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Bilateral internal mammary artery grafting in CABG surgery: an extra 20 minutes for an extra 20 years…

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Bilateral internal mammary artery (BIMA) grafting has been the operation of the future for 25 years - it must now arrive! One cannot talk about BIMA grafting without first discussing why venous bypass grafts are no longer best practice.

Why are vein grafts so bad?

Because veins were never meant to be arteries. It is true that some vein grafts last 30 years but the majority don't. The blood pressure in veins is 25-30 mmHg; the pressure in arteries is 120/80 mmHg. So when a vein is expected to do the job of an artery, it all too often fails. In 1996, FitzGibbon[1] studied 5,065 bypass grafts from 1969 to 1994: early graft patency (<3 weeks) was 88%. In 2010, the results for early patency were still exactly the same: 88.2% patency in 322 venous grafts at ≤7 days in a study by Kim[2] versus 98.9% (3,495/3,535) in arterial grafts. In a 2008 study meant to determine if edifoligide would prevent vein graft failure due to neointimal hyperplasia, the one-year venous graft patency was 74.3%[3]. In FitzGibbon's study, "A" vein graft patency at one year was 76%. Despite improvements in every area of medicine and surgery over decades, vein graft patency has remained the same: unacceptable. As time goes on, vein graft patency worsens: at 10 years, 48% are "A" grafts and at ≥15 years 40% are patent[1].

Why are BIMA grafts so good?

Because God made them that way. The literature is replete with the benefits of BIMA grafting: decreased risk of death, reoperation and angioplasty[4], improved in-hospital mortality[5], increased long-term survival[6-9]. BIMA is also better in certain subgroups of patients, e.g., those with reduced ejection fraction[10] and patients with diabetes[11,12]. Use of BIMA has been shown to have better five-year reintervention-free survival compared with drug-eluting stents in diabetic patients[13]. Most recently, Kurlansky[14] demonstrated that use of BIMA reverses the influence of gender on CABG outcomes short and long-term, ameliorating both the increased perioperative mortality in female patients and the reduced long-term survival of male patients. The cut-off age for benefit of BIMA grafting ranges from 65 to 74 years of age[8,15-17]. The low incidence of BIMA grafting is no longer justifiable with the evidence to date.

Why do surgeons use veins?

Because this is how they were taught, immediate results are good, it's easier, inertia (it is hard to leave one's "comfort zone" and perform more technically demanding procedures with the requisite learning curve). BIMA grafting devascularises the sternum more than single mammary harvest and predisposes to deep sternal

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wound infection. In the United States, the centres for Medicare and Medicaid Services no longer reimburse for the extra care necessary for treatment of deep sternal wound infection as this is deemed a "never event"[18]. World-famous chefs do not use "freezer-burned chicken" and "one-week-old lettuce" to create a culinary masterpiece; they use the very best ingredients. Then why do we as surgeons use a vein? Fast-food mentality?

Why do surgeons not use BIMA?

Because BIMA harvest is more time-consuming, surgeons like to be "slick". In some respects, we surgeons have not evolved much from the early days of barber-shop surgery. We now have general anaesthesia, so we do not have to be so "quick". It may take an extra 20 minutes in a three- to four-hour operation to use the second mammary (principally the harvest time). What a payback for patients – an extra 20 minutes for an extra 20 years….

In a survey of 101 of 147 Canadian surgeons by Mastrobuoni et al[19], the main factors influencing BIMA use by surgeons were: risk of sternal wound infection for 35% of surgeons, the reluctance to believe in the superiority of the right internal mammary artery (RIMA) over the saphenous vein for long-term outcome for 30% of surgeons, limited length of the RIMA for 28% of surgeons, and increased operative time or bleeding for 6% of surgeons.

One famous surgeon (I am not sure who) said "I think that maybe what we should be doing is just put two internal mammaries on the heart somewhere and leave it at that". This is a worthy thought: two IMAs on the two biggest territories (LAD, CIRC, or RCA) would leave the patient with single-vessel disease which (if symptomatic) could (if amenable) be addressed with PCI; this would perhaps be a more meaningful "hybrid" procedure than just the LIMA-LAD and the other two territories with DES stents.

The team effort

There is a common theme emerging from cardiologists all over the world – they "yearn for BIMA grafting". Why is this? Venous graft disease is almost impossible to deal with for two reasons: 1) patients with serious venous graft disease often have a patent LIMA to LAD on which most surgeons will be reluctant to perform reoperation for fear of damage to the IMA upon chest re-entry; 2) PCI is fraught with the danger of embolisation causing serious myocardial damage, and the atherosclerosis that develops in vein grafts is the biggest challenge for any type of stent. Drug-eluting stents are somewhat better[20], but nothing fully corrects the problem of vein graft atherosclerosis, except not using veins to begin with. Please do not misunderstand – there is a place for using the vein. It has saved many a patient's life, but its use should be the exception rather than the rule.

Cardiologists refer business to surgeons: as cardiac surgeons we are heartened when we see beautiful BIMA grafts studied years after CABG surgery. We rise to the occasion when the following is proposed: "If you would do a left internal mammary artery (LIMA) to the LAD and a RIMA to the RCA (or CIRC), we can do PCI for the third if the patient suffers angina". And then there is tough love – what if cardiologists didn't send surgeons CABG cases unless surgeons do BIMA(!)? Detailed discussion of cases between surgeons and cardiologists are often enlightening for both. We should learn to talk to each other - patients can only benefit…

Conflict of interest statement

T. Kieser is a consultant for Medistim ASA, Medistim USA and Ethicon Endosurgery.

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