ZENKER'S DIVERTICULUM

Despite its rare onset, Zenker's diverticulum (ZD) is by far the most common of all diverticular events arising in the esophagus. The first description of ZD dates back to 1769 by A. Ludlow. Little over a century later, in 1874, F.M. Zenker e H. Ziemssen not only provided a more detailed picture of the affliction, they were also the first to hypothesize its motor pathogenesis: hence, the name of the diverticulum that remains in use today. As alluded to above, while it accounts for 60 - 70% of all esophageal diverticula (90% for some authors), ZD is a rare disorder.

Etiopathogenesis

ZD presents as a classic pulsion diverticulum that progressively protrudes through a weak zone of the esophagus, in this case Laimer-Killian's triangle. This area constitutes the posterior wall of the hypopharynx and lies between the constrictor muscle fibers of the pharynx to the sides and the cricopharyngeal muscle, the so-called upper esophageal sphincter (UES), below. The mucosal layer is pushed outwards and, with time and the persistence of propulsive conditions, the resulting protrusion gradually assumes the form of a pouch (mucosal hernia). Because of the rigid vertebral plane lying posteriorly, ZD tends to protrude to the left; as it increase in length, it grows vertically, parallel to the esophagus, with the diverticular fundus sloping downwards.

Lahey's radiological classification aptly defines this evolution in size, form and position:

- 1st stage: contrast means tends to run throughout the esophagus;
- 2nd stage: the diverticulum compresses the esophagus, and swallowed food collects in part in the diverticulum and in part passes through the esophagus;
- 3rd stage: large diverticula prevent the passage of swallowed food in the esophagus, and patients may present complete dysphagia.

Because the "hernial port", i.e., Laimer-Killian's triangle, is wide, the diverticulum generally has a rather large pouch, often wider than the esophageal lumen itself. As a result, swallowings pushed downwards by pharyngeal pressure tend to follow the direction of the diverticulum; that is, the bolus, saliva and mucosal secretions are pushed by the swallowing mechanism into the diverticulum, thereby progressively increasing it in volume and leading to the already mentioned staging by Lahey.

Zenker's diverticula arise as a result of discoordination between the propulsive contraction of the pharynx and the release of the upper esophageal sphincter (UES): pharyngeal-esophageal manometry clearly reveals the pathophysiological mechanism underlying the phenomenon. Although numerous causes have been described, UES dyschalasia is the best documented and most plausible. As we will see below, these physiopathological premises underpin the rationale for surgical treatment for ZD, namely UES myotomy.

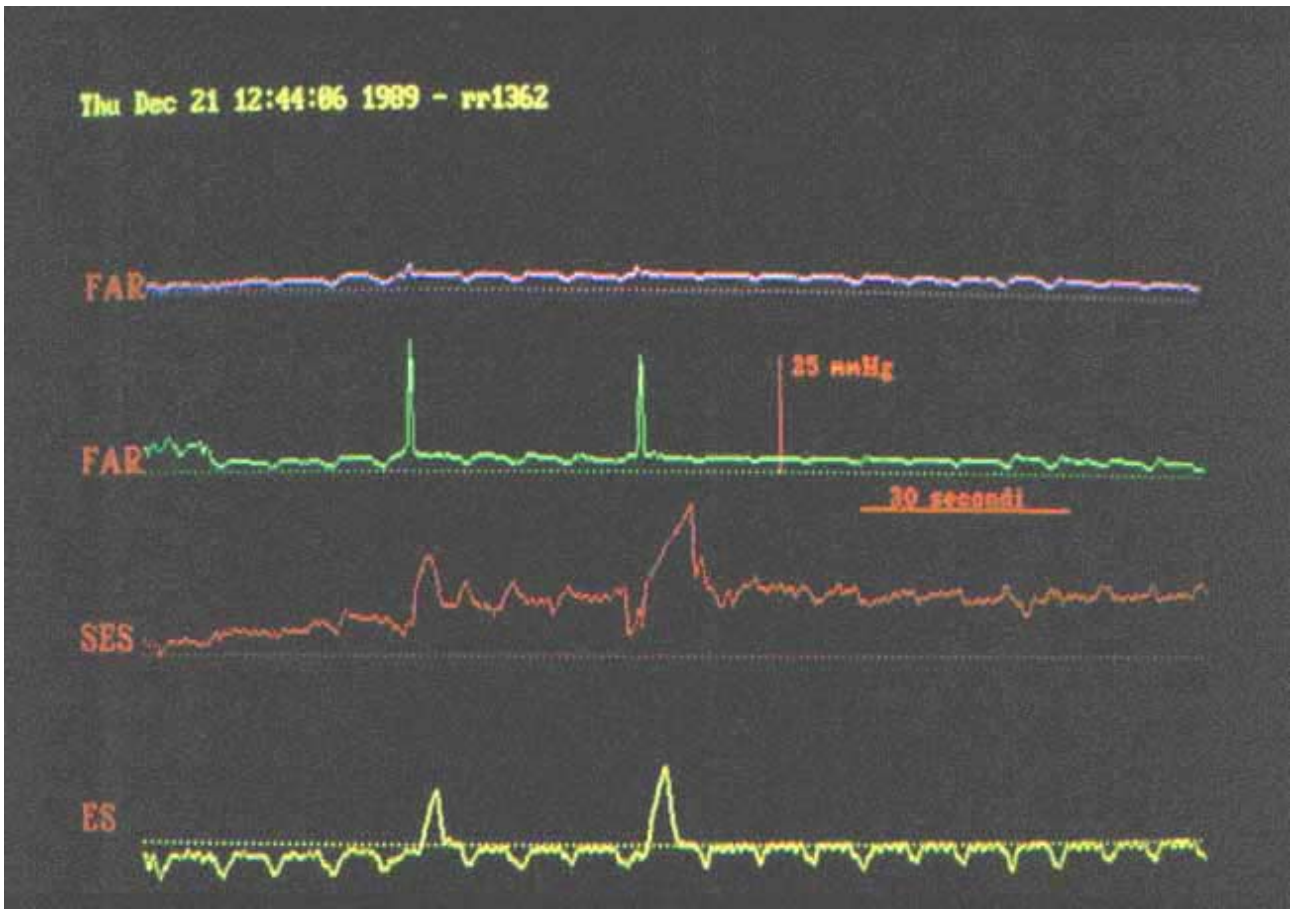

Fig. 1 – Pharyngoesophageal electromanometry – swallowing phase: high pressure of the SES (III°track) contrasts the pharyngeal wave (II° track).

The causes underlying this discoordination may be primary, but are most often secondary to a gastro-esophageal reflux disorder (GERD). This leads to a dyskinetic-hyperkinetic motor reaction in the esophagus that may also involve the UES. Nearly 2/3 of our cases showed lower esophageal sphincter (LES) incontinence, with GERD. An understanding of these etiopathogenic and anatomopathological features characterizing symptoms is crucial to defining the proper therapeutic approach.

Symptomatology

The characteristic symptom of ZD is “delayed dysphagia”: the patients begins eating and swallowing without problems, but at the third or fourth bite starts experiencing difficulty in swallowing (“dysphagia of the 3rd bite”). This difficulty is aggravated by further attempts to swallow. Often, the patient tries to compensate by drinking water: this, too, only worsens the situation. In many cases, complete dysphagia prevents the patient from eating any further.

This feature can be explained as follows: a first mouthful of food is swallowed, it enters the diverticulum, and the patient feels nothing different or abnormal. Progressively, however, the diverticulum becomes filled and, because it is wedged between the esophagus to the front and the spinal column to the rear, as it distends it exerts no pressure posteriorly (because of the vertebral column) but anteriorly on the esophagus, that in turn is compressed by another relatively rigid structure, namely the trachea. As the diverticulum fills, pressure on the esophagus rises, ultimately obstructing the esophageal lumen (extrinsic compression). As a result dysphagia sets in only after a few mouthfuls of food and progressively increases. This is the pathognomonic symptom of DZ.

Other symptoms, less frequent, isolated and/or concomitant with each other or with the above, include:

- Noisy, gurgling swallowing, above all with liquids;
- A swelling that appears after a few swallows, generally above the clavicle in the left latero-cervical region;
- Regurgitation (rumination) of swallowed food, be it spontaneously, particularly in a reclined position with consequent respiratory complications *ab ingestis*, or for patient provoked reasons; indeed, some patients often learn that squeezing the diverticulum empties the pouch and temporarily relieves the dysphagia;
- A feeling of suffocation;
- Halitosis: ingested material collecting in the diverticulum, especially if large, is subject to putrefying conditions, thus giving rise to an unpleasant odor of the breath. Decay of the ingested material may also lead to inflammatory conditions, both chemically and bacterially induced; it ensues that the mucous that the diverticulum is formed of always runs the risk of inflammation, usually chronic. These conditions, with time, are conducive to the by no means remote possibility of neoplastic transformation (squamous cell carcinoma).
- Gastroesophageal reflux disease (GERD) disturbances (as mentioned, a frequent cause itself of the diverticulum): retrosternal heartburn, chest pains, etc. In these cases, without specific symptoms, the diverticulum is evinced by a gastroesophageal X-ray.
- The diverticulum may be asymptomatic (especially if small) and may be seen only on radiological exam for other reasons, as mentioned above.

Diagnosis

Even if the above symptoms, particularly “delayed dysphagia” and swelling of the neck, lead to the diagnosis of ZD, only radiological imaging clarifies the presence and characteristics of a diverticulum. To be effective, however, the exam must be done with utmost attention paid to certain facets: i) it must include the whole esophagus, to obviate the exclusion of the upper esophagus (given the diverticulum’s location); ii) the patient should be examined in different positions in order to detect small diverticula, which may go unnoticed if not viewed from all directions; iii) the distal esophagus and stomach must also be examined in order to exclude other concomitant conditions, i.e., sliding transhiatal hernia, esophageal dyskinesia, signs of GERD, etc.

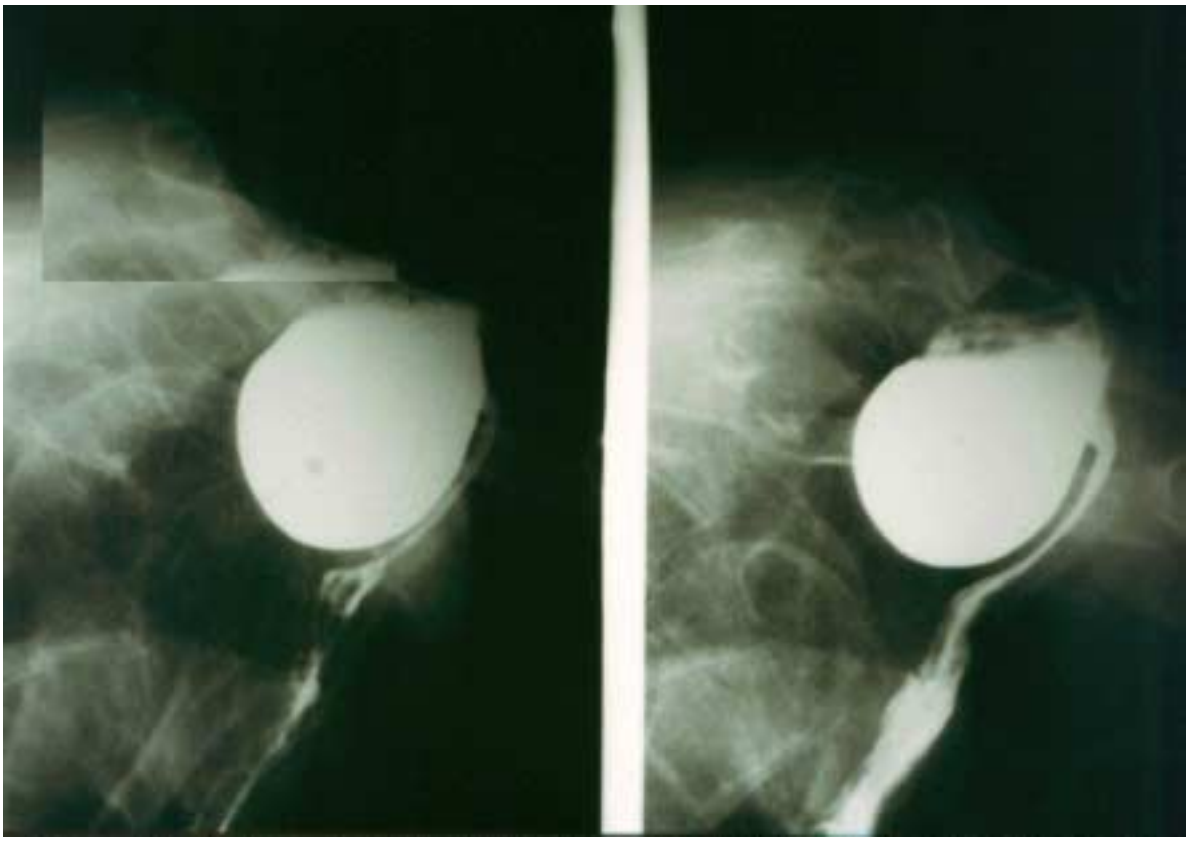

Fig. 2 – Radiological image of a large Zenker’ s diverticulum with compression and stenosis of underlying esofagus (2nd-3rd Lahey’s stage).

Complications

Complications may include:

- nutritional deficiencies;
- *ab ingestis* pneumonia;
- perforation (normally for iatrogenic reasons);
- neoplastic transformation.

Treatment

The treatment of ZD is surgical, and now includes one of two standardized procedures: open UES myotomy and diverticolectomy, or endoscopic diverticulopexy.

Standard UES myotomy and diverticolectomy

- premedication with anti-H2 or PPI, general anesthesia with endotracheal intubation;
- cervical incision along the medial margin of the left cleidomastoid sternum muscle, ideally prolonged medially at the base of the neck ("hook incision");
- sectioning of the platisma;
- sectioning of the left prethyroid muscles (sternum-ioideum and sternum thyroid);
- exposure of the left thyroid lobe, which is shifted to the right;
- identification and safeguarding of the left laryngeal nerve;
- interruption of the lower thyroid artery at its sighting, if necessary;
- exposure of the esophageal plane;
- recognition of the diverticulum and its gradual isolation (more complex cases may make use of surgical access from the right thanks to the medialization of the cervicotomy);
- identification and dissection of the diverticular neck (a guided nasal-gastric probe may be useful to better determine the esophageal lumen margins);
- traction of the sac upwards (cephalic end) to expose the UES and to achieve cleavage between the mucosa and muscle;

– myotomy of the UES, prolonged for approximately 2 cm. along the circular musculature of the esophagus; (Fig. 3)

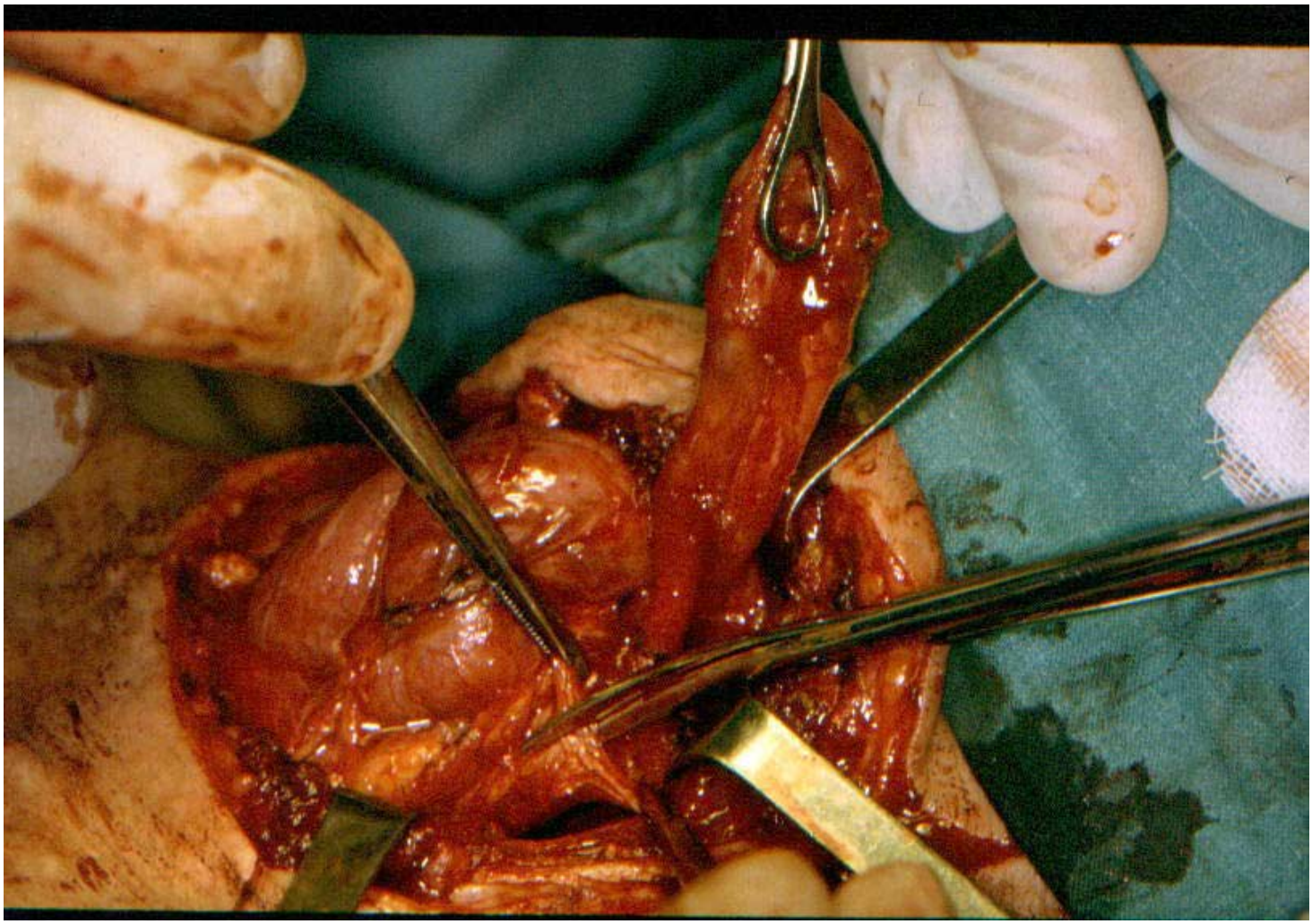

Fig. 3 - Traction of the sac upwards (cephalic end). Miotomy of UES by scissors.

– divarication of the margins of the myotomy;
– mechanical stapling (no. 30 linear device) of the diverticular neck and diverticolectomy (histological exam of the diverticulum) or hand-sewn diverticolectomy using a progressive sectioning-stapling technique;
– no treatment of the muscle wall;
– aspirating tubular drainage;
– closure of the prethyroid muscles, the platisma and the skin.

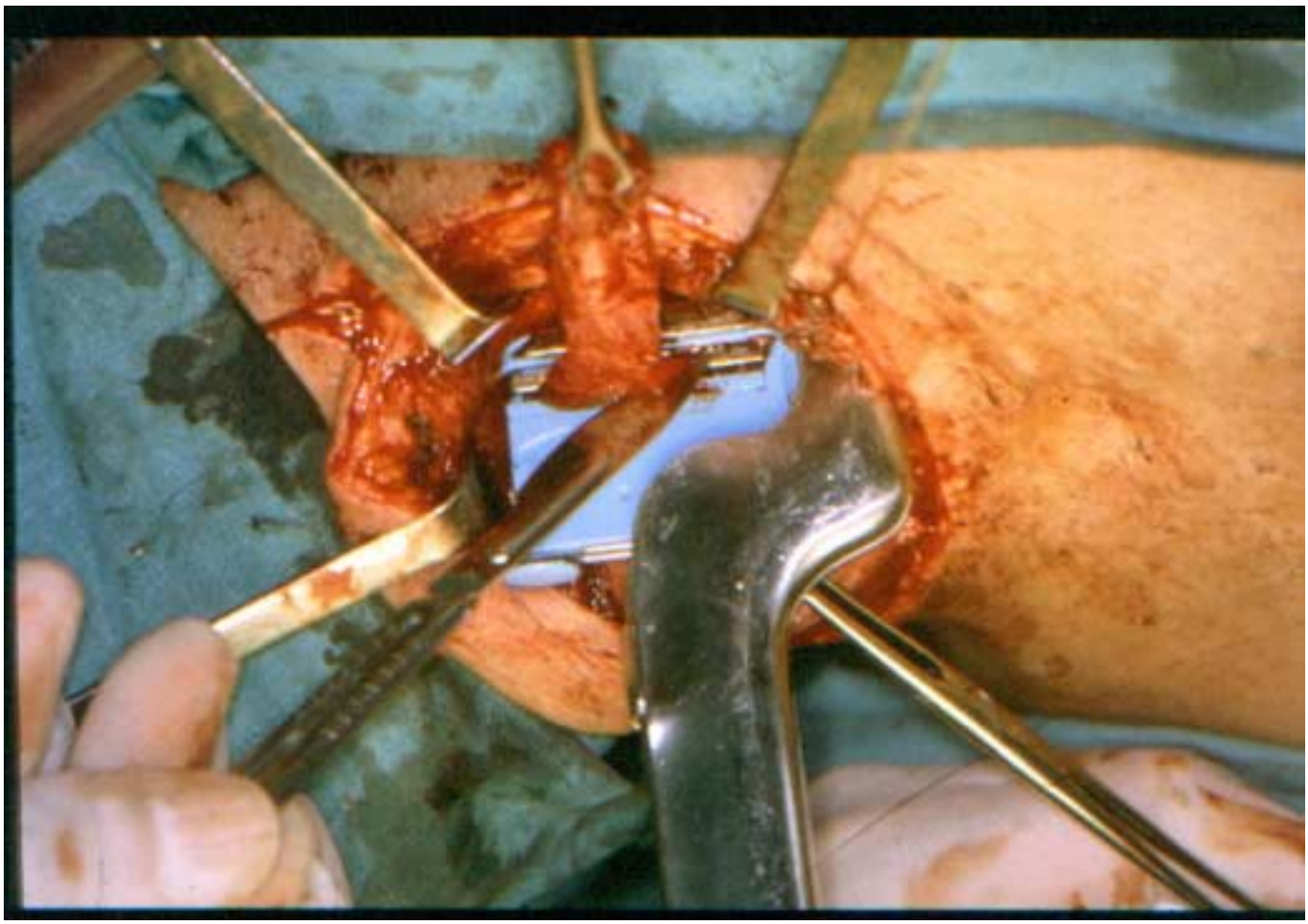

Fig. 4 - Mechanical stapling (no. 30 linear device) of the diverticular neck and diverticolectomy.

Collard's endoscopic esophago-diverticulopexy

Section-stapling of the esophageal-diverticular spur using a modified Weerda diverticoloscope and an no. 30 mechanical endoscopic linear stapler: three rows of metal points are used. This approach does not excise the diverticulum, but creates a cavity between the esophagus and the diverticulum by eliminating the spur that separates them.

Conclusions

Zenker's diverticulum is the result of a functional error developing because of abnormal pharyngeal-esophageal coordination. It is often triggered by GERD. Consequently, UES myotomy is the treatment of choice. Diverticolectomy follows to remove the secondary anatomic alterations and the all related inflammatory, dysplastic and (even if rare) neoplastic implications.

Myotomy plus diverticolectomy has proven to be a safe treatment option, yielding impressive immediate and long-term results as reflected by numerous experiences reported in the literature.

Endoscopic diverticulopexy in expert hands may be advantageous in particular cases, but still has the drawback of not removing the diverticulum.

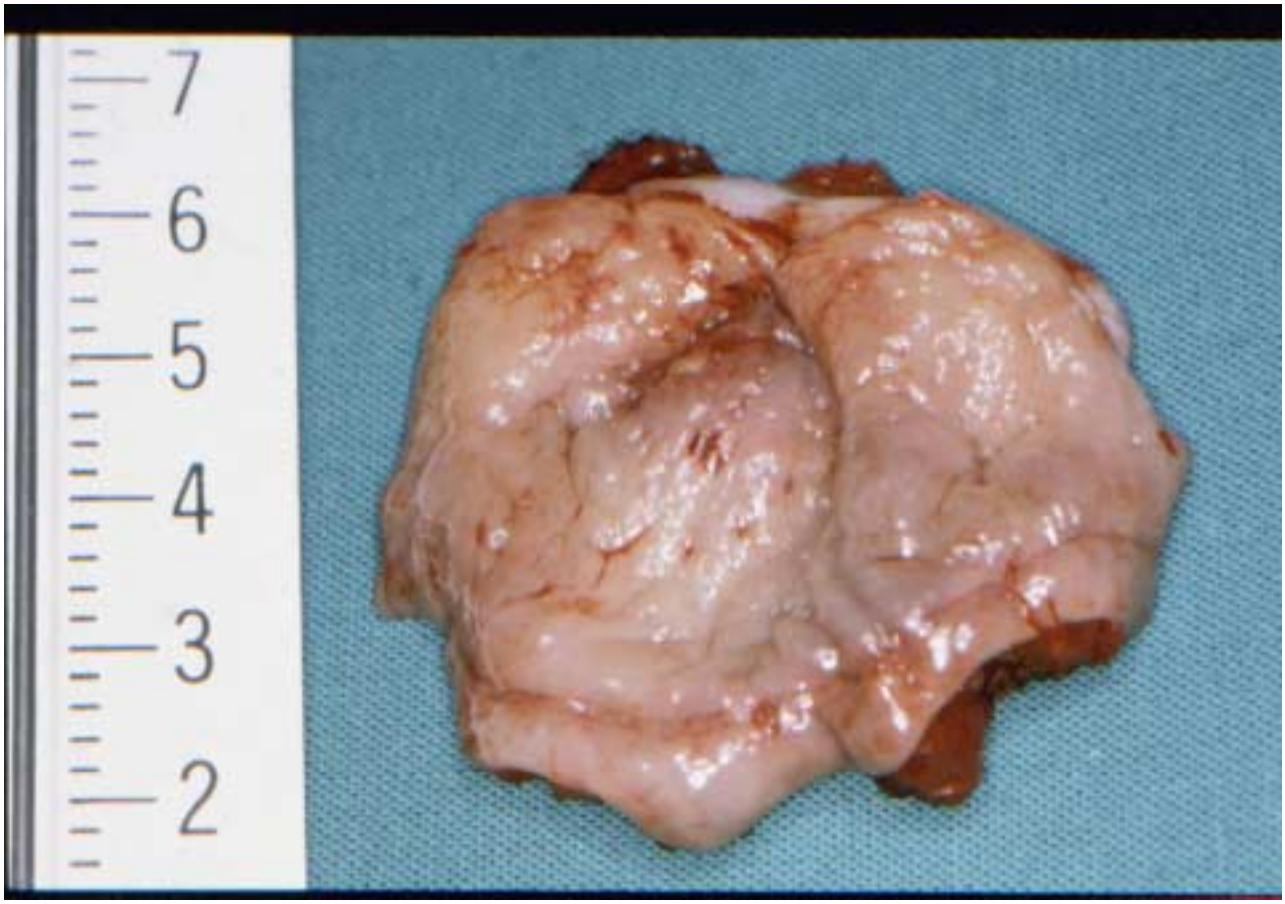

Fig. 5 - Inflammatory and dysplastic alterations of diverticular epithelium.

Further Reading

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