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Original article

Pyrrhic victory? Long-term results of biliopancreatic diversion on patients with type 2 diabetes and severe obesity

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Abstract

Background: The long-term results after biliopancreatic diversion (BPD) in patients with type 2 diabetes (T2D) and severe obesity is still being debated.

Objective: Retrospective evaluation of the long-term metabolic and clinical conditions of patients with T2D following BPD.

Setting: University hospital.

Methods: A total of 173 patients with T2D and severe obesity were investigated prior to and at 3–5 and 10–20 years after BPD. Anthropometric, biochemical, and clinical findings preoperatively and

173 consecutive patients with T2D and severe obesity undergoing BPD

173 patients with T2D and class II/III obesity undergoing conventional therapy and followed for 10–20 years served as controls

Due to the intestinal malabsorption of iron, calcium, liposoluble vitamins, and trace elements, all BPD patients were encouraged to take chronic supplementation indefinitely

Owing to the decreased protein absorption, patients were requested to maintain a protein intake greater than usual to prevent protein malnutrition

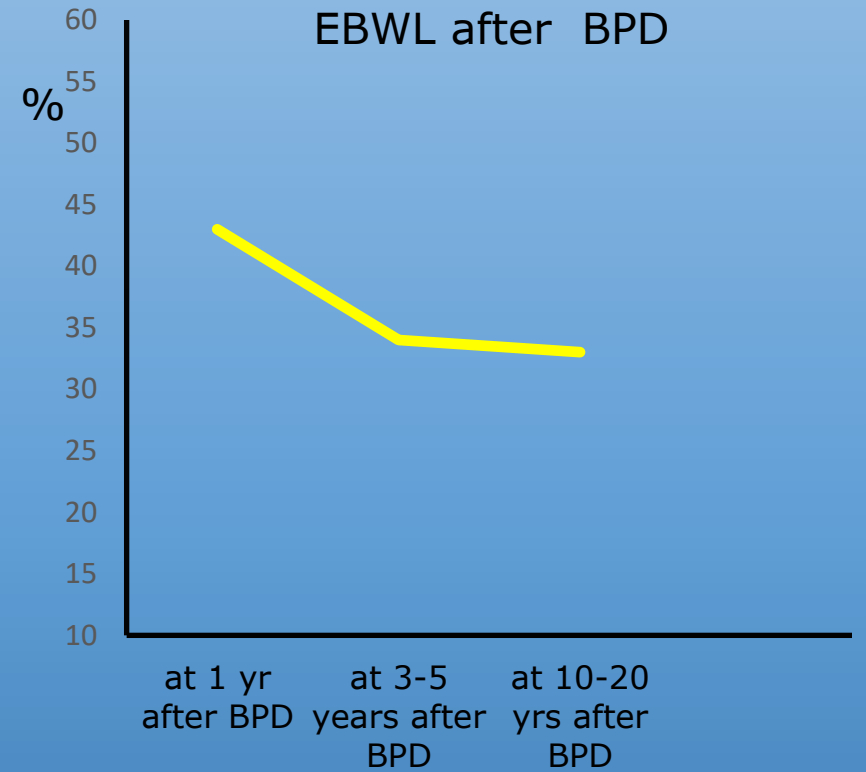
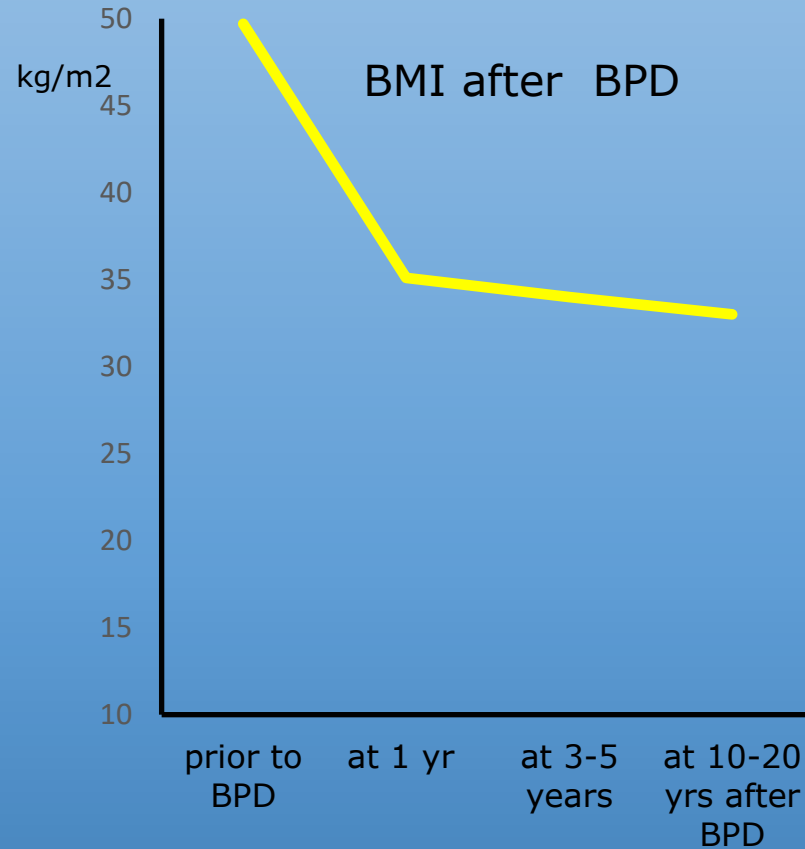
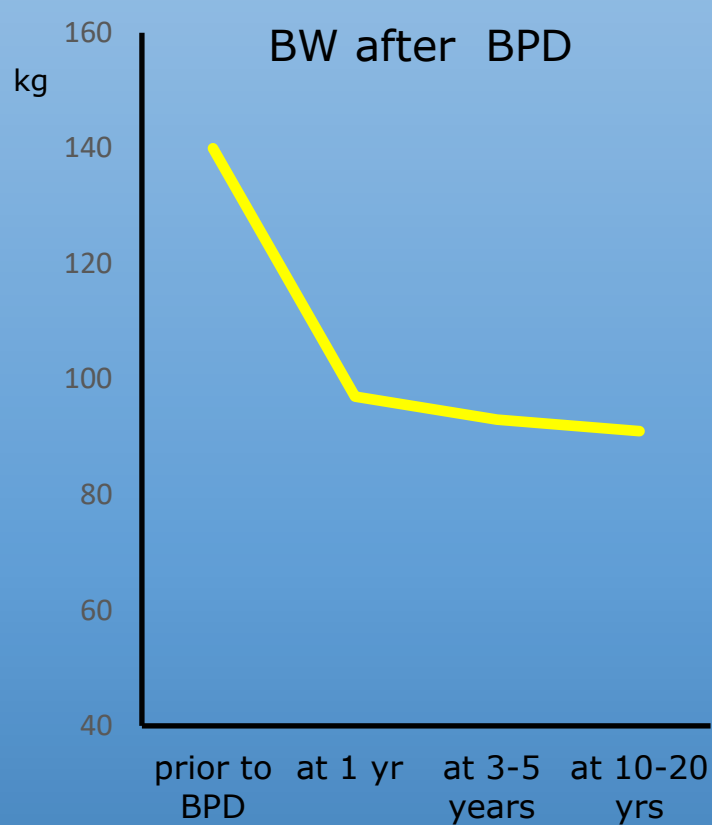
Because of the upper GI rearrangement, the chronic use of protein pump inhibitors was recommended to prevent GERD and UPPA



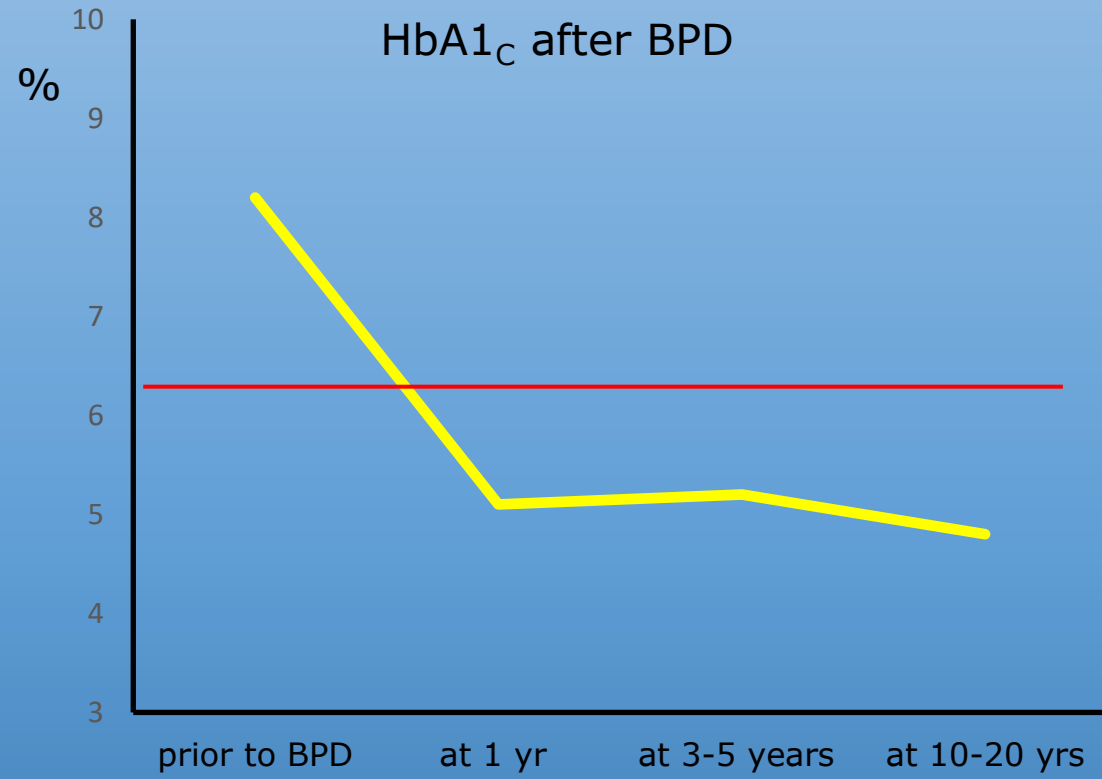
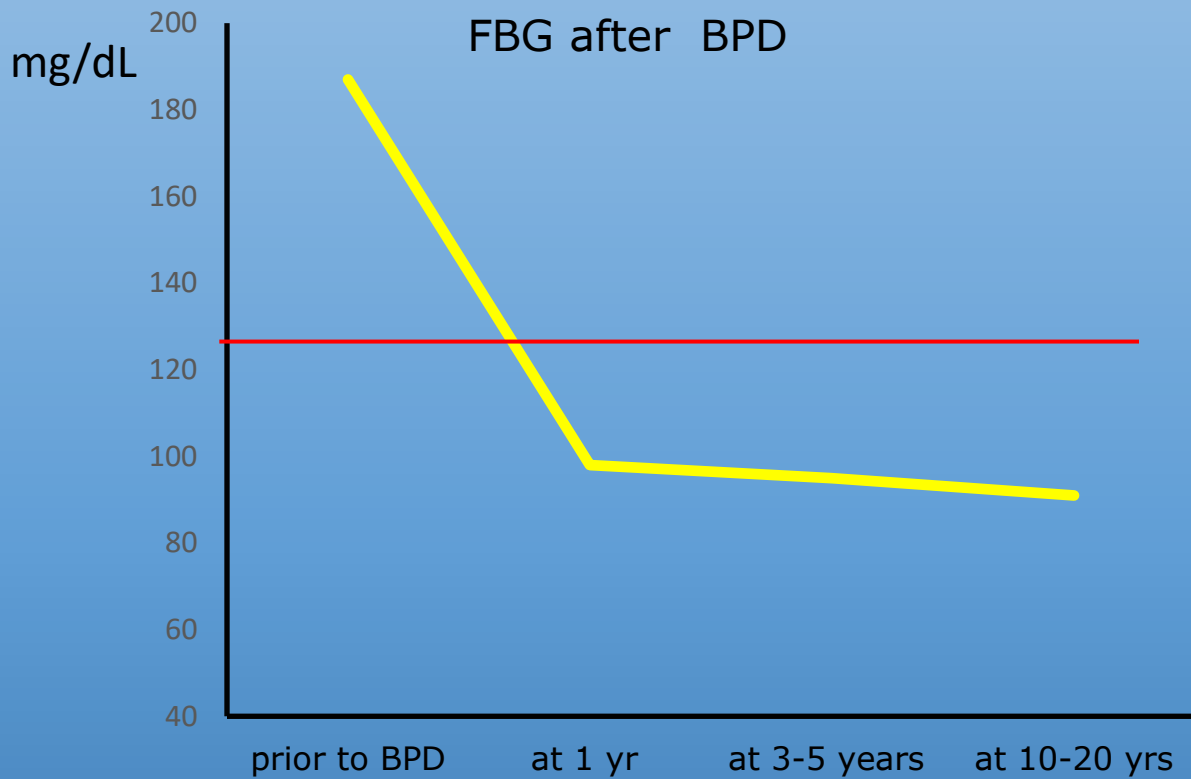
Anthropometric, biochemical and clinical findings obtained prior to BPD, at 1 year, at 3-5 years and at 10-20 years after the operation were reported

The development of severe complications and the appearance of meaningful clinical events was evaluated within the early or the late follow-up period

The follow up rate was 63% for the BPD patients and 70% for the control subjects



Within the first postoperative year, the BW, BMI and EBWL mean values sharply decreased, and the levels were closely maintained in the very long run



FBG and HbA1C mean values normalize within the first postoperative year, and remain stable below the diabetic range during all the follow-up period

factor	prior to BPD	at 1 yr	at 3-5 yrs	at 10-20
T2D n (%)	173 (100)	12 (8)	11 (8)	12 (14)
hypertension (%)	123 (96)	34 (36)	18 (33)	14 (28)
dyslipidemia n (%)	48 (30)	29 (20)	14(11)	3 (7)
OSAS n (%)	50 (29)	20(1)	0	0

Factor	At admission	At the end of the follow-up
patients	173	120
BW (kg)	100	91.5
BMI (kg/m ²)	35	33.6
FBG (mg/dL)	159	147
HbA1C	7.7	7.7
TG (mg/dL)	159	147
HDL cholesterol (mg/dL)	46	46
CVD n, (%)		17 (16)
Deaths n (%)		16 (16)

Patients with type 2 diabetes and severe obesity treated with conventional therapy.
Anthropometric and biochemical data at admission and at the end of follow-up

In subjects with T2D and severe obesity, after BPD in the vast majority of the cases **BW sharply reduces**, the **serum glucose concentration normalizes**, and in a significant proportion of the cases **a partial or total remission of the comorbidities**, as OSAS, hypertension and dislipidemia, does occur. These highly satisfactory results are maintained in the long and very long term.

Such anthropometric, biochemical and clinical improvements **were not observed in the non-operated cohort.**

BPD related complications throughout the postoperative follow-up in TD2 patients

	first post BPD year	early (3-5 yrs) follow-up period	late (10-20 yrs) follow-up period
Patients (#)	157	139	86
perioperative complications (#and %)	3 (2)		
acute bleeding from peptic ulcer (#and %)	7 (4)	5 (3)	
gastro-esophageal reflux disease (#and %)	9 (6)	6 (4)	4 (5)
distressing anorectal disorder (#and %)	14 (9)	14 (10)	4 (5)
severe and recurrent deficiency anemia (#and %)			6 (7)
metabolic bone disease (#and %)		2 (1)	6 (7)
protein malnutrition (#and %)	2 (1)	4 (3)	6 (7)
symptomatic vitamin deficiency (#and %)		4 (3)	16 (12)
GI transit alterations and chronic diarrhea (#and %)	7 (4)	5 (3)	17 (2)
liver cirrhosis (#and %)		2 (1)	3 (4)
incisional hernia (#and %)	80 (51)		
BPD revision or restoration (#and %)	0	1 (1)	10 (12)
No significant complications, excluding incisional hernia (#and %)	133 (85)	111 (79)	55 (64)

- Uneventful follow-up was observed only in half cases
- In 11 patients, a further operation was necessary for correcting a BPD-related complication.
- For protein malnutrition, the alimentary limb was elongated and in 4 cases and the BPD was converted in RYGBP in 2 cases.
- Total reversal of the operation was performed in 3 cases for vitamin deficit and in 2 cases for distressing anorectal disorder and foul-smelling stool.

BPD related and apparently not related mortality T2D patients with severe obesity submitted to BPD (# cases).

	first post BPD year	early (3-5 yrs) follow-up period	late (3-5 yrs) follow-up period
Massive pulmonary embolism			
Anastomotic dehiscence	1		
Protein malnutrition	1		
Liver cirrhosis		1	1
Bladder cancer			1
Acute myeloid leukemia		1	
Acute myocardial infarction		1	
Disseminated malignant melanoma			4
Amyotrophic lateral sclerosis			1
Peritoneal carcinosis			1
			1
Unknown causes			9
total			23

Meaningful clinical events not BPD related observed throughout the postoperative follow-up

	first post BPD year	early (3-5 yrs) follow-up period	late (10-20 yrs) follow-up period
Malignancy (#and %)	2(1)	4 (3)	3 (3)
Acute or chronic cardiovascular disease (#and %)	2 (1)	1 (0.5)	15 (17)
severe depression (#and %)	1 (0.5)	1 (0.5)	3 (3)
Lupus erythematosus (#and %)		1 (0.5)	
severe skin disease (#and %)		1(0.5)	1 (1)
amyotrophic lateral sclerosis (#and %)			1(1)

Clinical outcomes at the end of the follow-up in T2D patients after BPD and in the T2D subjects treated with conventional therapy

	BPD subjects	CO subjects
number	109	104
body weight (kg)	92 ±14	91 ± 22
type 2 diabetes (# and %)	12 (14)	105 (100)
Acute or chronic cardiovascular disease (# and %)	18 (17)	6 (16)
Deaths (# and %)	23 (27)	16 (16)*

*p<0.02 vs. BPD subjects

Despite the metabolic control, the prevalence of overt CVD after BPD was similar to that in the nonsurgical group, and the overall mortality rate was higher. This suggests that apart from the well-known metabolic risk factors, corrected after bariatric surgery, other factors may play a substantial role in determining the development of CVD. By the other hand, the hypothesis that the effects of chronic malabsorption offset the benefit obtained by normalization of the risk factors cannot be ruled out.

In any case, the stable normalization of FBG and of the lipid pattern did not correspond to an increase of survival or to an actual improvement of the clinical status

the severe complications after BPD are substantially accounted for by the surgical induced malabsorptive syndrome, that in turn is in itself responsible for the satisfactory weight and metabolic outcomes

The BPD-related complications are substantially similar in type and frequency of to those previously reported in nondiabetic patients. Therefore, the occurrence of complications after BPD is independent of the diabetic status and is most likely due to the specific procedure.

Severe BPD related complications affecting nearly 50% of the operated patients appeared only in the long term, while the initial follow-up was substantially uneventful. This strongly suggests that the negative effects of BPD tend to worsen over time and there is no evidence of any intestinal adaptation and/or long-run reduction of the BPD impact.

only very few deaths were directly or indirectly related to BPD, two early deaths for perioperative complications, one multiorgan failures after BPD correction for recurrent protein malnutrition and two fatal hepatic coma due to alcoholic liver cirrhosis.

This highlights the substantially effective post-BBP clinical assistance throughout all the follow-up period

CONCLUSION I

- In patients with T2DM and severe obesity, after BPD, FBG and other components of metabolic syndrome normalizes.
- These highly satisfactory results are closely maintained at long and very long term in more than 90% of the cases

CONCLUSION II

- BPD-related severe complications occur in nearly half of the operated patients
- The negative effects of BPD tend to worsen over time and are independent of T2D
- At 10-20 years, in 12% of the cases a BPD revision was performed, and the overall mortality rate was 27%.

In T2DM obese patients, the malabsorptive bariatric procedures must be adopted with caution.