Inertia of Success

A Response to Minimally Invasive Coronary Bypass: A Dissenting Opinion

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“To exist is to change, to change is to mature, to mature is to go on creating oneself endlessly.”

Henri Bergson

In a recent editorial, Bonchek and Ulliyot\textsuperscript{1} raised concerns regarding minimally invasive coronary bypass surgery. Their purpose was to “stimulate discussion and debate,” and to that end, we wish to challenge several of their assertions. While we totally agree that unbridled enthusiasm with a blind eye toward critical analysis is dangerous, equally precarious is taking the stance that we have a perfect operation that cannot or should not be made better. We believe that we are at a strategic inflection point in cardiac surgery and are in danger of becoming obsolete. In the history of information systems, the typewriter made a valuable contribution; however, it subsequently was made obsolete by computers. Although there is no question that coronary artery bypass surgery has changed the management of coronary artery disease dramatically, we need to realize that we are in the field of coronary revascularization and not just coronary artery surgery. Incremental progress, carefully measured, documented, and reported, should be encouraged rather than always accepting the status quo.

The authors begin by limiting the obvious successes of minimally invasive surgery to technically simple operations that require “a minimum of precision and almost no sewing.” Our colleagues in general surgery would most likely disagree that their successes in laparoscopic Nissen procedures and inguinal hernia repairs were not precise and did not requiring sewing. Although cardiac operations are technically more complex, this does not mean that we should ignore the principles, techniques, and enabling technology developed from technically simpler operations and extend them to more complex procedures. Is this not the nature of evolution?

The authors relate their own experience of isolated internal mammary artery (IMA)–to–left anterior descending coronary artery (LAD) grafting by median sternotomy on cardiopulmonary bypass as being safe, simple, and rapid. However, they cite the Society of Thoracic Surgeons (STS) Database showing us that this superb operation represents $<2\%$ of all coronary bypass procedures performed and $<3\%$ in Bonchek’s institution. Is there a message here? If the operation is so safe, simple, and rapid, with a high success rate, where are the people lining up to have it performed? They are opting for the least invasive form of coronary revascularization, i.e., catheter-based procedures.

They are also skeptical of target-vessel revascularization by our cardiology colleagues. While it is true that the surgical community over the years has been critical of incomplete revascularization, haven’t we become a little more sophisticated in our ability to select the appropriate procedure for each patient by ischemia-directed revascularization? The evidence most frequently cited for survival benefit from complete revascularization is the CASS study, a retrospective, nonrandomized study that showed by multivariate analysis that patients who received 3 or 4 bypasses did better than those who received only 1 or 2 bypasses.\textsuperscript{2} With sophisticated imaging techniques to demonstrate ischemia (thallium and PET scanning, stress and contrast echocardiographic studies), can we not be a little more discriminating in our revascularization techniques? Does every octogenarian with a critical proximal type C LAD lesion and a chronically occluded right coronary artery with good collateralization and a nonviable inferior wall require a median sternotomy and cardiopulmonary bypass to add a second graft to the right coronary artery when a minimally invasive direct coronary artery bypass (MIDCAB) left IMA (LIMA)–to–LAD graft alone might have provided sufficient revascularization and improved that patient’s “functional health” or outcome? In certain instances, it may be appropriate to adapt concepts of ischemia-directed revascularization from the cardiology experience, rather than continually maintaining tunnel vision and beating the drum of “complete revascularization” for every patient. Indeed, the concept of complete revascularization may not hold up to the physiological scrutiny of flow-wire technology. Could the bypass of coronary lesions that appear critical on anatomic imaging, but that in fact physiological testing shows not to be critical, be an explanation for the clinically unsuspected but significant early failure of saphenous vein grafts, which have no ability to autoregulate?

Although it is true that some patients are discharged from the hospital on day 3 or day 4 after conventional coronary artery bypass surgery, most are not. The STS Database indicates a mean postoperative stay of 6.6 days for first-operation, elective patients.\textsuperscript{3} Of those who are discharged on day 3 or 4, how many of these patients are ready to return to
full functional capacity, ie, work (or golf) at 1 or 2 weeks after surgery, as is true with many minimally invasive bypass patients? We agree that definitive cost data do not exist and that the cost savings of cutting the last 1 or 2 days of a hospital stay are minimal. However, the cost savings to society by quicker return to functional activity or decreased requirements for nursing home and rehabilitation facilities in older, high-risk patients with significant comorbidities may ultimately be more cost-effective. Data should soon be available to address this issue.

As Bonchek and Ullyot point out, there has been extensive publicity to the lay public about minimally invasive surgery. They allege that minimally invasive coronary bypass is being marketed to a gullible public by hospitals and surgeons encouraged by equipment companies. We personally resent the implication that this operation is being done only for marketing reasons. Beating-heart surgery is being pursued because of the proven benefits for patients of avoiding cardiopulmonary bypass, certainly not for the benefit of equipment companies. Limited-access surgery has been demonstrated to be beneficial by decreasing access trauma in many other surgical specialties. Finally, our patients have been among the biggest advocates of efforts to minimize the size of incisions and to limit postoperative pain and morbidity.

Let us not forget how these equipment companies were born: because of ideas by surgeons as to how to make a good operation better for our patients. The responsiveness of our industry partners in providing us with the enabling technology that we ask for is to be encouraged, not disparaged. It is our practice, as, we are sure, it is that of most surgeons, to fully inform all patients undergoing this operation of its new nature and our assessment of the efficacy of the procedure, our own operative experience, and our results. Any public misconceptions are easily countermanded by surgeon honesty. If the authors have any doubts about the clinical benefits of minimally invasive cardiac surgery, we suggest that they interview the patients who have undergone the operations. After all, it is their opinion, not that of the surgeons, hospitals, and commercial companies, that matters.

It is true that the benefits of minimally invasive cardiac surgery cannot be compared with the long-term benefits of conventional coronary artery bypass grafting, because the procedures have been performed for only 3 short years. Although we do not dispute the efficacy of IMA grafting, the reference Bonchek uses to document >95% graft patency is not accurate. The Cleveland Clinic operations cited to document the “standard techniques” were in fact not performed under conditions of cardioplegic arrest, as most conventional coronary bypass surgery is today, but rather with anoxic arrest without cardioplegia on a fibrillating heart. Nonetheless, the study demonstrated an 18-year intervention-free survival of 60.5% with LIMA-to-LAD grafting. Only 57 of those 100 patients underwent arteriograms, with a graft patency of 91.2%. Of 29 patients studied >10 years, LIMA graft patency was 89.7%.

We who propose to define, redefine, and evolve the current standard operation do bear the burden of demonstrating results comparable to those of conventional bypass surgery.

Bonchek and Ullyot ask for the evidence. Contained in the Table are the results of early angiographic follow-up after MIDCAB LIMA-to-LAD grafting. An additional percentage of patients (3% to 8%) in each series show evidence of stenosis. Concern regarding these findings found on early angiography appears to be waning, as evidence is accumulating that these abnormalities often resolve on later follow-up angiography. We submit that these data make MIDCAB the most closely scrutinized operation at this stage of evolution and that these early results are comparable to any published series on graft patency with conventional coronary bypass surgery.

The evolution of this operation is not unlike that of mitral valve repair in that it is more difficult than replacement, requires a longer learning curve as well as sufficient volume, and therefore may not be for every surgeon. But would the authors argue that mitral valve repair is not a good operation? Although it was successfully introduced by a few “virtuosos” >20 years ago, it eventually evolved so that today most cardiac surgeons are capable of successful repair.

Conventional coronary bypass surgery has been a good operation for the past 30 years that has contributed to the cardiac health of millions of patients and will continue to do so. However, there is always room for improvement. Conventional coronary bypass is only one technique for coronary revascularization in a growing armamentarium of therapeutic options, and the definition of appropriate application of each will continue to evolve. In the field of coronary revascularization, transcatheter techniques are becoming increasingly effective, and the advent of gene therapy is on the horizon. It is our challenge to develop minimally invasive alternatives to transcatheter techniques that take advantage of the superior long-term outcomes of surgical revascularization and combine this with the invasiveness of angioplasty. The concept of “hybrid” or “integrated” coronary revascularization, which may combine the superior outcomes of LIMA-to-LAD grafting with the least invasive properties of catheter-based intervention, is intriguing.

The minimally invasive surgery revolution has transformed orthopedics, gynecology, and general surgery with technological advances. It will soon do the same for cardiac surgery. For our specialty to survive and flourish in these rapidly changing times, we must have the courage to embrace the change and continually reinvent ourselves and our practices. Only our ability to evolve will guarantee our survival. We
must not become stagnant by the inertia of our past success and fail to grasp the opportunity of change.

References
3. Data analyses of the Society of Thoracic Surgeons, National Cardiac Surgery Database, the Fifth Year, January 1996.

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