Evolution of Gastro-esophageal Fundoplication

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Fundoplication has evolved from 360° total wraps to now 120° partial wraps. These are the second commonest laparoscopic procedures at present. Esophageal lengthening procedures have re-entered the debate since the days of open surgery.

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Fundoplication has been used as a surgical option in the treatment of gastro-esophageal reflux disease (GERD) when the conservative treatment has failed. It is also part of the repair for the rolling or paraesophageal hernia. With the advent of laparoscopic surgery lap-fundoplication has become commoner and is now the second most common laparoscopic procedure in digestive surgery. It is bordering at controversy in terms of the extent of its application – all the more in the presence of effective medicines like H2 blockers and proton pump inhibitors.

Belsey and Nissen methods are the examples of total fundoplication and have been in practice for many decades. The near-total wraps were the modifications described after Belsey and Nissen procedures. They were Toupet (270°), Guaran (240°) and Cheec (200°). The leading complications remained post-fundoplication dysphagia, gas-bloat and inability to vomit. The extent of the wrap was reduced even further and in 1962 Dor described anterior partial fundoplication as an adjunct to Heller’s operation. Watson described the (120°) anterior partial wrap in 1970’s. It was a modification of the Dor type. The short gastric vessels were not divided. The fundoplication stitches also passed through esophageal muscle. The successful results of laparoscopic Watson method were published in 1991. The post-fundoplication dysphagia was 2% and the gas bloat was nearly absent.

First laparoscopic Nissen was done by Dallemagne in Belgium in 1991. Mid 1990’s were spent improving the laparoscopic technique. The issue of esophageal shortening also entered the debate. Swanstrom in 1996 described the earliest results of laparoscopic esophageal lengthening. It was well known in the days of open surgery. Esophageal lengthening procedures date back to such times. With the advent of laparoscopic surgery it has now become a heavily discussed issue.

Fundoplication is combined with the repair of the diaphragmatic crura. Tension free repair of the crura is a prerequisite for success. It may require mesh – either bridging or buttressing. Laparoscopic cruroplasty currently lacks the accuracy and point-to-point crural matching seen in the open repairs. A pitfall is a tendency to over-repair the hiatus behind the esophagus. In larger defects this may lead to forward angulation of the gastro-esophageal junction resulting in postoperative dysphagia. To prevent this, additional hiatal stitches should only be applied anteriorly after the initial three or four posterior ones. It is possible that some of the fundoplication ‘strictures’ were in fact acute angulation of the intra-abdominal esophagus. However said that, Watson (2001) in a prospective trial demonstrated equivalent short-term results when the hiatal closure was mainly anterior as opposed to posterior.

The incidence of post-fundoplication reflux after more than four to eight weeks tends to be low and is 3-10%10. Recurrent post-fundoplication reflux affects 3.7% of patients and requires revisional surgery in 0.7%. The incidence of early post-fundoplication dysphagia (resolving within three to six months) is 11-20%8,9. It has been reported to be as high as 67%. Persistent dysphagia is seen in a variable figure of 2.5-24%8,10,11. Persistent dysphagia after dilatation is encountered in 3.5% and, after revisional operation, in 1%8. The Dutch randomized trial had to be terminated when 7/57 patients with laparoscopic Nissen fundoplication developed persistent dysphagia as compared to the open method (0/46)11. Disorder of esophageal motility does not appear to be a cause. The length of fundoplication was the source of debate and short 1.5cm wrap length has been recommended. The benefit is uncertain. However esophageal intubation (with 56F bougie) has been shown in a prospective trial to be protective towards long-term dysphagia14.

The concept of esophageal foreshortening has crept in from the days of open surgery. GERD is believed to lead to chronic transmural submucosal inflammation and fibrosis. The acquired shortening therefore is true and not just ‘spasm’. Collis gastroplasty is an esophageal lengthening procedure. It has not yet been accepted fully in laparoscopic surgery. Swanstrom in 1996 described the earliest results of laparoscopic esophageal lengthening. Some studies have demonstrated its efficacy. Others, especially more traditional surgeons are not entirely convinced. It is believed the modern effective medical treatment of GERD may have reduced the incidence of esophageal shortening15. There is some evidence that lack of gastroplasty may lead to a higher re-operation rate16. Laparoscopic Collis gastroplasty may use Swanstorm method (linear stapler 1996) or Hunter’s technique (circular and linear staplers 1998). The disadvantages of the procedure include suture-line leak from the
gastroplasty and acid-secreting mucosa in the neo-
esophagus. The neo-esophagus is non-motile. Improper
technique may result in stricturing or dysphagia. And
revisional surgery is difficult. The stomach may not always
be in a condition to be used as it may be scarred from
prior.

The reduction in the extent of the wrap over the last
four decades and the re-introduction of esophageal
lengthening marks a possible shift in the surgical
management of GERD. Others remain less entertaining to
anti-reflux surgery – certainly to the extent to which it is
being used in the laparoscopic era.

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