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Research Article

Peculiarities of the Acid-Producing Function of the Stomach in Patients with Giant Ulcers of the Duodenum and Pyloric Canal

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Abstract

The aim of our study was to investigate the nature of gastric acid production in patients with giant (more than 20 mm) duodenal ulcers and with pyloric duodenal ulcers, as well as its features and the degree of vagus nerve influence on hypersecretion in two groups of patients. We studied the acid-producing function of the stomach in 65 patients with giant pyloroduodenal ulcers. Patients were divided into two groups on the basis of ulcer defect localisation: in 28 patients the ulcer defect was determined in the duodenal bulb without involvement of the gatekeeper, and also in the postbulbar section and in 37 patients the defect was localised in the area of the gatekeeper with transition to the proximal section of the bulb. Gastric secretion was investigated by aspiration-titration method with stimulation according to A. Kay and «imaginary root». Kau and «sham feeding», according to O. Noring. The obtained results of studying the acid-producing function of the stomach in patients with giant pyloroduodenal ulcers. According to the results of our study, both basal hypersecretion and excessive acid production in response to maximal stimulation by histamine and modified sham feeding were observed in patients with pyloric canal ulcers and with duodenal bulb ulcers. Patients with bulb ulcers showed greater stimulation by sham feeding than patients with pyloric canal ulcers. Patients with pyloric canal ulcers showed a greater secretory response under maximal histamine stimulation than patients with bulb ulcers. In summary, we determined that patients with giant duodenal bulb ulcers have a hyperreactive (vagal) pattern of acid production. On the contrary, in patients with giant ulcers of the pyloric duct a non-vagus type of stimulation of gastric secretion was observed.

Keywords: Gastric and Duodenal Ulcer Disease; Acid Production; Giant Ulcers; Gastric Secretion; Pyloroduodenal Ulcers

Introduction

Topicality of the problem

One of the serious aspects of the treatment of gastric and duodenal ulcer disease remains not completely solved questions of surgical treatment of giant pyloroduodenal ulcers, the frequency of detection of which varies from 1.23 to 25%, and the share in the structure of operative activity is from 5% to 22, 3% [1-6,12]. First described in 1931 by I.G. Brdiczka [7] duodenal ulcers with a crater of more than 20 mm were subsequently named by F. Knuttson as "giant" [8]. At present, gastric body ulcers with a crater size of 30 mm or more and pyloroduodenal ulcers with a crater size of 20 mm or more are considered giant [3]. Ulcers of large sizes are difficult to be medically treated, usually penetrate into neighbouring organs and structures, and more often than ulcers of normal sizes have a complicated course [9-13,31,33]. Combined complications are most typical for patients with giant ulcers [14,32]. In this regard, a number of authors consider giant ulcers to be a severe form of peptic ulcer disease associated with the development of life-threatening complications [3,6,15,31-33].

The data of few studies of the acid-producing function of the stomach in patients with giant pyloroduodenal ulcers allow us to conclude that the main link in their pathogenesis, as well as in ulcers of normal size, is the acid-peptic factor [34-37]. At the same time, Lopes [24], Baron [27], Muller and Martinoli [26] pointed out the difference between the acid-producing function of the stomach

in patients with pyloric and prepyloric ulcers and with duodenal ulcers of normal size. The indices of gastric secretion occupied an intermediate place between ulcers of the stomach body and ulcers of the duodenal bulb. We did not find similar studies in patients with giant duodenal and pyloric ulcers.

Materials and Methods

The acid-producing function of the stomach was studied in 65 patients with giant pyloroduodenal ulcers who were undergoing inpatient treatment in surgical departments of Municipal Clinical Hospital No. 7 in Moscow (now the S.S. Yudin Clinical Hospital, which is the clinical base of the Department of Hospital Surgery of Sechenov University). The study was carried out in 65 patients with giant pyloroduodenal ulcers undergoing inpatient treatment in the surgical departments of GKB No. 7 in Moscow (currently S.S. Yudin Clinical Hospital), which is the clinical base of the Department of Hospital Surgery of Sechenov University. Among the examined patients there were 53 (81,5 %) men and 12 women (18,5 %). The average age of the patients was 49±2.1 years. Along with endoscopic and radiological investigations, taking into account pronounced deformation of pyloroduodenal region, the final localisation of ulcer defect was determined intraoperatively. Pyloric canal ulcers included ulcers located in the area of the gatekeeper, including those involving the upper-horizontal part of the duodenum. Ulcers localised in the bulb of the duodenum, without involvement of the gatekeeper, as well as in the postbulbar section, were referred to duodenal ulcers observed in 28 (43,07%) patients. In 37 (56,93 %) patients the ulcer defect was localised in the area of the gatekeeper with transition to the proximal part of the bulb.

The study of gastric secretion was performed by the aspiration-titration method. The maximum histamine test of Kau [18], as well as the modified «sham feeding» test proposed by O. Noring to assess the degree of influence of the parasympathetic nervous system on acid secretion were used [19]. Noring to assess the degree of influence of parasympathetic nervous system on acid production [19].

Gastric juice volume was estimated on fasting, after stimulation with modified sham feeding and maximum histamine stimulation. In addition, basal acid production (BAO), maximum histamine stimulated (MAO) and sham-feed stimulated (SAO) acid production were calculated based on the total hydrochloric acid flow rate in each of eight 15-minute servings [18]: 4 servings before stimulation and 4 servings after stimulation.

Statistical processing of data was performed using Microsoft Excel and Statistica 10 programmes. Statistical analysis was performed using parametric statistical methods. Reliability of differences was assessed by Student's t-criterion.

Results

The obtained results of studying the acid-producing function of the stomach in patients with giant pyloroduodenal ulcers are presented in the diagrams (Figure 1,2).

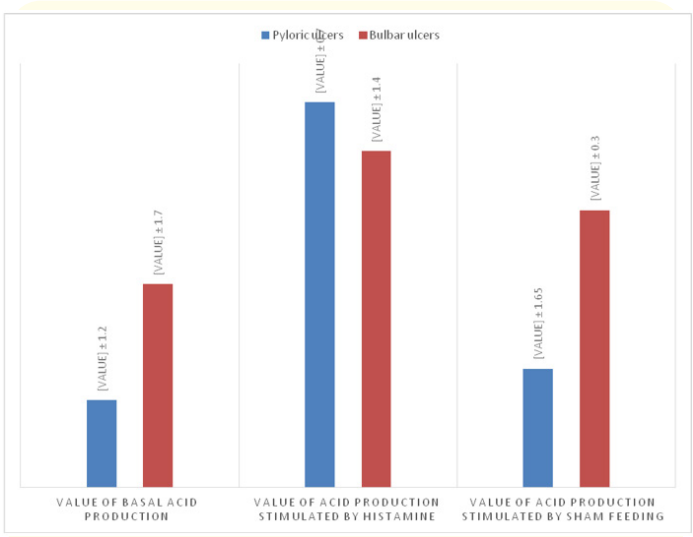

Figure 1: Values of volume (ml) of gastric juice on an empty stomach, as well as after maximum stimulation with histamine and sham feeding in patients with giant ulcers of the pyloric canal and duodenal bulb.

As follows from the data obtained, both basal hypersecretion and excessive acid production in response to maximal stimulation with histamine and modified sham feeding were observed in patients with pyloric duct ulcers and duodenal bulb ulcers. Significant differences in the two groups of patients concerned, first of all, the severity of secretion depending on its stimulation in the two studied groups. In patients with bulb ulcers there was a more significant stimulation by sham feeding than in patients with pyloric canal ulcers. At the same time, patients with pyloric canal ulcers demonstrated a greater secretory response under maximal histamine stimulation than patients with bulb ulcers.

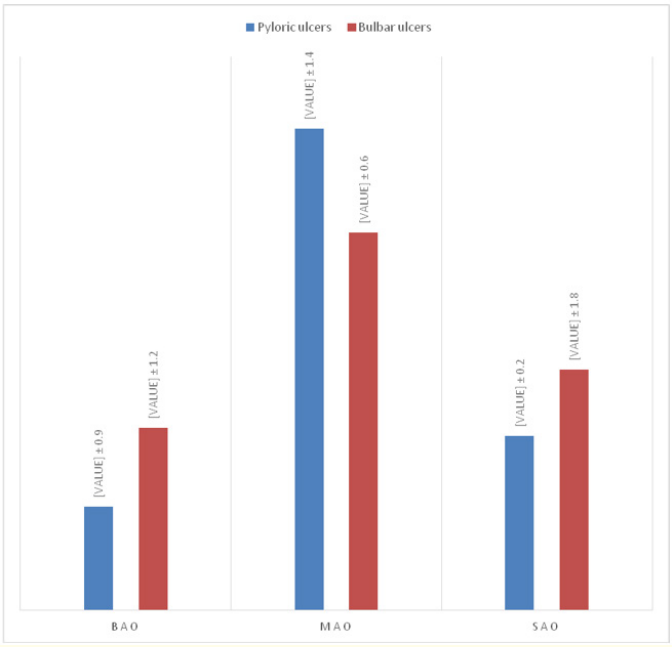

Figure 2: Levels (mmol/h) of basal acid output and stimulated acid output with modified sham feeding and maximum stimulation with histamine. Basal acid output (BAO), maximal acid output (MAO) and sham feeding-stimulated acid output (SAO) in patients with pyloroduodenal giant ulcers.

The obtained data allow us to conclude that the character of acid production in patients with large-sized pyloroduodenal ulcers of the gatekeeper and duodenal bulb is similar to that in patients with normal-sized ulcers of the same localisation. The described features can be taken into account when choosing the optimal, pathogenetically justified volume and method of surgical intervention in patients with complicated giant pyloroduodenal ulcers.

Observation

The peculiarities of acid-suppressing function of the stomach in patients with pyloric and prepyloric ulcers, described earlier by Lopez., *et al.* [24] were further discovered by Baron J.H. [27], who pointed out that as the ulcer defect approaches the outlet of the stomach, a "gradient of secretion" is observed: normal or moderately high values of basal and high values of maximal acid production. Subsequently, C. Muller and Martinoli [25] also pointed out that secretory parameters in pyloric and prepyloric ulcers occupy an intermediate position between type I ulcers [40] and duodenal ulcers. In this connection it would be logical to assume that patients with pyloric canal ulcers are characterised by a different, predominantly non-vagal type of hypersecretion than patients with bulb ulcers. Indirect evidence of this can be found in the high rate of ulcer recurrence in patients with pyloric and prepyloric ulcers after isolated selective proximal vagotomy [41,42].

To assess the influence of the vagus nerve on hydrochloric acid production, a number of authors use the modified "sham feeding" test [21,22,29,30]. Proposed by Noring [19], this test is used, among other things, to assess the completeness of parasympathetic denervation of the stomach after vagotomy surgery. As evidenced by the studies of Feldman., *et al.* Mayer., *et al.* [20,28], sham feeding, being a physiological stimulator of gastric secretion, causes minimal gastrin production in humans, and therefore, most reliably characterises the degree of influence of parasympathetic innervation on gastric acid production.

The study of peculiarities of gastric acid production in patients with giant ulcers allows to answer the questions concerning pathogenesis in this course of the disease for the choice of the optimal method of surgical intervention.

Conclusion

Analysing the obtained results, we can conclude that giant pyloroduodenal ulcers proceed against the background of both basal and stimulated hypersecretion, the nature of which differs depending on the localisation of the ulcer defect. Small values of basal volume of gastric juice, moderate basal hypersecretion combined with pronounced hypersecretion after maximal histamine stimulation along with insignificant secretory response to stimulation by sham feeding were observed in patients with giant pyloric duct ulcers, which indicates predominantly non-vagal type of gastric secretion stimulation. This circumstance may serve as a basis for the use of gastric resection, including economical resection with vagotomy in this category of patients [37-39]. On the contrary, basal hypersecretion in combination with a more pronounced response to the modified sham test indicates a predominantly hyperreactive (vagus) character of acid production in patients with giant ulcers of the duodenal bulb. Consequently, organ-preserving operations with vagotomy should be considered pathogenetically reasonable in patients with complicated giant duodenal ulcers.

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