

A rare variant of the internal thoracic (mammary) artery

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SUMMARY

The internal thoracic (mammary) artery (ITA) is a branch of the first part of the subclavian artery. It courses downwards in the ventral thoracic wall and terminates in the musculophrenic and superior epigastric arteries. We have observed a rare variant of the right ITA in a female cadaver. The ITA terminated at the level of the second costal cartilage in 2 branches, which anastomosed with each other in a stepladder pattern. The medial branch gave sternal branches and then continued as the superior epigastric artery. The lateral branch gave anterior intercostal arteries and then continued as the musculophrenic artery. Since this artery is increasingly used as bypass graft in coronary artery bypass grafting, this variation of ITA should be borne in mind.

Key words: Sternum – Superior epigastric artery – Bypass graft – Subclavian artery – Human

INTRODUCTION

The internal thoracic artery (ITA) is a branch arising from the inferior surface of the first part of the subclavian artery, and divides into its two terminal branches in the sixth intercostal space (Gabella, 1995). It supplies the sternum, thoracic wall and the diaphragm through sternal, anterior intercostal and two terminal branches. The ITA is increasingly used for coronary artery

bypass grafting, and revascularization of the myocardium by surgical anastomosis of the coronary artery and the ITA (Kuniyoshi et al., 2002). The anatomy of the ITA facilitates its mobilization during surgery and its increasing use in coronary artery bypass grafting highlights the need to understand its variations. Lateral internal thoracic arteries sometimes arise from the ITA, which run downwards between the spine and the sternum and anastomose with the intercostal arteries (Krechowiecki et al., 1973), thus jeopardizing the procedure of paracentesis. This artery may originate from the third part of the subclavian artery in 0.83% of cases (Vorster et al., 1998) or may be a branch of the thyrocervical trunk in more than 10% of cases (Lischka et al., 1982). In a rare case, Omar et al. (2001) reported that the ITA originated from the third part of the subclavian artery bilaterally, and in yet another case gave origin to the suprascapular artery (Yucel et al., 1999). This artery gives a third ramus called the xiphoid branch in 61% of cases, at the level of 6th intercostal space, along with other branches to supply the sternum (Lachman and Satyapal, 1999). Its additional branches such as sterno-intercostal and sterno-perforating also supply the sternum and thoracic wall, and they contribute to the collateral circulation (Gupta et al., 2002). Thus, the variations of this vessel have been extensively studied due to its frequent use in revascularization surgery. Here we report another unusual and to date unreported case of ITA in a female cadaver found during routine dissection.

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Submitted: January 11, 2004
Accepted: April 15, 2004

CASE REPORT

During routine dissection of a female cadaver aged around 45 years, this variation of the right ITA was observed. The ITAs on either side were dissected and cleaned. The distances from different landmarks to ITA were recorded. The abnormal right ITA was studied for its variations and photographed. The origin of the ITA was from the first part of the subclavian artery. The artery descended down and divided at the level of the right second costal cartilage into 2 large medial and lateral branches. These 2 branches anastomosed by horizontal communicating arteries in a stepladder pattern (Fig. 1). Four such cross anastomoses were observed between the 2 branches: 2 at the level of 2nd intercostal space whereas the other 2 were at the level of 4th costal cartilage. The medial branch provided the sternal branches and then continued as the superior epigastric artery. The lateral branch gave anterior intercostal arteries and then continued as the musculophrenic artery. Thus, the musculophrenic artery gave origin to the anterior intercostal arteries from the 2nd intercostal space onwards. These branches did not show any difference and

they followed a similar course to that of the anterior intercostal branches of a normal ITA. The distances from the lateral borders of the sternum to the corresponding arteries and their diameters were not very different (Table 1).

Table 1.— Distances from the lateral border of sternum to ITAs and diameters (mm)

Land mark	Distance (mm)		Diameter (mm)	
	right	left	right	left
First intercostal space	14	14	4	3
Second intercostal space	7M, 15L	1,3	3	2
Sixth intercostal space	4M, 23L	5	2	2

M = medial branch; L = lateral branch

DISCUSSION

The present case reports a rare variant of the right ITA with a stepladder pattern of anastomosis. It could be said that the ITA had divided at the level of the second intercostal space into 2 branches and that these had anastomosed with each other. No such variations of the ITA have been reported, although this artery is highly variable. This is the only case of this variant observed over the years out of around 100 cadavers dissected (1%). By observing the positions of these two arteries (Table 1), and comparing them with that of the left side, it is clear that both of them do not actually occupy the position of a normal artery, if present, especially at the 6th intercostal space. Thus, the traditional surface anatomy of this vessel, adopted during surgical procedures would lead to erroneous judgments and could lead to injury. Thus, routine angiographic evaluations of this vessel are necessary before any surgical procedures are initiated (Peric et al., 2000). The diameters of the medial and lateral branches of the right ITA and that of the left one were almost same, making it difficult to confirm which one of the 2 branches of the right ITA actually acts as the ITA.

In revascularization of the myocardium, the coronary artery is surgically anastomosed with the internal thoracic artery by mobilizing the latter (Moore and Dalley, 1999). The rare and unexpected occurrence of anomalies of the ITA such as the one reported here may complicate the entire procedure. The embryological basis of the present case is not known, since it is the first case reported so far in the international literatu-

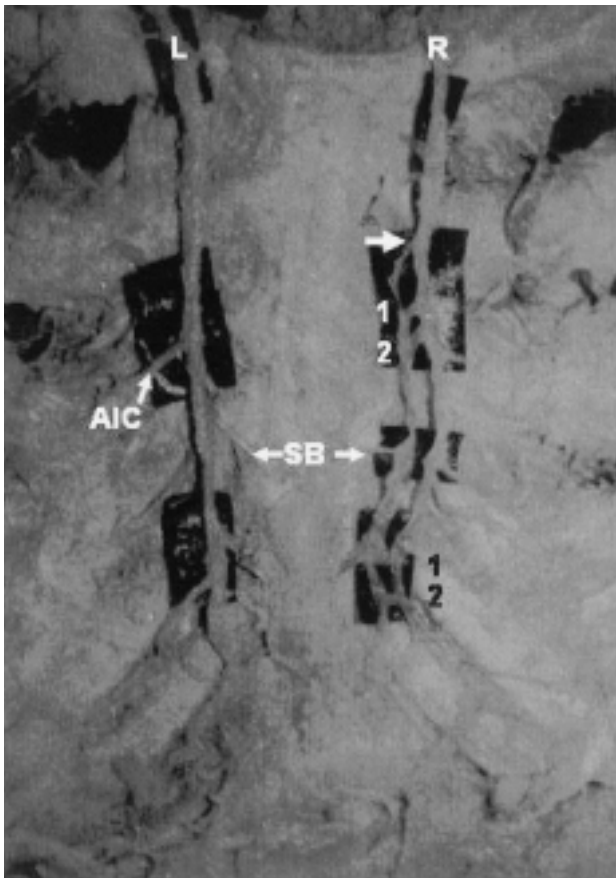


Fig. 1. Photograph of internal aspect of thoracic wall showing an abnormal ITA on the right side (R). Note that the left ITA is normal (L). The right ITA shows the upper division (arrow), and the 2 branches show 2 superior anastomoses (upper 1 and 2), and 2 inferior anastomoses (lower 1 and 2). Sternal branches (SB) and anterior intercostal arteries (AIC) are indicated.

re. The vertical part of the ITA develops from the ventral anastomoses between the ventral divisions of thoracic intersegmental arteries (Collins, 1995). We presume that in this case two vertical somatic anastomoses would have become established on the right side, which later became interconnected by four interconnecting branches. This persistent anastomosis would have formed the stepladder pattern of the ITA found in this case. It is possible that duplication of ventral anastomosis could be responsible for the variant. However, we conclude that this rare variant of ITA is of great concern during any surgical procedures that involve this artery or this area.

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