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The evolution of bariatric surgery

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Bariatric surgery has been one of the great medical success stories of the late 20th century. From 1970, when fewer than 10 obesity-related articles were published in major North American surgical journals, weight control surgery is now a major component of the General Surgery specialty. Before 1970, only a few dozen bariatric cases were performed annually, in dramatic contrast to the hundreds of thousands now done each year worldwide.

This remarkable transformation was in no small way aided by concurrent advances in surgical stapling technology and the laparoscopic revolution. Younger surgeons may not fully appreciate the challenges faced by the bariatric surgical pioneers operating in an era of far less sophisticated instrumentation and lighting in the operating room, and less refined knowledge of optimal postoperative care for a massively obese patient.

In 1970, Dr H. William Scott, a pioneer bariatric surgeon, stated the case for bariatric intervention succinctly, if bluntly:

> When an obese individual attains the Gargantuan level of the fat man or fat woman in the circus, I believe the term *morbid* should be added to emphasize the serious health implications and life-shortening hazards of such grotesque accumulations of fat. Individuals who fit into this unfortunate category suffer enormous psychologic, social, and economic consequences as well.[1]

As this quote makes clear, surgery for severe obesity is intended primarily "to attack the root cause of a myriad of secondary obesity-related health issues," some of which are listed in Table 1. Although there is room for debate on whether bariatric interventions should be strictly limited to the most severely obese patients, already suffering from secondary health issues, or offered more liberally before secondary health damage is done, all would agree that bariatric surgery is absolutely "not" intended as a cosmetic intervention, or solely to get the patient to a lower number on the scales.

In the early days, weight loss surgeons were often seen as mavericks. It is now abundantly clear that the surgical options, which have evolved over the last 40 years, offer the best presently available means of not only reversing the severe obesity itself, but also dramatically improving the weight-connected health and quality of life issues alluded to by Dr Scott. Much has been learned in nearly 2 generations of bariatric surgical experience. As in other areas of surgery, today's better outcomes are a result of lessons learned from yesterday's failures.

This brief review of bariatric surgical development is mainly intended to give historical perspective, and is not an attempt to cover the subject in detail. Illustrations, more detailed descriptions of many of the procedures mentioned, and related scientific outcome analyses are readily available

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Table 1 Major obesity-related conditions

Type 2 diabetes
Hypertension
Sleep apnea
Steatohepatitis
Esophageal reflux
Metabolic syndrome
Polycystic ovary syndrome
Urinary incontinence
Degenerative joint disease
Venous stasis and lymphedema
Medically significant pannus
Pseudotumor cerebri
Depression
Limitation of employment opportunity

via internet query as well as in the referenced journal citations.

Medically significant obesity was recognized by Hippocrates, but was rare before the 20th century in a time of less robust diets and more arduous physical demands in day to day living. If a person did become "morbidly" obese, then-prevailing medical wisdom was that the condition was self-inflicted, and until mid-century, these unfortunate individuals were sometimes exhibited as carnival "freaks." The medical profession had little to offer a severely overweight patient beyond blandishments to exercise more, eat less, or to be admitted for hospital-based prolonged starvation. Failure to control one's weight was seen almost exclusively as a defect of will, not a consequence of altered metabolism.

In the 1960s, as the population increasingly shifted from rural to city life and pre-prepared convenience foods and beverages changed dietary habits, obesity rates soared. Throughout North America, morbid obesity became—quite literally—a wide-spread problem.

Although "diet and exercise" advice is philosophically sound, for the severely obese it is dismally ineffective, and evidence emerged that in part severe obesity results from causative factors separate from simple summations of calories in versus calories out. Stunkard et al[1] showed that children born of obese biologic parents but raised by lean adoptive parents had strong likelihood of growing to adult weights which more closely mirrored their "biologic" rather than their adoptive parents, implying a genetic component to adult obesity.

In a study at the Vermont State Prison (truly a "captive environment"), the legendary obesity researcher, Sims, deliberately overfed volunteer inmates for several months, who were probably delighted to get a break from the usual jailhouse diet. Despite marked and prolonged overfeeding, some prisoners proved to be "natural ectomorphs," who gained weight only with difficulty and quickly returned to their original weight at study's end.[2] These observations gave credence to the hypothesis that severe obesity is in fact a complex, multifactorial disease, and not a condition to be exclusively blamed on the patient.

Many surgical procedures have come and gone over the years, but all currently accepted bariatric options that derive from 2 fundamental insights by the bariatric pioneers: altering small bowel absorption or limiting gastric capacity.

The earliest bariatric series came from a Los Angeles surgeon, Dr J. Howard Payne, whose results came from limiting small bowel absorption. Building on earlier experimental canine work in Minnesota by Kremen[3] showing weight loss when there was major exclusion of the distal small bowel from the alimentary stream, he devised a "jejunocolic shunt," wherein the uppermost 50 cm of jejunum anastomosed directly to the transverse colon. All remaining downstream small bowel was left in situ as a long blind end.[4] Not surprisingly (in retrospect), this jejunocolic arrangement often caused significant metabolic derangements, and led Payne to a new arrangement, which connected the proximal 35 cm of jejunum end-to-side to the terminal 10 cm of ileum, thus preserving the ileocecal valve. This operation, the "jejunoileal bypass" (JIB), became, in various modifications, the first widely popular bariatric operation nationally, for which there was a bandwagon of enthusiasm in the 1970s. There were advocates for either Payne's "end-to-side" construct or for Scott's alternative "end-to-end" JIB, with end-to-end jejunoileostomy, with the defunctionalized small bowel vented by a separate anastomosis to the colon.[5] With either of these strategies, weight loss was often impressive and better than all prior nonsurgical therapies. However, over time it became apparent that JIB could also cause major liver or kidney damage.

The increasing prevalence of these complications led to abandonment of JIB as a surgical therapy in North America, but in Europe, the Italian surgeon Scopinaro devised an alternative small bowel bypass procedure, known as biliopancreatic diversion.[6] This procedure, combined with subtotal gastrectomy, somewhat resembled JIB, limiting small bowel absorption, but with much more food contact length than in classic JIB. The Scopinaro procedure also critically differed from JIB by preserving biliary and pancreatic flow through the bypassed small bowel. Although not free of nutritional side effects, his outcomes were better overall than those of classic JIB. Scopinaro's procedure was a forerunner to the modern duodenal switch (DS) operation.

The strategy of limiting gastric capacity was pioneered by Dr Edward Mason, an Iowa surgeon. Having observed that substantial weight loss often followed subtotal gastrectomies for ulcer disease (then a relatively common operation), Mason partitioned off a 10% upper gastric "pouch" connected to a Billroth II loop gastrojejunostomy.[7] To make the procedure potentially reversible, the 90% distal gastric remnant was left in situ as a blind end. Weight loss was good. Mason's patients had few metabolic problems. However, the instrumentation and retractors of the era made the operation technically difficult. Acceptance was limited. As had been the case with JIB, variations on Mason's original anatomic arrangement quickly emerged.