Myocardial revascularization with both internal thoracic arteries 25 years after delayed repair for aortic coarctation

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Abstract

Aortic coarctation has been reported to cause alterations in the internal thoracic arteries that make these vessels unsuitable to be used as grafts for myocardial revascularization, especially if coarctation repair was performed in adulthood. This is the first reported bilateral internal thoracic grafting for myocardial revascularization in a patient who had undergone aortic coarctation repair 25 years earlier.

Keywords: Aorta and great vessels • Coronary artery disease • Coronary artery bypass graft

INTRODUCTION

Aortic coarctation in adult patients is, among other features, characterized by dilatation of the internal thoracic and intercostal arteries, in order to supply collateral flow to the distal aorta. The dilatation and augmented flow in these vessels have been associated with local atherosclerotic changes [1, 2]. Several authors, indeed, have reported the unsuitability of internal thoracic artery grafts for myocardial revascularization in patients previously operated for late coarctation repair [3]. In the present paper, we report a case of bilateral internal thoracic artery (ITA) grafting in a patient with previous repair of aortic coarctation.

CASE DESCRIPTION

A 68-year old woman was admitted to our hospital after the onset of chest pain and dyspnoea at rest. Twenty-five years earlier, the patient underwent surgical repair of an isthmic aortic coarctation by resection and end-to-end anastomosis through a left thoracotomy at another hospital. On admission, chest and heart examination were normal. Systolic/diastolic blood pressure was 150/80 mmHg and heart rate was 75 beats/min. Baseline electrocardiogram (ECG) showed left ventricular hypertrophy with anterior Q waves. Echocardiogram showed a hypertrophic left ventricle, normal ejection fraction and a limited area of hypokinesia at the apex. A rest-stress myocardial perfusion scintigraphy was performed, revealing inducible ischaemia in the antero-lateral wall and confirming necrotic areas on the mid-portion and apical septum. Coronary angiogram showed severe atherosclerotic stenosis in the left anterior descending (LAD) and in the right coronary artery. Surgical revascularization was scheduled.

At surgery, both left and right ITAs were dissected in a skeletonized and semi-skeletonized fashion, respectively. As expected, they were dilated, measuring ≈5 and 4.5 mm in diameter, respectively (Fig. 1A). The two arteries were carefully evaluated: blood flow was excellent in both of them and no signs of calcification were found. The in situ left internal thoracic artery (LITA) was used to graft the LAD and the in situ right internal thoracic artery (RITA) was used to graft the right coronary. Intraoperative flowmetry revealed normal function of both grafts.

Figure 1: (A) Intraoperative view of the dilated internal thoracic arteries. RITA: right internal thoracic artery. LITA: left internal thoracic artery. (B) Histopathological examination of the discarded segments of internal thoracic arteries. Left: 2.5× haematoxylin–eosin staining; right: 2.5× (inset 10×) immunostaining with anti-eNOS. M: tunica media; I: tunica intima; arrow: reactive cell.
The postoperative course was uneventful. Blood pressure control was troublesome, requiring the concurrent administration of β-blockers, calcium channel blockers, α₁-receptor antagonists and angiotensin-converting enzyme inhibitors. Pre-discharge ECG and echocardiogram were normal. The patient was discharged on postoperative day 8, in good condition.

Histopathological evaluation of the discarded ITA segments using haematoxylin–eosin and Masson trichrome staining revealed normal medial and adventitial layers and a markedly thickened endothelium. There was no cellular disarray, focal atherosclerosis or hyperplastic degeneration. Immunostaining with anti-factor VIII and anti-endothelial nitric oxide synthase type III (anti-eNOS) antibodies was performed according to described methods [4] in order to evaluate endothelial integrity and vascular wall function. Anti-factor VIII reaction revealed an intact endothelial layer and anti-eNOS immunostaining demonstrated normal expression of eNOS in the endothelium and in the media (Fig. 1B).

An angiographic control performed for study purposes 2 months after the operation showed that both the LITA and RITA grafts were patent, although they had minor luminal irregularities (Fig. 2).

**COMMENT**

The atherosclerotic changes occurring in the ITAs of aortic coarctation patients have not been extensively investigated in the literature. A relatively small number of reports have been published regarding the use of ITAs as conduits for revascularization in this special subset of patients. In most of cases, ITAs were rejected due to the evidence of poor flow once the arteries were transected after harvesting. In a smaller number of reports, the ITA was used, though abnormally dilated: in all but one case, the operation and the immediate postoperative course were uneventful [3]. This has led to contrasting opinions on the subject, with some authors even advising against the use of internal thoracic arteries, despite the evidence of a good flow [5].

Our patient is the first reported case in which both of the ITAs have been used. Intraoperative flowmetry and follow-up angiographic control demonstrated normal function of both grafts (although the potential impact of the described endoluminal irregularities on long-term graft patency is not known at present). Moreover, histopathological and immunohistochemical evaluation revealed an artery that, although abnormal, showed preserved architecture and vascular function.

We support the hypothesis that a history of aortic coarctation (whether concomitant or already repaired in adulthood) in a surgical candidate for coronary artery bypass graft does not necessarily rule out the possibility of grafting the coronaries using the ITAs. Besides intraoperative evaluation (qualitative and eventually quantitative, with the aid of transit-time flow measurement), a targeted preoperative evaluation by the means of transthoracic colour Doppler ultrasound and selective LITA and RITA catheterization at the time of the coronary angiography can be helpful for optimal preoperative planning.

**Conflict of interest:** none declared.

**REFERENCES**


**eComment. Evidence-based selection of conduits in coronary artery bypass grafting**

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We read with great interest the article by Gaudino et al. [1]. They have performed coronary artery bypass grafting (CABG) with both internal thoracic arteries (ITA) in a 68-year old patient with a surgical history of aortic coarctation repair. However, there