

Original Article

Efficiency of gastroscopy in the diagnosis of gastrointestinal tract diseases: a retrospective of 442 pediatric patients

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Abstract: Objective: To investigate the gastroscopy characteristics of children with digestive tract symptoms. Methods: A total of 442 children (age: 52 days-15 years) with gastrointestinal tract symptoms undergoing gastroscopy in the department of pediatrics of Hangzhou First People's Hospital from January 2010 to October 2013 were included in this study. The features of gastroscopy and biopsy pathology were analyzed, as well as the detection of *Helicobacter pylori* infection. Results: Two hundred and fifty-two cases showed abdominal pain and/or discomfort. Others showed concurrent symptoms, such as sour regurgitation and belching (n=56), nausea and vomiting (n=102), poor appetite (n=38), hematemesis and dark stools (n=15), chest pain (n=17), erythra in both lower extremities (n=12), and dysphagia (n=1). Among the 442 patients receiving gastroscopy examination, 248 (56.1%) were diagnosed with chronic superficial gastritis or antral gastritis, while the other showed concurrent conditions, including bile regurgitation (14.1%), duodenal bulb inflammation and/or gastric ulcer (12.9%), erosive gastritis (4.6%), esophagitis (2.3%), and foreign bodies in the esophagus (1.2%). Three hundred and one patients received histopathology examination in this study. A total of 246 patients (81.7%) were confirmed with chronic superficial gastritis according to the pathological report. Among these patients, 41 were in the active phase (16.7%) concurrent with 7 intestinal metaplasia (2.8%), 11 lymphocyte proliferation in stoma (4.5%), and 2 eosinophilic granulocyte proliferation in stoma (0.8%). In addition, 55 were confirmed with atrophic gastritis (18.3%), including 42 (76.4%) with mild atrophy and 13 (23.6%) with medium atrophy. Conclusion: Gastroscopy is effective for the diagnosis of digestive tract disease in pediatric patients.

Keywords: Gastroscope, helicobacter pylori, childhood

Introduction

Digestive tract disorder is commonly reported in pediatric children especially those aged less than 12-year-old [1, 2]. The disorder, mainly included chronic gastritis and peptic ulcer, causes great threats to the growth and development of children [3].

In adults, the diagnosis of digestive tract disorder is mainly depended on the gastroscopy [4, 5]. Despite the clinical diagnosis rate was greatly improved with the prevalence of gastroscopy in pediatrics, some children with lower tolerance to the procedure of gastroscope may present potential complications, which may affect the outcome of the disease [6]. To our knowledge, rare studies have been conducted

to investigate the efficiency of gastroscopy in pediatrics, especially those aged less than 12 yrs. This leads us to investigate the accuracy and diagnosis efficiency of gastroscopy in the pediatric patients.

In this retrospective study, 442 children with gastrointestinal tract disorders undergoing gastroscopy in our hospital within 3 years were included. We aimed to investigate the diagnostic efficiency of gastroscopy in pediatric patients.

Patients and methods

Patients

A total of 442 children (male: 211, female: 231; age: 52 days to 15 yrs, averaged age: 10.6 ±

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Table 1. Results of disease diagnosis in all age groups

Conditions	<3 years	3-6 years	7-12 years	>12 years	Total	P value
Superficial gastritis	6 (1.4)	31 (7.0)	134 (30.3)	77 (17.4)	248 (56.1)	0.00026
Bile regurgitation	2 (0.5)	1 (0.2)	25 (5.7)	34 (7.7)	62 (14.1)	0.00819
Bulb ulcer	2 (0.5)	2 (0.5)	18 (4.1)	31 (7.0)	53 (12.1)	0.00850
Bulb inflammation	0	3 (0.7)	29 (6.6)	20 (4.5)	52 (11.8)	0.21556
Esophagitis	0	3 (0.7)	2 (0.5)	5 (1.1)	10 (2.3)	0.09204
Erosive gastritis	1 (0.2)	1 (0.2)	5 (1.1)	13 (2.9)	20 (4.5)	0.07340
Gastric ulcer	0	1 (0.2)	1 (0.2)	1 (0.2)	3 (0.6)	N/A
Esophageal ulceration	0	0	0	1 (0.2)	1 (0.2)	N/A
Complex ulcer	0	0	0	1 (0.2)	1 (0.2)	N/A
Foreign body in esophagus	0	3 (0.7)	1 (0.2)	1 (0.2)	5 (1.1)	N/A
Esophageal hiatal hernia	1 (0.2)	0	0	0	1 (0.2)	N/A
Laceration of cardia orifice	1 (0.2)	0	0	0	1 (0.2)	N/A
Heterotopic pancreas	0	0	1 (0.2)	0	1 (0.2)	N/A
Gastric polypus	0	1 (0.2)	0	0	1 (0.2)	N/A
Normal	1 (0.2)	1 (0.2)	1 (0.2)	0	3 (0.6)	N/A

N/A: unsuitable for chi square test. The data were presented as n (%).

3.6 yrs) with gastrointestinal tract disorders undergoing gastroscopy in the department of pediatrics of Hangzhou First People's Hospital from January 2010 to October 2013 were selected in this study. Among the children, 9 cases were in infancy (age: 0-1 yr), 10 cases were in infancy (age: 1-3 yrs), 45 cases were in preschool age (age: 3-6 yrs), 211 cases were in school age (age: 7-12 yrs), and 167 cases were in puberty (age: >12 yrs). The study protocols were approved by the Ethical Committee of Hangzhou First People's Hospital.

Methods

The clinical manifestations and their general state of health were analyzed by sophisticated physicians. In addition, the data of gastroscope and pathology were collected, and the retrospective analysis was performed.

Statistical analysis

Measurement data were presented as mean $\pm$ standard deviation. Numeration data were presented as the percentage (%). Chi square test was used for the comparison among groups. The inter-group comparison was performed using SNK method and LSD method. All data were analyzed by SPSS 17.0, and $P < 0.05$ was considered to be statistically significant.

Results

Clinical manifestations of the patients

No distinctive conditions were identified in the pediatric patients as the general manifestations were diverse. Among these patients, 252 cases showed abdominal pain and/or discomfort and others showed concurrent symptoms, such as sour regurgitation and belching ($n=56$), nausea and vomiting ($n=102$), poor appetite ($n=38$), hematemesis and dark stools ($n=15$), chest pain ($n=17$), erythra in both lower extremities ($n=12$), and dysphagia ($n=1$).

Gastroscopy examination results

Among the 442 patients received gastroscopy examination, 248 (56.1%) were diagnosed with chronic superficial gastritis or antral gastritis, while the other showed concurrent conditions, including bile regurgitation ($n=62$, 14.1%), duodenal bulb inflammation and/or gastric ulcer ($n=57$, 12.9%), erosive gastritis ($n=20$, 4.6%), esophagitis ($n=10$, 2.3%), foreign bodies in the esophagus ($n=5$, 1.2%), esophageal ulceration ($n=1$, 0.23%), esophageal hiatal hernia ($n=1$, 0.23%), laceration of cardia orifice ($n=1$, 0.23%), heterotopic pancreas ($n=1$, 0.23%), and gastric polypus ($n=1$, 0.23%).

Patients with chronic superficial gastritis or antral gastritis account for 56.1% (248/442),

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Table 2. Results of biopsy pathology

Condi ti ons	<3 years	3-6 years	7-12 years	>12 years	Total
Superficial gastritis	5	16	125	100	246
Atrophic gastritis	2	1	20	32	55
Mild	1	1	17	23	42
Moderate	1	0	3	9	13
Severe	0	0	0	0	0

Table 3. Infection rate of *H. pylori*

	<12 years	>12 years
Positive	32	34
Negative	129	84

Table 4. Relationship between *H. pylori* and disease

Conditions	<i>H. pylori</i> positive	<i>H. pylori</i> negative
Superficial gastritis	17	153
Active phase of superficial gastritis	28	10
Atrophy	10	31
Active phase of atrophy	6	2
Peptic ulcer	28	1

patients accompanied by duodenal ampulla inflammation accounted for 11.8% (52/442), patients accompanied by bile regurgitation accounted for 14.1% (62/442), patients with bulbar ulcer and gastric ulcer accounted for 12.9% (57/442), patients with erosive gastritis accounted for 4.6% (20/442), patients with esophagitis accounted for 2.3% (10/442), patients with foreign bodies in the esophagus accounted for 1.2% (5/442), patients with normal gastric mucosa accounted for 0.6% (3/442), 1 case with esophageal ulceration, 1 case with hiatal hernia, 1 case with cardia tearing, 1 case with heterotopic pancreas, 1 case with gastric polypus (**Table 1**).

Histopathological analysis

Three hundred and one patients received histopathology examination in this study (**Table 2**). A total of 246 patients (81.7%) were confirmed with chronic superficial gastritis according to the pathological report. Among these patients, 41 were in the active phase (16.7%) concurrent with 7 intestinal memplasia (2.8%), 11 lymphocyte proliferation in stoma (4.5%), and 2 eo-

sinophilic granulocyte proliferation in stoma (0.8%). In addition, 55 were confirmed with atrophic gastritis (18.3%), including 42 (76.4%) with mild atrophy and 13 (23.6%) with medium atrophy. Nine patients (17.0%) were in an active phase, and 7 (13.2%) were in an active phase combined with intestinal memplasia.

Helicobacter pylori infection

H. pylori detection was carried out in 279 cases. Sixty-six patients (23.7%) showed positive results, among which 32 cases (19.9%) were aged less than 12-year-old. Besides, 34 cases (28.8%) were aged more than 12-year-old (**Table 3**). In this study, Chi square test was used to determine the correlation between *H. pylori* detection and various disorders, including superficial gastritis, active phase of superficial gastritis, gastric atrophy, active phase of atrophy, and peptic ulcer. The results revealed no obvious correlation between the *H. pylori* and these conditions (**Table 4**).

Discussion

Gastroscopy contributes to the direct and accurate diagnosis of upper digestive tract diseases in children [7]. It could directly display the location and features of the lesions [8]. Besides, great strides have been in the pediatric field including biopsy, endoscopy assisted management and detection of *H. pylori*. These procedures contribute to the elevation of accurate diagnosis of digestive tract disorders especially the gastritis, gastric ulcer, and digestive tract hemorrhage [9]. It could directly display the location and features of the lesions. Besides, great strides have been in that field including biopsy, endoscopy assisted management and detection of *H. pylori*. These procedures contribute to the elevation of accurate diagnosis of digestive tract disorders especially the gastritis, gastric ulcer, and digestive tract hemorrhage.

Despite the application of gastroscopy in the diagnosis of pediatric disorders, it has been reported to trigger complications such as hypoxia, asphyxia, aspiration pneumonia, arrhythmia, bleeding and perforation [10]. In this study, adult gastroscopy was used in the children, and no complication was found, which indicated that adult gastroscopy was still suitable for the children. As is known to all, digestive system

diseases in children showed no specificity, which was mainly complaint of abdominal pain and discomfort [11]. In line with this, 252 (57%) cases showed abdominal pain and discomfort, and the concurrent conditions included sour regurgitation and belching, nausea and vomiting, poor appetite, hematemesis, dark stools and thoracalgia. For the pediatric patients, careful inquiry was necessary as the chief complaint could not be fully expressed by the patients themselves. Moreover, swallow of foreign body by mistake was reported in 5 patients, including swallow of coins (60%) or button (40%) by mistake.

In our study, the disease detection rate was 99.3%. Inflammatory diseases were the main types of disorders in the patients. A large number of patients showed chronic gastritis, bile reflux gastritis, peptic ulcer and duodenitis with a proportion of 56.1%, 14.1%, 12.1%, and 11.8%, respectively. Statistical difference was observed in the incidence rate of chronic gastritis, bile reflux gastritis and bulb ulcer in children of school age (7-12 years) compared with those aged less than 3-year-old. No statistical differences were identified in the incidence rate of other diseases.

Bile reflux gastritis is mainly caused by an excessive reflux of duodenal contents into the stomach [12], which shows an incidence of more than 10% in adults. In our study, 14.1% cases showed bile regurgitation, which was similar to the ratio in adults. To date, radionuclide scintigraphy is the golden standard for the diagnosis of bile reflux gastritis based on the 24-hour monitoring of gastric bilirubin, however, the procedure is expensive with high technical demands [13]. Therefore, the diagnosis of such condition is still highly depend on the clinical manifestation and gastroscopy in China mainland [14]. Our results revealed the main symptoms of bile reflux gastritis were not specific, which were mainly featured by belching, vomiting, and abdominal pain accompanied by abdominal distension. In addition, statistical difference was identified in the incidence rate of bile reflux gastritis in the puberty group (>12 years) compared with the other patients. This may be related to the functional disturbance of vegetative nerves caused by heavy mental pressure. Subsequently, it may affect the coordination exercise of stomach-pylorus-duode-

num, and finally triggered the regurgitation of duodenum.

The diagnosis of gastric ulcer in pediatric patients was improved with the use of gastroscopy [15]. In children, ulcer was the second most common disease that was frequently reported in upper digestive tract. To our knowledge, the case history of ulcer in pediatric patients was not typical, and bulbar ulcer was the most common type of ulcer disease [16]. In our study, 15 cases showed dark stools and hematemesis, 53 cases (12.1%) with bulbar ulcer, and 3 cases (0.6%) with gastric ulcer. Besides, remarkable difference was noticed in the incidence rate of ulcer among patients of different ages. To be exact, the occurrence rate was highest in the puberty group (>12 years), which may be related with heavy mental pressure, living environment and *H. pylori* infection.

Tissue pathology biopsy helps the diagnosis of gastroscopy. In our study, results of biopsy pathology showed that chronic superficial gastritis accounted for 81.7% (246/301). Moreover, 18.3% (55/301) patients had atrophic gastritis, including 76.4% (42/55) mild atrophy, 23.6% (13/55) medium atrophy, and no severe atrophy. Of the atrophic gastritis, the infection rate of *H. pylori* was 32.7%, which indicated that the atrophic gastritis was related to *H. pylori* infection.

H. pylori infection has been considered as an important contributor to the digestive tract diseases in children [9]. In our study, *H. pylori* was detected in 23.7% of the patients. The infection rate in patients of school age was remarkably lower than those in the puberty age (19.9% vs. 28.8%). To explain this, we speculate that it may be related with the higher pressure as these patients showed similar symptoms as the adults, together with concurrence of complex ulcer, multiple ulcer, and bulbar ulcer.

We also determined the infection rate of *H. pylori* in several disorders. The results revealed the infection rate of *H. pylori* showed statistical difference in superficial gastritis, active phase of superficial gastritis, atrophic gastritis, active phase of atrophic gastritis, and peptic ulcer ($P < 0.0001$). The infection rate of *H. pylori* was up to 96.5% in patients with peptic ulcer. In addition, in line with the previous report [17],

the infection rates of *H. pylori* in active phase of superficial gastritis and active phase of superficial gastritis were 73.7% and 75.0%, respectively. This confirmed that *H. pylori* was the main etiological factor of chronic gastritis. To explain this, we assumed that a positive correlation may present between *H. pylori* infection and inflammation. As previously described, the *H. pylori* infection was remarkably correlated with the activity of various chronic gastritis.

In conclusion, gastroscopy is still suitable for the diagnosis of digestive tract disorders in pediatrics, which is considered safe and feasible. Gastroscopy should be performed timely for children with repeated pain in superior belly or umbilical part, belching, sour regurgitation, upper gastrointestinal hemorrhage, and dyspepsia.

Disclosure of conflict of interest

None.

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