THE FORMATION OF GASTRIC ULCER IN PREGNANT AND NONPREGNANT RATS IN THE LIGHT OF DATA ON THE GESTATION DOMINANT

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Research in antenatal physiology and pathology, and study of the factors promoting fetal implantation and the formation of a full-value placenta, have permitted I. A. Arshavskii to prove his theory of the gestation dominant [1,2,3]. Constant afferent impulsation from the uterine interoceptors, which appears after fertilization of the ovicell and its implantation in the uterine mucosa [5], causes a focus of excitation to develop in the relevant nerve centers, which regulate the gonadotropic function of the hypophysis and the hormonal function of the corpus luteum. The associated inhibition attending the dominant focus of excitation allows one to understand the increase in the threshold of a pregnant organism in relation to a series of stimuli, especially pathogenic ones [1-4, 6, 9-14]. Sandweiss, Saltstein, and Farbman [14] cite statistical data on 70,310 women which indicate the absence or disappearance of incipient gastric and duodenal ulcer during pregnancy.

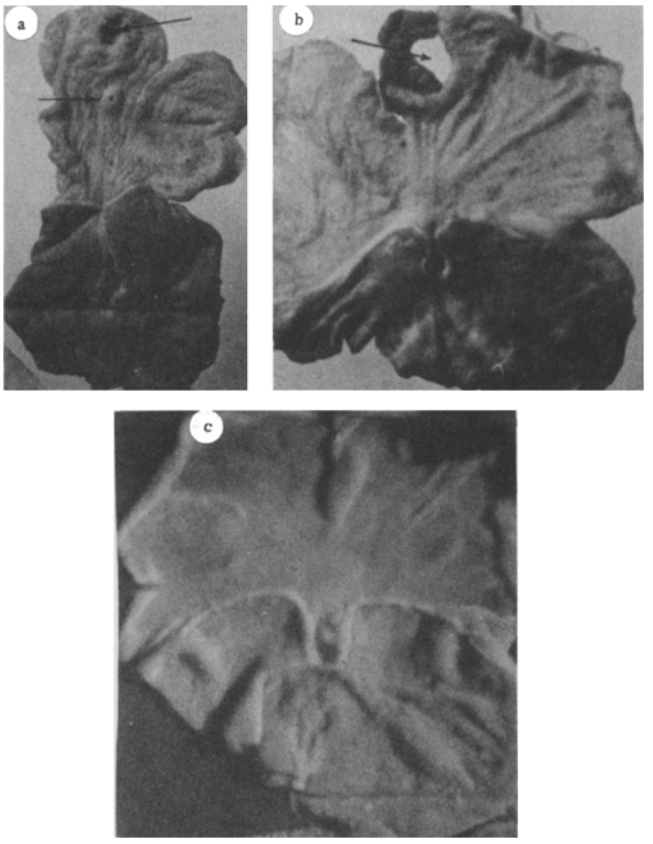
The purpose of this work was to determine experimentally the possibility of gastric ulcer formation in pregnant, as compared with nonpregnant rats.

Experimental Methods and Results

Gastric ulcer was induced by a slightly modified version of K. A. Meshcherskaya's method [7,8]. In the first series of experiments, we first administered 5 mg/100 g caffeine into the gastric cavity on a hungry stomach and, 30 minutes later, we introduced arsenous acid administered in a dose of 1 mg/100 g in a 0.1% soda solution. In view of the poor solubility of arsenous acid, we added 100 mg sodium bicarbonate to 100 ml of the aqueous solution of the acid. We used a larger dose of caffeine in our experiments than specified by K. A. Meshcherskaya, because gastric ulcer does not form as easily in females as in males.

The administration of caffeine and arsenous acid began one or two days after the rats were bred, and continued daily for 15-19 days. The rats were then sacrificed and the stomach and uterus opened.

The first series of experiments were performed on 12 pregnant and 20 nonpregnant rats. A more or less expressed ulcerative process was discovered in the antral portion of the stomach of all the control (nonpregnant) animals: in six rats, this process was very slightly expressed, consisting of 1-2 small (1-1.5 mm in diameter) superficial ulcers; the formation of either a few or many ulcers was observed in four rats, but these ulcers were also small and not apparent from the external surface of the stomach; in eight of the rats, the small ulcers had begun to coalesce, and the process involved the deeper layers of the gastric wall (see figure, a). In these cases, the injury was apparent from the external aspect of the stomach, and adhesions to adjacent organs were often noted. In the last two nonpregnant rats in this series of experiments the injury was still greater, ending, in one



Gastric mucous membrane of rats after 19-day administration of caffeine (5 mg/100 g) and arsenous acid (1 mg/100 g): a, b) of nonpregnant, control rats; c) of pregnant rat (arrows show ulcers in antral portion of stomach).

case, with perforation of the gastric wall (see figure, b). The rats in which the ulcers had begun to coalesce and to involve the deeper layers of the stomach could be distinguished by their outward appearance: they were thin, with dirty, yellow fur. The rats had adopted a rather awkward position with extremities extended and back humped, so that the abdomen was slightly raised as if to protect itself from irritation.

In 10 of the 12 pregnant rats observed in the experiments of the first series, no changes of any kind were found in the gastric mucous membrane (see figure, c); each of the other two rats had one very small ulcer which involved only the surface of the mucosa, and was not apparent from the external aspect of the stomach.

In the second series of experiments, performed on 13 rats (7 nonpregnant and 6 pregnant), the preparations were administered for 15 days, and the caffeine dose was doubled (to 10 mg/100 g) seven days after the beginning of the experiment, while the dose of arsenous acid was increased $1\frac{1}{2}$ times. We increased the doses of the preparations in order to ascertain whether the higher doses would induce the ulcerative process in the pregnant rats, as well as in the nonpregnant ones.

When the rats' stomachs were opened, we found an acutely pronounced ulcerative process showing coalescence of small ulcers and involvement of the deeper layers of the gastric wall. In spite of the increased dosages of the preparations, we only observed a very slight ulcerous lesion in one of the six pregnant rats. When the stomachs of the other five were opened, no signs whatever of the ulcerative process could be detected.

Summing up the material from the two series of experiments, one can conclude that an insignificant superficial affection of the gastric mucosa with no involvement of the serous membrane occurred in only 16.6% of the pregnant rats as a result of the administration of caffeine and arsenous acid. In the two experimental series, the

ulcerative process developed in 100% of the nonpregnant control rats, severe lesions with the coalescence of small superficial ulcers into large ones, and the involvement in the process of all the gastric layers being observed in 60% of these animals. Adhesions to the adjacent organs, or perforation of the gastric wall, were observed in some cases.

In his time, R. Virkhov explained the resistance of the pregnant organism to infectious diseases by the hypothesis that a certain immunity to acute infections is intrinsic to pregnant organisms. The data obtained allows one to conclude that, during pregnancy, the organism acquires a high resistance to the action of other, noninfectious pathogenic agents also. Sandweiss and co-authors [14] have attributed the absence of gastric ulcer in pregnant women to the action of a special pituitrinlike hormone. However, their attempt to prove the effectiveness of antuitrin-S in analogous experiments on dogs was not successful.

On the basis of the material cited in this article and the conception of the gestation dominant, we believe the resistance of the pregnant organism to factors inducing an ulcerative process to be due to inhibition of the relevant nerve centers from the dominant focus of excitation, which is formed during pregnancy in the central nervous system.

SUMMARY

Caffeine and arsenous acid were administered per os to pregnant and nonpregnant rats for a period of 15 to 19 days to induce gastric ulcer. The ulcerative process developed in 100% of the control, nonpregnant female rats; severe lesions with coalescence of small superficial ulcers into large, and involvement of all the gastric layers in the process, were observed in 60% of the animals. In some cases, adhesions to the adjacent organs, or perforation of the stomach wall were noted. An insignificant superficial affection of the gastric mucosa, with no lesions of the serous membrane, was noted only in 16.6% of the pregnant rats.

The above material leads to a conclusion that the gestation dominant formed during pregnancy depresses the development of the gastric ulcerative process by producing inhibition in the relevant nervous centers.

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