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CASE REPORT

Acute pancreatitis in children: a tertiary hospital report

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Abstract

Introduction. The incidence of acute pancreatitis (AP) in children has increased significantly in the past two decades. ***Objective.*** All cases of AP, acute recurrent pancreatitis (ARP), and chronic pancreatitis examined between May 2002 and May 2012 at Hospital de Braga, Portugal, were reviewed. ***Material and methods.*** Patients were identified by searching the hospital's electronic discharge records for the *International Classification of Disease, Ninth Revision* (*ICD-9*) code 577.0 (acute pancreatitis). ARP was considered as two or more episodes of AP per year or more than three episodes over a lifetime with intervening return to baseline. The following data were analyzed: demographic information, clinical, laboratory and imaging test results, etiology of pancreatitis, medical and surgical management, length of hospitalization, and outcome. The clinical and laboratory factors used in the pediatric acute pancreatitis severity score system and computed tomography severity index (CTSI) score were compared between patients with mild and severe disease. ***Results.*** A total of 37 patients, 31 episodes of AP and 6 patients with ARP, were documented. The most prevalent etiologies were biliary stones/sludge (24.3%) and trauma (16.2%). Admission elevated white blood cell count ($p = 0.011$), 48-h trough calcium ($p = 0.007$), and 48-h rise in blood urea nitrogen ($p = 0.025$) correlated significantly with disease severity. CTSI on admission had a score below 4 in three patients with severe disease. ***Conclusion.*** This Portuguese pediatric pancreatitis report highlights the multiple and complex etiology of this disease. Better pediatric scoring systems and management algorithms are needed.

Key Words: *acute pancreatitis, acute recurrent pancreatitis, pediatrics*

Introduction

Acute pancreatitis (AP) is a reversible condition characterized by acinar cell injury of the pancreas and a subsequent inflammatory response that may involve adjacent and distant tissues and organs. The magnitude of this inflammatory response determines the severity of AP and can lead to complications such as pancreatic necrosis, effusions, shock, and multiorgan system failure. A small number of patients have recurrent episodes of AP and are at risk of developing chronic pancreatitis (CP). Fibrosis and chronic inflammation can lead to exocrine failure and in a later stage endocrine compromise with the development of diabetes [1–5].

Pancreatitis in pediatric patients is a costly and increasingly recognized disease [6–8].

The current incidence seems to be around 3.6–13.2 cases per 100,000 individuals per year, according to some studies from Australia and United States [1,2,7–9]. The reasons for this increase are not entirely clear and could represent more a geographic

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than a worldwide phenomenon. However, it could result from greater physician awareness or changing trends in pancreatitis etiologies [7–11].

There is limited literature on AP, acute recurrent pancreatitis (ARP), and CP in children, and knowledge is often extrapolated from adult data. The INSPPIRE (International Study Group of Pediatric Pancreatitis: In search for a cure) consortium was formed and since 2012 it represents the first initiative to create a multicenter approach to systematically characterize pancreatitis in children [12].

Materials and methods

The records of all children and adolescents treated for pancreatitis at our institution from May 2002 to May 2012 were reviewed. Patients were identified by searching the hospital's electronic discharge records for the *International Classification of Disease, Ninth Revision* (*ICD-9*) code 577.0 (acute pancreatitis). All diagnoses were manually confirmed by review of admission histories, laboratory values, and imaging findings.

The definition of AP diagnosis required at least two of three criteria: abdominal pain, especially in the epigastric region, serum amylase, or lipase activity at least three times greater than the upper limit of normal and imaging findings compatible with AP [1,2,12,13]. ARP was considered as two or more episodes of AP per year or more than three episodes over a lifetime with intervening return to baseline: complete resolution of pain (≥1 month pain-free interval) or complete normalization of pancreatic enzymes levels along with resolution of pain (can be shorter interval than 1 month) [1,12]. The diagnosis of CP was checked in the group of ARP patients, based on a combination of symptoms (abdominal pain and/or loss of exocrine function), imaging studies, and pancreatic noninvasive function tests (fecal elastase screen test and 72-h fecal fat collection) [1,12].

The following data were analyzed: demographic information, clinical, laboratory, and imaging test results, and etiology of pancreatitis. Additional variables collected were medical and surgical management, length of hospitalization, and outcome. Statistical analysis was performed with unequal variance *t*-test and $p < 0.05$ was considered statistically significant. The severity of the disease was classified as mild, moderately severe, and severe according to the last international revision of the Atlanta classification [13].

The clinical and laboratory factors used in the pediatric acute pancreatitis severity (PAPS) score system and computed tomography severity index (CTSI) score were compared between patients with mild and severe disease [14–17].

Results

Braga hospital served a total of 128,465 pediatric patients according to Portuguese census 2001. In 2010, the number of children and adolescents increased, since the hospital became the reference hospital of Minho region, serving a total of 257,114 pediatric patients according to Portuguese census 2011.

There were 37 patients (59.5% female) admitted for pancreatitis between May 2002 and May 2012. We identified 2–6 cases per year with a uniform distribution over the years. During this period, there were 31 (83.8%) patients with AP and 6 (16.2%) with ARP. CP was not diagnosed in this pediatric sample, since there was resolution of pain and/or decrease of amylase and lipase levels after a mean follow-up period of 1 month. Fecal elastase test and 72-h fecal

Table I. Etiology of pancreatitis ($n = 37$).

Etiology	$n = 37$	AP n	ARP n
Biliary disease	10		
Gallstones/sludge		8	1
Choledochal cyst (type I)		1	
Trauma	6		
Blunt abdominal injury		4	
Motor vehicle accident			1
Projectile firearm injury			1
Medication	4		
Azathioprine		1	
Corticosteroids		1	
Estrogen		1	
Sodium valproate		1	
ERCP	3	3	
Infection	2		
Hepatitis A		1	
Mycoplasma pneumoniae		1	
Systemic	2		
Systemic lupus erythematosus		1	
Ulcerative colitis with sclerosing cholangitis		1	
Surgery	2	2	
Metabolic	1		
Diabetic ketoacidosis		1	
Periampullary obstruction	2		
Pancreas divisum			1
Enteric duplication cyst		1	
Genetic	1		
Heterozygous I507del+IVS8 (5T) cystic fibrosis			1
Oral refeeding	1	1	
Neoplasic	1		1
Solid pseudopapillary neoplasm		1	
Idiopathic	2	2	

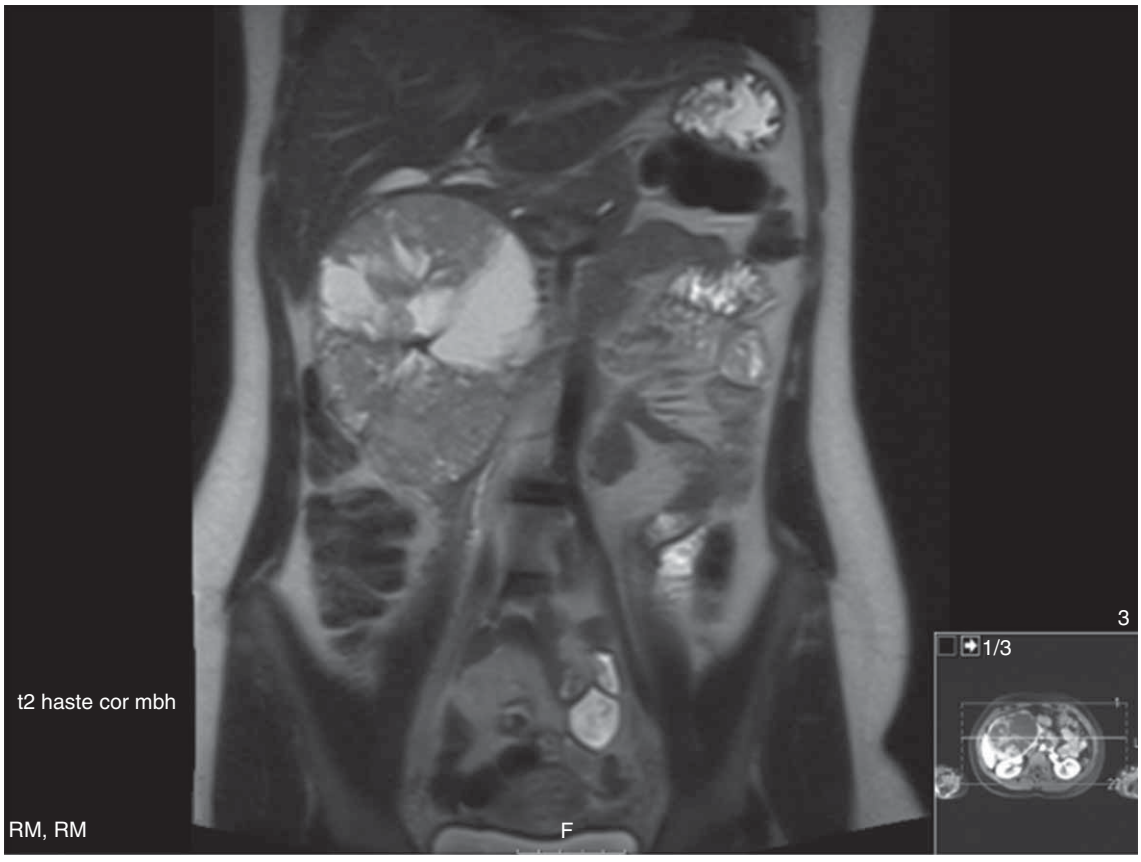

Figure 1. MR (T2): Tumoral cystic mass.

fat collection were performed in ARP patients, but loss of exocrine pancreatic function was not found. Development of diabetes did not occur.

There were two patients with family history of pancreatitis. Abdominal pain was the most recorded symptom (97.3%). Specifically, epigastric pain was reported in 70.3% and diffusely in 27% of the patients. Epigastric pain radiating to the back occurred in 13.5% patients. Vomiting was the second most frequent symptom reported (45.9%), followed by fever (10.8%). Jaundice was diagnosed in 8.1% and a palpable mass was detected in 5.4% patients. Systemic inflammatory response syndrome with transient (<48 h) organ failure was reported in 2.7%.

In this pediatric sample, 9 (24.3%) patients developed severe pancreatitis. All of these were moderately severe cases, according to the last international revision of the Atlanta classification [13], since the most severe case resolve cardiovascular and renal dysfunction within 48 h.

The median age at presentation was 15 years (range, 7–17 years). No significant difference in age was noted between the mild and moderately severe pancreatitis group of patients ($p = 0.137$).

The median duration of hospitalization was 6 days (range, 2–89 days). Patients with moderately severe pancreatitis had longer hospital stays than those with mild pancreatitis (mean: 40.4 days vs. 10.5 days; $p = 0.013$).

The etiological causes associated with pancreatitis were diverse (Table I).

Biliary disease (gallstones/sludge) was the most prevalent etiological cause (24.3%), followed by trauma (16.2%), and medications (10.8%). We identified pancreatitis secondary to endoscopic retrograde cholangiopancreatography (ERCP) in 3 (8.1%) patients. A case of *pancreas divisum*, a heterozygous I507del+IVS8 (5T) cystic fibrosis patient [18], and a solid pseudopapillary neoplasm of pancreas (Figure 1) were rare etiologies related with ARP.

Idiopathic pancreatitis cases were two, but we need to say that no genetic screening for *PRSS-1*, *SPINK-1*, *CFTR*, or *CTRC* was done. These two cases did not have more than one episode of pancreatitis and are followed in our consultation.

Pancreatic fluid collections (Figure 2) and pseudocysts (Figure 3) were the most frequent complications (Table II). Despite the occurrence of two cases of systemic complications (pulmonary edema and

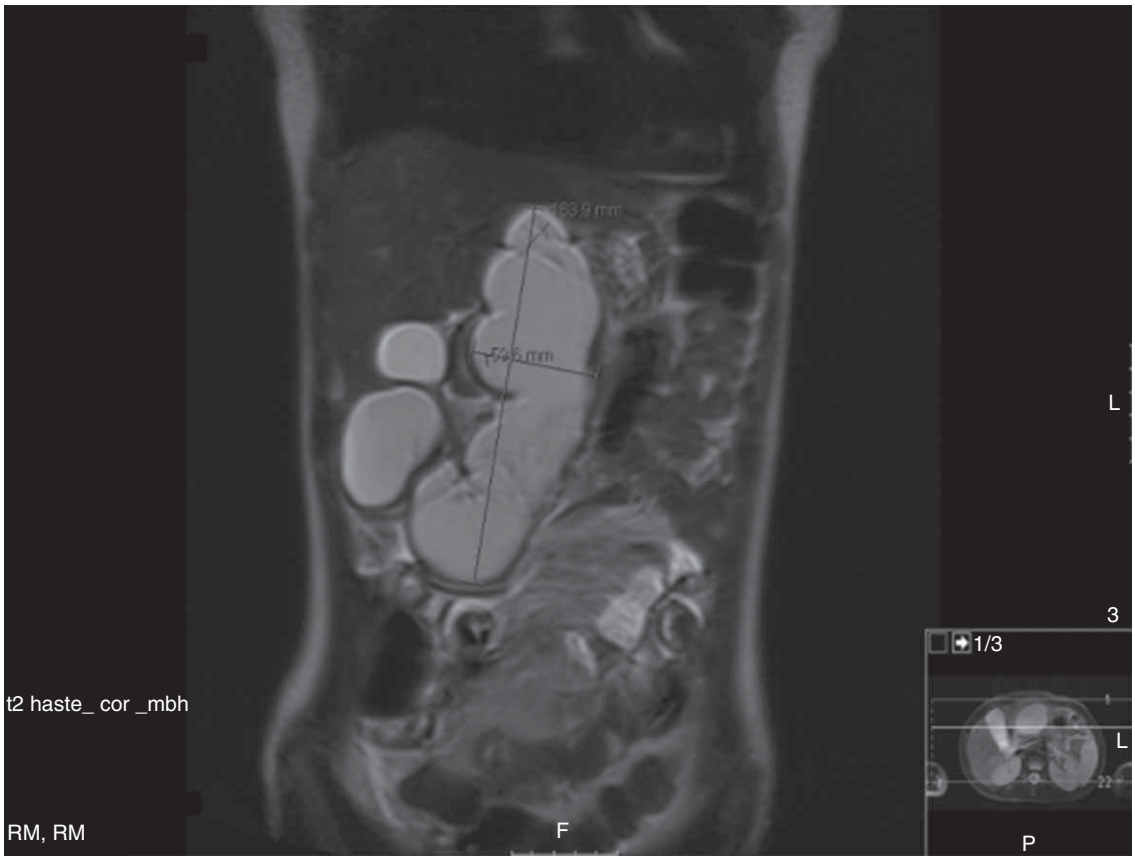

Figure 2. MRCP (T2): Fluid pancreatic collections + Wirsung ductal injury.

systemic inflammatory response syndrome), no one died. The patient who developed pulmonary edema was the case of *pancreas divisum*, and the other with transient organ failure was related to a blunt abdominal injury with severe pancreatic dysfunction. Other etiological cause or disease was not found to be responsible for the systemic complications.

Unequal variance *t*-test analysis of laboratory data was applied to our pediatric population. Using the cutoff values of the PAPS score system, admission

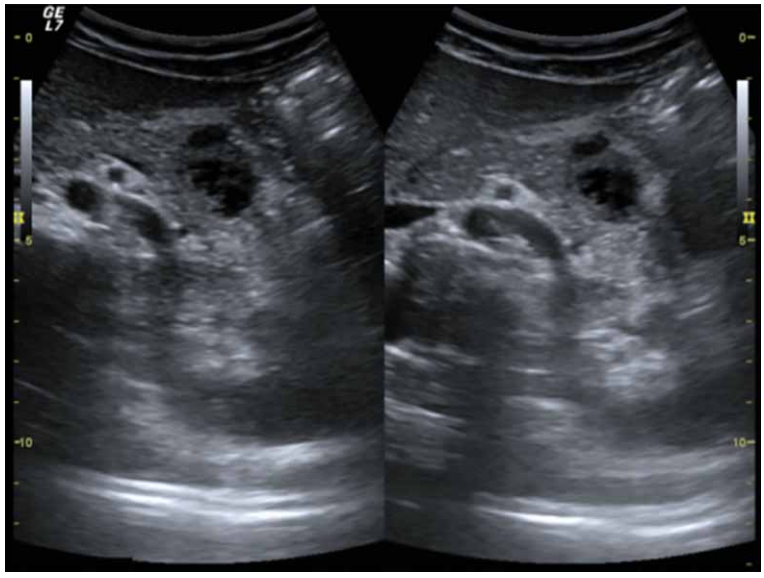

Figure 3. US: Pseudocyst.

Table II. Complications related with moderately severe pancreatitis.

	Complications
Local	Acute peripancreatic fluid collection/pseudocyst – 4 Acute necrotic collection – 2 Pancreatic tumor – 1
Systemic	Systemic inflammatory response syndrome – 1 Pulmonary effusion – 1

elevated white blood cell count (WBC – mean: 10315 ± 698.6 vs. 17700 ± 2236.6; $p = 0.011$), 48-h trough calcium (48-h Ca^{2+} – mean: 9.0 ± 0.2 vs. 8.1 ± 0.2; $p = 0.007$), and 48-h rise in blood urea nitrogen (BUN – mean: 0.7 ± 0.3 vs. 3.2 ± 0.9; $p = 0.025$) correlated significantly with disease severity (Table III). Admission elevated lactate dehydrogenase (LDH) and 48-h trough albumin did not have a statistically stronger association with severe pancreatitis. The admission levels of amylase and lipase did not have that correlation with children's morbidity (Table III).

Trans-abdominal ultrasonography revealed inflammatory changes of the pancreas in 27 of the 34 patients evaluated. Ultrasound diagnosed all the patients with gallstone disease and traumatic etiology. The most common findings included pancreatic edema, dilated pancreatic duct, calcifications, and fluid collections.

Contrast-enhanced CT scans were performed in 22 patients, showing evidence of pancreatitis in all of them, including 7 patients who had negative results on ultrasound examinations.

CTSI applied in our study showed a score below 4 in three patients with severe disease. ERCP was done in six patients and it was responsible for three cases of AP. Magnetic resonance cholangiopancreatography (MRCP) performed in six patients was used for the diagnosis and better characterization of type I choledochal cyst case and evaluation of some complications. This exam was not useful for determining the real cause of the two idiopathic cases.

Supportive therapy (hydration, analgesia, and antiemetics) was used in all of the cases. Total parental nutrition was necessary for 5 (13.5%) patients (mean duration: 20.5 ± 11.2 days) and 2 (5.7%) patients were fed through enteral tube. Antibiotic therapy was used in the two patients who developed systemic complications and in the patient subjected to surgical removal of solid pseudopapillary tumor. The two children with pseudocyst and imaging evidence of minimal wall necrosis, along with the two other with acute necrotic collections, were also under antibiotics.

Surgical management was necessary in 11 (29.7%) patients, including 4 with post-traumatic injuries. Cholecystectomy after conservative therapy was performed in 5 (13.5%) patients, laparoscopic or percutaneous pancreatic pseudocysts drainage in 4 (10.8%), and partial pancreatic resection with debridement in 2 (5.4%) patients.

Conclusion

AP in children is an increasing health problem [7–9]. The results of this pediatric sample show that pancreatitis can have multiple and complex etiologies in children. Among the diverse range of etiologies of pediatric AP, gallstones and biliary disease seem to play a greater role than previously thought [1,2,10,11,19–21]. In this report, it was also the most common (24.3%) etiological cause. CP was not diagnosed in this pediatric sample.

Admission elevated WBC ($p = 0.011$), 48-h trough calcium ($p = 0.007$), and 48-h rise in BUN ($p = 0.025$) correlated significantly with disease severity. We did not find a statistical significant correlation between amylase and lipase admission levels and pancreas damage.

An abdominal ultrasound examination is a useful tool for the confirmation of clinically and laboratory diagnosed pancreatitis [1,2,22,23]. In our study, the sensitivity of trans-abdominal ultrasonography in detecting pancreatitis was 79.4%. Our results show that CT scans are useful for the diagnosis of pancreatitis in clinically suggestive patients, when abdominal ultrasound results are not clear [1,22,23].

Table III. Laboratory parameters (mean values).

PAPS score system	Mild pancreatitis	Severe pancreatitis	*p*
Admission WBC (/μL)	10315 ± 698.6	17700 ± 2236.6	**0.011**
Admission LDH (IU/L)	338.3 ± 35.8	482.3 ± 127.9	0.321
48-h trough Ca^{2+} (mg/dL)	9.0 ± 0.2	8.1 ± 0.2	**0.007**
48-h increase BUN (mg/dL)	(↑) 0.7 ± 0.3	(↑) 3.2 ± 0.9	**0.025**
48-h trough albumin (g/dL)	3.7 ± 0.2	3.2 ± 0.3	0.111
Other lab data			
Admission amylase (IU/L)	735.9 ± 174.3	699.4 ± 108.2	0.909
Admission lipase (IU/L)	1277.6 ± 347.4	3117.9 ± 1536.2	0.283

Some studies also evaluated the utility of CTSI in children with AP, and concluded that this index was superior to clinical scoring systems for identifying children at heightened risk for developing serious complications (cutoff score of 4+). However, the findings are observer-dependent, and not all patients with severe disease have a CTSI equal to or higher than four [15]. In our study, three patients with severe disease have an index score below 4.

Current guidelines for classifying, diagnosing, and managing AP are frequently based on standards that are developed and validated in adult patients [12,13,16,23–25]. Better scoring systems to determinate prognosis and new management algorithms are urgently needed.

Pediatric patient's outcomes seem to be better than adults, but the complications related with this disease are clinical problems difficult to resolve and responsible for longer hospital stays.

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