Intraluminal penetration of the band in patients with adjustable silicone gastric banding: radiological findings

Abstract  The aim of this study was to analyse radiological findings in patients surgically treated for adjustable silicone gastric banding (ASGB) for morbid obesity complicated by band penetration into the gastric lumen. We reviewed the records of four patients with surgically confirmed penetration of gastric band into the gastric lumen; three had preoperative opaque meal, one only a plain abdominal film. Vomiting was the presenting symptom in two cases, whereas others had new weight gain and loss of early satiety. Two patients had normally closed bands: radiography showed that their position had changed from previous controls and the barium meal had passed out of their lumen. Two patients had an open band. One patient had the band at the duodeno-jejunal junction, and the tube connecting the band to the subcutaneous port presented a winding course suggesting the duodenum. In the other case, both plain film and barium studies failed to demonstrate with certainty the intragastric position of the band. As ASGB is becoming widely used, radiologists need to be familiar with its appearances and its complications. Band penetration into the stomach is a serious complication which needs band removal. Patients with this problem, often with non-specific symptoms and even those who are asymptomatic, are encountered during radiographic examinations requested either for gastric problems or follow-up purposes, and have to be properly diagnosed.

Key words  Adjutable silicone gastric banding · Gastric surgery · Complications · Stomach · Contrast studies

Introduction

Adjustable silicone gastric banding (ASGB) is a gastric restriction operation which has been popularized as a minimally invasive and completely reversible treatment for morbidly obese patients. Although the surgical procedure has been developed using a laparotomic approach [1], both the band and the operation technique have been recently modified and the intervention is now more commonly performed through laparoscopy [2].

In both open and laparoscopic ASGB operations, a silicone band is fastened around the subcardial area to divide the stomach into two portions: a smaller proximal pouch, made of the most cranial part of the fundus; and a larger, more distal one, comprising the whole gastric body and antrum. The manoeuver aims to create early sense of fullness after ingestion of small quantities of food. The size of meals is then diminished, global food intake decreases, and as a consequence body weight reduces. The band contains an inflatable inner cuff connected by silicone tubing to a subcutaneous injection port, usually sutured in the anterior abdominal muscles. The diameter of the stoma between the two pouches can be adjusted through injection or aspiration of small quantities of fluid in the port. Alterations in the gauge
of the stoma between the two gastric portions speed up or slow down the passage of the alimentary bolus [1].

Despite being "minimally invasive" and fully reversible, the ASGB is not free from complications and a large variety of both functional and anatomic problems have been reported in these patients, leading even to removal of the band itself [3, 4, 5, 6, 7].

Radiological techniques have been proven to be useful in identifying both early and late postoperative complications and to guide proper patient management [8, 9, 10]. In this paper will describe the radiographic findings observed in four patients with penetration of the band into the gastric lumen, a relatively rare major problem requiring band removal, which has been recently brought to clinical attention [3, 5, 6, 7].

**Materials and methods**

We reviewed the records of a series of 45 obese patients submitted to ASGB between February 1990 and August 1996 (38 females and 7 males; age range 12–44 years, mean age 29 years; weight range at surgery 80–129 kg, mean weight 95.7 kg). Of these patients, 34 underwent open surgery (original Kuzmak’s band and technique [1]), whereas 11 were operated on laparoscopically (Lap-Band and 1994 Cadière’s technique [2]). Five patients, all in the laparoscopic group, had band removal due to band penetration into the stomach. One of them had the diagnosis and intervention done at another hospital; the remaining four form the basis for this report.

All subjects had undergone a preoperative barium study of the stomach to exclude the presence of lesions that would constitute contraindications to the operation. Post-surgical clinical and radiological follow-up was routinely obtained at 4 and 12 months. Additional examinations were performed if and when patients became symptomatic, suggesting presence of a complication.

In patients of the present series, a barium study had been performed shortly before removal of the penetrated band in three of four cases. The remaining one had only plain films of the abdomen and preoperative gastroscopy. The radiographic images were reviewed by two of the authors who were aware of the diagnosis and who tried to explain the radiographic findings on the basis of the surgical report.

**Results**

The clinical characteristic of the four patients, including time elapsed since band implantation, surgical technique, history, presenting symptoms and surgical findings, are summarized in Table 1. In none of the cases was gastric band penetration suspected before the radiographic studies.

Review of the radiographic images showed that in two patients (cases 1 and 2) the band was regularly closed, whereas two (cases 3 and 4) had an open band.

In both, cases 1 and 2, there were two radiological findings which suggested the presence of complications: the contrast medium did no longer pass only through the lumen of the band, but either was flowing outside, or both, inside and outside, of it. The position of the band was different from that demonstrated in previous controls. In fact, case 1 had slight caudal displacement of the band, whereas case 2 had both displacement and change in orientation of the band, which was no longer at 90° with respect to the gastric lumen (Figs. 1, 2). At surgery, the band in case 1 was found to be still partially embedded within the gastric wall.

In patient 3 only plain abdominal films were taken. After this study, the patient underwent gastroscopy which allowed the diagnosis of band erosion. Radiography showed that the subcutaneous port was in normal location, whereas the band was open, was located in the inferior abdomen and changed in position according to variations in decubitus of the patient. Surgery demonstrated it within the first jejunal loop, shortly after the

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**Table 1** Clinical characteristics of the four patients. *BMI* body mass index

<table>
<thead>
<tr>
<th>Case no./gender/age (years)</th>
<th>BMI (kg/m²) at surgery</th>
<th>BMI (kg/m²) at reoperation</th>
<th>Surgical approach</th>
<th>Time after surgery (months)</th>
<th>Complications</th>
<th>Symptoms</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1, M, 49</td>
<td>40.3</td>
<td>34.3</td>
<td>Laparotomy</td>
<td>35</td>
<td>Infection at 12 months with port removal</td>
<td>Weight gain</td>
<td>Partially intragastric band</td>
</tr>
<tr>
<td>Case 2, F, 19</td>
<td>35.9</td>
<td>22.3</td>
<td>Laparotomy</td>
<td>12</td>
<td>Proximal pouch dilatation at 4 months</td>
<td>Persisting vomiting for 6 months</td>
<td>Total intragastric band</td>
</tr>
<tr>
<td>Case 3, F, 27</td>
<td>36.7</td>
<td>23.4</td>
<td>Laparotomy</td>
<td>54</td>
<td>-</td>
<td>Nausea and vomiting for 2 months</td>
<td>Band at duode-nono-jejunal junction; hemoperitoneum</td>
</tr>
<tr>
<td>Case 4, F, 28</td>
<td>47.7</td>
<td>39.6</td>
<td>Laparotomy</td>
<td>36</td>
<td>-</td>
<td>Weight gain Loss of early satiety</td>
<td>Total intragastric band</td>
</tr>
</tbody>
</table>