Long-term Results of Biliopancreatic Diversion in the Treatment of Morbid Obesity

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Zusammenfassung: Grundlagen: Die kontinuierliche Entwicklung und der Aktionsmechanismus der biliopankreatischen Umleitung als Malabsorptionsmethode in der chirurgischen Behandlung der Adipositas werden erfasst.


Ergebnisse: Eine durchschnittliche permanente Reduktion des initialen Überschüttgewichtes von 45% wurde erzielt, einhergehend mit einer Normalisierung von Cholesterin und Blutzucker. Die operative Mortalität lag unter 0,5%. Spezifische late complications included: anemia, less than 5% with adequate iron and/or folate supplementations; stomal ulcer, reduced to 3.0% by oral H2-blockers prophylaxis; bone demineralization, increasing up to the fourth year and tending to decrease thereafter, with need of calcium and vitamin D supplementation; neurological complications, totally avoidable by prompt vitamin B administration to patients at risk; protein malnutrition, which was reduced to a minimum of 2.8% with 1.2% recurrence, in exchange with a smaller weight loss, by adapting the volume of the gastric remnant and the length of the alimentary limb to the patient’s individual characteristics.


Introduction

Because of the absence of a blind loop and of the malabsorption essentially selective for fat and starch, biliopancreatic diversion (BPD) is free of the complications pertaining to JIB (23, 24, 25). The qualities of BPD have gradually led to reacceptance of malabsorption as a surgical approach to obesity therapy, the procedure being increasingly used in all the Western World in its numberless possible versions.

Subjects and methods

Of the total series of 2273 patients operated on since May 1976, 1372 (444 men and 928 women) underwent the present "ad hoc stomach" (AHS) type of BPD performed by the same surgical team between June 1984 and September 1997. Mean age was 37 years (11–70), mean weight 128 kg (73–236), and mean excess weight was 69 kg (20–136), corresponding to 117% (41–311) and to a mean BMI of 47 kg/m² (29–87). Maximum follow-up was 160 months. Follow-up rate was 98%.

In the AHS BPD (Fig. 1) the gastric volume, which is the main determinant of the initial weight loss (temperatures, food intake limitation效果, the more intense and lasting the smaller the gastric volume), is adapted to the preoperative excess weight and to other individual characteristic (such as sex, age, eating habits, social-economical status and expected degree of compliance), with the aim of attaining in all cases the weight of maintenance around the end of the first postoperative year (28). Intestinal lengths, which determine energy absorption and thus the weight of stabilization and its indefinite maintenance, were adapted to the patient’s characteristics only in the last 5 years (as described below).

Fig. 1. Schematic representation of AHS BPD. Alimentary limb, from gastroenterostomy to enterenterostomy (EEA); biliopancreatic limb, from duodenum to EEA; common limb, from EEA to ileocecal valve.
Eating habits
During the first postoperative months all patients undergoing BPD, due to the food stimulation of the ileum (17), have reduced appetite, and they have early satiety, occasionally in association with epigastric pain and/or vomiting. These symptoms characterize the postcibal syndrome and are caused by rapid gastric emptying with subsequent distension of the postanatomotic loop. All these symptoms rapidly regress with time, most likely due to intestinal adaptation. 1 year after operation the appetite and the eating capacity are fully restored and patients mean reported food intake is 1.5 times as much as preoperatively. Patients undergoing BPD must be aware that for the rest of their lives they will absorb minimal fat (27), little starch, sufficient protein (5, 27), and nearly all mono and disaccharides, short-chain triglycerides, and alcohol (i.e., the energy content of sugar, fruit, sweets, soft drinks, milk, and alcoholic beverages). They must also understand that when their body weight will have reached the level of stabilization the intake of these elements may be varied as needed for individual weight adjustments.

Interestingly, the vasomotory phenomena characterizing the dumping syndrome are always absent after BPD, this indicating the lack in the ileum of the specific receptors and/or the vasoactive gut hormones which are thought to be implicated in the pathogenesis of d.s.

Bowel habits
After full resumption of food intake, BPD subjects generally have 2 to 4 daily bowel movements of soft stools. Nearly all have foul smelling stools, and most have flatulence. These phenomena, which can be reduced by modifying eating habits or by neomycin or metronidazole administration, tend to decrease with time along with a reduction of bowel movement frequency and an increase of stool consistency. Diarrhea usually appears only in the context of postcibal syndrome, and then it rapidly disappears, being practically absent by the fourth month (23).

The absence of diarrhea after BPD is easily explained considering that, unlike following JIB, the loss of bile salt into the colon was calibrated to about 750 mg/day by choosing the appropriate length for the common limb (27), and that, due to the lack of fat digestion, steatorrhea is essentially neutral, fecal pH resulting around 7. In fact, studies on intestinal transit time after BPD showed, in comparison with preoperatively, a transport speed decreased by 50% in the small bowel but unchanged in the large bowel (27), this being in keeping with the observed changes in gut hormones active on intestinal motility (20).

Weight loss
Weight reduction after AHS BPD, when expressed as percent loss of the initial excess weight (IEW%), was 74 ± 15 at 2 years (1312 cases), 75 ± 15 at 4 years (1140 cases), 75 ± 15 at 6 years (850 cases), 76 ± 15 at 8 years (469 cases), 77 ± 16 at 10 years (138 cases) and 78 ± 17 at 12 years (85 cases), with no differences between “morbidly obeses” and “super obeses” (IEW > 120%) (13). As said above, the initial weight loss is determined by the temporary forced food limitation occurring immediately after operation. On the contrary, the weight of stabilization depends on the amount of daily energy absorption allowed by the BPD, as a consequence of a mechanism which acts permanently. As a rule, the operated patient fully recovers appetite and eating capacity before the weight of stabilization is attained, so that the final weight loss depends on the reduced energy intestinal absorption. The latter is also greatly influenced by the gastric volume, as a smaller stomach, resulting in a more rapid gastric emptying, accelerates intestinal transit, thus reducing absorption.

Weight maintenance
The extraordinarily good weight maintenance that occurs after BPD is exemplified by a group of 40 subjects who underwent the original “half-half” (HH) type of operation, which differs from the present AHS type only in that the stomach is bigger and the alimentary limb is longer (26). Comprehensively, the weight reduction was smaller, but the weight attained was strictly maintained up to the 18th year of follow-up (Fig. 2). It is noteworthy that these data are the only over 15-years results ever reported in obesity therapy.

Some clinical-statistical observations on the modalities of this very long term weight maintenance indicate that body weight after BPD is essentially independent of individual and interindividual variations of food intake. This prompted us to investigate the relationships between energy intake, energy intestinal absorption and energy expenditure after BPD. The results of our studies demonstrated that the indefinite weight maintenance that follows the operation is due to the existence of a threshold absorption capacity for fat and starch, and thus energy, while the weight loss is partly due to an increase of resting energy expenditure consequent to changes of body composition (21).

Other beneficial effects
The other benefits obtained after BPD are listed in Table 1. The percentage of changes observed after the operation were calculated for each complication in patients with a minimum follow-up corresponding to the postoperative time after which there was generally no further substantial modification. Recovery and improvement were considered only when favorable changes were essentially maintained at all subsequent re-examinations. The observed beneficial effects are obviously not attributable to the BPD itself, but to either the reduced nutrient absorption or the weight loss, the only 2 exceptions being the effects on glucose and cholesterol metabolism.

In fact, the permanent normalization of serum glucose in all patients with preoperative simple hyperglycemia or frank type II diabetes mellitus, accompanied by normalization of serum insulin and insulin sensitivity, implies a specific action of BPD on glucose metabolism. This latter can be identified with the virtual annulment of the entero-insular axis consequent to the operation (22).

Another specific action of BPD accounts for the permanent serum cholesterol normalization in 100% of the previously hypercholesterolemic patients, and it is the calibrated interruption of the entero-hepatic bile salt circulation, which cause an enhanced synthesis of bile acids at the expenses of the cholesterol pool (18).

BPD may be effectively used for the treatment of severe type II diabetes mellitus and familial hyperlipidemia also in lean subjects.

Nutrition
The easiest way to appraise nutritional status is to observe and talk to the subject. A person who looks well and exhibits com-