Can thiệp qua đường mạch quay từ mô phỏng đến thực tiễn

TS.BS. Nguyễn Quốc Thái

Viện Tim mạch Việt Nam

Đại hội Tim Mạch toàn quốc lần thứ 13, Hạ Long 7-10/10/2012

Mô phỏng thực tế trong y học

Catheterization and Cardiovascular Interventions 51:522–527 (2000)

Equipment and Technology

Designing a Computer-Based Simulator for Interventional Cardiology Training

Steven L. Dawson,[1*] MD, Stephane Cotin,[1,2] PhD, Dwight Meglan,[2,3] PhD, David W. Shaffer,[1] PhD, and Margaret A. Ferrell,[4] MD

Interventional cardiology training traditionally involves one-on-one experience following a master-apprentice model, much as other procedural disciplines. Development of a realistic computer-based training system that includes hand-eye coordination, catheter and guide wire choices, three-dimensional anatomic representations, and an integrated learning system is desirable, in order to permit learning to occur safely, without putting patients at risk. Here we present the first report of a PC-based simulator that incorporates synthetic fluoroscopy, real-time three-dimensional interactive anatomic display, and selective right- and left-sided coronary catheterization and angiography using actual catheters. Significant learning components also are integrated into the simulator. *Cathet. Cardiovasc. Intervent. 51:522–527, 2000.*

Key words: simulation; training; interventions; computer-based education; haptics

Đào tạo trên mô hình

Approval of Virtual Reality Training for Carotid Stenting

What This Means for Procedural-Based Medicine

Anthony G. Gallagher, PhD
Christopher U. Cates, MD

SPECIAL COMMUNICATION

Clinical competence statement on carotid stenting: Training and credentialing for carotid stenting—multispecialty consensus recommendations

A Report of the SCAI/SVMB/SVS Writing Committee to Develop a Clinical Competence Statement on Carotid Interventions

INTRODUCTION

RATIONALE FOR A TRAINING AND CREDENTIALING STATEMENT IN CAROTID STENTING

Virtual Simulator is getting recognized

Paper to prove effectiveness

Approval of Virtual Reality Training for Carotid Stenting

What This Means for Procedural-Based Medicine

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by experienced physicians during an actual clinical procedure.

training on patients has raised concern
ion and the public about how physicians
ient skill to safely perform new, poten-
idovascular procedures such as carotid

SPECIAL COMMUNICATION

Clinical competence
stenting: Training an
stenting—multispeci
recommendations

A Report of the SCAI/SVMB/
Clinical Competence Statemen

INTRODUCTION

Percutaneous carotid intervention with distal
protection is a rapidly emerging field that is being i
rated into interventional cardiovascular, vascular
vascular medicine, and interventional radiology p
The recently published SAPPHIRE trial has est
carotid stenting in high-surgical risk patients as an
alternative to carotid endarterectomy.[1]

Contemporary techniques for carotid stenting
bolic protection were developed by multiple sp
including interventional cardiologists, vascular su
interventional radiologists, and vascular medicine
ists, transferring technology, interventional skills,
junctive medical therapies perfected in their coron
peripheral vascular experience.[1-5]

Cardiologists, as board-certified cardiovascu
cialists, have recognized the systemic nature of
sclerotic disease and appropriately taken an incr
active role in the management of noncardiac
diseases, including stroke prevention. Compre
and coordinated management of cardiovascular
(both cardiac and noncardiac) has become the s
of care in contemporary clinical and intervention
tice. Vascular surgeons have traditionally perform

Competition of interest: none.

This document was approved by the Society for Cardiovascular An
and Interventions Board of Trustees in September 2004, the S
Vascular Surgery Board of Trustees in October 2004, and the S
Vascular Medicine and Biology Board of Trustees in October 2
document was endorsed by the American College of Cardiolog
tion Board of Trustees in October 2004. This document was en
the Society for Clinical Vascular Surgery Executive Council in
2004.

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0741-5214/$30.00

doi:10.1016/j.jvs.2004.12.009

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From the Society for Vascular Surgery

Computer simulation as a component of catheter-based training

Rajeev Dayal, MD, Peter L. Faries, MD, Stephanie C. Lin, MD, Joshua Bernheim, MD, Scott Hollenbeck, MD, Brian DeRubertis, MD, Susan Trocciola, MD, Jason Rhee, BA, James McKinsey, MD, Nicholas J. Morrissey, MD, and K. Craig Kent, MD, *New York, NY*

Introduction: Computer simulation has been used in a variety of training programs, ranging from airline piloting to general surgery. In this study we evaluate the use of simulation to train novice and advanced interventionalists in catheter-based techniques.

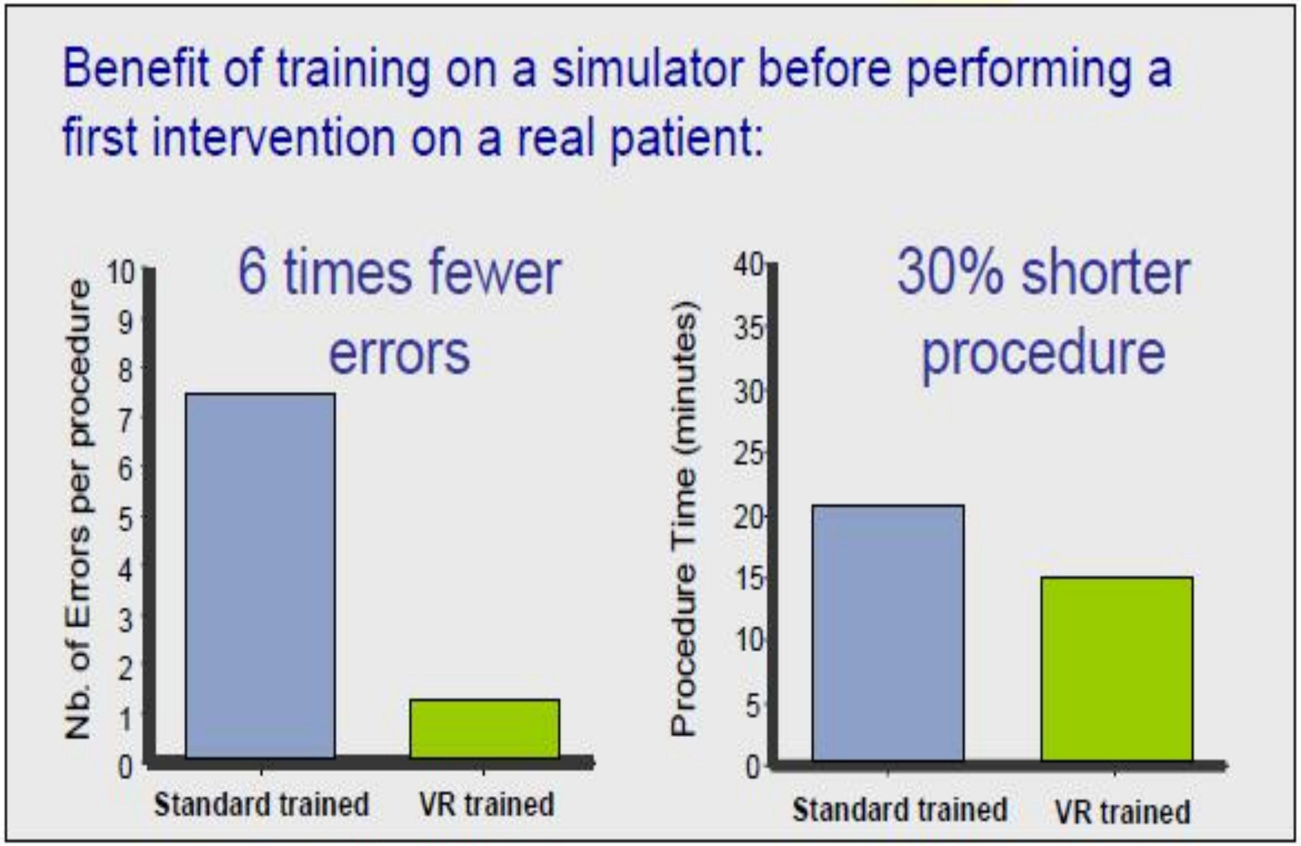
Methods: Twenty-one physicians underwent evaluation in a simulator training program that involved placement of a carotid stent. Five participants were highly experienced in catheter-based techniques (>300 percutaneous cases), including carotid angioplasty and stenting (CAS); the remaining 16 participants were interventional novices (<5 percutaneous cases). The Procedicus VIST simulator, composed of real-time vascular imaging simulation software and a tactile interface coupled to angiographic catheters and guide wires, was used. After didactic instruction regarding CAS and use of the simulator, each participant performed a simulated CAS procedure. The participant's performance was supervised and evaluated by an expert interventionalist on the basis of 50 specific procedural steps with a maximal score of 100. Specific techniques of guide wire and catheter manipulation were subjectively assessed on a scale of 0 to 5 points based on ability. After evaluation of the initial simulated CAS procedure, each participant received a minimum of 2 hours of individualized training by the expert interventionalist, with the VIST simulator. Each participant then performed a second simulated CAS procedure, which was graded with the same scale. After completion, participants assessed the training program and its utility via survey questionnaire.

Results: The average simulated score for novice participants after the training program improved significantly from 17.8 ± 15.6 to 69.8 ± 9.8 ($P < .01$), time to complete simulation decreased from 44 ± 10 minutes to 30 ± 8 minutes ($P < .01$), and fluoroscopy time decreased from 31 ± 7 minutes to 23 ± 7 minutes ($P < .01$). No statistically significant difference in score, total time, or fluoroscopy time was noted for experienced interventionalists. Improvement was noted in guide wire and catheter manipulation skills in novices.. Analysis of survey data from experienced interventionalists indicated that the simulated clinical scenarios were realistic and that the simulator could be a valuable tool if clinical and tactile feedback were improved. Novices also thought the simulated training was a valuable experience, and desired further training time.

Conclusions: An endovascular training program using the Procedicus VIST haptic simulator resulted in significant improvement in trainee facility with catheter-based techniques in a simulated clinical setting. Novice participants derived the greatest benefit from simulator training in a mentored program, whereas experienced interventionalists did not seem to derive significant benefit. (J Vasc Surg 2004;40:1112-7.)

Since 2003, the EAES has started to offer a CME-accredited training course that uses a simulator that was built and designed to their specification.

Đào tạo trên mô hình trong y học



Gallagher et al. Ann Surg 2002; 236: 458-63

Ưu điểm của đào tạo trên mô hình

- ✓ Không gây nguy cơ cho bệnh nhân và không gây áp lực cho người thực hành
- ✓ Có thể thực hiện lại trên nhiều ca và các tình huống khác nhau.
- ✓ Thực hành đến khi đạt được mức an toàn và nhanh
- ✓ Đánh giá mục tiêu cần đạt
- ✓ Linh hoạt trong thiết lập các chương trình đào tạo

TRI Computer Simulator

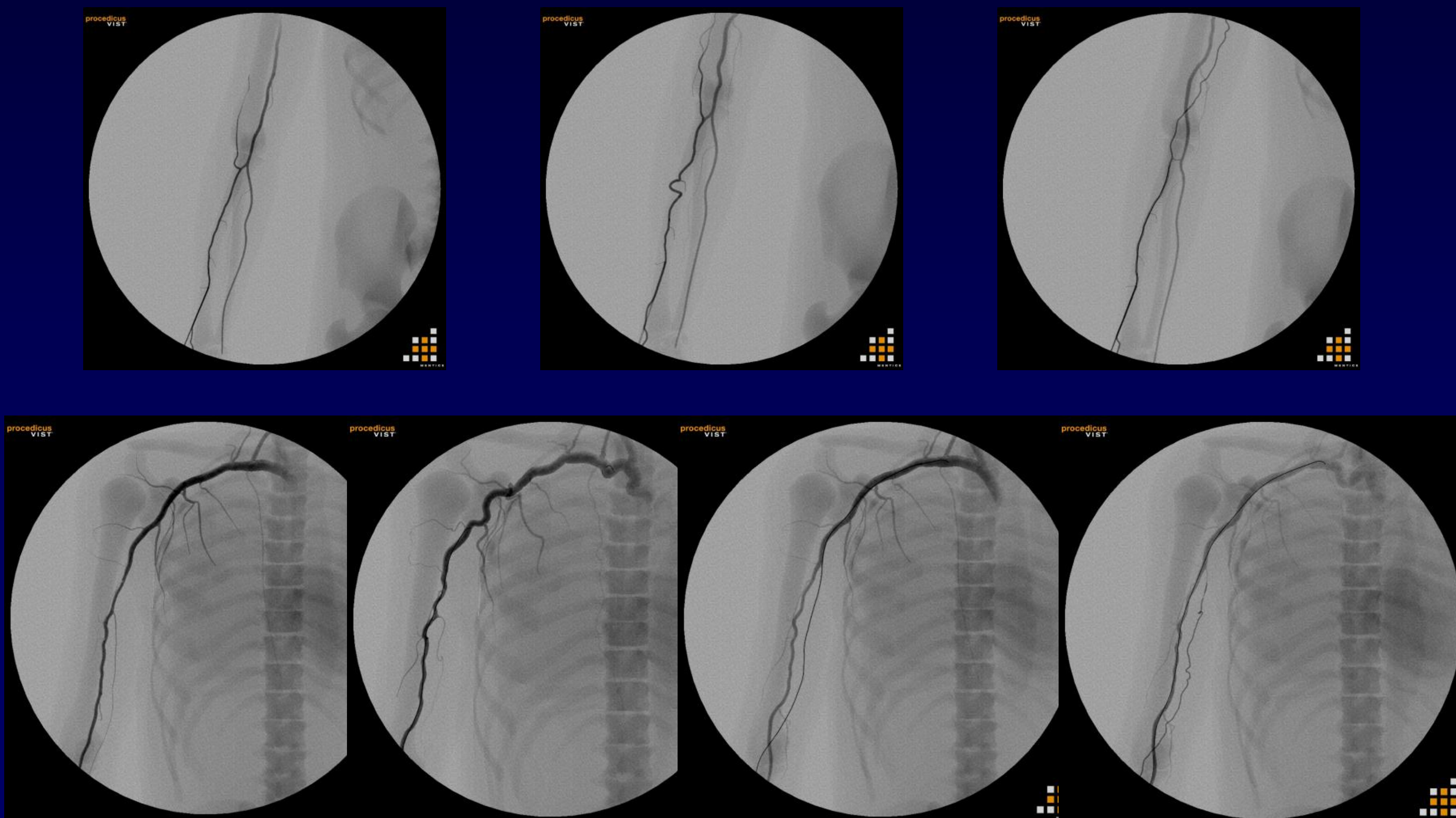
The first virtual simulator dedicates for TRI training

Lý do thực hành can thiệp qua đường mạch quay trên mô hình

- ✓ Qua đường mạch quay trong chẩn đoán và can thiệp tim mạch giảm thiểu biến chứng tại vị trí chọc mạch đặc biệt ở những BN nguy cơ cao và đem lại sự thoải mái cho BN.
- ✓Tuy nhiên can thiệp qua đường ĐM quay khó hơn qua đường ĐM đùi nên cần có sự đào tạo từng bước
- ✓Một số biến chứng nặng có thể sảy ra do thiếu kinh nghiệm.

To learn safe transradial approach

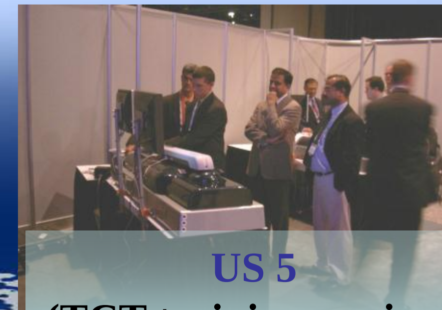
→ include variety of anatomies



32 simulators are active in the world

EU 6
(PCR training session)

Japan 7
(In hospital training etc)



US 5
(TCT training session)

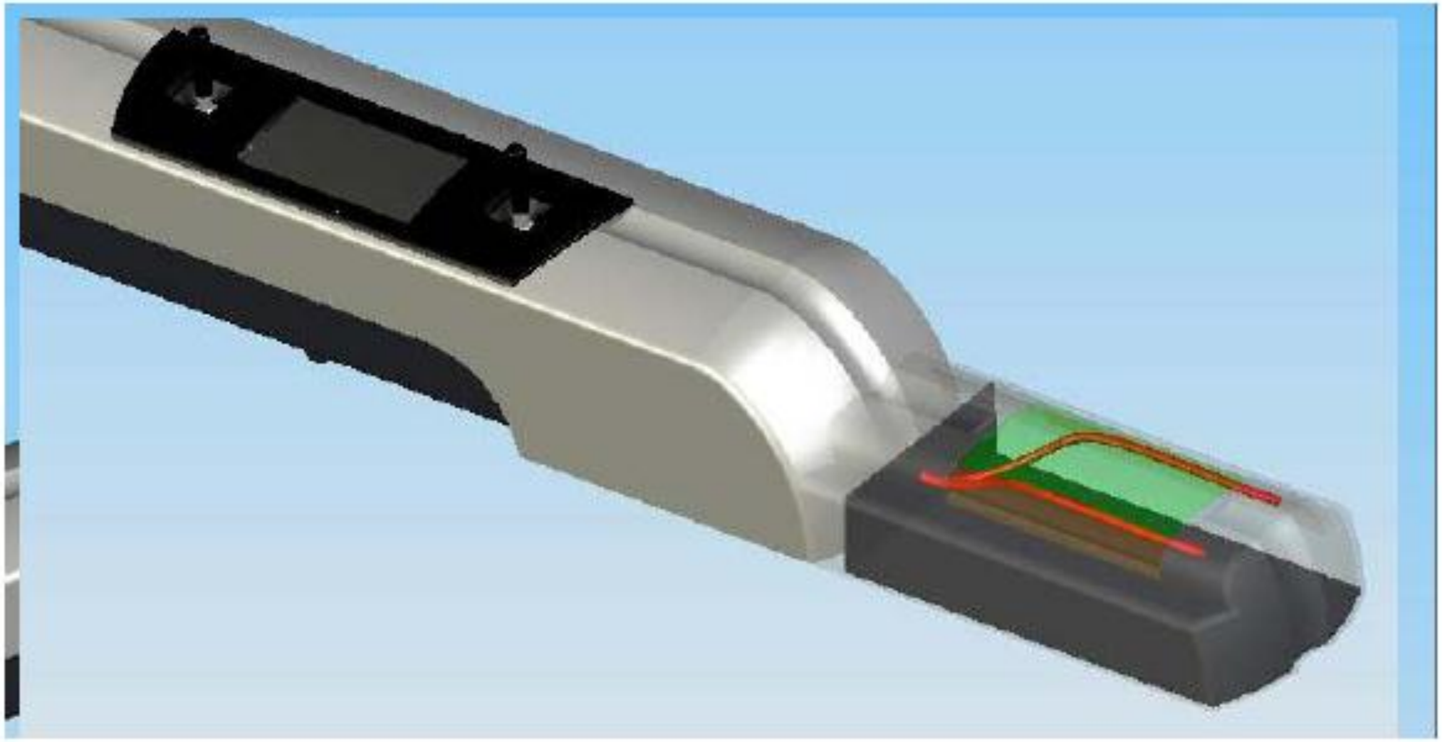
Asia 4, China 3, Mid East 4, Latin America 3
Safe TRI procedure

- **Fellows, TRI beginners training**
- **Inter company training (Sales, engineers …)**

Cấu tạo mô hình can thiệp qua đường ĐM quay

TRI Simulator Features

1. Puncture: pulsatile air compressed flow



TRI Simulator Features

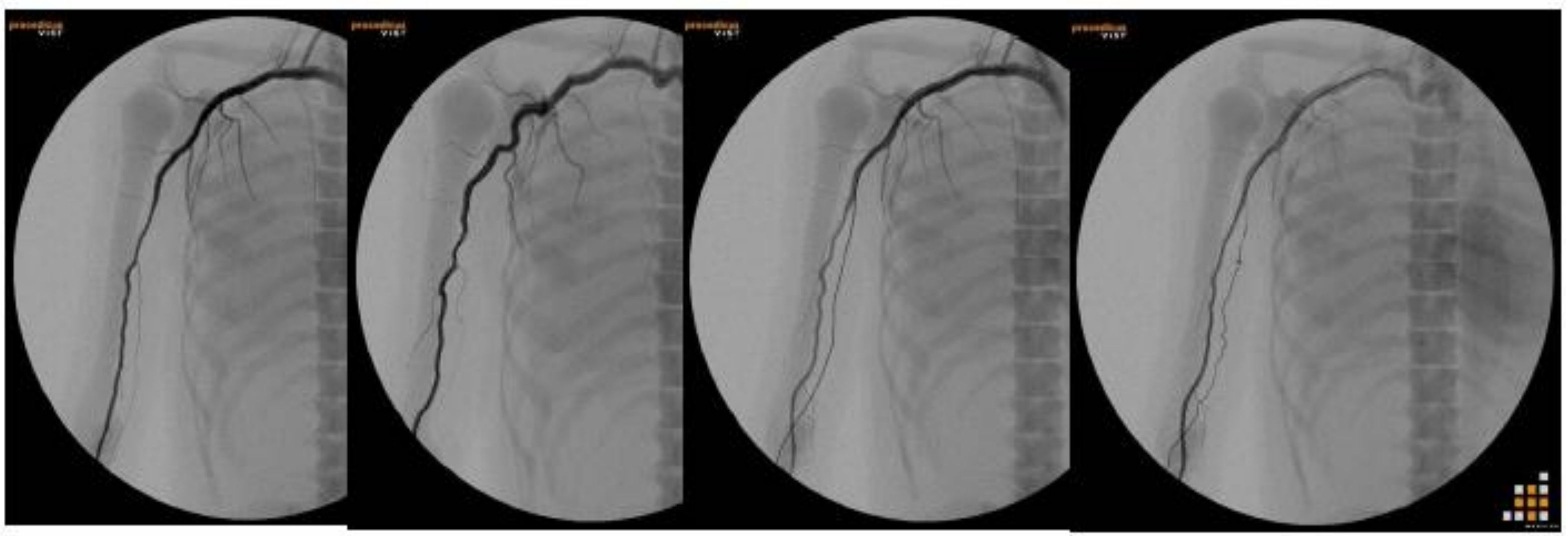
Different radial anatomies

To learn typical difficulties with TRA

TRI Simulator Features

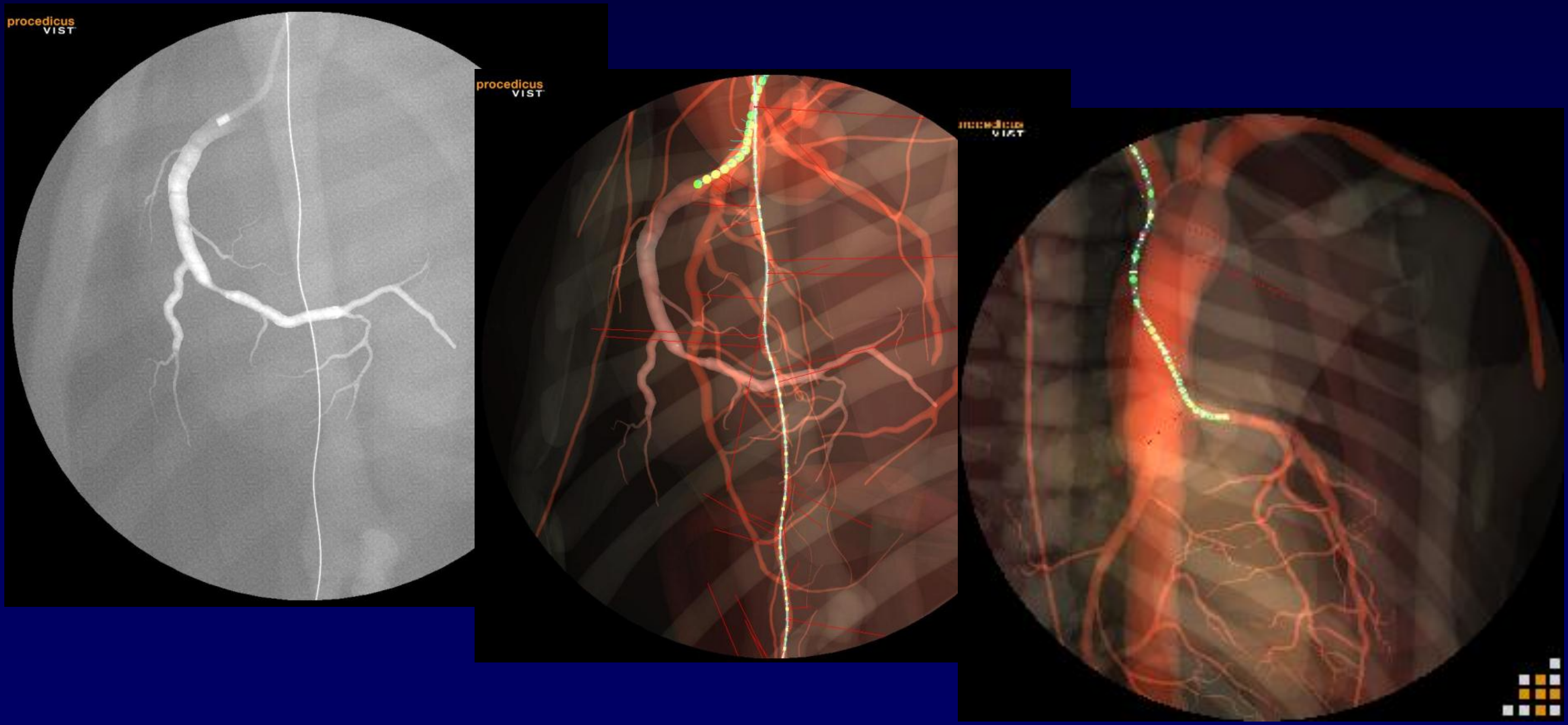
Different humeral and axillary anatomies

To learn typical difficulties with TRA



Hai dạng hình ảnh (Cine and 3D)

Học cách nhìn các góc độ và vị trí hỗ trợ của Guiding Catheter



VR TRI Simulator by TERUMO®

Easy to use, close to the real world PCI

Journal | Table/Fluoro | Tool Selection | Cineloop | Roadmap | About | Exit

CASE 1
TRANSRADIAL APPROACH

PATIENT DESCRIPTION

Patient ID:	VIST TERCI001
Age:	42 years
Gender:	Male
Height:	69.3 in, 176 cm
Weight:	209 lbs, 78kg

RISC FACTORS WITH PROCEDURE

Current smokers,
Hypercholesterolemia

CLINICAL PRESENTATION

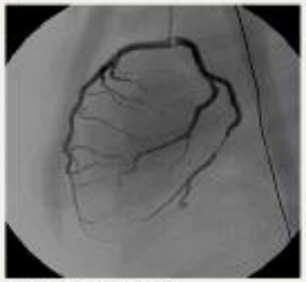
De novo angina pectoris, during effort 3 times during the 2 last weeks, spontaneous chest pain after diner last night, lasting 10 minutes. Cardiologist consultation this morning: negative T wave in V5-V6 ECG leads, Troponin I = 4.2 ng/ml

Clinical examination normal

Angiography showed a LCX lesion

Projection 1 AP

Projection 2 RAO 30

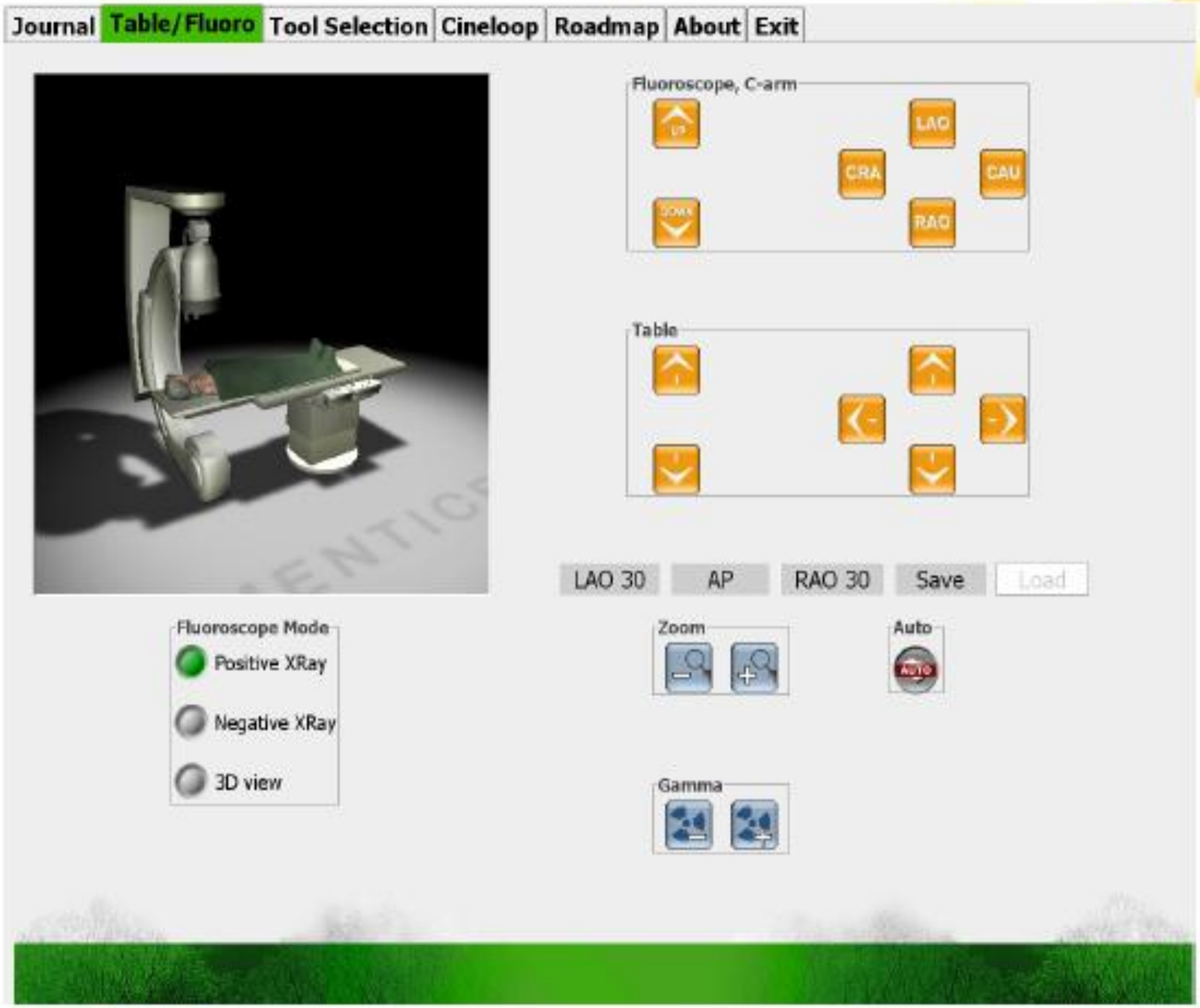


Projection 3 LAO 90

TRY the TRI

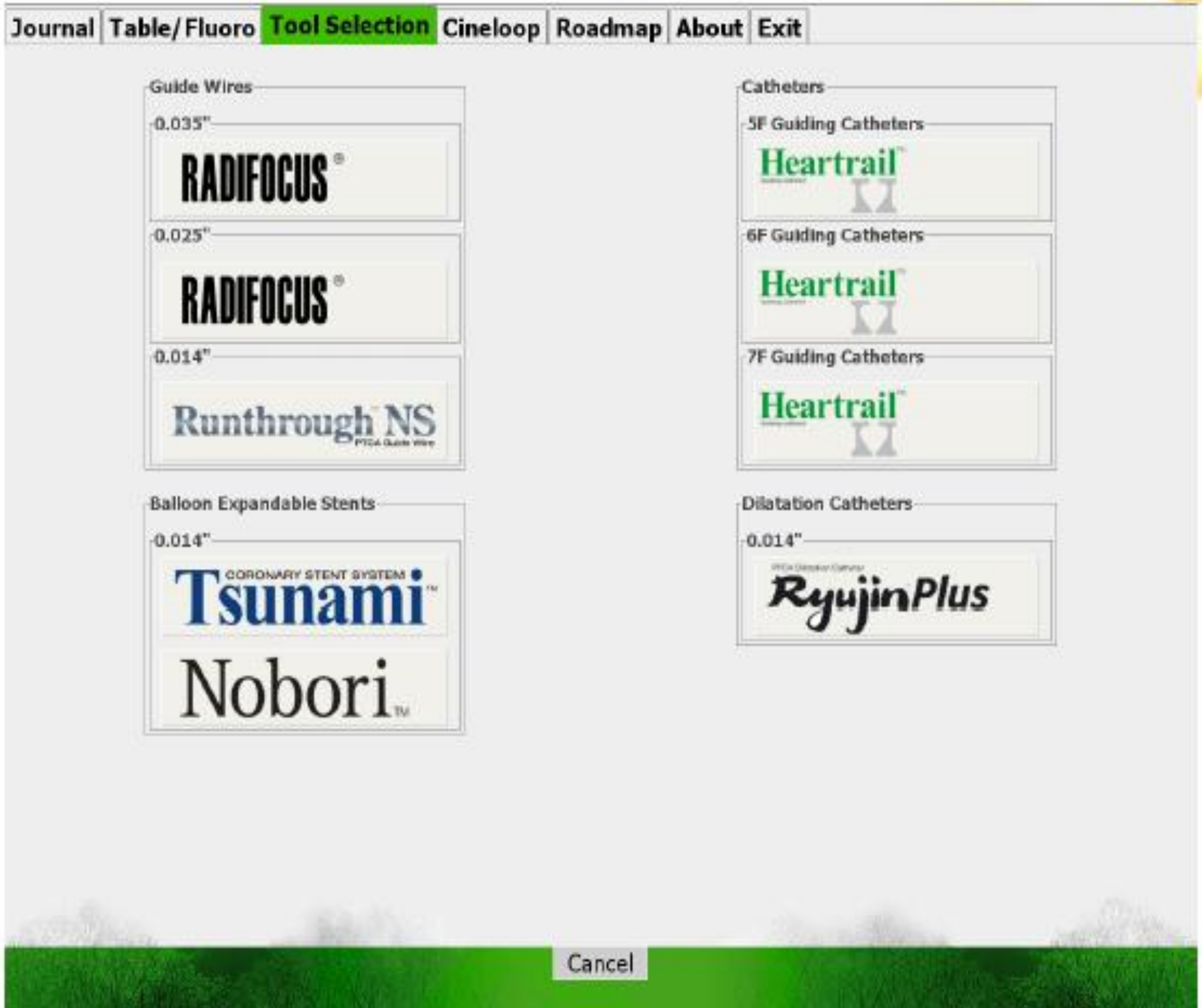
TERUMO®

VR TRI Simulator by TERUMO®



TERUMO® Contributing to Society Through Healthcare

VR TRI Simulator by TERUMO®



Những hạn chế của mô hình

✓ Ống thông can thiệp nhìn mềm hơn so với thực tế

Hãy:

✓ Đưa các dụng cụ chậm

✓ Không rút bằng tay phải

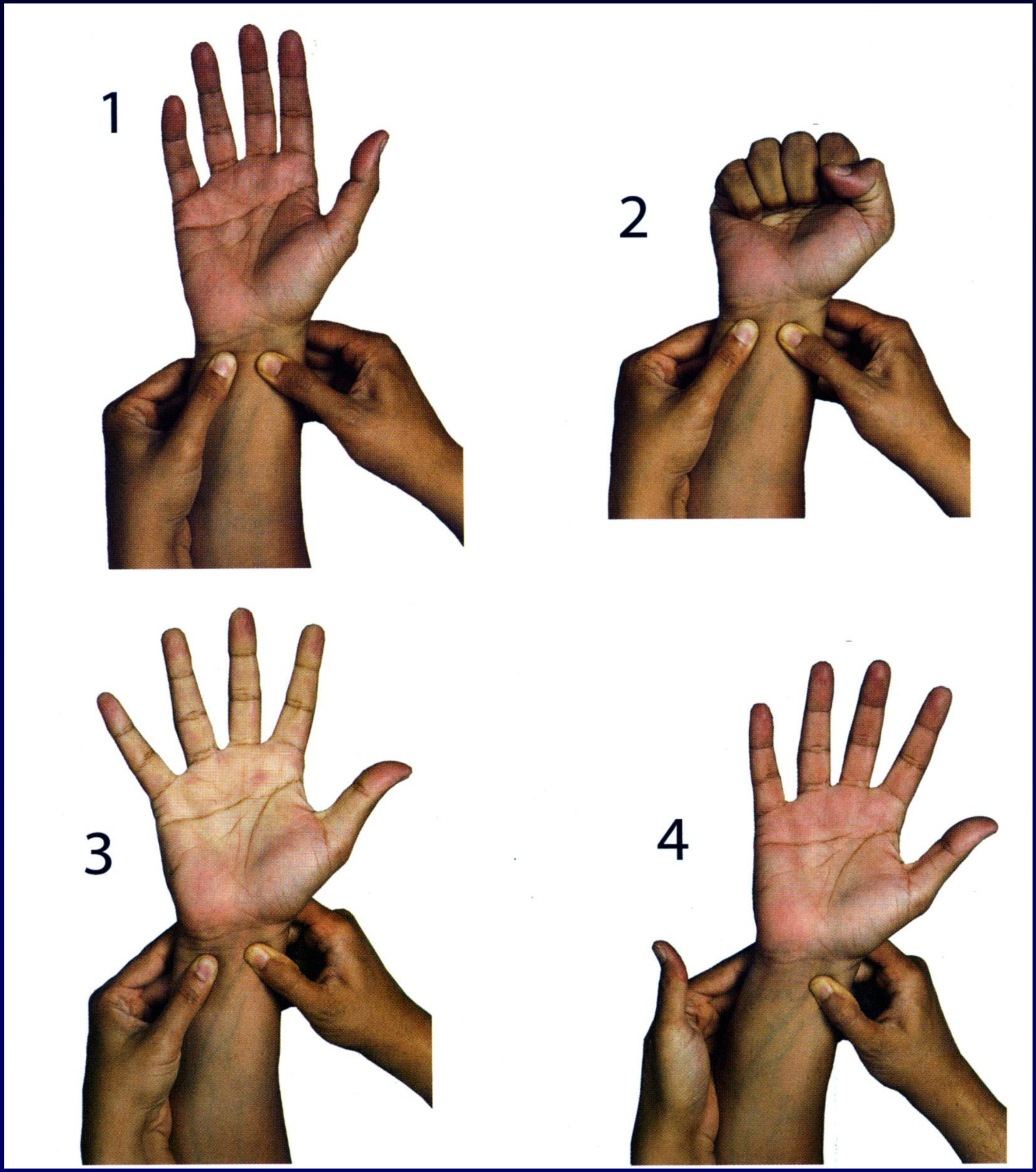
✓ Không đưa 0.014” GW đến tận cùng mạch máu để tránh biến chứng

TRI basic tips & tricks

Các bước chuẩn bị cho can thiệp qua đường ĐM quay

- Allen’s test
- Giải phẫu của ĐM dưới đòn và ĐM cảnh?
- Kiểm tra HA hai tay có khác biệt?
- Phân tích các sai số có thể gặp sau này?
- Khả năng dùng ĐM quay cho CABG?
- Nếu cần dùng Guiding catheter hỗ trợ tốt hơn?
- Raynaud’s Disease

Allen's test



（PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics）

Positive：

The normal palm color return within <u>5sec</u>

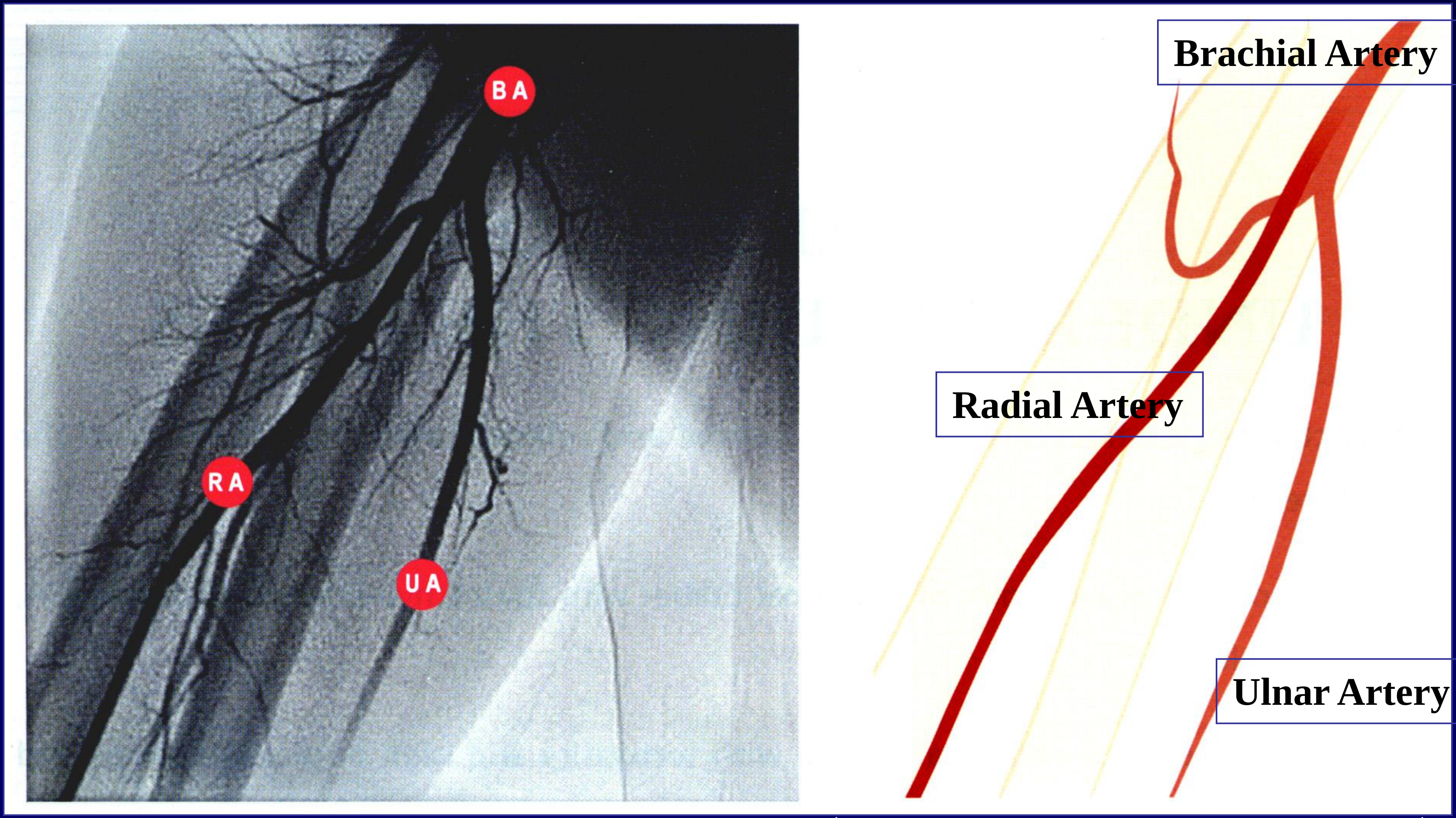
Negative (Borderline) :

The normal palm color return within <u>5sec – 9Sec</u>

Negative :

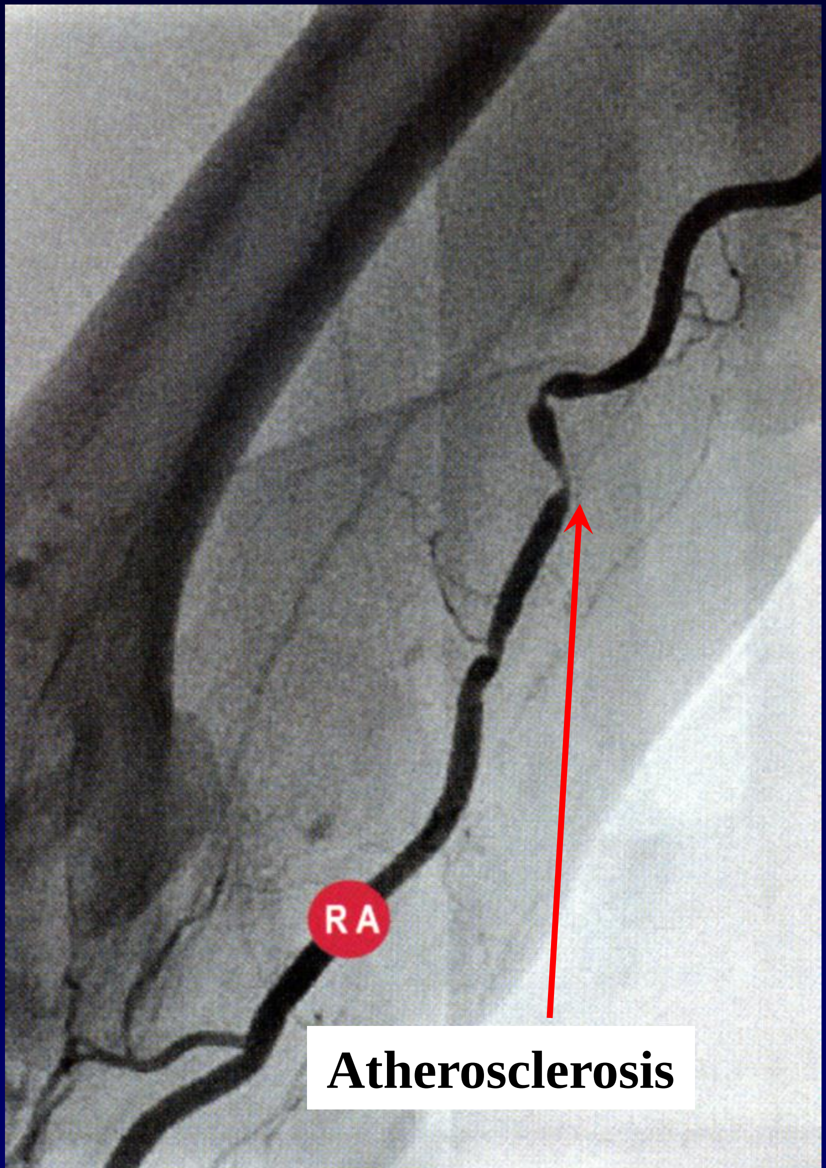
The normal palm color return within more than <u>10 min.</u>

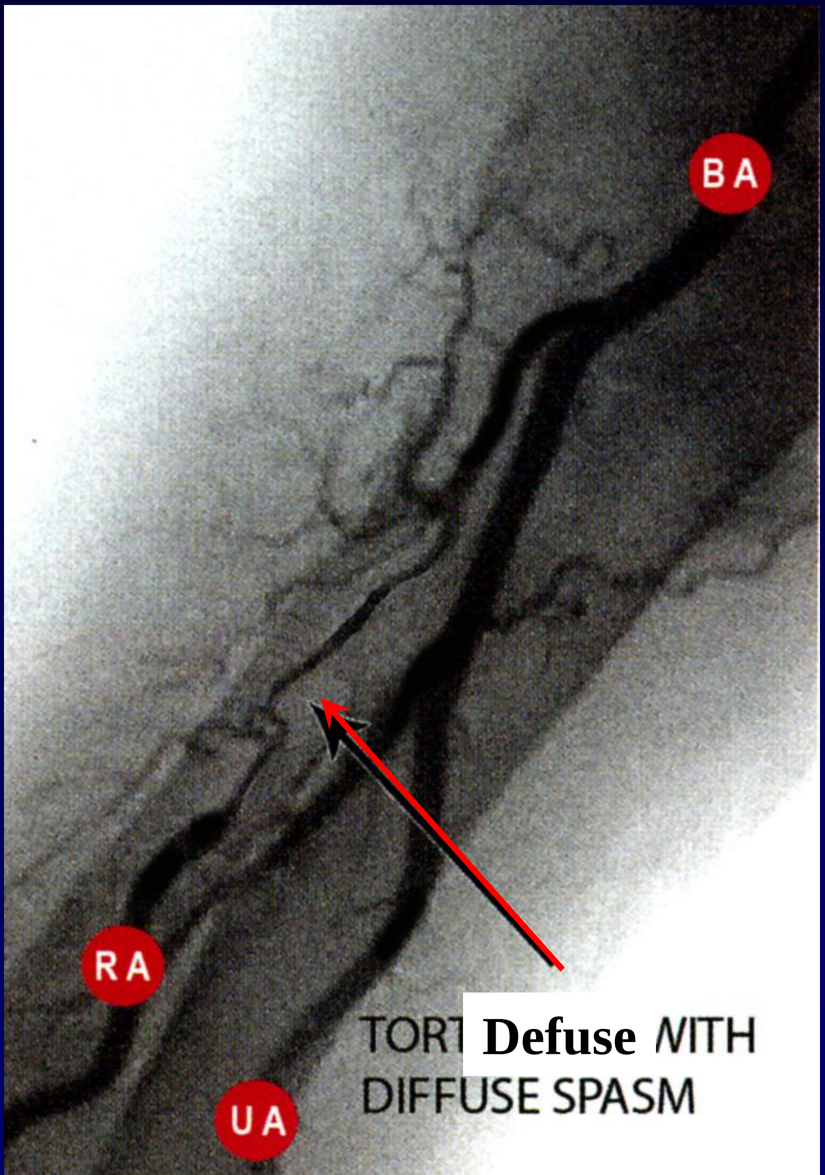
Giải phẫu ĐM quay



（PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics）

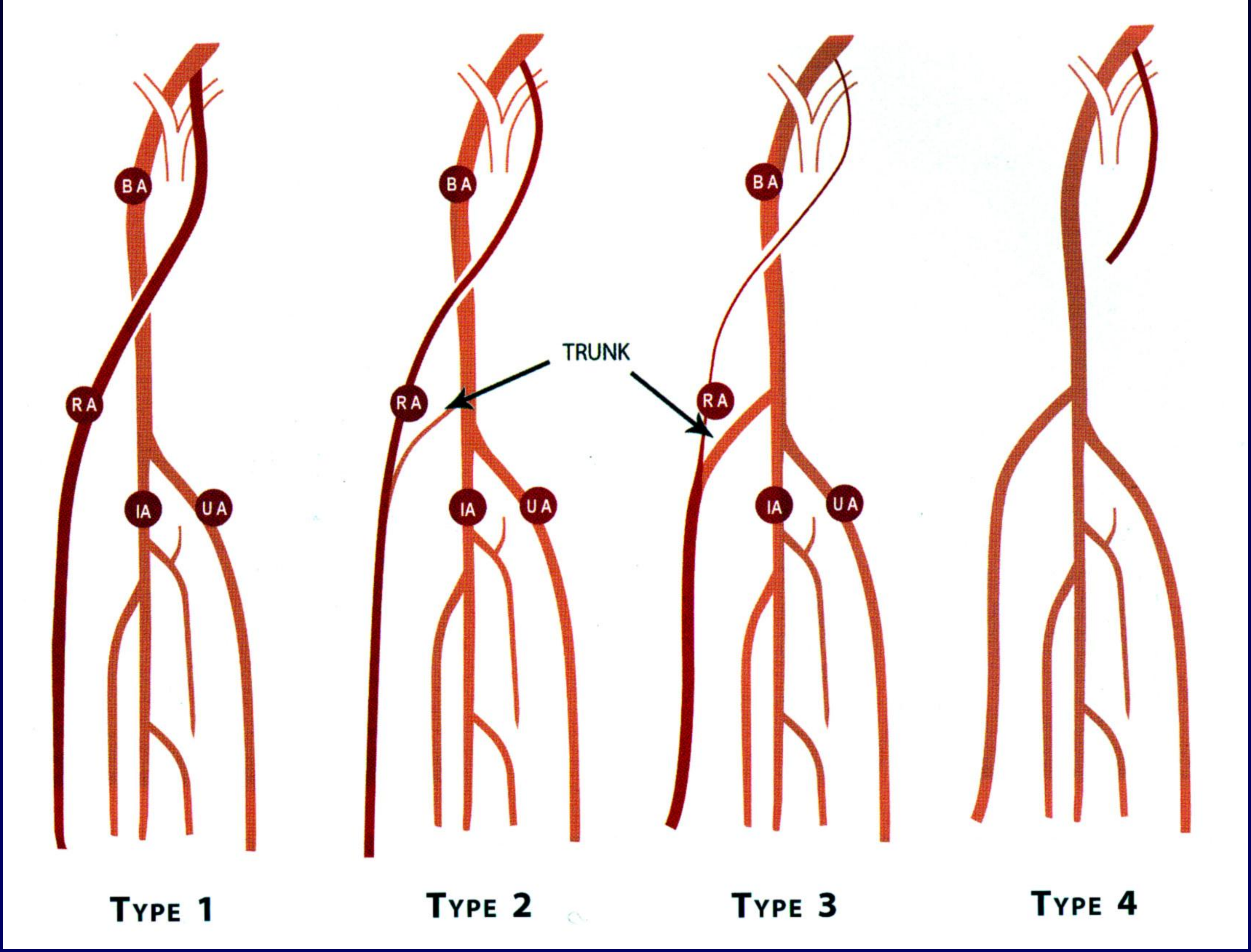
Co thắt ĐM quay





(PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics)

Các dạng giải phẫu của ĐM quay



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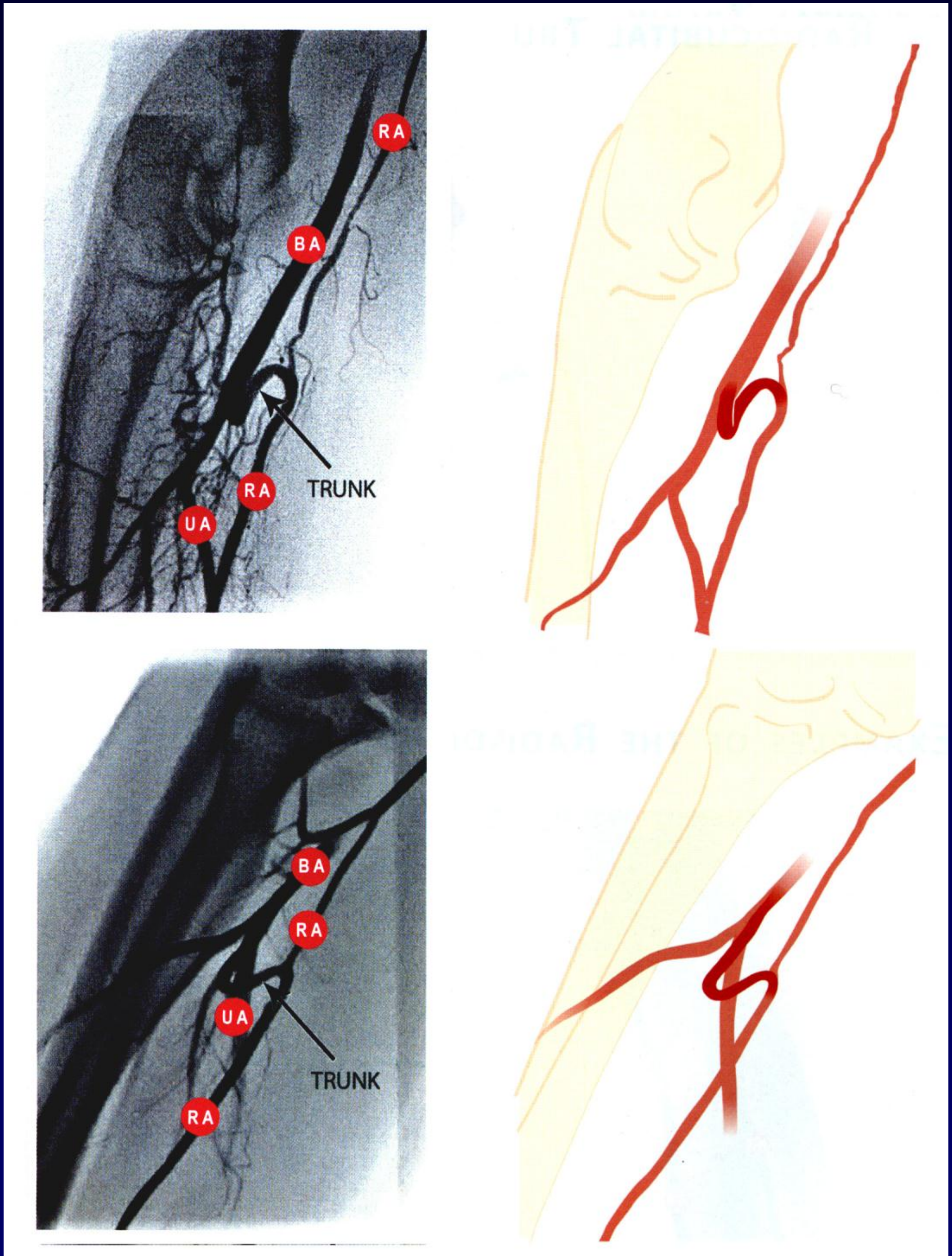
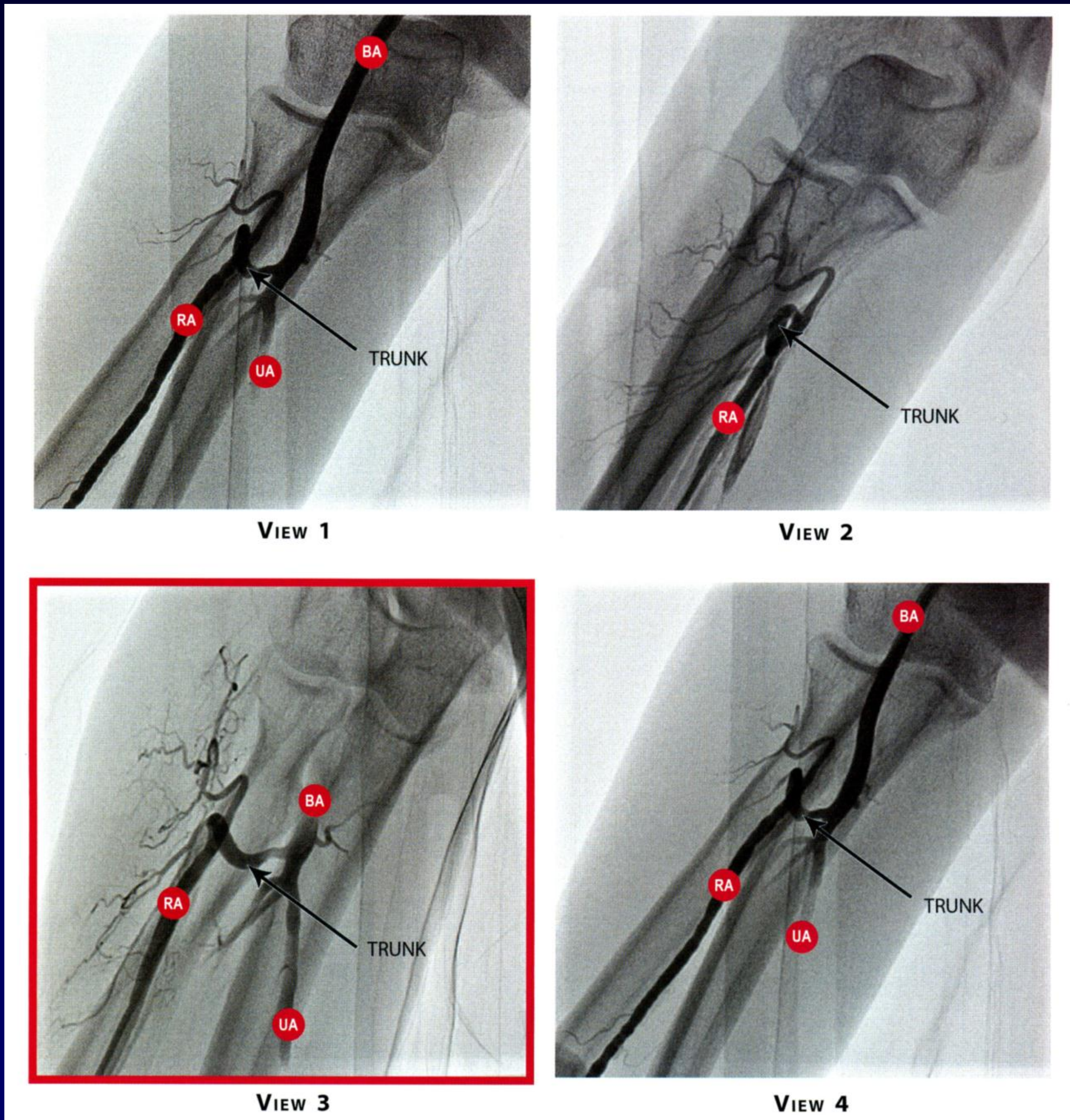


(PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics)

Type 2 trunk

This may be aware that the Guide wire does not go through up-to the Brachial artery.

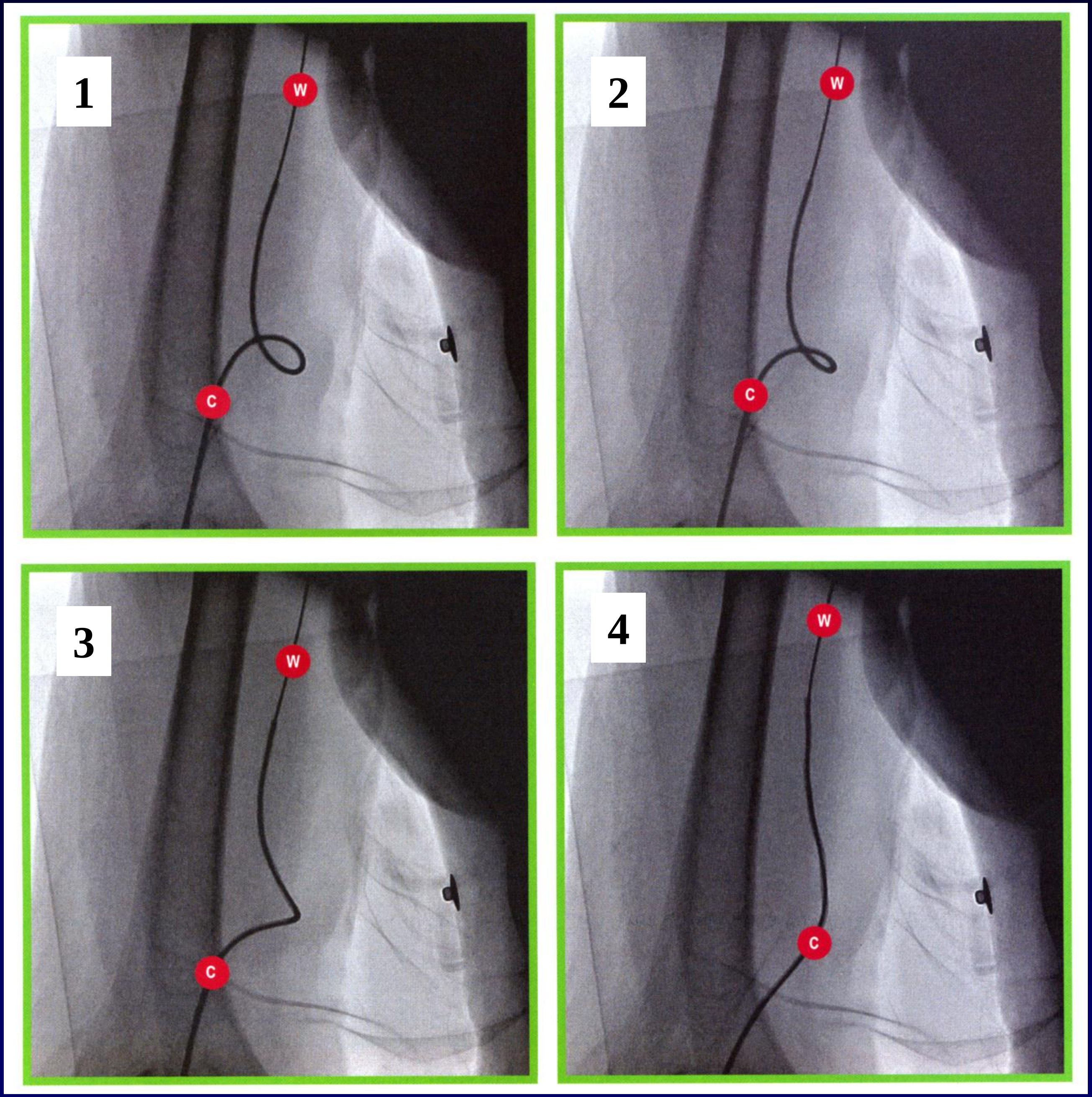
The artery will straighten by careful Guide wire proceeding under fluoroscopy



Loop⇒
Check anatomy by changing View angle

View 3 is the best angle to see the straighten the loop.

(PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics)

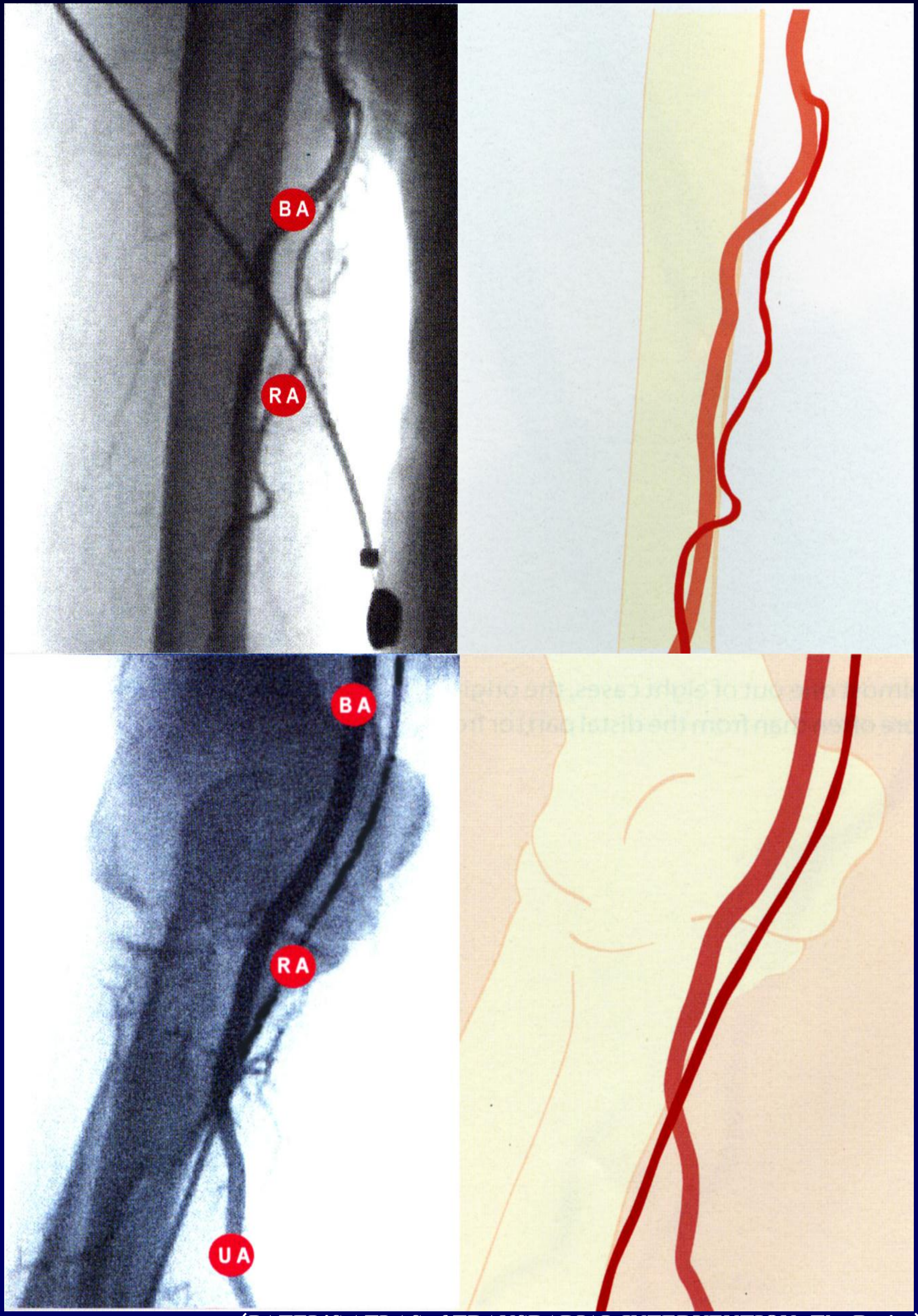


Loop⇒
It can be straighten by guide wire.

Hydrophilic, floppy tip type Guide wire should be used.

（PATEL’S ATLAS of TRANSRADIAL INTERVENTION: The Basics）

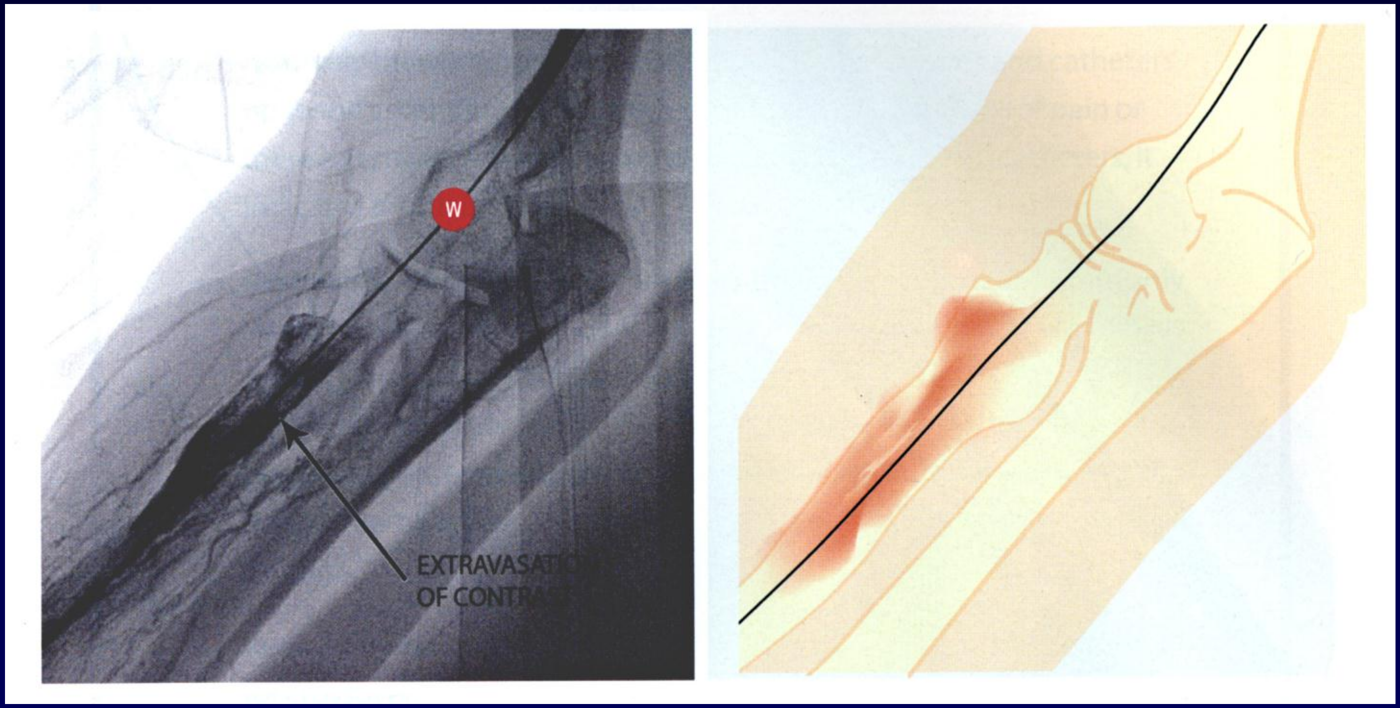
High take-off



(PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics)

Guide wire can pass through as normal but you may feel resistance for the catheter. Mostly it founds by angio.

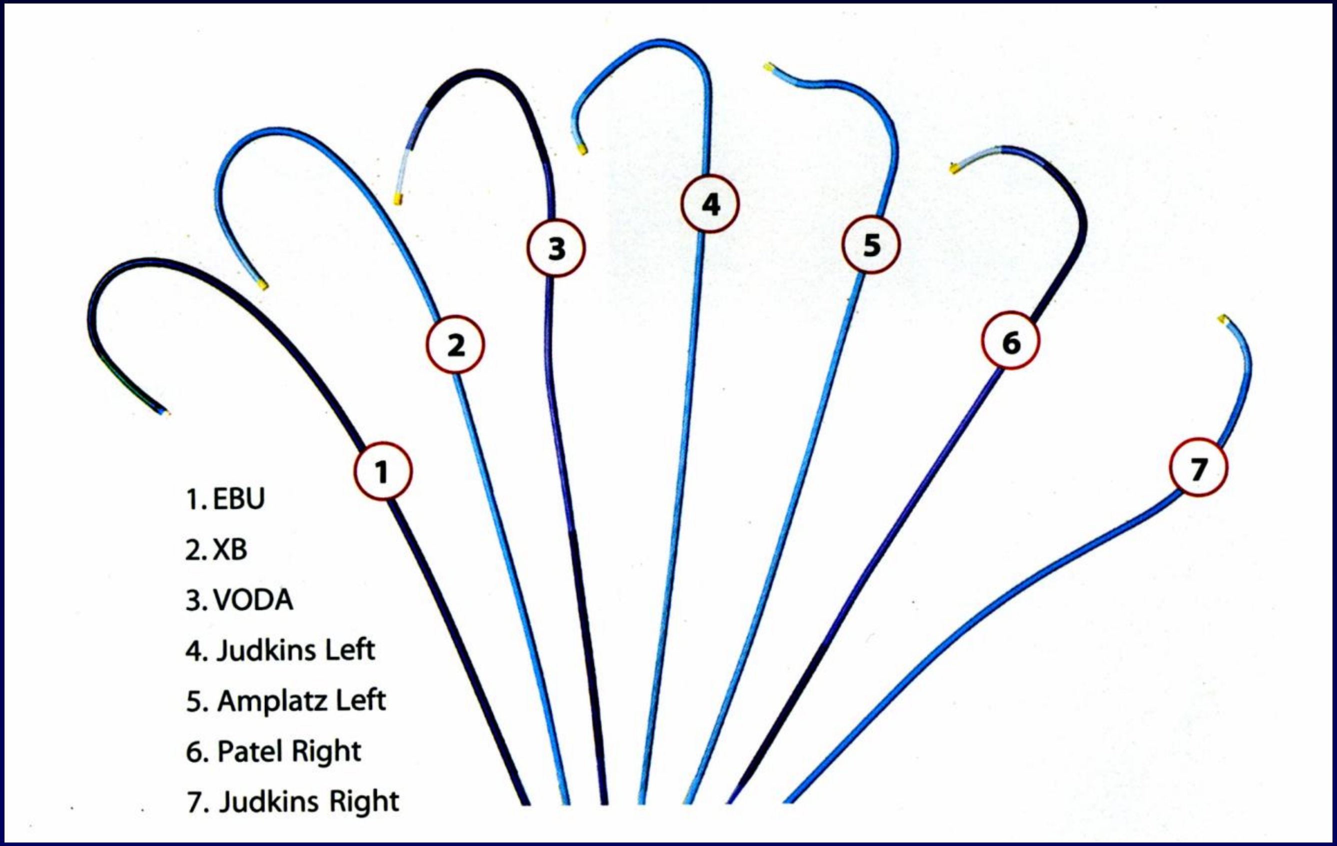
Vỡ ĐM quay



(PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics)

- **Đưa GW dưới sự hướng dẫn của màn hình.**
- **Sheath đưa theo GW chỉ khi xác định đầu GW đã tới ĐM cánh tay.**
- **Thông thường BN sẽ không đau và đưa dụng cụ vào dễ dàng. Không tiếp tục đẩy dụng cụ và tìm nguyên nhân nếu BN đau và có lực cản khi đưa vào.**
- **Bơm thuốc cản quang để kiểm tra 2- 3 lần. Lần đầu bơm chậm và ngắn để xác định chắc chắn GW nằm trong lòng thật.**

Các dạng Guiding Catheter



（PATEL'S ATLAS of TRANSRADIAL INTERVENTION: The Basics）

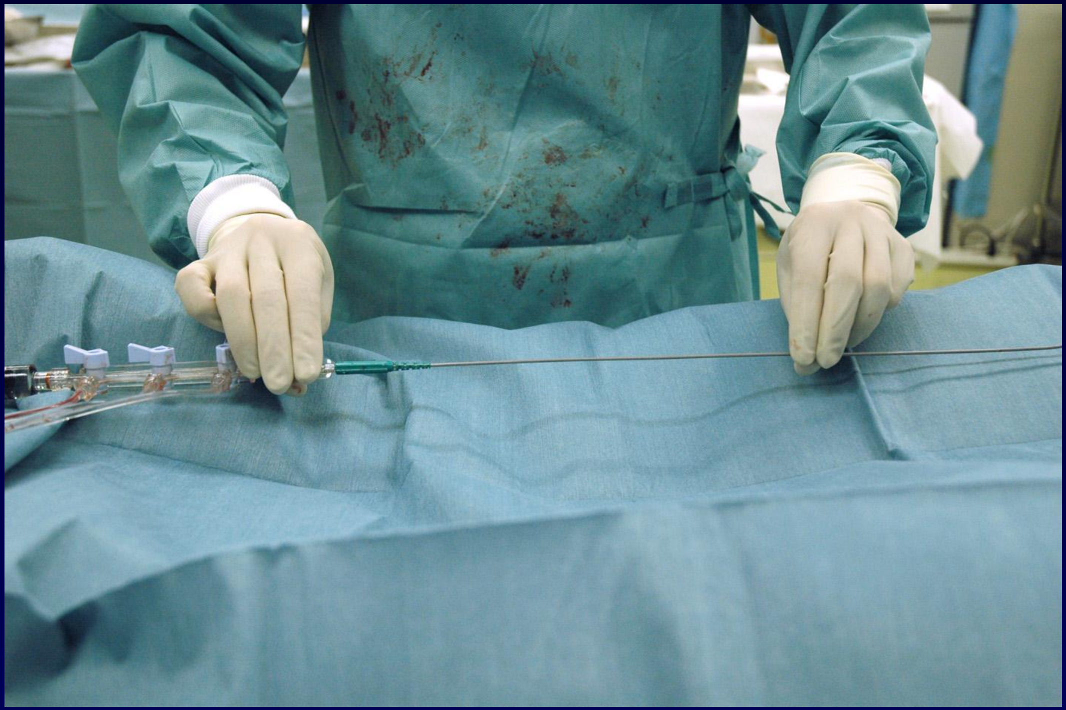
RCA

- **RCA is horizontal or inferior direction at LAO view: JR4.**
- **RCA is superior direction at LAO ： Amplaz left**
- **Anteror take off : Amplaz left**

LCA

- **LAD ：JL 40、EBU、Voda**
- **LCX ：Amplaz left、Voda**
- **Multi : Ikari, Tiger**

Cách cầm và lái Catheter

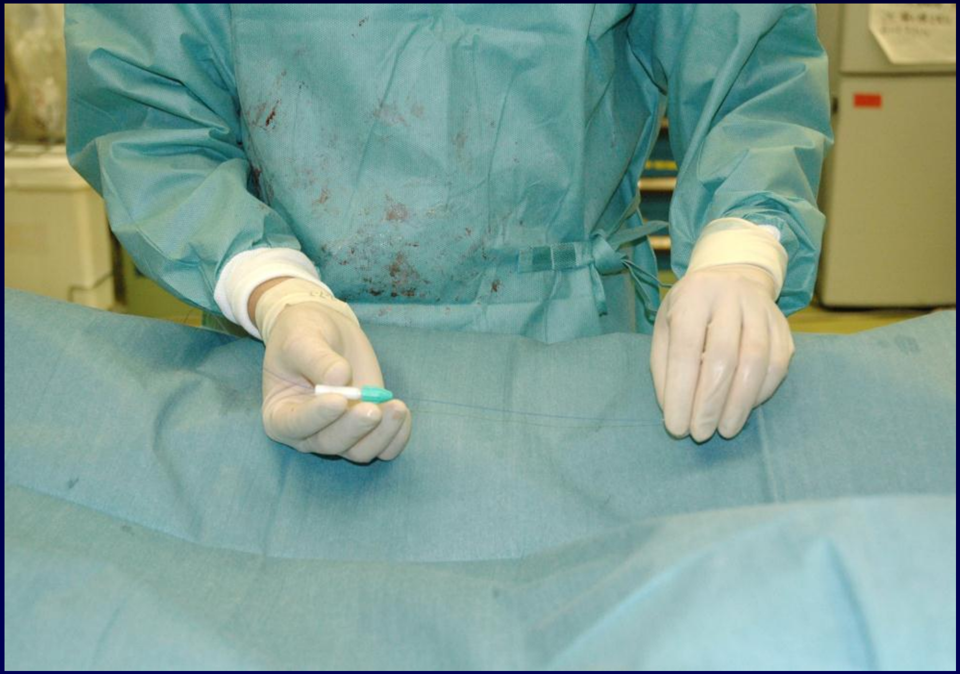


• Giữ Catheter bằng hai tay ngang tầm vai và lái bằng cả hai tay cho catheter được đồng trục.

• Nếu catheter không lái được mặc dù đã xoay 90^0 so với lúc ban đầu thì không nên xoay tiếp để tránh hiện tượng xoắn catheter. Nên thử lái lại cùng với GW.

• Kiểm tra dưới màn hình ở các góc độ khác nhau để chắc chắn đầu catheter đồng trục.

Cách lái Guidewire



- **Tay phải dùng để lái GW, tay trái dùng để đẩy và rút GW.**
- **Tìm góc độ nào rõ nhất bộc lộ được các nhánh bên khi lái wire qua chỗ tổn thương. Cẩn thận khi thao tác lái wire.**
- **Không tiếp tục đẩy GW khi đầu bị uốn cong lại, rút GW lại cho đầu GW được tự do và thay đổi hướng của đầu GW.**
- **Thay đổi các góc khác khi GW không đưa vào nhánh lựa chọn.**


Now, try it for yourself !