Bilateral internal mammary arteries: a very important missing trick for coronary artery bypass grafting

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In the current issue of the journal, Grau et al. [1] described 17-year outcomes of a propensity-matched group of 928 patients with bilateral internal mammary arteries (BIMAs) and 928 with a left internal mammary artery (LIMA) and additional vein grafts as necessary. Their most important conclusion is a clinically important survival benefit with BIMAs at \( \approx 10\% \) at 10 years and 18% at 15 years and further enhanced if performed as an off-pump procedure. If correct, this should encourage a change in clinical practice because currently fewer than 10% of patients in Europe and fewer than 5% in the USA receive BIMA grafts. So, two fundamental questions are: (i) are the conclusions supported by the data and (ii) are the conclusions consistent with other existing evidence?

Before answering these questions, some relevant background information is useful. The IMA story began in earnest over a quarter of a century ago when Loop et al. [2] from the Cleveland Clinic published their seminal paper reporting that an IMA graft to the left anterior descending coronary artery, in comparison to a saphenous vein graft, over a 10-year period significantly improved the survival accompanied by a reduction in the incidence of myocardial infarction, recurrent angina and the need for repeat intervention. In 2001, our own group published the first systematic review of BIMA versus SIMA in almost 15,000 patients and reported a hazard ratio of death at 0.81 in favour of BIMA patients [3]. Such observations were entirely consistent with several angiographic studies reporting superior angiographic patency of both IMAs in comparison to saphenous vein grafts when placed to the left-sided coronary vessels both early [4] and late [5] after surgery.

Although such evidence in favour of BIMA has been available for over a decade, their routine use in clinical practice as
mentioned earlier remains very low. This is even more surprising when a majority of polled surgeons reported that they did believe that BIMA offered clinical benefits to most patients (and indeed two-thirds of surgeons said that they would personally want BIMA if they required coronary artery bypass grafting [CABG]) [6]. It has to be assumed therefore that the low rate of BIMA use is explained by the fact that, in the same survey, a majority of surgeons believed that the use of BIMA had a ‘learning curve’, would add to the duration of the operation and could actually increase early mortality and morbidity and especially deep sternal wound infections [6].

To date, there has only been one publication of a randomized trial of BIMA versus SIMA [7]. The arterial revascularization trial (ART) is one of the largest trials ever conducted in cardiac surgery and randomized 3102 patients in 28 centres in seven countries by 67 surgeons to SIMA or BIMA with supplemental veins or radial arteries as necessary. Although the primary outcome of this trial is 10-year survival, the 1-year results have been published [7], reporting similar 30-day and 1-year outcomes in terms of death (1.2 and 2.4% for both groups), stroke, myocardial infarction and repeat revascularization. BIMA increased the length of surgery by 23 min, but its main adverse effect was an increase in the need for sternal wound reconstruction at 1.9 versus 0.6% in the SIMA group.

The current study by Grau et al. [1] described the 17-year survival in relatively contemporary (from 1994) propensity-matched groups of 928 BIMA and 928 SIMA patients (from a database containing 6313 patients). The groups were well matched for 18 pre-operative and 5 intraoperative factors although the BIMA group remained on average 2 years younger with a slightly lower body mass index. There was a high proportion of off-pump procedures (around half of the patients in both groups) indicating a high level of surgical expertise. There were no significant differences in 30-day mortality at ~1% or in any important post-operative complication and especially stroke.

If the survival benefit of BIMA reported in the current study is real, then it is clinically very important and should encourage more routine use of BIMA. It is certainly consistent with several other studies reporting a survival benefit of BIMA [3, 8] and it is noteworthy that no study has reported a long-term detrimental effect of BIMA. What is also particularly striking in the current report is the very low incidence of deep sternal wound infection (0.3%) in both groups. This is much lower than that traditionally reported in the literature and is especially surprising as the authors report using a pedicled technique to harvest the IMA as a skeletonized approach (i.e. only harvesting the IMA and not denuding the surrounding tissues) has been reported to reduce the incidence of sternal wound problems [9]. It is especially noteworthy therefore that the incidence of diabetes in the propensity-matched patients was 11% in contrast to 31% in the whole population, suggesting a strong selection bias against using BIMA in patients with diabetes. Indeed, there is much evidence to suggest that the major predictors of sternal wound infection are diabetes, obesity and chronic lung disease [2] and the ART showed an increase in the need for sternal reconstruction from 0.6 in the SIMA group to 1.9% in the BIMA patients.

Another potential advantage of the bilateral IMA technique is when used in conjunction with off-pump surgery allowing a no-touch aortic technique. Several groups have reported a reduced incidence of stroke by avoiding cardiopulmonary bypass and any aortic manipulation such as attaching saphenous veins or radial artery to the aorta [10].

Despite almost a decade of strong evidence of the clinical superiority of BIMA grafting, there remains a low use of BIMA in patients undergoing CABG. There is now robust evidence from the literature both from large registries and from one randomized trial that the use of BIMA does not increase early mortality or most aspects of morbidity with the possible exception of a slight increase in sternal wound problems. Even this complication can be reduced dramatically by avoiding the use of BIMA in diabetic patients or those with marked obesity. The low use of BIMA grafts is an indictment on contemporary CABG and professional societies should actively encourage the performance of BIMA grafts and use this as part of a quality matrix for assessing the standard of CABG.

REFERENCES


