Three types of bowel lengthening for Protein-Caloric Malnutrition. Video

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**Background:** Protein-Caloric Malnutrition (PCM) is the most severe long-term complication of the complex restrictive plus mal absorptive operations for morbid obesity such as Bilio-Pancreatic Diversion (BPD), BPD-Larrad, Duodenal Switch (BPD/DS) and the Distal Gastric Bypass (DGBP) where both components are important ¹.

Preventive measures are the correct measures of the bowel lengths and proportion where the Common Channel (CC) should be 10% of the whole bowel, the Alimentary Limb (AL) a 40% and the Bilio-Pancreatic Limb (BPL) 50% ². The PCM is extremely rare after simpler restrictive operations. The basic cause of the PCM is too much restriction combined with to severe mal absorption ².

Signs of PCM are asthenia, anorexia, excessive weight loss, etc. PCM should be suspected when pitting edema occurs, months or years after a complex operation for obesity and should be confirmed with a serum Albumin level below 3 mg/dl.

PCM can be corrected in some cases in the sporadic PCM form with high protein intake (by mouth or IV), vitamins and pancreatic enzymes (such as Kreon). If correction has not been achieved within 1-2 months bowel lengthening of the intestinal absorptive component should be done ³.

**Key Words.** Protein-caloric malnutrition; Bowel lengthening; Kissing-X; Biliopancreatic diversion

**Surgical alternatives:**

There are 3 surgical interventions to resolve the PCM:

1) **Type I.** Revert the small bowel to the initial normal situation shape and function, with a possible drawback of weight re gain if the restrictive component of the operation is not enough; (Fig. 1A)

2) **Type II.** Perform a side-to-side small bowel anastomosis between AL and BPL 60-70 cm proximal to the RNY to increase the absorptive bowel capacity in what is called “Kissing-X” operation (Fig. 1B);

3) **Type III.** Bowel lengthening the CC by moving the AC > 100 cm proximally on the BPL over the previous RNY (Fig. 1C)

We do present in these 2 videos of the 3 alternatives

1. – Complete reversal of bowel

Type I -  [www.youtube.com/watch?v=TUgteIZevRY](http://www.youtube.com/watch?v=TUgteIZevRY)  

Type II & III -  [http://www.youtube.com/watch?v=7lfz-dF-QY](http://www.youtube.com/watch?v=7lfz-dF-QY)

- Five Lap 5 mm ports are used. The BPL and AL are identified when they join the RNY.
- Proximal to the RNY >60 cm are measured at the BPL and the AL and both are marked with 2 clips distally and 1 proximally to prevent mistakes or rotations. This step of marking is very important. The 60 cm are sufficient on both AL & BPL. A silk suture in the loops and can be brought outside the abdomen without a port and use a s traction.
- A continuous silk suture joins the posterior outer layer and is tied as a De Cushieri knot.
- Both loops are opened with the ultrasonic scalpel
- A second running suture of PDS joins the inner mucosa and Muscular layers.
- Then the anterior wall is brought together from distal to proximal by a continue PDS suture and tied to the posterior one.

- The anterior sero-muscular layer is done with a silk suture.
Finally the mesenteric defect is closed to prevent internal hernias
This “Kissing-X” anastomosis is simpler since no staplers are necessary

3. Bowel CC lengthening based on the BPL by moving the AL proximally on the BPL

IN this case we have to use a 10 mm port and linear stapler to cut the bowel at the end of the AL
The Ileo-cecal valve is identified and the appendix removed (optional)
The CC is measured as far as the RNY.
Then the AL is measured starting under the mesocolon and down to the RNY
The 3 loops are identified at the RNY junction
The BPL is identified at the Treitz ligament and followed as far as the RNY and marked with clips at > 100 cm
The AL mesentery is easily identified because it has no scar, contrary to the BPL mesentery that has one, and it is divided with the ultrasound scalpel
The end of the AL is divided with a linear stapler
The divided end of the AL is brought end-to-side at > 100 cm on the BPL above the RNY
A sero-serosa silk suture bring together both AC and BPL loops end-to-side
Both loops are opened with the scalpel
A PDS continue suture joins the posterior aspect of the anastomosis
And another one joins the anterior aspect of the anastomosis
And then a silk suture for the serosa
The mesentery defect is always closed with a non-absorbable suture

Laparotomy was used on 11 cases without incidents or mortality. Laparoscopy was used in the last 13 and 2 of them suffered iatrogenic injuries to the bowel due to the long laparoscopy instrumentation and handling that required laparotomy but sepsis developed and died 4.

We learn from those 2 patients that PCM bowel is easily injured by laparoscopic instruments. The bowel wall is extremely fine and delicate most of all in between the fine bowel wall vessels where mucosal “hernias” occur. If long, > 35 cm instruments are used, invisible lesions can occurs and the intestinal perforations.

IF laparoscopy is finally decided upon this are our advices: 1) Do not measure all the bowel since it is easier to injure it measuring 4.5-6 m of bowel than if only 200 cm are handled; 2) Use soft instrumentation; 3) Identified the AL by and the CC without mesentery scar and the BPL with scar on the mesentery; 4) Use the type II operation since is much simpler and less possibility of parietal wall injury and 5) Always leave drains to detect any early leaks.

All patients but one had resolution of the PCM. One patient with Type III required a conversion to a Type I to resolve his PCM.

References:

1. Hess DS, Hess DW. Correspondence. Limb Measurements in Duodenal Switch. Obesity Surgery, 13, 966