

MALATTIE ISCHEMICHE DEL MIOCARDIO

- *RIDUZIONE DEL FLUSSO EMATICO CORONARICO*

SINDROMI ANATOMO-CLINICHE

- 1) ANGINA PECTORIS
- 2) INFARTO MIOCARDICO
 - (NECROSI DA OSTRUZIONE CORONARICA)
- 3) CARDIOPATIA ISCHEMICA CRONICA
 - (DANNI MIOCARDICI DA ISCHEMIA DI LUNGA DURATA)
 - a) atrofia miocardica con focolai di sclerosi disseminata
 - b) estesi infarti multipli
- 4) MORTE IMPROVVISA CORONARICA

CARDIOPATIA ISCHEMICA

- PRIMA CAUSA DI MORTE NEI PAESI SVILUPPATI DELL'OCCIDENTE
- MASCHI: 5° - 6° Decennio
- FEMMINE 7° Decennio

FATTORI DI RISCHIO (Vedi Aterosclerosi)

IPERCOLESTEROLEMIA

FAMILIARITA'

FUMO

DIABETE

IPERTENSIONE

IPEROMOCISTEINEMIA

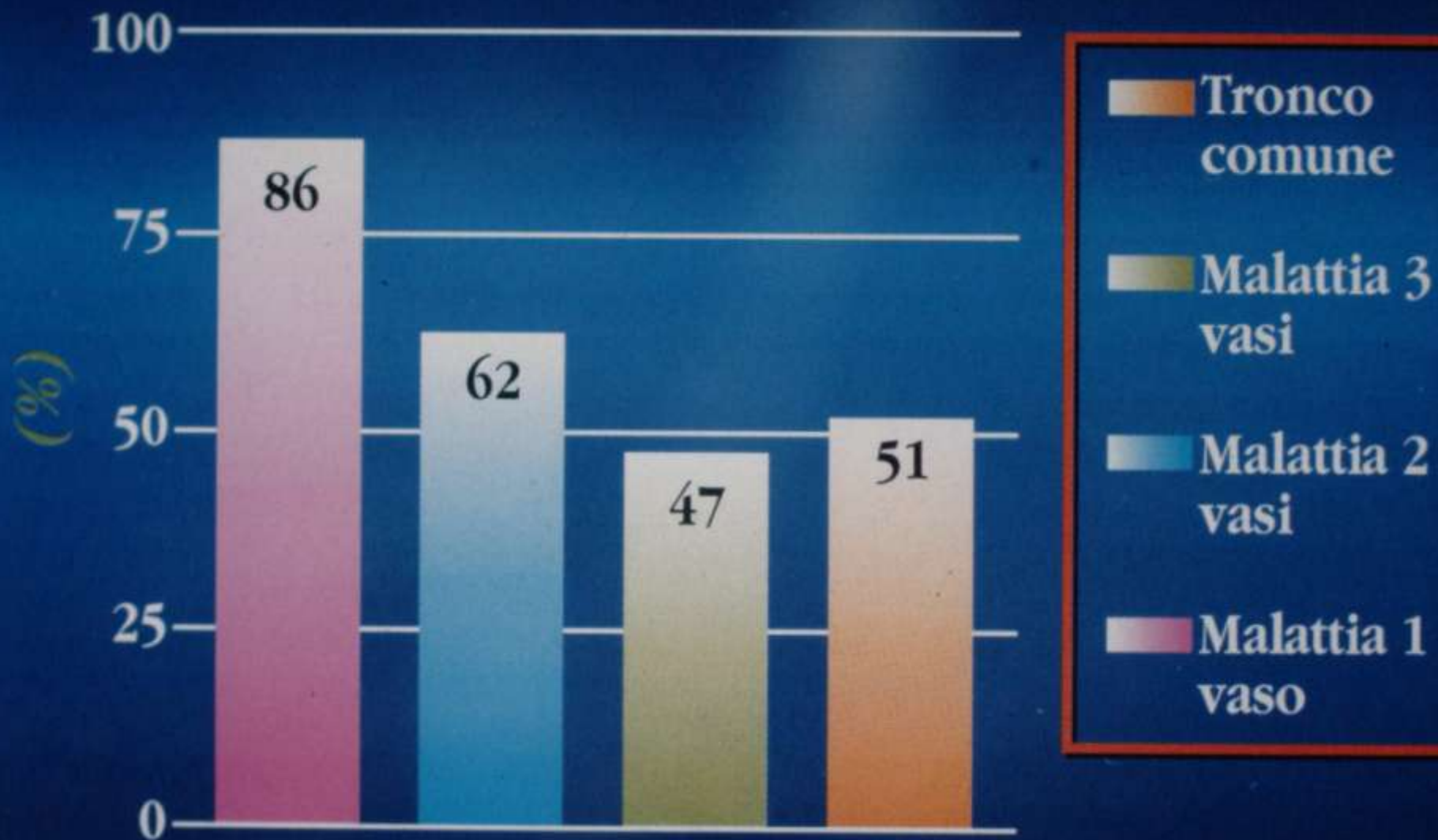
IPERTRIGLICERIDEMIA

IPERURICEMIA

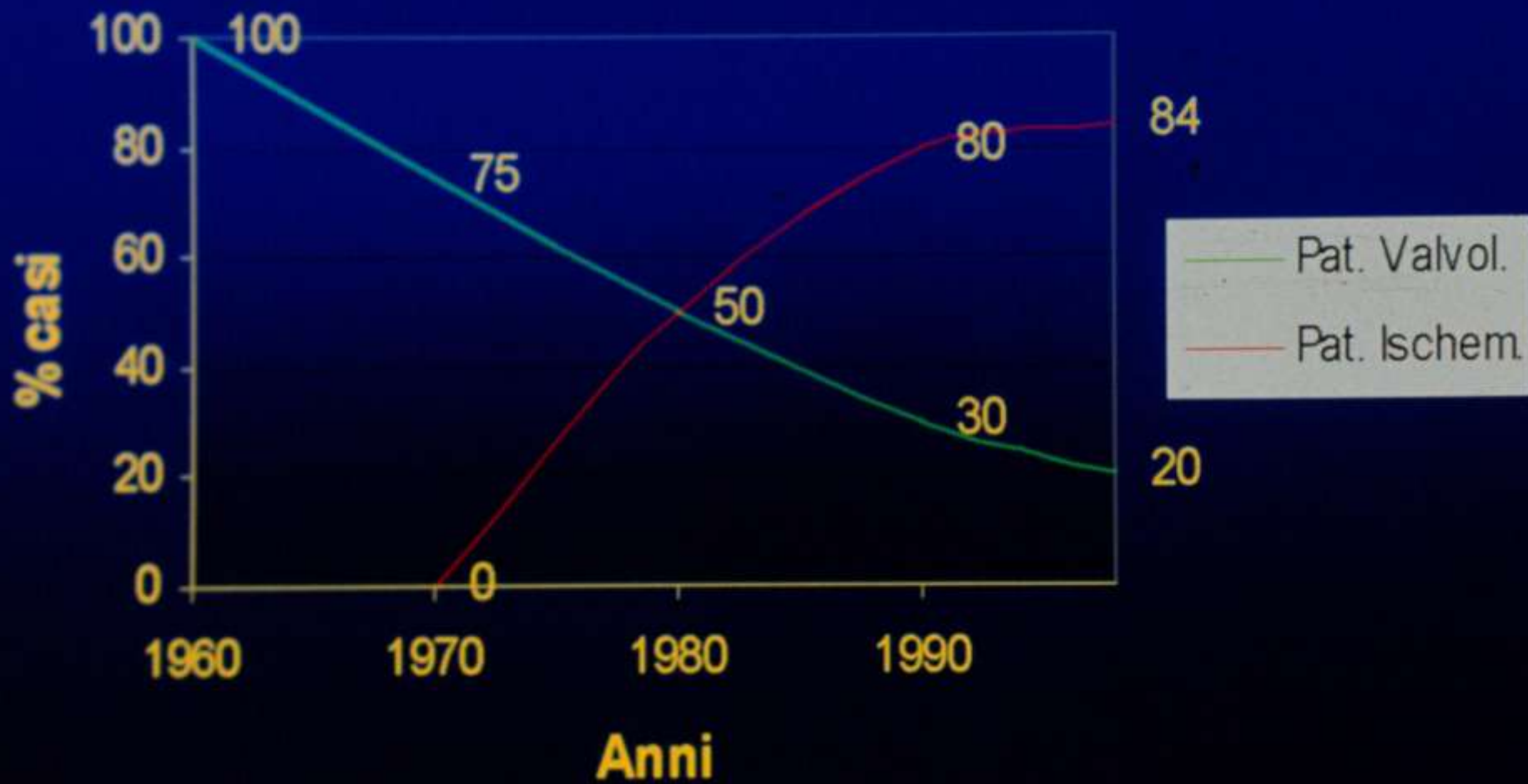
Frequenza della placche aterosclerotiche nelle arterie coronariche di 97 soggetti deceduti per cause traumatiche



Sopravvivenza a 5 anni



Pat. valvolare e Pat. Ischemica



Cardiopatía isquémica

Evento inicial



Elettrocardiogramma

Sensibilità

Specificità

Sottoslivellamento del tratto ST, in una o più derivazioni monitorate, uguale o maggiore di 1 mm (o 1,5 mm a 0,08 sec dal J se ST ascendente)

Buona

Buona

Sottoslivellamento del tratto ST, seguito eventualmente da un sottoslivellamento nelle stesse derivazioni

Bassa

Alta

Inversione dell'onda U

Scarsa

Alta

Diminuzione dell'ampiezza dell'onda R

Scarsa

Scarsa

Aumento dell'onda Q

Scarsa

Scarsa

Alterazione dell'onda T

Scarsa

Scarsa

Aritmie ventricolari

Scarsa

Notevole

Disturbi di conduzione

Scarsa

Notevole

ANGINA PECTORIS

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graph TD; A[ANGINA PECTORIS] --> B[ECG da sforzo  
male interpretabile]; A --> C[Interessamento  
ischemico ventricolo  
destro]; B --> D[Scintigrafia da  
perfusione a riposo  
e da sforzo]; C --> E[Ventricolografia  
radioisotopica a  
riposo e da sforzo]; D --> F[Presenza di aree  
"fredde" ischemiche]; E --> G[Riduzione o  
mancato aumento  
frazione d'eiezione];
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*ECG da sforzo
male interpretabile*

Scintigrafia da
perfusione a riposo
e da sforzo

*Presenza di aree
"fredde" ischemiche*

*Interessamento
ischemico ventricolo
destro*

Ventricolografia
radioisotopica a
riposo e da sforzo

*Riduzione o
mancato aumento
frazione d'eiezione*

ANGINA PECTORIS: LA CORONAROGRAFIA

Indicazioni

Angina da sforzo

- Prova da sforzo positiva a basso carico
- Prova da sforzo con tendenza al peggioramento
- Eà < ai 40 anni
- Angina post-infartuale
- Angina dopo by-pass
- Angina dopo angioplastica

Angina a riposo

- In fase acuta
- Attacchi subentrati

Controindicazioni

- Ictus cerebrale recente
- Insuff. renale conclamata
- Insuff. respiratoria grave
- Febbre origine infettiva
- Anemia grave
- Emorragia tubo digerente
- Paraproteinemia

Angina pectoris: finalità della terapia

Ridurre la domanda di O₂ del miocardio

Ridurre la frequenza cardiaca (β -bloccanti, Ca-antagonisti)

Ridurre la contrattilità (β -bloccanti, Ca-antagonisti)

Ridurre il pre- e post-carico (nitrati, alcuni Ca-antagonisti)

Aumentare l'apporto di O₂ al miocardio

Trattamento dello spasmo e redistribuzione del flusso (nitrati, Ca-antagonisti)

Angioplastica coronarica

By-pass aortocoronarico

ANGINA PECTORIS: ANGIOPLASTICA CORONARICA

Indicazioni

- Singola stenosi emodinamicamente significativa
- Duplice stenosi in un solo ramo coronarico
- Occlusione coronarica recente
- Stenosi in due rami

Rischi

Maggiori

- Età > di 65 anni
- Sesso femminile
- Coronaropatia plurivasale
- Pregresso infarto
- Malattie dismetaboliche

Minori

- Età < di 65 anni
- Sesso maschile
- Coronaropatia monovasale
- Lesione unica

ANGIOPLASTICA CORONARICA: COMPLICANZE

Maggiori

Ostruzione del vaso per:

- **formazione di un trombo**
- **dissecazione dell'intima**
- **spasmo delle coronarie**

Minori

- **Sanguinamento dell'arteria sede di introduzione del catetere**
- **Aritmie ipocinetiche**
- **Blocchi atrio-ventricolari**

BY-PASS AORTOCORONARICO: INDICAZIONI

Criteri clinici

- **Angina pectoris grave**
- **Grave ischemia miocardica**
- **Ridotta capacità funzionale**
- **Stenosi critica di due o più rami coronarici principali**

Criteri anatomici

- **Stenosi > 50% del tronco comune coronaria sx**
- **Stenosi > 70% dei tre rami coronarici principali**

MALATTIA TRIVASCOLARE

TER. CHIR. TER. MED.

-EUROPEAN CORONARY SURGERY
STUDY GROUP

95% (*)

85% (*)

(*) sopravvivenza a 5 anni

V.A. COOPERATIVE STUDY

80% (o)

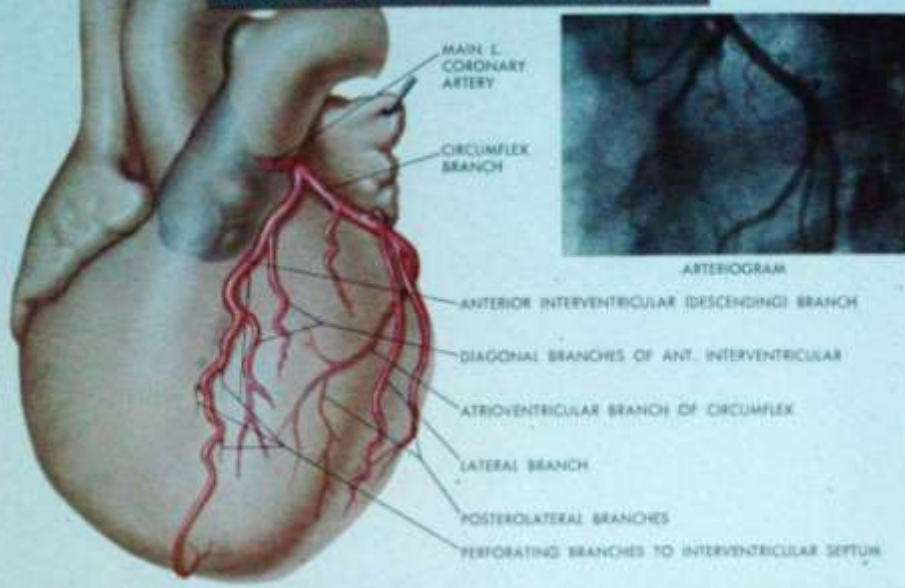
65% (o)

(o) sopravvivenza a 6 anni

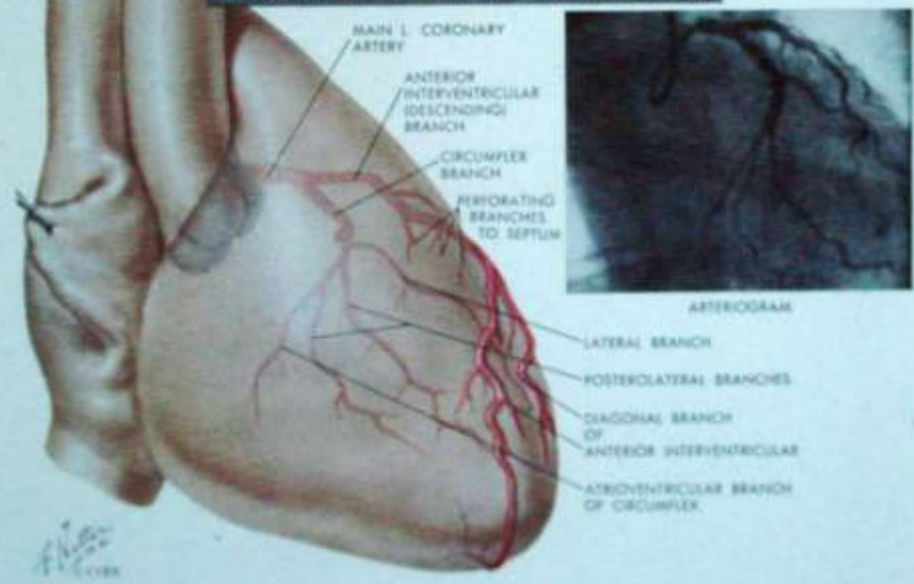
STENOSI TRONCO COMUNE

	TER. CHIR.	TER. MED.
- EUROPEAN CORONARY SURGERY STUDY GROUP	93% (*)	62% (*)
(*) sopravvivenza a 5 anni		
- V.A. COOPERATIVE STUDY	87% (°)	65% (°)
(°) sopravvivenza a 2,5 anni		

LEFT CORONARY ARTERY: LEFT ANTERIOR-OBLIQUE PROJECTION



LEFT CORONARY ARTERY: RIGHT ANTERIOR-OBLIQUE PROJECTION



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RIGHT CORONARY ARTERY: LEFT ANTERIOR-OBLIQUE POSITION



ARTERIOGRAM

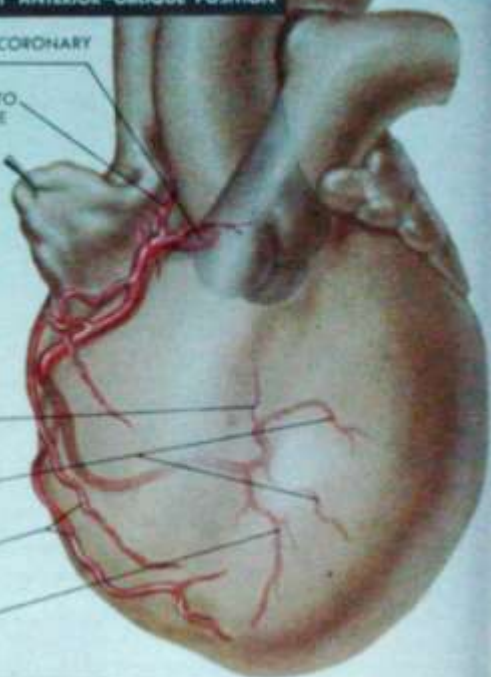
R. MAIN CORONARY ARTERY
BRANCH TO S-A NODE

BRANCH TO A-V NODE

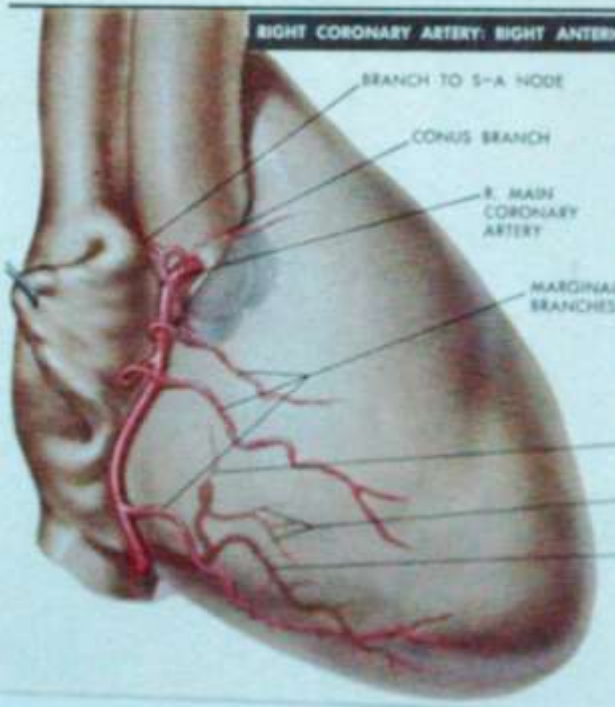
BRANCHES TO BACK OF L. VENTRICLE

MARGINAL BRANCHES

POSTERIOR INTERVENTRICULAR (DESCENDING) BRANCH



RIGHT CORONARY ARTERY: RIGHT ANTERIOR-OBLIQUE POSITION



BRANCH TO S-A NODE

CONUS BRANCH

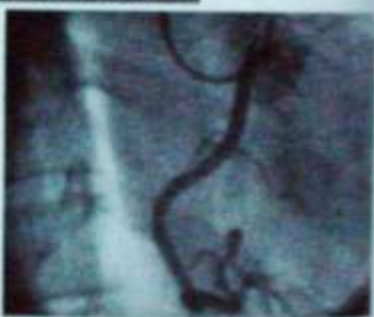
R. MAIN CORONARY ARTERY

MARGINAL BRANCHES

BRANCH TO A-V NODE

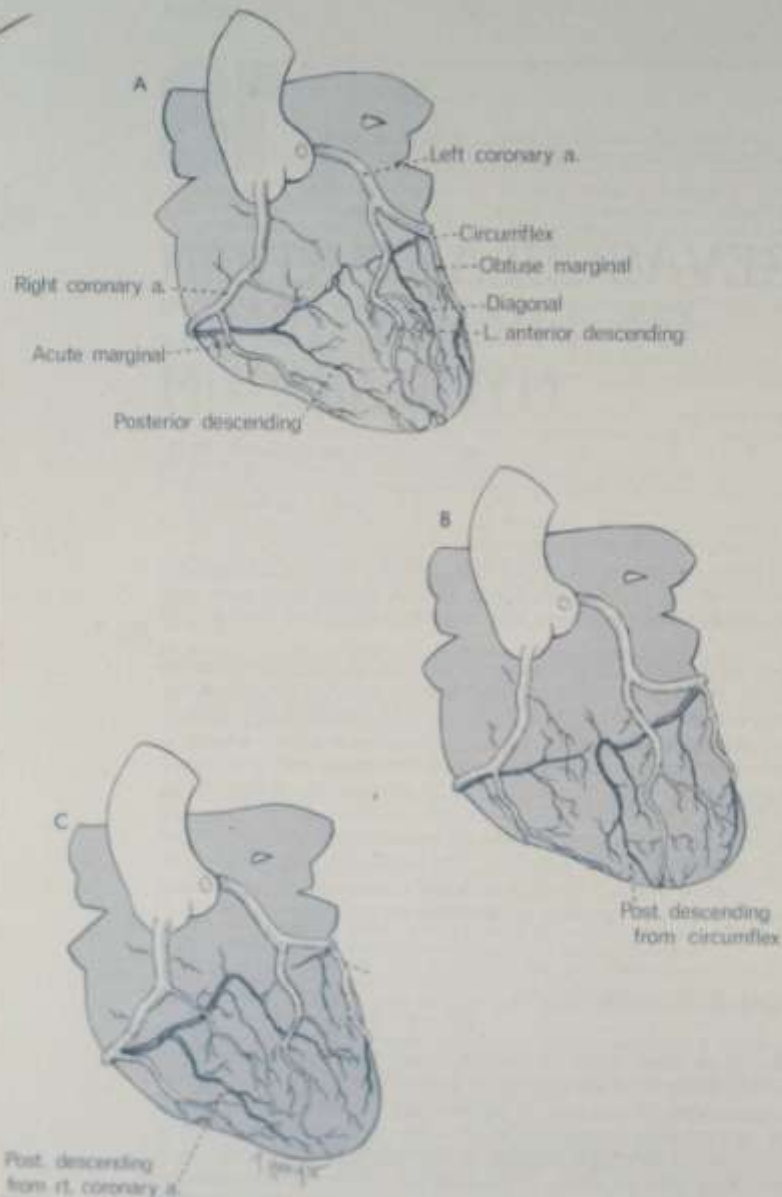
BRANCHES TO BACK OF L. VENTRICLE

POSTERIOR INTERVENTRICULAR (DESCENDING) BRANCH



ARTERIOGRAM

REVASCULARIZATION OF THE ISCHEMIC MYOCARDIUM



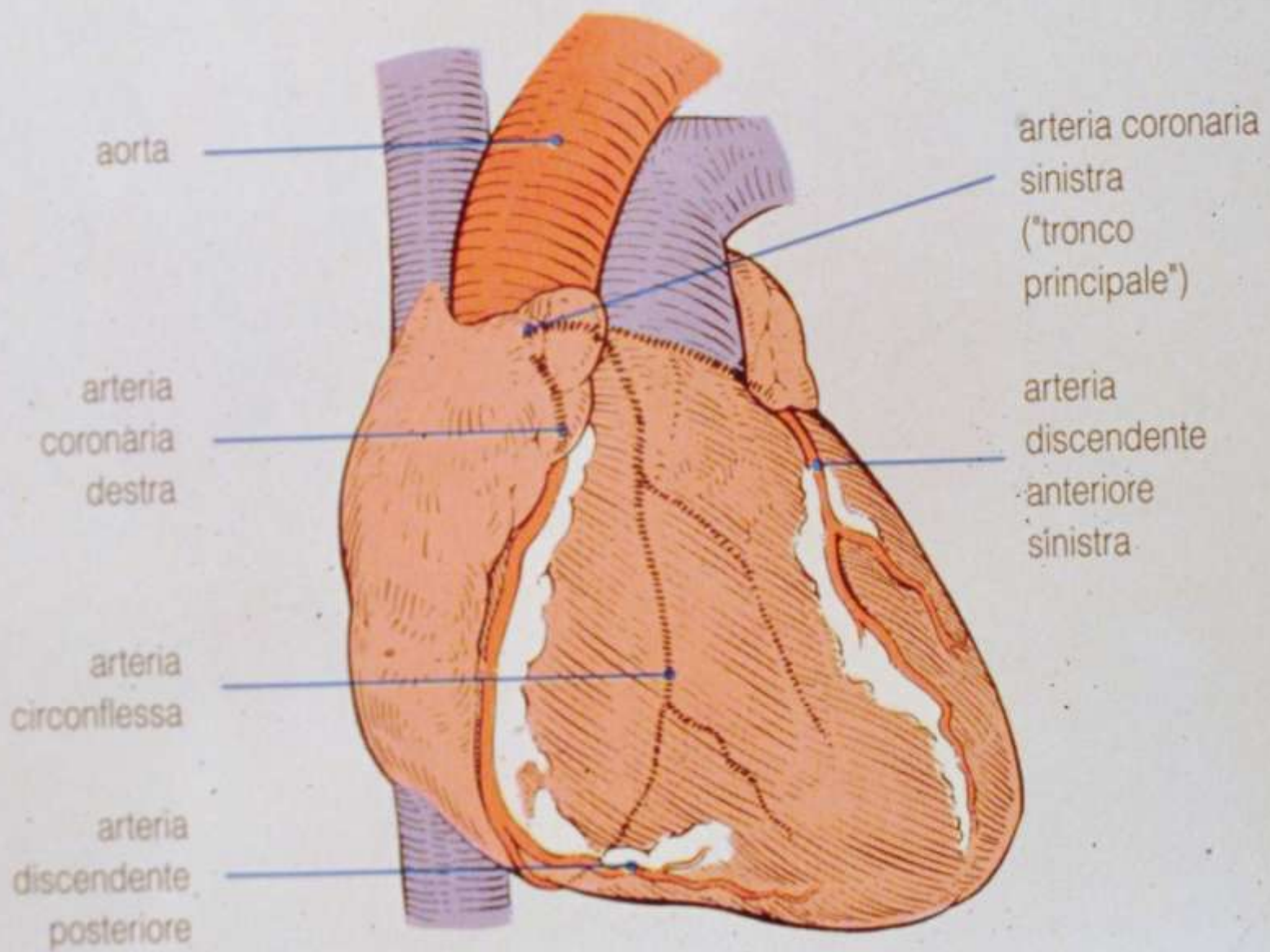
18-1. Three types of coronary circulation.

A. A balanced circulation results in equal distribution to the posterior ventricular wall from the right and left coronary system.

B. A dominant left system is present when the circumflex posterior descending coronary artery supplies both the right and left posterior ventricles and when the right coronary artery is small.

C. The most common type is the dominant right circulation. The right coronary artery supplies the posterior surface of the right ventricle and part of the left ventricle beyond the right coronary vein and septum. The balance of the circulation is important in determining which vessels to bypass on the posterior wall.

Anatomia



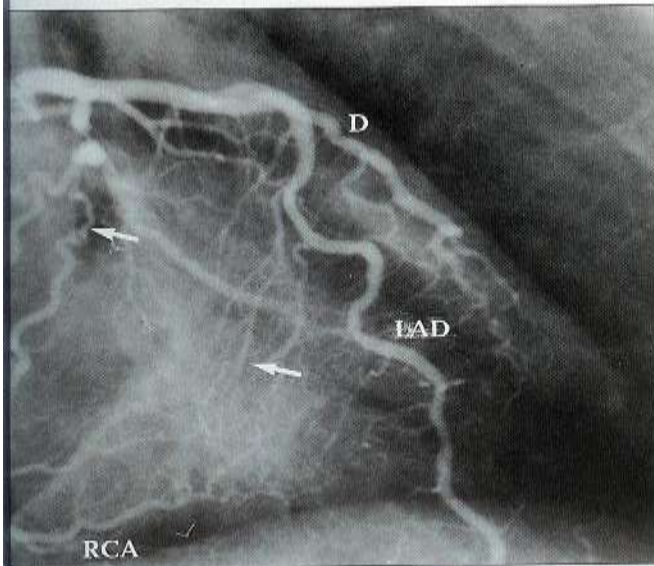
Visualizzazione angiografica delle stenosi coronariche

nonselective injections into the aorta to demonstrate an are usually not very helpful because of contrast over-illumination. Catheters with a small diameter (4French) are helpful in certain circumstances because they diminish the chance of extravascular ultrasound can be used to confirm a diagonal narrowing.

Coronary vasospasm can be a local phenomena suggesting an ostial lesion or, in a longer segment, it may suggest a small vessel disease (see Fig. 2.14). It can also be created by catheter manipulation and may mimic an ostial lesion. When it is unclear whether a stenosis is caused by an arteriosclerotic lesion or spasm, intracoronary nitroglycerin should be administered and the contrast re-injected.

Underfilling

Underfilling with contrast material can be the result of a poor injection, an insufficient amount of contrast, a severe stenosis, or diminished distal flow, insufficient filling distal to an



Contrast injection into the left coronary artery in the right anterior oblique projection with superimposition of the proximal left anterior descending and the diagonal branch (D). The occluded right coronary artery

visualization of the different segments. The first small size branch is the conus branch, which sometimes originates separately from

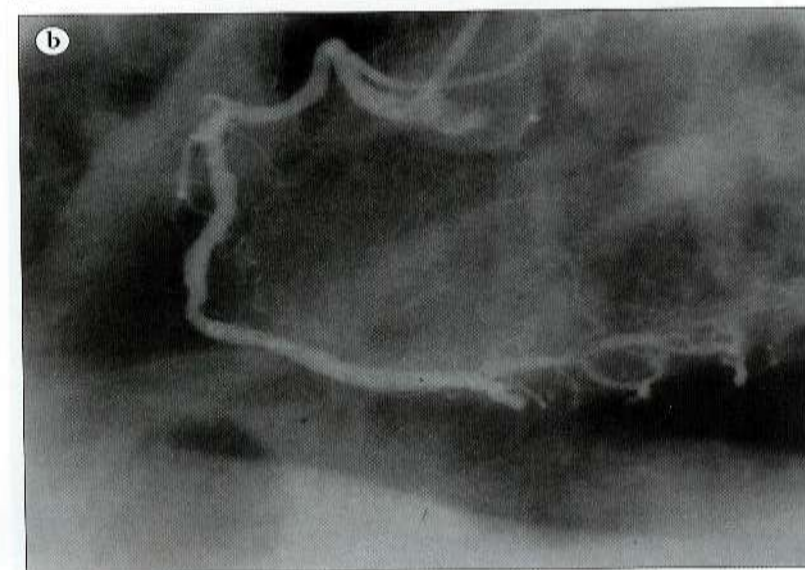
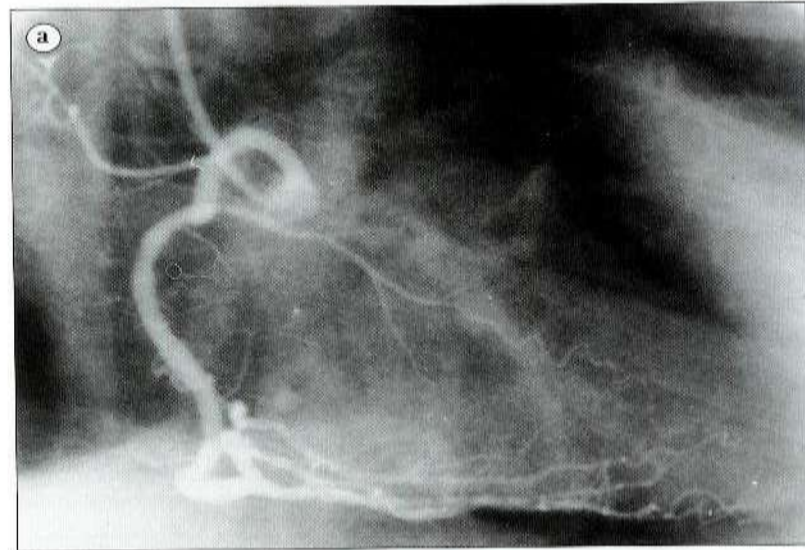
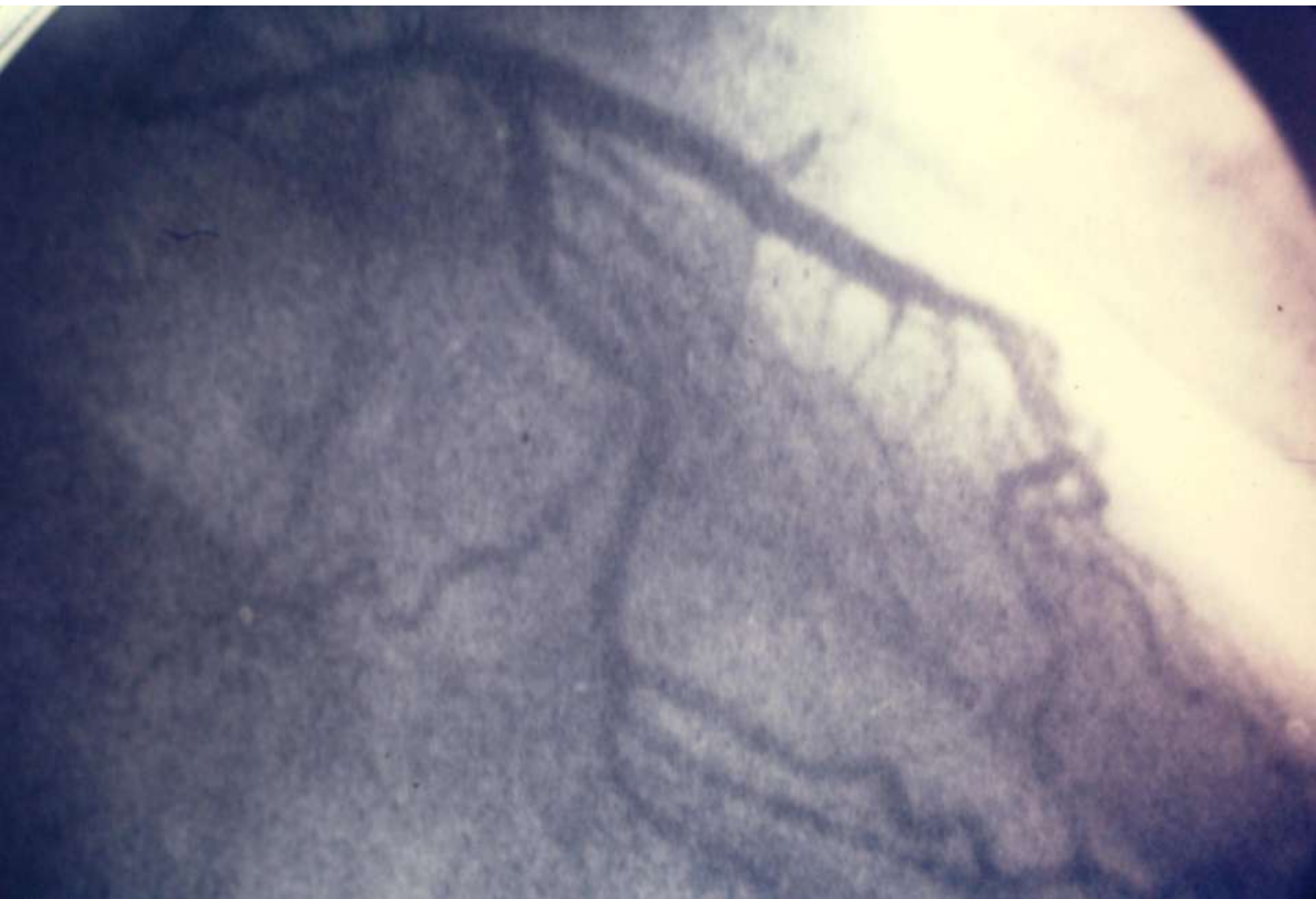
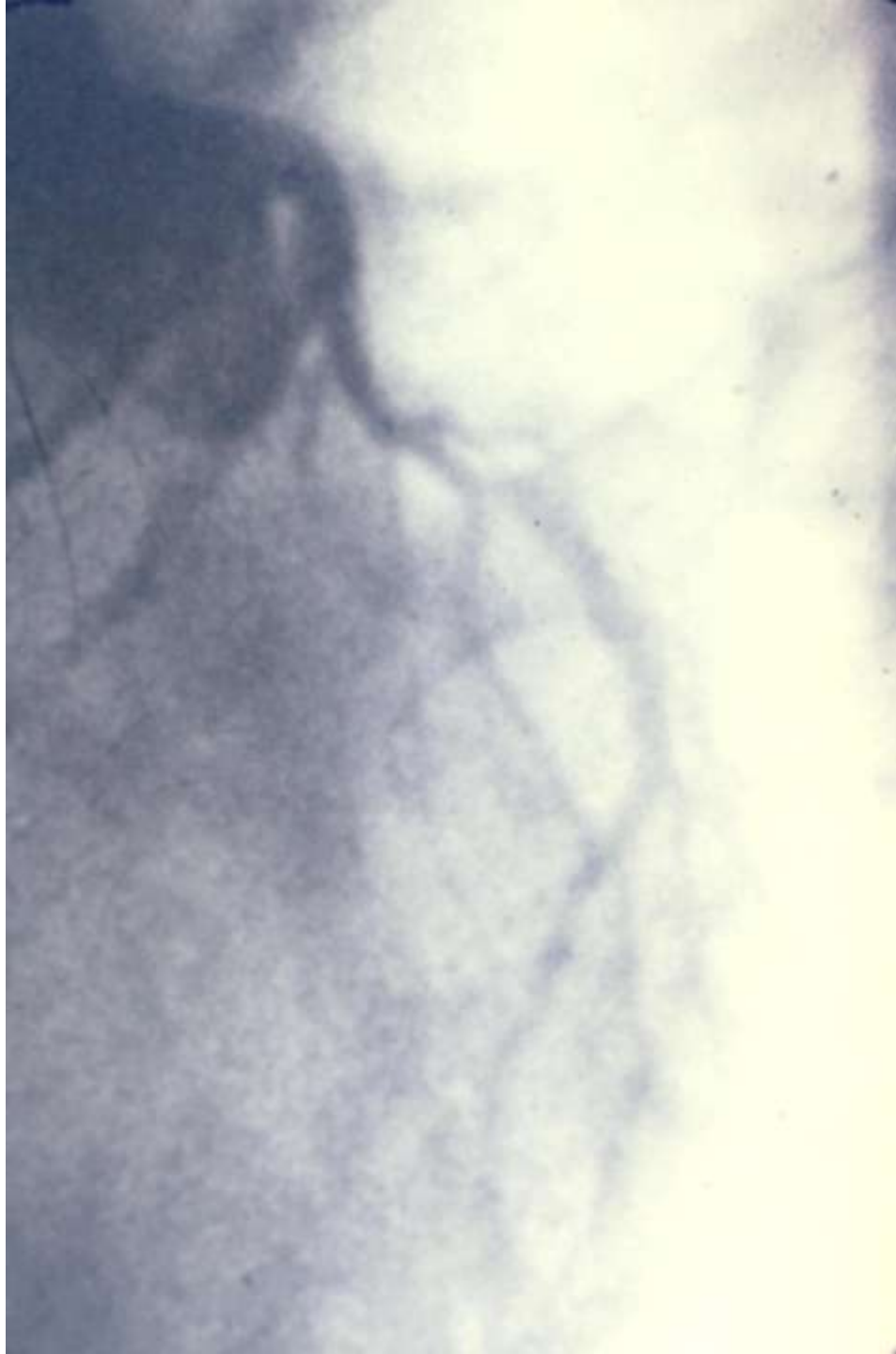
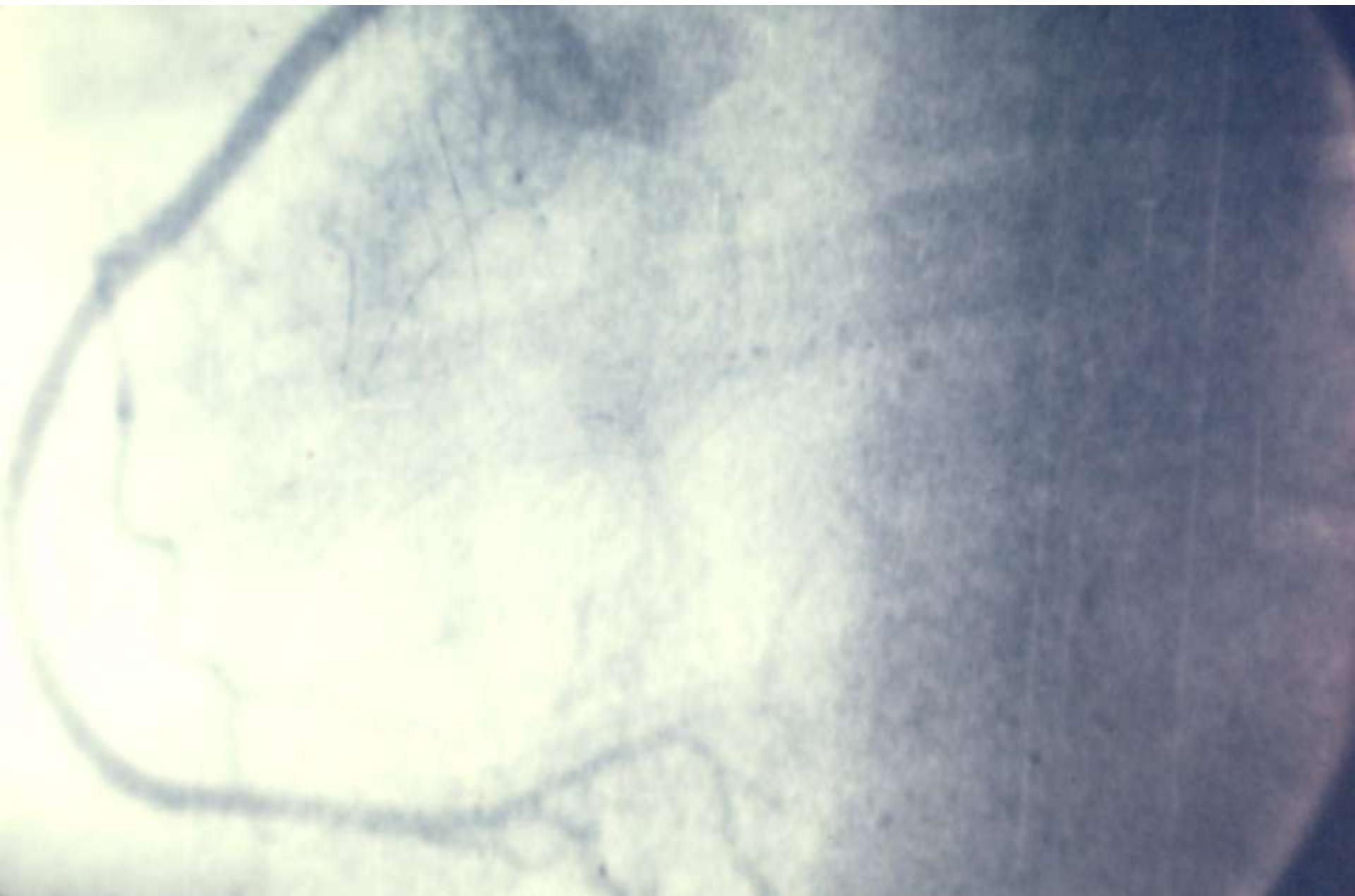


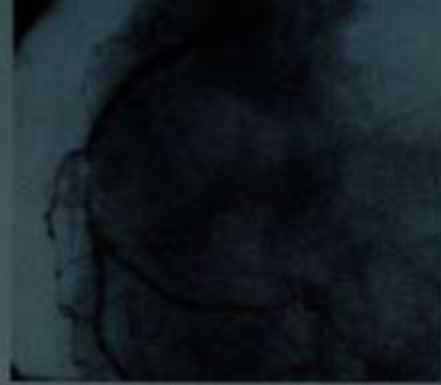
Figure 2.16a,b Contrast injection in the right coronary artery. (a) Right anterior oblique projection with superimposition of the posterior descending artery











1: R. CORONARY ARTERIOGRAM, L. ANT. OBLIQUE PROJECTION, SEVERE OBSTRUCTION AT MIDDLE THIRD OF R. MAIN CORONARY ARTERY



2: SAME PATIENT AS IN "1," NINE MONTHS AFTER ENDALECTOMY AND PERICARDIAL PATCH GRAFT, OBSTRUCTION RELIEVED



3: L. CORONARY ARTERIOGRAM, L. ANT. OBLIQUE PROJECTION, TOTAL OCCLUSION (OL) OF ANT. INTERVENTRICULAR BRANCH (A1) OF L. CORONARY ARTERY, DIA. HIGH DIAGONAL BRANCH (D1), P1-A. PERFORATING BRANCH (P1), C=CATHETER, C=CORONARY BRANCH



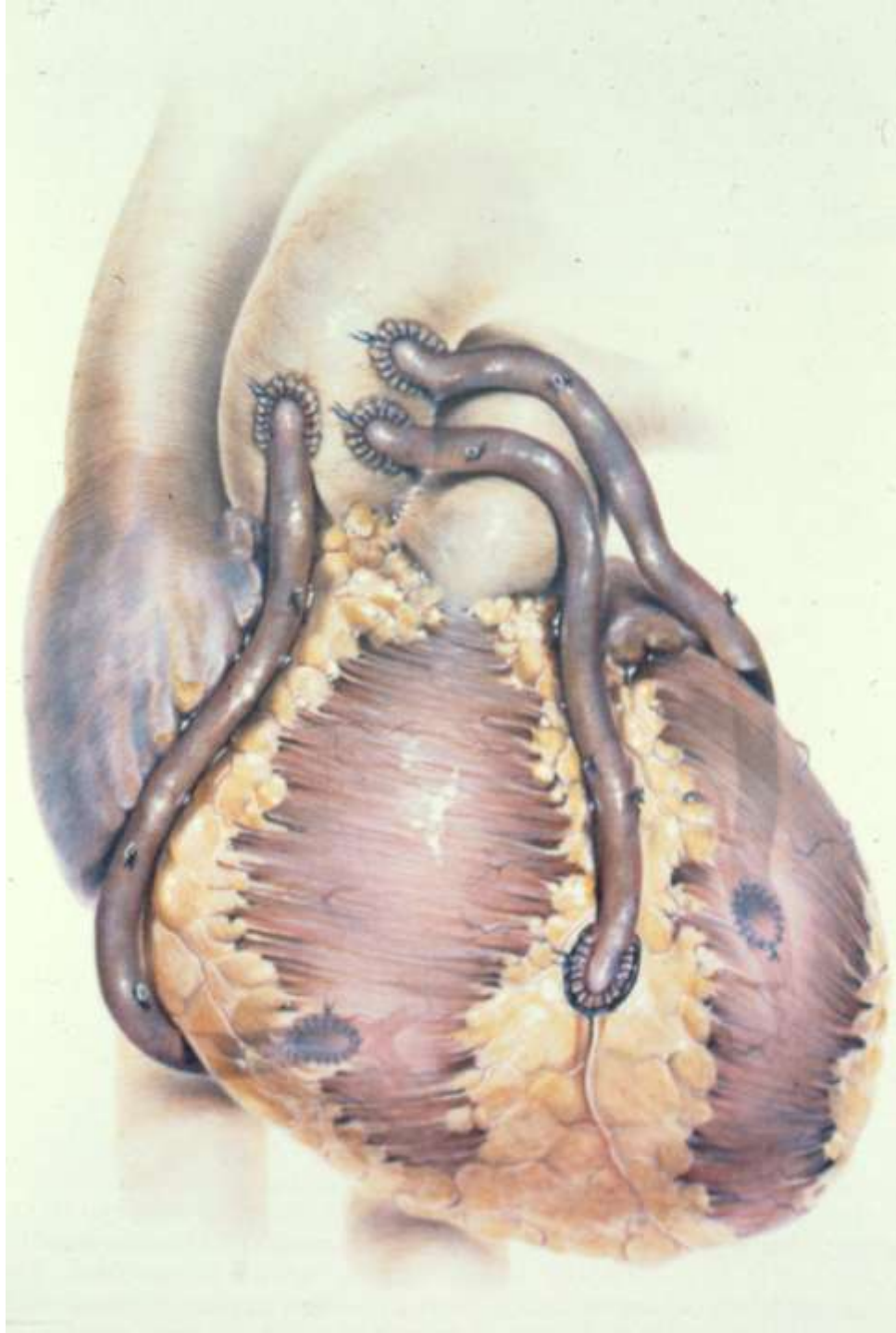
4: L. INT. THORACIC ARTERIOGRAM, SAME PT. AS IN "3," TEN MONTHS AFTER IMPLANTATION OF INT. THORACIC ARTERY (IT), THE LATTER HAS MADE CONNECTION AT "C" WITH A TERTIARY BRANCH (T) OF THE ANT. INTERVENTRICULAR (A1), AND, VIA THIS, A DISTAL DIAGONAL BRANCH (D1) AND THE ANT. INTERVENTRICULAR BEYOND THE OBSTRUCTION HAVE BEEN RUSS



5: R. CORONARY ARTERIOGRAM, L. ANT. OBLIQUE PROJECTION, TOTAL OCCLUSION (OL) OF R. CORONARY ARTERY (CO) ABOUT 2 CM FROM ITS ORIGIN, C=CATHETER



6: SAME PT. AS IN "5" AFTER OBLITERATED SEGMENT OF R. CORONARY ARTERY WAS REPLACED BY A SAPHENOUS-VEIN GRAFT (S), REESTABLISHING NORMAL BLOOD FLOW



Vena Grande Safena

PREPARAZIONE CHIRURGICA



- Punti di repere: malleolo mediale e faccia mediale della tibia.

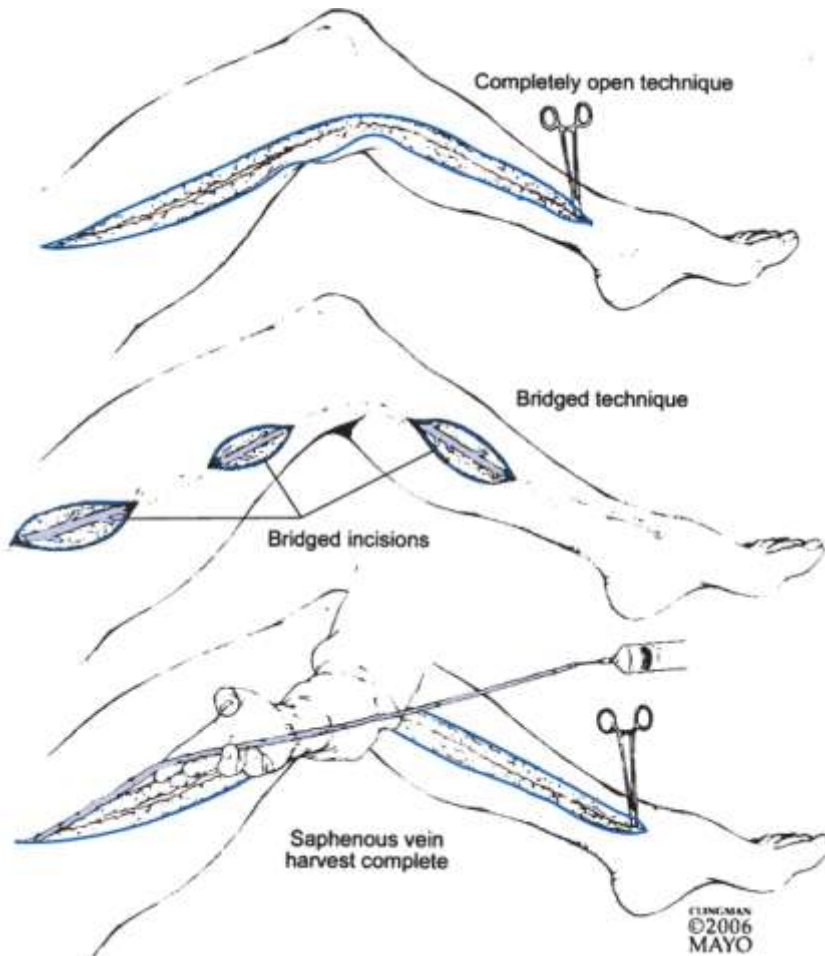
ATTENZIONE AL

- Incisione con bisturi a lama fredda 1 cm al davanti del malleolo mediale

NERVO SAFENO!!!

- Con l'ausilio delle forbici, isolamento dei piani sottocutanei per la prosecuzione dell'incisione, che prosegue seguendo il decorso del vaso.

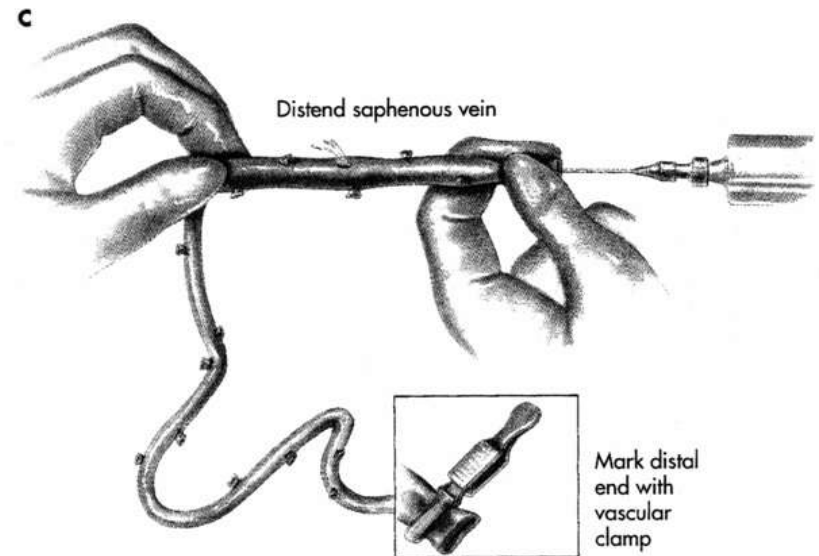
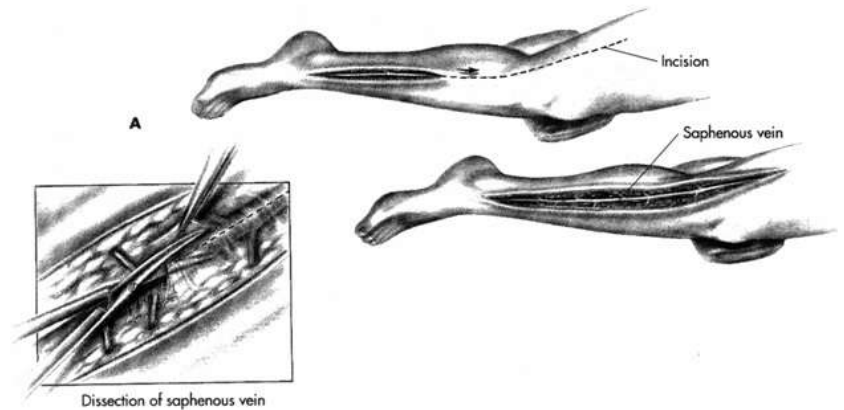
Vena Grande Safena PREPARAZIONE CHIRURGICA

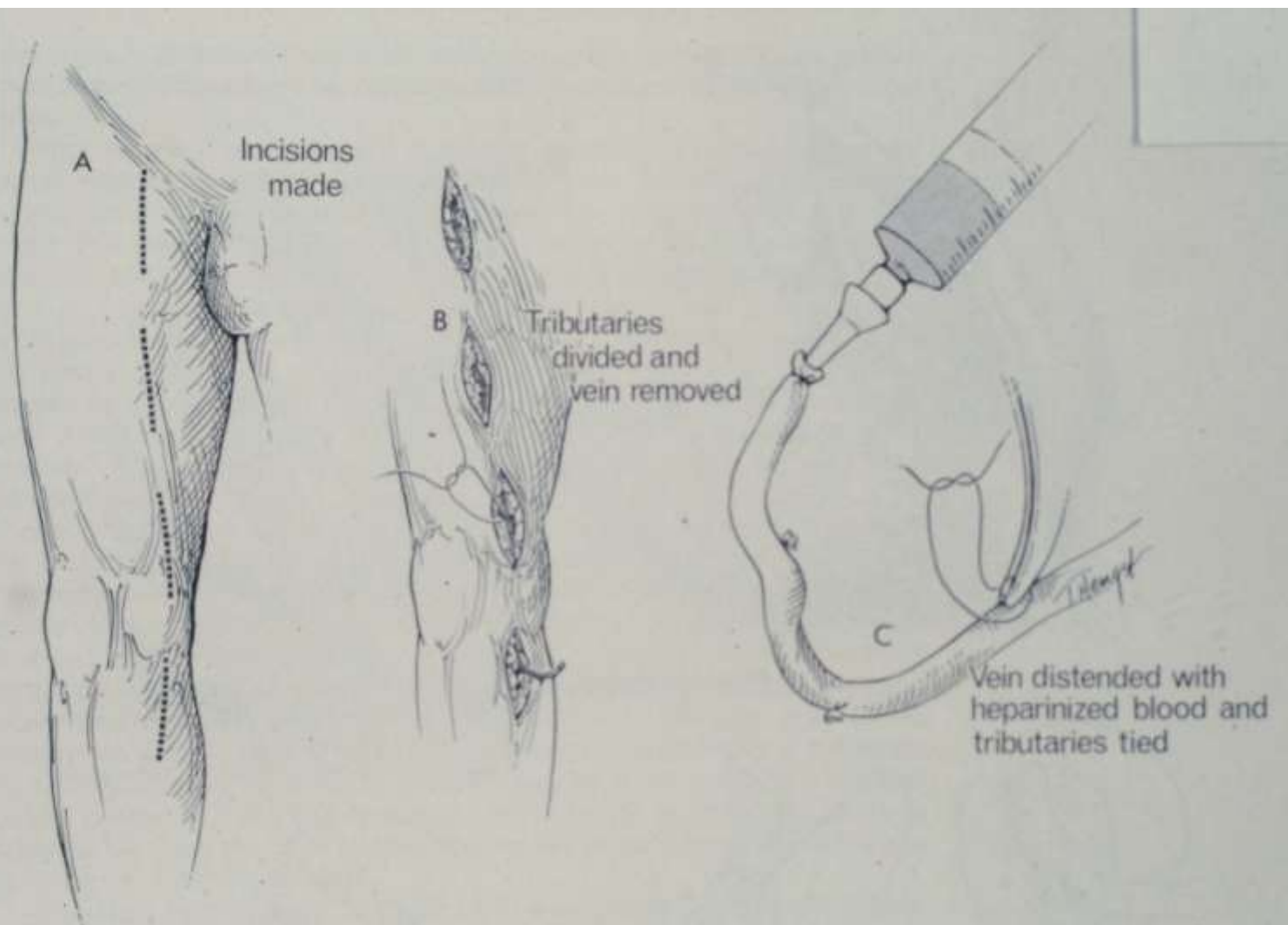


Vena Grande Safena

PREPARAZIONE CHIRURGICA

- Una volta esposta una porzione adeguata di vena, incisione parziale del vaso e cannulazione per valutarne il calibro
- Isolamento e resezione delle collaterali, che si occludono mediante legatura con fili di seta
- Resezione della vena che verrà utilizzata come graft



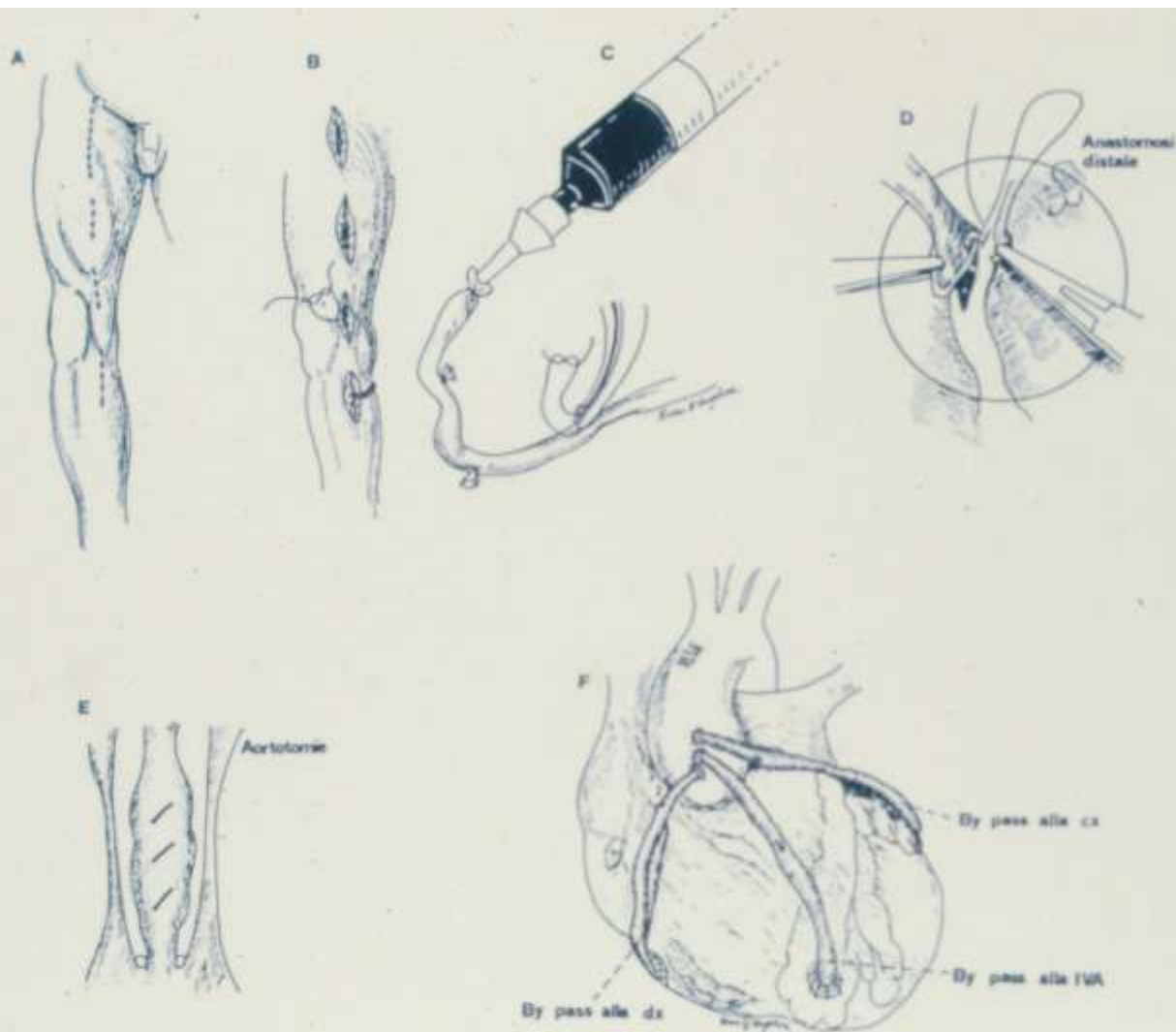


18-3. Saphenous vein removal.

A. The dotted lines indicate the incisions made along the thigh and calf for saphenous vein procurement. An incision through the inguinal crease is avoided.

B. The saphenous vein is removed by ligation or by clipping of the distal ends of the tributaries.

C. The vein is distended gently with heparinized blood and the tributaries are tied, never clipped. At this time, areas of kinking are removed. The vein is then irrigated and placed in the heparinized blood.

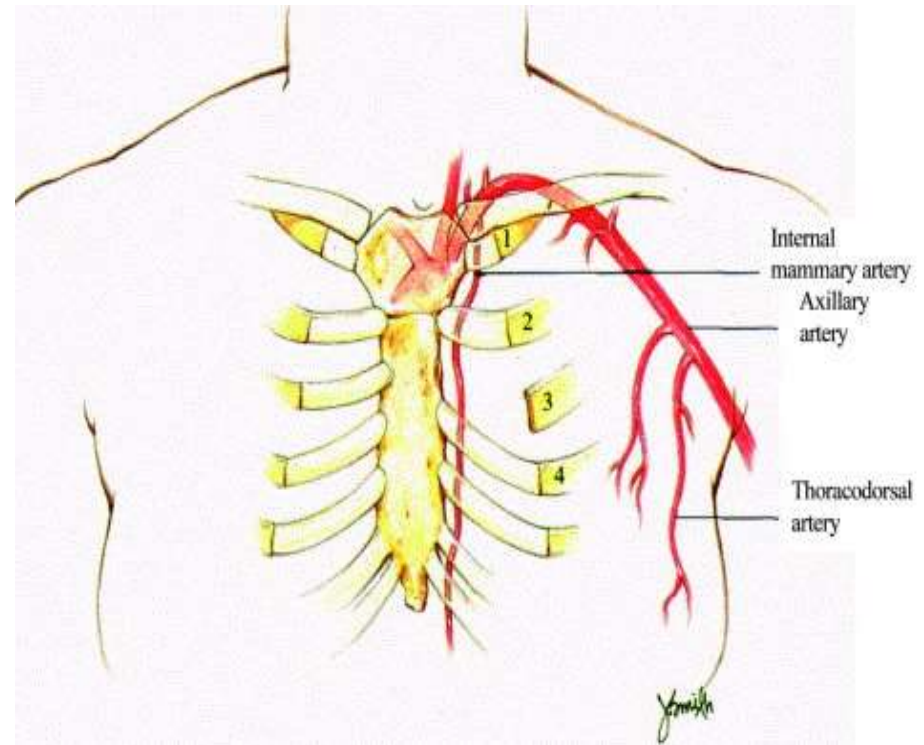


By-pass aorto-coronarico multiplo con vena safena autologa: A) Incisioni multiple per il prelievo della vena safena interna. B) Preparazione dell'innesto venoso con legatura delle collaterali. C) Distensione della vena e controllo delle legature. D) Anastomosi distale termino-laterale 'a becco di flauto' a cuore fermo con sutura continua a soprigitto in polipropilene monofilamentoso 6/0. E) Clampaggio tangenziale dell'aorta ascendente a cuore battente ed aortotomie multiple per le anastomosi prossimali. F) Triplice by-pass aorto-coronarico ultimato.

Arteria Mammaria Interna

ANATOMIA

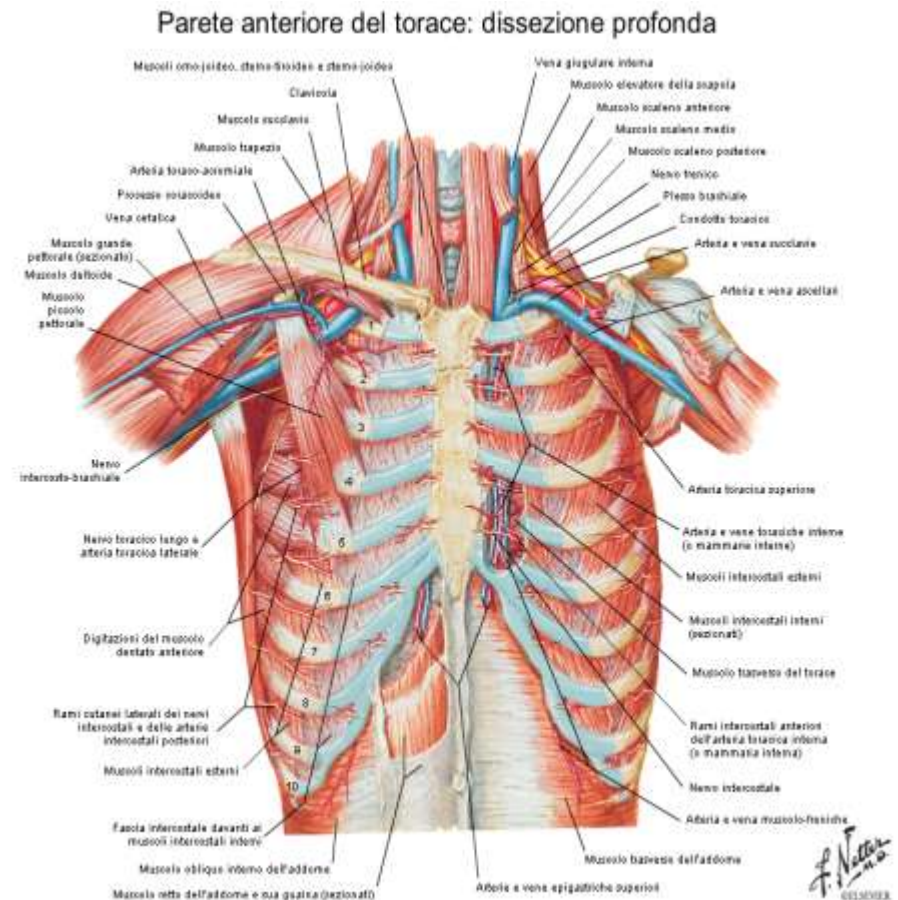
- Nasce dal versante antero-inferiore della prima porzione dell'arteria succlavia
- Si dirige in basso, in avanti e medialmente dietro l'estremità mediale della clavicola, tra la cupola pleurica e la vena succlavia
- Al di dietro dell'articolazione sterno-clavicolare è incrociata dal nervo frenico. Al di sotto di questo punto dà origine ad un sottile e lungo ramo pericardiofrenico.



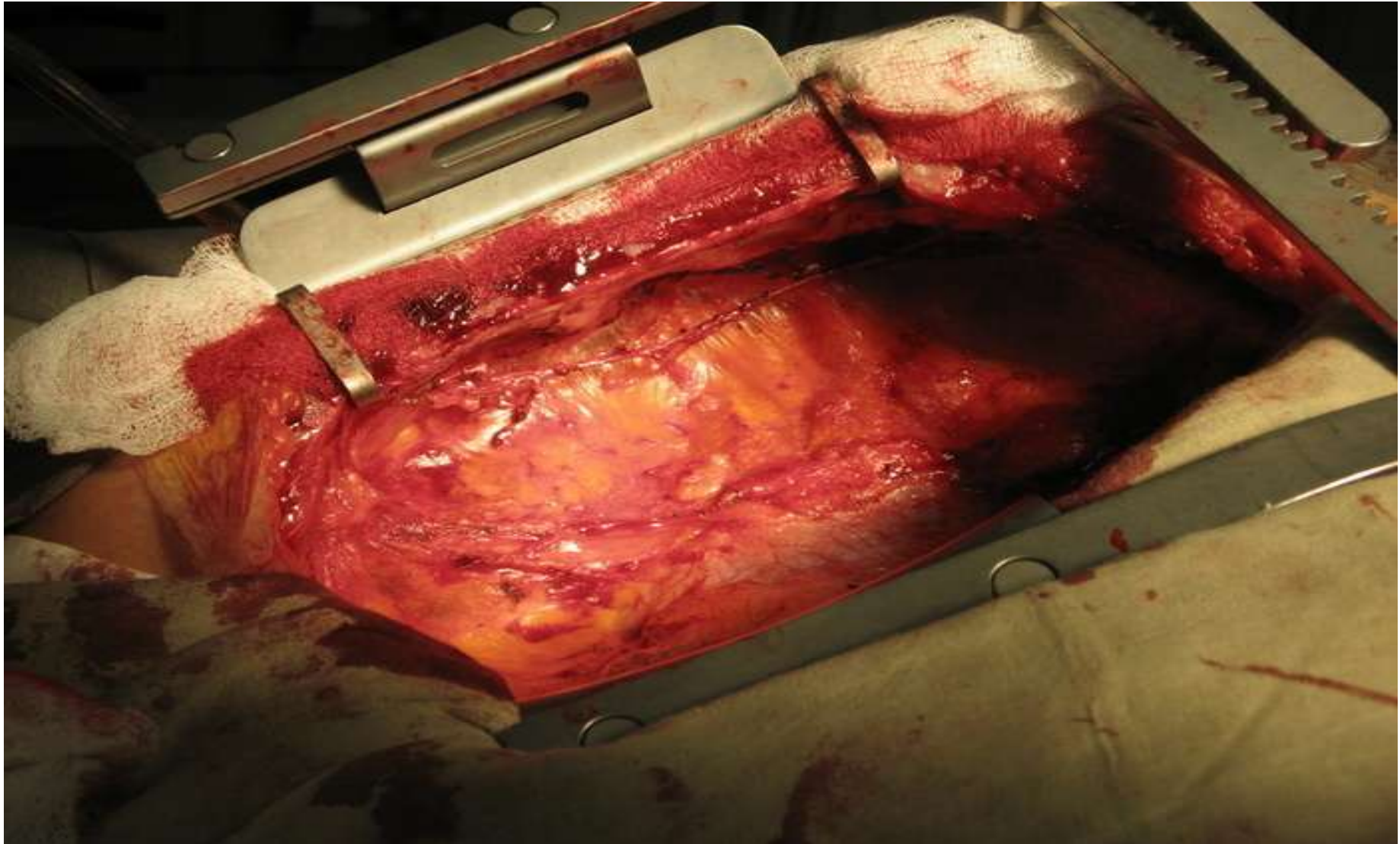
Arteria Mammaria Interna

ANATOMIA

- Incrocia quindi la cartilagine della I costa e discende nel torace, decorrendo 10-15 mm all'esterno del margine laterale dello sterno - compresa tra le prime 6 cartilagini costali ed il foglietto pleurico parietale - accompagnata da una catena di linfonodi e da due vene satelliti
- Termina a livello del VI spazio intercostale, dando origine alle arterie epigastrica superiore e muscolofrenica.
- Rami collaterali: Intercostali, Perforanti, Mediastinici e Sternal.



Arteria Mammaria Interna **PREPARAZIONE CHIRURGICA**



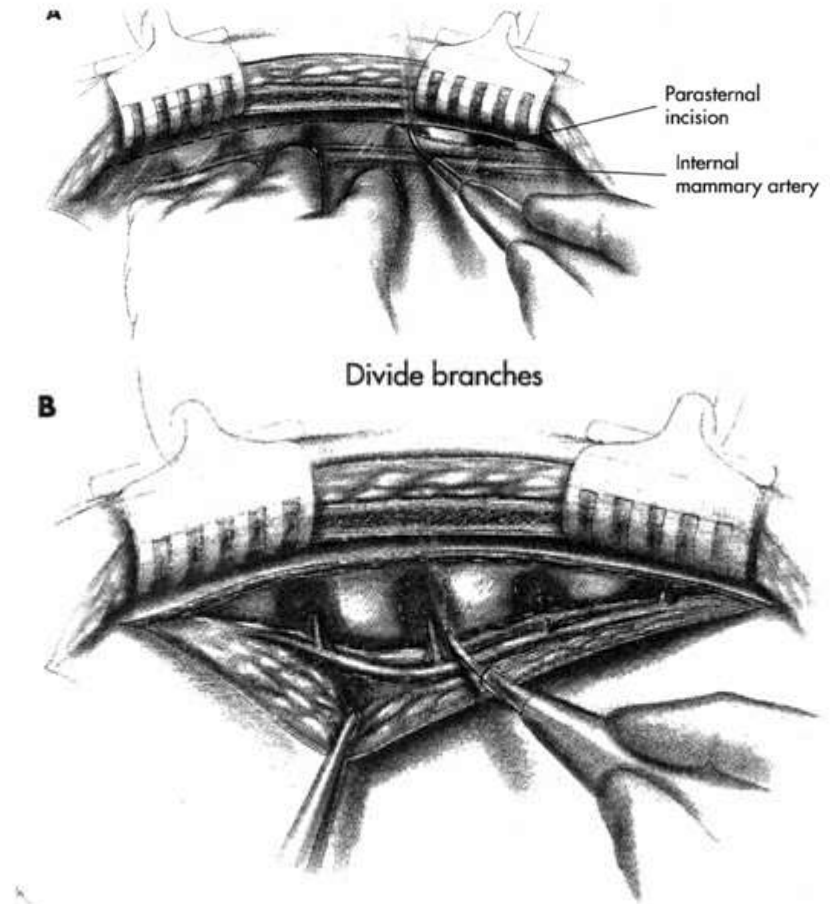
Arteria Mammaria Interna PREPARAZIONE CHIRURGICA

- Dopo la sternotomia si scolla la porzione mediale del foglietto pleurico parietale della parete toracica

ATTENZIONE AL

NERVO FRENICO!!!

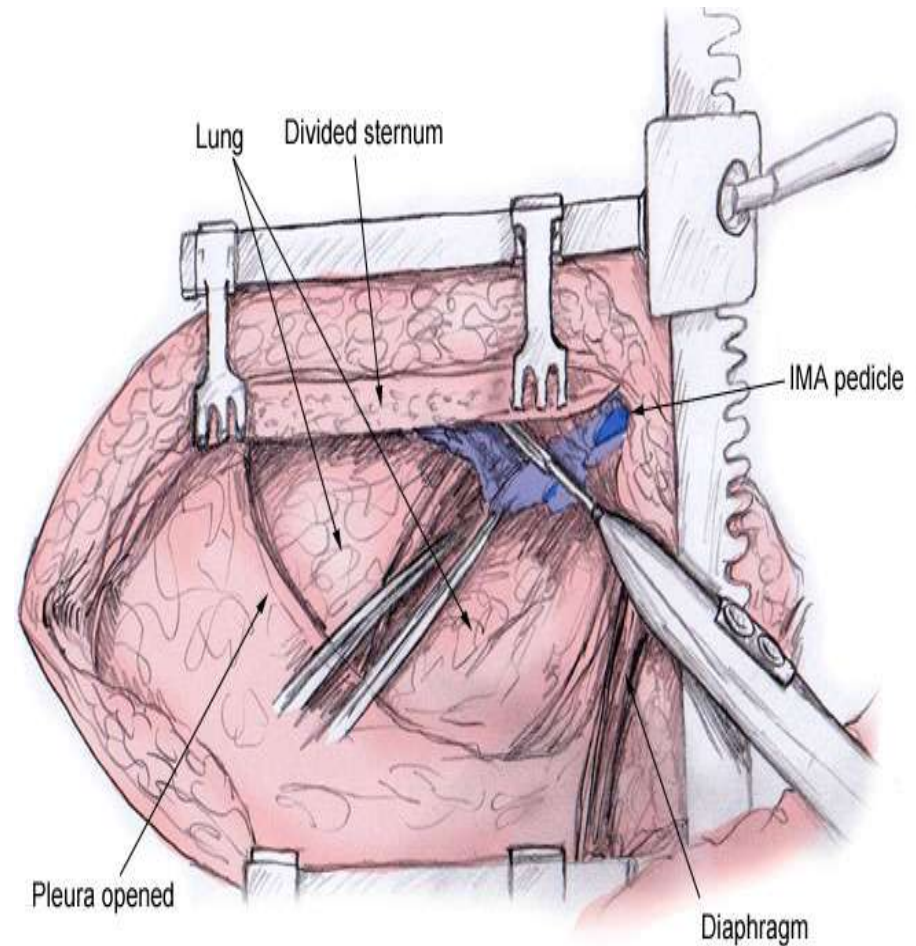
- Il condotto viene isolato con l'ausilio del bisturi elettrico, mantenendosi a circa 1 cm di distanza dalle vene satelliti

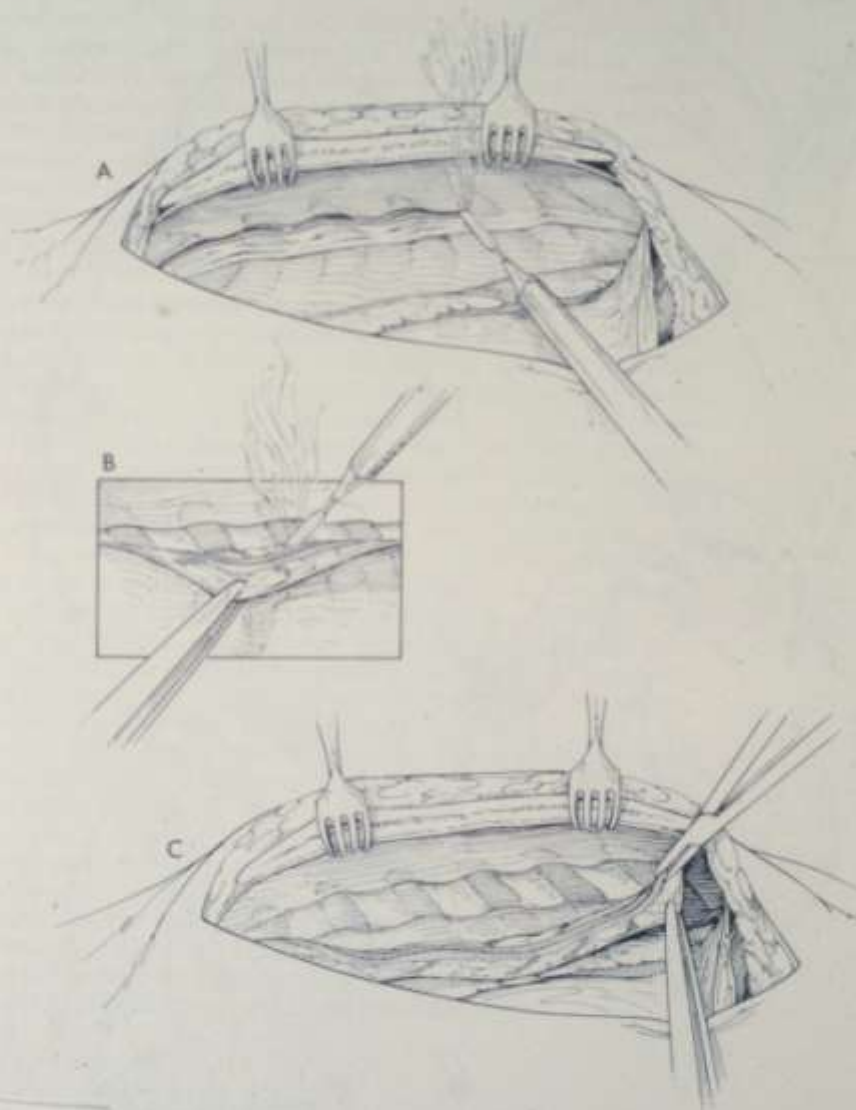


Arteria Mammaria Interna

PREPARAZIONE CHIRURGICA

- L'AMI, se pedunculata, è mobilizzata con le sue vene satelliti e con il tessuto adiposo periavventiziale, costituendo un peduncolo di circa 10 mm di diametro
- Si somministra eparina e si seziona soltanto l'estremità distale dell'arteria, immediatamente prima della biforcazione.
- Se scheletrizzata, la dissezione deve procedere delicatamente all'interno dello spazio tra arteria e vene satelliti.





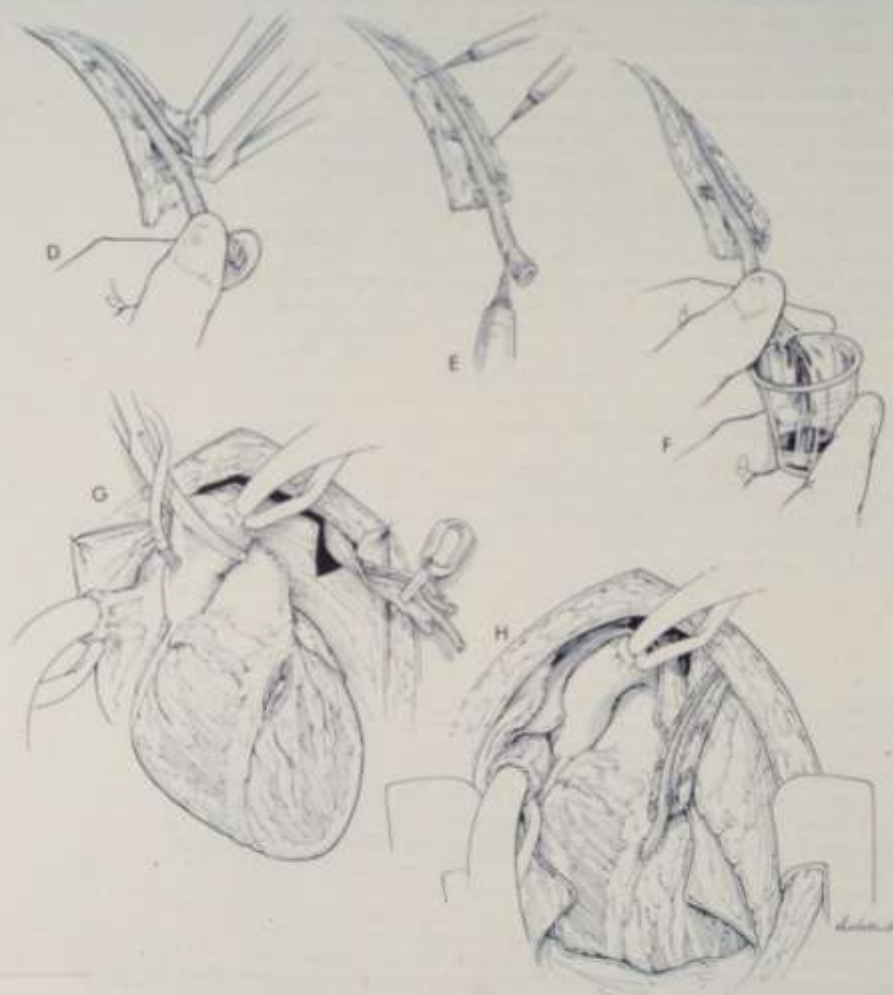
18-19. Surgical procedure for the use of the internal mammary artery (IMA) in coronary artery bypass surgery.

A. The IMA is mobilized from the chest wall by cautery. A parallel incision is made on each side of the pedicle, which includes the vein, artery, lymphatics, fascia, and muscle.

B. Only the tissue around the IMA can be handled with forceps. The distal intercostal arteries and branches are electrocoagulated. Metal clips or ligatures are placed on the proximal branches.

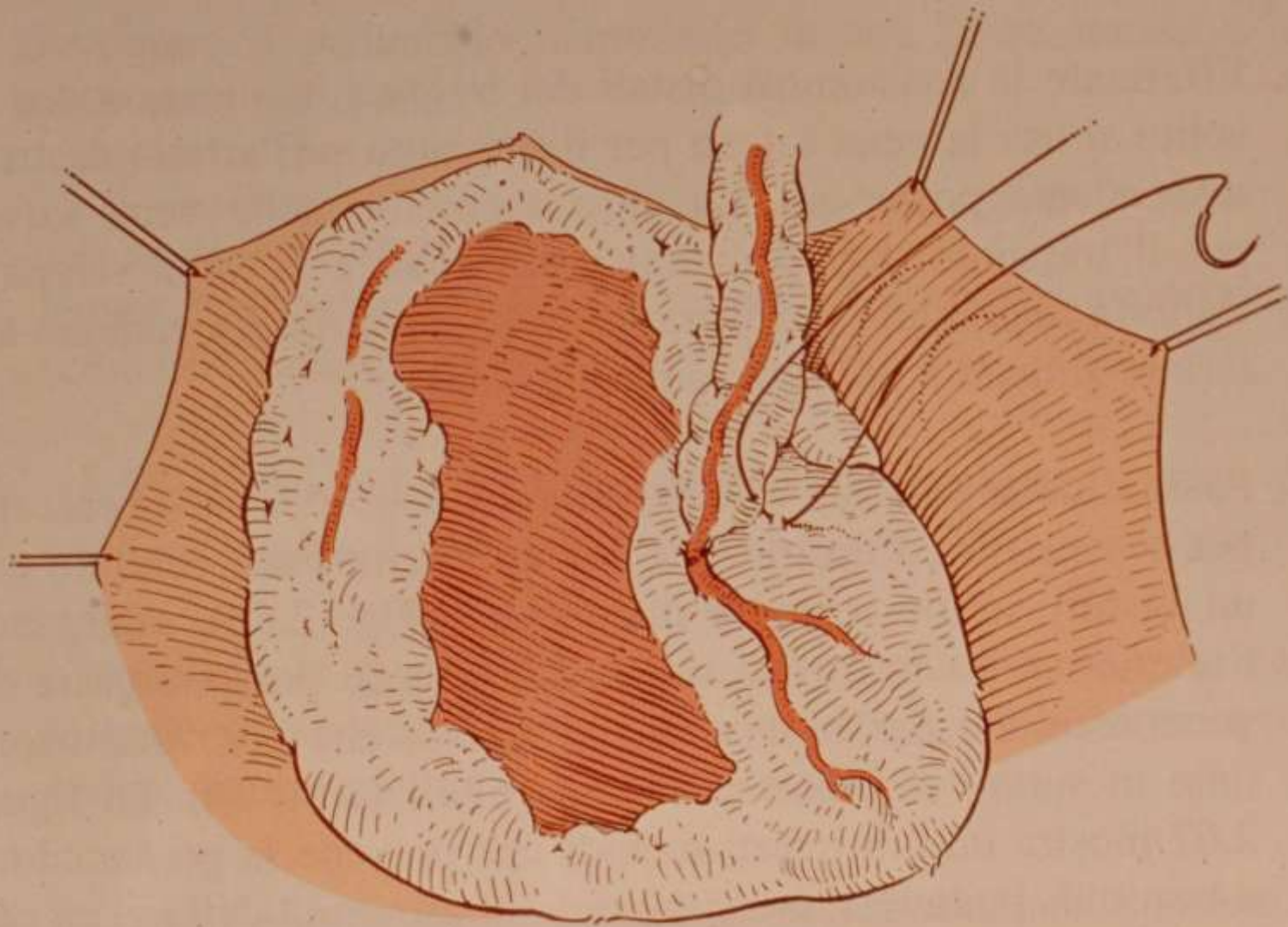
C. The distal portion of the pedicle surrounding the IMA has been removed, and a metallic clip has been placed on the distal mammary artery. Hemostasis of the pedicle is then assured by metallic clips, avoiding hematoma formation or trauma to the IMA.

REVASCULARIZATION OF THE ISCHEMIC MYOCARDIUM

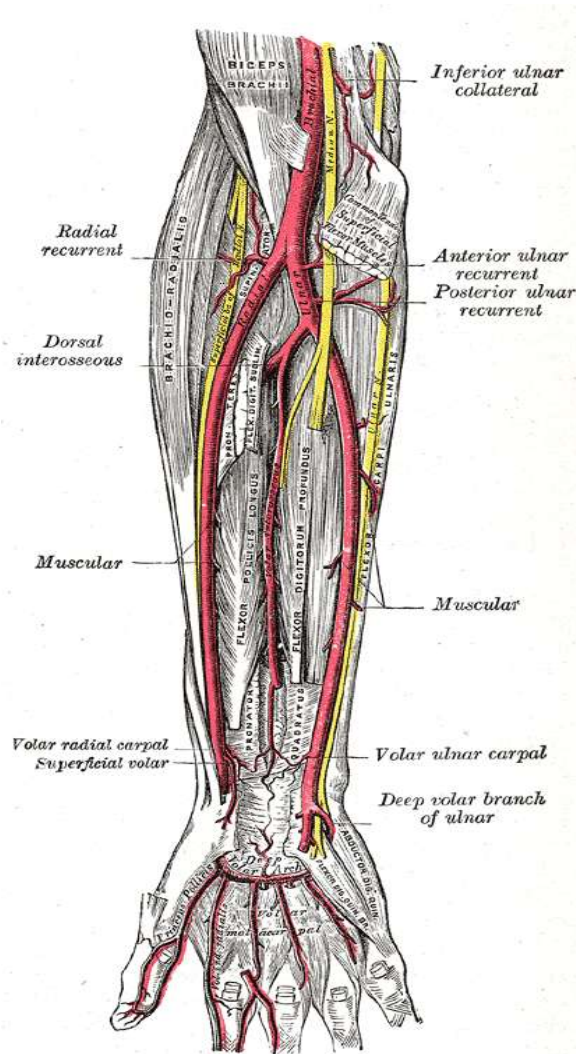


18-19. Continued. D. The pedicle is cleaned of its distal portion, and the artery is exposed.
 E. A solution of papaverine (30 mg/100 cc) is injected into the mammary artery with a syringe. Papaverine solution is also applied to the pedicle.
 F. After distention of the graft, the flow is assessed. If the flow is less than 60 to 100 cc/min, the graft cannot be used. A more proximal portion may be obtained to facilitate a higher flow.
 G. The left anterior descending coronary artery has been isolated under cardiopulmonary bypass. The pericardium has been incised to allow for proper placement of the graft. The graft is aligned to the left anterior descending coronary artery.
 H. The anastomosis demonstrating the position of the pedicle has been completed. Care must be taken to assure proper alignment of the graft on the myocardium, especially with respect to the pericardium, the pleura, the lung, and the beating heart. This also should be assessed after the retractor has been removed.

Fissaggio dell'arteria mammaria interna con punti di sutura epicardici



Arteria Radiale ANATOMIA

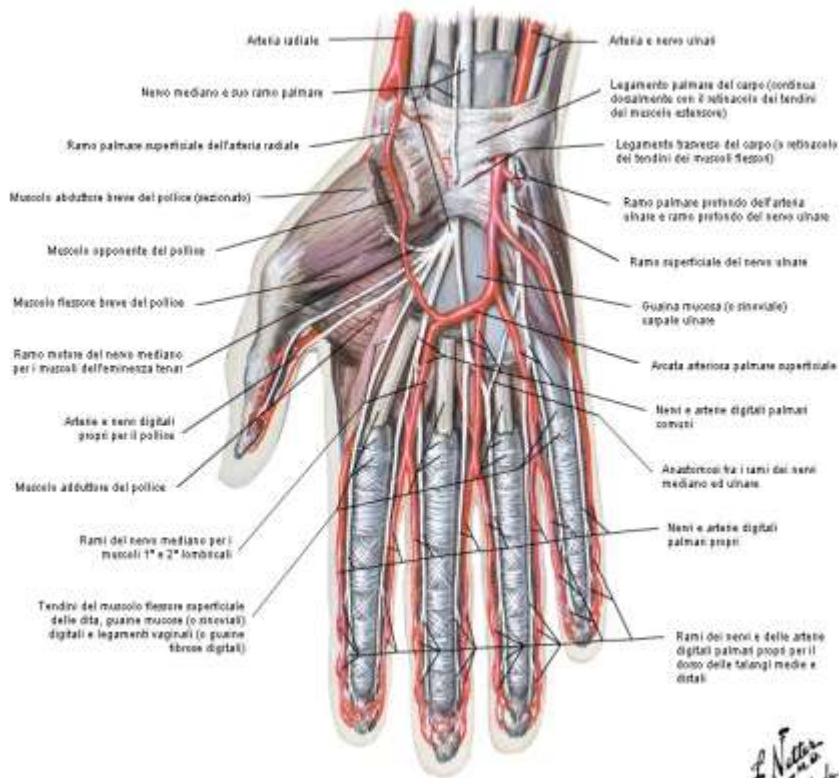


- Ramo laterale di biforcazione dell'arteria brachiale
- Nasce a livello del processo coronoideo dell'ulna, circa 1 cm al di sotto della piega del gomito, e decorre sul lato radiale dell'avambraccio fino al processo stiloideo del radio.
- Accompagnata nel suo decorso da due vene satelliti

Arteria Radiale

ANATOMIA

Arterie e nervi della mano
Veduta anteriore



F. Natta
C. Natta
DEISENER

- Circonda poi il margine laterale del carpo e raggiunge, sul dorso della mano, lo spazio tra il I ed il II osso metacarpale
- Attraversa questo spazio e penetra nel palmo della mano, dove decorre trasversalmente verso il lato ulnare andando a formare l'arcata palmare profonda, anastomizzandosi con il ramo profondo dell'arteria ulnare

Arteria Radiale

ANATOMIA

RAPPORTI ANATOMICI

Nell'avambraccio:

➤ **LATERALMENTE**

- M. Brachioradiale
- Ramo sup. del N. Radiale

➤ **MEDIALMENTE**

- M. Pronatore Rotondo (in alto)
- M. Flessore Radiale del Carpo (in basso)

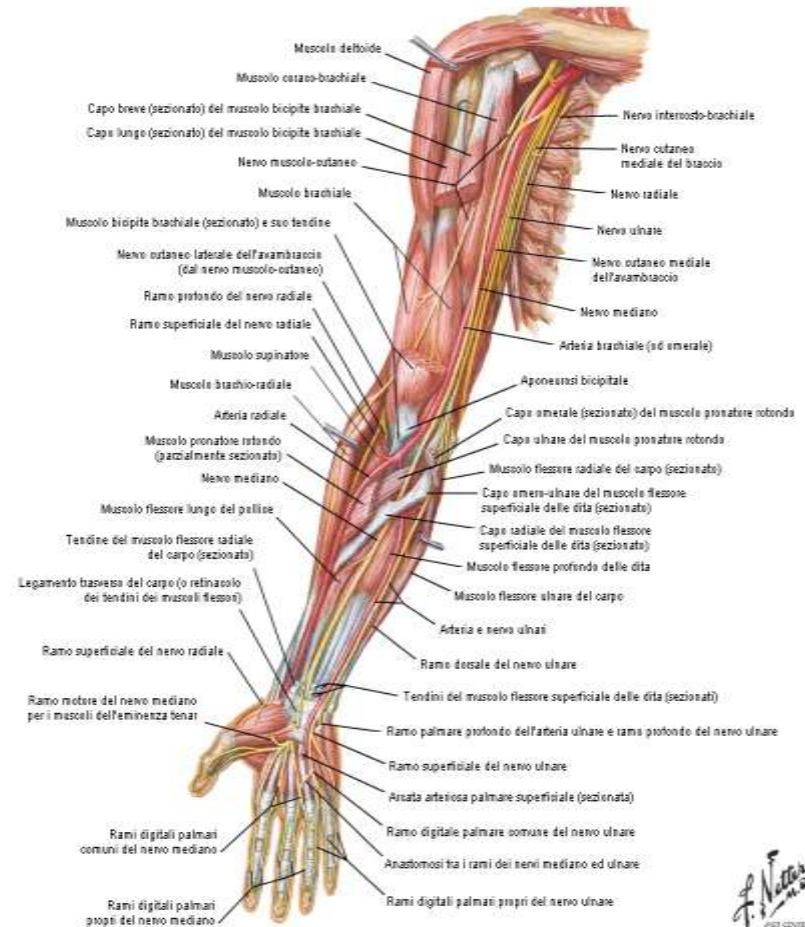
➤ **POSTERIORMENTE**

- Tendine del M. Bicipite
- Mm. che ricoprono faccia anteriore Radio

➤ **ANTERIORMENTE**

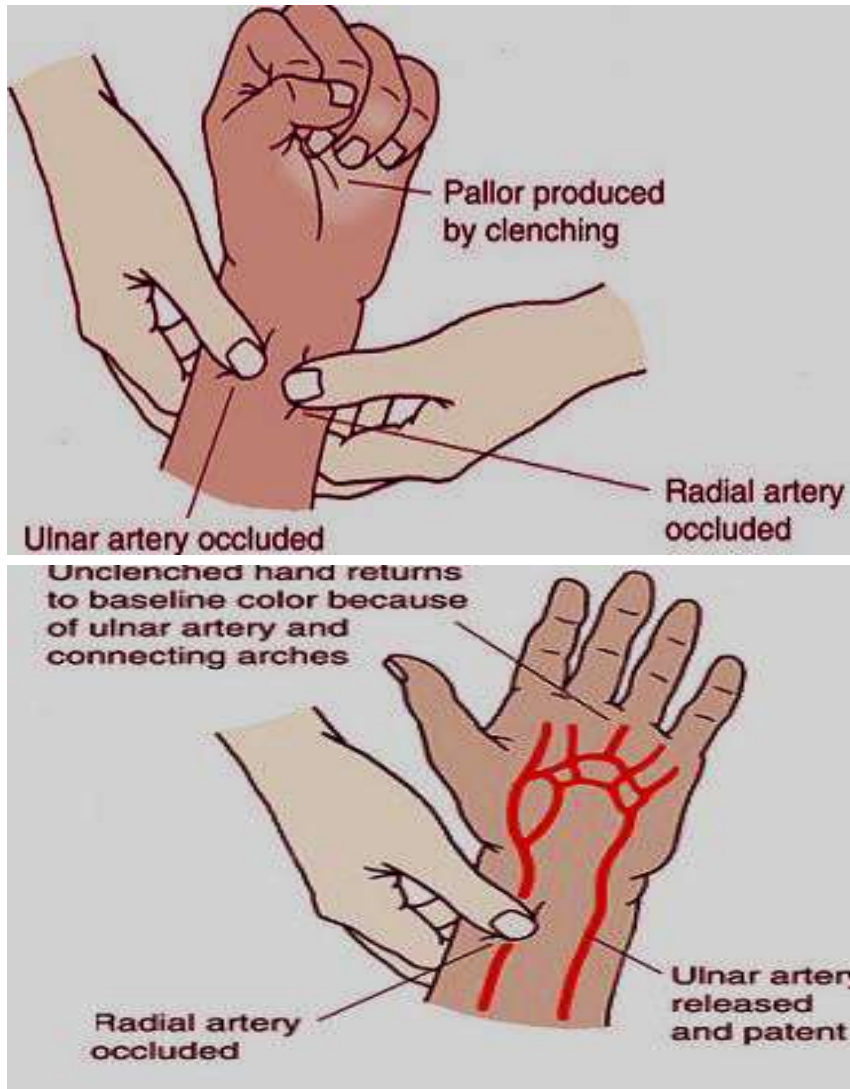
- Ricoperta dal M. Brachioradiale (III prox)
- Ricoperta da aponeurosi e cute (III dist)

Arterie e nervi dell'arto superiore
Veduta anteriore



Arteria Radiale

PREPARAZIONE CHIRURGICA

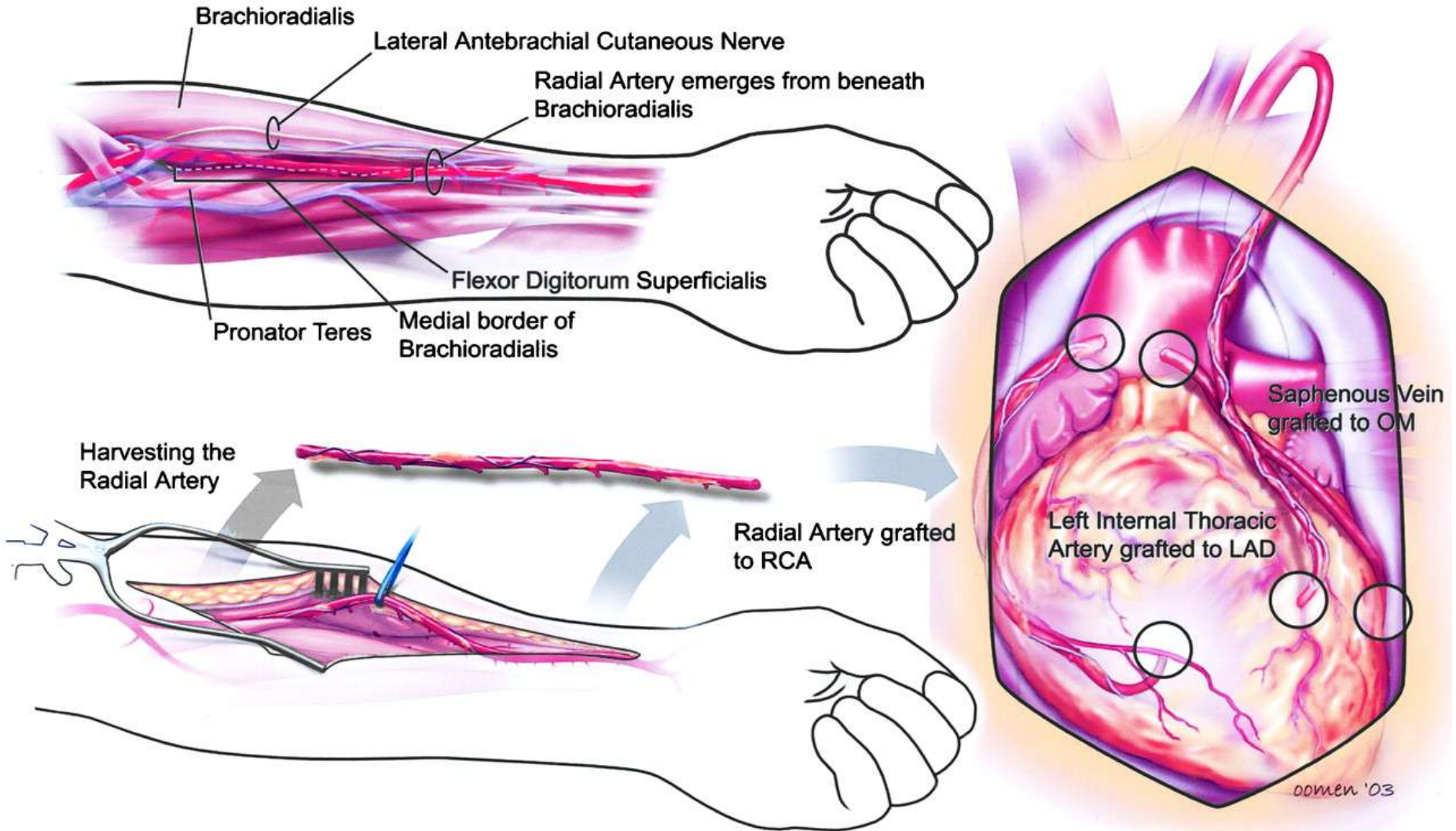


Test di Allen

- Verifica dell'esistenza di un valido circolo collaterale dell'arteria ulnare al fine di evitare l'ischemia post-operatoria della mano.

Arteria Radiale

PREPARAZIONE CHIRURGICA



CONDOTTI ARTERIOSI COMPOSITI (Y o T - Graft)

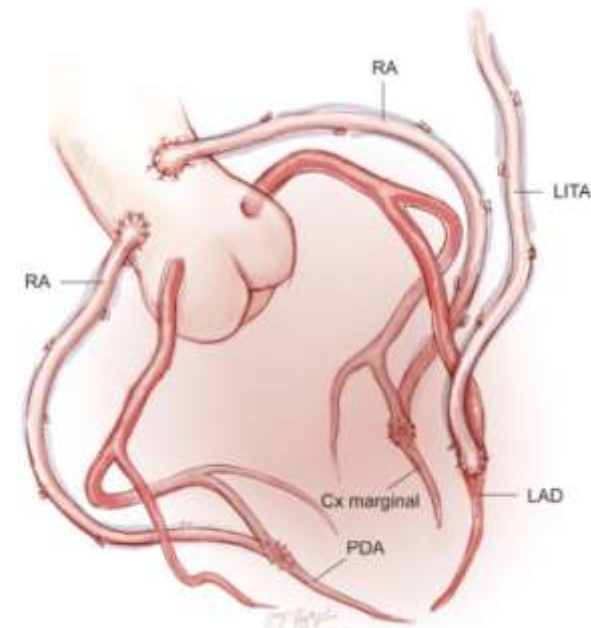
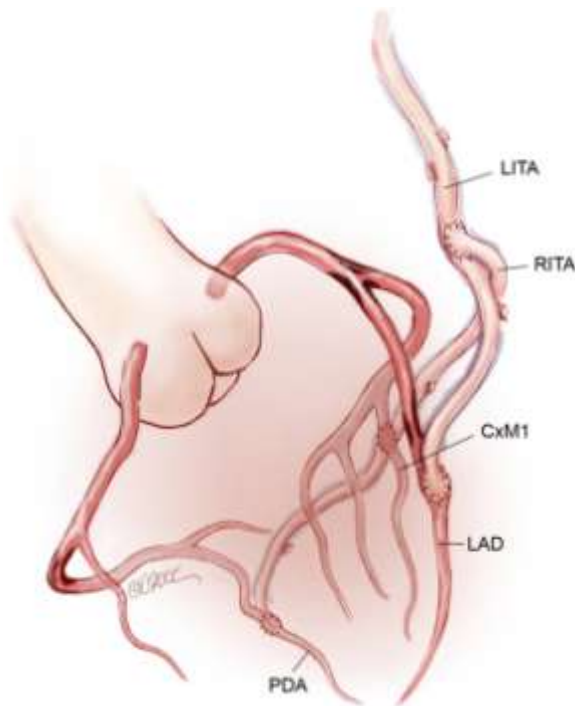
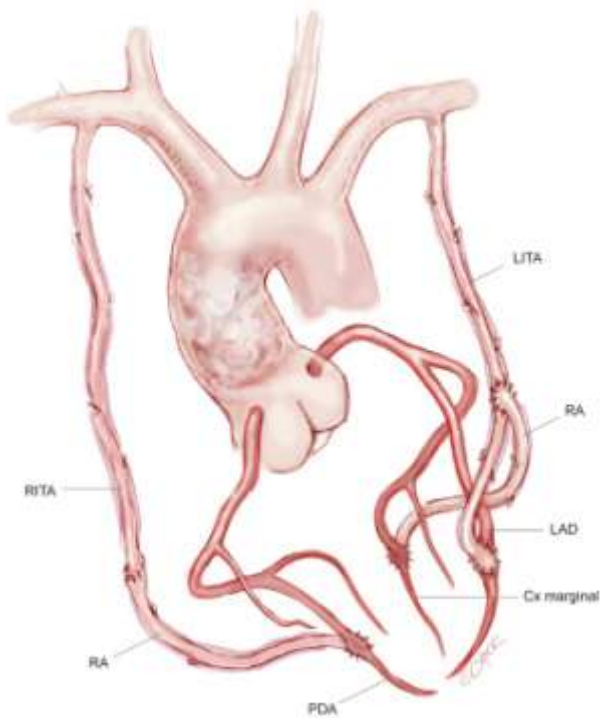
PRO

- ✓ Possibilità di rivascularizzazione totalmente arteriosa (arterie in situ o solo 2 condotti arteriosi)
- ✓ Possibilità di utilizzo di condotti arteriosi alternativi anche se di lunghezza ridotta
- ✓ Assenza di rischio aggiuntivo di mediastinite

CONTRO

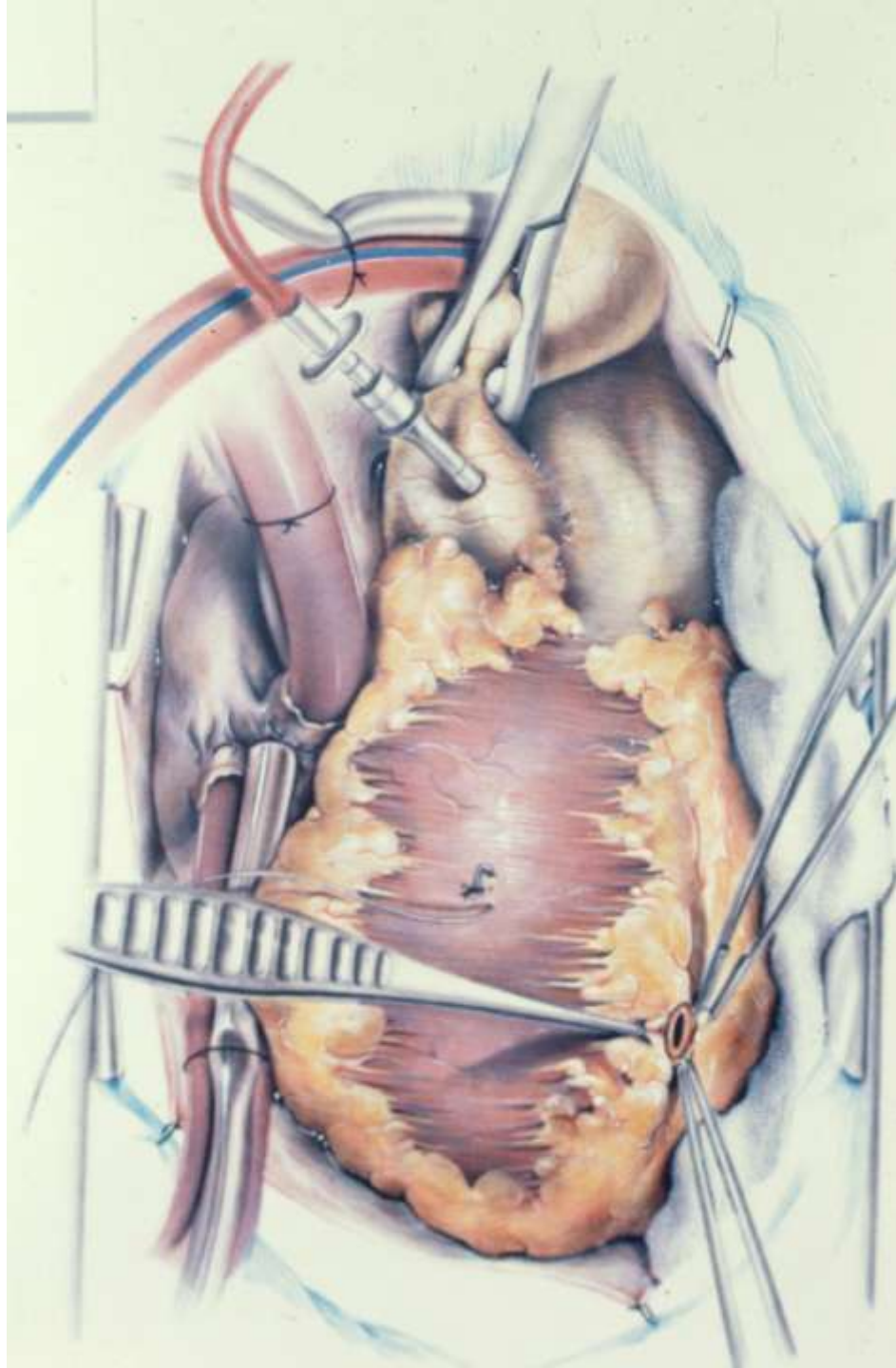
- Tutta la rivascularizzazione arteriosa è affidata ad una sola fonte
- Maggiore complessità tecnica
- Anastomosi sequenziali

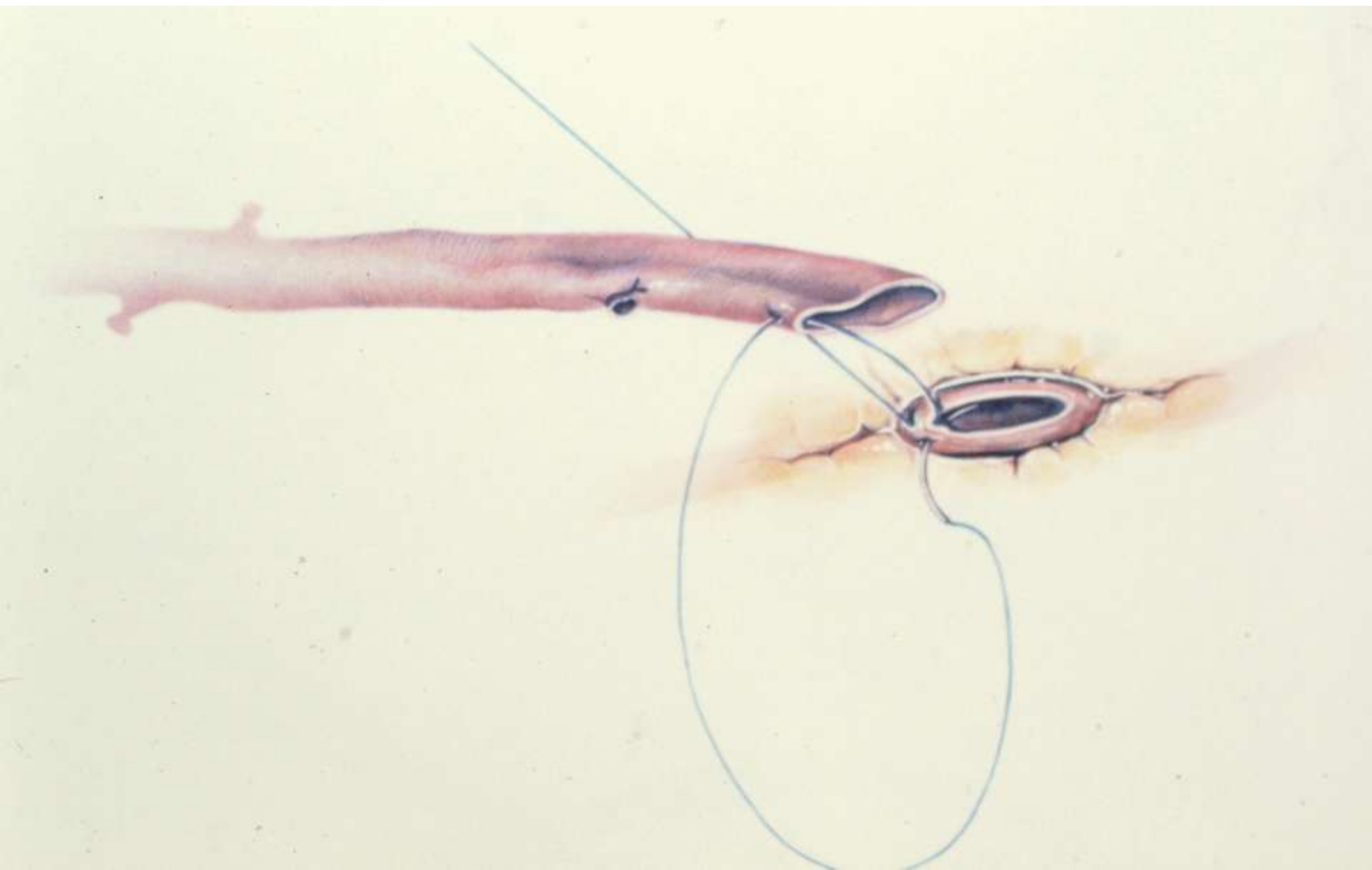
Un nuovo target: la rivascularizzazione completamente arteriosa



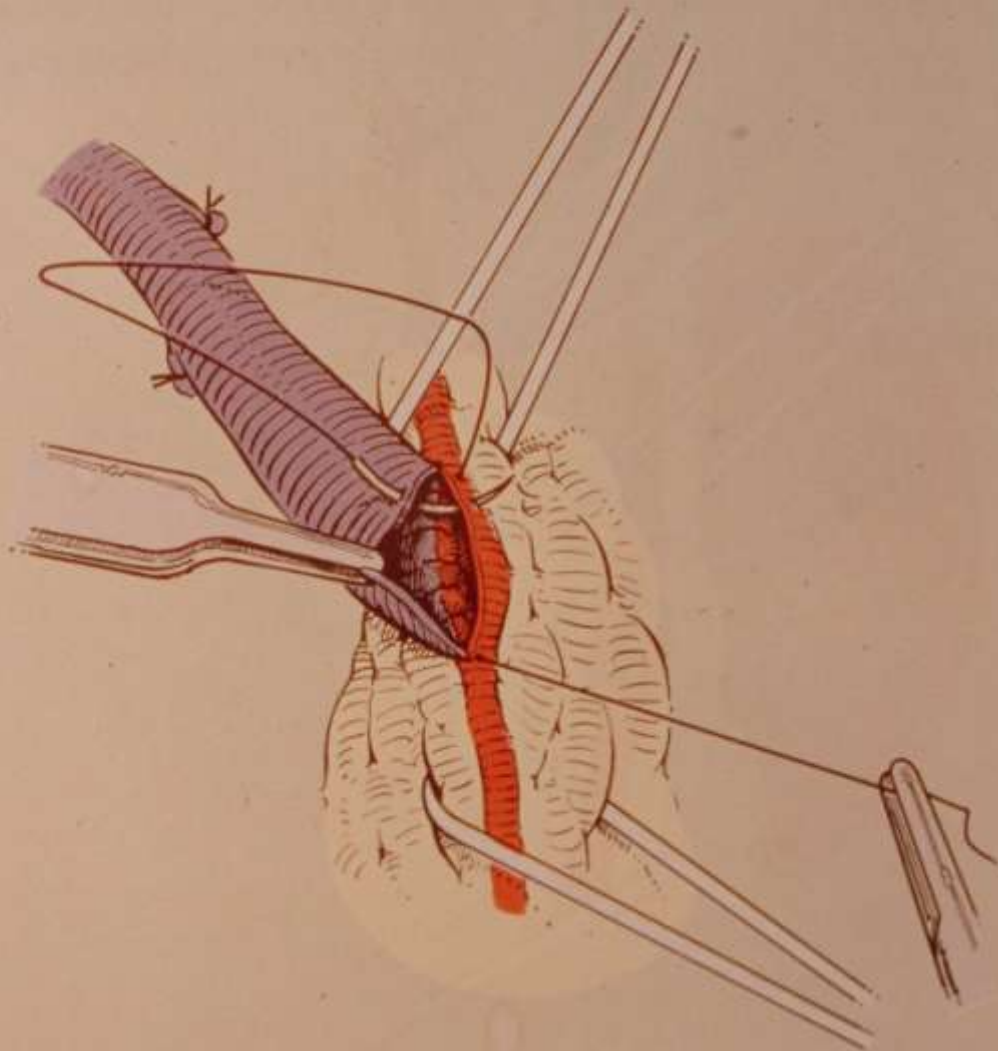
The art of arterial revascularization—total arterial revascularization in patients with triple vessel coronary artery disease *Ann Cardiothorac Surg.* 2013 July; 2(4): 543–551.



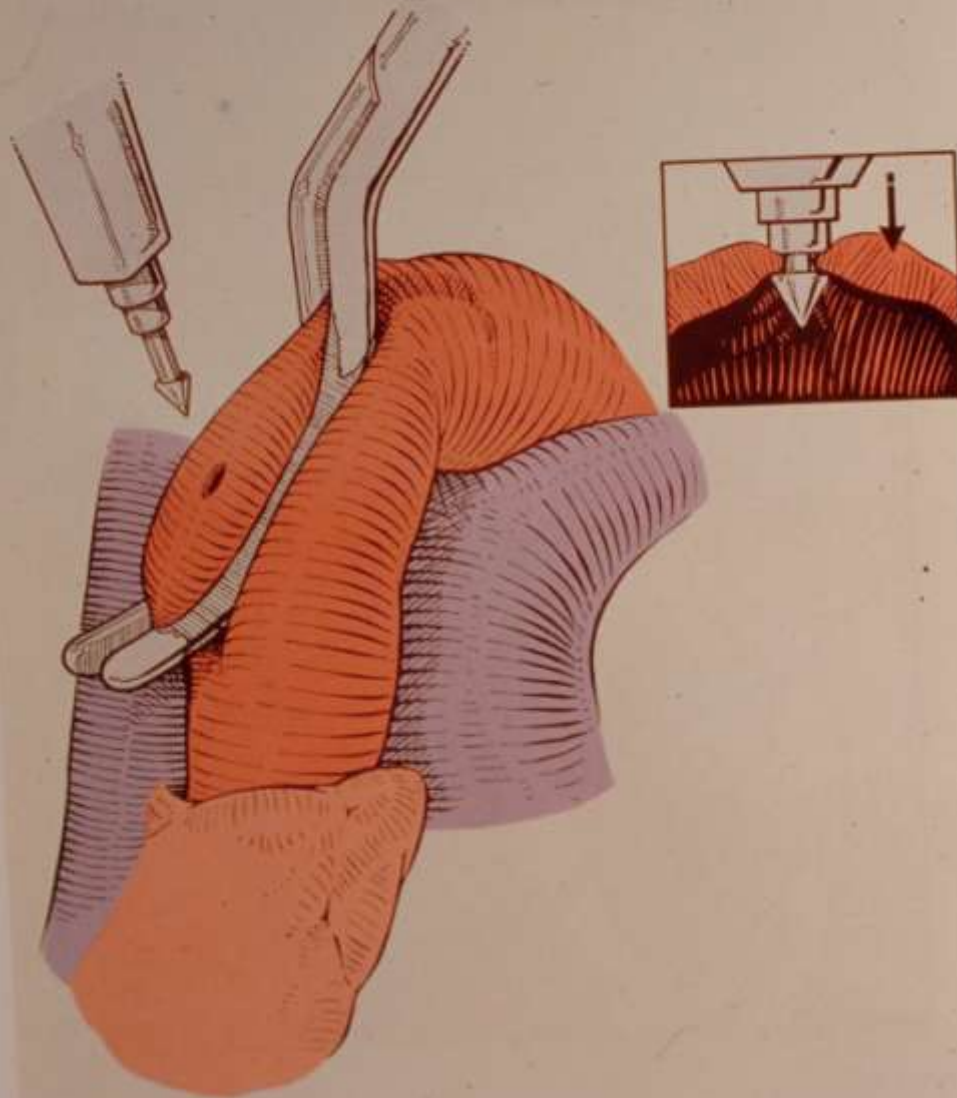




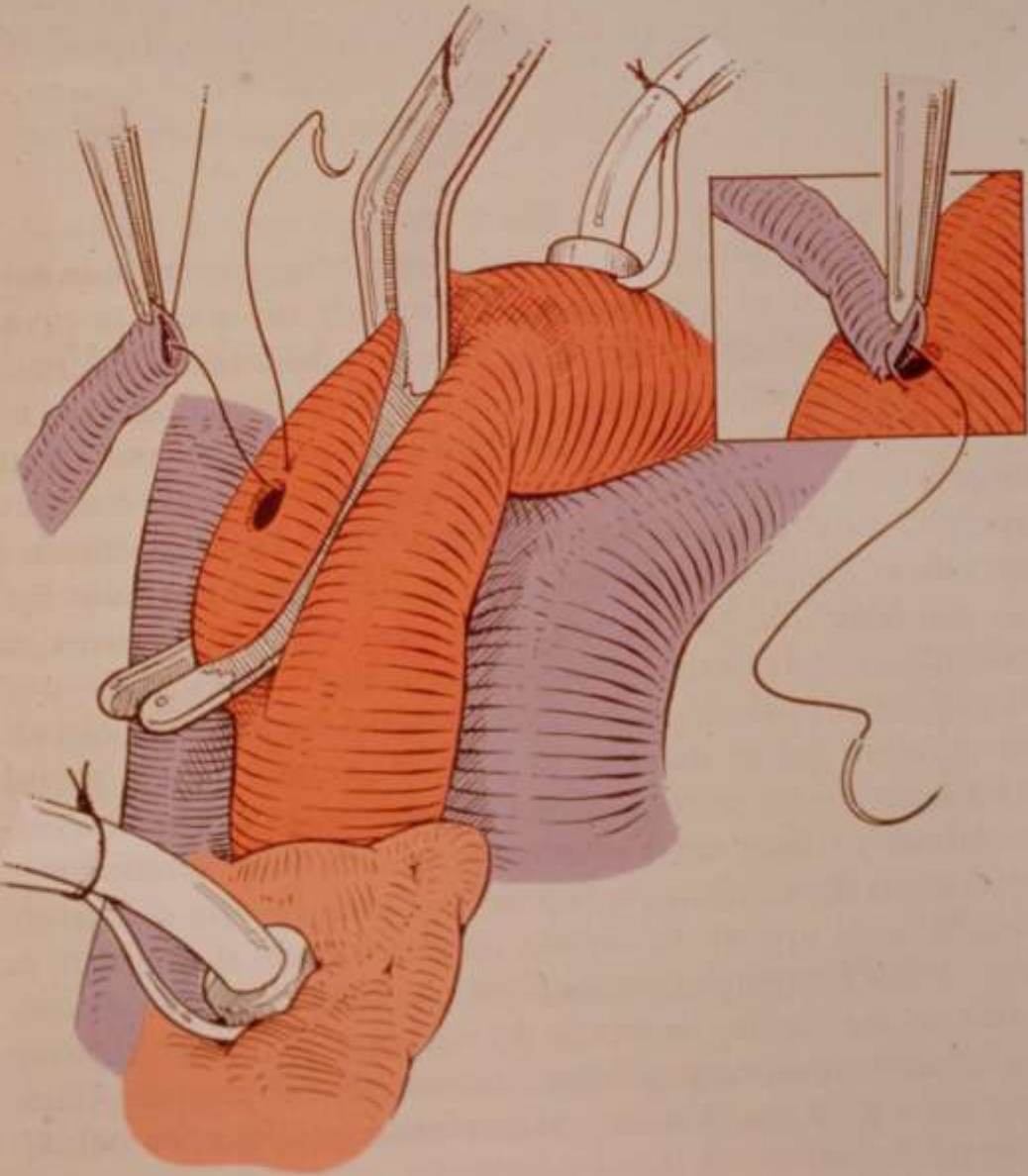
Anastomosi della vena safena con l'arteria coronaria



Punzione aortica per l'anastomosi prossimale



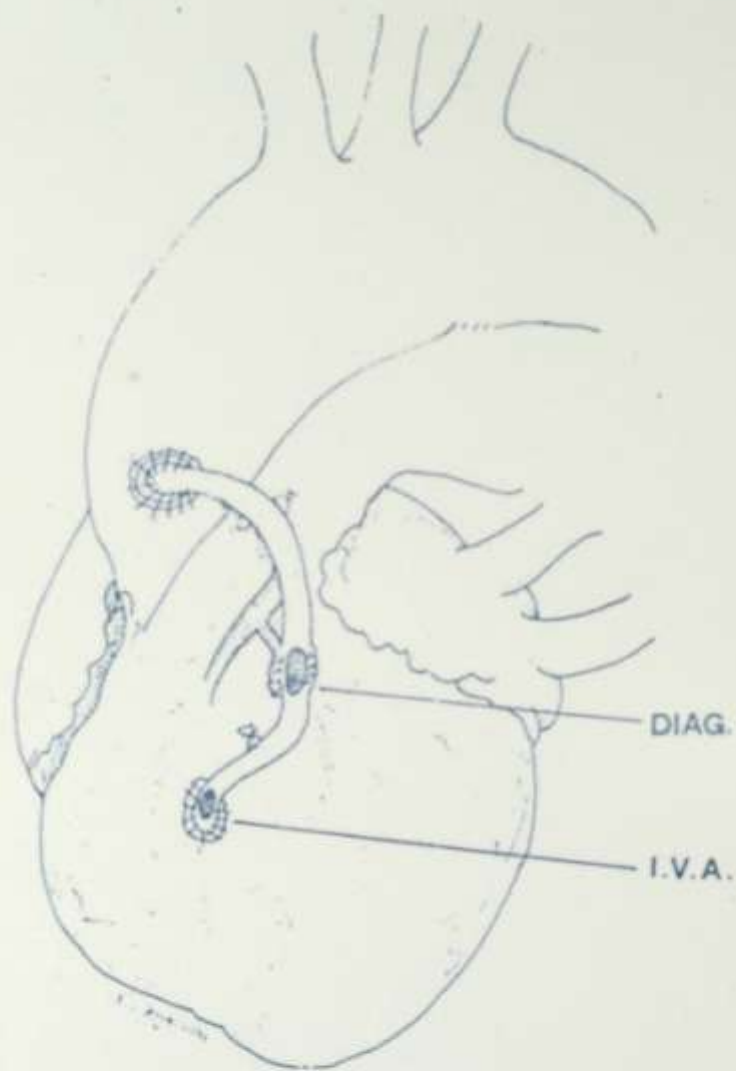
Anastomosi prossimale



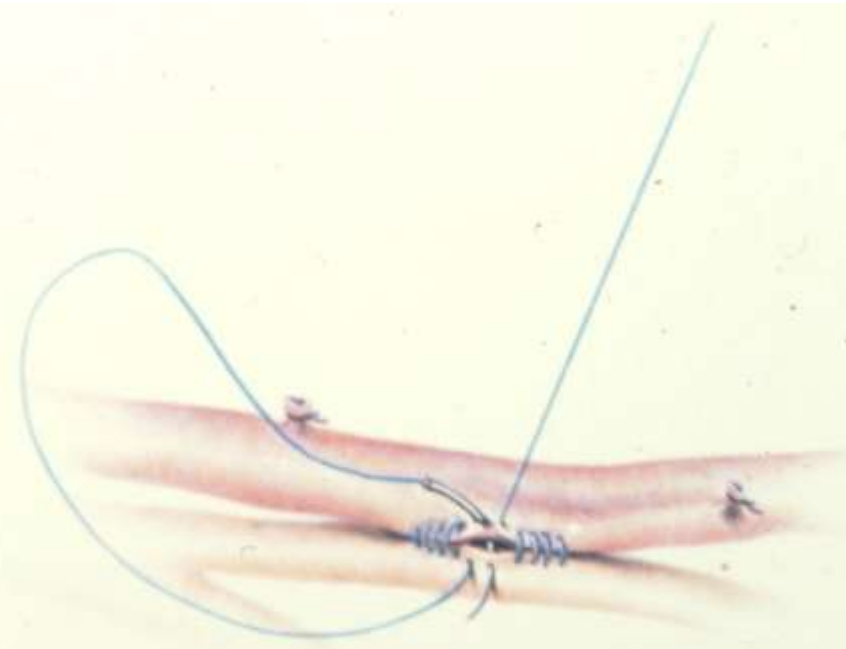
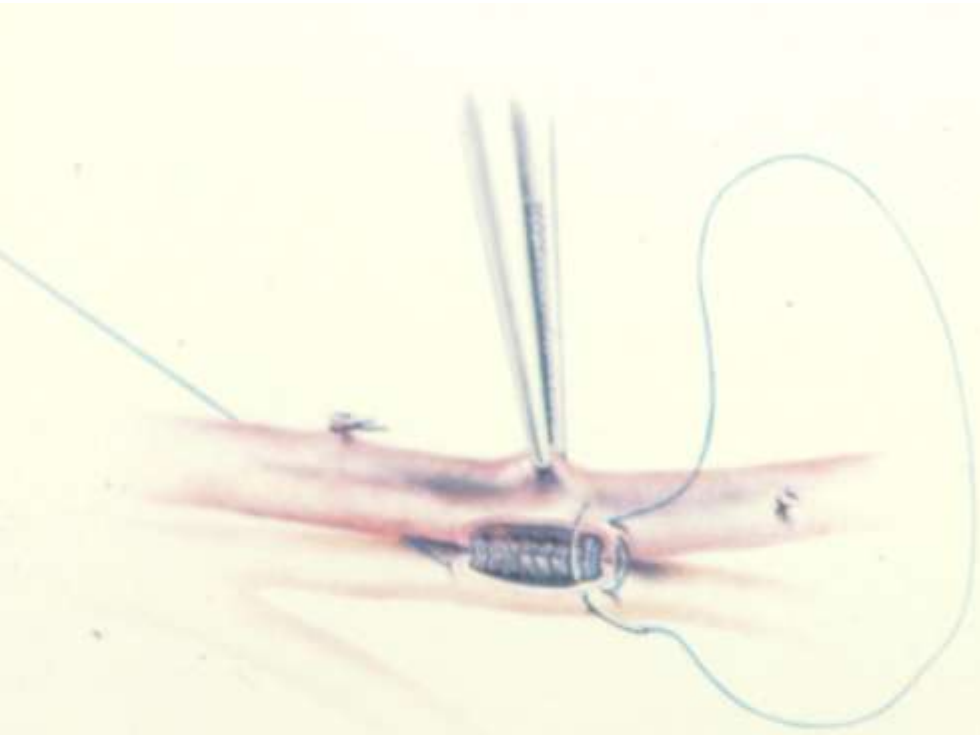


18-6. Technique for right coronary endarterectomy.

- A. An occluded right coronary artery is considered for endarterectomy.
- B. The incision is made just above the crux and the core brought out through the incision. Gentle traction is exerted on the distal portion while the artery is peeled back.
- C and D. A complete endarterectomy results when all the distal branches are free of plaquing. The distal vessels should be cleared individually. The proximal portion is then removed by gentle traction until it breaks free from the proximal area. It is important to obtain a clearly feathered proximal portion.
- E. The specimen is considered satisfactory when the distal specimen and small branches have feathered ends.
- F. A vein graft is then placed to the arteriotomy to assure flow in both directions.

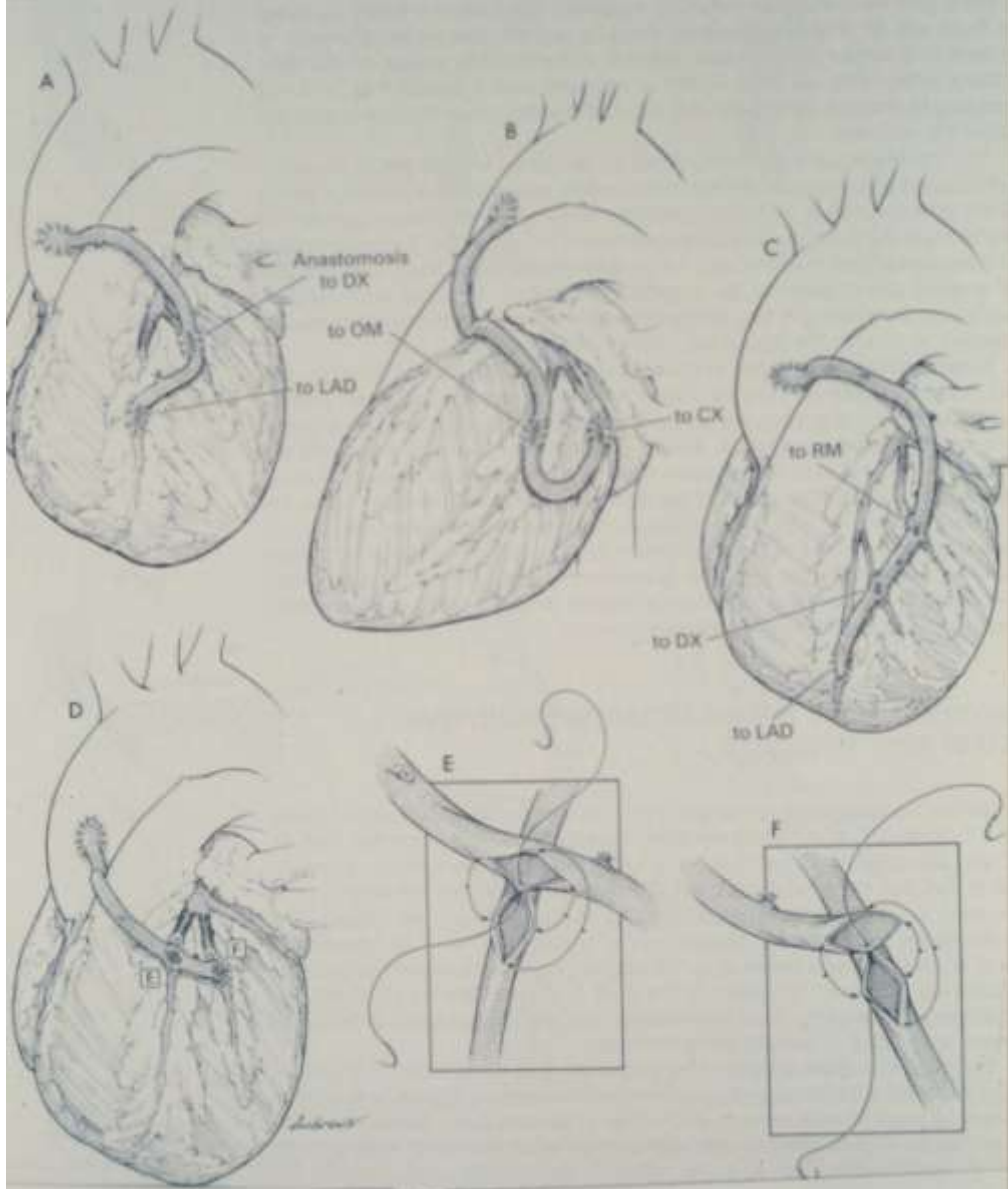


Rivascolarizzazione della arteria diagonale e della arteria interventricolare anteriore con innesto venoso unico secondo la tecnica dell'impianto «sequenziale»: l'anastomosi sulla diagonale è latero-laterale mentre quella sulla interventricolare anteriore è termino-laterale.

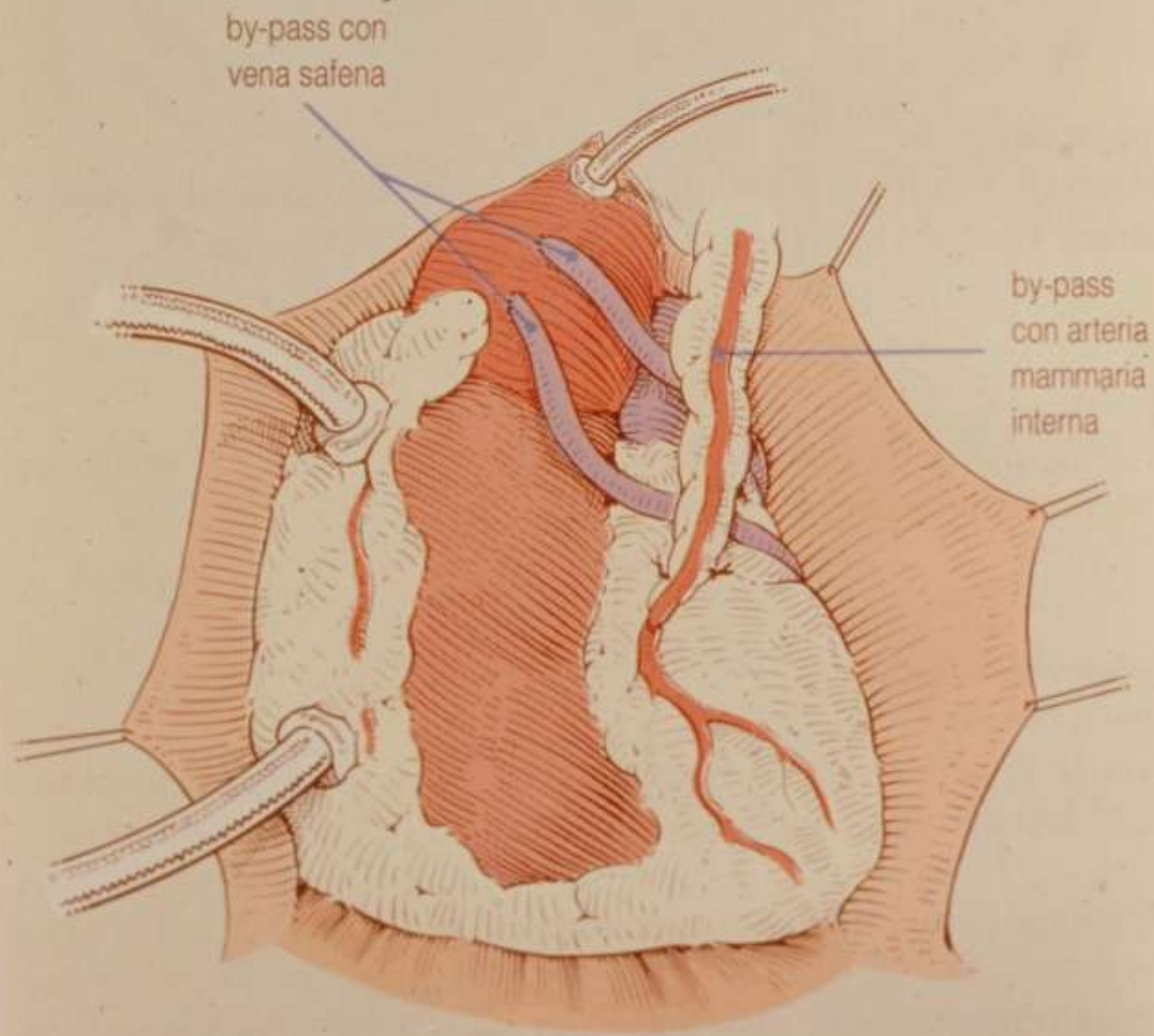


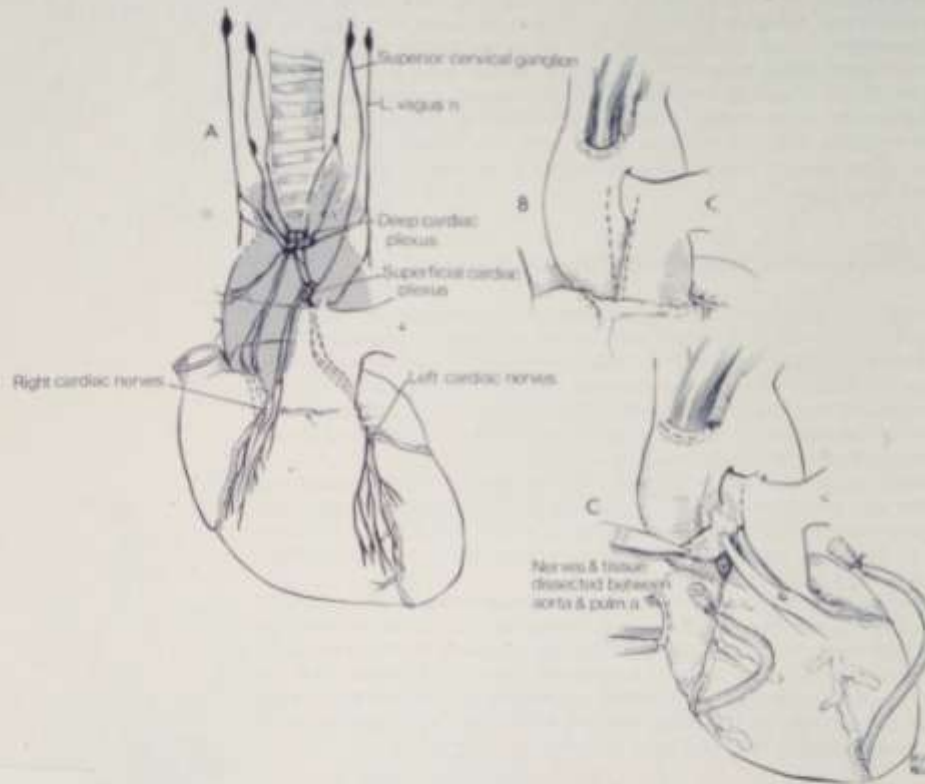
9-63

REVASCULARIZATION OF THE ISCHEMIC MYOCARDIUM



Rivascolarizzazione coronarica completata





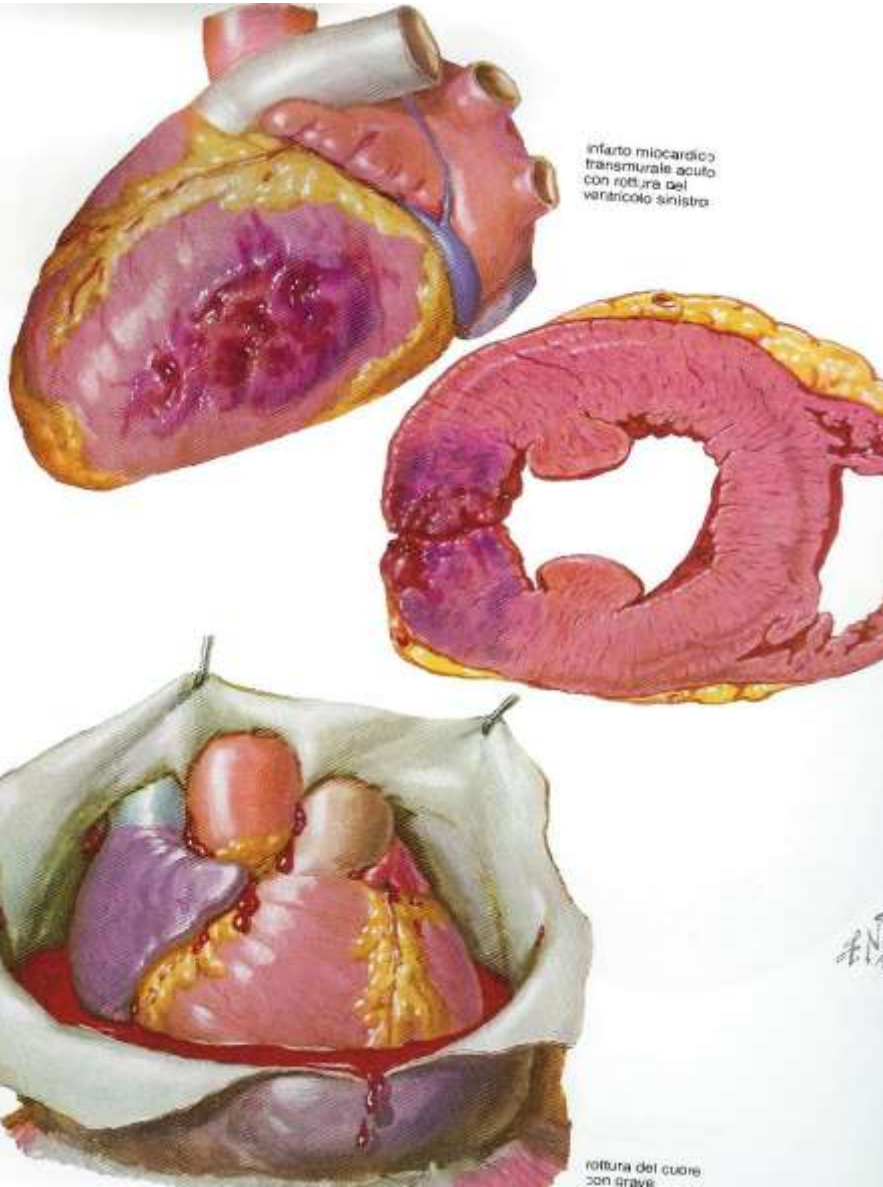
18-18. The anatomy and technique for periaortic neurectomy or plexectomy.

A. The autonomic nerve supply of the heart is shown. Branches arise from the deep cardiac plexus on the ascending aorta. The superficial cardiac plexus is at the junction of the ascending aorta near the area of the right pulmonary artery. The right cardiac nerves branch over the right ventricle and pass through the periaortic tissue between the pulmonary artery and the aorta. The left cardiac nerves are distributed over the left ventricle, arising and passing behind the pulmonary artery.

B. Epicardial incisions over the pulmonary artery and the aorta for periaortic neurectomy are shown.

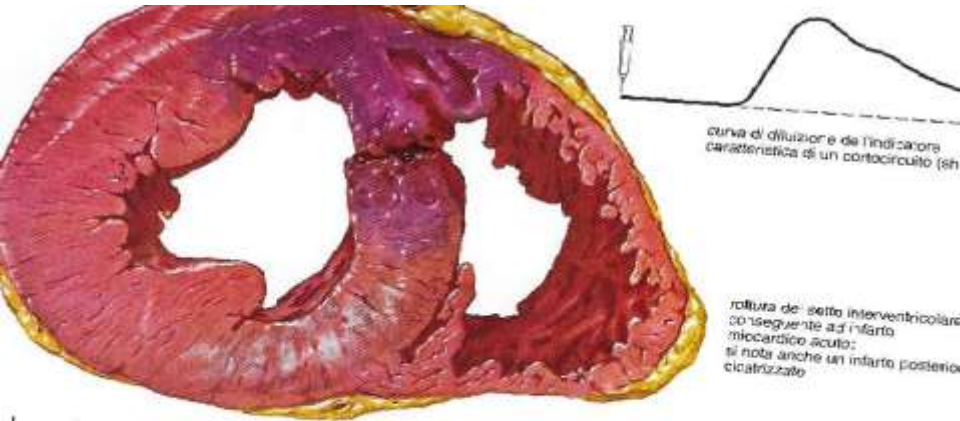
C. The nerve and plexus tissue between the pulmonary artery and aorta are completely removed with careful adventitial stripping. This procedure usually is done after the distal vein anastomoses are completed and before the proximal aortic connection is made.

Complicanze chirurgiche dell'IMA



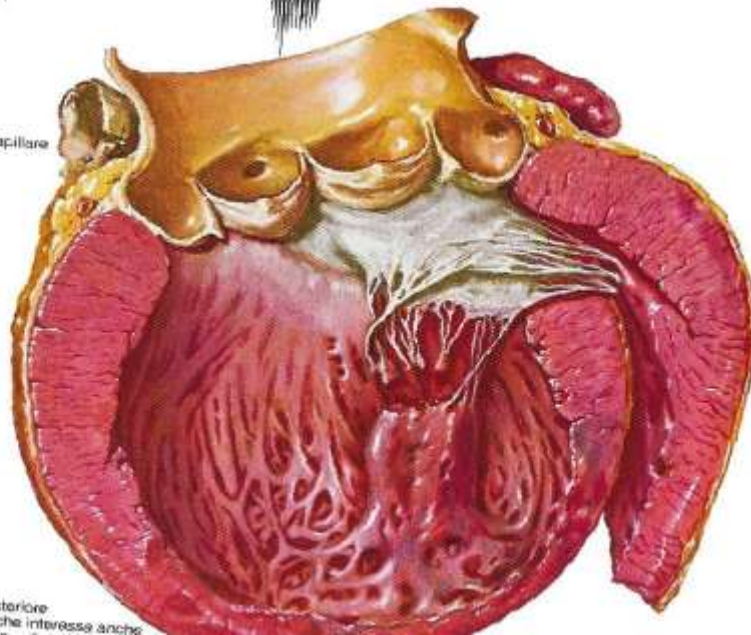
- Rottura di cuore con tamponamento cardiaco

Complicanze chirurgiche dell'IMA

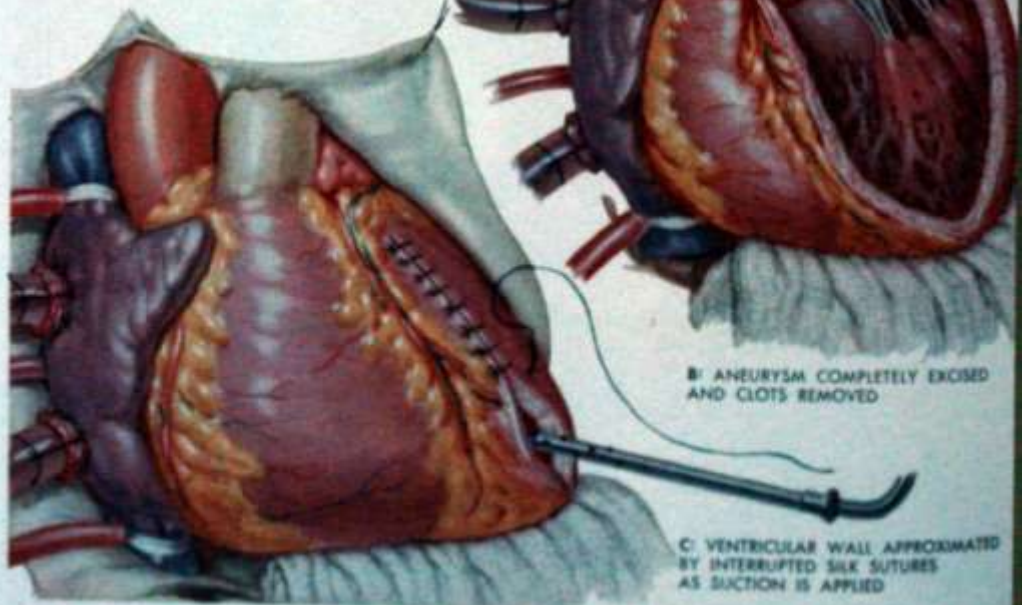
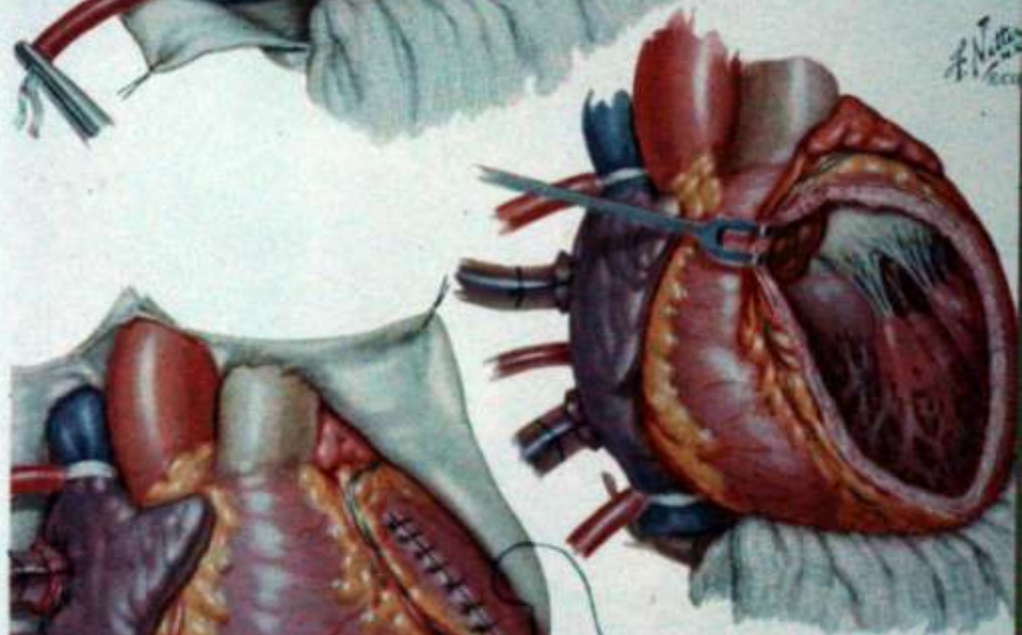
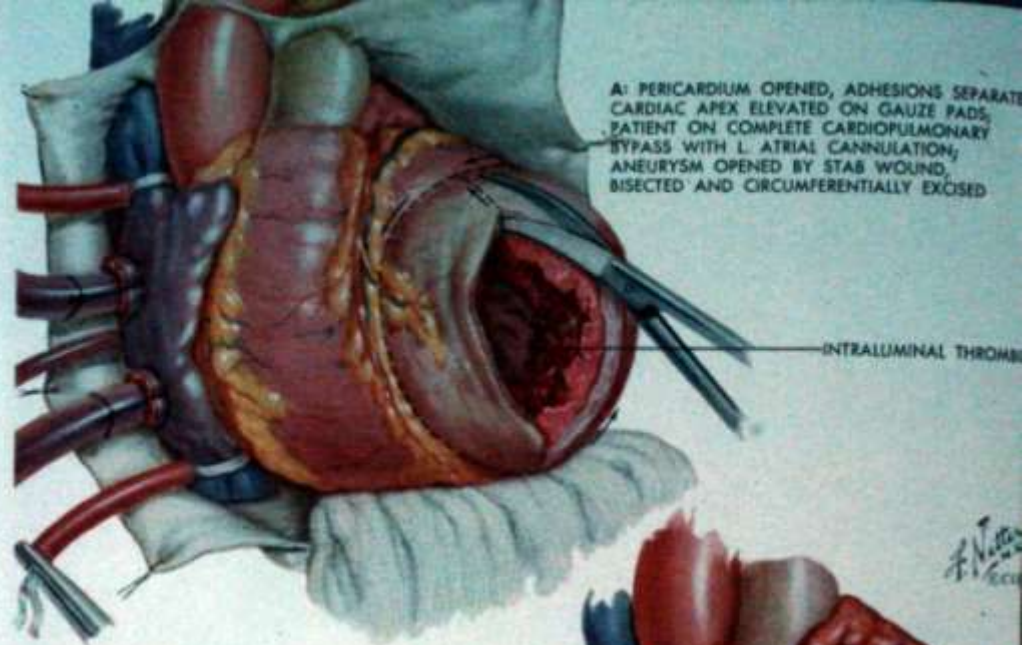


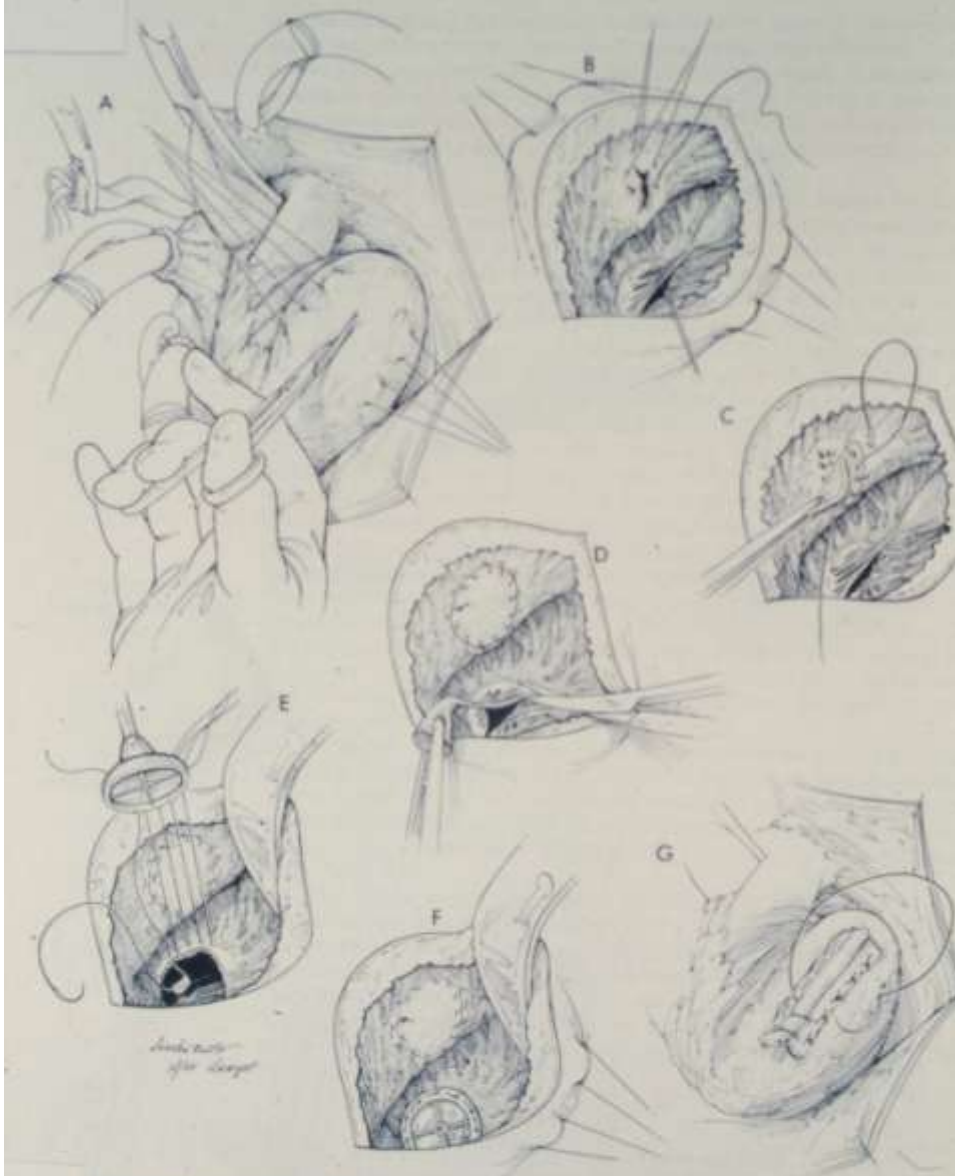
Difetto interventricolare postinfartuale

rottura del setto interventricolare
conseguente ad infarto
miocardico acuto;
si nota anche un infarto posteriore
cicatrizzato



Rottura del muscolo papillare e
conseguente insufficienza mitralica
severa

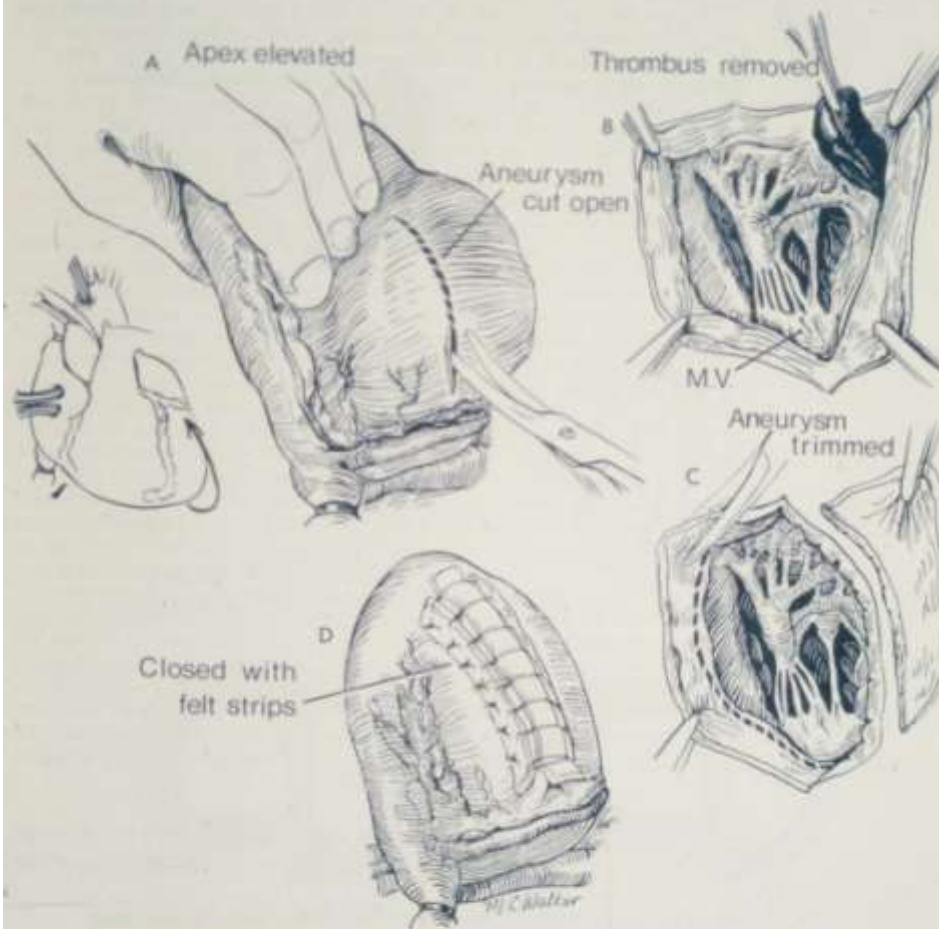




16-17. Closure of ventricular septal defect and mitral valve replacement through a large left ventricular aneurysm.

- A. The ventricular aneurysm is incised in the usual manner.
- B. The ventricular septal defect, which has a fibrous margin, is closed with sutures.
- C. A patch reinforces the area of septal closure.
- D. The regurgitant mitral valve is excised through the ventricular aneurysm.
- E. A low-profile valve prosthesis is then placed with interrupted pedgeted sutures.
- F. The valve is tied in place, showing the septal defect repair and placement of the valve.
- G. The ventriculotomy is closed as previously shown with felt strips reinforcing the repair.

REVASCARULARIZATION OF THE ISCHEMIC MYOCARDIUM



18-12. The operative technique for repair of a posterior ventricular aneurysm.

A. The apex is elevated, and the aneurysm is opened.

B. The thrombus is removed. The area of the mitral valve, aortic coronary valve, trabecula, and atriun must be inspected for remnants of thrombus so that embolization will not occur. The mitral valve is also inspected for function, and the area of the base of the papillary muscles is avoided so that distortion of the valvular apparatus does not occur.

C. The aneurysm is trimmed, and a fibrous edge remains.

D. The aneurysm is then closed with felt strips. In some cases of wide-mouthed aneurysm in which felt strip closure would interfere with papillary muscle function, a large woven Dacron patch can be utilized for closure of the defect.

