Effects of bile reflux and intragastric microflora changes on lesions of remnant gastric mucosa after gastric operation

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AIM: To investigate the effects of bile reflux and intragastric microflora on lesions of remnant gastric mucosa after gastric operation.

METHODS: Concentration of bile acid and total bacterial counts (TBC) in gastric juice were measured in 49 patients with peptic ulcer before and after gastrectomy. One year after the operation, sample of gastric mucosa taken from all the patients were used for histological examination.

RESULTS: The concentration of gastric bile acid was significantly increased in group B-I, or B-II and SV+A than that in group HSV (P<0.05-0.01). The abnormal histological changes in the remnant gastric mucosa were more common in the first 2 groups than in the last group.

CONCLUSION: The type of gastrectomy can affect bile reflux. The abnormal histological changes in the remnant gastric mucosa are closely related to the elevation of bile acid concentration and increase of TBC in gastric juice. HSV can effectively prevent bile reflux and keep the gastric physiological functions stable.

INTRODUCTION

Bile reflux was usually found after routine operation in the treatment of peptic ulcer, and for some patients, it could be found very serious complications, such as epigastric causalgia, obstinate biliary vomiting, body mass descent and so on, its incidence is 5-35%.1-4 Forty-nine patients with gastric resection in treating peptic ulcer were observed in order to investigate the effects of bile reflux and intragastric microflora changes on lesions of remnant gastric mucosa after gastrectomy gastric resection.

MATERIALS AND METHODS

A total of 49 patients with peptic ulcer (32 male, 17 female, average age 44.3 years) including 14 patients with gastric ulcer, 28 patients with duodenal ulcer and 7 patients with compound ulcer were investigated in a retrospective manner. These patients were divided into 4 groups according to the operation kind: 10 patients with Billroth I (B-I), 14 patients with Billroth II (B-II), 12 patients with selected vagotomy plus antrectomy (SV+A), 13 patients with High selected vagotomy (HSV).

Gastric juice on an empty stomach was been extracted at 3-5 d pre-operation, 7 d post-operation, 3 wk and 1 year post-operation, the bile acid concentration was measured by radio-immunity analysis(RIA), obtained from Wuzhou Institute of Isotope.

A 0.5 mL gastric juice plus 5 mL broth was put into sterilization test tube and cultured at 37 °C for 24-48 h, it was defined sterile growth if it had no bacteria growth through observation of 48 h, if bacteria were found, it were separated and evaluated by means of platinum loop.

For pro-operation annual patients, 2 samples of gastric mucosa were fixed by formaldehyde solution, then were observed through light microscope. Diagnosis of gastric ulcer was based on the detection standard of gastric mucosal disease formulated by gastric cancer co-operation group in 1981. The result was indicated by count scores as follow: the normal gastric mucosa was equal to 0; slight-degree, medium-degree, and sever-degree superficial gastritis were 1, 2 and 3; slight-degree, medium-degree, and sever-degree atrophic gastritis were 4, 5, and 6; if gastritis plused slight-degree, medium-degree and severe-degree intestinal metaplasia, the scores would be plus 1, 2, 3.
The effect of bile reflux on total bacterial count and the changes of remnant gastric mucosa histological Current concepts suggest that gastric acid possesses strongly germicidal effect, the count of bacteria of gastric acid was only 10⁵/mL, and the denomination of bacteria was similar to that in buccal cavity. Oxyntic cell was deleted or its innervation was broken after gastric operation, so the ability of stomach excreting acid decreased, the data of pH were increasing if rat was raised by carcinogens (MNNG) and the change of gastric remnant histological abnormality alteration associated with increasing of concentration of gastric juice cholic acid.

**DISCUSSION**

Bile reflux was common in gastric post-operation and the mod of operation could affect the degree of bile reflux, generally speaking, it was slight after high selected vorgotomy, it was severe after gastroectomy, and it was very common in Billroth II[1]. In our study, the concentration of gastric juice cholic acid was significantly increased in group B-II, it was higher in group B-I and group SV+V than that in group HSV. There was no significant difference between pre-operation and post-operation in group HSV although it was slight higher after operation, so it suggested that HSV could reduce bile reflux. Traditional gastrectomy and SV+A destructed the normal gastric dissection and deleted the function of Pyloric and innervation, these factors resulted in gastric emptying disorder (especially Gram-Negative bacillus and Anaerobe) could reflux to stomach and reproduced here[5-10]. Because of these bacteria, the conjugate cholic acid changed to freeing cholic acid which has a strongly toxic effect, and the following could damaged the integrity of gastric mucosa, certain cationic permeability could increased, such as H+ could contra-direction diffuse, and these changes can result in Mast cell releasing histamine and 5-sertonin, so it could be found capillary telangiectasia, mucosa hyperemia, edema, bleeding, and superficial Ulceration[11,12].

In our study, the concentration of cholic acid in gastric juice was higher, the bacterial count of gastric juice was more, and the denomination of flora in intestinal tract was more. Pathological examination found that flaming cell infiltration, atrophic gastritis, and intestinal metaplasia, all these could indicate that the abnormal histological changes of gastric mucosa associated with the increasing concentration of cholic acid in gastric juice and increasing total bacterial count of gastric juice.

The role of dodecadactylon regurgitation resulting in gastric mucosa precancerous lesion and gastric cancer was though highly, Houghton et al. found that follicle cell and DNA count was increased if rat was raised by carcinogens (MNNG) and

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**Table 1** Changes of bile acid concentration of gastric juice in different group (C₇ nmol·mL⁻¹, mean±SD)

| Group | Pre-operation | Post-operation |
|-------|---------------|----------------|
|       |               | 1 wk | 3 wk | 1 yr |
| B-I   | 14            | 21.15±1.36 | 36.50±25.27 | 76.60±48.38<sup>a</sup> | 59.75±29.80<sup>a</sup> |
| B-I   | 10            | 22.17±7.74 | 45.13±19.08<sup>b</sup> | 52.98±25.04<sup>b</sup> | 43.79±9.89<sup>b</sup> |
| SV +A | 12            | 22.43±10.15 | 39.04±18.72 | 54.84±27.49<sup>b</sup> | 46.33±14.52<sup>b</sup> |
| HSV   | 13            | 23.54±11.56 | 30.12±17.24 | 28.02±16.18 | 27.68±15.44 |

<sup>a</sup>P <0.05, <sup>b</sup>P <0.01 vs HSV.

**Table 2** Changes of total bacterial count of gastric juice in different groups (log₁₀/mL, mean±SD)

| Group | Pre-operation | Post-operation |
|-------|---------------|----------------|
|       |               | 1 wk | 3 wk | 1 yr |
| B-II  | 14            | 1.27±2.14 | 3.83±2.09<sup>a</sup> | 4.96±0.38<sup>a</sup> | 3.97±1.97<sup>a</sup> |
| B-I   | 10            | 1.77±1.35 | 4.30±1.64<sup>b</sup> | 4.33±1.55<sup>b</sup> | 3.82±1.99<sup>b</sup> |
| SV +A | 12            | 1.84±2.27 | 3.90±1.79<sup>b</sup> | 4.13±1.68<sup>b</sup> | 3.85±2.04<sup>b</sup> |
| HSV   | 13            | 1.26±2.07 | 2.41±2.35 | 2.59±2.78 | 1.56±2.13 |

<sup>a</sup>P <0.05, <sup>b</sup>P <0.01 vs HSV.

**Table 3** Results of histological examination of remnant gastric mucosa 1 year after operation

| Group | Normal | Superficial gastric | Atrophic gastritis | Intestinal metaplasia |
|-------|--------|---------------------|-------------------|-----------------------|
|       |        |                     | Slight | Medium | Severe | Slight | Medium | Severe |
| B-II  | 14     | 0                   | 9      | 2      | 2      | 2      | 1      | 1      |
| B-I   | 10     | 0                   | 7      | 2      | 1      | 1      | 2      | 0      |
| SV +A | 12     | 0                   | 8      | 1      | 1      | 1      | 1      | 1      |
| HSV   | 13     | 0                   | 10     | 1      | 1      | 1      | 0      | 0      |

histological abnormality alteration in group B-II, B-I and group SV+V was significantly higher than that in group HSV (P values separately were 2.047, 2.025, 2.029, P<0.05), and the change of gastric remnant histological abnormality alteration associated with increasing of concentration of gastric juice cholic acid.
at the same time reinforced regurgitation from dodecadactylon to stomach, so the ratio of gastric carcinoma was significantly increased. Freeing cholalic acid was confirmed as carcinogen, it could resulted in stomach carcinoma if it was higher in a long term\textsuperscript{[13-17]}. For patients with higher concentration of cholalic acid in gastric juice, intragastric bacterial over-growth (IBO), and pathological examination finding abnormal changes, should be thought highly of the occurrence of stomach carcinoma.

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