**Alimentary tract and pancreas**

**Oesophageal function before, during, and after healing of erosive oesophagitis**

**F Baldi, F Ferrarini, Annamaria Longanesi, M Angeloni, M Ragazzini, M Miglioli, and L Barbara**

*From the Department of Internal Medicine and Gastroenterology, University of Bologna, Bologna, Italy*

**SUMMARY** In order to investigate the relationship between oesophageal motor abnormalities and oesophagitis, we carried out four hour studies of oesophageal motility and 24 hour pH measurements in fasting and fed conditions in eight patients before, during (pH only), and after medical healing of erosive oesophagitis. Gastrooesophageal acid reflux decreased (ns) during the treatment, but tended to return to basal values at the end. Oesophageal body motility was unchanged after healing, while the lower oesophageal sphincter basal tone was significantly increased at the end of the study in the postcibal period. The results suggest that the impairment of the sphincter tone in reflux oesophagitis is secondary to the presence of the oesophageal lesions. Macroscopic healing is not paralleled by improved major pathogenic factors of the disease, however – that is, acid reflux and oesophageal body motility.

It is well established that oesophageal motor abnormalities play a major role in the pathogenesis of reflux oesophagitis. Moreover, animal and studies in mammal have shown that the impairment of the lower oesophageal sphincter (LOS) tone parallels the severity of the oesophageal lesions. It is, however, not yet clearly defined whether the motor abnormalities precede or follow the appearance of the mucosal lesions. In fact, only few studies, performed for short periods of time, have investigated the oesophageal function before and after healing of the oesophagitis.

Our aim was, thus, to evaluate both oesophageal motility and acid gastroesophageal reflux for prolonged periods, before and after regression of erosive oesophagitis.

**Methods**

**SUBJECTS AND EXPERIMENTAL DESIGN**

Eleven outpatients with endoscopic evidence of uncomplicated erosive oesophagitis (II-III degree according to Savary) underwent oesophageal motility and acid reflux evaluations at the start of a 12 week course of ranitidine, 150 mg tid. Acid reflux was also assessed after six weeks of therapy. An endoscopic evaluation was repeated on the last day of treatment and the patients who showed healing of the oesophageal lesions (0-1 degree according to Savary) underwent a further assessment of oesophageal motility and acid reflux within 10 days. Of 11 patients, nine were healed at the end of the treatment but one refused the pH and motility studies. Thus, our report is based on eight patients (seven men and one woman) aged 25–65 years, who gave their informed consent before starting the study.

**OESOPHAGEAL MOTILITY**

We used a polyvinyl probe (Dentsleeve, Australia) consisting of eight catheters (ID 0.8 mm, OD 1.2 mm) fused together (OD 4.5 mm) with distal side holes 1 cm distal to the distal end of the sleeve and 5 and 10 cm proximal to its proximal end respectively. Each catheter was continuously perfused with distilled water (0.5 ml/min) by means of a pneumatic system (Beckman, mod. 999449); the pressure rise rate was always greater than 450 mmHg/sec on sudden occlusion of the side holes. The
recording catheters were connected to pressure transducers (Statham P23 ID, Puerto Rico) and the deglutitions were recorded with a belt pneumograph placed around the patient’s neck. These and the endoluminal pressures were recorded on a 6-channel polygraph (Cis, OTE Biomedica, Italy) running at a paper speed of 1.25 mm/sec. The subjects were studied in the morning after an overnight fast. No medication was allowed for 48 hours before the experiments. The manometric assembly was passed nasally into the stomach, the LOS was located by a continuous pull through technique and the sleeve sensor was positioned across the highest pressure zone which showed relaxation upon swallowing. The recordings continued for four hours, with the patient changing his body position at hourly intervals (supine, sitting, sitting, supine). At the end of the second hour a standardised balanced meal was given. The meal consisted of a soup with pasta 30 g, homogenised meat 70 g and ham 45 g. Parmesan cheese 5 g, mashed potatoes 170 g, whipped apple 150 g to which 35 g of a mixture of oligosaccharides (385 KCal/100 g) was added, sunflower seed oil 10 g and tap water 200 ml. The total caloric content was 850 KCal with 46% carbohydrates, 36% fats, and 18% proteins.

GASTROESOPHAGEAL REFLUX

At the end of the manometric study the subject was extubated and a miniature combined glass electrode (Ingold 440 M, Switzerland), whose calibration was checked with two buffer solutions (pH 4 and 7) before and after each study, was introduced nasally. The electrode was positioned 5 cm above the previously determined LOS and was connected with a portable recording unit (Autronicord CM 18 pH, WG). The patient was then sent home with the advice to eat during meals only, to avoid cigarette smoking, coffee, alcoholic drinks and foods with an acidic pH and to return to our laboratory 24 hours after the start of the pH recording. A diary card was also given in order to record the timing of the meals and of bedtime.

ANALYSIS OF THE RECORDINGS

The manometric tracings were coded and visually evaluated at the end of the study, according to a previously reported protocol, by the same observer who was unaware of the order in which the studies had been done. The LOS basal tone was calculated every minute by subtracting the corresponding fundic pressure. The measurements were not done during and immediately after relaxations of the sphincter and in correspondence with abdominal straining, as indicated by an increase of the fundic pressure. All the motor sequences occurring in the oesophageal body were counted and defined as peristaltic— that is, monophasic non-repetitive waves moving distally between the recording levels in temporal sequence, or synchronous— that is, monophasic waves occurring simultaneously. The oesophageal body motility was evaluated as the per cent frequency of peristaltic sequences of all the oesophageal body motor events.

The pH data were analysed with a computerised system (TRS 80, mod. I). Acid gastroesophageal

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Table: Acid gastroesophageal reflux, expressed as mean reflux time per hour (min/h ± SD) and mean duration of reflux episodes (min ± SD), before, during, and after successful treatment of oesophagitis

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Fig. 1 Oesophageal peristaltic activity, expressed as per cent of total motor activity (MV ± SEM), before and after healing of oesophagitis, in fasting (□) and fed (■) periods.
reflux was considered to be present when the oesophageal pH fell below 4 for at least 20 seconds and it was evaluated by subdividing the 24 hour study period into three fractions (postcibal = three hours after each meal; night = seven to nine hours; fasting = the remainder up to 24 hours). The parameters used were the mean reflux time per hour (min) and the mean duration of reflux episodes (min).

The statistical analysis of the results was carried out by the Student's t test for paired data.

Results

Acid gastroesophageal reflux decreased, not significantly, during treatment, in the fasting, fed and nocturnal periods. This was true for the duration of oesophageal acid exposure and for the mean duration of the reflux episodes (Table). One week after the cessation of ranitidine treatment both reflux parameters showed higher values than during treatment (not significant).

The frequency of oesophageal peristaltic activity (Fig. 1) was not significantly different before and after healing of the oesophageal lesions, neither in fasting nor in fed conditions (83.1±2.6% v 70.2±9.9% and 77.0±2.2% v 58.3±10.6% MV±SEM). The LOS basal pressure (Fig. 2), evaluated before the treatment, decreased after the meal, reaching the statistical significance during the first postcibal hour (12.5±1.6 v 3.5±0.5 mmHg (MV±SEM) p<0.01). The behaviour of the LOS was quite different after healing of the oesophagitis. In fact, the ingestion of the meal was not followed by a significant decrease of the sphincteric tone (12.1±2.7 v 10.5±1.7 mmHg, MV±SEM). The difference between the postcibal values before and after healing was statistically significant (p<0.01).

Discussion

In our study acid gastroesophageal reflux decreased, albeit not significantly, during ranitidine, thus explaining the favourable outcome of the treatment. This effect was not longstanding, because one week after the end of therapy acid reflux tended to return to pretreatment values. This was true for the mean reflux time and for the mean duration of the reflux episodes, thus confirming that the clearing capacity of the oesophageal body was unaffected by the treatment. In fact, the oesophageal peristaltic activity, which was slightly impaired in our patients at the start of the study according to the normal values for our laboratory (≥90% of the deglutitions followed by peristaltic sequences), was also unchanged after successful ranitidine treatment. The peristaltic function was evaluated in our patients exclusively after spontaneous dry swallows, thus we did not take into account the amplitude, duration and velocity of the waves, as these parameters are rather variable in the same subject under these conditions.11 12

Our data show that the short term treatment with H3 blockers does not modify the motor activity of the oesophageal body. Similar results were reported by Russell et al., who did not find any modification of the oesophageal peristalsis (evaluated with scintigraphic methods) before and three months after successful surgical treatment of reflux oesophagitis.

As far as the LOS is concerned, previous studies14–16 have not shown significant differences of its resting tone before and after medical treatment of oesophagitis with cimetidine at doses ranging from 1.2–1.6 g/day and for periods from eight to 104 weeks. Similar results are reported in the only study14 which evaluated the sphincter pressure according to the outcome of the treatment. It must be noted, however, that all the aforementioned authors assessed the LOS tone in fasting conditions, for short periods and with discontinuous sampling. In our study the sphincter tone was evaluated for four hours with a continuous technique, in fasting and fed conditions. In fact, LOS pressure before and after healing was found to be significantly different only in the postcibal period, which is characterised by a physiological pressure drop.15 16

Our results regarding the LOS are in agreement with previous experimental studies in the cat28 and suggest that the impairment of the sphincter tone in reflux oesophagitis is secondary to the presence of the oesophageal lesions. On the other hand, the main pathogenetic factors of the disease – for example, acid reflux and oesophageal peristalsis, are not
significantly modified by a successful 12 week medical treatment, thus suggesting that macroscopic healing of the oesophageal lesions is not accompanied by a functional improvement.

References