Oesophageal dysfunction and disease in obesity

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Abstract
Patients with morbid obesity suffer a wide range of symptoms that relate to their oesophagus and stomach. It is rather paradoxical that patients who are overweight suffer the symptoms of difficulty in swallowing, pain during eating or pain after eating, because the symptoms of difficulty eating do not translate into weight reduction. There are a range of underlying causes that include gastro-oesophageal reflux disease, dysmotility in the oesophagus, peptic ulceration and the nature and pattern of dietary intake. In addition the surgical treatments used for morbid obesity cause similar symptoms from gastric bands leading to dysphagia or reflux from being too tight or from erosion into the stomach, from balloons being displaced and bypass complications. Serious oesophageal conditions occur more frequently in patients with obesity such as Barrett’s oesophagus and Adenocarcinoma of the oesophagus. This article reviews the literature to highlight the range of potential problems from oesophageal symptoms and disease and how they can be managed in the context of morbid obesity.

Keywords
Obesity, Reflux, GORD, Bariatric, Balloon, Gastric band, Gastric Bypass, Dysphagia, Sleeve gastrectomy, Vertical gastric banding

Introduction
Patients with morbid obesity suffer a wide range of symptoms that relate to their oesophagus and stomach. It is rather paradoxical that patients who are overweight suffer the symptoms of difficulty in swallowing, pain during eating or pain after eating because the symptoms of eating difficulty do not translate into weight reduction. There are a range of underlying causes that include gastro-oesophageal reflux disease, dysmotility in the oesophagus, peptic ulceration and the nature and pattern of dietary intake. The pathophysiology of gastro-oesophageal reflux disease and of dysphagia will be considered. The detrimental effects of the treatments of balloons, gastric bands and gastric bypass will be described and options for management discussed. The serious complications of adenocarcinoma and its premalignant precursor, Barrett’s oesophagus will be reviewed.

Gastro-oesophageal reflux disease (GORD)

GORD is highly prevalent in obese people with increasing BMI a risk factor for developing the disease. The relation between GORD and obesity has been studied for decades and there have been conflicting results. A person with BMI of ≥30 kg/m² is 3 times more likely to suffer from heartburn and acid regurgitation 1.

Though the mechanism of this is poorly understood, a number of epidemiological studies have proven this association. Since recently, more evidence has emerged in favour of a positive association 2. In 2000, Lagergren et al, based on a population based interview study on 820 Swedish, concluded that GOR symptoms occurred independent of BMI 3. His claim was supported by two previous studies, one of which used oesophageal pH measure and other assessed the impact of weight loss on symptom relief 4, 5. A contrary view has emerged since this, with large number of western studies showing a positive association 1, 2, 6-12. This, however, has not been the case with Asian and Afro-Caribbean population. In a large population study with various ethnicities, a strongly positive association was found between BMI and GOR symptoms in white population. This was not the case in Asian and black population 13, a view reiterated by another study from Iran 14. The overall incidence of GORD is high in western world between 10% and 20%, compared to 5% in Asia 6.

The mechanism of GORD in obesity is very poorly understood. Various theories have been postulated and the evidence for each is discussed below, including the theory that the pathophysiology of reflux in the morbidly obesity could differ from others and might require a different therapeutic approach 9

Increased intra-abdominal pressure as a cause of reflux

Increasing intra-abdominal pressure has been hypothesised to be the cause for reflux symptoms. Increasing BMI has been shown to increase intra-gastric pressure and pressure study in a prospective cohort has shown 10% increase in intra-gastric pressure with rise in each unit of BMI 15. A pH and manometry study in general population with GORD showed a higher pressure gradients across the Oesophageo-gastric junction than that in controls both before and during transient lower oesophageal sphincter relaxation. This phenomenon is thought to be caused by increased intra-gastric pressure, supporting the above theory 16.
Lower oesophageal sphincter dysfunction as a cause

Kuper et al showed a dysfunction of LOS and altered oesophageal motility even in asymptomatic patients with morbid obesity using pH and manometry study (BMI >40 kg/m²) 17 and Wu et al showed an abnormal post-prandial LOS with prolonged transient lower oesophageal relaxation 18, 19. These findings were re-iterated by ayazi et al, showing obese patients to be more than twice as likely to have a mechanically defective LOS 20. However, another study back in 1987 had shown a similar LOS pressure in normal weight and obese patients, though the gastro-oesophageal pressure gradient to LOS pressure ratio was high in obese 21.

Diet

The amount or composition of dietary intake and its relation to GORD has been studied. There is some evidence that volume, fat content and a high-caloric diet increases the oesophageal acid exposure time, giving rise to symptoms 22-24. This would suggest an improvement of symptoms with reduction of these in the diet. More studies have shown an improvement in reflux symptoms with improved diet 25-29. But, there is no convincing evidence to implicate the role of diet in reflux symptoms of obese patients.

Hiatus hernia

The incidence of hiatus hernia is over 50% in morbid obesity 30. Hiatus has been shown to be predicted by intra-gastric pressure, gastrectoesophageal pressure gradient and BMI. BMI has in turn been shown to predict the former two. This confirms a positive association between BMI and presence of hiatus hernia 31. High BMI is more likely to have oesophago-gastric junction disruption, leading to hiatal hernia and an augmented gastro-oesophageal pressure gradient, providing a perfect scenario for reflux to occur 32. The incidence of defective LES was twice as much in obese patients with hiatus hernia, compared to obese without it 33. Hiatus hernia thus plays a role in the obese patients and the subsequent development of GORD 35.

Poor mobility and mental state

There is no evidence to support the theory of reflux symptoms secondary to poor mobility and depression in the morbidly obese patients.

Treatment of GORD in obesity

Medical therapy

Medical therapy with a PPI remains the first line of treatment of GORD symptoms in obesity as in patients with a normal BMI. No guidelines are available for dose adjustments in the obese patients 34. They continue to receive the standard therapy, adjusted to the severity of disease and symptoms.

Endoluminal therapy

Endoluminal therapy was introduced recently as treatment alternative for GORD and has shown promising results. This looked a safe option for use in obese patients. However, published results have shown high rate of post-operative PPI requirement in the obese patients 35. Further evidence has to emerge before this option can be recommended for use in the obese patients.

Balloon

Intra-gastric balloon therapy has been an established temporary procedure for weight loss. GORD symptoms in obese tends to improve with weight loss, but as studies have shown, a balloon insertion tended to worsen symptoms 36, 37. Balloon is hence not considered an option for treatment of obesity with patients with reflux symptoms.

Gastric band

Gastric banding provides a sufficient anti-reflux barrier in most of the obese patients with GORD. Abnormal manometric findings like increased LES (lower oesophageal sphincter) residual pressure and peristaltic wave duration are frequently encountered after banding. The clinical significances of these manometric abnormalities are not clear 38. The oesophageal stasis caused by the band could explain the reflux in patients during longer follow up. Though, the reflux from the distal stomach is prevented by the gastric band, formation of a proximal pouch predisposes to stasis and reflux. This is more common in patients with preoperatively defective oesophageal motility. The studies suggesting a good GORD symptom control following banding had shorter follow up, explaining the results 39, 40. Hence it could be concluded that gastric banding may aggravate GORD symptoms and cause oesophageal dilatation, especially in patients with pre-operative motility defects. Routine pre-operative testing should be done and alternative bariatric surgical procedures such as Roux-en-Y gastric bypass considered in these patients 41-43.

Sleeve Gastrectomy (Vertical gastric banding)

Gastrectomy reduces weight, but not gastro-oesophageal acid reflux. Although this procedure has been shown to have anti-reflux properties 44, it has fallen to disrepute in terms of relieving the reflux symptoms, especially with the superior results of RYGB 45-48. A number of these cases requiring revision, due to reflux symptoms, have been reported 49-51.

Gastric Bypass Vs Anti-reflux surgery

Though laparoscopic fundoplication is the standard operation for GORD, gastric bypass has been shown to improve the reflux symptoms in the morbidly obese, apart from reducing their weight and obesity related co-morbid conditions such as diabetes mellitus, hypertension etc. Patterson et al. showed an equivalent symptomatic improvement and objective DeMeester score improvement with Laparoscopic Nissen fundoplication
Barrett’s have gained momentum in the recent year. Abdominal obesity or waist circumference has been shown to be more associated with Barrett’s than BMI.

A recent systematic review showed a statistically significant relation between increasing BMI and Barrett’s. However, two older systematic reviews had found a rather weak relation between these two, showing a need for further well designed studies. To mention a few studies, Jacobson et al showed a positive relation between BMI and Barrett’s in women, independent of GORD, though the waist circumference was not found to have any association and Stein et al., found a positive relation between BMI and Barrett’s in war veterans. Abdominal obesity or circumference appears to be more influential in the incidence of Barrett’s oesophagus in another study. There is however, little evidence to suggest an increased progression of Barrett’s to neoplasia in obesity.

Obesity is a modifiable risk factor and if proven to be a risk for Barrett’s and subsequent neoplasia, resources can be directed at modifying this, as there is evidence to suggest the regression Barrett’s with weight loss. Barrett’s have been shown to regress with weight loss following gastric bypass and hence this has been recommended as bariatric procedure of choice in the morbidly obese with Barrett’s. A precise endoscopic evaluation before bariatric surgery with continuing postsurgical surveillance in patients with known Barrett’s oesophagitis, and early evaluation in patients who develop new symptoms of GERD after bariatric surgery is suggested.

Adenocarcinoma of oesophagus

The incidence of oesophageal adenocarcinoma has increased about 400% during the past three decades, the most rapid rate of increase of any cancer in the United States. The association between high BMI and oesophageal adenocarcinoma is strong and well established, though the mechanism of this is still unclear. The risk is higher with increasing BMI, especially in men. Obesity has also been shown to play a role in adenocarcinomas with a family history. The incidence of adenocarcinoma of the cardia of stomach has not been so strongly related to BMI. Squamous cell carcinoma of oesophagus has not shown any association to obesity either. Few studies have negated the association of obesity with oesophageal adenocarcinoma, but many were due to the fact that they included oesophageal and proximal stomach together. The majority of these cancers arise from a background of premalignant Barrett’s oesophagus, though less than 10% of the patients with oesophageal adenocarcinoma were known to have Barrett’s oesophagus previously. Presently there is no evidence that strongly supports any specific strategy to screen a subgroup of the population at risk for Barrett’s oesophagus and adenocarcinoma of the oesophagus.

and laparoscopic gastric bypass. The LES (lower oesophageal sphincter) pressure was also noted to improve, following bypass. This was in light of an earlier report of 31% recurrence rate of reflux symptoms following laparoscopic Nissen’s in obese patients. Hence, morbidly obese patients with GORD should be offered laparoscopic gastric bypass as a surgical option.

The improvement in GORD symptoms after gastric bypass is related to the way that the operation staples off the distal 90% or more of the stomach body and antrum, removing any possibility that acid generated in this part of the stomach can reach the oesophagus. The parietal cell mass within the small gastric pouch that is left attached to the oesophagus, the complete elimination of duodeno-gastric reflux owing to a long Roux limb, and decrease in intra-abdominal pressure with weight loss all contribute to an almost total reflux control in all patients. The overall complications secondary to this procedure were lower than in laparoscopic fundoplication. It is also the procedure of choice for previous other weight-loss surgery, when reflux symptoms develop. Thus, a bariatric team prior to surgical intervention should review obese patients with GORD symptoms.

Dysphagia in obesity

Dysphagia in obesity is often related to the interventions used to treat obesity, though it can be primary in nature. Various modalities of interventions available in obesity have been discussed above. Intra-gastric balloon therapy can be complicated by its displacement into the distal stomach, precipitating dysphagia and outlet obstruction. Gastric bands can be overfilled, causing this problem, and a slipped band or a band eroding through the stomach wall can also lead to dysphagia. There has been no report of gastric bypass resulting in dysphagia, in the literature.

It is our understanding that patients with obesity may present with primary oesophageal dysmotility. Although there is little published literature on this issue, it is our hypothesis that fatty infiltration of the oesophageal wall and myenteric plexus may result in a poor amplitude peristaltic contraction.

Other oesophageal conditions associated with obesity

Barrett’s Oesophagus

This is characterised by the replacement of the normal squamous epithelium of the lower oesophagus by a specialised metaplastic columnar epithelium. Barrett’s oesophagus is a known risk factor for oesophageal adenocarcinoma, with a 30 to 125 times increased risk compared to general population. Risk factors leading to Barrett’s have been poorly understood, though GORD is widely believed to be the main risk factor. Since several studies have found an association between obesity and GORD, and obesity as a risk factor for
A number of studies have also looked at the mechanism or pathway of this malabsorption-disordenaugmentation sequence. Visceral adiposity rather than BMI is thought to have a greater role in chronic inflammation and subsequent neoplasia. It has a clear association with Barrett’s as above. Increasing abdominal girth increases the risk of adenocarcinoma and it has been shown for Barrett’s 98. Visceral fat is hypothesised as a major producer of interleukin-6, adinopectin, leptin and other adipokines that may be associated with the development of various gastro-intestinal cancers 101-103. More specifically, insulin-like growth factor has been implicated in the pathogenesis of adenocarcinoma in the obese 104. Oesophagogastric tumours after bariatric surgery, has been reported, though rare. This condition, when occurs, requires the close collaboration of the bariatric team to achieve a successful oncological result, due to the altered anatomy like the blood supply to the gastric pouch and excluded stomach 105.

Conclusion

Obesity is associated with oesophageal disease, benign and malignant, and both the effects of obesity and the effects of it’s treatment can aggravate oesophageal symptoms. The management of reflux and of dysphagia in obese patients requires a broad understanding of these issues.

Competing Interests
None declared

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