Helicobacter pylori infection and mast cells of the antrum mucosa

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Abstract

The studies aimed at evaluating mast cells in inflammatory infiltration of gastric mucosa in children with H. pylori infection, as well as in those after the infection eradication.

Biopsy specimens of gastric mucosa were evaluated, the specimens collected from 59 H. pylori-positive patients (Group I), 29 patients after H. pylori infection (Group II) and 18 H. pylori-negative children (Group III). The specimens were assessed for infection and inflammation and stained with anti-human mast cell tryptase to count mucosal mast cells. The evaluations of histopathological changes in the antrum mucosa of the children were performed, according to Sydney's Classification. In morphometric evaluation, slight differences were found in the numbers of mast cells among Groups: I, II and III of the examined children (the number of mastocytes being: 86.4, 81.4 and 70.2 cells/mm^2 of specimen, respectively).

Key words: Helicobacter pylori, antrum mucosa, mast cell.

Introduction

Helicobacter pylori (H. pylori) infection elicits conspicuous infiltration with neutrophils, eosinophils, lymphocytes and plasma cells. The pathogenesis of the basic lesion, i.e., chronic active inflammation of the gastric mucosa, remains incompletely understood. Following the results of to-date's studies, it has been proven that cytokines, produced by mast cells, affect all the effector cells of inflammation, as well as the majority of reactions, which occur at the site of action of an inflammation inducing stimulus [1, 2]. H. pylori or H. pylori extracts (potentiate histamine release from serosal rat mast cells in vitro and can induce mast cell degranulation around rat mesenteric venules) lead to mast cell degranulation and to a release of active chemical compounds in in vitro conditions [3]. Using a monoclonal antibody for human mast cell tryptase for mucosal mast cell identification in formalin-fixed human tissue, a study was designed, attempting to determine whether mast cells participate in inflammatory responses of the gastric mucosa, in order to evaluate their possible role in the inflammatory infiltrations of H. pylori-infected children, as well as in children after H. pylori infection eradication.

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Material and methods

Gastric mucosal biopsy specimens from the following three groups of individuals were studied by light microscopy: (I) 59 children (29 girls and 30 boys; the age range: 2-19 years) with chronic active inflammation of the gastric mucosa with H. pylori infection with positive IgG antibody anti- H. pylori; (II) 29 children (14 girls and 15 boys; the age range: 3-19 years) after H. pylori infection without timely colonization and without active inflammation of the gastric mucosa with maintaining positive IgG antibody anti- H. pylori. (III) 18 children (12 girls and 6 boys; the age range: 5-17 years) with gastrointestinal disease, without H. pylori infection, with correct levels of IgG antibody anti- H. pylori. In all the examined children, endoscopic examinations and histopathological studies of the stomach were performed, classifing the obtained results in accordance to Sydney's Classification [4].

The urease test was performed in the course of endoscopy in all the children.

The specimens were fixed in 10% buffered formalin. They were processed, oriented on edge, embedded in paraffin, cut in sequential 5-µm sections, and stained by haematoxylin and eosin (H+E) for the evaluation of inflammation and by the Giemsa method. All the biop-

Table 1. Mast cells in the antrum mucosa of the examined children.

Experimental Groups	Mast cells in the antrum mucosa /mm²								
	Number of patients (N)	Result (min)	Result (max)	Arithmetic mean (x)	Median value (ME)	Mode	Standard deviation (SD)	Low quartile	High quartile
Group I	25	0	187	86,4	99,0	0	46,5	53,0	107,0
Group II	15	52	113	81,4	78,0	52	21,1	65,0	101,0
Group III	6	32	101	70,2	82,5	-	30,0	44,8	88,8

Figure 1. The degree of inflammation of the antrum mucosa in the examined children

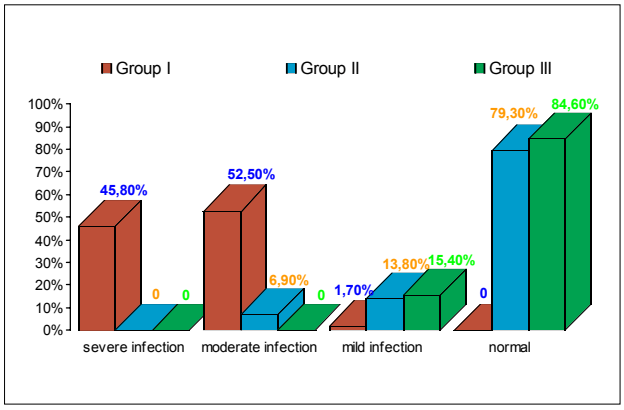
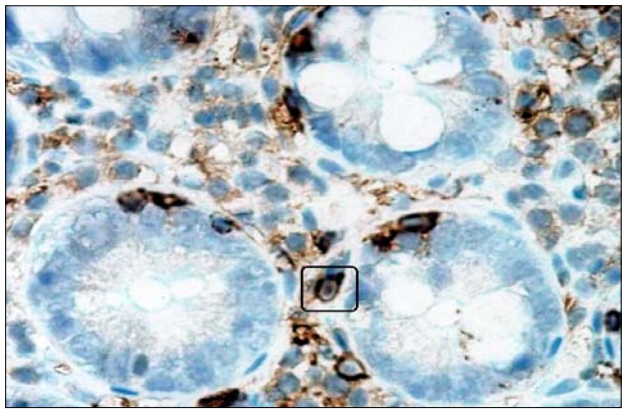


Photo 1. Antrum mucosa. Immunohistochemical reaction with mast cells (tryptase-positive). Magnification 400x.



sy specimens from each of study group were stained by an immunohistochemical method for the evaluation of mast cells in the mucosa. The ABC method was used, according to commercial protocol. The number of mast cells in the mucosa was counted in discrete areas, measuring 0.785 mm² each, by using a light microscope. All the counts were performed, using a magnification of 200x.

The numbers of positively stained cells were presented as the mean values per 1 mm² of analysed gastric section area. All the mast cell counts were performed by a single observer (I. K.), who was unaware either of the H. pylori status or of the subject's clinical group.

The analysis of the preparations and their photographic documentation were performed with an Olympus Bx50 light microscope, with a video circuit and a Pentium 120 PC computer with the Lucia G (Nikon) software for microscope image analysis.

Mast cell density was compared between the groups of studied subjects, using the Student's't' test. Statistical calculations included the arithmetic mean, standard deviation (SD), the median value (ME), the minimal result (min) and the maximal result (max). The levels of the studied parameters were compared by means of Student's t test, either for independent or paired tests. All the differences were regarded significant at $p<0.05$. The obtained results have graphically been presented. Both the clinical examinations and all the laboratory tests were performed in the children, following previous unrestrained consents of their parents or legal protectors and an approval of the Ethical Commission at the Medical University of Białystok.

Results

According to Sydney's Classification, severe gastric mucosa inflammation was diagnosed in only 45.8% of the children in Group I, moderate - in 52.5% of the children with H. pylori infection and in 6.9% of the children after H. pylori infection eradication, mild - in 1.7% of the children in Group I, in 13.8% of the patients in Group II and in 15.4% of the children in the control group. Normal gastric mucosa of the antrum was found in 79.3% of the children from Group II and in 84.6% of the children in the control group (Fig. 1).

A quantitative assessment of mast cells in the antrum mucosa (the mean number of cells per 1 mm² of specimen area), performed by immunohistochemical staining, revealed comparable numbers of mast cells in the group of H. pylori-affected children (86.4 ± 46.5 cells/mm²), in the group after H. pylori infection eradication (81.4 ± 21.1 cells/mm²) and in the control group (70.2 ± 30 cells/mm²) (Table 1, Photo 1).

Discussion

Mast cells are an important element in the cellular infiltration in the course of gastric mucosa inflammation with H. pylori infection [2, 5]. In result of secreted mediators, mast cells actively participate in the induction and enhancement of the inflammatory process by their influence on: vascular dilation and an increased

blood flow capacity, migration of inflammatory cells and inflammatory infiltration development [3, 6].

There is but little data in the available literature, concerning the number of mast cells in chronic inflammation of the gastric mucosa of H. pylori aetiology in children. In own studies of children with gastric mucosa inflammation in the course of H. pylori infection, the number of mastocytes in the antrum mucosa was not statistically significantly higher from the number of cells in the group of children with gastric mucosa inflammation, in whom the bacteria had been eradicated. The number of mast cells did not change with inflammatory process enhancement in the antrum mucosa. Similar results were obtained by Sulik, who had employed the same diagnostic approach [3]. In studies, concerning adult population, Nakajiama et al. [6] demonstrated an increased number of mast cells in gastric mucosa inflammation with H. pylori infection. The obtained results correlated with the degree of inflammation, while the number of mast cells decreased after treatment. In contrast to the population of children, the absolute numbers of mast cells were higher in adults, what may be explained by their number, increasing with the body growth and the achievement of target values in the adult age. Similar observations were also made by Whitneyet et al. [7]. Kurose [8] was the first, who demonstrated that H. pylori extracts could induce mast cells to degranulation. That was found already after 10 minutes from the mesentery exposition to an aqueous extract of H. pylori. Activated mast cells release also pro-inflammatory factors, which may increase vascular flow capacity. Attention should be drawn to the increased numbers of mast cells, found in gastric biopsy specimens from not only H. pylori-infected children but also from those infected by Giardia Lamblia intestinalis but without any clinical or biochemical features of alimentary allergy [5].

The results of the studies suggest that mast cells play an important role in disturbing the functioning of the gastric mucosa in infected children but without allergy features.

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