

Rapid formation of a radiolucent pancreatic stone: a case report (with video)

Journal of International Medical Research

48(9) 1–6

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DOI: 10.1177/0300060520951418

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Abstract

Background: Over 90% of pancreatic stones are radiopaque and can be treated with endoscopy or surgery. However, radiolucent stones are different than radiopaque stones in nature and formation, and therefore, treatment varies.

Case presentation: A 25-year-old woman was admitted because of recurrent acute pancreatitis. Imaging examinations confirmed the diagnosis of chronic pancreatitis (CP), and which revealed the existence of radiolucent stones. Endoscopic retrograde cholangiopancreatography (ERCP) was performed and abundant protein-like radiolucent stones were extracted. Three 10F, 7-cm plastic stents were placed. However, the stents were completely occluded by radiolucent stones 1 month later. A nasopancreatic tube was then inserted and flushed regularly, but protein-like stones formed continuously. After multidisciplinary consultation, the following conservative treatment strategy was applied: 1) no more endotherapy; 2) a diet with 40% to 50% of calories from fat was recommended; 3) no pancreatic enzyme replacement therapy; and 4) regular exercise. The above advice aimed to stimulate the secretion of pancreatic fluid to achieve auto-flushing of the pancreatic duct and prevent protein-like stones from depositing. No acute pancreatitis recurred during the 5-year follow-up.

Conclusions: This strategy was effective for auto-flushing the pancreatic duct in patients with radiolucent pancreatic stones after the main pancreatic duct stricture was resolved.

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Keywords

Pancreatic stone, radiolucent stone, chronic pancreatitis, endoscopic retrograde cholangiopancreatography, pancreatic enzyme, pancreatic duct stricture

Date received: 21 February 2020; accepted: 24 July 2020

Introduction

Pain is the over-riding symptom of chronic pancreatitis (CP), which occurs in over 90% of patients.¹ Pain in CP is highly associated with ductal hypertension that is caused by pancreatic stones or pancreatic duct stricture.² Therefore, endoscopic therapy, including stone clearance, stent placement, and nasopancreatic tube drainage, have been widely performed to relieve pain that is caused by CP. However, copious protein-like radiolucent stones that are rapidly and continuously produced would interfere with endoscopic therapies. Therefore, we proposed a conservative strategy to deal with this condition.

Case report

A 25-year-old woman was admitted to our hospital because of recurrent acute pancreatitis (AP) for 2 years. Her body mass index (BMI) was 16.5 kg/m². She had no family history of pancreatic disease and did not drink regularly or smoke. Her fasting blood glucose was 5.1 mmol/L and HbA1c was 5.3%. Symptoms such as steatorrhea or diarrhea did not occur. Upper abdominal computed tomography (CT) and magnetic resonance imaging (MRI) revealed a ductal stricture in the pancreatic head with upstream dilation, and a filling defect (the radiolucent stone) of the pancreatic duct was displayed in the MRI. Radiolucent stones were observed in the pancreatic duct, confirming the diagnosis of CP. Endoscopic retrograde cholangiopancreatography (ERCP) was performed (Figure 1). After sphincterotomy,

radiolucent stones were extracted and an 8.5F, 5-cm plastic stent was placed (Figure 2). The patient was discharged, but had AP 2 weeks later, and a second ERCP was performed. The plastic stent was found to be occluded by protein-like stones. Balloon sphincteroplasty was performed and the stricture was dilated to 1.0 cm. Three 10F, 7-cm plastic stents were placed to achieve better drainage (Figure 3). Two months after the second ERCP, she again had AP. CT showed three well-placed plastic stents and a greatly dilated pancreatic duct. A third ERCP was performed. Three plastic stents were found to be occluded by protein-like radiolucent stones (Figure 4) and the main pancreatic duct (MPD) was full of protein-like stones.



Figure 1. ERCP revealed a ductal stricture in the pancreatic head with upstream dilation. ERCP, endoscopic retrograde cholangiopancreatography.

The pancreatic duct was cleaned using a stone extraction balloon, and a nasopancreatic tube was inserted. The nasopancreatic tube was flushed four times a day with normal saline, but protein-like stones formed continuously and rapidly. After 2 weeks of flushing, the pancreatic juice still contained copious protein-like stones (Figure 5).

After multidisciplinary consultation, the following conservative treatment strategy was proposed: (1) no more endotherapy;

(2) no dietary restriction and a diet with 40% to 50% of calories from fat was recommended; (3) no pancreatic enzyme replacement therapy; and (4) regular exercise (more than three times a week, more than 30 minutes of moderate-intensity exercise each time, and 6000 to 10,000 steps of physical activity per day).

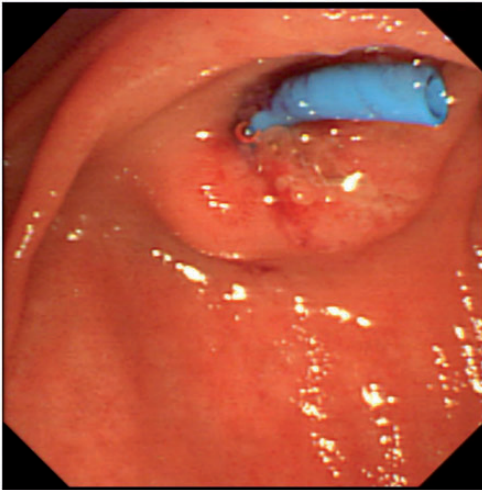


Figure 2. An 8.5F, 5-cm plastic stent was placed.

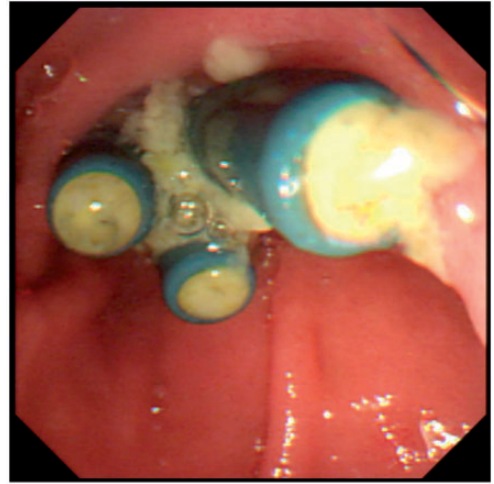


Figure 4. A third ERCP was performed 2 months later. The three plastic stents were occluded by protein-like stones. ERCP, endoscopic retrograde cholangiopancreatography.

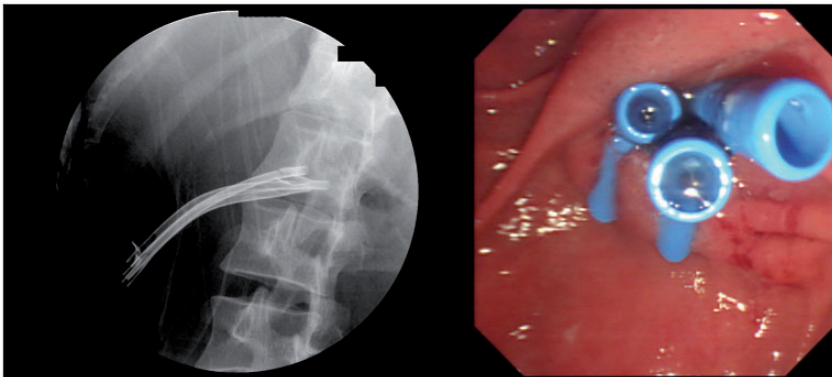


Figure 3. Three 10F, 7-cm plastic stents were placed.

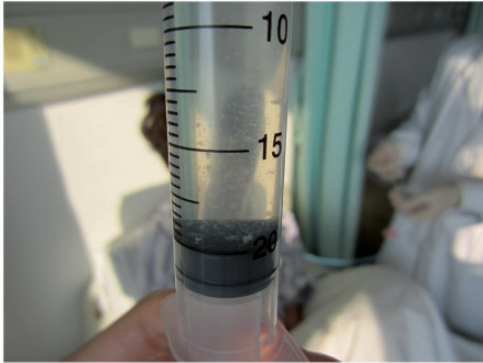


Figure 5. The pancreatic juice contained a large number of protein-like stones.

These suggestions aimed to increase the secretion of pancreatic fluid to achieve auto-flushing of the pancreatic duct so that the protein-like stones would not occlude the pancreatic duct. No AP or CP-related symptoms occurred during the 5-year follow-up. The patient's BMI increased to 19 kg/m², and she achieved complete pain relief after she implemented the above recommendations.

Discussion

Conservative methods for this patient were effective for avoiding protein-like stone deposition and reducing the frequency of AP attacks after the MPD stricture was resolved.

The natural history of CP is characterized by pancreatic stone formation.³ The repeated AP attacks in this patient were acute-on-chronic pancreatitis that resulted from ductal obstruction by pancreatic stones. Based on radiopacity, pancreatic stones can be divided into two forms, as follows: radiopaque and radiolucent stones. However, the mechanism of pancreatic stone formation is obscure. Some researchers hypothesized that stone formation was related to abnormal

secretion or metabolism of some proteins, including lithostathine,⁴ lactoferrin,⁵ trypsinogen,⁶ osteopontin,⁷ GP2 and others.⁸ These abnormalities could lead to the formation of insoluble peptides that may produce different types of protein aggregates. Some of these aggregates promote calcium carbonate apposition, which results in the formation of radiopaque stones. Conversely, aggregates that combine together without affinity for calcium lead to the formation of radiolucent stones.⁴

Generally, stones in the MPD, especially in the pancreatic head, should be removed to relieve ductal obstruction. For small pancreatic stones, sphincterotomy and stone extraction during ERCP are the usual strategy. Large pancreatic stones require fragmentation by extracorporeal shock wave lithotripsy before stone extraction or spontaneous stone clearance. However, because radiopaque stones are soft, ERCP alone is enough to extract stones of any size.

Because CP is an inflammatory disease that leads to progressive and irreversible destruction of pancreatic parenchyma and ductal structures, many patients develop an MPD stricture.⁹ Dominant strictures in the MPD are usually managed by endoscopic pancreatic duct stent placement.¹⁰ However, the pancreas in this patient produced protein-like stones continuously and rapidly, which obstructed the MPD and occluded pancreatic stents after the MPD stricture was resolved. The mechanism of this manifestation is unclear and conventional endoscopic therapy is invalid for preventing obstruction of the MPD by protein-like radiolucent stones. Consequently, a conservative treatment strategy was recommended for this patient. A diet with 40% to 50% of calories from fat was suggested to stimulate pancreatic juice secretion, which helped to flush the pancreatic duct and reduce radiolucent stone

formation. Pancreatic enzyme replacement therapy helps to digest and relieve the burden of pancreatic exocrine secretions. However, large amounts of pancreatic enzyme would inhibit pancreatic enzyme secretion in a negative feedback loop. Our strategy was to achieve auto-flushing of the pancreatic duct, and therefore, pancreatic enzyme replacement therapy was not recommended for this patient.

Because there are different characteristics of radiopaque and radiolucent stones, the treatment strategy should be adjusted. Our strategy was effective for patients with recurrent radiolucent stones without MPD stricture. We believe that investigation of the mechanisms that are involved in pancreatic stone formation may contribute to a better understanding of CP pathophysiology and a more reasonable treatment strategy for CP patients.

Authors' contributions

DW, YWB, and HX collected and analyzed the patient data and wrote the manuscript. TW wrote part of the manuscript, and LHH, ZSL, and ZLX contributed to the conception of the article. All authors read and approved the final manuscript.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Ethics approval and consent

The treatment was approved by the Ethics Committee of Shanghai Changhai Hospital. Written informed consent was obtained from the patient for publication of the case report and any accompanying images.

Funding

This study was supported by the National Natural Science Foundation of China (Grant No. 81770635 [LHH] and 81900590 [DW]),

Shanghai Rising-Star Program (Grant No. 17QA1405500 [LHH]), Special Foundation for Wisdom Medicine of Shanghai (Grant No. 2018ZHYL0229 [LHH]), Shanghai Science and Technology Innovation Action Plan (Grant No. 19DZ2201900 [LHH]), and Shanghai Sailing Program (Grant No. 19YF1446800 [DW]).

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Supplemental material

Supplemental material for this article is available online.

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