

## Acute Pancreatitis in Children – A Disorder against whose Incessant Attacks Even Hercules could not have Stood

Donna A Cheung and Edgardo D Rivera-Rivera\*

Department of Paediatric Gastroenterology, University of Miami, Jackson Memorial Hospital, Miami, USA

\*Corresponding author: Edgardo D Rivera-Rivera, Department of Paediatric Gastroenterology, University of Miami, Jackson Memorial Hospital, 3005A 1601 NW 12th Ave, Miami, FL 33136, USA, Tel: 3052433166; E-mail: [eriverarivera@med.miami.edu](mailto:eriverarivera@med.miami.edu)

Received date: March 18, 2017; Accepted date: March 25, 2017; Published date: April 01, 2017

Copyright: © 2017 Rivera-Rivera ED, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License; which permits unrestricted use; distribution; and reproduction in any medium; provided the original author and source are credited.

### Introduction

Acute pancreatitis is a reversible inflammatory process which results from auto-digestion of the pancreas from premature activation of pancreatic proenzymes [1]. Though reversible, this condition can lead to significant morbidity and mortality with up to a quarter of pediatric cases developing severe complications and mortality rates reaching up to 10% [2,3]. One of the proposed theories behind the death of Alexander the Great in 323 BC implicates acute pancreatitis [4]. The incidence of acute pancreatitis in children, like in adults, has been on the rise but acute pancreatitis has been clinically described since 1652. Dutch anatomist Tulp first described a young man with a suppurated pancreas on autopsy who presented with “continuous fever”, severe abdominal pain that “he had no possibility of lying down” and “was tortured to death by this agony in such a miserable way”, “against whose incessant attacks even Hercules could not have stood” [4-6]. This clinical scenario summarizes very well the presentation of acute pancreatitis. Clinical symptoms of acute pancreatitis include fever, nausea, vomiting, abdominal distension and constant epigastric abdominal pain aggravated by eating. In children, abdominal pain may be diffuse, back pain is less frequently involved and non-verbal children may present with irritability [7].

According to the 2012 consensus definition by the INSPPIRE consortium, the diagnosis of acute pancreatitis in children ≤ 18 years of age requires meeting two of three criteria (Table 1). Imaging features may include edema, necrosis, hemorrhage or abscess of the pancreas, peri-pancreatic inflammation or ascites. A pancreatic pseudocyst may also indicate a recent acute pancreatitis episode [7].

Diagnostic criteria for the diagnosis of pancreatitis in paediatrics
Abdominal pain compatible with acute pancreatitis
Serum pancreatic enzyme(s) (amylase and /or lipase) at least 3 times the upper limit of normal
Imaging findings (any study; can be US, CT or MRI) characteristic of, or compatible with acute pancreatitis

**Table 1:** Diagnostic criteria for the diagnosis of pancreatitis in paediatrics (from the INSPPIRE group recommendations).

Acute recurrent pancreatitis is a different entity that is diagnosed when two or more distinct episodes of acute pancreatitis occur with return to baseline in between. Acute recurrent pancreatitis and chronic pancreatitis are not covered in this review.

The main causes of acute pancreatitis in children are multiple (Table 2) [3,7]. The history should focus on discerning one of these possible etiologies when evaluating a patient with acute pancreatitis. It is

particularly important in this age group to be mindful that trauma may be non-accidental. Laboratory evaluation may include the pancreatic enzymes, tests used as prognostic markers or tests used to identify possible etiologies. These may include calcium, triglycerides, transaminases, bilirubin, white blood cell count, urea nitrogen, and serum albumin [8,9]. Lipase is the more sensitive of the pancreatic enzymes in children. The daily monitoring of pancreatic enzymes is not routinely recommended, and management should be directed by the clinical status.

Common etiologies	Less common etiologies
Biliary disease	Metabolic disorders
Medication induced	Familial
Infectious	Hereditary
Trauma	Autoimmune

**Table 2:** Etiologies for acute pancreatitis in paediatrics.

Various imaging modalities are available but the most commonly used is transabdominal ultrasonography as it is non-invasive, does not involve radiation exposure or sedation. It is not necessary for the diagnosis of pancreatitis, if the other two criteria are met, as ultrasonography of the pancreas will often be normal especially early in the disease process and in mild disease. The pancreas may also be difficult to examine on ultrasonography in acute pancreatitis because of overlapping bowel gas from a localized ileus or pain-induced aerophagia where patients swallow large quantities of air [3]. Ultrasonography is useful, however, to identify obstructive biliary disease such as gallstones and choledochal cysts. Other imaging modalities that may be utilized include CT with IV contrast, endoscopic retrograde cholangiopancreatography (ERCP), endoscopic ultrasonography (EUS), or magnetic resonance cholangiopancreatography (MRCP) with/without secretin stimulation.

Management of acute pancreatitis is predominantly derived from adult data and there are no established pediatric guidelines. Fluid resuscitation is the cornerstone to managing acute pancreatitis and is typically done with isotonic fluids. There is new adult data to suggest that Lactated ringers may potentially be better than normal saline [10]. Patients will generally require more than maintenance IV fluids but there are no recommendations on volume or rate in pediatric patients. Very young children may have difficulties maintaining their glucose levels with fasting and dextrose containing solutions (typically 5-10%) should be considered in their hydration management as well as glucose and electrolytes monitoring.

No preferred analgesic has been identified in clinical trials but opioids, including morphine, are considered appropriate options. Historically there is a concern that morphine may cause spasm of the sphincter of Oddi but there is limited data to support this [8,11,12]. With mild pancreatitis, oral low fat diet can be initiated quickly after improvement of pain regardless of pancreatic enzyme levels. Enteral nutrition has been shown to improve outcomes in severe pancreatitis. Enteral nutrition is believed to maintain mucosal integrity, inhibit bacterial translocation and lower morbidity. Total parenteral nutrition is reserved for cases unable to tolerate enteral nutrition. Studies have shown no difference between nasogastric and nasojejunal feeding [13,14]. Nasojejunal feeds requires specialty placement under radiological or endoscopic guidance and can be considered if nasogastric feeds are not tolerated. Polymeric or elemental formulas may be used. Antibiotic prophylaxis is not recommended and its use is reserved for treatment in necrotizing pancreatitis [15].

Acute pancreatitis can be a devastating disorder and more data is needed to establish appropriate guidelines and improve care in pediatric patients with acute pancreatitis. There is a lot of ongoing research and the INSPPIRE consortium was partly formed to tackle these gaps. Certainly, standardization of systems and the development and dissemination of scoring tools and management guidelines are very valuable in the process of improving patient's care and outcomes [16]. This research is promising and will be able to help us better care for our young patients who have to battle a disorder whose "incessant attacks even Hercules could not have stood".

## References

1. Bai HX, Lowe ME, Husain SZ (2011) What have we learned about acute pancreatitis in children? *J Pediatr Gastroenterol Nutr* 52: 262-270.
2. Filho EM, Carvalho WB, Silva FD (2012) Acute pancreatitis in pediatrics: A systematic review of the literature. *J Pediatr* 88: 101-114.
3. Restrepo R, Hagerott HE, Kulkarni S, Yasrebi M, Lee EY (2016) Acute pancreatitis in pediatric patients: Demographics, etiology, and diagnostic imaging. *AJR Am J Roentgenol* 206: 632-644.
4. Podolsky DK, Camilleri M, Fitz JG, Kalloo AN, Shanahan F, et al. (2016) Yamada's textbook of gastroenterology (2nd edn).
5. Pannala R, Kidd M, Modlin IM (2009) Acute pancreatitis: A historical perspective. *Pancreas* 38: 355-366.
6. Howard JM, Hess W (2002) History of the pancreas: Mysteries of a hidden organ (1st edn). Springer Science & Business Media, New York, USA. pp: 7-14.
7. Morinville VD, Husain SZ, Bai H, Barth B, Alhosh R, et al. (2012) Definitions of pediatric pancreatitis and survey of current clinical practices: report from insppire (international study group of pediatric pancreatitis: in search for a cure). *J Pediatr Gastroenterol Nutr* 55: 261-265.
8. Abu-El-Hajja M, Lin TK, Palermo J (2014) Update to the management of pediatric acute pancreatitis: Highlighting areas in need of research. *JPGN* 58: 689-693.
9. Park A, Latif SU, Shah AU, Tian J, Werlin S, et al. (2009) Changing referral trends of acute pancreatitis in children: A 12-year single-center analysis. *J Pediatr Gastroenterol Nutr* 49: 316-322.
10. Wu BU, Hwang JQ, Gardner TH, Repas K, Delee R, et al. (2011) Lactated ringer's solution reduces systemic inflammation compared with saline in patients with acute pancreatitis. *Clin Gastroenterol Hepatol* 9: 710-717.
11. Basurto Ona X, Rigau Comas D, Urrútia G (2013) Opioids for acute pancreatitis pain. *Cochrane Database Syst Rev* CD009179.
12. Meng W, Yuan J, Zhang C, Bai Z, Zhou W, et al. (2013) Parenteral analgesics for pain relief in acute pancreatitis: A systematic review. *Pancreatology* 13: 201-206.
13. Oláh A, Romics L (2014) Enteral nutrition in acute pancreatitis: A review of the current evidence. *World J Gastroenterol* 20: 16123-16131.
14. Besselink M, van Santvoort H, Freeman M, Gardner T, Mayerle J, et al. (2013) IAP/APA evidence-based guidelines for the management of acute pancreatitis. *Pancreatology* 13: e1-15.
15. Meier R, Ockenga J, Pertkiewicz M, Pap A, Milinic N, et al. (2006) ESPEN guidelines on enteral nutrition: *Pancreas*. *Clin Nutr* 25: 275-284.
16. O'Reilly DA, McPherson SJ, Sinclair MT, Smith N (2017) Lessons from a national audit of acute pancreatitis: A summary of the NCEPOD report 'Treat the Cause'. *Pancreatology* S1424-3903.