

Carbon Dioxide Cholangiography in Diagnosis of Gallbladder Perforation: Deciphering Black, and White

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ABSTRACT

Gallbladder perforation is a rare and serious complication of acute cholecystitis that requires prompt diagnosis and treatment. Current imaging techniques, such as the use of iodinated contrast agents, have limitations in certain patient populations. Carbon dioxide (CO₂) contrast media has emerged as a potential alternative due to its non-nephrotoxic and non-allergenic properties. However, there is limited research on the use of CO₂ cholangiography for assessing gallbladder perforation. In this case presentation, we describe the use of CO₂ cholangiography in a 72-year-old woman with suspected acute cholecystitis and gallbladder perforation. The patient underwent percutaneous cholecystostomy because of her unsuitable general condition for surgery. CO₂ cholangiography revealed loss of biliary tract integrity and obstruction of the cystic canal. CO₂ cholangiography offers the advantages of decreased cholangitis risk and improved patient comfort. Although this case demonstrates the feasibility of CO₂ cholangiography for gallbladder perforation assessment, further studies are needed to validate the safety and efficacy of this technique. Overall, CO₂ contrast media may provide high-quality imaging with a lower risk of complications, highlighting the potential benefits of its use in percutaneous interventions for biliary leakage evaluation.

Keywords: Carbon dioxide (CO₂), cholangiography, gallbladder perforation

INTRODUCTION

Gallbladder perforation is a relatively rare complication that occurs most frequently as a result of acute cholecystitis, with a relatively high mortality [1]. In patients with suspected acute cholecystitis, imaging is important for two main reasons; first, to confirm the diagnosis of acute cholecystitis, the latter is to detect complications that require urgent surgery such as gangrenous, emphysematous cholecystitis, and perforation [2]. Iodinated contrast agents are accepted as the gold standard for percutaneous and angiographic imaging worldwide [3]. A better alternative is carbon dioxide (CO₂) contrast, which is used for vascular interventions in patients with renal impairment or iodine hypersensitivity due to non-nephrotoxic and non-allergenic characteristics [4]. There are few studies in the literature on using CO₂ contrast media in biliary imaging. There is no study published about gallbladder perforation assessment using CO₂ cholangiogram.

CASE PRESENTATION

A 72 years old woman presented to our hospital emergency department with acute onset fever, severe abdominal pain, nausea, and vomiting. The patient was referred to the radiology department for imaging purposes with prediagnosis of acute cholecystitis, according to the findings of the physical examination and laboratory findings. Ultrasonographic examination revealed that the gallbladder wall of the patient was markedly edematous and thickened, the sac was hydroptic, and the luminal sludge was full of gallbladder calculi were also monitored at neck level approximately 2 cm in diameter. It has also been suspected to be a sustained integrity of the gallbladder wall. Heterogeneous hypoechoic solid lesions were observed in the liver parenchyma with a multiplicity of which the greatest is about 6 cm in diameter and primarily interpreted in favor of metastasis. In subsequent examinations, cholangiocarcinoma was detected as the primary pathology.



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Percutaneous cholecystostomy was performed with sonographic guidance in our interventional radiology unit owing to the fact that the general condition of the patient is not suitable for surgery due to a history of dementia and heart failure. For this patient, CO₂ cholangiography was chosen as a control imaging technique because of the low risk of cholangitis [5]. CO₂ cholangiography showed that the integrity of the biliary tract was lost and the cystic canal was obstructed (Figure 1).

DISCUSSION

Perforation of the gallbladder, which was first reported in 1844 by Duncan, is a rare serious complication of cholecystitis [5]. Clinical manifestations of acute gallbladder perforation can be similar to those of acute cholecystitis, and this could account for the delay in the diagnosis [6].

Rates of gallbladder perforation have fallen because of widespread imaging methods and better treatment approaches. Nonetheless, accurate diagnosis is crucial to decrease rates of mortality and complications such as peritonitis [7]. For this purpose, CO₂ cholangiography can be used as a safe imaging technique because of the decreasing rate of cholangitis.

Initially, CO₂ was used for retroperitoneal insufflation [8]. More recently, it has been safely injected intraarterial digital subtraction angiography [9]. Recently, CO₂ retrograde cholangiography reduces the risk of cholangitis and therefore can be used for percutaneous imaging of gallbladder perforation [10]. CO₂ is being used as a contrast material for a long time in endoscopic retrograde cholangiopancreatography (ERCP) imaging of the biliary tree and is increasingly preferred due to its

safety, less painful, and discomfort complaints [11]. In addition, the utilization of CO₂ in cholangiography significantly reduced the incidence of cholangitis and the mean hospital stay time after ERCP [10]. Even though there was not enough experience in anterograde cholangiography with CO₂, perforation was clearly observed in this study. The accuracy of the method should have been investigated with a greater number of patients. The use of CO₂ during percutaneous interventions in the evaluation of biliary leakage can be superior to other methods to provide higher quality images with lower risk of cholangitis and allergic reaction and higher postoperative comfort of the patient. Further studies are needed to advance this method and elaborate the safety and validity of the technique.

Ethics

Informed Consent: Informed consent was obtained from the patient.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: İ.C., Concept: İ.C., Design: İ.C., Data Collection or Processing: İ.C., M.B.D., A.B.Y., Analysis or Interpretation: İ.C., Literature Search: İ.C., Writing: İ.C., A.M., M.B.D., A.B.Y.

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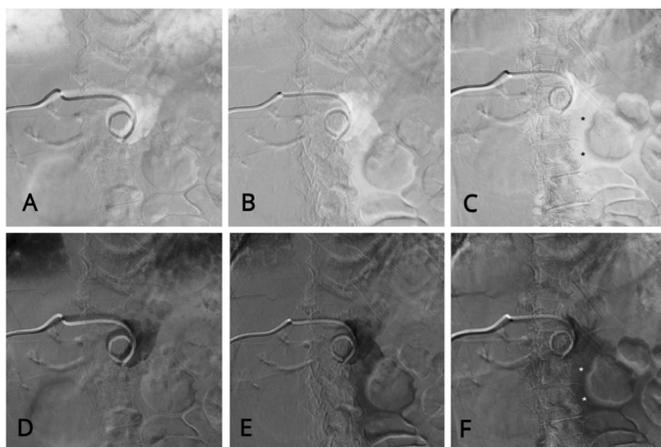


Figure 1. A-C images were obtained with injection of CO₂ contrast material. D-F are negative images of these images. As indicated by the stars (*) in the C and F images, the contrast material in the carbon dioxide cholangiography is more expanse

CO₂: Carbon dioxide

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