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Editorial

Metabolic surgery: a brief history and perspective

In 1978, Richard L. Varco and I wrote and edited a book titled *Metabolic Surgery*. In the Foreword, we defined metabolic surgery "as the operative manipulation of a normal organ or organ system to achieve a biological result for a potential health gain" [1]. In the history of surgery, surgeons have added to our armamentarium as we transitioned from incisional to extirpative to reconstructive procedures. Surgeons have now firmly progressed to metabolic surgery, a concept that is no longer an interesting speculation for the future, but the epitome of the present and the foundation of the future.

Although metabolic surgery was defined >30 years earlier, it has been practiced for about 100 years. The classic historical example of metabolic surgery was surgery for peptic ulcer disease, in which surgeons operated on a perfectly normal stomach and performed subtotal gastrectomies, vagotomies of several types, with or without antrectomies, or pyloroplasties, all without touching the actual pathologic lesion—the duodenal ulcer. Metabolic surgery, as represented by the partial ileal bypass [2], was the intervention modality for the first affirmative lipid-atherosclerosis trial, the Program on the Surgical Control of the Hyperlipidemias (POSCH), in which the marked low-density lipoprotein cholesterol lowering engendered by this procedure was associated with statistically significant reductions in a second myocardial infarction and cardiovascular death, the incidence of coronary artery bypass grafting or percutaneous transluminal coronary angioplasty, and the progression of peripheral vascular disease, as well as arteriographic retardation, the reversal of coronary plaques, and an increase in life expectancy [3–5].

The advent of bariatric surgery in 1953, and the subsequent profusion of operations, was mechanistically defined as purely restrictive (e.g., vertical banded gastroplasty, laparoscopic adjustable gastric banding), restrictive/malabsorptive (e.g., gastric bypass), and primarily malabsorptive (e.g., biliopancreatic diversion/duodenal switch) [6]. These terms were obvious descriptions of the anatomic changes created by these procedures; however, they were never proven to be the true mechanisms of action. Furthermore, the more recent introduction of gastric and vagal electronic stimulation operations into bariatric surgery have made these descriptive terms even less plausible as etiologic explanations of the causes for the weight loss observed.

The mechanical explanations for bariatric surgery procedures were soon challenged by Scopinaro et al. [7–9] and Pories et al. [10]. In several milestone publications, starting in 1986, Scopinaro et al. [7–9] stated that their own biliopancreatic diversion was effective in correcting type 2 diabetes and, with only a 50-cm common channel, caused long-term weight control, not by malabsorption, but, rather, by engendering a physiologic correction of eating behavior and caloric absorption to influence the body weight to trend toward normal and maintain weight loss. In 1995, Pories et al. [10], in a landmark report titled "Who would have thought it? An operation proves to be the most effective therapy for adult-onset diabetes mellitus," questioned the mechanical perspective and advocated hormonal reasons for the effect of gastric bypass, often independent of weight loss, on type 2 diabetes.

Taking advantage of these insights, new operations were soon proposed and, more importantly, explained by alterations in hormonal or neurogenic pathways. These metabolic procedures concentrated on resolving, or ameliorating, type 2 diabetes, without significant weight loss.

In 2004, Rubino and Marescaux [11] showed that placing a plastic sleeve within the duodenum in a diabetic rat model, thereby preventing contact of the ingested food with the duodenal mucosa, caused type 2 diabetes resolution. When the sleeve was perforated and returned to the duodenum, the diabetes recurred [11]. Clinical adaptation of this finding followed, with the duodenojejunal bypass procedures by Cohen et al. [12] and Ramos et al [13] and the sleeve gastrectomy with ileal interposition procedures of DePaula et al. [14]. A gastric electrode implantation system (Tantalus System, MetaCure, Bermuda) causes modest weight loss but significant reductions in hemoglobin A1c, certainly not by a mechanical mechanism of action but by metabolic, hormonal, and/or neurogenic actions [15].

In 2007, the executive bodies of the American Society for Bariatric Surgery and the International Federation for the Surgery of Obesity placed before their respective organizations proposals to alter the names of these established societies to reflect the recognition and presence of the po-

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tential of metabolic surgery. Indeed, bariatric surgery is metabolic surgery. Surgeons operate on perfectly normal organs or organ systems "to achieve a biological result for a potential health gain." Thus, the American Society for Bariatric Surgery has become the American Society for Metabolic and Bariatric Surgery, with the inclusion of the term "Metabolic," and the International Federation for the Surgery of Obesity has become the International Federation for the Surgery of Obesity and Metabolic Disorders.

The definition of metabolic surgery has also been expanded to include the elucidation of metabolic mechanisms for the observed metabolic outcomes. Easily one half of the reports published today in this discipline are concerned with clinical, physiologic, or basic research of the causes for clinical events. Eventually, these lines of inquiry will not only explain why our metabolic/bariatric operations work but possibly the origins of obesity and certain metabolic diseases or syndromes.

Because of the inability of diet and drug therapy to resolve obesity, the obesity pandemic will long need bariatric surgery; however, it will be metabolic surgery in which the future of our discipline resides. Metabolic surgery is becoming the pathway for the acceptance of surgical procedures by our medical colleagues. Not to accept the insights engendered by metabolic surgery will be to fall behind in medicine's search for knowledge and methods to cope effectively with the afflictions of disease. Metabolic surgery allows all of us in the medical sciences to keep our compact with humanity.

Disclosures

The author has no commercial associations that might be a conflict of interest in relation to this article.

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