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# Severe Necrotizing Pancreatitis in a Pediatric Patient with COVID-19: A Case Report

*Lucinda Li, DO, *Mojdeh Mostafavi, MD, †John W. Miller, Jr. MD, ‡Barry Hirsch, MD, §Stephen O'Connor, MD, and ‡Wael N. Sayej, MD

**Abstract:** We describe a 15-year-old female diagnosed with necrotizing pancreatitis in the setting of coronavirus disease 2019 with severe complications including splenic vein and portal vein thromboses, pleural effusion requiring chest tube, acute hypoxic respiratory failure requiring noninvasive positive-pressure ventilation, and new-onset insulin-dependent diabetes mellitus, requiring over a month-long hospitalization. Following discharge, the patient experienced a prolonged loss of appetite, nausea, and extreme weight loss., During her prolonged hospitalization, she was diagnosed with necrotizing pancreatitis with walled-off collection which was ultimately treated with transgastric endoscopic ultrasound-guided drainage, multiple endoscopic necrosectomies, lumen-apposing metal stents, and double-pigtail plastic stent. Nine months after her initial presentation, patient's clinical symptoms improved, and her weight stabilized. This case highlights the importance of recognizing acute and necrotizing pancreatitis and its morbidities as complications associated with coronavirus disease 2019.

**Key Words:** necrotizing pancreatitis, COVID-19, endoscopic necrosectomies

## INTRODUCTION

The novel coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), most commonly presents with fever/chills, malaise, and dry cough. In some instances, adult patients with COVID-19 have presented with acute pancreatitis in the absence of respiratory symptoms (1). We report a case of severe acute necrotizing pancreatitis associated with COVID-19 in an adolescent female.

## CASE REPORT

A partially immunized, 15-year-old female with a history of congenitally absent right kidney and prior herpes simplex virus-1 infection, presented to an affiliated satellite hospital with severe abdominal pain. The patient reported episodic abdominal pain for several months with acute worsening in the 6 days before presentation along with nonbloody/nonbilious emesis, constipation, and poor oral intake.

In the emergency department, the patient was afebrile, tachycardic, and normotensive without signs of respiratory distress. Laboratory data were notable for hyperglycemia (glucose 697 mg/dL) with associated pseudo-hyponatremia (corrected Na 132 mEq/L), hyperkalemia (K 7.3 mmol/L), hypochloremia (Cl 82 mmol/L), high anion-gap metabolic acidosis ($HCO_3$ 19 mmol/L, AG 17), elevated blood urea nitrogen (36 mg/dL), creatinine (1.1 mg/dL), elevated alkaline phosphatase (277 IU/L), elevated aspartate aminotransferase (55 IU/L), elevated beta-hydroxybutryate (1.90 mmol/L), elevated C-reactive protein (63.3 mg/dL), and elevated lipase (689 IU/L). She was found to be positive on screening by nasal swab polymerase chain reaction for SARS-CoV-2. Due to concerns for diabetic ketoacidosis, the patient was transferred to the pediatric intensive care unit at our institution.

In the pediatric intensive care unit, initial abdominal ultrasound showed findings consistent with possible necrotizing pancreatitis, patent portal vein with slow flow, no flow within splenic vein concerning for thrombosis, and small-moderate volume ascites. Follow-up computerized tomography abdomen with contrast a few hours later confirmed extensive necrotizing pancreatitis with extensive splenic and portal vein thromboses indicative of rapid clot progression versus embolization (Fig. 1A, B). The patient was started on therapeutic heparin infusion and broad-spectrum antibiotics. Due to concern for a possible multisystem inflammatory syndrome of children, the patient received treatment with intravenous immunoglobulin (1 mg/kg).

The hospital course was complicated by persistent tachycardia and hypertension, acute respiratory failure requiring noninvasive positive-pressure ventilation, large exudative pleural effusion requiring chest tube placement, worsening anemia requiring transfusion of blood products, new-onset insulin-dependent diabetes mellitus, hypervolemia requiring diuresis, and proteinuria with concern for focal segmental glomerulosclerosis. Repeat abdominal ultrasound 3 weeks into the hospital course showed a new 11 cm well-circumscribed cystic structure indenting the anterior left hepatic lobe, concerning for loculated peripancreatic collection (Fig. 1C, D). The patient was discharged from the hospital after approximately 1 month with a plan to repeat pancreatic imaging as an outpatient.

Four months after discharge, the patient underwent repeat magnetic resonance imaging which showed a persistent, large, walled-off area of necrosis along with a second large fluid collection in the right abdomen (Fig. 1E, F). Given her persistent abdominal pain, nausea, loss of appetite, early satiety, and extreme weight loss (from >90th%ile to <10th%ile), the decision was made to pursue endoscopic ultrasound guided transgastric drainage. During that

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From the *Department of Internal Medicine and Pediatrics, University of Massachusetts Chan Medical School - Baystate, Springfield, MA; †Department of Internal Medicine, Gastroenterology, University of Massachusetts Chan Medical School - Baystate, Springfield, MA; ‡Department of Pediatric Gastroenterology & Nutrition, University of Massachusetts Chan Medical School - Baystate, Springfield, MA; and §Department of Radiology, University of Massachusetts Chan Medical School - Baystate, Springfield, MA.

Correspondence: Wael Sayej, MD, Division Chief, Pediatric Gastroenterology & Nutrition, University of Massachusetts Medical School – Baystate, 50 Wason Avenue, Springfield, MA 01107. E-mail: Wael.Sayej@baystatehealth.orgz

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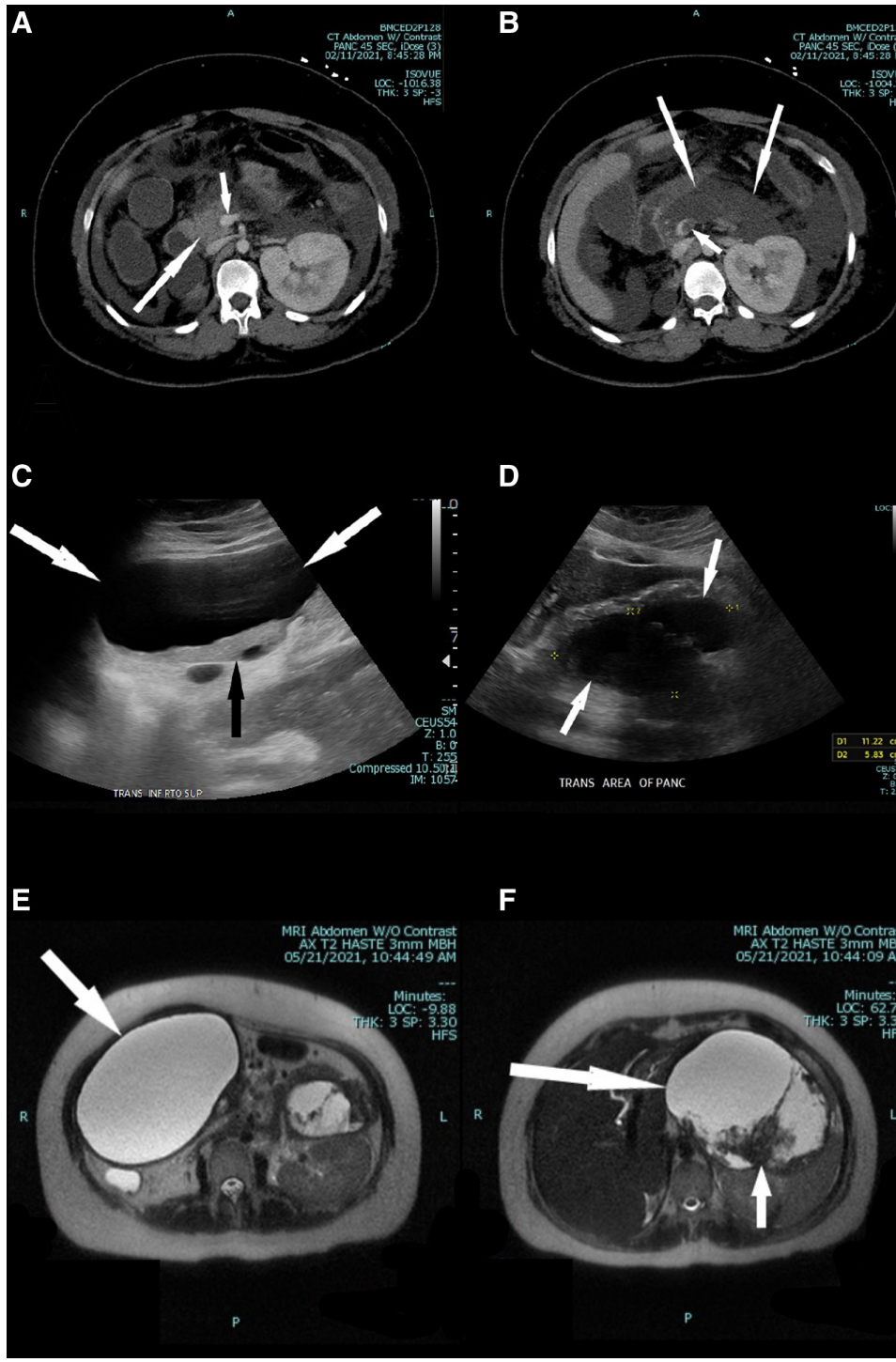


**FIGURE 1.** Radiographic imaging. A) Contrast enhanced helical computerized tomography (CT) scan on the day of presentation shows normal enhancement of the pancreatic head (long arrow) and portal vein at junction with splenic vein (short arrow). B) Image slightly higher shows complete necrosis of the pancreatic body and tail (long arrows) and thrombosis causing filling defect in the portal vein (short arrow). C) Abdominal ultrasound 2 weeks later shows an 11 cm pseudocyst (white arrows) displacing the liver posteriorly (black arrow). D) Another image from the same study shows an 11 cm complex collection in the pancreatic bed consistent with necrosis. E) Axial T2 weighted image rom abdominal magnetic resonance imaging (MRI) almost 14 weeks later shows a persistent large pseudocyst in the right upper quadrant (arrow). F) Axial T2 weighted image higher up shows part of a 21 cm complex peripancreatic collection (long arrow) and residual necrotic pancreatic debris posteriorly (short arrow).

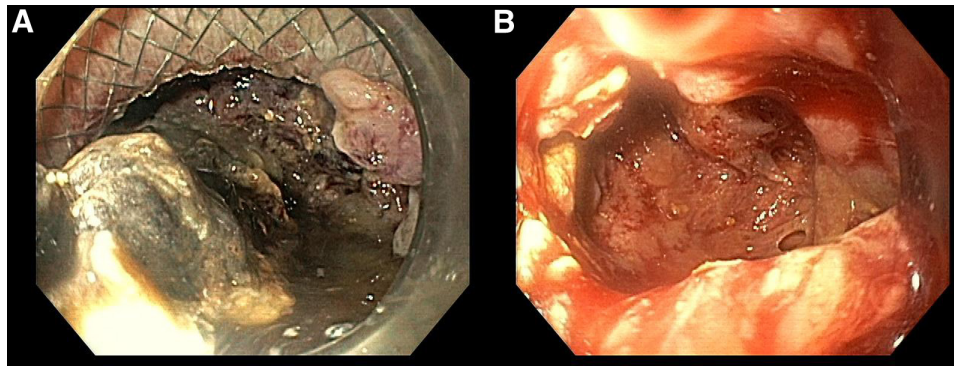


**FIGURE 2.** Endoscopic imaging. A) Initial Direct Endoscopic Necrosectomy. Transgastric view of necrotic pancreatic collection through lumen-apposing metal stent featuring solid necrotic debris within cavity. B) Completion of Endoscopic Necrosectomy. Transgastric view of pancreatic collection following removal of the lumen-apposing metal stent with clearance of solid necrotic debris and granular, viable tissue within wall of the collection.

examination, we noted a simple, anechoic collection without necrosis which was felt to represent the previously visualized right upper quadrant collection. A separate, large 6 cm × 9 cm, mostly anechoic fluid collection was seen in the body of the pancreas with internal debris consistent with necrosis. At that time, patient underwent guided drainage of the necrotic collection with temporary placement of a lumen-apposing metal stent and a double-pigtail plastic stent (Fig. 2). Patient underwent three additional necrosectomies over a 6-week period. The perihepatic right upper quadrant collection remained stable without evidence of necrosis, as such drainage was not attempted and the collection self-resolved.

At 18-month follow-up, patient reported significant symptom improvement and stabilization of weight. She remained insulin-dependent due to presumed beta cell failure with negative pancreatic antibodies. She completed 3 months of anticoagulation in the setting of splenic and portal vein thromboses and was subsequently identified to have protein S deficiency in evaluation by hematology. In evaluation with endocrinology, patient was found to have primary amenorrhea secondary to premature ovarian failure with eventual karyotype confirming diagnosis of Turner's syndrome. Patient was not assessed for high-risk alleles associated with pancreatitis.

## DISCUSSION

Common causes of pancreatitis within the pediatric population include trauma, gallstones, medications, or viral infections (2). This patient had no history or evidence of trauma, gallstones or medication toxicity. While this patient had incomplete immunization history, she was up to date with mumps and varicella, making these unlikely etiologies. Tests for cytomegalovirus, Epstein-Barr virus, HIV, Hepatitis A, and enterovirus were also negative. While she had a known history of prior herpes simplex virus infection, she was in remission at time of initial presentation with development of active lesions midway through the course. This patient was found to be SARS-CoV-2 positive on admission, suggesting COVID-19 as the underlying etiology for her necrotizing pancreatitis.

SARS-CoV-2 has been shown to use the angiotensin-converting enzyme 2 receptors, highly expressed in pancreas acinar and islet cells, for entry into cells causing direct cytotoxicity (3). In addition to direct infection, SARS-CoV-2 can cause dysregulation of the immune system resulting in profound inflammation secondary to a cytokine storm, believed to contribute to development of acute pancreatitis (4). In a recent, international multi-center cohort study, adult patients with concomitant SARS-CoV-2 and acute pancreatitis were at a significantly increased risk of developing severe pancreatitis (22.6% vs. 6.3%) when compared to those without SARS-CoV-2 (5). Furthermore, the 30-day mortality was significantly higher in patients with concomitant SARS-CoV-2 and acute pancreatitis (14.7% vs 2.6%). In a smaller survey, pediatric patients with concurrent SARS-CoV-2 and acute pancreatitis similarly took longer to recover with prolonged ICU length of stays when compared to those without SARS-CoV-2 (6).

We report a previously healthy adolescent female, now diagnosed with Turner syndrome, who presented with severe acute pancreatitis associated with persistent organ failure beyond 48 hours (7). She subsequently developed complications including walled off necrosis, separate pseudocyst formation, and new-onset insulin dependent diabetes, all of which significantly impacted her overall health and quality of life. Our case further highlights the importance of recognizing acute and necrotizing pancreatitis as complications associated with COVID-19, especially given the significant morbidity and mortality associated with such conditions.

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Verbal consent was obtained from the patient and her mother to publish this case report. All identifying information has been removed.

Written consent was obtained from the parent (mother) or guardian for the purpose of attaining consent to publish this case report. All identifying information has been removed.

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