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With the increasing use of antireflux sur-

Value of Endoscopic Marking of the Z-Line for Detecting Short Esophagus Before Repeat Surgery for Recurrent Paraesophageal Hernias

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gery in the treatment of gastroesophageal reflux disease, the need has arisen for an accurate method of assessing the length of the esophagus. The enigmatic finding of short esophagus is a continuing matter of controversy with regard to prevalence, cause, and management. Short esophagus precludes a tension-free intra-abdominal antireflux procedure. The most effective treatment for the condition is an esophagus-lengthening procedure using a Collis gastroplasty. Alternative procedures, such as intrathoracic fundoplication or esophageal resection, are not widely accepted. The risk of encountering a short esophagus requiring a Collis gastroplasty is significantly greater in the presence of paraesophageal hernia, Barrett's esophagus, an esophageal stricture, and repeat surgery [1]. Esophagography has been reported to have a sensitivity of 66% and a positive predictive value of 27% for diagnosing short esophagus, whereas the length as measured by manometry had a sensitivity of 43% and a positive predictive value of 25% [2]. Intraoperative techniques have also been described that combine laparoscopic with endoscopic methods to determine the position of the gastroesophageal junction. The length of the intra-abdominal esophagus is determined by using a probe to measure the distance between the esophagogastric junction and the crura of the diaphragm [3]. Recurrent paraesophageal hernia is the most challenging scenario for repeat laparoscopic surgery, and the one most likely to require conversion to an open procedure. Some 30-80% of patients with paraesophageal hernias 5 cm or larger require gastroplasty [4,5].

Between 1 January 2001 and 31 August 2003, we marked the Z-line with endoscopic clips (Olympus HX-200L-135) in eight patients in order to detect a potential short esophagus due to a large recurrent paraesophageal hernia. Immediately after clipping, an upright contrast study was carried out. The length of the esophagus, the distance between the Z-line and



Figure 1 a A large recurrent paraesophageal hernia with an esophageal diverticulum. b Endoscopic clipping of the Z-line. c The precise location of the Z-line and the fact that the esophagus is appropriately long are well seen on this lateral esophagram. **d** The expected position of the Z-line after surgery.

the diaphragm, and the expected position of the esophagogastric junction after the operation were assessed on sagittal and lateral esophagrams (Figure [1]). With this method, it was predicted for three patients that it would not be possible to pull the esophagogastric junction at least 2 cm below the crura of the diaphragm. In these cases, a Collis gastroplasty was carried out (Figure [2]). In the other five patients, the method made it possible to exclude the possibility of a short esophagus, and this conclusion was confirmed by the findings during redo surgery. No recurrences were observed during a 1-year follow-up period.

We consider that this method is appropriate and can be recommended not only before surgery for recurrent paraesophageal hernia, but in all pathological conditions in which the possibility of a short esophagus may arise.

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Figure 2 a,b A large paraesophageal hernia, with a definite short esophagus. c,d The esophagram after a Collis gastroplasty, with the lengthening of the esophagus by approximately 6 cm marked.

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