Biliopancreatic Diversion with Duodenal Switch


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Abstract. In 1990 Scopinaro’s technique of biliopancreatic diversion with distal gastrectomy (DG) and gastroileostomy was modified. A sleeve gastrectomy with duodenal switch (DS) was used instead of the distal gastrectomy; and the length of the common channel was made 100 cm instead of 50 cm. A questionnaire and a prescription for blood work were sent to 252 patients who underwent DG a mean 8.3 years ago (range 6–13 years) and 465 patients who underwent DS 4.1 years ago (range 1.7–6.0 years). The questionnaire response rate was 93%, and laboratory work was completed for 65% of both groups. The mean weight loss after DG was 37 ± 21 kg and after DS 46 ± 20 kg. There were fewer side effects after DS: The number of daily stools was lower (p < 0.0002), as was the prevalence of diarrhea (p < 0.01), vomiting (p < 0.001), and bone pain (p < 0.001). Greater benefits related to several aspects of life were reported after DS than DG (p < 0.0001). The mean serum levels of ferritin, calcium, and vitamin A were higher (p < 0.001), and parathyroid hormone was lower.

The yearly revision rate for excessive malabsorption was 1.7% per year after DG and 0.1% per year after DS. The two procedures were equally efficient for treating co-morbid conditions such as diabetes, hypertension, and hypercholesterolemia. Biliopancreatic diversion with sleeve gastrectomy/duodenal switch and a 100-cm common limb was shown to produce greater weight loss with fewer side effects.

To obtain the weight loss required to correct severe obesity and its co-morbidity, it is necessary to counteract the physiologic mechanisms that maintain excess weight. Until effective medical treatment becomes available, surgery remains the only viable option. Surgically, food intake can be restricted or food absorption decreased. Scopinaro et al [1–4] showed that it was possible to decrease nutrient absorption by shortening the functional intestinal length and decrease fat absorption further by diverting biliopancreatic juices. The procedure was followed by large weight loss. Disturbing physiology seemed a reasonable price to pay when justified by the loss of large amounts of excess weight. The major advantage of this bariatric procedure was the preservation of normal eating behavior. Modifying absorptive mechanisms entails the possibility of late sequelae; therefore legitimate concerns with the possible consequences of fat-soluble vitamin and calcium malabsorption have delayed wider use until longer follow-up is available.

From 1984 to 1990, biliopancreatic diversion (BPD), as described by Scopinaro, was our procedure of choice for treatment of morbid obesity [5]. In 1990 two modifications were adopted with the hope of decreasing side effects while preserving the efficient weight loss [6]. One modification was the use of a sleeve gastrectomy with duodenal switch instead of a distal gastrectomy and gastroileostomy. The duodenoleal switch, described by DeMeester et al [7, 8], preserved the antropyloric pump, left the vagal innervation undisturbed, and contributed a short segment of duodenum to the alimentary path. The sleeve gastrectomy decreased the volume of the gastric reservoir and diminished the parietal cell mass to minimize the ulcerogenicity of the duodenoleal switch. A second modification was placement of an ileoileal anastomosis along the alimentary limb 100 cm from the ileocecal junction (instead of 50 cm), thereby doubling the length of the common channel while maintaining a total alimentary intestinal limb of 250 cm. The decision to double the length of the common channel was based on our experience with the often successful treatment of excessive diarrhea and malnutrition by surgical relocation of the ileoileal anastomosis from the initial site 50 cm proximal to the ileocecal junction to a new site 100 cm from the ileocecal junction.

After our initial experience with BPD with duodenal switch and a 100-cm common channel, a better clinical outcome was immediately apparent, making us reluctant to do a randomized series. Since 1990 this has been our procedure of choice. Seven years later, we now report a cross-sectional study of the clinical outcome after both procedures, comparing BPD with distal gastrectomy (DG) to BPD with duodenal switch (DS).

Materials and Methods

Patients

In January 1997 patients who underwent BPD 18 months ago or more were chosen as the subjects of this study. Between January 1984 and July 1995 a total of 747 patients underwent BPD as a primary or secondary procedure for morbid obesity. The selection criteria for bariatric surgery was 100 lb excess weight; there were no exclusion criteria. There were 13 (1.7%) perioperative deaths. Fifteen patients (2%) died over the years, and three were reoperated to restore normal intestinal continuity. Most of these patients were followed yearly by ourselves or their family physicians, who were asked to send their patients’ yearly laboratory
Results are the means ± SD.
Nineteen patients who underwent secondary BPD/DG and 8 patients who underwent secondary BPD/DS were excluded.

Using the Metropolitan Life Table, 1980.

results. The patients are advised to take five supplements a day (multivitamin, iron, calcium, vitamin D, and vitamin A).

In January 1997 there were 717 patients still alive following BPD. Among them, 259 patients underwent BPD with DG between 1984 and 1990, and 465 patients underwent BPD with DS after 1990. These two groups of patients were comparable for age, sex, and preoperative weight; but the mean duration of follow-up after DG was 8.3 years (range 6–13 years) and after DS 4.1 years (range 1.7–6.0 years) (Table 1).

Procedure

When a biliopancreatic diversion was performed, the alimentary limb was a segment of ileum measured from the ileocecal junction to a constant length of 250 cm, where the gut was divided. The intestinal segment proximal to this division was termed the biliopancreatic limb, and its length accounted for the remainder of the small intestine. The biliopancreatic limb was isolated proximally from the path of ingested nutrients and thus carried digestive juices only. The distal cut end of the biliopancreatic limb was anastomosed to the alimentary limb at a site either 50 or 100 cm from the ileocecal junction. The segment of the alimentary limb distal to this anastomosis where nutrients and digestive juices mixed was termed the common limb. The cut end of the alimentary limb was brought up to receive the ingested nutrient stream by the creation of either a gastroileal anastomosis or a duodenoleileal anastomosis (Fig. 1).

From 1984 to 1990 a distal gastrectomy with gastroileal anastomosis was used. This extended antrectomy reduced the gastric reservoir by two-thirds and acted as an acid-reducing procedure. Scopinaro suggested creating smaller gastric reservoirs for heavier patients, but we performed the distal gastrectomy to the extent necessary for an antulcer result in all patients without regard to the patient’s degree of obesity. The volume of the fundic reservoir was not measured, and the anastomosis was widely patent. In these patients, the ileoileal anastomosis was placed 50 cm proximal to the ileocecal junction, resulting in a 50-cm common limb. This procedure is referred to as biliopancreatic diversion with distal gastrectomy.

Since 1990 a sleeve gastrectomy with a duodenoleileostomy was performed. The duodenal switch preserved vagal integrity as well as the antrum and pylorus, and it added a short segment of duodenum in the alimentary tract. Resection of the greater curvature of the stomach to create a lesser curvature gastric sleeve reduced the gastric volume to an extent judged similar to that achieved by the distal gastrectomy. The reduction of the parietal cell mass may have reduced acid production. In these patients, the ileoileal anastomosis was placed 100 cm proximal to the ileocecal junction, resulting in a 100-cm common limb. This procedure is referred to as biliopancreatic diversion with duodenal switch.

From 1990 to 1992 (226 patients) the duodenal switch was performed using a surgical stapling instrument across the duodenum to occlude the lumen, and a duodenoleileal side-to-end anastomosis was created proximal to the staple line. After 1992 (239 patients) the duodenum was divided instead of stapled, and a duodenoleileal end-to-end anastomosis was created proximal to the staple line (Fig. 2).

The technical difficulty was comparable for the two procedures. The appendix was removed when present in all patients. Prior to 1992 cholecystectomy was performed if gallstones were present or at the surgeon’s discretion. Since 1992 cholecystectomy has been performed in all patients. Perioperative mortality, operative complication rates, and delayed mortality (related or not) were comparable (Table 2).

Questionnaire

A questionnaire and a prescription for blood work was sent to all patients, with a postcard reminder 3 weeks later. Phone calls were made to verify delivery of the study materials and encourage participation.

A structured written questionnaire with mostly multiple choice questions was used to obtain data on the present and nadir weight, the prevalence of side effects, and the patient’s own evaluation of results. Questions assessed patient’s evaluation of their eating behavior and specifically how their diet was restricted. Patients were asked about the frequency and severity of vomiting and if their appetite had changed following surgery. Questions also assessed bowel habits, specifically the frequency of bowel movements and the consistency of the stools. Other questions were intended to obtain the patients’ own assessment of the severity of the problem caused by the frequency and odor of their stools and flatus. Patients were asked questions about the frequency and severity of heartburn, abdominal pain, abdominal bloating, and bone pain.

The questionnaire included a series of questions to assess the effect of surgery on self-confidence, acceptance by others, social life, marital relations, sexual relations, and ability to perform various activities of daily living, such as maintaining personal hygiene, walking, climbing steps, carrying grocery bags, running, and performing household chores. The choices given were (A) greatly improved; (B) improved; (C) unchanged; (D) worsened; (E) greatly worsened. Finally, two questions were intended to measure the patients’ satisfaction with their weight loss and overall outcome. The choices given were (A) very much satisfied; (B) satisfied; (C) hesitate to answer, unsure; (D) not satisfied; (E) very much dissatisfied. Answers to multiple choice questions were assigned numerical values: (A) = 5, (B) = 4, (C) = 3, (D) = 2, (E) = 1 to obtain a mean score for each group on a scale of 1 to 5, with 5 the best result.