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Diagnostic Difficulties of Spontaneous Gastric Peforation 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 age[1]. The etiology of gastric perforations includes peptic ulcer disease (PUD), spontaneous, iatrogenic dermatomyositis, ingestion of caustic materials, trauma and surgery[1-5]. 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 cases[14-16]. To the best of our knowledge, there is only one published article about spontaneous gastric SGP in adolescents[2].

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 2patients, 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 7patients. 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 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 series[20-24]. 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 Baltrünaite 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 adolescents[2], 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 patology	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 apandisitis	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 1patient. 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 Baltrünaite 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 radiography[28-30]. 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 study[31-34]. One retrospective study showed a recent increase in the use of CT and laparoscopic repair for peptic ulcers in adult patients[35].

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 diagnosis[36]. Laparoscopic approach also serves the advantage of pathology identification in patients with uncertain diagnosis, thus avoiding a misplased abdominal incision[37].

Conclusion

Gatric perforation is a rare cause of acute abdomen. Gatric perforation should be considered in patients with sudden abdominal pain and peritonitis sign on exam. We should be aware that SGP could be in adolascents 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.

References

1. Seifarth FG, Soldes OS. Congenital anomalies and surgical disorders of the stomach. In: Wyllie R, Hyams J, Kay M. editors. Pediatric Gastrointestinal and Liver Disease. 5th ed. Philadelphia: Elsevier Saunders; 2016. 25:284–293.
2. Akalonu A, Yasrebi M, MolleRios Z. Spontaneous gastric perforation in two adolescents. Am J Case Rep. 2016;17:694–698.
3. Curt S. Koontz, Mark L. Wulkan. Lesions of the stomach. In: Holcomb, GW, Murphy JP, Ostlie DJ. editors. Ashcraft's Pediatric Surgery. 6th ed. Philadelphia: Elsevier Saunders; 2014. 29:403–413.
4. Hua MC, Kong MS, Lai MW, Luo CC. Perforated peptic ulcer in children: a 20-year experience. J Pediatr Gastroenterol Nutr.2007; 45:71–74.
5. Restrepo R, Marin DV. Acquired disorders. In: Coley BD, Bates DG, Faerber EN, Hernanz Schulman M, Kan H, Lee EY, Panigrahy A, Rigsby C. editors. Caffey's Pediatric Diagnostic Imaging. 12th ed. Philadelphia: Elsevier Saunders; 2013. 102:1048–1056.
6. Libeer F, Vanhamel N, Huyghe M, Verlinden E. Spontaneous gastric rupture in non-neonatal children: a case report. Acta Chir Belg. 2007;107(5):560–563
7. Rygl M, Pýcha K. Perforation of the stomach by a foreign body in a girl with anorexia nervosa: case report. Rozhl Chir. 2002; 81(12):628–630.
8. Morrison S., Ngo P., Chiu B. Perforated peptic ulcer in the pediatric population: a case report and literature review. J Pediatr Surg Case Rep. 2013;416–419.
9. Baltrünaite J, Trainavicius K. Perforated peptic ulcer in children: diagnosis and treatment. Lithuanian Surgery 2015;14(1):38–45.
10. Carol WY, Wong PHY, Chung PKH, Tam K, Wong KY. Laparoscopic versus open operation for perforated peptic ulcer in pediatric patients: a10-year experience. J Pediatr Surg. 2015; 50:2038–2040.
11. Koç O, Yildiz FD, Narci A, Sen TA. An unusual cause of gastric perforation in childhood: trichobezoar (Rapunzel syndrome). A case report. Eur. J. Pediatr. 2009; 168(4):495–497.
12. Nunn A, Jahn N, Hewes J, Wong C. Gastric perforation in a 16-year-old girl. BMJ. 2017; 357:1859.
13. Koplewitz BZ, Daneman A, FracrS, Ein SH, McGuigan MA, Mian M. Gastric perforation attributable to liquid nitrogen ingestion. Pediatrics 2000; 105(1):121–123.
14. Grosfeld JL, Molinari F, Chaet M, Engum SA, West KW, Rescorla FJ, Scherer LR 3rd. Gastrointestinal perforation and peritonitis in infants and children: experience with 179 cases over ten years. Surgery 1996; 120:650–655.
15. Shorter NA, Liu JY, Mooney DP, Harmon BJ. Indomethacin-associated bowel perforations: a study of possible risk factors. J Pediatr Surg 1999; 34:442–444.
16. Miserez M, Barten S, Geboes K, Naulaers G, Devlieger H, Penninckx F. Surgical therapy and histological abnormalities in functional isolated small bowel obstruction and idiopathic gastrointestinal perforation in the very low birth weight infant. World J Surg. 2003; 27:350–355.
17. Langell JT, Mulvihill SJ. Gastrointestinal perforation and the acute abdomen. Med Clin N Am. 2008; 92:599–625.
18. Awolaran OT. Radiographicsigns of gastrointestinal perforation in children: a pictorial review. Afr J Paediatr Surg. 2015; 12(3):161–166.

19. Chey WD, Wong BC. Practice parameters committee of the American College of Gastroenterology. American College of Gastroenterology guideline on the management of Helicobacter pylori infection. Am J Gastroenterol. 2007; 102(8):1808–25.
20. Metzger J, Styger S, Sieber C, Flüec M, Vogelbachd P, Hardera F. Prevalence of Helicobacter pylori infection in peptic ulcer perforations. Swiss Med Wkly. 2001; 131(7-8):99–103.
21. Seelig MH, Seelig SK, Behr C, Schönleben K. Comparison between open and laparoscopic technique in the management of perforated gastroduodenal ulcers. J Clin Gastro enterol. 2003; 37(3):226–9.
22. Ng EK, Lam YH, Sung JJ, Yung MY, To KF, Chan AC, et al. Eradication of Helicobacter pylori prevents recurrence of ulcer after simple closure of duodenal ulcer perforation: randomized controlled trial. Ann Surg. 2000; 231(2):153–8.
23. Sharma AK, Mittal S, Malvi SK. Association of Helicobacter pylori with peptic perforation in Chhattisgarh region of India. Trop Gastroenterol. 2000; 21(1):42–3.
24. Chu KM, Kwok KF, Law SY, Tuen HH, Tung PH, Branicki FJ, Wong J. Helicobacter pylori status and endoscopy follow-up of patient shaving a history of perforated duodenal ulcer. Gastrointest Endosc. 1999; 50(1):58–62.
25. Amin P, Cheng D. Management of complicated appendicitis in the pediatric population: when Surgery doesn't cut it. Semin Intervent Radiol. 2012; 29(3):231–236.
26. Kuhls TL. Appendicitis and pelvic abscess. Feigin and Cherry's Textbook of Pediatric Infectious Diseases. 7th ed. Philadelphia: Elsevier Saunders; 2014. 679–689.
27. Blundell S., Campbell A., Patel R., Besarovic S. Valentino's Syndrome in an adolescent boy with pepticulcer perforation simulating acute appendicitis. J Pediatr Surg Spec. 2015; 9(4):40–42.
28. Chen SC, Yen ZS, Wang HP, Lin FY, Hsu CY, Chen WJ. Ultrasonography is superior to plain radiography in the diagnosis of pneumoperitoneum. Br J Surg. 2002; 89:351–4.
29. Braccini G, Lamacchia M, Boraschi P, Bertellotti L, Marrucci A, Goletti O, et al. Ultrasound versus plain film in the detection of pneumoperitoneum. Abdom Imaging. 1996; 21:404–412.
30. Chen KC. Role of point of care ultrasound in the diagnosis of perforated peptic ulcer. Ultrasound in Medicine&Biology 2017; 43:111–112.
31. Cadenas RL, Martí de Gracia M, Saturio Galán N, Pérez Dueñas V, Salvatierra Arrieta L, Garzón Moll G. Use of multi detector computed tomography for locating the site of gastrointestinal tract perforations. Cir Esp.2013; 91:316–323.
32. Oguro S, Funabiki T, Hosoda K, Inoue Y, Yamane T, Sato M, et al. 64-Slice multi detector computed tomography evaluation of gastrointestinal tract perforation site: detectability of direct findings in upper and lower GI tract. Eur Radiol. 2010; 20:1396–403.
33. Chen CH, Huang HS, Yang CC, Yeh YH. The features of perforated peptic ulcers in conventional computed tomography. Hepatogastroenterology 2001;48:1393–6.
34. Solis CV, Chang Y, De Moya MA, GC Velmahos, Fagenholz PJ. Freeair on plain film: do we need a computed tomography too? J Emerg Trauma Shock.2014; 7(1):3–8.
35. Thorsen K, Glomsaker TB, vonMeer A, Søreide K, Søreide JA. Trends in diagnosis and surgical management of patients with perforated peptic ulcer. J Gastrointest Surg. 2011; 15:1329–35.
36. Yu SY, Chiu JH, Loong CC, Wu CW, Lui WY. Diagnostic laparoscopy: indication and benefit. Zhonghua Yi Xue Za Zhi (Taipei).1997; 59(3):158–63.
37. Yildiz T, Tilla Ilce H, Ceran C, Ilce Z. Simple patch closure for perforated pepticulcer in children followed by Helicobacter pylori eradication. Pak J Med Sci 2014; 30(3):493–496.