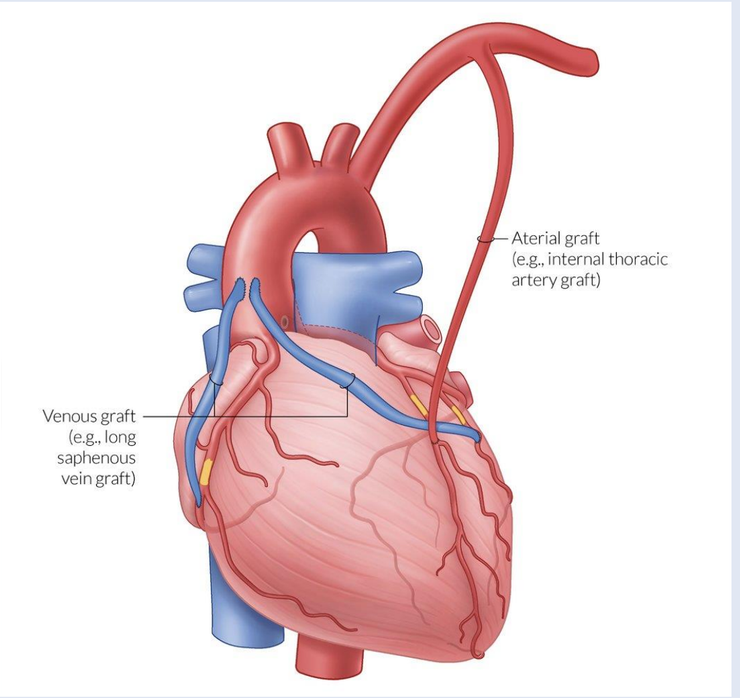
2023년도 대한흉부심장혈관학회 제 16차 전공의 연수교육

Surgical technique of CABG

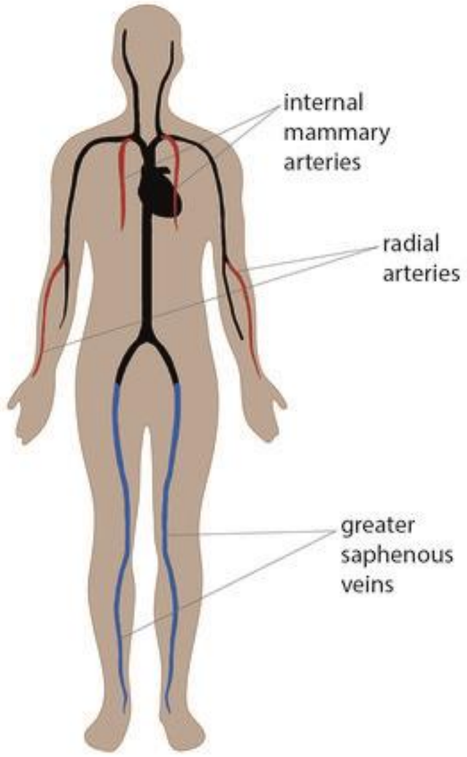
삼성서울병원 심장외과 정수련

목차 Contents

01 Selection and harvesting of Bypass conduit



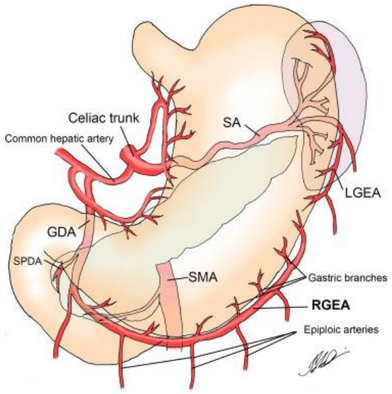
Bypass conduit of CABG



ITA (Internal thoracic artery) >> GSV> Radial artery>GEA

Key point!

LITA grafting to the LAD is the gold standard for primary CABG



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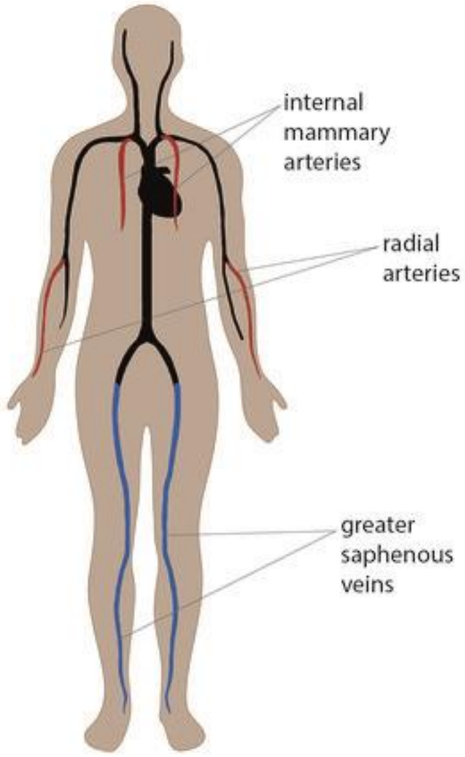

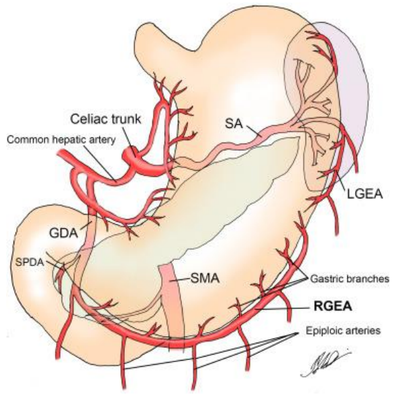

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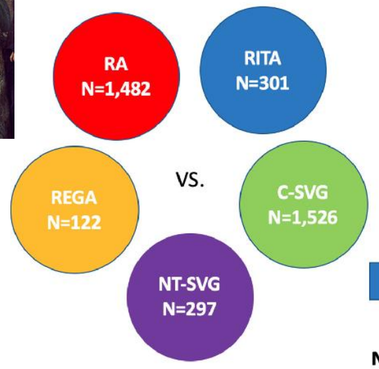
Graft patency of a second conduit for coronary artery bypass surgery: a network meta-analysis of randomized controlled trials

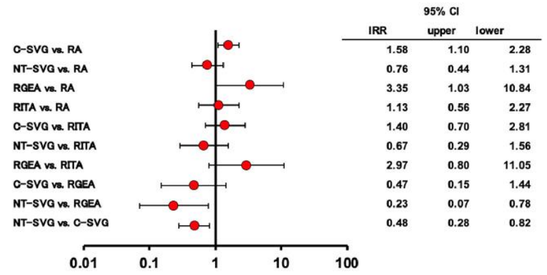


13 Randomized Trials, N=3,728

Network Meta-Analysis

Second conduit in CABG

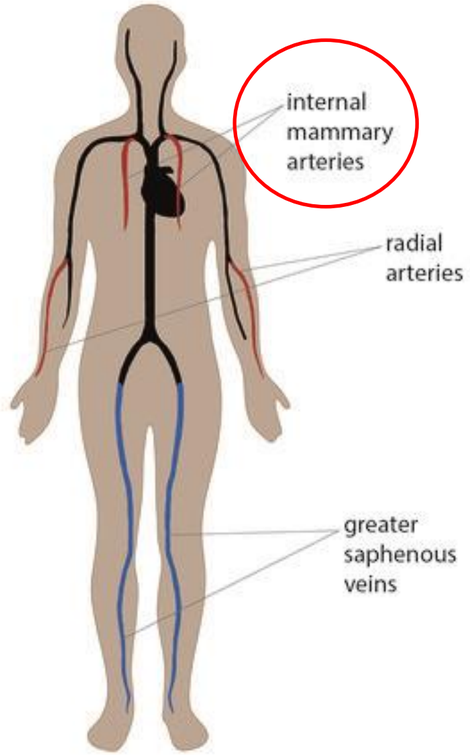
Graft failure

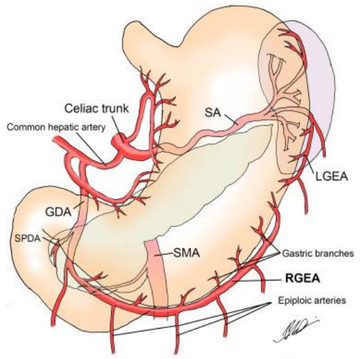


Graft failure rates were lower in RA and NT-SVG compared to C-SVG and RGEA.
Our result might encourage the use of NT-SVG over arterial grafts.

(Semi Thoracic Surg 34:102-109)

Bypass conduit of CABG





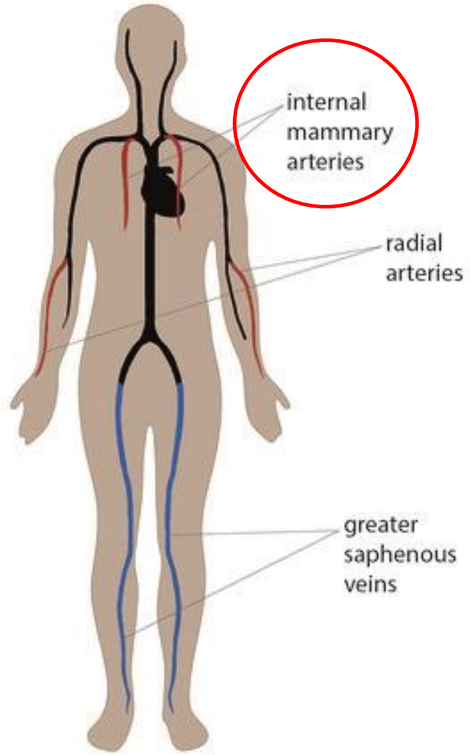
왜 internal thoracic artery를 선호하는가?

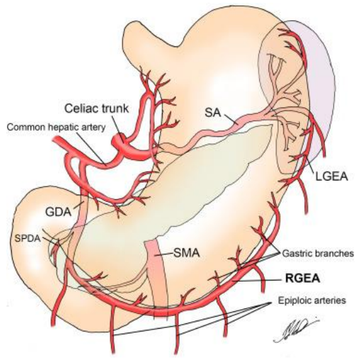
1. Sternotomy 후 추가 절개 없이 획득 할 수 있다.

2. Vessel 의 media 층에 9개의 탄력층이 있어 동맥압을 흡수하는 완충 작용이 우수하고 다른 vessel에 비해 평활근이 적어 발작적 연축현상이 잘 일어나지 않는다.

3. 혈관벽 자체에서 혈관이완 작용이 있는 prostacyclin , NO 분비하여 잘 수축되지 않는다.

Bypass conduit of CABG





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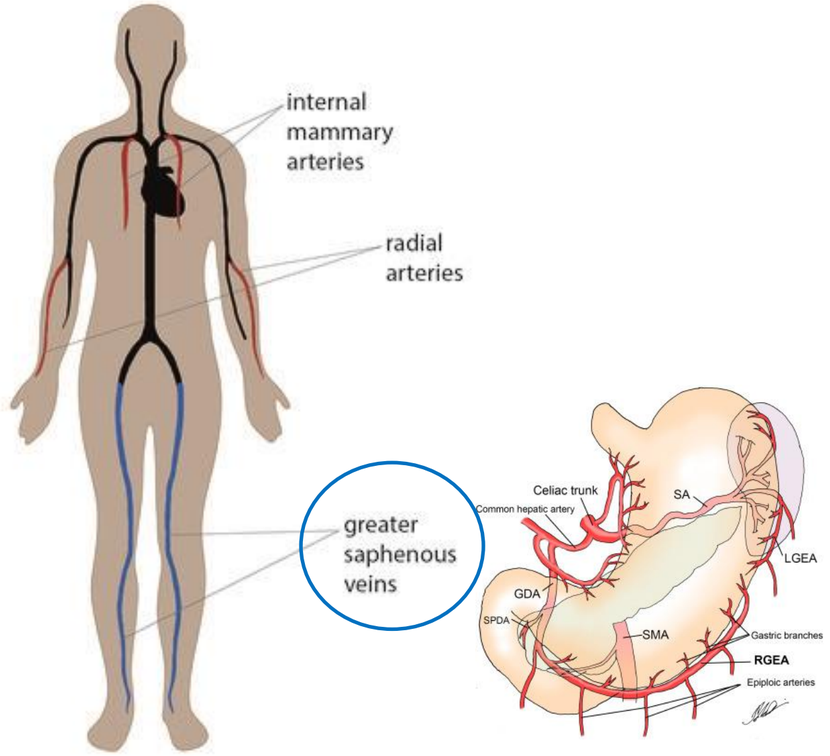
Caution!! **양측 내흉동맥 사용시 획득 시간이 오래 걸리고 수술 후 흉골 치유에 장애가 있을 수 있다. (응급 수술, 당뇨, 비만)**

Bypass conduit of CABG



Greater saphenous vein	Radial artery	Right gastroepiploic artery
• 획득이 쉽다. • 직경이 5mm 정도여서 문합이 용이하다. • 길이가 충분하다 • 연축 현상이 적다	• 내경이 크다. • 길이가 20-24cm 정도 길게 획득이 가능하다.	• 정중흉부 절개에서 조금만 연장하면 획득할 수 있다. • In-situ 로 사용할 수 있다.
• 10년 개통률이 70-80% • 정맥류 등이 질환이 있으면 사용이 불가하다. • 다리에 긴 창상이 남는다.	• 미용상 좋지 않다. • 연축이 잘생긴다. • 고령의 말단 동맥경화가 있거나 Raynaud disease, 투석 예정환자는 사용하지 못한다.	• 복부에서 흉부를 향해 역행하여 혈류 공급이 되어 혈류 경쟁이 발생한다. • 연축 작용이 잘생긴다.

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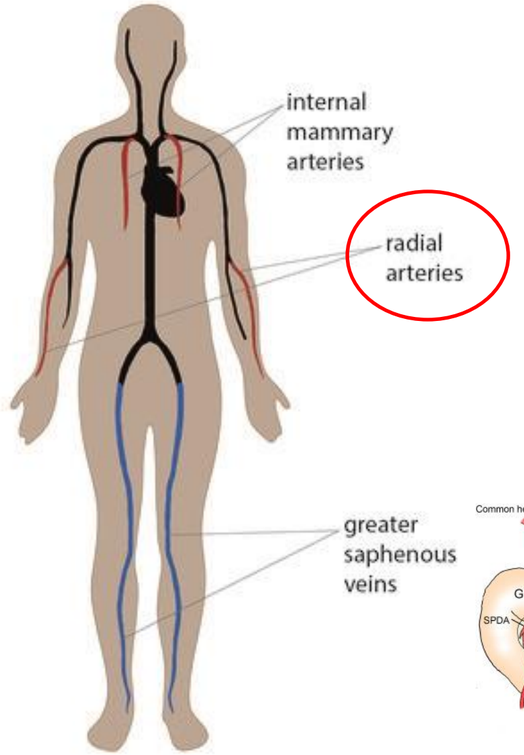

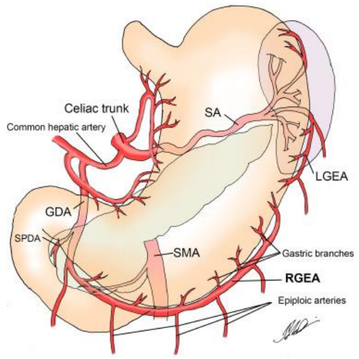

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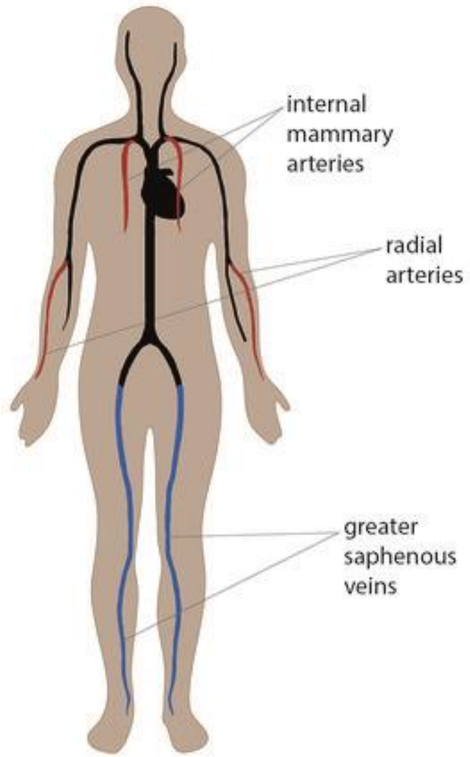

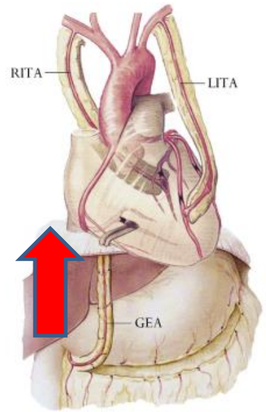

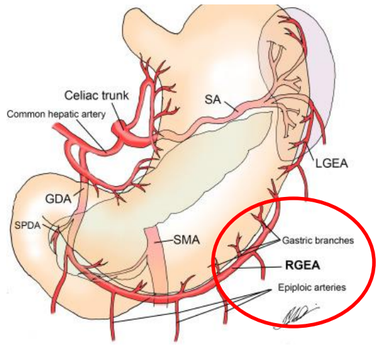

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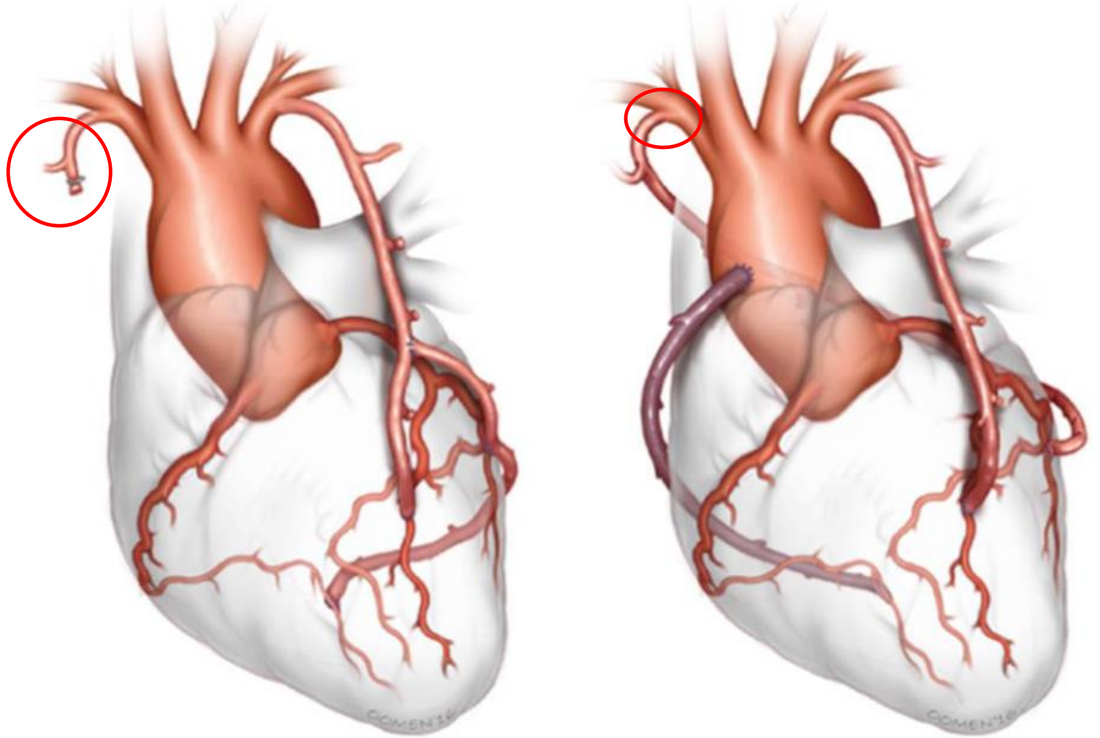
Harvesting technique of bypass conduit

- In-situ graft
- Free graft
- Skeletoni-zed
- Pedicle

Harvesting technique of bypass conduit

Free graft



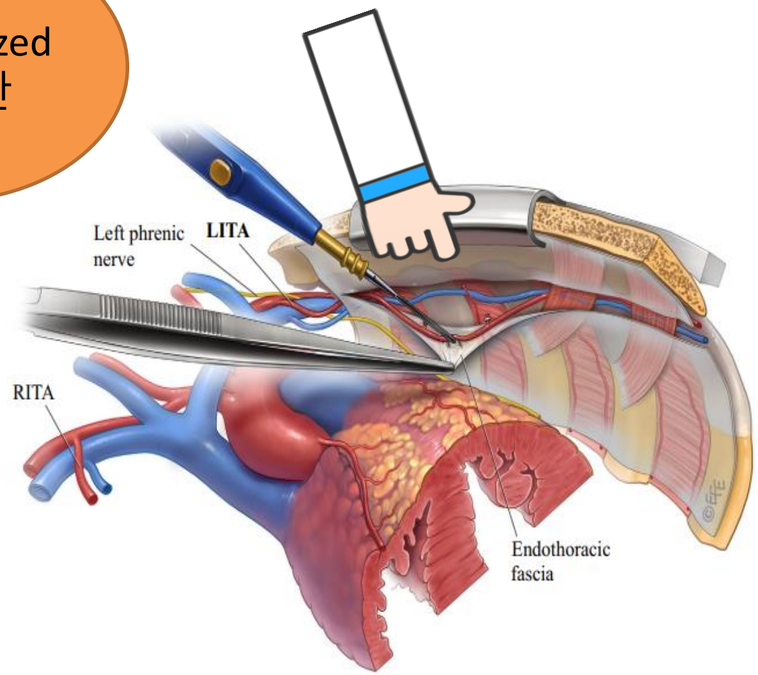
COMPOSITE BITA

IN SITU BITA

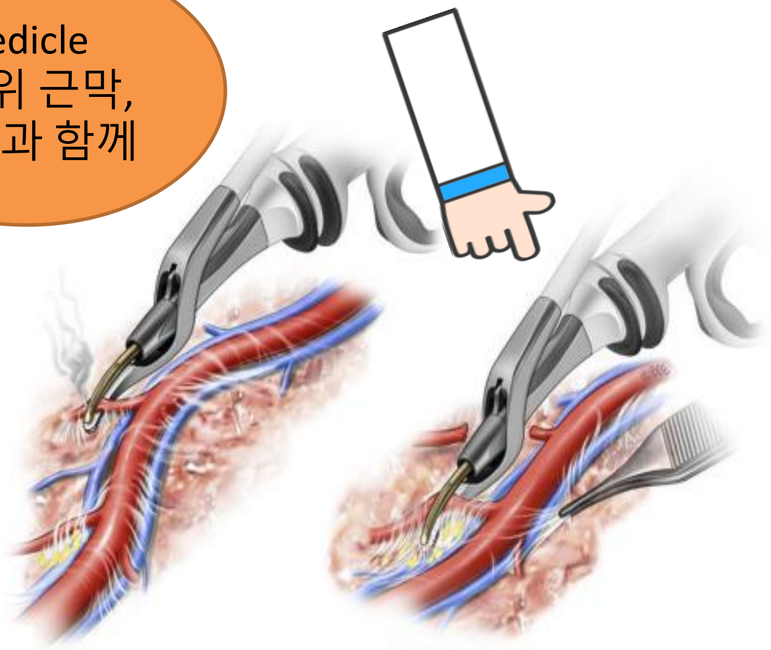
In-situ graft

Harvesting technique of bypass conduit

Skeletonized
-동맥만

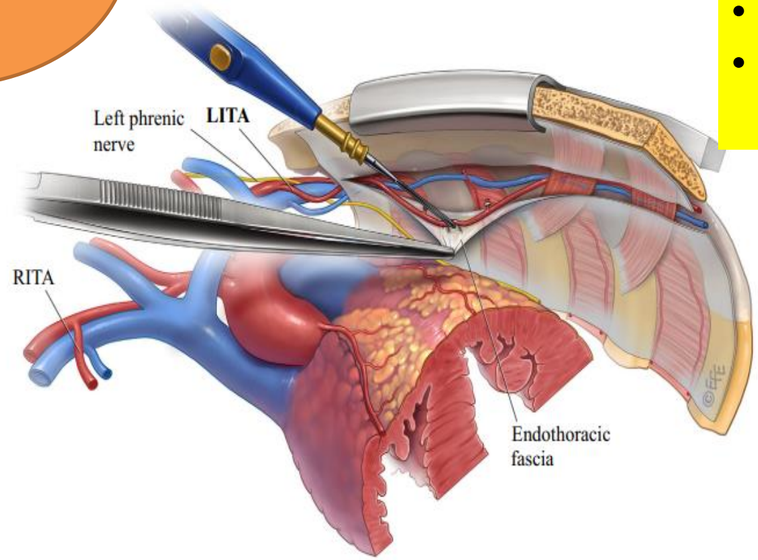


Pedicle
- 주위 근막, 정맥과 함께

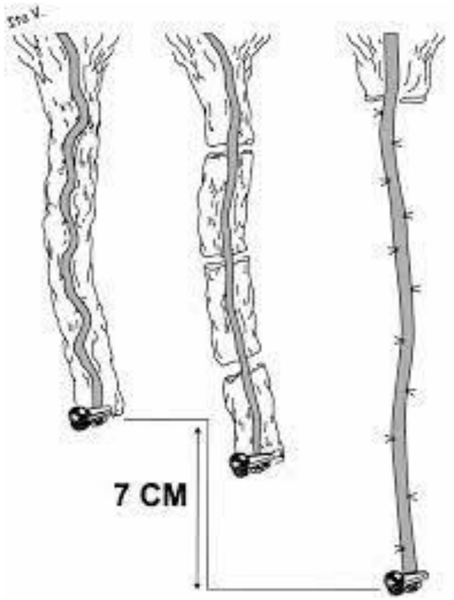


Harvesting technique of bypass conduit

Skeletonized
-동맥만



- Produced longer conduit
- Less disruption of sternal blood supply
- Advantageous for healing
- Enables accurate blood flow measurement

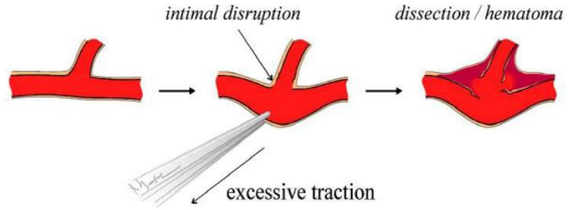


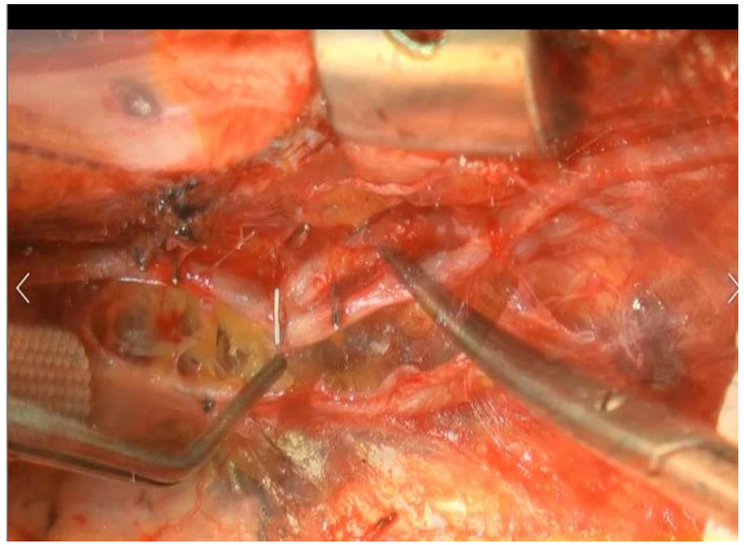
(Ann Thorac Surg 1999;68:406-12)

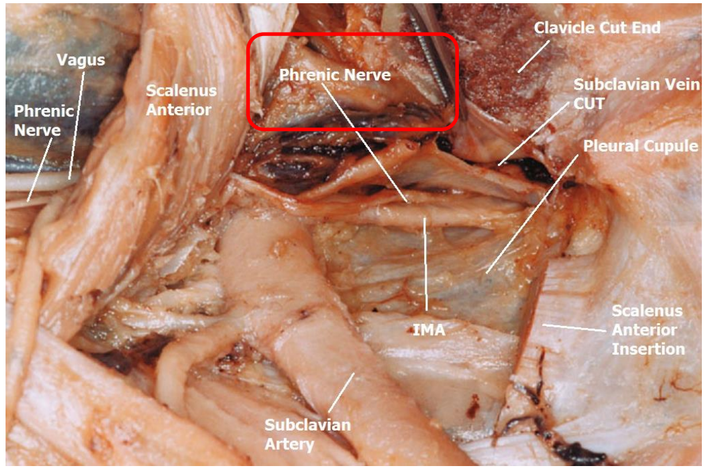
Harvesting technique of bypass conduit

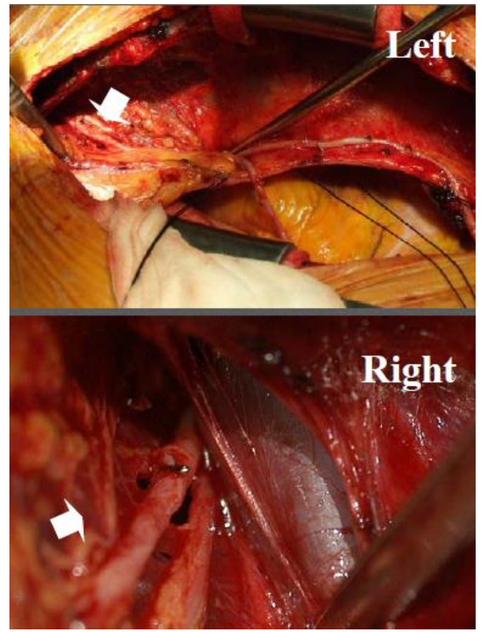
Skeletonized
-동맥만

Caution!!



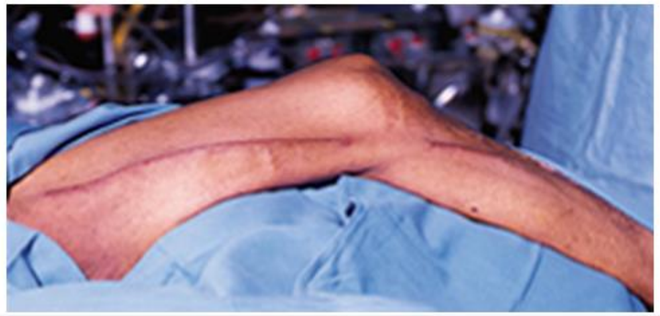


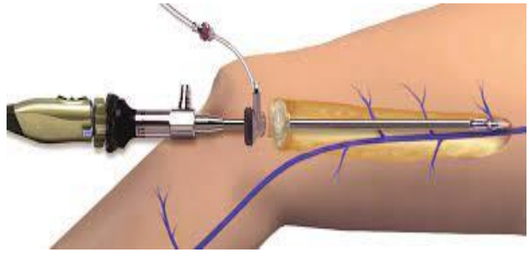


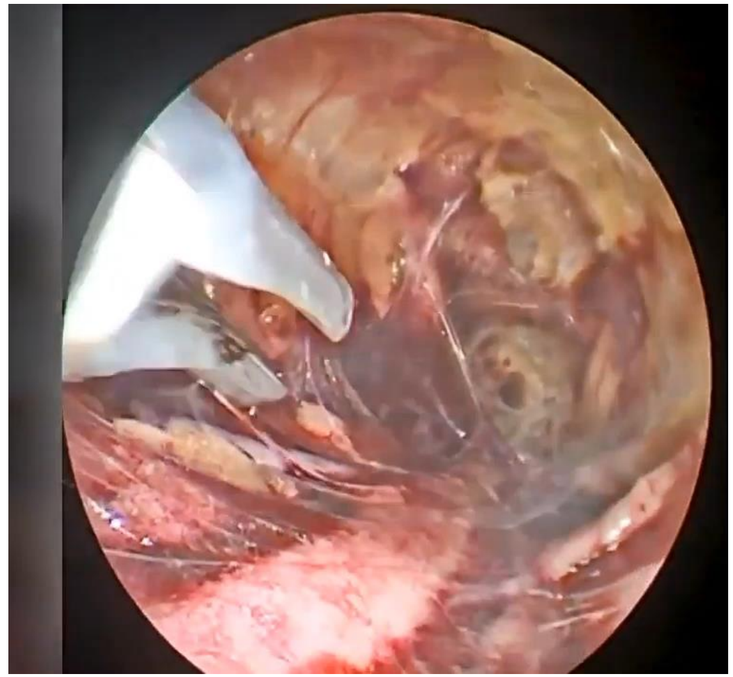


Harvesting technique of bypass conduit

Open Vessel Harvesting

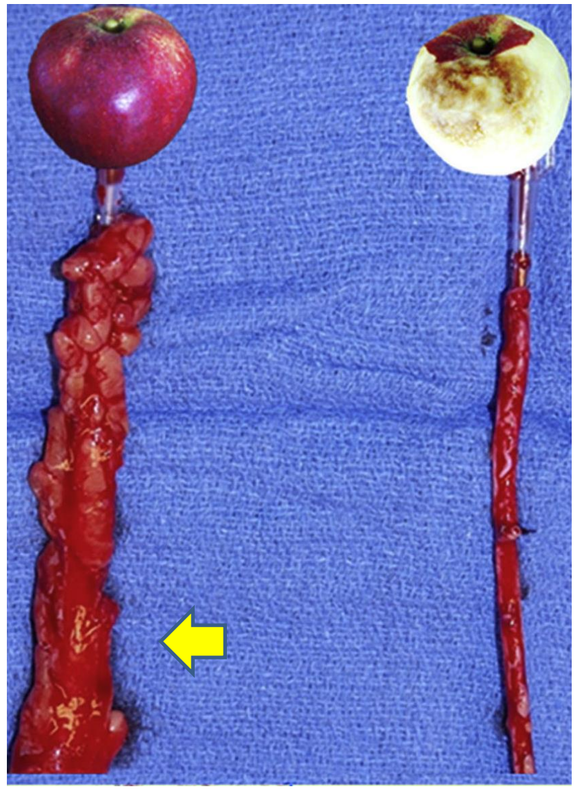






Endoscopic Vessel Harvesting

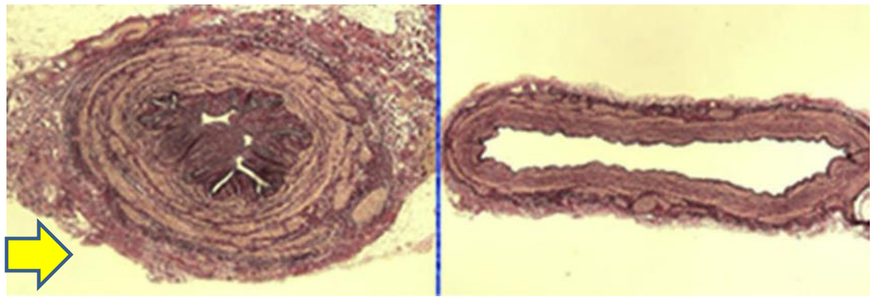
Harvesting technique of bypass conduit



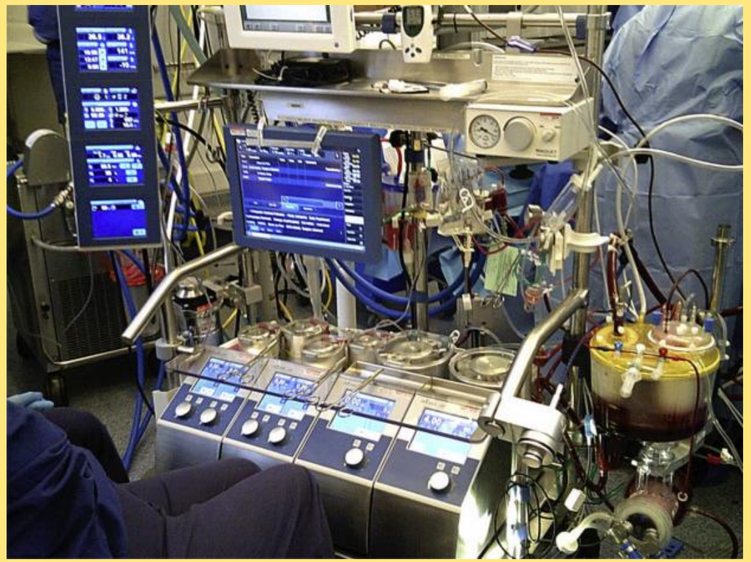
“ No touch technique “

=> harvesting with surrounding tissue

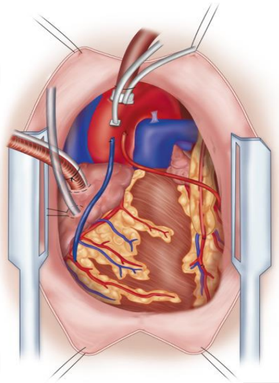
(“unpeeled apple”)

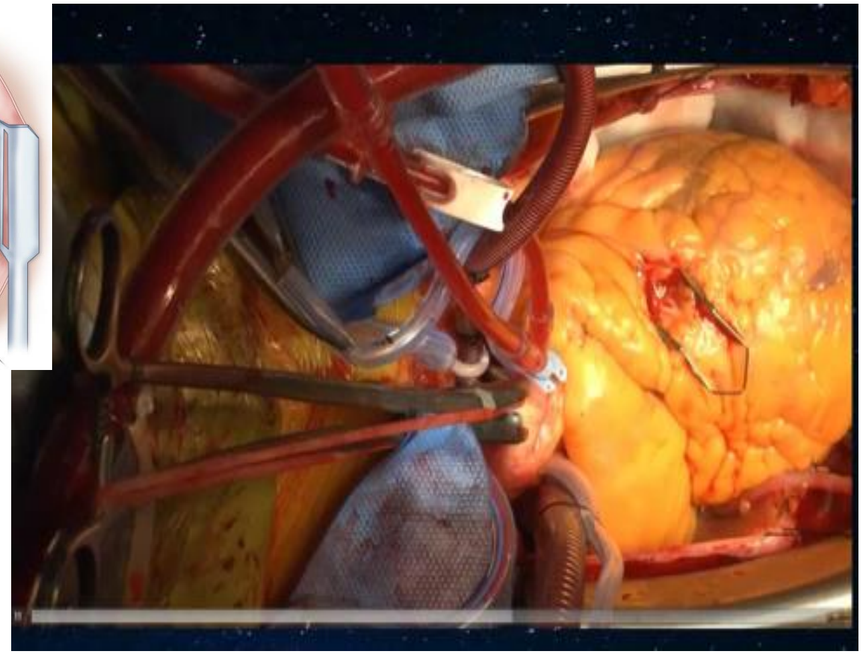


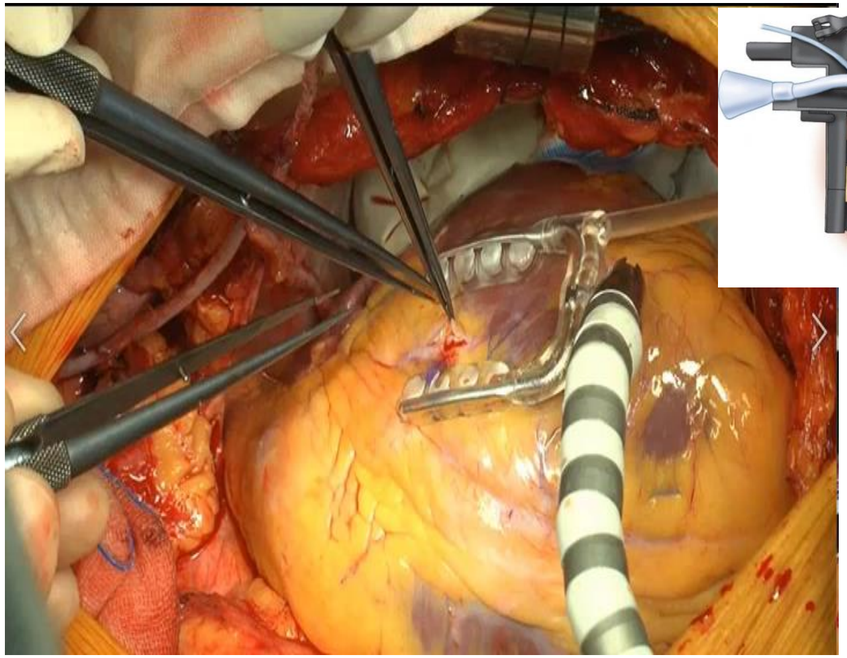
02 On-pump vs Off-pump



On-pump vs Off-pump CABG







On-pump CABG

Off-pump CABG

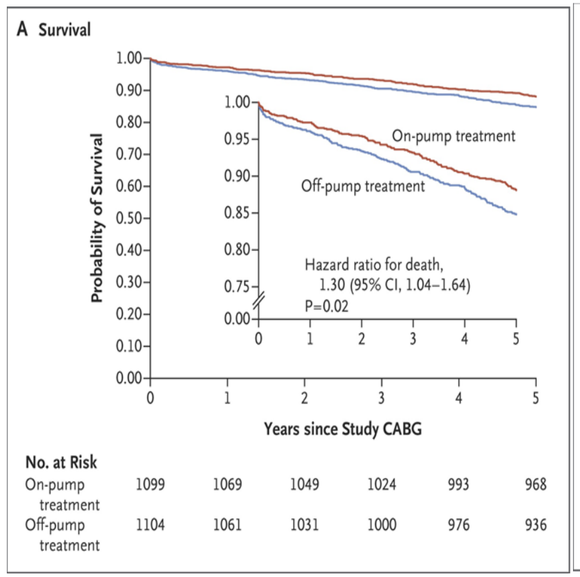
On-pump vs Off-pump CABG

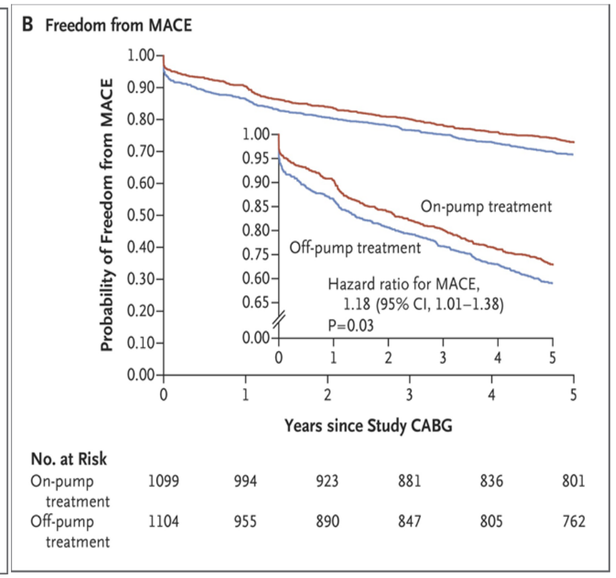
Favoring On-pump CABG	Favoring Off-pump CABG
• Less technically demanding • Shorter “ learning curve” • Possibly better long-term graft patency • Easier to graft posterior bypass targets • Probably more bypass graft constructed	• Probably less bleeding • Probably less renal dysfunction • Probably less short-term neurocognitive dysfunction, especially if **aorta is calcified** • Possibly shorter overall length of hospital stay

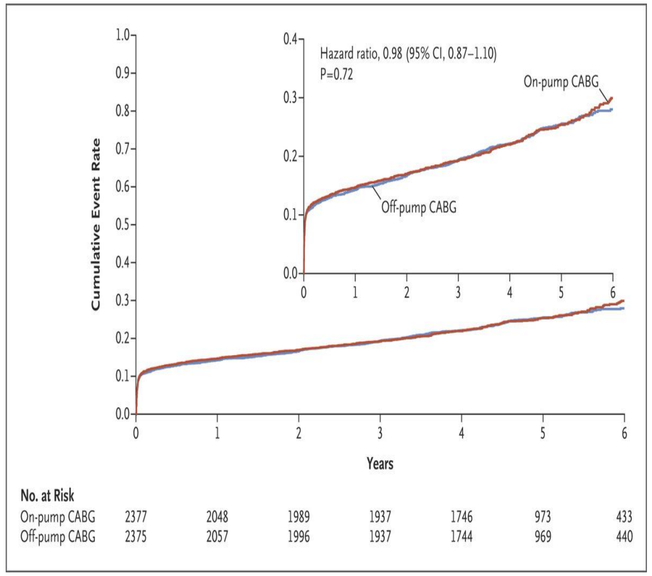
Key point!

- Stable vital sign during procedure
- More easily anastomosis

On-pump vs Off-pump CABG







ROOBY (Randomized On/Off bypass) trial
: On-pump better

CORONARY Investigator :
Similar on- and off- pump

On-pump vs Off-pump CABG

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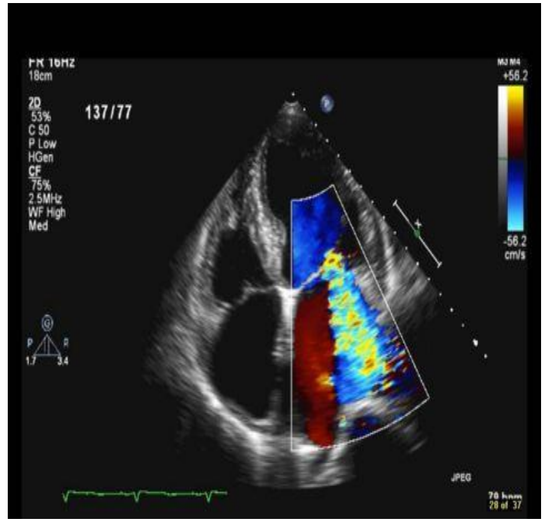
수술 중 OPCAB 에서 On-pump CABG로 conversion 해야 할 때는??

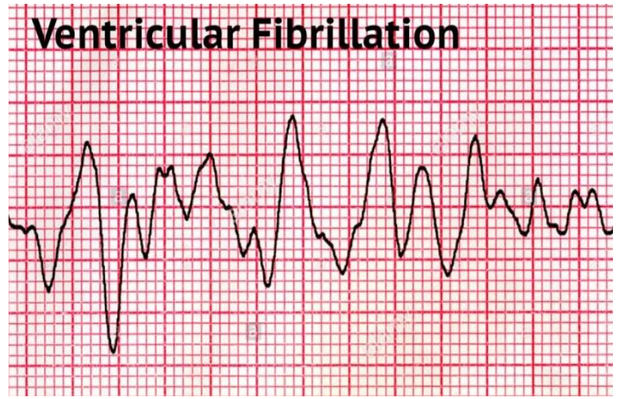
On-pump vs Off-pump CABG

Key point!

수술 중 OPCAB 에서 On-pump CABG로 conversion 해야 할 때는??
=> unstable vital sign (심정지, 심실성 부정맥 등
=> 주로 OM or PDA anastomosis 로 retraction시 주의

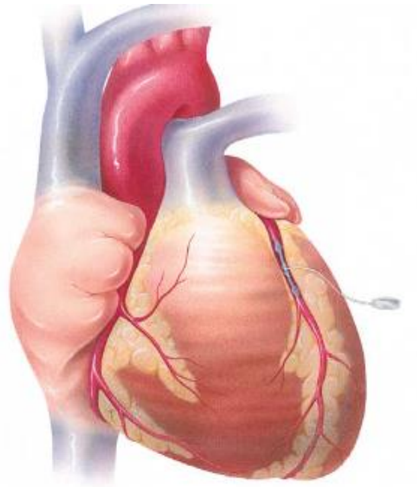
과도한 retraction으로 acute MR with pulmonary edema





Off-pump CABG tip! – LAD flow 유지

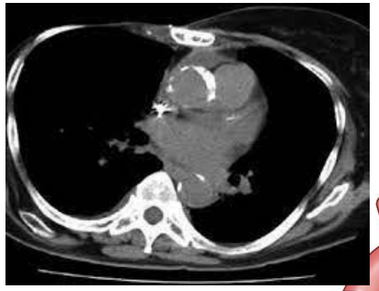
“LAD first “ –Intraluminal coronary shunt

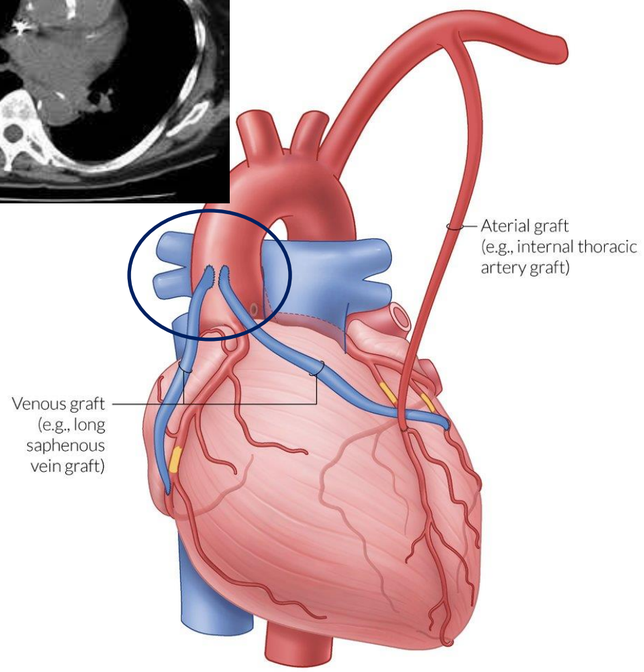


Easy Atraumatic Removal

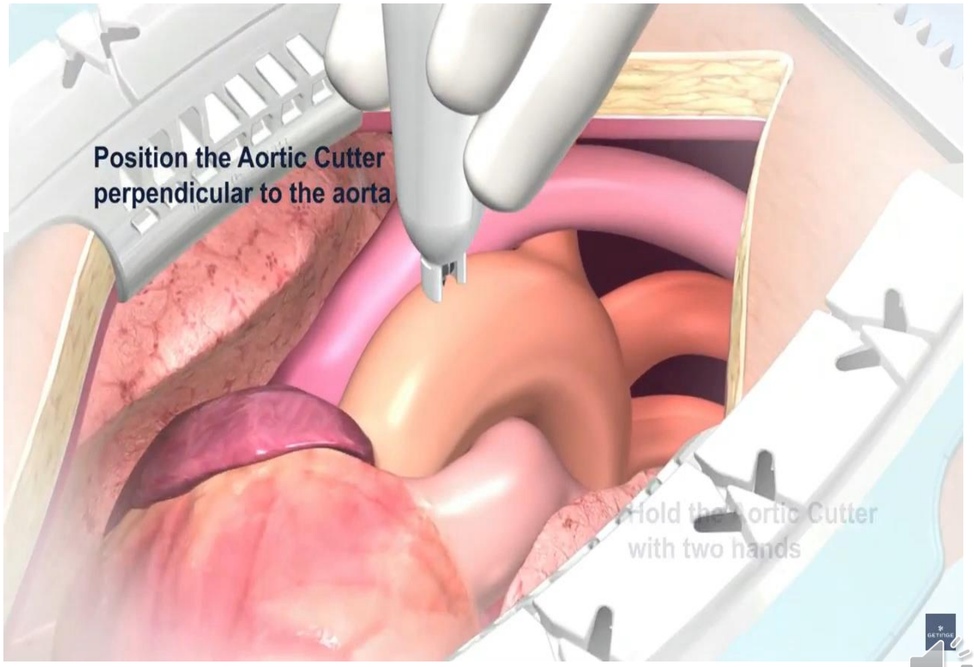
Off-pump CABG tip! – Calcified aorta

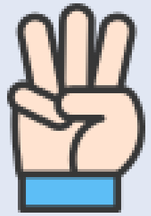
Vein graft 문합시 calcified aorta 여서 clamp가 위험한 경우??



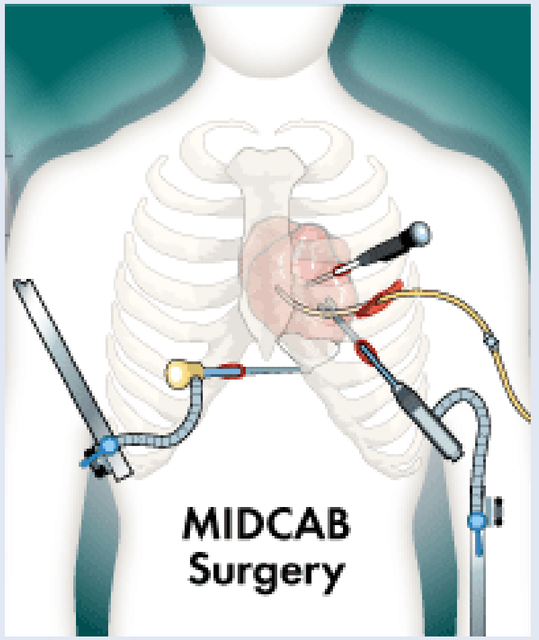


Heartstring III proximal seal system





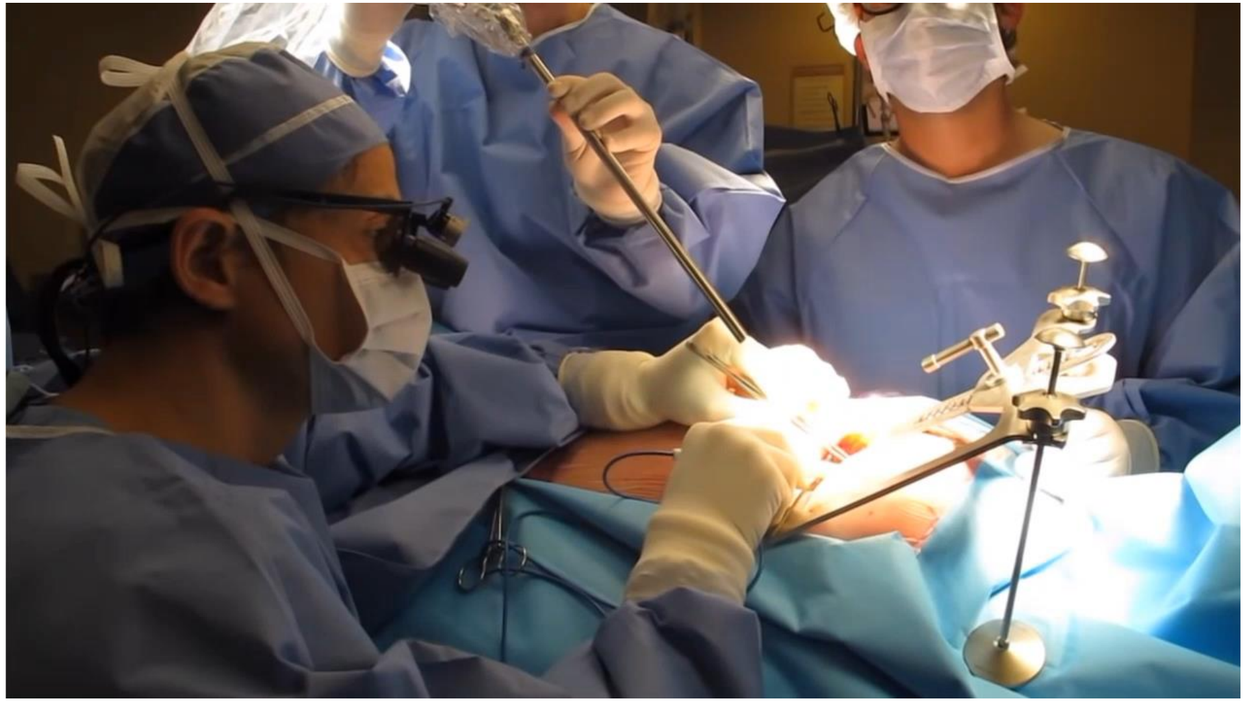
03 Minimal invasive CABG



Minimally invasive CABG (MIDAB)

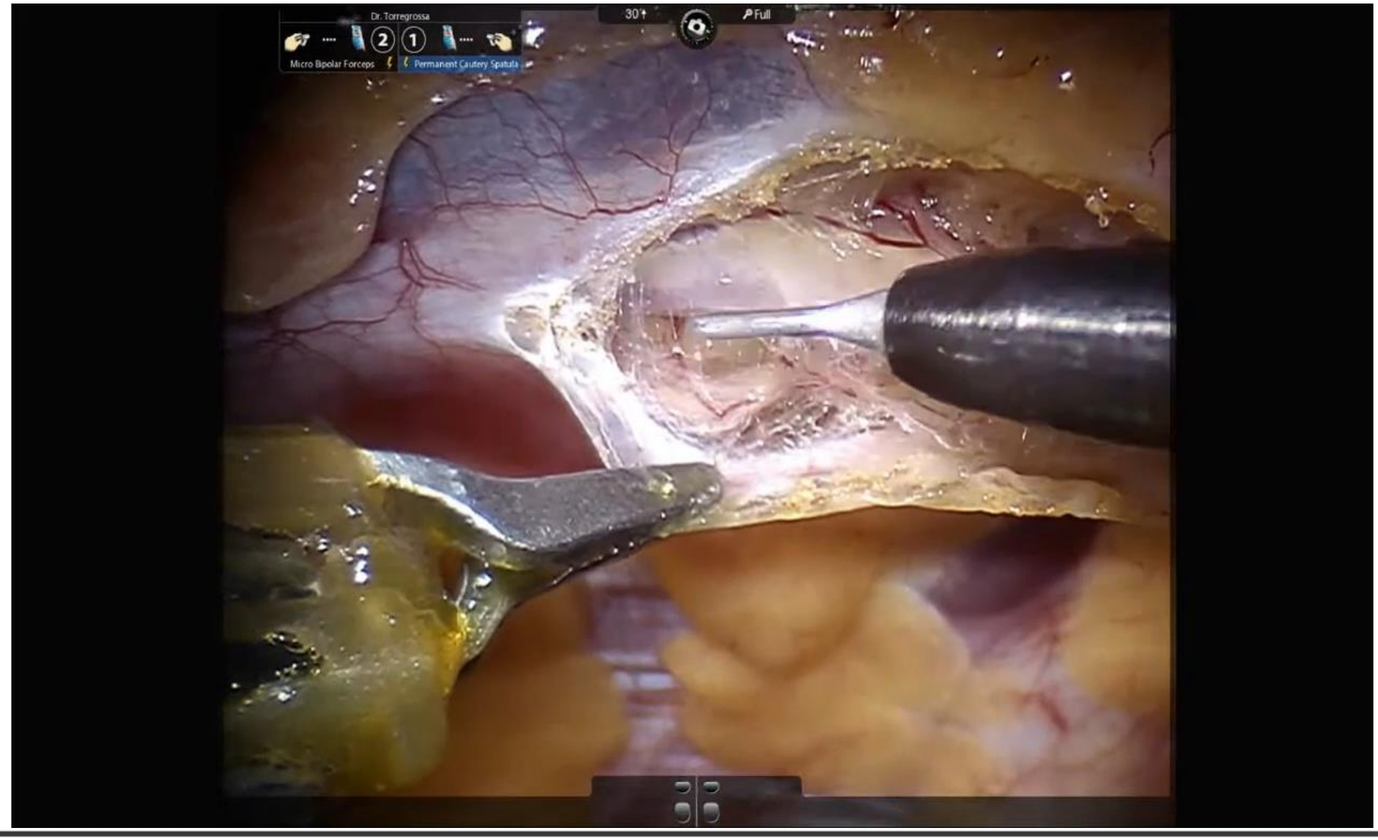
“ LITA (in-situ) to LAD “

Minimally invasive CABG using the Medtronic stabilization system requires much smaller incisions that cause less disruption to the body.



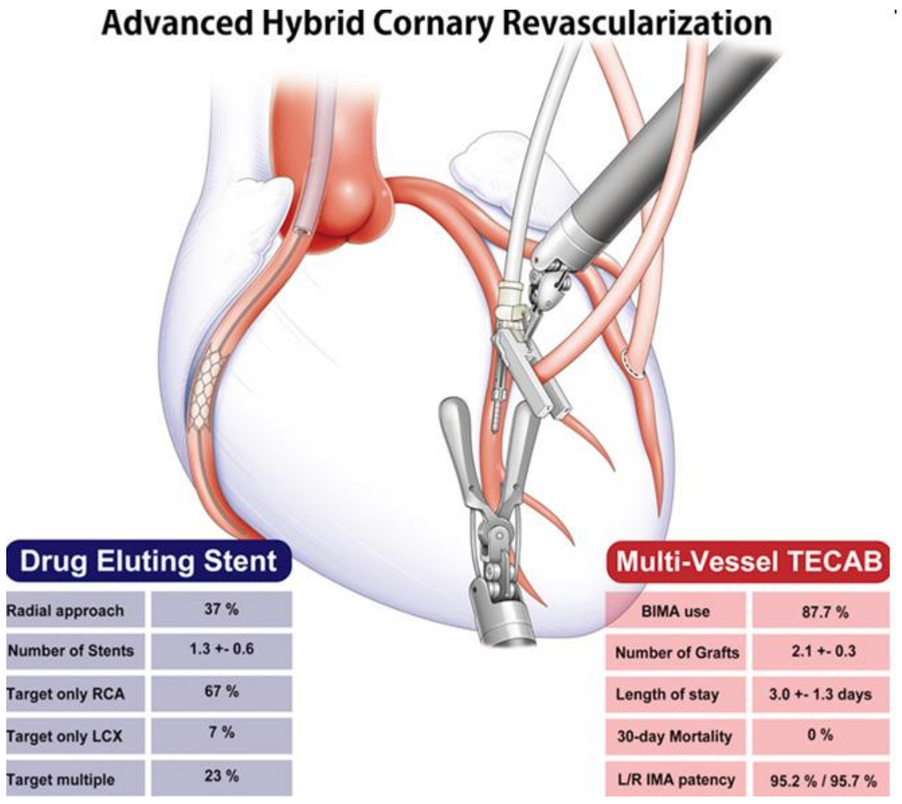
Robotic CABG

“ LITA (in-situ) to LAD “



Hybrid coronary revascularization (HCR)

- **LIMA** is best treatment for proximal **LAD disease**
- Long-term patency of vein or arterial grafts suboptimal and may be comparable to **DES**
- Patients and cardiologists interested in minimally invasive options



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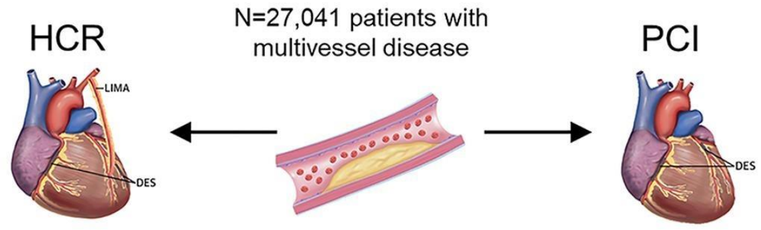
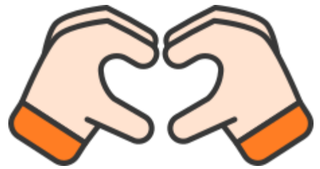
Hybrid Coronary Revascularization versus Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis



30-day mortality, myocardial infarction, target vessel revascularization, or stroke	**No difference**
Myocardial infarction at follow-up	**Favors HCR** OR 0.40, 95% CI 0.20-0.80
Target vessel revascularization at follow-up	**Favors HCR** OR 0.49, 95% CI 0.37-0.64
Mortality and stroke at follow-up	**No difference**

(IJC Heart &Vasculature 37(2021)100916)

강의를 마치겠습니다.

수고하셨습니다. 

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