Use of the Internal Mammary Artery Graft and In-Hospital Mortality and Other Adverse Outcomes Associated With Coronary Artery Bypass Surgery

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The use of the left internal mammary artery (LIMA) to bypass the left anterior descending artery (LAD) is the “gold standard” of coronary artery revascularization, recognized by interventionalists and surgeons alike. The better size match with the coronary artery, the single anastomosis, and the biochemical and physical qualities of this conduit for the most important coronary artery in the human circulation, the LAD, are clear advantages over the saphenous vein graft. The seminal paper by Loop et al showed the important influence of this operation on the longevity of patients who are operated on for coronary artery disease, and their data have been substantiated by others.

Nevertheless, the LIMA has not been generally used by surgeons in the variety of clinical coronary artery syndromes requiring coronary artery bypass grafting (CABG) because of some relative contraindications. These have included left ventricular hypertrophy, severe left ventricular dysfunction, emergency operations, chronic obstructive pulmonary disease with enlarged lungs, advanced age, and an obstructed left subclavian artery. Theoretically, increased conduit blood flow is considered necessary in these situations, and this was thought best provided by a saphenous vein graft to the LAD rather than a LIMA. Thus, the LIMA was not recommended for emergent/urgent situations or in patients with the above complications. Also, the longer harvest time of the IMA and the increased bleeding tendency of the emergent patient, especially those undergoing interventional procedures in the cardiac catheterization laboratory who may be on some form of anticoagulation and in the fragile elderly, were also considered contraindications to the use of the LIMA. Therefore, in the comprised patient with any of the above stipulations, even the young, the LIMA has not been generally used.

This prospective study by Leavitt and colleagues of >21 000 patients undergoing CABG for the first time who had their surgery performed in the “modern” era (between 1992 to 1999) has refuted many of these long-held beliefs. In every clinical situation, including the aforementioned ones heretofore thought relative contraindications, the use of this conduit for LAD coronary bypass was positively correlated with improved survival when compared with the use of a venous conduit to the LAD. Although this study would seem to be counterintuitive for the reasons cited above, it is an important study when one looks at the current trends in coronary bypass surgery and the pathophysiology of failed grafts.

At present, CABG is performed extremely well and significantly better than in the 1970s and 1980s, when the relative contraindications were suggested. Even in the emergent situation, most experienced surgical units can harvest the LIMA in a relatively short time, with little or no blood loss despite the use of intravenous antiplatelet agents from the catheterization laboratory. The suture techniques, the familiarity with physiology, and the use of intraoperative and postoperative vasodilators and antispasmodics has made this operation extremely successful. Thus, the application of the LIMA to a greater community of patients undergoing coronary bypass surgery, including those with emergency requirements or left ventricular dysfunction and the elderly, is not unreasonable and is now recommended. The authors point out that the improved patency and, probably, increased flow with this conduit may be the reason for its immediate success. Considerable size discrepancies may exist between vein grafts and coronary arteries, especially in the acute situation, where there may be low flow or low cardiac output, and this may promote thrombosis. Thrombosis leads to a promulgation of thrombus, probably throughout the coronary outflow tract, so that this condition in patients who have had a coronary occlusion makes the treatment worse than the otherwise bypassable disease. In addition, even the noncardiac complication rate in Leavitt et al’s study was better in the LIMA group, suggesting improved cardiac output from improved flow to the critical LAD.

The fact that this was a multi-institutional study is a strongly positive factor supporting these data. The Northern New England Cardiovascular Database is a well-recognized, sophisticated data bank that has done an excellent job reporting operative trends in large numbers of patients undergoing coronary revascularization. It has had an important impact on practice patterns.

Although surgeons have been using the LIMA more frequently in difficult clinical situations, including elderly patients, this report will encourage an even wider use of the best conduit available to cardiovascular surgeons for the performance of a coronary bypass. In fact, the trend toward total arterial revascularization, especially in the younger...
patient, has grown based on the excellent data with first one IMA and then two IMAs. Mammary artery conduits, combined with the radial artery conduit, have given rise to an operation that proposes the best long-term solution for coronary revascularization in younger patients.

More data on CABG will continue to be analyzed from this database. Observational clinical data like this report are extremely important to continually evaluate and upgrade CABG surgery, which is already the most well-studied operation in history. Such data are essential for improving outcomes in the increasingly complicated patient base referred for CABG in the new millennium.

References


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