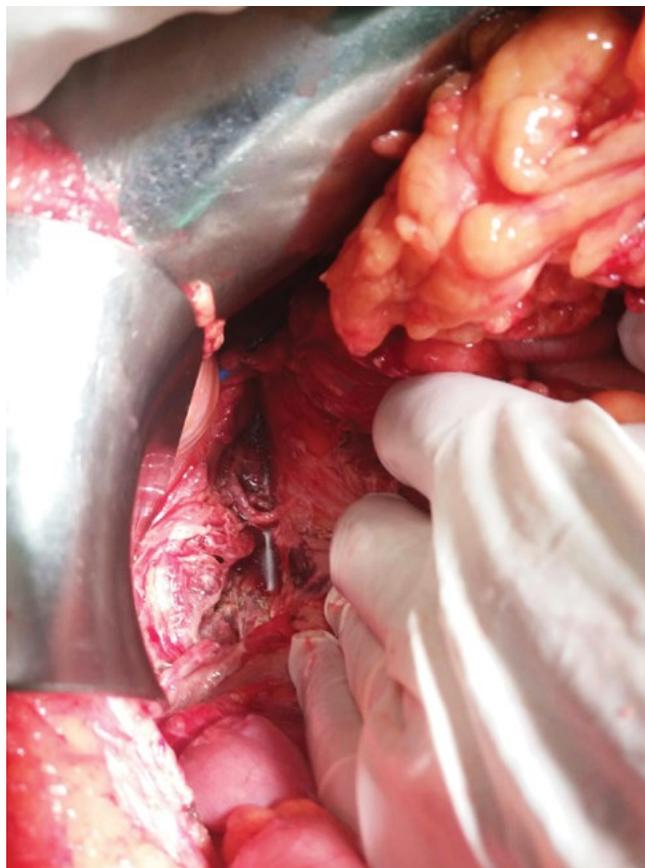
**Fig. 3.** Echogenic particles flowing within the portal vein and inferior vena cava, and multiple non-shadowing echogenic foci within the liver parenchyma consistent with the presence of intrahepatic portal venous gas

The patient was transferred to the intensive care unit for stabilization. A second ultrasound examination performed 8 hours later revealed a marked reduction in the number of microbubbles (Video 2 – available at [www.jultrason.pl](http://www.jultrason.pl)), while computed tomography performed 4 hours afterwards showed massive retroperitoneum (Fig. 4), though the intrahepatic portal venous gas was no longer visible. Surgical intervention was performed on an emergency basis with debridement and multiple drainage of the retroperitoneal cavity (Fig. 5). The patient's condition improved slowly, and he was discharged 4 weeks later.

The described anomalies are consistent with the presence of venous air embolism (both portal and systemic). Typical ultrasonographic features are represented by small highly



**Fig. 4.** Contrast-enhanced CT scan of the abdomen performed 4 hours after the second abdominal ultrasound examination showing massive retroperitoneum (arrows) and a post-cholecystectomy drainage tube. Gas is no longer visible in the liver or portal venous system



**Fig. 5.** Image of the retroperitoneal cavity taken during the surgical intervention

echogenic particles flowing within the vessel lumen, as shown in the videos. In the case of hepatic portal venous embolism, ill-defined, highly echogenic, non-shadowing foci and spots are also present within the hepatic parenchyma, mostly in the non-dependent part, and represent features that are important in the differentiation from pneumobilia. When systemic, it may impact cardiac function and determine persistent hypotension, as in the presented case.

Venous embolism is a rare complication of ERCP, with only few cases reported so far, usually with good outcomes. It can be associated with the more frequently encountered post-ERCP complications pancreatitis<sup>(1)</sup> or cholangitis<sup>(2)</sup>. However, it can also be noted with perforation, when surgical exploration is usually necessary<sup>(3)</sup>. Its sometimes-transient nature<sup>(4,5)</sup> strengthens the rationale for early transabdominal ultrasound, since its presence could be able to herald major post-procedural complications.

#### Conflicts of interest

*Authors do not report any financial or personal connections with other persons or organizations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication.*

#### References

1. Wu JM, Wang MY: Hepatic portal venous gas in necrotizing pancreatitis. *Dig Surg* 2009; 26: 119–120.
2. Lee CS, Kuo YC, Peng SM, Lin DY, Sheen IS, Lin SM *et al.*: Sonographic detection of hepatic portal venous gas associated with suppurative cholangitis. *J Clin Ultrasound* 1993; 21: 331–334.
3. ASGE Standards of Practice Committee, Chandrasekhara V, Khashab MA, Muthusamy VR, Acosta RD, Agrawal D *et al.*: Adverse events associated with ERCP. *Gastrointest Endosc* 2017; 85: 32–47.
4. McNicholas DP, Kelly ME, Das JP, Bowden D, Murphy JM, Malone C: Disappearing portal venous gas in acute pancreatitis and small bowel ischemia. *Radiol Case Rep* 2017; 12: 269–272.
5. Maher MM, Tonra BM, Malone DE, Gibney RG: Portal venous gas: detection by gray-scale and Doppler sonography in the absence of correlative findings on computed tomography. *Abdom Imaging* 2001; 26: 390–394.