Complications in Bariatric Surgery

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Abstract: Objective. Describe the possible complications that may occur after bariatric surgery. They may be immediate or long-term. Some are very serious such as hemorrhage pulmonary embolism, poor ventilation, leaks, poor weight loss, malnutrition, intestinal obstructions, liver failure, calcium metabolism, or vitamin disorders. Prevention, high suspicion, confirmation and specialized treatment should be practiced.

Key words: Bariatric complications; Post-bariatric hemorrhage; Leaks; Post-bariatric malnutrition; Liver failure.

Introduction

Bariatric surgery (from the Greek baros= Weight and from Iatrein= treatment) is the operative treatment of a prevalent XXI century diseases caused by a “chronic intoxication of calories”. It is as a perennial, progressive, multifactorial disease that leads to other diseases called co morbiddities. The healthy digestive system will not be in such good condition before surgery and surgery is oriented toward: 1) Restricting the intake of calories 2) Producing mal absorption or 3) Both of them, as mixed surgery. Surgeons perform these operations in an organ that IS NOT the cause of the disease, something unique in the history of surgery. The family, other medical colleagues, nor the general public understand the morbidly obese disease, no less the need for surgical remedies. The bariatric surgeon is also discriminated since others do not understand why he is taking care of the morbidly obese. Since Ren [1] published the procedure for doing the Laparoscopic Duodenal Switch (LDS), the most complex elective bariatric operation by laparoscopy, followed by Baltasar [2], at last the beginning of metabolic surgery mainly in the isolated metabolic syndrome (diabetes, cholesterol, triglycerides) with or without obesity. Nowadays, bariatric surgery should be done entirely using the laparoscopic technique even thought in the 2011; the BOLD reports only 41% of LDS are lap and 59% open. Meanwhile the rest of bariatric operations are done using Lap.

We will not enter into the specific complications of Open surgery since we feel this is not a relevant practice today in bariatric surgery. The main drawbacks of open surgery are wound infection, pain in the wound, systemic trauma, etc. and actually the two main advantages of Lap surgery are 1) No post-op hernias, which may be as high as 40% in some studies and b) lack of intra-abdominal adhesions.

The systemic complications of bariatric surgery are very important and need to be prevented. There are three main fields of complications:
1.-Thromboembolism. Prophylactic treatment is necessary. Early ambulation (ICU admission should not be a standard procedure) and LMW heparins are the primary treatments. Progressive leg compression has not proved to be essential. Pulmonary embolism is the most serious medical complication and in selected individual, even inferior vena cava filters, are necessary.
2.- Pulmonary evaluation and active physiotherapy pre and post to prevent hypoventilation. The use of CPAC is being debated since it may facilitate air entering into the operated stomach.
3.-Infection. Mainly of the soft tissues. However, since the advent of laparoscopy, this complication is almost non-existent. Abdominal contamination is also minimal.
4.- Emergency trachetomy in the OR is very rare. But we provide two examples here of two patients with BMI 48 and 35. (Figs. 1 and2)
Failure of intubation is a rare condition. We thought it to be almost non-existent. We have two cases, #1309 and #1423 in our experience that, without any previous signs of airway problem, the anesthetist could not intubate these patients. Emergency OR tracheotomy was necessary due to severe and acute SO2 depression. Advice: 1) Have a very good anesthetist; 2) Evaluate if intubation should be done with the bronchoscope assistance; and finally 3) Surgeons should be trained, proficient and ready for an emergency life-saving tracheotomy since there may not be any time at all to call for any other assistance.

**Monitoring:** The morbidly obese needs intra and post-operative monitoring. Two very good references are 1) Mason’s [4] paper on the importance of discovering any tachycardia >120 in the 2-3 post-opdays to be treated “before sunset” and 2) Capella’s [5] description as to whether invasive monitoring is needed or not. We have had complications [6], such as two atrial perforations with CVP catheters, and we think that the morbidly obese can be closely monitored adequately using the Pulsioximeter and by monitoring blood pressure. There is no need for routine invasive monitoring with CVP, urinary catheter, epidural anesthesia, arterial lines, etc. No routine admission to ICU since this will delay walking. All invasive methods may have their own complications such us perforation of atrium, arterial clotting, urinary infection, etc. and we have seen all of them!

**Serious immediate complications**

**Hemorrhage.** This complication is becoming less common and it is related to a specific procedure: a) *The ports* on the epigastric or mammary artery; b) *Intra abdominal* due to incomplete homeostasis on the mesos, visceral vessels, spleen, liver, etc. c) *Intra luminal,* mainly if the anastomosis has been done with staples instead of with hand-sutures (looking into the bowel with the scope, if possible). Blood transfusions, as a general rule, are worse than doing a laparoscopy. With an extensive irrigation, find the bleeding point and control it by any means possible. Inthis way the surgeon can go home and sleep well and the patient benefits too. The cost and trauma to the patients are also less!!

**Leaks:** It is the more costly complication and a cause of severe morbidity. It happens in a previous suture or staple line. This is the main reason why bands have lower complications rate. If a patient has had a recent operation and the immediate follow-up is not satisfactory always think about a leak! The abdominal symptoms may be nil. Nowadays, if tachycardia, white count and more so a high neutrophils rate plus elevated RCP always think about an inflammatory or infection, and radiological swallow and CT scans are indicated. We agree with Dr. Cortes of Santiago de Chile that the best radiological study is to use a Gastrografin contrast first and then followed by a barium, and CT scan. If a serious leak is seen with Gastrografin no barium intake is necessary because barium may interfere with further CT scans.

Besides a good diagnosis, lavage and good drainage all patients need 1) Hypercaloric nutrition and hydration. Enteral nutrition (with naso-enteric sound or jejunostomy); 2) Broad-spectrum antibiotics; and 3) Follow up with CT scans to rule out residual or “de novo” collections. The need for covered “Stents” [7] is common until the leak cures, usually for 45 days, unless there is a local cause and the leak becomes chronic and needs different attention, such as a diverting RNY loop.

**Specific operations and its leaks:**

1. **Gastric Bypass (GBP).** This is the most popular operation in the USA and has possible leaks at: 1) Gastro jejunal; 2) Vertical staple-line of the reservoir; 3) Vertical suture-line of the excluded stomach and 4) The RNY loop. Leaks are possible from all and each one of them! Prompt lap surgery is needed to clean the area and apply a suture. For leaks >3 days POD, a well directed drain is the best approach. Sutures of the leak usually fail. The aim of laparoscopy is to clean the area, confirm the position of the leak/s and a feeding gastrostomy on the excluded stomach.

2. **Gastric Sleeve.** This is the newest bariatric operation developed by surgeons who were performing the open DS. It has become a laparoscopic technique, but a very complicated operation that is only used on the Super-obese. Leaks occurs almost always occurs at the Esophageal-gastric junction (EGJ) and were was not a well understood complication. Today, it is the subject of symposia and meetings. The sleeve can be as long as 40 cm (more so if the sleeve is carried down to the pylorus) and has a high-pressure zone on a small tube with low compliance [7-11]. Prevention of the leak can be achieved by leaving a decompressing NG tube for 24 hours. Confirm with an x-ray study that there is no leak before feeding. We began in 1996 covering with sero-serosa suture of the stapler-line with Lambert stitches [8, 9, 10] and more recently by encompassing the greater omentum.
in the suture [11].

We use Vertical Gastrectomy (VG) as the scientific term for this operation, which has been legally accepted in Brazil and by the SECO (Spanish Bariatric Society) 2010 Assembly. We think that the terms “Sleeve”, “tube” and/or “manga” are not acceptable term together with Gastrectomy (of – ektome in Greek) which means division and removal of part of the stomach. These terms cannot be used to modify the noun “gastrectomy” because what is removed is not a “sleeve” or “tube shaped”, but in fact, what remains is a “sleeve” or “tube” [12].

The VG or Gastric Sleeve (GS) is “one easy” operation to perform but very difficult to master since it requires the craftsmanship of just one expert. It has not been standardized and there are many variables. It may be that in the long-run it has one of the largest failure rates since the stomach remains too large (much more than the recommended 50 c/c) and the antrum is not removed. This is why a new re-sleeve operation [13, 14] is used more often or there is a need to convert to a DS or RNY-GBP.

Chronic fistulas are very difficult to cure since most likely there is a local cause (stenosis on the distal stomach being one of them, angulations another, etc.) and a RNY diversion may be the preferred treatment [16-18] or even a total gastrectomy [19]. The pancreatic capsule may also be injured with the ultrasonic scalpel and a pancreatic-cutaneous fistula can occur [20].

3. Pancreato-biliary diversion: The Scopinaro or DS operations are causes of leaks at a) The excluded duodenal stump, b) Gastro or Duodeno–jejunal anastomosis, c) RNY, and d) the GS of the DS. We should assume that the DS is more prone to a fistula since the duodenum is less reliable than the stomach [19].

Long-term complications

Less than satisfactory long-term results may occur after Bariatric Surgery such as

1. - Ineffective operation: Some patients do not lose enough weight. The way to measure Weight Loss (WL) has not been standardized even though more than 400,000 operations are done yearly.

The formula of Percentage of Excess WL (%EWL) is:

\[ \%EWL = \frac{(IW - FW)}{IW - IBW} \times 100 \]

IW=Initial Weight, FW=Final W, IW=Initial W; IBW=Ideal Body W. Height is used only to calculate the IBW! But not for the rest of the measurements

The minimum %EWL should be at least 50.

Using BMI = Body Mass Index = Kg / m² (Quetelet Index. Normal 18- 25) is a more reliable form of WL reporting, where

Percentage of the excess BMI (%EBL or %EBMIL) takes into account height in all measurement.

\[ \%EBMIL = \frac{(IBMI - FBMI)}{FBMI} \times 100 \]

FBMI= Final BMI; FW=Final W; IBMI= Initial BMI;
PBMI=Predicted BMI. Height is used for all the measurements

The main drawback using BMI is that a final BMI of 25 is expected for ALL the individuals. This may not be difficult for patients with a BMI around 40, but for patients with a high Initial BMI (the super obese) this may prove to be impossible.

In a study of 7,421 patients [21, 22] we were able to formulate an equation where an “Expected” or “Predictable” Final BMI would more likely be achievable for all patients regardless of BMI. All individuals have a different one depending on the Initial BMI (IBMI). This formula has been obtained by another group of investigators, too [23].

\[ PBMI = IBMI \times 0.4 + 12 \]

So, anyone with IBMI-60, the PBMI will be 36; for IBMI-50, the PBMI will be 32; for IBMI-40 the PBMI will be 28; etc.

We only have to substitute in the %EBL formula, the number 25 for the Predicted BMI and the formula will be:

\[ \%PBMI = [(IBMI – FBMI / IBMI – PBMI)] \times 100 \]

With this Predicted BMI formula we can make comparisons between different patients, different hospitals, different countries, etc. This or another similar formula is the logical way to compare results, but as it happens, even with the decimal system, it will take many years to become standard.

¿What to do when WL is not good enough?

- Study the patient to rule out any dietetic non-compliance or anatomical defects.
- If the residual stomach is too large, perform a re-gastrectomy, adding a band or a BPD [13, 14].
- In case of too much WL and/or protein-caloric malnutrition, the bowel length should be oriented to have a Common Channel of 10% of the bowel, 40% alimentary loop and 50% bilio-pancreatic loop (23). However, extreme care should be taken because the bowel is easily damaged [24].

Effects of excess WL surgery.

2. - Late Complications

Every single bariatric patient ought to have complete information of his records, and if any complication
arises the original surgeon should be consulted. He is the only one who knows what and how the operation was done, unless the patient has a tape recording of the operation and no complications occurred in the immediate post-op period.

1. **Iron deficit.** Taking iron tablets or through an IV (such as VENO-FER) is the best solution.
2. **Vitamin B1.** If the patient has severe vomiting, rule out this deficiency. Beriberi can be very dangerous. 1) Suspect it! 2) Treat it before the labs results and 3) Confirm the diagnosis and treat accordingly!
3. **Vitamin C.** Nocturnal blindness
4. **Mg, Sn deficiencies.**
5. **Calcium.** Calcium can be a real long-term problem to follow-up and control. Only 1% of the body calcium is located in the blood and this is why serum calcium is not reliable. Low Vitamin D-25 and elevated PTH (due to insufficient bowel Calcium absorption) are the primary causes of poor Calcium metabolism. High dose calcium plus Vitamin D25 treatment (over 50,000 IU) may be required.
6. **Diarrheas.** Sometimes they are chronic and can be a serious problem. Metronidazol 250 mg every 8-12 hours is a possible remedy and should be used.
7. **Protein-caloric malnutrition.** This is one of the more serious long-term complications after BPD or any mal-absorptive procedure. It should be suspected in any bariatric operation where bilateral ankles edema occurs. Low Albumin levels can confirm the diagnosis. High intake of proteins (meats, eggs, etc.) and pancreatic enzymes should be given. An increase in the Common channel length may be necessary [23, 24, 25].
8. **Severe Hypoglycemia.** Reversal of the intestines. Complications 5, 6 and 7 plus episodes of severe hypoglycemia may occur together in a single patient, months or even years after surgery. Bowel reconstruction or reversal may be the best solution [25].
9. **Bowel obstruction:** GBP or BPD may complicate with bowel obstruction due to adhesions.

The patient, general physicians and surgeons should know that any bariatric surgery where the small bowel was operated on may develop internal hernias or adhesions which can cause bowel obstruction. Serra [26] published the first study in the world about internal hernias, and, today, this complication is discussed in all bariatric forums. Prevention is done by closure of all mesenteric defects. Any patient admitted with abdominal pain after bariatric small bowel surgery needs a CT instead of a radiological study since the bilio-pancreatic loop may be the cause of the obstruction and only a CT will show it.

10. **Liver failure.** Baltasar [27] reported 10 cases of Hepatic Impairment due to DS bariatric operations.

It is a rarely reported complication [28] but we know of at least 12 cases (Brazil, San Francisco, Canada, etc.) and three in Spain.

Case #10 occurred 12 years ago after an Open DS without incidents. She developed jaundice and liver failure was not recognize in a tertiary center. She needed a liver transplant [29] but a match was found too late.

Case #2 has been published [29] at Valdecilla Hospital in Spain and it was reported as the first world case.

Case #3 was our second case. Her Initial BMI was 49 and dropped to BMI-19. Six months later she developed progressive jaundice, then suffered liver failure and went into coma and successfully received a transplant in a agonic state with partial BPD reversal. She is asymptomatic now with a BMI-23 (Fig.3).

**Conclusions**

Bariatric surgery is functional surgery, done in patients with "chronic caloric intoxication", morbid obesity is permanent, perennial and progressive. Surgery is done in healthy organs that are not causing the disease and do not remain better than pre-op. It produces restriction, mal-absorption, or both. Surgery can complicate with grave and strange problems. Bariatric surgery, and more so laparoscopic surgery, has been a driving force in the XXI century, since many surgeons have extensive practice on thousands of patients with whom he cannot adequately do follow-ups by himself. A multidisciplinary unit and an medical bariatric specialist are mandatory.
Liver Total gastrectomy for complications of the Liver cirrhosis and bariatric operations.

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