The role of heterotopic gastric mucosa with or without colonization of Helicobacter pylori upon the diverse symptomatology of Meckel's diverticulum in children

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SUMMARY: Oğuzkurt P, Talim B, Tanyel FC, Çağlar M, Şenocak ME, Büyükpamukçu N. The role of heterotopic gastric mucosa with or without colonization of Helicobacter pylori upon the diverse symptomatology of Meckel's diverticulum in children. Turk J Pediatr 2001; 43: 312-316.

The roles of heterotopic gastric mucosa either with or without colonization of Helicobacter pylori (HP) upon the diverse symptomatology of Meckel's diverticulum (MD) in children have been evaluated retrospectively. The medical records of 92 patients who underwent MD excision either incidentally or symptomatically between 1976 and 1997 were reviewed retrospectively. Age at admission and symptoms were recorded. The slides were stained with hematoxylin eosin and Giemsa to identify the presence of heterotopic tissue, ulceration, hemorrhage, inflammation and HP. Bleeding, obstruction and inflammatory groups were statistically compared with chi-square test. The age of the patients ranged between 1 day and 14 years with a mean of 3.5 ± 3.8 years. The male: female ratio was 3.6:1. Among 92 MD, 18 (19.5%) were removed incidentally, one of which had heterotopic gastric mucosa. The indications for surgical removal of MD were intestinal obstruction, diverticulitis and bleeding in 45 (48.9%), 11 (11.9%) and 18 (19.5%) patients, respectively. Heterotopic gastric mucosa was detected in 28 (30.4%) patients, of whom 8, 3, and 16 presented with intestinal obstruction, diverticulitis and bleeding, respectively.

Helicobacter pylori was not detected in one patient with incidental removal of MD; with heterotopic gastric mucosa however, three patients with obstruction, one patient with diverticulitis and one patient with bleeding had HP in the heterotopic gastric mucosa located in MD. MD may become symptomatic due to a complicated course such as rectal bleeding, intestinal obstruction or diverticulitis. The presence of heterotopic gastric mucosa in MD seems to mainly associate with rectal bleeding. The presence of HP colonization in heterotopic gastric mucosa does not increase the incidence of rectal bleeding. The other complications of MD, including intestinal obstruction and diverticulitis, are not directly related to the presence of heterotopic gastric mucosa in the MD. However, colonization of heterotopic gastric mucosa by HP seems to increase the incidence of these complications.

Key words: Meckel's diverticulum heterotopic gastric mucosa Helicobacter pylori.

Meckel's diverticulum (MD) is the most common congenital anomaly of the gastrointestinal tract. It represents the failure of regression of the vitelline duct, a process that normally occurs between the 5th and 7th week of fetal life[1,2]. The incidence of MD is reported to vary between 0.3 and 3.0% of the population[3].

While the majority of MD cases are asymptomatic and are detected incidentally during laparotomy in adult series[2], MD is usually symptomatic in childhood. The clinical presentations are usually associated with complications. The most common clinical presentations of MD are lower gastrointestinal

bleeding, intestinal obstruction due to intussusception, volvulus or band, and inflammatory complications[1]. Complications are often reported to be associated with the presence of heterotopic mucosa within the diverticulum, with gastric heterotopia being the most common type[2,3].

Helicobacter pylori (HP) is a microorganism which locates in the gastric mucosa. It may also locate in gastric mucosa at heterotopic locations. HP located in heterotopic gastric mucosa has been suggested to associate with a complicated course. Hemorrhagic cystitis following bladder augmentation with the use of stomach and rectal bleeding due to heterotopic gastric mucosa have been implicated to be associated with the presence of HP[4,5].

Since the MD frequently contains heterotopic gastric mucosa, a retrospective study was planned to define the role of heterotopic gastric mucosa either with or without superimposed HP colonization on the complicated course of MD in children.

Material and Methods

During a 21-year period from 1976-1997 inclusive, a total of 92 surgically removed MD cases were evaluated retrospectively. The medical records of the patients were reviewed and age at admission and symptoms were recorded. In addition to initial slides, 10 additional slides were prepared from the paraffin blocks for each of the specimens. The slides were stained by hematoxylin-eosin and Giemsa, and were evaluated for the presence of heterotopic tissue, ulceration, hemorrhage, inflammation and HP. While the presence of lymphocytes and plasma cells was accepted as chronic inflammation, additional presence of neutrophils was regarded as active chronic inflammation. Identification of characteristic curved wavy to spiral bacilli in hematoxylin-eosin and Giemsa stained sections indicated the presence of HP. All of the samples were evaluated by two pathologists of the study group.

The patients were classified according to the clinical picture that necessitated the removal, and included incidental, obstructive, inflammatory and bleeding groups.

Removal of MD during laparotomies for other reasons such as intestinal atresia, gastroschisis, omphalocele, malrotation, appendicitis and during splenectomies for hematologic diseases constituted the incidental diverticulectomies.

Patients with obstructions were further divided into subgroups according to the mechanism of obstruction. If the MD was the leading point in intussusception, those patients were regarded as having invaginating MD. If the obstruction was associated with a persisting omphalomesenteric band from the tip to the umbilical region, patients were included into the omphalomesenteric band MD group. If the obstruction developed due to the adherence of MD to neighborhood structures resulting in volvulus due to kinking, twisting or internal herniation in the absence of an omphalomesenteric band, the obstruction was regarded as adhesive MD obstruction.

Patients with inflammation or perforation due to diverticulitis were accepted as diverticulitis associated MD.

If the reason for removal was rectal bleeding, these patients were classified as bleeding MD.

Incidences of presence of gastric mucosa and of HP in the heterotopic gastric mucosa were determined. The mean ages of the patients among the groups were compared with Student's t-test, and the incidence of heterotopic gastric mucosa and HP among the groups was compared using chi-square test. P values less than 0.05 were considered significant.

Results

Ninety-two patients (72 males, 20 females; male to female ratio 3.6: 1) were included in the study. The ages of the patients ranged between newborn to 14 years with a mean age of 3.5 ± 3.8 years.

Among 92 diverticulectomies, 18 (19.5%) were performed incidentally. The reasons for surgical intervention were intestinal obstruction, diverticulitis and bleeding in 45 (48.9%), 11 (11.9%) and 18 (19.5%) patients, respectively. Statistical analysis of mean ages of the patients between groups revealed no difference ($p > 0.05$). Adhesion of the MD to surrounding structures including mesentery and adjacent intestinal loops was the most common mechanism of obstruction, encountered in 31 patients (68.8%). Obstruction resulted from invaginating MD in 12 patients (26.6%) and from omphalomesenteric band MD in two patients (4.4%).

Evaluations revealed the presence of heterotopic gastric mucosa in 28 patients (30.4%). Heterotopic gastric mucosa was present more frequently among the symptomatic children

($p < 0.0001$). Heterotopic gastric mucosa was determined in one patient (1.08%) who underwent incidental removal of MD, and in eight (8.7%), three (3.2%) and 16 (17.3%) patients who presented with intestinal obstruction, diverticulitis and bleeding, respectively (Table I). Gastric mucosa had significantly higher incidence ($p < 0.05$) in the bleeding MD group when compared to the obstructive MD and diverticulitis associated MD groups.

Among the 45 patients with obstruction, the presence of gastric mucosa varied according to the mechanism of obstruction. Six among 31 patients with adhesive MD and one patient from each of the groups of invaginating MD and omphalomesenteric band MD had heterotopic gastric mucosa (Table II). No significant difference was found in the presence of heterotopic gastric mucosa between the groups with various obstructive mechanisms ($p > 0.05$).

All three patients with HP colonization in the obstruction group had adhesive MD obstruction (Table I). Comparison of bleeding and other complications of MD, including the obstruction and diverticulitis groups, revealed that the presence of HP in the heterotopic gastric mucosa increased the incidence of complications other than bleeding significantly ($p < 0.05$).

Among 23 patients with heterotopic gastric mucosa but without HP colonization, seven patients (30.4%) had no additional histopathologic findings. Superficial submucosal and serosal hemorrhage were detected in three specimen. Hemorrhage with active chronic inflammation or chronic inflammation was detected in two and one patients, respectively. While ulceration with active chronic inflammation was detected in five specimens, chronic inflammation was associated with ulceration in one specimen. Hemorrhage, ulceration and active chronic inflammation were detected in another specimen.

Table I. Clinical Data of Patients Who Underwent Meckel's Diverticulum Removal Either Incidentally or Symptomatically

Reason	Mean age of the patients	No. of patients	Patients with gastric mucosa n (%)	Patients with HP n (% in total), (% in gastric mucosa)
Incidental	4.1 ± 4.5	18	1 (1.08)	–
Obstruction	2.9 ± 3.5	45	8 (8.70)	3 (3.20) (10.7)
Bleeding	2.5 ± 2.6	18	16 (17.3)*	1 (1.08) (3.50)
Diverticulitis	6.2 ± 5.0	11	3 (3.20)	1 (1.08) (3.50)
Total	3.5 ± 3.8	92	28 (30.4)	5 (5.40) (17.8)

HP: Helicobacter pylori.
* Significanly different from other groups within the column ($p < 0.05$).

Table II. Clinical Data of Patients in Obstructive Meckel's Diverticulum Group According to the Mechanism of Obstruction

Mechanism of obstruction	Mean age of the patients	No. of patients	Patients with gastric mucosa	Patients with HP
Intussusception	2.8 ± 3.5	12	1	0
Omphalomesenteric band	7.4 ± 9.3	2	1	0
Adhesive	3.2 ± 3.3	31	6	3
Total	2.9 ± 3.5	45	8	3

HP: Helicobacter pylori.

Helicobacter pylori was not detected in the paitent with incidental MD removal who had heterotopic gastric mucosa. On the other hand, HP was found in the heterotopic gastric mucosa of three, one and one patients who presented with intestinal obstruction, diverticulitis and bleeding, respectively.

Among the five patients with HP colonization, two had hemorrhage accompanied by a mild active chronic inflammation, one had hemorrhage, ulceration and active chronic inflammation, one had hemorrhagic necrosis and active chronic inflammation, and one had only active chronic inflammation.

Discussion

The incidence of heterotopic gastric mucosa in MD is reported to range between 10 to 25% in adult series. According to the reported two series in the literature evaluating pediatric patients, 179 patients were asymptomatic and 202 were symptomatic[7,8]. Five percent of the asymptomatic and 56% of the symptomatic patients had heterotopic gastric mucosa[7,8]. Among symptomatic patients, heterotopic gastric mucosa was detected in 80% of patients who presented with rectal bleeding[7,8]. Although the exact rate of heterotopic gastric mucosa incidence has not been reported in children, 54% of the symptomatic patients were reported to have heterotopic mucosa in the diverticulum, most of which was gastric mucosa[1]. Among our patient population, 28 paitents (30.4%) out of 92 with MD had heterotopic gastric mucosa. All but one of the patients with heterotopic gastric mucosa presented with signs directly related to MD or to the complications of the MD. If incidental diverticulectomies were excluded and only symptomatic patients considered, the incidence of heterotopic gastric mucosa reached 36.5%. The only patient who was incidentally found to have MD with gastric mucosa had been operated for duodenal web and malrotation.

Helicobacter pylori is a small, spiral Gram-negative bacillus that can colonize only in human gastric mucosa[9,10]. Colonization of the gastric mucosa with HP is a very common finding in duodenal ulcers and active chronic gastritis[10]. Outside the stomach, HP has always been associated with gastric type mucosa, such as gastric heterotopia in the duodenum and in Barrett's esophagus[9]. It has been reported that HP could also colonize the heterotopic gastric epithelium in the rectum and in the stomach which has been used for bladder augmentation, and the heterotopic gastric mucosa of MD, though these are rarely encountered[4,5,11]. In the English language literature there are adult series reviewing the presence of HP in heterotopic gastric mucosa located in MD. DeCothi et al.[12] reported that eight of 13 patients with heterotopic gastric mucosa had evidence of histologic gastritis, but only four patients had HP-like organisms. On the other hand, Morris et al.[11] reviewed 228 diverticula, of which 65 contained gastric mucosa. Of the four cases with inflammation restricted to gastric mucosa, HP-like organisms were detected in one. In the series of Fich[9], no evidence of HP was detected in the gastric epithelium of MD. Bemelman et al.[6] reported that of the 18 patients with gastric mucosa in MD, 16 were with inflammation. HP-like organisms were identified in one of the patients who underwent an incidental diverticulectomy.

When bleeding is the presenting manifestation of MD, gastric mucosa is almost always present[1]. Heterotopic gastric mucosa was detected in 98% of the patients presenting with rectal bleeding[7,8]. In the present series, of 28 patients with heterotopic gastric mucosa, 16 (57.1%) were admitted with rectal bleeding. Among 18 patients who presented with rectal bleeding, 16 (89%) had heterotopic gastric mucosa. Among those patients, HP was detected in only one patient. In 11 patients presenting with other complications of MD such as diverticulitis and obstruction, which are not directly related to the presence of heterotopic gastric mucosa, HP was detected in four of the resected specimens. In all patients with HP colonization, active chronic inflammation accompanied by submucosal and serosal hemorrhages, ulcerations or hemorrhagic necrosis was detected.

The presence of heterotopic mucosa in MD, of which 65-90% has been reported to be gastric mucosa, has been implicated as causing the symptoms and complications in more than 50% of the symptomatic cases[2,3]. However, gastric mucosa was detected in 36.5% of the symptomatic patients in our series. The rate of heterotopic gastric mucosa incidence was 89% in the patients who presented with rectal bleeding. The association of the presence of heterotopic gastric mucosa and bleeding is significant. This result is compatible with the other large series in the literature[7,8]. Therefore, bleeding MD seems to be mainly related to the presence of heterotopic gastric mucosa.

Among the reported 114 symptomatic patients with heterotopic gastric mucosa in MD, 23 (20%) presented with intestinal obstruction or inflammation[7,8]. Therefore, the presence of heterotopic gastric mucosa in MD has not been accepted as a contributory factor to complications such as obstruction and diverticulitis. In the present series, among 27 symptomatic patients with heterotopic gastric mucosa, three and eight patients, respectively, had diverticulitis and

obstruction. On the other hand, among 47 symptomatic patients without gastric mucosa, 37 presented with obstruction and eight presented with diverticulitis. Therefore, our series also confirmed that the presence of heterotopic gastric mucosa does not contribute to complications other than bleeding. Furthermore, the presence of gastric mucosa does not seem to mandate histopathological findings even in symptomatic patients. The histologic examination of six paitents (27%) without HP colonization revealed normal histology in our series.

Helicobacter pylori colonization in the heterotopic gastric mucosa did not increase the risk of bleeding. On the other hand, incidence of other complications, including obstruction and diverticulitis, seemed to be increased with the colonization of HP.

Meckel's diverticulum may present with diverse symptomatology such as rectal bleeding, intestinal obstruction or acute abdomen due to inflammatory complications. The presence of heterotopic gastric mucosa does not always cause histopathological findings even in symptomatic patients. Heterotopic gastric mucosa does not seem to contribute to the symptomatology of MD other than bleeding. On the other hand, colonization of HP causes an active chronic inflammation in the heterotopic gastric mucosa, and it seems to increase the risk of diverticulitis and intestinal obtruction.

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