

Diagnostic Difficulties of Spontaneous Gastric Perforation in Adolescents

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Abstract

Objective: Spontaneous gastric perforation (SGP) in adolescents is very rare. This study aims to evaluate the diagnostic difficulties and misdiagnoses associated with SGP.

Methods: The medical records of patients that underwent surgery for a gastric perforation over the past 2 years at our paediatric surgery clinic were evaluated retrospectively. Patient demographics, symptoms, diagnostic evaluation, diagnostic difficulties, operative findings, and post operative clinical course were evaluated.

Results: Seven patients were identified as having SGP. All of the patients were adolescents. Only 1 patient had a history of gastritis; the other 6 patients did not have a history of any disease, surgery or trauma. Radiological evidence of pneumoperitoneum using upright radiography was only found in 1 patient (16.6%). One patient was misdiagnosed and thought to have appendicitis. In 2 patients, the diagnosis was unclear, so diagnostic laparoscopy was performed. Conclusion: SGP can be seen in adolescents. However, sometimes it is difficult to diagnose. Even if all the imaging studies and laboratory tests are normal, if there is a sign of peritonitis upon physical examination, diagnostic laparoscopy could be performed.

Keywords: gastric perforation, spontaneous gastric perforation

Introduction

Gastric perforation is an acute abdominal surgical condition that can present at any age¹. The etiology of gastric perforations includes peptic ulcer disease (PUD), spontaneous, iatrogenic dermatomyositis, ingestion of caustic materials, trauma and surgery¹⁻⁵. Neonatal gastric perforation is generally thought to be spontaneous in children experiencing trauma^{5,6}. In older children or in adolescents some studies have reported on gastric perforation due to causes such as trauma and PUD^{4,7-13}. However, most of the articles on spontaneous gastric perforation in children have been reported in the Japanese and Chinese literature; there are only isolated European cases¹⁴⁻¹⁶. To the best of our knowledge, there is only one published article about spontaneous gastric SGP in adolescents².

The diagnosis of SGP is suspected based on the physical examination findings, and it is confirmed by the presence

of free air on an upright abdominal X-ray and indirect signs of perforation, such as ascites on ultrasonography (USG) and computed tomography (CT)^{1,4,17,18}. Rapid diagnosis and treatment of gastric perforation is essential in order to reduce the high mortality rate of secondary peritonitis^{1,17}. The present study aimed to evaluate the diagnostic difficulties of SGP and to determine a better way to diagnose it.

Materials and Methods

This paper presents our experience of 7 pediatric patients who underwent surgery at our institution between January 2016 and October 2017 due to gastric perforation. There were 6 male patients and 1 female patient ranging in age from 15 to 17. The clinical, imaging and surgical findings were reviewed for all 7 patients. A diagnostic evaluation was made.

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Results

Only 1 patient had a history of gastritis, for which he was taking medication. None of the 7 patients had a history of smoking or alcohol use. None of the 7 patients had a history of trauma and surgery. All 7 of the patients had complaints of sudden and worsening abdominal pain, lasting from 2 to 48 hours. Three of the patients had emesis.

Upon examination, all 7 of the patients appeared unwell. Only patient 7 had right lower quadrant tenderness and guarding. Patient 2 and patient 4 had a rigid abdomen. The other 5 patients had tenderness and involuntary guarding at all quadrants. None of the patients had abdominal distension.

The results of the laboratory studies were not significant. The white blood cell (WBC) count ranged from normal (<12.000/UL) to elevated (Table 1). The C-reactive protein (CRP) was <1 in 5 of the 7 patients; it was not counted in the other 2 patients. Subdiaphragmatic free air was detected by upright radiography in only 1 patient. On USG, there was no sign of perforation. In 2 patients, free air was not detected on CT. When it was detected on the other 5 patients, the cause of the perforation was unclear.

Patient 7, who had no free air based on the X-ray results, was thought to have appendicitis. Laparotomy was performed with a right lower transverse incision. The appendix was normal, and pathology-like fluid and food were not observed in the right lower quadrant. Since the findings for this patient were not compatible with the abdominal examination, other quadrants were checked. Fibrin was observed in the upper quadrants. The first incision was closed and an upper midline incision was made in order to repair the gastric perforation. Patients with free air, as noted on the CT scans, underwent laparotomy for gastric perforation. The diagnosis was unclear for patient 1 and patient 4, so a diagnostic laparoscopy was performed. All of the gastric perforations were in the anterior distal stomach, which were repaired using an omental patch. All of the patients were discharged home on omeprazole 40 mg daily.

The stool specimen *Helicobacter pylori* (*H. pylori*) enzyme linked immunosorbent assay and antibody panel were

negative for all 7 patients. We recommended endoscopy to all 7 patients but only 3 underwent an upper endoscopy 3 months later. The histopathology results of the endoscopic biopsies confirmed the diagnosis of gastritis. None of the patients had pathological evidence of an *H. pylori* infection.

Observation and Discussion

Paediatric gastric perforation is a rare condition^{2,4,8}. In the literature, most pediatric gastric perforations are seen in adolescents^{2,4,9,10}. All of our patients presented with abdominal pain. This is the most common presenting symptom^{4,8,9,10,19}. In our study, 6 patients had no prior history of any disease or chronic abdominal pain. Hua et al. reported that 29 (55.7%) of the 52 patients in their study had a history of chronic abdominal pain and 11 patients had a history of PUD. In other studies, children usually presented without prior suspicion of PUD or a history of chronic pain^{4,9,10}. In our study, none of the patients had any evidence of *H. pylori* infection. The rate of *H. pylori* infection in perforated peptic ulcer (PPU) in adults ranges from 47% to 81%, as reported in different series²⁰⁻²⁴. However, there is no current data on the *H. pylori* infection rate in pediatric PPU. Hua et al. reported that only 4 (7.7%) patients in their study had evidence of *H. pylori* infection; Wong et al. reported that 2 (15.4%) out of 13 patients in their study had *H. pylori* infection and Baltrūnaite et al. reported that 4 of the 15 patients in their study tested for *H. pylori* infection, and 2 patients were positive^{4,9,10}. In the literature, only a few studies have investigated gastric perforation in adolescents without any pathology. However, all of these studies reported that PUD is the etiology of gastric perforation without providing enough evidence of PUD^{4,8-10}. In the literature, only one previous study investigated SGP in adolescents², but there was no evidence of any disease or history of PUD in the patients in that study. Similarly, in our study, we did not find any evidence or history of PUD. We thought that, in the other studies, PPU could have been wrongly diagnosed or some of the patients might have had SGP.

Similar to our findings, other studies reported that, upon physical examination, patients can have right quadrant ten-

Table 1. Laboratory and Imaging studies

Patients	WBC	CRP	Freeair on X-ray	USG	CT
1	Normal	<1	No	15mm freefluid in the pelvis noother pathology	No free air
2	Normal	<1	No	Normal	Minimally free fluid in the pelvis
3	Normal	<1	Yes	-	Free air
4	Normal	<1	No	12mm apandisitits	Free air
5	Normal	-	No	-	No free air, inflamation on right lower quadrant and free fluid in the pelvis, apandisit suspision
6	↑	-	No	-	Free air
7	↑	<1	No	Normal	Free air

derness or diffuse tenderness and guarding, similar to acute or perforated appendicitis^{9,10,25-27}. In our study, free air was only identified by upright radiography in 1 patient. The reported specificity of plain X-ray for pneumoperitoneum ranges from 53% to 89.2%^{28, 29}. Wong et al. conducted a study on PPU and reported that the radiography results for 8 (60%) of the 13 patients did not show free air [10]. Hua et al. reported that the radiography results for 9 (17.3%) of the 52 patients in their study did not show free air, and Baltrūnaite et al. reported that the radiography results for 12 (20%) of the patients in their study did not show free air^{4,9}. These findings demonstrate that 10% to 50% of patients can be misdiagnosed.

Studies in adults show that USG could be a better method for detecting free air than abdominal radiography²⁸⁻³⁰. However, in our cases, USG did not show free air and it resulted in misdiagnosis. Abdominal CT is widely available and is very specific and sensitive for pneumoperitoneum. The overall sensitivity and specificity of CT for gastrointestinal perforation is generally in the 80–100% range, depending on the study³¹⁻³⁴. One retrospective study showed a recent increase in the use of CT and laparoscopic repair for peptic ulcers in adult patients³⁵.

In our study there were not free air on X-ray in 6 patients. In two of these 6 patients we did not get any benefit from CT too so we diagnosed gastric perforation with diagnostic laparoscopy in two patients. Diagnostic laparoscopy benefits patients by avoiding unnecessary surgery, avoiding unnecessary delay in diagnosis³⁶. Laparoscopic approach also serves the advantage of pathology identification in patients with uncertain diagnosis, thus avoiding a misplaced abdominal incision³⁷.

Conclusion

Gastric perforation is a rare cause of acute abdomen. Gastric perforation should be considered in patients with sudden abdominal pain and peritonitis sign on exam. We should be aware that SGP could be in adolescents if patients do not have any PUD history or an other disease history. Imaging studies can help us in confirmation of the diagnosis but sometimes free air can not be detected as though. Although all imaging studies are normal, if there is a peritonitis sign on exam diagnostic laparoscopy could be performed.

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