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ORIGINAL ARTICLE
ORİJİNAL ARAŞTIRMA

Endoscopic and Histopathological Findings of Upper Gastrointestinal Tract Lesions in Pediatric age Group

Pediatrik Yaş Grubunda Üst Gastrointestinal Sistem Lezyonlarının Endoskopik ve Histopatolojik Bulguları

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ABSTRACT

Aim: Upper gastrointestinal (GI) tract endoscopy is a diagnostic procedure utilized to identify pathologies within this region, establish treatment plans, and determine prognoses. This procedure, commonly employed in adults, is now considered safe for use in pediatric patients. The objective of this study was to conduct a retrospective analysis of the results obtained from upper GI endoscopies performed on pediatric patients at a single center.

Material and Method: During the period between September 2017 and March 2020, we evaluated total of 488 patients who were aged between 5 months and 17 years and who underwent upper GI endoscopy and biopsy at the Pediatric Gastroenterology Department of Konya Training and Research Hospital.

Results: A total of 488 pediatric patients underwent upper GI endoscopy and biopsies were obtained in 30 months. The most commonly reported complaints were abdominal pain and dyspepsia. The most common lesions seen during the endoscopy procedure were gastritis, duodenitis and ulcers. Histopathologic examination revealed chronic gastritis in the stomach and chronic duodenitis and esophagitis in the duodenum and esophagus, respectively. In 195 cases, *Helicobacter pylori* infection was detected. Eight patients had intestinal metaplasia and three had gastric atrophy. Sixty-four patients were diagnosed with celiac disease and started on a gluten-free diet. Barret's esophagus was also detected in four patients.

Conclusion: Endoscopic procedures are becoming increasingly significant in diagnosing pediatric patients due to their ease of use under appropriate sedation and low incidence of complications. These procedures are crucial in ensuring accurate diagnosis and avoiding unnecessary treatment for children.

Keywords: Children, endoscopy, gastrointestinal system, biopsy

ÖZ

Amaç: Üst gastrointestinal (GI) sistem endoskopisi, bu bölgedeki patolojileri tanımlamak, tedavi planlarını oluşturmak ve prognozları belirlemek için kullanılan tanısal bir prosedürdür. Yetişkinlerde yaygın olarak kullanılan bu prosedürün artık çocuk hastalarda da kullanılmasının güvenli olduğu düşünülmektedir. Bu çalışmanın amacı, tek bir merkezde çocuk hastalara yapılan üst GI endoskopilerinden elde edilen sonuçların retrospektif bir analizini yapmaktır.

Gereç ve Yöntem: Eylül 2017 ile Mart 2020 tarihleri arasında, Konya Eğitim ve Araştırma Hastanesi Çocuk Gastroenteroloji Bölümü'nde üst GI endoskopi ve biyopsi yapılan, yaşları 5 ay ile 17 yaş arasında değişen toplam 488 hasta değerlendirilmiştir.

Bulgular: Otuz ayda toplam 488 pediatrik hastaya üst GI endoskopisi yapıldı ve biyopsiler alındı. En sık bildirilen şikayetler karın ağrısı ve dispeptik şikayetler idi. Endoskopi işlemi sırasında en sık görülen lezyonlar gastrit, duodenit ve ülserdi. Histopatolojik incelemede, midede en sık kronik gastrit, duodenumda ve özofagusta ise sırasıyla kronik duodenit ve özofajit saptandı. Olguların 195'inde *Helicobacter pylori* enfeksiyonu tespit edildi. Sekiz hastada bağırsak metaplazisi, üç hastada ise mide atrofisi görüldü. Altmış dört hastaya çölyak hastalığı tanısı konuldu ve bunun sonucunda glutensiz diyet başlandı. Ayrıca dört hastada Barret özofagusu tespit edildi.

Sonuç: Endoskopik işlemler, uygun sedasyon altında kullanım kolaylığı ve komplikasyon görülme sıklığının düşük olması nedeniyle pediatrik hastaların tanısında giderek daha önemli hale gelmektedir. Bu prosedürler, doğru teşhisin sağlanması ve çocuklarda gereksiz tedavilerin önlenmesi açısından çok önemlidir.

Anahtar Kelimeler: Çocuk, endoskopi, gastrointestinal sistem, biyopsi

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INTRODUCTION

The gastrointestinal tract (GIT) is a complex system comprising the esophagus, stomach, small intestine and large intestine, and it plays a vital role in maintaining homeostasis (1). While pathologies affecting this system can occur at any age, the causes and incidence rates vary between pediatric and adult patients (2). Over the past three decades, endoscopic procedures have become more frequent and safer, particularly in pediatric patients, leading to an increased understanding of pediatric GIT pathologies (3). Esophagogastroduodenoscopy (EGD), also known as gastroscopy, is crucial in defining pathologies within these regions, enabling biopsy, treatment planning, and prognosis determination.

Although its history dates back to 1000 AD, the first fully bendable endoscope was produced by Hirschowitz and Curtiss in 1957. In the 1970s, it started to be used in children. Especially in the last three decades, it has been introduced into routine practice with its increasing use worldwide, putting radiologic applications in the second plan (4-5).

As the frequency of pediatric EGD procedures has risen, so too has the incidence of diseases requiring EGD for diagnosis in children. However, this increase may be due to enhanced disease detection rates rather than a genuine rise in the number of cases. A study by Franciosi et al. revealed that the number of gastroscopies conducted in 2005 was 12 times higher than that in 1985 (4). The same study suggested that performing endoscopy in children with less severe clinical symptoms and obtaining more biopsies per procedure may have contributed to the increased diagnosis rates of lesions in the GI tract.

The objective of this study was to conduct a retrospective analysis of pediatric patients who underwent upper GI endoscopy at a single medical facility within three years. The study aimed to assess the indications for endoscopy, identify the findings and complications associated with the procedure, and evaluate its effectiveness in contributing to diagnosis and treatment.

MATERIAL VE METHOD

All pediatric patients who underwent upper GI endoscopy and biopsy at the Pediatric Gastroenterology Department of Konya Training and Research Hospital between September 2017 and March 2020 were included in this study.

Information regarding the age and gender of the patients at the time of diagnosis, indication for endoscopy, macroscopic findings during the endoscopy procedure, and presence of complications related to the procedure were retrieved from the database.

The available Hemotoxylin & Eosin, modified Giemsa and Periodic acid schiff -Alcian Blue stained pathology slides of the patients were re-evaluated independently by three blinded pathologists under a light microscope. They were re-examined for parameters such as inflammatory cell types and ratios, presence of metaplasia and dysplasia, villus and crypt abnormalities, and presence of infectious agents such as *Helicobacter pylori* and giardiasis.

The research project was discussed at the Local Ethics Committee of the Faculty of Medicine of Karatay University meeting on 17/06/2022 and approved with the decision number 2022/008.

RESULTS

A total of 488 patients aged between 5 months and 17 years underwent upper GI endoscopy during the study period. This number constituted 4.5% of all upper GI endoscopies (10671) performed in all age groups in our center. Of the patients, 333 were female (68.2%), and 155 (31.8%) were male. Children under ten years of age constituted 29.1% of the patients.

The most frequent indications for endoscopy in our center were chronic abdominal pain in 274 patients, dyspepsia in 122 patients, and nausea/vomiting in 70 patients (some of the patients presented to the outpatient clinic with more than one complaint). **Table 1** demonstrates the clinical characteristics of the cases.

Table 1. Demographic and clinical characteristics of the cases.

	n (%)
Gender	
Male	155 (31,8)
Female	333 (68,2)
Age group	
<1	5 (1,02)
1-5	50 (10,28)
6-10	87 (17,8)
>10	346 (70,9)
Indications for endoscopy *	
Abdominal pain	274 (56,14)
Dyspepsia	122 (25)
Nausea and vomiting	70 (14,34)
Developmental delay	34 (6,96)
Upper GIS bleeding	22 (4,5)
Diarrhea	13 (2,66)
Anemia	7 (1,43)
İngestion of caustic products	4 (0,81)

*Some of the patients presented to the outpatient clinic with more than one complaint.

There were no complications associated with the conscious sedation and the procedure.

Considering all age groups, 23 (4.7%) patients had normal EGD. Most lesions were observed in the stomach (73.9%). Endoscopy findings were gastritis in 361 cases, duodenitis in 133 cases, ulcer in 46 cases (8 esophageal, 12 gastric, 19 duodenal, 7 gastric and duodenal localization), and gluten enteropathy in 44 cases (Some patients had more than one finding on endoscopy) (**Table 2**).

Table 2. Endoscopic findings of the cases.

Endoscopic findings *	n (%)
Gastritis	361
Duodenitis	133
Ulser	46
Gluten enteropaty	44
Normal	23
Ectopic pankreas	3
Polyp	2
Pyloric dysfunction	1
Hiatal hernia	1

*Some patients had more than one finding on endoscopy.

Antrum/corpus biopsy was taken from all patients during the endoscopy procedure. In addition, duodenal biopsy was conducted in 310 patients, and esophageal biopsy in 34 patients. The histopathologic features of the cases are summarized in **Table 3**. Sidney classification (6) was performed in the pathology department, and chronic gastritis was observed in 305 gastric biopsy specimens. Chronic active gastritis was the second most common finding. Intestinal metaplasia was observed in 8 patients, and gastric atrophy in 3 patients. No dysplasia was observed. In 22 cases, no specific pathologic findings were observed. The most common finding on examination of duodenal tissues was duodenitis. Intestinal giardiasis was found in 2 cases. Sixty-four patients with villus crypt abnormalities and increased intraepithelial lymphocytes were evaluated for celiac disease. Based on the modified Marsh classification (7), 31 of 64 patients were classified as stage 3a, 25 as stage 3b, and eight as stage 3c. These patients with positive antigliadin antibodies were diagnosed with celiac disease, and gluten-free diet treatment was initiated. There were 74 patients evaluated as normal. Barret esophagus was observed in 4 of 34 patients whose esophageal tissues were examined. The youngest of these patients was five years old, and the oldest was 16 (mean age 11.2 years). One patient with Barret metaplasia had concomitant celiac disease and type 1 diabetes mellitus.

Helicobacter pylori infection was detected in 195 (40%) patients. Of these patients, 144 were girls, 52 were boys, and the mean age was 13 years. *H. pylori* was positive in 18 (39.1%) of 46 patients with ulcers on endoscopy. These patients were started on eradication treatment.

Table 3. Histopathological features of the cases.

	n
Antrum/corpus	488
Chronic gastritis	305
Chronic active gastritis	148
Chemical gastritis	11
Eosinophilic gastritis	1
Hyperplastic polyp	1
Normal	22
Duodenum	310
Duodenit	158
Celiac disease	64
Peptic duodenit	9
Eosinophilic duodenit	5
Normal	74
Esophagus	34
Esophagitis	16
Barret esophagus	4
Eosinophilic esophagitis	3
Squamous papilloma	1
Normal	10

DISCUSSION

The literature suggests that the frequency and indications for endoscopy in pediatric patients vary between developing and developed countries. Recurrent abdominal pain is reported to be the most common indication for pediatric EGD in developing countries, with rates varying between 22% and 90% in some studies. (8-12) Conversely, growth retardation has been reported as the most common indication in developed countries. (13). Other reasons include recurrent vomiting, chronic diarrhea, upper GI bleeding, and ingestion of foreign bodies. (14-15). In our study, abdominal pain was the most common indication for gastroscopy in all age groups and accounted for 56.14% of cases. This percentage was reaching 70%, in patients over the age of seven. The rate of patients presenting with developmental delay was 6.96%. It is worth noting that, compared to the last 30 years, the number of patients undergoing endoscopy for gastrointestinal bleeding has significantly decreased. These findings are consistent with the indications for endoscopy reported in the literature.

The appearance of normal mucosa in endoscopy does not always indicate normal tissue. According to the literature, when biopsies are taken only from mucosal areas that appear abnormal during pediatric endoscopies, 48.5% of cases can miss histopathological abnormalities. (16-17). Therefore, routine esophageal, gastric and duodenal biopsies are recommended during endoscopic procedures, even if the mucosa appears normal (18). The limitation of this study is that esophageal and duodenal biopsies were not obtained from all patients in endoscopy. In our study,

the GI mucosa was found to be normal in endoscopy procedure in 23 cases. However, when the biopsies were evaluated, it was seen that most of these patients had pathologic findings, 12 were diagnosed with *H. pylori* infection and 7 were diagnosed with chronic gastritis. Biopsy results were reported as normal in only 4 cases. These differences in endoscopic and histopathologic findings may be attributed to the fact that biopsies were taken from local areas during the procedure and the lesions were patchy.

Helicobacter pylori (HP) infection is crucial in developing gastritis, peptic ulcers, and duodenal ulcers. It has been identified as a primary carcinogen by the International Agency for Research on Cancer. It is less common in the pediatric age group than in adults, and its prevalence varies between 8% and 70%, depending on the country's developmental status. In developed countries, person-to-person transmission is the main transmission route, while poor hygiene conditions and low socioeconomic status are associated with its presence in developing countries. Eradication treatment for HP is crucial not only to alleviate symptoms but also to prevent late complications. In our study, 40% of cases were infected with HP and received eradication treatment.

Celiac disease has been identified as the most common underlying cause of developmental delay in children, as indicated by various studies (24-25). This condition is a malabsorption syndrome that develops in response to gluten protein in wheat. Although its prevalence varies depending on geographical region, it is estimated to be between 1:77 and 1:300 (17). In order to determine the indication for biopsy, patients' complaints, clinical findings, and some serologic tests can be useful. However, as serologic tests may yield false positive or negative results, a definitive diagnosis is made by small bowel biopsy. Histopathologic examination reveals flattening and atrophy of the villi, increased intraepithelial T lymphocytes, and crypt hyperplasia. These findings are graded according to the Marsh classification, which is widely used by clinicians. (7, 17, 26). Clinical symptoms in most cases of celiac disease tend to improve with a gluten-free diet. However, in rare cases where the response to the gluten-free diet is inadequate, suspicion of celiac disease should be considered. Especially in pediatric patients, poor dietary adherence may be a reason for lack of response to treatment. In our study, 20.6% of patients who underwent duodenal biopsy were diagnosed with celiac disease, with Marsh Stage 3a being the most common. Although this rate was high in our study, we think that factors such as the fact that most of the patients included in endoscopy were suspicious for celiac disease and that the patients were selected affected this rate. Gluten-free diet treatment was initiated in these patients.

Besides congenital anomalies such as esophageal atresia and tracheoesophageal fistula, the most common esophageal diseases in children are gastroesophageal reflux disease (GERD) and burns due to ingestion of corrosive substances (2, 22, 27). While GERD shows symptoms including epigastric pain, chest pain and dysphagia in adolescents and older children as well as in adults, whereas it shows findings including regurgitation, vomiting and refusal to feed in young children (28-29). Endoscopic evaluation is important for accurate diagnosis especially in young age groups who cannot express their complaints clearly. In addition, the esophagus is exposed to high levels of acid in the presence of hiatal hernia and as a result, patients are diagnosed with reflux esophagitis, especially Barrett esophagitis (22). Although very rare in the pediatric age group, esophageal adenocarcinoma developing on the background of Barrett's esophagitis and squamous cell carcinomas developing due to corrosive substance ingestion have also been reported in the literature. (30-31). In our study, Barrett's esophagitis was observed in 4 patients (0.8%). The mean follow-up period was 63 months and no malignancy was observed.

In the literature, the risk of complications associated with GI endoscopy is relatively low. Thakkar et al. reported a complication rate of 2.3% in a study including over 10,000 cases, with most being minor complications. The most frequently observed complication was transient hypoxia due to anesthesia. In the present study, no complications were observed in any patients who underwent GI endoscopy.

CONCLUSION

GI endoscopies have a low complication rate and can be performed easily with appropriate sedation. This retrospective study in a large patient group, supports the importance of endoscopic examination in pediatric patients with common GI complaints in making the correct diagnosis and preventing unnecessary treatment in accordance with the literature. However, more studies are needed to standardize the identification of patients who should undergo endoscopic examination after a detailed physical examination and careful history in patients presenting with recurrent complaints.

ETHICAL DECLARATIONS

Ethics Committee Approval: The research project was discussed at the Local Ethics Committee of the Faculty of Medicine of Karatay University meeting on 17/06/2022 and approved with the decision number 2022/008.

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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