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EDITORIAL

Surgery for gastroesophageal reflux: Ebb and flow

Gastroesophageal reflux disease (GERD) is common: in 2006, the overall prevalence was 31% in France; GERD with frequent episodes of reflux occurred in 7.8% of the French population [1].

In the past, surgery was proposed when medical treatment failed. The operations performed at that time were either fundoplication or total duodenal diversion (partial gastrectomy and Roux-en-Y gastro-jejunostomy) *via* laparotomy. The introduction of proton pump inhibitors (PPIs) in the 1980s was an enormous turning point, because this treatment allowed better control of acid secretion, and was much more effective than Histamine-2 receptor blocker-based medication. At last, there was an effective therapy for pyrosis, and consequently the indications for surgery decreased considerably. The advent of PPI revolutionized the treatment of GERD.

The wave of enthusiasm inspired by laparoscopy in the 1990s did not spare GERD surgery. So-called mini-invasive surgery was better accepted by patients, the post-operative course was shorter and less painful, and the indications for surgery increased exponentially. Operations that had already had been shown to be ineffective, such as Rampall's procedure or the Angelchik prosthesis were resurrected under the pretext that they could be performed much more easily under laparoscopy [2]. At the slightest manifestation of GERD, whether typical or not, surgical procedures flourished, at times with unjustified indications and flawed techniques. Outcomes were often less than good, with dramatic and occasionally fatal complications, such as esophageal perforations. Such results were difficult to accept for functional surgery, and they shook the confidence of gastro-enterologists and patients seriously. Surgery for GERD suddenly plummeted again: PPIs worked just as well as surgery, as was shown in the Swedish study published by Lundell *et al*. [3]. In this multicenter trial that compared anti-secretory treatment to total fundoplication, outcomes were similar with regard to control of GERD, but fundoplication often led to overcorrection. Meanwhile, the PPIs had many qualities, and no adverse effects.

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During the 2010s, research in the field of endoscopy led endoscopists to describe and then test endolumenal anti-reflux procedures: audacious fundoplication techniques that were made possible thanks to a clever endolumenal suturing device or radioablation at the level of the lower esophageal sphincter (LES) [4]. After a rush of enthusiasm, this time from the endoscopists, but under the worried eyes of surgeons, the expected results were not confirmed and these techniques never became a widespread community practice: PPIs remained the best treatment for GERD, at the price of long-term daily intake.

Improved knowledge of the mechanisms behind GERD, and in particular, the role of transitory relaxations of the LES, led to propose treatment by Baclofen®, a GABA receptor agonist. However, although effective and perfectly adapted to the physiopathology of GERD, this modality had too many side effects, particularly neurological, for routine use. Likewise, prokinetic treatment, which is purported to accelerate gastric emptying and reduce GERD-related symptoms, has not been convincingly effective. PPIs had the last word, and still remained the best treatment for GERD.

Currently, the indications for laparoscopic fundoplication surgery to treat GERD are limited to specific scenarios: inadequate response to PPIs, in particular, persistence of food regurgitations, PPI-dependent GERD in the young patient or PPI-refractory GERD.

The evolution of PPIs is similar to that of many other molecules: in the initial phase of their use, all the positive qualities are highlighted but no side effects are found; then, as time passes, side effects are reported, and limitations for treatment appear. PPIs have resisted fairly well, essentially because of the advent of second-generation PPIs, such as esomeprazole, which seems to be more active than the original omeprazole. Finally, the side effects become well-recognized. The first of these was reduced acid-dependent calcium absorption. Thus, long term PPI use leads to the risk of osteoporosis and femoral neck fractures [5]. Other adverse effects have been reported: kidney failure, galactorrhea, or hyperplastic gastric polyps. For these reasons, long-term prescription of PPIs is not recommended, especially in menopaused women. In the end, not all PPI effects are advantageous.

Surgery for GERD has reappeared on stage, with the same traditional indications: PPI-dependent GERD, partially effective medical treatment with persistent positional regurgitation and failure of medical treatment. On the front page today is the increased incidence of GERD that occurs after bariatric sleeve gastrectomy (SG), essentially *de novo* reflux, and aggravation of pre-existing GERD [6]. The topicality is further driven by the important rise in the incidence of adenocarcinoma of the esophagogastric junction, which has increased 6-fold during the last 25 years [7]. It was already recognized that control of GERD reduced the risk of malignant degeneration in Barrett's esophagus, but did not completely eliminate it [8]. We know that Barrett's esophagus is the consequence of biliopancreatic reflux, which is not influenced by PPIs, to the contrary of an efficient fundoplication. This has given rise to the logical suggestion that surgery for GERD could prevent adenocarcinoma of the esophagus and the esophagogastric junction.

Fundoplication remains the standard treatment of GERD, whether by a partial or a circumferential wrap. Two meta-analyses [9,10] concluded that the efficacy of these two procedures was similar. However, fewer side effects (dysphagia or hypercorrection syndromes such as the gas bloat syndrome) are observed with partial fundoplication.

Another new treatment modality appeared in 2010: peri-esophageal magnetic sphincter augmentation, using a laparoscopically implanted device commercialized under the name of Linx® [11]. This device, although not yet available in France, has been widely assessed, particularly in North America, with promising objective and subjective results [12]. This could be a simple and effective solution for the treatment of GERD, particularly after SG, where fundoplication is impossible, and where the only other therapeutic option is transformation of the SG into a Roux-en-Y gastric bypass.

However, effective anti-reflux surgery requires that indications be correctly observed, with patient selection by a tailored pre-operative workup including high-resolution esophageal manometry that should eliminate esophageal motor disorders (a notorious cause of poor outcomes), endoscopy and pH-metry or impedance pH-metry whenever the manifestations of GERD are not typical. The surgical technique should be rigorous: the fundoplication should be at least 3 cm long, without undue tension, and with associated crural repair. The recent article by Spechler *et al.*, published in 2019 [13], is particularly interesting in this respect. The authors concluded that fundoplication was superior to medical treatment for patients with PPI-refractory heartburn. Of 366 patients with PPI-refractory heartburn, only 78 had documented reflux, for which surgery is the best therapeutic option. In other words, their exacting pre-therapeutic workup eliminated 78% of patient who did not have authentic GERD. This clearly illustrates the need for surgeons to understand the disease, its typical and atypical manifestations, and to be able to correctly interpret the elements of the pre-therapeutic workup. This is indispensable for correct indications and good results for GERD surgery.

It is therefore important that surgeons, or at least a group of surgeons, once more take an interest in this frequent disease, which has been neglected for a while, but is now highly topical. It also raises the question of hyper-specialization in visceral and digestive surgery: should we organize a formal surgical specialty to treat GERD and the surgery of the esophago-gastric junction? Maybe we do not need to go that far, but it might be desirable that this type of functional surgery for which the indications are increasing, be conducted by highly motivated practitioners, if not specialists, and therefore, should be ''error-free''.

Disclosure of interest

The authors declare that they have no competing interest.

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