In the Internal thoracic artery, more diameter does not always mean more flow

To the Editor,
With great interest, I read the article by Chandran et al.[1] and congratulate them for the quality of the study conducted on other possible methods to increase the flow of the internal thoracic artery (ITA) in coronary revascularization. In view of the authors’ interest in this topic, I would like to make some comments in this regard.

Since the introduction of papaverine during ITA harvesting in 1971 by George E. Green,[2] cardiac surgeons have attempted to find more effective methods of increasing the diameter, length, and flow of the artery. This research is on the same path as those efforts and its results show that vasodilation by sympatholysis does not seem to be the solution either.

It is generally believed that an increase in the diameter of ITA, by whatever means, will lead to an increase in its flow. However, in 2017 Satdhabudha and Noppawinyoowong demonstrated that native ITA flow (artery in situ) decreases almost half after harvesting, even with topical administration of papaverine for 5 min.[3] The only explanation for this finding is that, in the particular case of ITA, the amount of its flow is determined by a more important factor than the diameter of the vessel.

It should not be forgotten that ITA is an exceptional vessel, fed by at least three arterial systems, receiving flows from different directions and with different intensities. In this anatomical scenario, an increase in the diameter of the artery by sympatholysis will not cause a significant increase in its antegrade flow, since at the same time, endoluminal resistance to that flow also increases (competition).

In this case, since the increase in flow is practically nil, endothelial nitric oxide (NO) production will not increase either and the expected vicious cycle leading to further dilation of the artery will not start. This physiological situation can perfectly explain the results of the study by Chandran et al., specifically related to the flow of ITA.

Since 2015, I have introduced an effective method to increase the free flow of ITA in my hospital, which seems to have few limitations. It consists of occluding the distal end of the artery at the beginning of its preparation.[4] By abolishing early-flow competition, higher NO production is obtained, mediated by an increase in ITA systolic flow, and improving the mentioned vicious circle.

We recently completed a randomized control trial (unpublished data), which compared the results of applying this method with the generally used skeletonization technique, also in two homogeneous groups of 50 patients. Differences in the diameter of the arteries were not measured, but there were very significant differences in the postharvest free flow, being higher in the group where the arteries were occluded distally at the beginning of their preparation ($83 \pm 24$ Vs. $44 \pm 15$ ml/min; $P < 0.001$).

In addition, other interesting benefits related to mediastinal and sternal protection against future infectious complications are obtained.[5]

Financial support and sponsorship
Nil.
Letters to the Editor

Conflicts of interest
There are no conflicts of interest.

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Submitted: 21-May-2020   Accepted: 21-Jun-2020
Published: 22-Jan-2021

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In reply

To the Editor,
Yoandy López-de la Cruz in his letter submits that the internal thoracic artery (ITA) is fed by at least three arterial systems and an increase in the diameter of the artery by sympatholysis will not cause a significant increase in its antegrade flow, since at the same time, the endoluminal resistance to that flow also increases (competition). He also mentions that occluding the distal end of ITA at the beginning of its preparation abolishes early flow competition.

I thank Yoandy López-de la Cruz for the keen interest shown in our study titled “Combined effect of left stellate ganglion blockade and topical administration of papaverine on left internal thoracic artery blood flow in patients undergoing coronary revascularization”.

The idea for this study was based on the study conducted by Gopal et al where they provided objective data (using fluoroscopy) about vasodilation in the left ITA after Stellate Ganglion Blockade (SGB) using fluoroscopy in 30 patients undergoing coronary angiogram and thus postulated this technique of SGB to be of use in patients undergoing coronary artery bypass grafting (CABG).

Dönmez A et al also conducted a similar study and demonstrate the increase in the size of radial artery and ITA after SGB in patients undergoing CABG.

Internal mammary artery is maximally susceptible to spasm and vasoconstriction in the immediate postoperative period, especially in view of the extensive handling of the artery during the dissection.

There are numerous publications available in the literature over the years regarding the use of vasodilators for preventing internal mammary artery spasm after harvesting for CABG, including papaverine, nitroglycerine, calcium channel inhibitors, and phosphodiesterase inhibitors. The purpose of using pharmacological agents or a stellate ganglion block is to minimize the resistance to blood flow in the graft by preventing vessel spasm.

In our trial, we tried the use of preemptive stellate ganglion block to prevent the vasoconstriction and spasm of left ITA and utilized flow rate from the cut end of ITA as a way of numerically quantifying our hypothesis. We found that the vasodilatory effects of left SGB are nonadditive to that of papaverine. This was probably because papaverine alone was adequate...