



Editorial comment on “current practice of saphenous vein graft harvesting in coronary artery bypass graft surgery: an Indian survey”

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Despite all emerging interventional techniques, coronary artery bypass grafting (CABG) remains the gold standard for complex coronary artery disease and the most commonly performed cardiac surgical treatment, with a relatively stable number of procedures performed worldwide [1]. Several types of bypass grafts can be used in CABG surgery, and there is a lively and ongoing debate about total arterial revascularization [2].

Since observational evidence suggested a better clinical outcome with the use of multiple arterial grafts, the latest trial, the Randomization of Single versus Multiple Arterial Grafts (ROMA) Trial, was conceived based on data and an analysis of the existing randomised and observational studies to end the ambiguity once and for all [3]. To date, the surgical community awaits the final results of this ongoing trial. Up to 80% of all CABG operations worldwide use at least one vein graft for the procedure despite the known shortcomings termed under the notion “VGF-vein graft failure” [4]. There are multiple reasons for vein graft failure in the long-term following CABG: intimal hyperplasia, graft atherosclerosis, or smooth muscle cell triggered restenosis [4]. The role of initial trauma during harvest has not been fully elucidated so far but is undisputedly one of the most influential factors [5]. The status of the vein graft prior to

implantation is of great importance and should be considered an essential timepoint as this is the last time the surgeon can have a positive or negative influence on this “auto-transplant” [6].

Saphenous vein grafts offer, on the other hand, several benefits that account for their popularity. The so-called technical simplicity of harvesting and easy handling, as well as the relatively long segments, are important points, but they are also the most fragile and affect the most the long-term outcome [7]. The present study “Current practise of Saphenous Vein Graft Harvesting in Coronary Artery Bypass Graft Surgery: An Indian Survey”, published in this issue, reflects the current practice as seen and reported worldwide. The call for a standardised and evidence-based procedure to end the jumble of various approaches and recipes has to be highlighted as a magnificent reflection and forward-thinking strategy in this study.

Since the PREVENT IV trial, many questions have been formulated and studied: how to harvest a vein graft, overdistension, which graft to choose for which coronary vessel to be bypassed, and how to flush and store the graft segments [8]. For every CABG procedure, it is necessary to harvest at least one graft, but most frequently several grafts. These vessels are prepared with clips or ligations, flushed, and stored at least for a short period of time between procurement and construction of the anastomosis. In contrast, the internal mammary artery is often left in situ or wrapped in a cloth immersed in different preparations, but mostly in papaverine.

Surprisingly, little attention has been paid over a long period to the aspect of storage solutions and flushing of vein grafts prior to surgery when compared to other procedural details [8]. As reported in the review by Tsakok et al. in 2012, three well-designed studies suggest preserved endothelial function when saphenous vein grafts are stored in saline compared with storage in autologous whole blood (AWB). Other studies showed no effect or even detrimental effects of autologous whole blood [9]. AWB loses CO₂ and the pH rises dramatically once removed from

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the circulation, indicating alkalotic injury; saline follows this path and should no longer be recommended as a storage solution due to its inferiority in preserving the human endothelium [10]. Santoli et al. published a study in 1993 focusing on morphological changes of the intima assessed by electron microscopy. Fifteen patients undergoing CABG were included and portions of distal saphenous veins were then either immediately fixed (control) or immersed either in AWB, University of Wisconsin Solution (UWS), or heparinized saline solution with papaverine (HSSP). This study revealed that autologous blood is not without pitfalls and identified AWB as a risk factor for significant damage to the endothelium as segments treated by AWB showed enhanced cell loss, oedema, and even necrotic areas when compared to veins stored in UWS or HSSP. The authors concluded that the development of other solutions such as UWS may be promising and therefore called for the development of alternative solutions [11]. Despite known evidence and a long history of investigations by various studies, saline and AWB are still the most widely used solutions in use worldwide. Buffered solutions offer several advantages and the rate of acceptance is rising, as reflected in the current article, due to the growing awareness of the influence of flushing and storage solutions on VGF. Dura-Graft®, a novel specific solution, demonstrated promising results and was designed to address the aforementioned shortcomings. With growing awareness on the topic of VGF, several studies have confirmed the positive effects on the vessel wall integrity and the ischemia–reperfusion complex, provided that the solutions are disposable and fundable [12, 13]. The same aspect accounts for the type of harvesting. As initially reported in 2009, endoscopic vein-graft harvesting was independently associated with vein-graft failure and adverse clinical outcomes, which led to a periodic wide discontinuation of the technique [14]. Various studies followed and the technique, harvest system, and especially the case load and training status of the associated specialist were identified as influencing factors. Soon, reports and trials followed, stating that endoscopic saphenous vein harvest is associated with a lower rate of leg infection and that the endoscopic approach was not an independent predictor of in-hospital or midterm adverse outcomes [15]. The choice is dependent on the patients' characteristics and the surgeons' experience again, besides funding issues and reimbursement, but indisputable initial trauma, e.g. overdistension, side branch injury, or thermal injury, has to be avoided, as already reported in the PREVENT IV trial. The current numbers of the underlying survey reflect the individual and deliberate approach, though more and more patients demand endoscopic access due to its known cosmetic benefits [15]. The technique of external stenting of vein grafts should receive attention in the context of the present topic. As reported in the Venous

External Support (VEST) IV Trial, external stenting mitigates saphenous vein graft remodelling and significantly reduces diffuse intimal hyperplasia and the development of lumen irregularities after coronary artery bypass surgery [16]. Palanisamy et al. recently commented on the topic and the technique behind it with a positive review, adding an interesting hint to consider in terms of segment selection and venous valves to further enhance the already positive effect on graft patency [17].

The current article displays the changing paradigms in terms of vein graft treatment and preventing VGF. The authors call for a uniform and evidence-based approach to graft harvesting, storage solutions, and treatment to optimise long-term patency. The underlying study as stated in the limitations section does not provide clinical outcomes or a control group but this requires at least a mid-term follow-up in regard to VGF and repeat angiographies to define the grade of graft failure. Coronary angiographies are difficult to obtain and to conduct apart from the ethical point in a real study setting. As a second step, an in-depth analysis of clinical outcomes, reintervention rates, and repeat hospitalizations—if the data is made available by the participating centres—could be another option to gain a very informative and representative dataset. The top priority of this first study was of course to give or create the necessary information in the form of a survey-designed study to define the status quo to open and ignite the discussion to plan further steps based on this data.

In conclusion, with an eye towards the future, novel techniques to enhance long-term vein graft patency show promising results in the mid-term, while old regimens might be outdated and even be harmful. The current article presents in a detailed way the status quo and opens the discussion to reflect on the current techniques and paradigms to enter the next step in this field of our speciality.

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Declarations

Ethics approval This is an invited editorial and is not required to have ethical committee approval.

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