Reply to the Letter to the Editor

Reply to Kargar and Aazami

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Keywords: Composite arterial graft; CABG; Myocardial revascularization; Thoracic artery; Radial artery

We thank Kargar and Aazami [1] for their interest in our recent article on flow dynamics and wall shear stress (WSS) in the left internal thoracic artery (LITA) [2]. In this study we show that the LITA has a marked adaptability to flow dynamics with a clear propension to adequate WSS and cross-sectional area to flow requirements. Two modifications take place into proximal LITA used as a composite Y-graft: (1) a ‘passive’ increase in blood flow due to the lower resistance of the parallel vascular circuit represented by the Y-graft, as expressed by the Kirchoff’s 2nd law, and (2) an ‘active’ increase of proximal LITA diameter related to the higher average peak velocity and blood flow that stimulate the synthetic and secretory functions of endothelial cells, modulating the production of nitric oxide and endothelin-1 to obtain proximal LITA dilatation. Finally also the flow pattern could have a role in the production of vasoactive substances by vascular endothelial cells, presenting the proximal part of LITA Y-graft a diastolic-predominant peak of flow velocity, probably related to the reduced vascular resistance of the parallel vascular circuit. In conclusion our study shows that in composite Y-graft the proximal LITA is able to actively adapt its dimension to the flow demand, probably through the release of endothelial vasoactive mediators, consequence of higher values of WSS. This process of adaptation begins immediately after the operation because of the passive increase of blood flow due to the lower vascular resistance of the Y-graft system.

Kargar and Aazami seem to be skeptical about the adaptability of the LITA to increased myocardial blood flow requirements. However we have shown that soon after the operation the LITA used as a Y-graft can significantly increase blood flow in response to conditions of increased MVO₂, keeping normal the O₂ supply-to-demand ratio. We obtained these data measuring blood flow in Y-graft both at rest and during atrial pacing at the 85% of the patient age-predicted maximum, considering the heart rate-systolic blood pressure relationship.

Both the afore mentioned functional data and the favourable clinical results coming from LITA used as a Y-graft [4] should comfort Kargar and Azami about the safety and efficacy of the LITA in Y-graft configuration.

We thank again Kargar and Aazami for their interest in our paper.

References


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Letter to the Editor

Remodeling of vein grafts after local application of fibrin glue

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Keywords: CABG; Neointima; Intimal hyperplasia; Vein graft

With interest I read the article ‘Differential, time-dependent effects of perivenous application of fibrin glue on medial thickening in porcine saphenous vein grafts’ by Wan et al. [1]. The authors found a significantly reduced intimal area in fibrin glue treated porcine vein grafts at 1 month postoperatively. At 4 months the total wall thickness in the treatment group was significantly increased versus controls. The authors conclude that fibrin glue should be avoided due to these findings. By going through the morphometric data of this study I would like to discuss a positive effect of fibrin glue in this experiment: (1) At 1 month postoperatively there was a significant decrease of neointimal hyperplasia in grafts treated with fibrin glue (maybe by decreasing the radial wall stress?). (2) At 4 months postoperatively the wall thickness was increased in fibrin glue treated grafts. But this increase was due to an increase of medial thickening, whereas in the neointimal thickness no difference was found. Together with the fact that the luminal area was equal in both groups I would discuss this results as ‘arterial remodeling’ of the veins. The increase of wall thickness is an adaption process of the thin venous wall to the arterial blood pressure. If the wall thickening occurs in the media (and not in the neointimal!) and does not compromise the luminal area it could be regarded as positive remodeling [2]. Therefore the perivascular use of fibrin glue may be discussed positive in this study, not negative.

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Reply to Schachner

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We thank Dr Schachner for his interest and comments on our recent experimental findings [1]. The first facet of our study was that although initially (at 1 month), neointima formation in vein grafts was inhibited by perivenous application of fibrin glue at the time of implantation, at 4 months neointimal formation was not significantly different from controls [1]. Dr Schachner has implied that this is of no consequence. It is a widely held view that neointima formation is axiomatic in promoting vein graft failure [2]. The study therefore demonstrates that there may be a rebound effect that is manifest over the longer term. This also indicates that with acute or pulse treatments of vein grafts with fibrin glue or indeed cytostatic drugs or even gene transfer, care should be exercised when assessing effects at one month only and that potential rebound effects at later time points should be taken into account.

Secondly, Dr Schachner has also suggested that increased medial thickening but no change in luminal area in response to fibrin glue at 4 months could be perceived as a “positive remodeling” effect. We accept that medial thickening is a necessary adaptive response of saphenous vein grafts to arterial conditions and have stated so on many occasions [3,4]. However, excessive thickening of the media may be equally as deleterious as neointima formation. Since medial thickening involves the proliferation of vascular smooth muscle cells and the deposition of matrix proteins, our data at 4 months indicate that these key events are actively occurring in these vein grafts at this time point. Although we did not study effect of fibrin glue in the longer term, it is reasonable to suggest that the trend toward excessive thickening may continue. Indeed, graft thickening in man has long been recognized to become clinically significant at 12–24 months after surgery [2], that is, over more prolonged time courses. Furthermore, vein graft hyperplasia is more aggressive at the anastomoses of vein into artery grafts, sites at which fibrin glue may be applied by surgeons to prevent bleeding. Fibrin glue may be particularly deleterious at these sites by augmenting hyperplasia. Such effects are perhaps not surprising since fibrin is a potent mitogen for vascular smooth muscle cells [5].

Thus, despite the interesting views of Dr Schachner, we reaffirm our conclusions that the application of fibrin glue may elicit untoward effects on vein graft thickening that in the long term may compromise vein graft patency.

References


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Letter to the Editor

Systemic oxidative stress associated with lung resection during single lung ventilation

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Systemic oxidative stress appears to be associated with lung resection during single lung ventilation. In our study, we examined systemic oxidative stress in patients undergoing lung resection during single lung ventilation. We observed a significant increase in the production of oxidative stress markers, including 4-hydroxy-2-nonenal (4-HNE), nitrotyrosine (NT), and thiobarbituric acid-reactive substances (TBARS), in postoperative blood samples. These findings suggest that lung resection during single lung ventilation induces systemic oxidative stress, which may have implications for patient outcomes.