Bilateral internal mammary arteries—are they really enough?

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In a retrospective study titled Bilateral internal mammary arteries (BIMA) are enough for total coronary revascularization published later in this issue [1], the authors have presented their experience of multiple arterial grafting and proposed that bilateral internal mammary arteries alone are adequate to revascularize the myocardium.

In the study, 4571 out of 4952 (92.3%) patients received a single internal mammary artery (SIMA). Of the remaining, 191 (3.8%) received BIMA along with a third graft which was either a vein or another artery, and another 190 (3.8%) received only BIMA. Using the EuroSCORE, the authors selected a similar number of patients ($n = 190$) from the SIMA group and compared the three groups for short-term outcomes.

The main conclusion the authors draw is BIMA usage, with or without an additional conduit, is associated with significantly reduced neurological events. They have also shown that it is possible to bypass comparable number of targets using BIMA alone and have therefore suggested that a third conduit is not really necessary.

Their findings have indeed been substantiated by evidence from other researchers. Studies in the past [2] and in more recent times [3–5] have demonstrated the superiority of BIMA over SIMA. It has also been shown that coronary artery operations exclusively with BIMA grafting using composite grafts may be associated with better long-term survival than grafting with SIMA plus other types of conduits [6]. However, their final assertion which is also the title of their work

“Bilateral internal mammary arteries are enough for total coronary revascularization” needs further discussion.

The authors have reported no difference in outcome between patients receiving only BIMA grafts and those who received an additional graft, at times arterial, along with BIMA. However, they have only reported short-term outcomes, and it is well-known that the main advantage of using arterial grafts lies in improved long-term outcomes, and probably, this was one of the reasons why the 5-year data of the ART trial failed to demonstrate the superiority of BIMA over SIMA [7]. Since the authors have not reported any follow-up data in their paper, do they feel they can be certain that the patient population which received a third arterial conduit in addition to BIMA will not have better long-term outcome? In fact, there are some single center reports that provide evidence to the contrary [8, 9]. Also, a recently published meta-analysis that evaluated pooled data from 10,287 matched patients receiving two versus three arterial conduits reported that the use of a third arterial graft is associated with a 24% survival benefit at a mean follow-up of 77.9 months, and this survival advantage is independent of the patient's sex and diabetic status [10].

The other concern is methodological. The authors have used EuroSCORE to select matched patients from their SIMA cohort. Even though the three groups the authors have thus created appear reasonably well-matched, there are some significant intergroup differences in terms of age, left main stem stenosis, and presence of diffuse coronary artery disease. In view of these, why did the authors choose EuroSCORE to select their patients and not propensity score matching which would have allowed them to control for these intergroup differences and provide a more accurate comparison?

Lastly, the authors have shown that in the short-term, there is a reduction in early neurological events in the BIMA group. However, the authors in this study have not detailed the prevalence of carotid artery disease in the three groups and thus

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ignored the influence of carotid artery stenosis and plaque characterization on adverse neurological outcomes. There is a proven association between left main stem stenosis, diffuse coronary artery disease, and presence of carotid artery disease [11]. Since both left main stem stenosis and diffuse coronary artery disease were significantly higher in the SIMA group, it is quite possible that this group also had significantly higher prevalence of carotid artery disease which in turn may have contributed to the worse neurological outcome seen in this group. In the absence of data on carotid artery disease, can the authors postulate that avoiding aortic manipulation alone was responsible for the lower neurological events seen in the BIMA groups?

Despite the questions raised, this is a very important piece of work carried out by the authors, but it falls short of achieving its full potential due to the issues discussed. The importance of the study lies in the fact that it reminds us that BIMA grafting can be performed with no increase in short-term morbidity especially wound infections and perhaps provides neurological benefit. Considering that usage of BIMA is still very low worldwide, advocating a third artery for coronary artery bypass may be purely academic, and taking a pragmatic view, one has to agree with the authors that currently BIMA is perhaps adequate for coronary artery revascularization.

Compliance with ethical standards

Conflict of interest The author declares that he has no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by the author.

Informed consent There were no participants involved hence there was no requirement for informed consent.

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