النتائج المبكرة لجراحة توصيل الشرايين التاجية باستخدام شرياني الثدي الأيسر والأيمن في وحدة جراحة قلب ذات حجم محدود

رساله
توطئة للحصول على درجة الماجستير فى جراحة القلب و الصدر

مقدمه من الطبيب

إبراهيم محمد محمد السيد
بكالوريوس الطب والجراحه
جامعة الأزهر

تحت اشراف

أ.د./وليد جمال الدين ابو سنه
أستاذ جراحة القلب و الصدر
كلية الطب، جامعة القاهرة

أ.د./ طارق أحمد نصير
أستاذ جراحة القلب و الصدر
كلية الطب، جامعة القاهرة

د/ حسام فتحي علي سيد
مدرس جراحة القلب و الصدر
كلية الطب، جامعة القاهرة

كلية الطب
جامعة القاهرة

٢٠١٤

Early outcome of bilateral internal thoracic artery grafting in coronary artery bypass surgery in a low- volume cardiac surgery unit

Thesis
Submitted for partial fulfillment of a master degree in cardiothoracic surgery

BY

Ibrahim Mohammed Mohammed Al-sayed
M.B.,B.CH
Al-Azhar university

Under supervision of

Prof.Dr. Waleed Gamal Eldin Abu senna
Professor of cardiothoracic surgery
Cairo university

Prof.Dr. Tarek Ahmed Nosier
Professor of cardiothoracic surgery
Cairo university

Dr.Hosam Fathy Ali Sayed
Lecturer of cardiothoracic surgery
Cairo university

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بسم الله الرحمن الرحيم

فاما الزبد فيذهب جفاء واما ما ينفع الناس فيمكث فى الارض

صدق الله العظيم

"سورة الرعد ايه 17"

SURGICAL ANATOMY

Origin and course of internal thoracic artery :

The internal mammary artery (IMA) arises from the subclavian artery, above and behind the sternal end of the clavicle. In 70% of cases the LIMA originates alone, whereas in 30% it arises from a common trunk with other arteries (thyreocervical trunk, suprascapular artery, inferior thyroid artery) **(Figure 1)** (8).

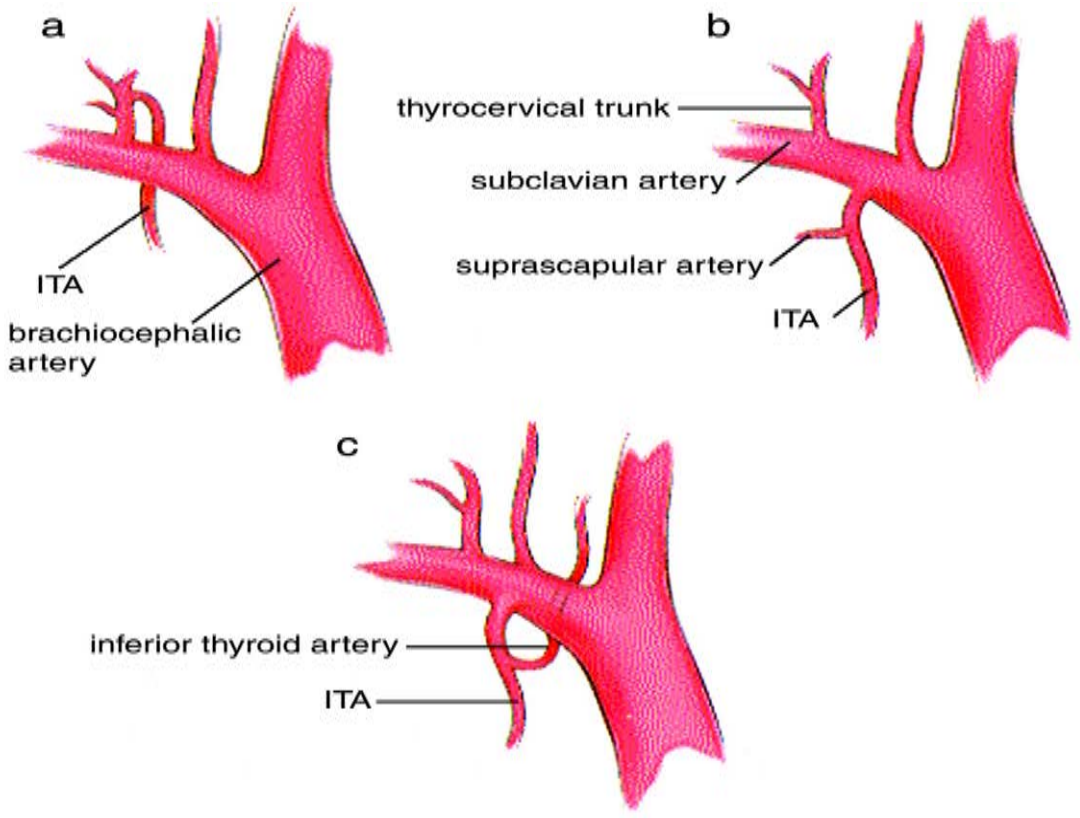

Figure 1. Internal mammary artery can have different origins:(a) from the thyrocervical trunk; (b) together with the suprascapular artery; (c) together with the inferior thyroid artery ***(9).***

In an angiographic study,the LIMA can originate together with other arteries in more than 1/3 of cases **(Figure 2)** (10).

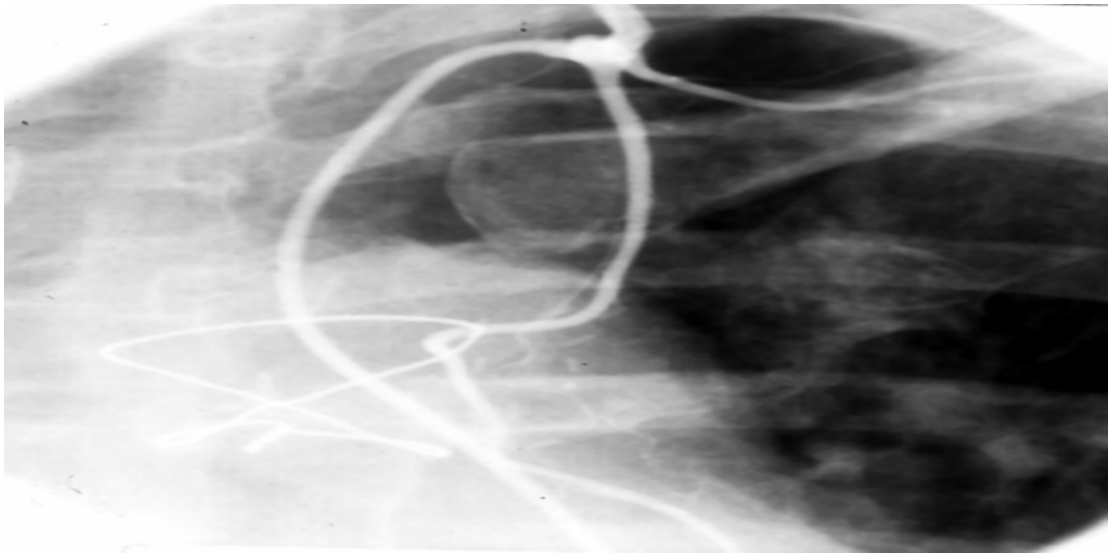

Figure 2. Angiographic demonstration of common origin of the internal mammary artery with the inferior thyroid artery and suprascapular artery***(10)*** **.**

In an echographic study, the right inernal mammary artery (RIMA) arises alone from the right subclavian artery in 95% of cases whereas in the remaining 5% it originates from a common trunk with other arteries. In 95% of the cadavers the IMA descends anteromedially behind the internal jugular vein and the brachiocephalic vein **(Figure 3)** (*8*)**.**

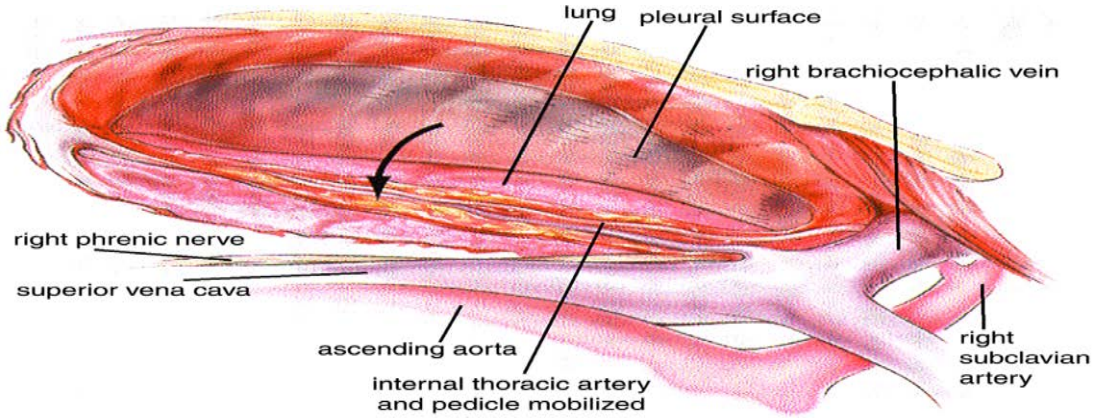

Figure 3. Internal mammary artery descends antero-medially behind the internal jugular vein and the brachiocephalic vein ***(9).***

Passing behind the first costal cartilage, close to the phrenic nerve, it goes down into the thorax. The artery descends vertically 1 cm lateral to the sternal border, behind the first six costal cartilages. The IMA is separated from the pleura at the second or third costal cartilage by a strong layer of endothoracic fascia and inferiorly by the transversus thoracis muscle. It is accompanied by two mammary veins, which ascend medially and laterally, respectively (*9)*. Both phrenic nerves cross the ITAs anteriorly in 54% of the cases and posteriorly in 14%. The left phrenic nerve crosses the artery anteriorly and the right phrenic nerve posteriorly in 12% of the cases, whereas the reverse relationship was observed in 20%*(10*).

The lateral costal branch is present in 15% of the cases,single side in 10%, and both sides in 5% **(Figure 4).**

All the arteries that sometimes have a common origin with an IMA and the lateral costal branch originate from the first centimeters of the IMA and are never ligated, as the subclavian vein lies over them(10).

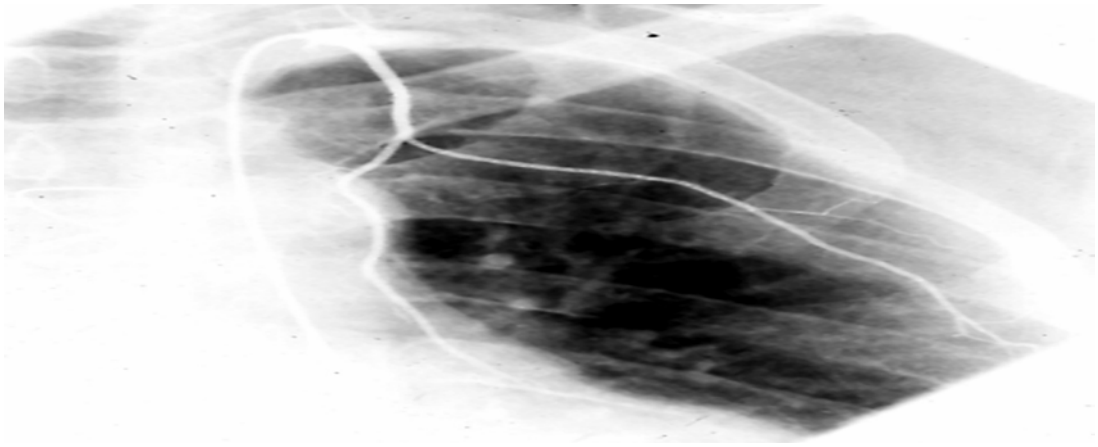

Figure 4. Angiographic demonstration of the presence of the lateral costal branch ***(10).***

Termination :

The ITA ends as a bifurcation in 93% of the cases(superior epigastric and musculophrenic arteries), and as a trifurcation in 7% (a third branch, the diaphragmatic branch adds to the previous ones) (8).

Internal mammary artery and sternal vascularization:

Sternal vascularization is provided by six different types of vessels **(Figure 5)**, five arising from the IMA and one running close to it. Three out of six can potentially act as conduits for collateral flow to the sternum.

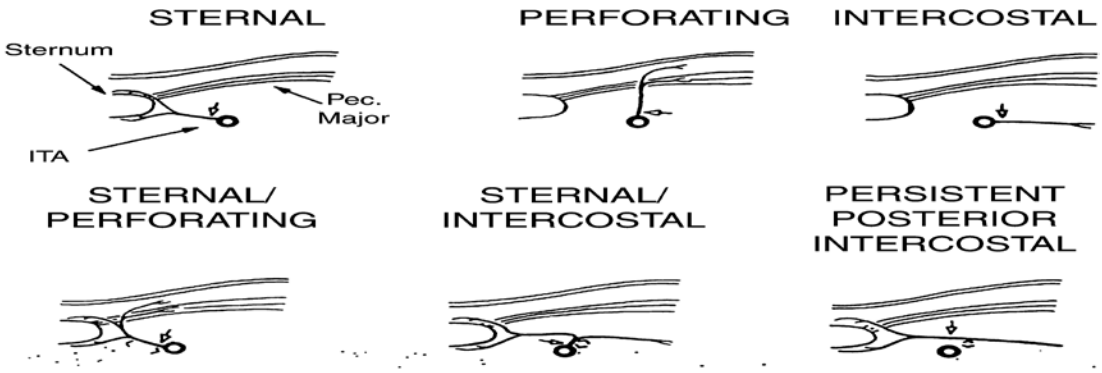

Figure 5. Sternal vascularization is provided by six different types of vessels ***(11).***

The three non-collateral branches are: sternal, intercostal,and perforating. They typically arise, respectively,from the medial, lateral, and anterior aspects of the IMA. Noncollateral vessels outnumber collateral vessels by approximately 5:2*(11).*

The three collateral branches are: sternal/intercostals (S/I) from the anterior or lateral aspect of the IMA; sternal/perforating (S/P) from the anterior or medial aspect of the IMA; and, rarely, a persistent posterior intercostal artery.While the first two branches arise from the IMA as a common trunk, dividing then to supply both the sternum and an adjoining area, the intercostal space (S/I) or the anterior soft tissue (S/P). The third one runs bypassing the ITA without

anastomosing with it. After mobilization of the IMA, collateral blood flow could reach the sternum by way of an S/I or S/P branch. For this to occur, the point of division of the S/I or S/P branch into its sternal and intercostals (*or perforating*) sub-branches must be protected from surgical damage. The length of the common trunk ranges from 1 to 12 mm for the S/I branches), with a mean of 4.1 mm **(Figure 6A)**, and from 0 to 16 mm for the S/P branches. The distance is less than 5 mm in 67% of cases and less than 10 mm in 95% of cases **(Figure 6)** (11).

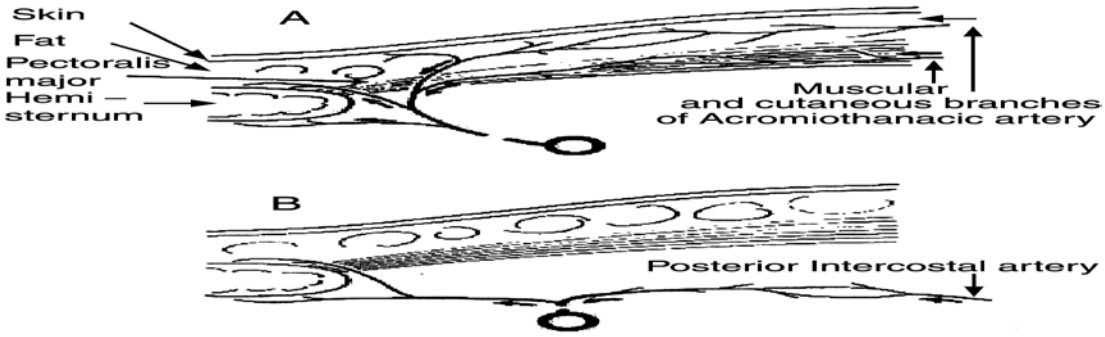

Figure 6. Presumed route of collateral flow to the sternum after mobilization of the internal thoracic artery: (A) via sternal/perforating branches and (B) via sternal/intercostal branches***(11).***

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CONTENTS

LIST OF ABBREVIATIONS

ABG	Arterial blood gases
ACC	American college of cardiology
ACS	Acute coronary syndrome
ACT	Activated clotting time
AF	Atrial fibrillation
AHA	American heart association
ART	Arterial revascularization trial
AXCT	Aortic cross clamp time
BIMA	Bilateral internal mammary artery
BMI	Body mass index
bpm	Beat per minute
CABG	Coronary artery bypass grafting
CAD	Coronary artery disease
CCS	Canadian cardiovascular society
CPAP	Continuous positive airway pressure
CPB	Cardiopulmonary bypass
CSRS	Cardiac Surgery Reporting System
CTA	computed tomographic angiography
EF	Ejection fraction
GEA	Gastroepiploic artery
HMG co-A	3-hydroxy-3-methyl-glutaryl-CoA reductase
IABCP	Intraaortic ballon counterpulsation
IMA	Internal mammary artery
IV	Intravenous
LAD	Left anterior descending artery
LIMA	Left internal mammary artery
LITA	Left internal thoracic artery
MACCE	Major adverse cardiac and cerebrovascular events
MI	Myocardial infarction
MMPs	Matrix metalloproteinases
NO	Nitric oxide
NO-cGMP	Nitric oxidegyanylate cyclase
NSTEMI	Non ST segment elevation myocardial infarction
OM	Obtuse marginal