

## Radial Approach: Concepts and Technique

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Mount Sinai Health System  
New York, NY

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### Disclosures

- ▶ Advisory Board: Terumo Interventional Systems, Em
- ▶ Consultant: Terumo, Celonova Biosciences, Neuway Medical
- ▶ Speaker: Terumo, Merit Medical, Surefire Medical
- ▶ Research Support: BTG, Merit Medical, Surefire Medical

I AM A RADIALIST!



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### Why Radial?

- ▶ Fewer vascular complications
- ▶ Greater patient satisfaction
- ▶ Immediate ambulation
- ▶ Procedure cost savings
- ▶ Long term cost savings?
- ▶ Less pain and anesthesia?

▶ LESS INVASIVE!



Stewart et al. Comparison of radial and femoral approaches for percutaneous coronary intervention: a systematic review and meta-analysis. *European Heart Journal*. 2012;33(16):1925-32.  
 Fitzgerald et al. Radial versus femoral randomized investigation in ST segment elevation acute coronary syndrome: the RIVAL-OTACS (Radial Versus Femoral Randomized Investigation in ST Segment Elevation Acute Coronary Syndrome) study. *Journal of the American College of Cardiology*. 2014;63(12):1241-50.  
 Fitzgerald et al. Radial versus femoral randomized investigation in ST segment elevation acute coronary syndrome: the RIVAL-OTACS (Radial Versus Femoral Randomized Investigation in ST Segment Elevation Acute Coronary Syndrome) study. *Journal of the American College of Cardiology*. 2014;63(12):1241-50.  
 Fitzgerald et al. Radial versus femoral randomized investigation in ST segment elevation acute coronary syndrome: the RIVAL-OTACS (Radial Versus Femoral Randomized Investigation in ST Segment Elevation Acute Coronary Syndrome) study. *Journal of the American College of Cardiology*. 2014;63(12):1241-50.

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### Background

- ❑ 1953 - femoral artery access
  - ❑ Sven Seldinger
- ❑ 1989 - first diagnostic angiogram via radial artery
  - ❑ Dr. Lucien Campeau
- ❑ 1992 - first angioplasty via radial artery
  - ❑ Dr. Ferdinand Kiemeneij -the "father of transradial intervention"
- ❑ 1993 - first coronary stent via radial artery
  - ❑ Dr. Ferdinand Kiemeneij



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### Background


#### Radial vs. Femoral Randomized Investigation in STE ACS: The RIFLE STEACS Study

Analysis of 1,001 STEMI pts, with net adverse clinical events as primary endpoint (cardiac death, MI, TLR, stroke, bleeding).

30-Day Follow-up	Radial (n = 500)	Femoral (n = 501)	P Value
Primary Endpoint	13.6%	21.0%	0.003
MACE	7.2%	11.4%	0.029
Non-CABG Bleeding	7.8%	12.2%	0.026

**Conclusion:** Based on the results, the radial approach should be considered the recommended PCI access method for STEMI pts.

Romagnoli E, et al. *J Am Coll Cardiol.* 2015. *Epub ahead of print.*

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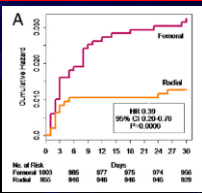
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### Background - RIVAL Study

Effects of Radial Versus Femoral Artery Access in Patients With Acute Coronary Syndromes With or Without ST-Segment Elevation


Shamir R, Mehr R, MD, MSc; Soraj S, Jolly, MD, MSc; John Cairns, MD; Karl Nemoto, MD, PhD; Smitl Y, Rao, MD; Anu N, Chandra, MD, PhD; Philippe Gabriel Inq, MD; M Warren J, Cantor, MD; F Vladimir Danchik, MD; Andrey Budaj, MD, PhD; J Michael Rehal, MD; Vaseer Yalowitz, MD; J Peggy Gao, MSc; Saliu Yusuf, MBBCh, DPM, for the RIVAL Investigators

Hamilton, Timaru, Newmarket, Ontario, Edmonton, British Columbia, Canada; Tampa, Florida; Durham, North Carolina; Paris, France; Havana, Poland; and Valencia, Spain



➤ Over 7000 patients randomized

➤ Reduced cardiac mortality in STEMI patients

@MountSinaiR Mehta et al. Radial vs. Femoral Artery Access in STEMI. *JACC* Vol. 60, 24-2012 

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Where should we access?

RADIAL  
FEMORAL  
BRACHIAL

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Where should we access?

RADIAL  
FEMORAL

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Why Radial? - It hurts less!

**"The Catheterization Questionnaire"**

Please place a mark on the line indicating your answer for each item.

1. If you require another catheterization, which method would you prefer?

	radial	femoral	brachial	groin	arterial	venous
Radial access	1	2	3	4	5	6
Femoral access	6	5	4	3	2	1

2. Please rate the overall discomfort since the procedure.

None	1	2	3	4	5	6	7	8	9	10
Worse	10	9	8	7	6	5	4	3	2	1

3. How do you experience any discomfort around the catheterization site?

None	1	2	3	4	5	6	7	8	9	10
Worse	10	9	8	7	6	5	4	3	2	1

4. How do you feel back pain since the procedure?

None	1	2	3	4	5	6	7	8	9	10
Worse	10	9	8	7	6	5	4	3	2	1

5. How do you feel difficulty going to the bathroom since the procedure?

None	1	2	3	4	5	6	7	8	9	10
Worse	10	9	8	7	6	5	4	3	2	1

6. How do you feel difficulty feeding or caring for your self since the procedure?

None	1	2	3	4	5	6	7	8	9	10
Worse	10	9	8	7	6	5	4	3	2	1

7. In the last 24 hours, how do you feel difficulty walking?

None	1	2	3	4	5	6	7	8	9	10
Worse	10	9	8	7	6	5	4	3	2	1

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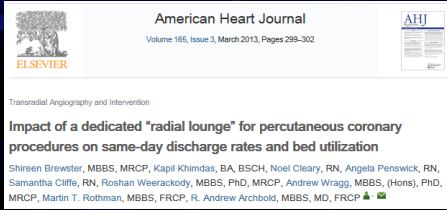
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### Why Radial? - Recovery is easier

- ▶ Leave recovery room sooner



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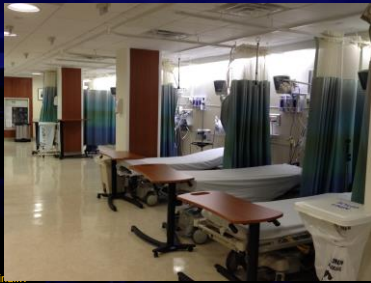
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### Recovery Room



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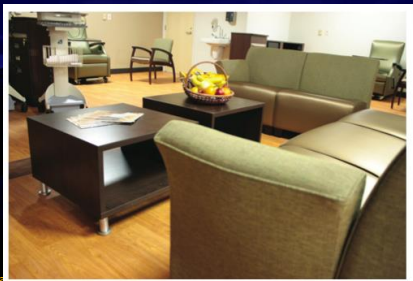
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### Radial Lounge



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### Femoral Access is easy until it is not.....



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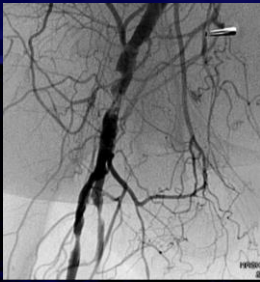
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### Rest pain after TACE - Angioseal



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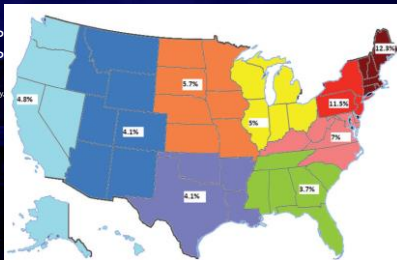
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### Adoption of TR Technique in USA

- ▶ 2013: 1 in 6 coronary P
- ▶ 2015: 1 in 4 coronary P estimated

Alfonso, Cohen, Cardiac Interventions Today



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### Advantages of TR Approach

- ▶ Obese patients
- ▶ Patients with groin sensitivity
- ▶ No closure device
- ▶ Less bleeding complications
- ▶ Immediate ambulation



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### Visceral Arteries - "It's all about the angle"



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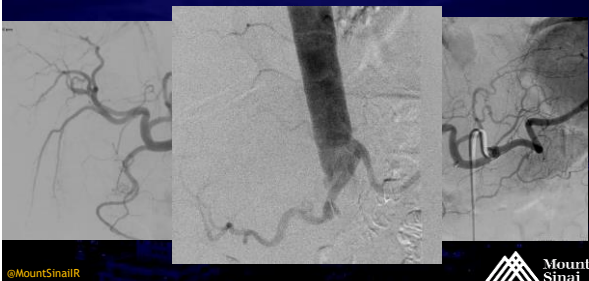
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### Radial vs. Femoral Approach



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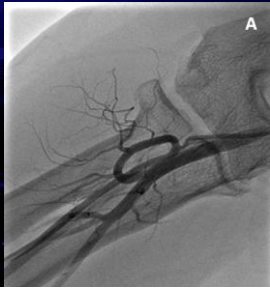
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### Disadvantages of TR Approach

- ▶ Arterial size, spasm
- ▶ Anatomic variants
- ▶ Severe tortuosity
- ▶ Cone Beam CT is more difficult, but not impossible!



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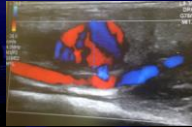
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### Potential Complications

- ▶ Hematoma
- ▶ Radial artery spasm
- ▶ Pseudoaneurysm
- ▶ AV fistulas
- ▶ Vessel perforation
- ▶ Dissection
- ▶ Radial arteritis - forearm pain with normal pulse
  - ◆ Treated with NSAIDs or steroids
- ▶ Compartment syndrome - rare
- ▶ Radial artery occlusion (1-3%) - asymptomatic
- ▶ Stroke risk?



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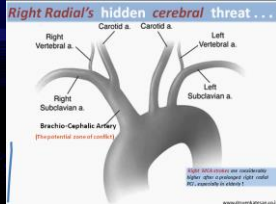
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### Stroke Risk

- ▶ Metaanalysis of over 11,000 patients TF vs TR in cardiology
  - ◆ No difference
- ▶ Anecdotal in IR - Close to 4000 cases in the US
  - ◆ None reported
- ▶ Use good judgement
- ▶ Patient selection
- ▶ Consider how often you form femoral catheters in the arch



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Int J Cardiol. 2013 Oct 15;168(6):5234-8. Epub 2013 Aug 14.  
 Meta-analysis of stroke after transradial versus transfemoral artery catheterization.  
 Papanicolaou DA, Gurm H, Gurm HS, Jinnouchi S, Jinnouchi EG.




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## Complications



Table 1  
Summary of previously reported cases of hand ischemia after radial artery catheterization.

Case	Age:sex	Onset of symptoms	Presenting symptoms	Sheath	Treatment	Outcome
Ruzia et al (2010)	49M	4 weeks	Pain, coldness	5 F Hydrophilic (Cordis Co)	Subintimal angioplasty	Ischemia resolved
Rhyne et al (2010)	72M	2 weeks	Numbness, paresthesia, and pallor	6 F Femoro hydrophilic	Subintimal angioplasty	Ischemia resolved
De Bussart et al (2011)	53M	8 weeks	Pain and numbness	Not reported	Conservative	Amputation of index finger
Rademakers et al (2012)	44F	1 week	Numbness, paresthesia, and pallor	6 F Radifocus Introducer II	Unsuccessful thrombolysis, followed by thrombectomy	Ischemia resolved
Taglieri et al (2012)	60F	1 day	Numbness, paresthesia, and pallor	6 F Radifocus Introducer II	Manual thrombus aspiration	Ischemia resolved




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## Radial Artery Occlusion

- ▶ Asymptomatic in Barbeau A-C
- ▶ More common in women
- ▶ Incidence increases with sheath size
- ▶ Incidence decreases with radial artery size
- ▶ Can be accessed thru occlusion
- ▶ Technical expertise minimizes
- ▶ Some people use anticoagulation to treat, but not really evidence based ????




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## Contraindications

- ▶ Radial artery too small < 2mm
- ▶ Larger sheath needed (greater than 7F)
- ▶ AV fistula / dialysis patient
- ▶ Severe aortic tortuosity
- ▶ Barbeau D waveform




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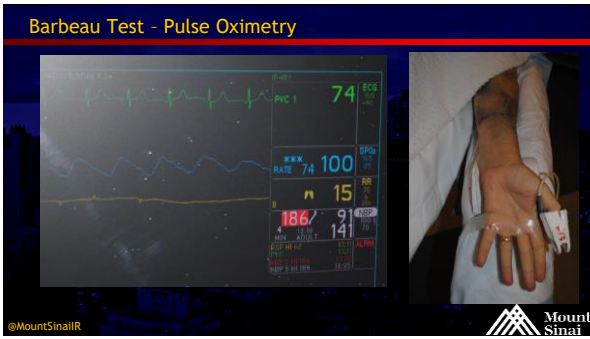
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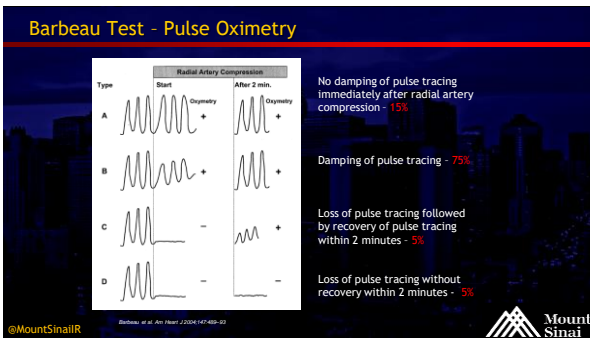
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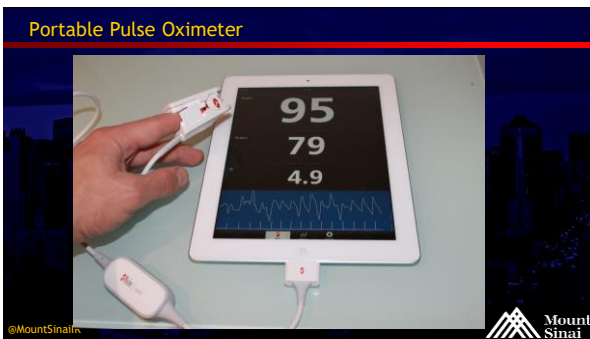
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### Outpatient Office Visits



- SpO<sub>2</sub>: Blood oxygenation saturation
- PR: Pulse rate
- PI: Perfusion index
- SRS: Signal quality bar

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### Radial Artery

- ▶ US studies demonstrate mean diameter of 2.6mm
  - ◆ Range (2.2 to 3.4 mm)
- ◆ Outer diameter of 6F sheath - 2.6 mm
- ◆ Outer diameter of 7F sheath - 3.1 mm
- ◆ Outer diameter of 6F Glidesheath slender - 2.4 mm



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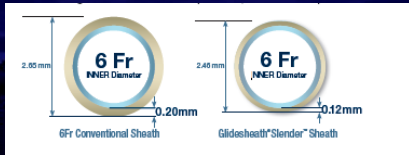
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### New Sheath Technology



- ▶ Q4 2013
- ▶ Thin walled sheath
- ▶ 4-7F sheath size
- ▶ Allows 1F downsizing!



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### Access Sheaths



Packed 5 per box and includes a dilator and a spring wire.

**CLINICAL RESEARCH**

**Impact of Length and Hydrophilic Coating of the Introducer Sheath on Radial Artery Spasm During Transradial Coronary Intervention**

**A Randomized Study**

Katlin Burton, MD, Richard U. Berlin, MD, Matthew Frankel, MD, Ashraf Hakouk, MD, Joseph D. Miller, MD, Nick D. Papan, MD, Douglas A. Wong, MD, PhD, J. Martin, MD

Leopoldo Schindt Angiano

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### Setup - "The Four Pillars of Radial Access"



- ▶ Micropuncture
- ▶ US guidance
- ▶ Hydrophilic sheath
- ▶ Antispasmodic "cocktail"

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### Setup - Arm Positioning

- ▶ **Left** wrist used for all interventions **below** diaphragm
- ▶ Prop arm above left groin
- ▶ Use towel roll and arm board if necessary



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### Setup - Prone Positioning



Kern, B.W., et al. (2012). "Prone position coronary angiography: due to refractory back pain, anterior approach compared to transpedicular approach." *J. Invasive Cardiol*, 24(11), 655-662.



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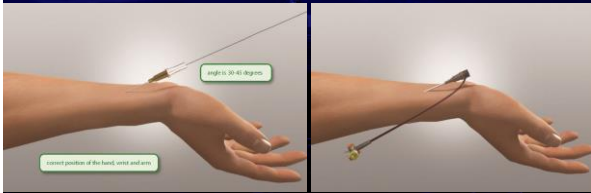
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### Technique - Vessel Access



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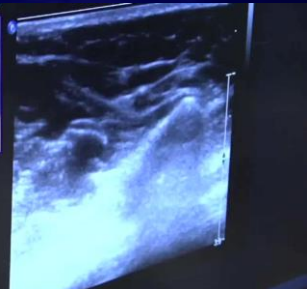
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### Access Technique



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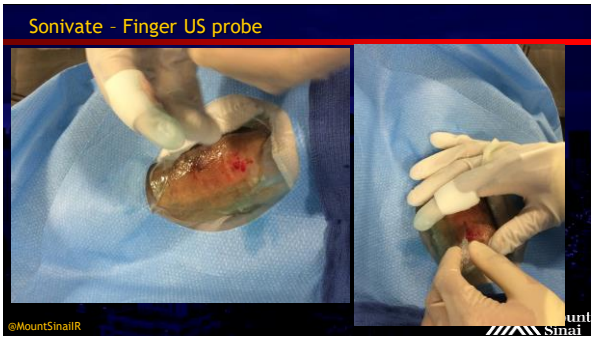
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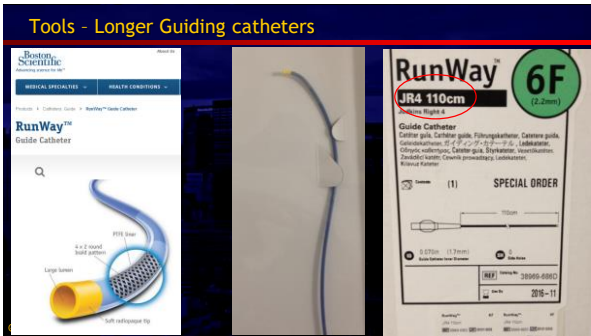
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**PRE-DILATE Protocol**

Contents lists available at ScienceDirect  
International Journal of Cardiology  
journal homepage: www.elsevier.com/locate/ijcard

Topical nitroglycerin and lidocaine to dilate the radial artery prior to transradial cardiac catheterization: A randomized, placebo-controlled, double-blind clinical trial<sup>1,2,3,4</sup>  
The PRE-DILATE Study

Anna T. Beyer<sup>1</sup>, Ramford Ng<sup>1</sup>, Amardeep Singh<sup>1</sup>, Jeffrey Zimmet<sup>1</sup>, Kendrick Shunk<sup>1</sup>, Yerem Yeghiazarians<sup>1</sup>, Thomas A. Ports<sup>1</sup>, Andrew J. Boyle<sup>1,5</sup>  
Division of Cardiology, University of California San Francisco, San Francisco, CA

- ▶ 40mg of lidocaine cream (EMLA)
- PLUS
- ▶ 30mg of nitroglycerin ointment

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**Navigating the Descending Aorta**

- ▶ Reverse Curve
- ▶ Cobra
- ▶ Sarah/ Jacky
- ▶ Use an .016 wire to "flop down"

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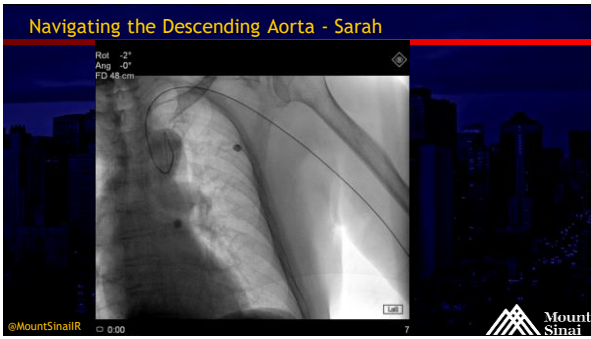
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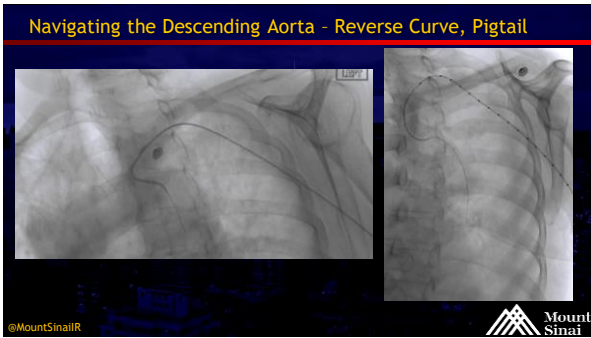
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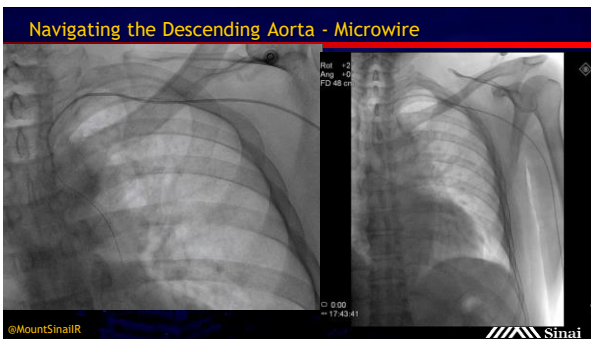
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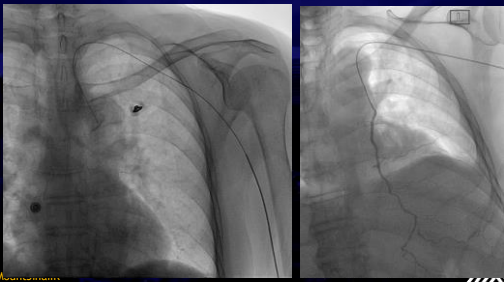
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### Be Wary of Collaterals!



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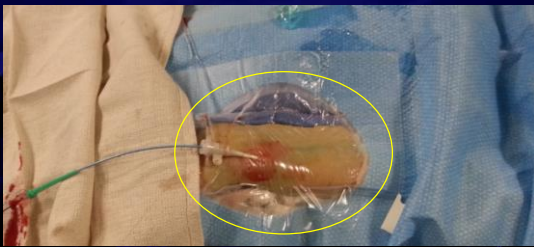
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### Secure Hydrophilic Sheath



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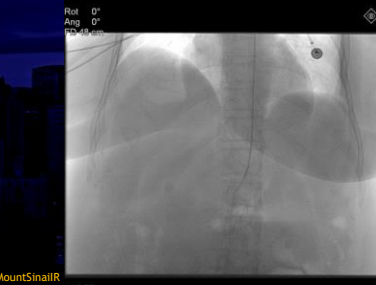
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### Celiac/SMA Catheterization



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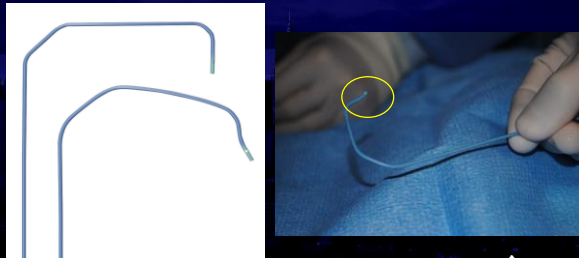
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### Catheter Selection



The diagram on the left shows two different catheter shapes: one with a long, straight shaft and a curved tip, and another with a shorter shaft and a more pronounced curve. The photo on the right shows a person's hands holding a blue catheter, with a yellow circle highlighting a specific part of the tip.

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### Technique - Catheters Used

- ▶ 5F Sarah Radial 110cm (Terumo)
- ▶ 5F Cobra 100cm (Terumo)
- ▶ 5F Jacky Radial 110cm (Terumo)
- ▶ 4F Aqua 125cm (Cordis)
- ▶ 4F Cobra 100cm (Cordis)
- ▶ 5F Envoy 100 Guidecath (Cordis)
- ▶ 5F JR4 100cm (Cordis)
- ▶ 5F MPA 100cm (Cordis)
- ▶ 5F Bern 120cm (Penumbra)
- ▶ 5F Sherpa AL1 Guide (Medtronic)
- ▶ 5F Sherpa H51 Guide (Medtronic)
- ▶ 5F Launcher Guide (Medtronic)
- ▶ Other shapes (Champ, MP1, RDC, MAC, IMA, SCR, SCL)

Longest Lengths in our lab:  
 Guiding sheath: 110cm  
 Guiding catheter: 125cm  
 Diagnostic catheter: 190cm



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### Toolbox Tips

- ▶ 110 cm ideal length for visceral arteries
- ▶ 110 Optitorque PIGTAIL is awesome!
- ▶ Microcatheters should be 150cm, not 130 cm
- ▶ Glidesheath Slender
- ▶ Extra "cocktail" for spasm or small arteries
- ▶ Ultrasound the arm to look for radial loops?
- ▶ Don't be afraid to go ulnar if the radial is small



The image shows the packaging for a Sarah Radial catheter. The box is white with red and black text. It specifies 'Fr. 5 (1.50 mm)', '110 cm', and '1000 psi'. The product number is 'Riv+ GBL4021A'.

**Progreat** Microcatheters NOW AVAILABLE IN 150cm LENGTH

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65 y/o male with CMI , in-stent restenosis, proximal lesion



- ▶ ICAST Covered Stent
- ▶ 6F Cook Sheath
  - ◆ 90 cm, 110 cm



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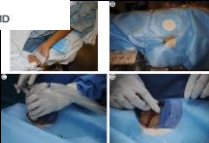
Techniques in Vascular and Interventional Radiology 2015



Techniques in Vascular and Interventional Radiology

A Technical Guide Describing the Use of Transradial Access Technique for Endovascular Interventions

Aaron M. Fischman, MD, Nathaniel C. Swinburne, MD, and Rahul S. Patel, MD



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Equipment in 2016



CONCIERGE Guiding Catheter



SAFEGUARD Pressure Assisted Device



Rad Board



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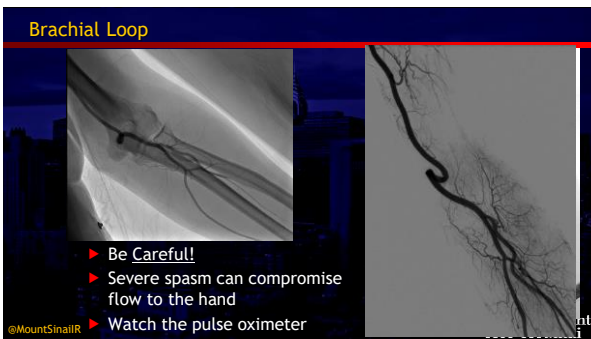
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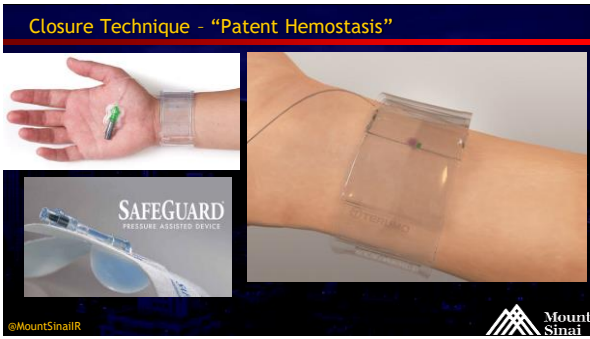
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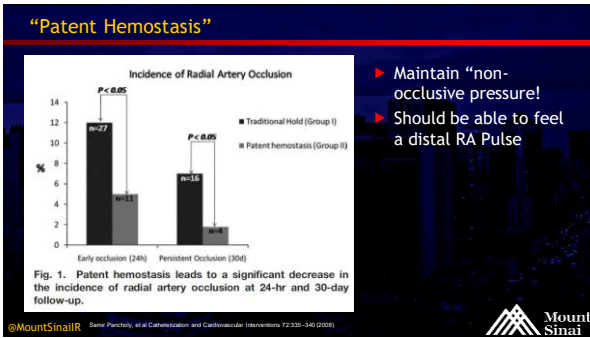
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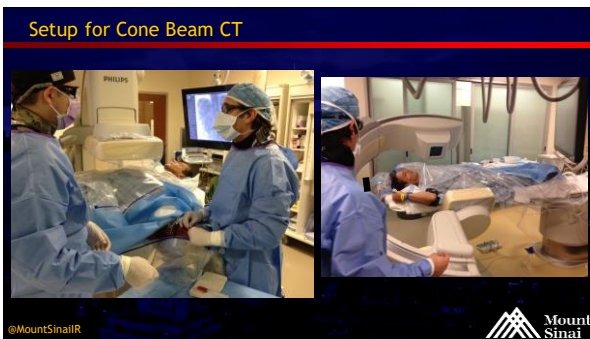
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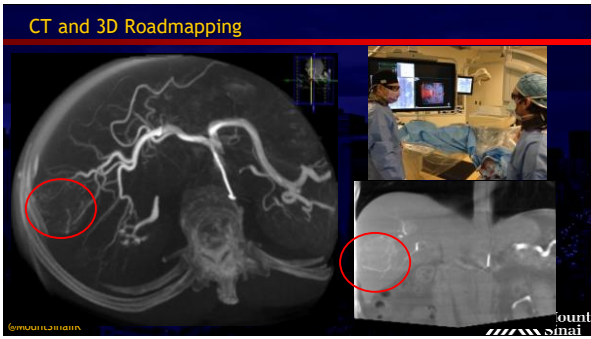
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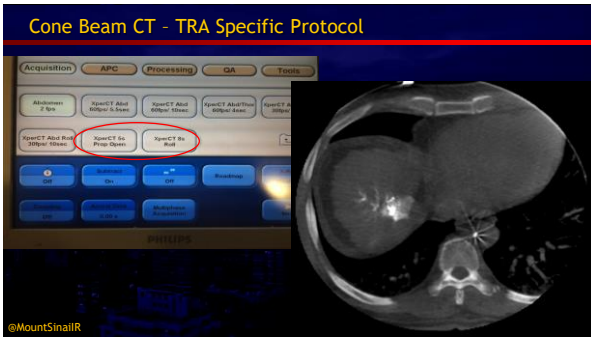
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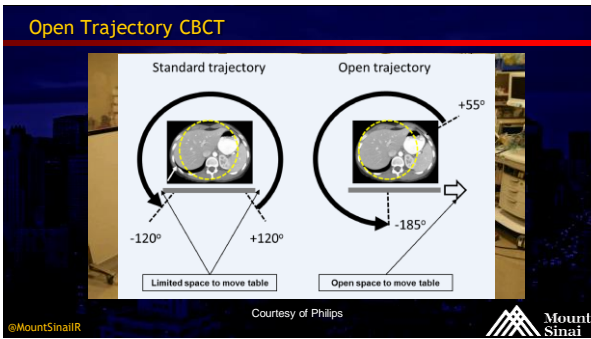
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What can't we do?

- ▶ SFA and below
- ▶ Stent and balloon systems
- ▶ Brachial artery occlusions
- ▶ 400, 500 cm wires?
  - ◆ Extra table? Extra fellows to hold wires?



@MountSinaiR




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Catheter Length Issues

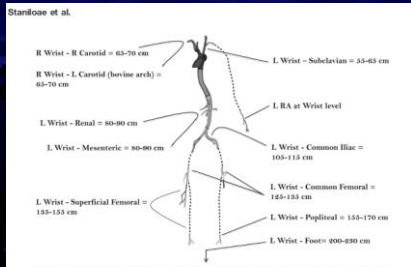


Fig. 1. Anthropometric measurements of distance from the right or left wrist to various vascular beds. (Abbreviations: L, left; R, right).

@MountSinaiR




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The Mount Sinai Experience - 4 years

- ▶ 2000 TR interventions since April 2012
- ▶ Over 1500 Liver Directed Therapies
- ▶ Over 180 Uterine Fibroid Embolizations
- ▶ Overwhelming Patient Satisfaction
- ▶ >90 % Patient preference for TR over TF
- ▶ Very low complication rate
- ▶ Repeat interventions common



@MountSinaiR




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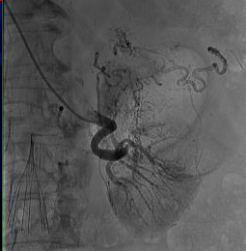
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### Where are we headed in 2016 and beyond?

- ▶ Randomized studies specific to IR (particularly in Interventional Oncology)
- ▶ Quality of life surveys (IPAD and SMS)
- ▶ Training courses/CME for IR
- ▶ Catheter and Guide design underway.....



*Glue Embolization of bleeding renal mass*

@MountSinaiR 

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### Final Thoughts

- ▶ Patients request radial approach!
- ▶ IR trainees benefit greatly from learning radial techniques
- ▶ Most catheters are designed for femoral approach
- ▶ Partnership with industry is critical
  - ◆ Training programs
  - ◆ Catheter and equipment development
- ▶ New procedures lend well to TR
  
- ▶ THE TIME IS NOW!

@MountSinaiR 

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### TREAT - TransRadial Endovascular Advanced Therapies

TREAT Symposium Friday, May 20, 2016 New York, NY

TransRadial Endovascular Advanced Therapies

Icahn School of Medicine at Mount Sinai  
Hines Center for Science and Medicine  
The Boone M. Davis, MD and Kenneth L. Davis, MD Auditorium, 2nd floor  
1020 Madison Avenue (Between 93rd and 102nd Street)  
New York, NY 10029  
[www.icsm.mssm.edu/cme/courses](http://www.icsm.mssm.edu/cme/courses)

Endorsed by 



- ▶ CME Course - 2<sup>nd</sup> annual
- ▶ "First Ever" in IR
- ▶ May 2016
- ▶ Live Cases
- ▶ Dedicated to TRA
- ▶ Embolization

@MountSinaiR Course Directors: Aaron Fischman MD, Rahul Patel, MD 

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# Transradial Approach for Mesenteric Interventions



Dr Darren Klass MBChB MD MRCS FRCR FRCPC  
Clinical Assistant Professor  
University of British Columbia



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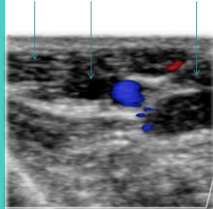
## Overview:

LA mixture  
100mcg GTN  
9mL 1% Lidocaine  
10mL syringe

Inject along length of RA under  
Palpation for length of needle (4cm)

Tumescent anaesthesia

Single wall 60 degree puncture  
No skin nick



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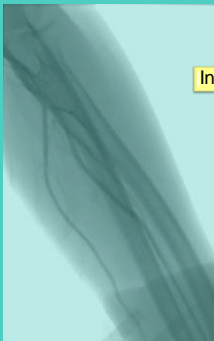
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## Sheath and cocktail injection



Insert radial sheath

Inject antispasmodic

Flush sheath and connect to infuser

US evaluation of RA or 2mL angiogram

Insert catheter preloaded with wire

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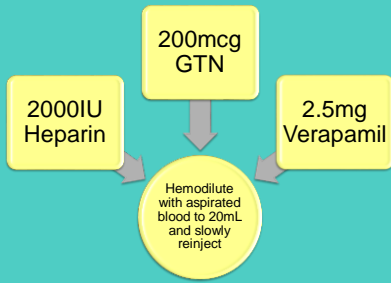
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### Anti-spasmodic cocktail



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### Sheath Selection

- ▣ 5fr Sheath workhorse
- ▣ 6fr for specific indication
  - ▣ Radial spasm
  - ▣ Small target vessel
- ▣ 7fr
  - ▣ Avoid unless procedure dictates – advanced cases

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### Advanced cases:

- ▣ Technical considerations
- ▣ Room Set up
- ▣ Issues around hemodynamics

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## Approach to advanced cases:

- ▣ Assess anatomy carefully
  - ▣ Origins of vessels
  - ▣ Tortuosity
  - ▣ Distance to target
- ▣ Inventory
  - ▣ Longer delivery systems
  - ▣ 120cm minimum
  - ▣ Wire lengths
  - ▣ Monorail vs OTW

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## Access:



- Decide on sheath size prior to puncture
- Assess size of the RA
- Decide whether the vessel can accommodate sheath
- Guide catheter vs Sheathless guidecath

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## RA size and sheath compatibility

RA size 10mm proximal to styloid (n=250)

3.1 ± 0.6 mm in men  
2.8 ± 0.6 mm in women<sup>11</sup>

Ext diameter 6-F sheath is 2.52 mm  
86% men and 63% of woman suitable for 6Fr sheath

Sheathless guide - outer diameter 1.5 F smaller than the analogous sheath capable of accommodating a guide catheter of the same caliber.

Saito S et al Catheter Cardiovasc Interv. 1999;45:173-176.

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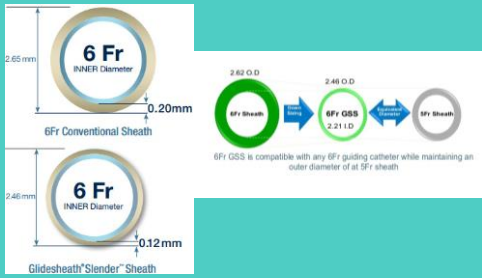
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## Terumo Slender




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## Asahi Sheathless Guidecath

Eaucath (100cm)

Sheathless PV (120cm)




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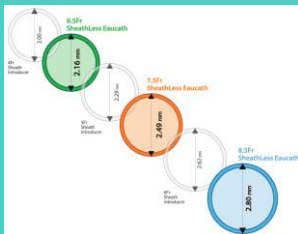
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## Sheathless Guidecath



- Ability to deliver balloon mounted stents
- Saves repeated exchanges along the RA
- Allows for easy cannulation of visceral vessels
- Ygo administration
- Needs a hemostatic valve

- FLO 30
- HVA 100

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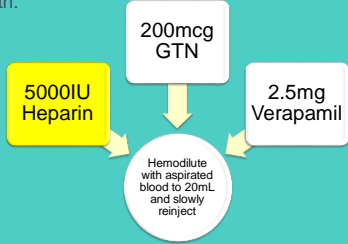
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## Advanced cases:

Once you have decided the case requires a larger bore sheath, change the cocktail when inserting the sheath.



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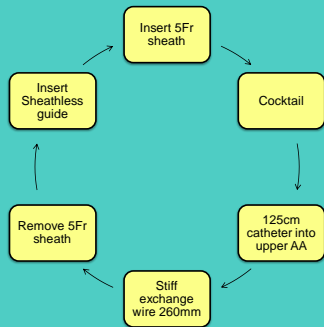
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## Technique for sheathless guidecath insertion



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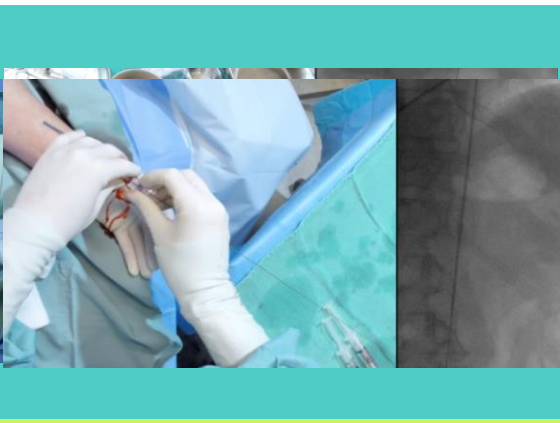
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- Need sheath 1 Fr size larger
- 7Fr guide catheter
- 8Fr sheath
  
- 8Fr guide catheter (2.7mm OD)
- 6Fr sheath (2.62mm OD)

### Creating a platform: Guide catheters

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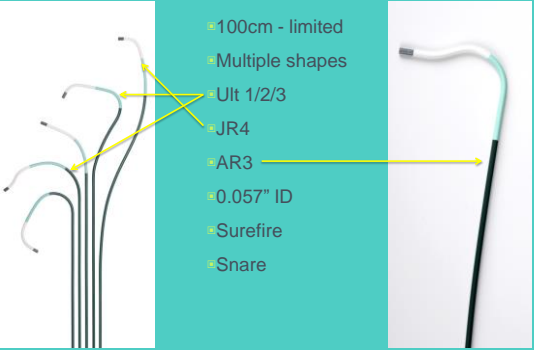
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### Concierge Guidecath



- 100cm - limited
- Multiple shapes
- Ult 1/2/3
- JR4
- AR3
- 0.057" ID
- Surefire
- Snare

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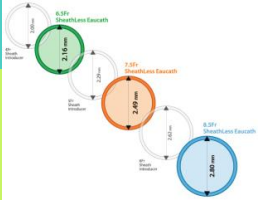
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### Guide catheters

PRODUCT DESCRIPTION				
SF	6F	7F	8F	
GUIDE OD	0.070" (1.7 mm)	0.082" (2.0 mm)	0.092" (2.3 mm)	0.105" (2.7 mm)
GUIDE ID	0.057" (1.4 mm)	0.070" (1.78 mm)	0.078" (2.0 mm)	0.088" (2.2 mm)




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### Technical considerations:

- Guide catheters are stiffer than diagnostic.
  - More torque
  - Stable in vessels
  - Sheathless guide
- Use 5Fr catheter to cannulate target vessel and advance sheathless guide over catheter and wire.

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### Sheathless PV:

- 125cm base catheter will be too short.
  - Lose length on HVA and hub
  - 150cm catheter base.
- Stent and balloon delivery lengths.

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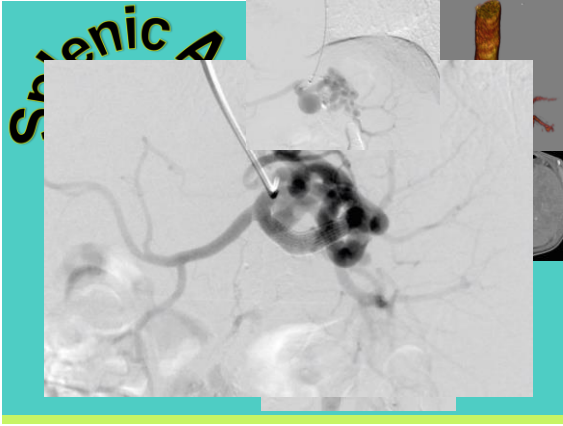
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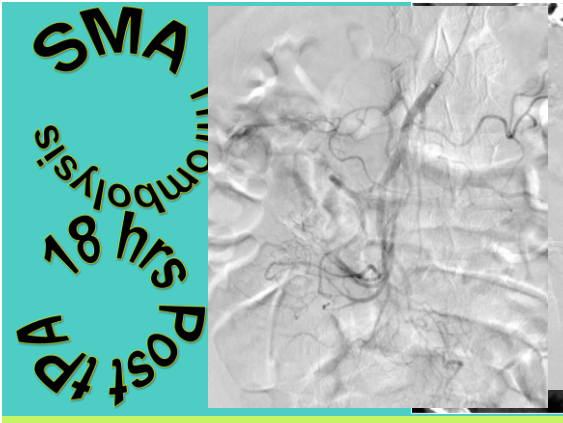
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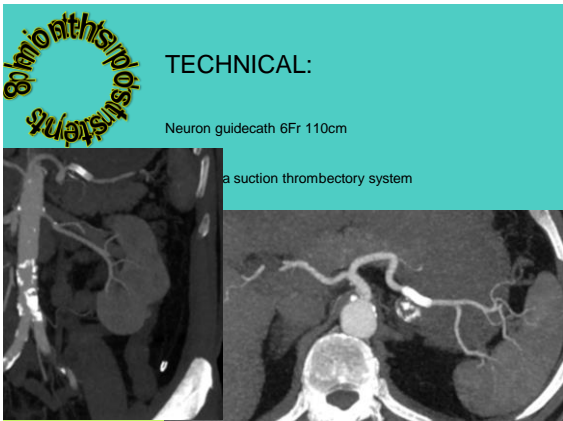
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## Transradial Approach for Dialysis Access Interventions



Amish Patel MD

Interventional Institute  
Holy Name Medical Center  
Teaneck, NJ



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## Disclosures

- None



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## Goals

- Understand the data regarding transradial dialysis access interventions
- Become familiar with tools
- Become familiar with common clinical scenarios and complications

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**Original Studies**

**Transradial Intervention for Native Fistula Failure**

Osami Kawarada,\* MD, Yoshiaki Yokoi, MD, PhD, FSCAI, Shinji Nakata, MD, Nobuyuki Morioka, MD, and Kazushi Takemoto, MT

- Seminal paper
- 11 patients
  - Mix of stenoses and occlusions
- 100% success
- Safe and feasible

Nephrol Dial Transplant (2009) 24: 2497-2502  
doi: 10.1093/ndt/gfp087  
Advance Access publication 3 March 2009



**Radial artery approach for endovascular salvage of occluded autogenous radial-cephalic fistulae**

Chih-Cheng Wu<sup>1,2</sup>, Szu-Chi Wen<sup>1,2</sup>, Meng-Kan Chen<sup>3</sup>, Chung-Wei Yang<sup>4</sup>, Shih-Yun Pu<sup>1</sup>, Kuei-Chin Tsai<sup>1</sup>, Charrng-Jiang Chen<sup>4</sup> and Cheng-Han Chao<sup>5</sup>

<sup>1</sup>Department of Medicine, Hsinchu General Hospital, Hsinchu, <sup>2</sup>School of Medicine, Yang-Ming University, <sup>3</sup>Institute of Preventive Medicine, College of Public Health, National Taiwan University, Taipei and <sup>4</sup>Hemodialysis center, Hsinchu General Hospital, Hsinchu, Taiwan

Correspondence and offprint requests to: Chih-Cheng Wu, E-mail: wuacc01@ms66.hinet.net

- 48 patients
- Occluded fistulae
- Balloon thrombectomy, Arrow-Terrotola, AngioJet
- 96% success

Cardiovasc Intervent Radiol (2009) 32:952-959  
DOI 10.1007/s00270-009-9625-4

**CLINICAL INVESTIGATION**

**Outcomes of Interventions Via a Transradial Approach for Dysfunctional Brescia-Cimino Fistulas**

Shyh-Ming Chen · Chi-Ling Hang · Hon-Kan Yip · Chi-Yuan Fang · Chiung-Jen Wu · Cheng-Hsu Yang · Yuan-Kai Hsieh · Gary Bib-Fang Guo

- 154 procedures in 131 patients
  - 52 (33.8%) totally occluded AVF
- Excluding those, 99% success
- 3-m and 1-yr patency similar to direct puncture



From the Society for Vascular Surgery

## Transradial approach for percutaneous intervention of malfunctioning arteriovenous accesses

Linda Le, MD, Ashton Brooks, MBBS, Melissa Donovan, MD, Taylor A. Smith, MD, W. Charles Sternbergh III, MD and Herman A. Bazan, MD, *New Orleans, La*

- 50 procedures
- 88% success
  - Could not cross lesion → most failures
- 1, 3, 6, 12-m and 1-yr patency similar to direct puncture

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### TECHNICAL NOTE

#### Percutaneous treatment of thrombosed prosthetic brachial-basilic access by the transradial approach

Ung Bae Jeon, MD,\* Chang Won Kim, MD,\* and Sung Woon Chung, MD,<sup>†</sup> *Pusan, Republic of Korea*

- 7 procedures in 5 patients
- Thrombosed upper arm grafts
- 100% success

## Pro and Con

### ADVANTAGES

- Single puncture
- Able to treat lesions at artery site, anastomosis site, or multiple sites
- Hemodynamic monitoring to gauge immediate success
- No fistula compression
- High clinical success rate

### DISADVANTAGES

- Puncture technique may be complex and demanding
- More potential for complications with repeated procedures
- Only small balloons can be accommodated
- Easy to achieve hemostasis

## Tools

- Glidesheath (Terumo)
  - 4 Fr and 6 Fr Slender
- 0.018" PTA Balloon
  - Sterling (Boston Scientific)
  - Advance 18LP (Cook)
- Fox or Armada Balloon (Abbott)

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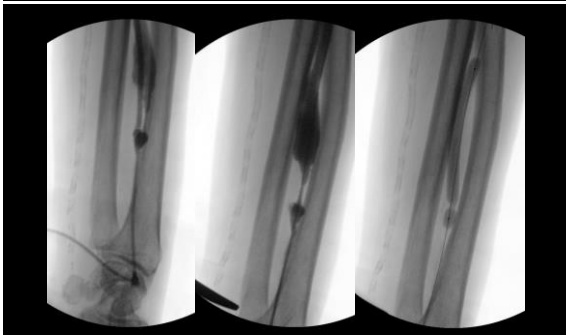
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## Juxta-anastomotic stenosis



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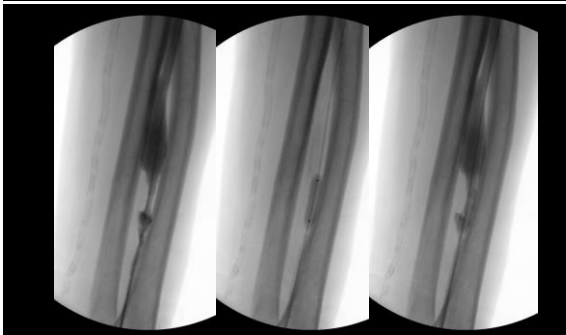
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## Juxta-anastomotic stenosis



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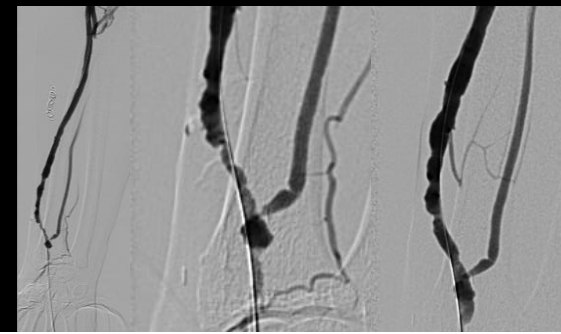
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### Non-maturing Fistula



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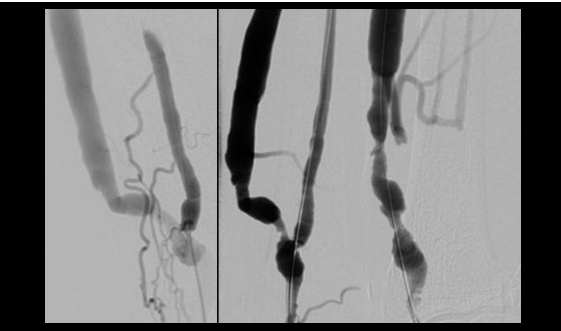
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### Non-maturing Fistula



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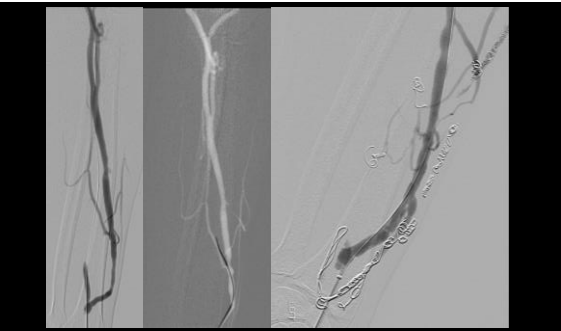
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### Non-maturing Fistula



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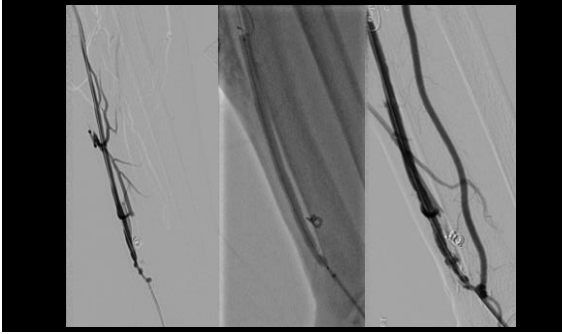
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### Non-maturing Fistula



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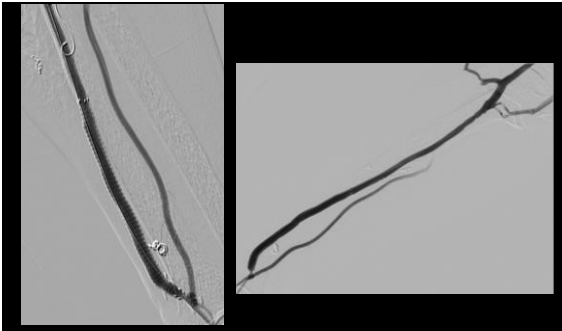
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### Non-maturing Fistula



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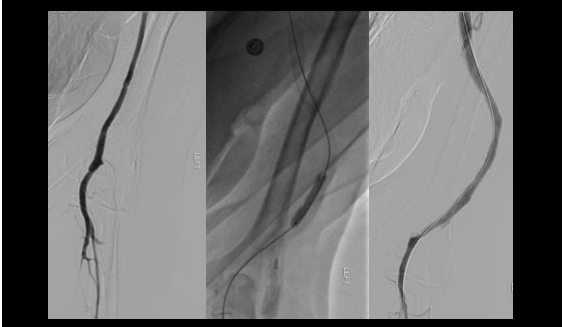
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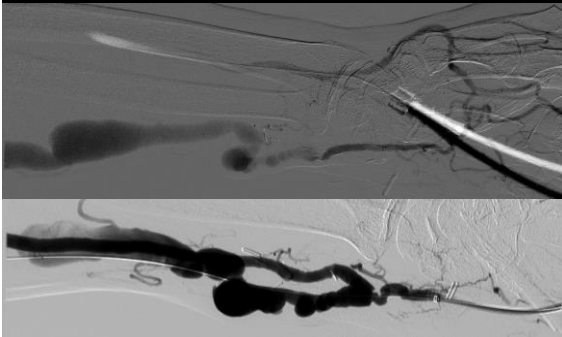
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### Transulnar



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### Central Stenosis



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## Central Stenosis



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## Complications



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## Complications



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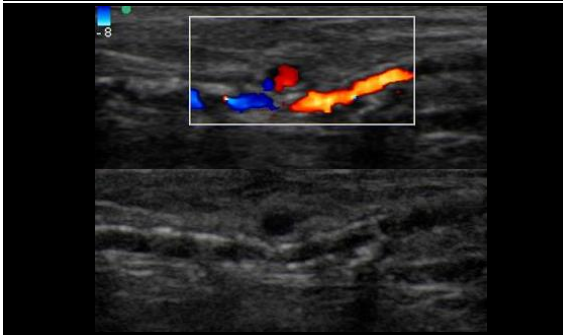
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## Complications



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## References

- Kawarada O. Transradial Intervention for Native Fistula Failure. *Catheterization and Cardiovascular Interventions* (2006) 68:513–520.
- Wu CC. Radial artery approach for endovascular salvage of occluded autogenous radial-cephalic fistulae. *Nephrol Dial Transplant* (2009) 24: 2497–2502.
- Chen SM. Outcomes of Interventions Via a Transradial Approach for Dysfunctional Brescia-Cimino Fistulas. *Cardiovasc Intervent Radiol* (2009) 32:952–959.
- Le L. Transradial approach for percutaneous intervention of malfunctioning arteriovenous accesses. *J Vasc Surg* (2015) 61:747-53.

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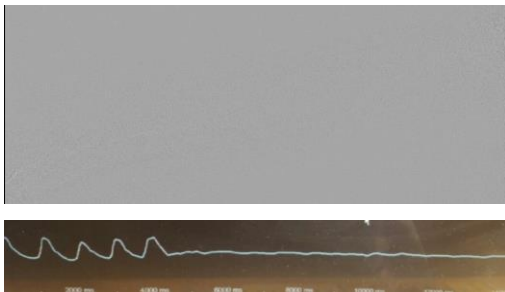
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## Barbeau D



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**Thank you!**

■ amishpatelmd@gmail.com

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VuMedi Webinar  
Radial Approach for Visceral Interventions

# Transradial Approach for Hepatic Interventions

Marcelo Guimaraes, MD FSIR  
Division of Vascular Interventional Radiology  
Associate Professor of Radiology and Surgery  
Medical University of South Carolina



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## Disclosure

### Consultant

- Terumo Interventional Systems
- Cook Medical

### Patents holder

- Cook Medical



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## Why Radial access?



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**Why radial access for visceral interventions?**  
Patient's perspective

- ✓ Immediate ambulation
- ✓ Greater patient satisfaction
- ✓ Shorten length of stay
- ✓ Fewer access site complications (bleeding)
- ✓ Mobility is allowed: nausea/vomiting  
chronic back pain  
access to the restroom



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**Why radial access?**



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**Why radial access for visceral interventions?**  
Technical perspective

- ✓ "Pressure Hemostasis" concept
- ✓ Borderline coagulopathy in liver disease  
> INR, < platelets
- ✓ Favorable anatomy for catheterization from above



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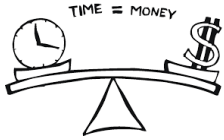
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### Why radial access for visceral interventions? Work-flow/business perspective

- ✓ Supplies cost savings (no closure device)
- ✓ Quicker turn-over of recovery beds
- ✓ Optimization of the recovery area space



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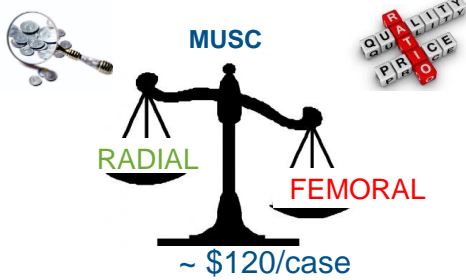
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### Cost Analysis



Supplies (only) savings/year: \$ 48-60K



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### COAGULOPATHY ?

MANY PATIENTS HAVE COAGULOPATHY FROM LIVER DISEASE

- Hypersplenism
- Thrombocytopenia 16K, 4 packs.... 22K.??



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### Coagulopathy ?




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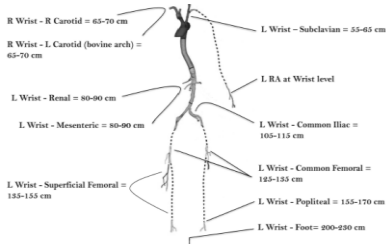
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### Radial access. When?

#### Suitable for everyone?




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### Radial access. When?

#### Suitable for everyone?

Patients > 70 years

History of stroke

Calcified Aortic arch




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## Background

Transradial Approach for Transcatheter Arterial Chemoembolization in Patients With Hepatocellular Carcinoma  
 Comparison with Conventional Transfemoral Approach  
 Shunichi Shitazono, MD, Akira Funahara, MD, Shunpei Endo, MD, Hiroyuki Kato, MD, Takao Katsube, MD, Kenichi Komazawa, MD, Yoshitake Narisaka, MD, and Kenji Ogawa, MD

177 cases via the radial artery  
 > July 1999 to October 2002

65/70 patients (92.9%) replied that they would request transradial approach next time

*J Clin Gastroenterol* 2003;37:412-417




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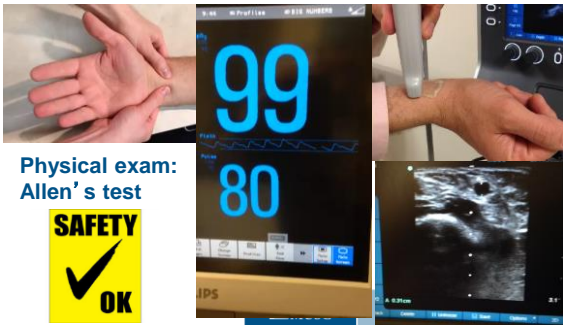
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## Work-up in clinic

### Safety check - Eligibility for TRI access




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### Safety check - Eligibility for TRI access

#### Physical exam: Allen's test

Edgar Van Nuys Allen, American physician, 1893-1986




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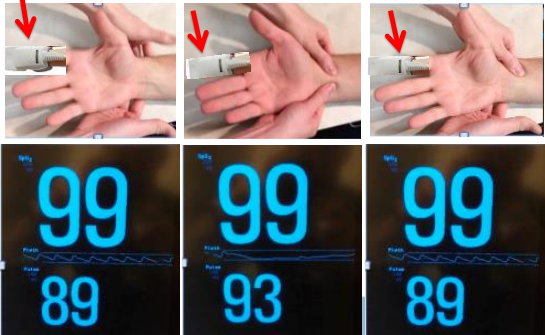
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### Safety check - Eligibility for TRI access

TIS-036-09182015

#### Barbeau's test

Barbeau GR, et al. Am Heart J. 2004;147:489-493.




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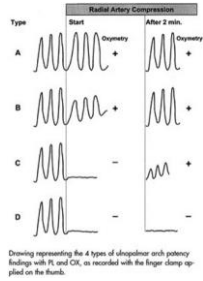
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### Safety check - Eligibility for TRI access

#### Barbeau's test

Barbeau GR, et al. Am Heart J. 2004;147:489-493.




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### EVALUATION FOR ELIGIBILITY ANYWHERE...

#### Maximo (SpO2TM) Pulse Oximeter for iOS Platform (iPhone, iPad & iPod touch) for Consumers\* to Debut at CES

Maximo (SpO2TM) Pulse Oximeter for iOS Platform (iPhone, iPad & iPod touch) for Consumers\* to Debut at CES. The device is currently in development and is not yet available for sale. ©2015 Masimo Corporation. All rights reserved.




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### Safety check - Eligibility for RAVI access Radial artery US exam – 2 objectives



Patency and Radial artery > 2.0mm (AP diameter): good for 5-Fr sheath  
\* Female, smoker

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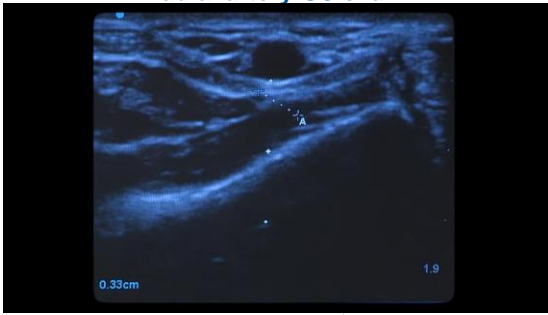
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### Safety check - Eligibility for RAVI access Radial artery US exam



Radial artery > 2.0mm (AP diameter): good for 5-Fr sheath  
\* Female, smoker

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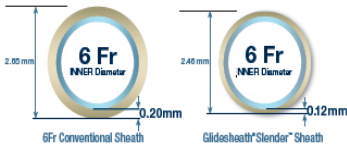
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### New Sheath Technology



#### Glidesheath Slender™

- ✓ Introduce like a 5-Fr
- ✓ Use as a 6-Fr
- ✓ 1-Fr reduction in outer diameter
- ✓ Thin walled sheath



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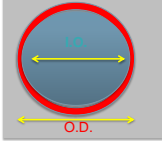
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Glidesheath Slender™ Transradial Introducer Kit

- ✓ Glidesheath Slender™
- ✓ 4/5 Fr, 5/6 Fr, 6/7 Fr
- ✓ Outer diameter (O.D.)
- ✓ Inner diameter (I.O.)



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### Radial access step-by-step

3 alternatives for left arm positioning:

- Crossing the pelvis
- Left side of the body
- 90 degrees abduction



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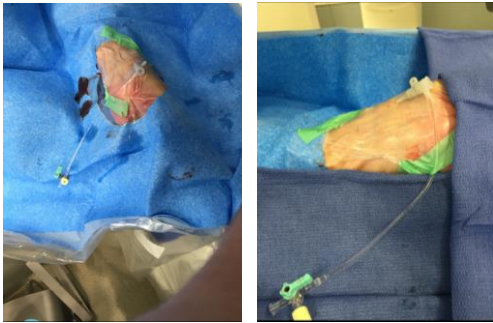
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**Radial access step-by-step**

Table, arm set up

- Arm positioning in 90 degrees abduction



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### Radiation safety



- > Distance from the radiation source
- Shield: between the operator and patient/radiation source

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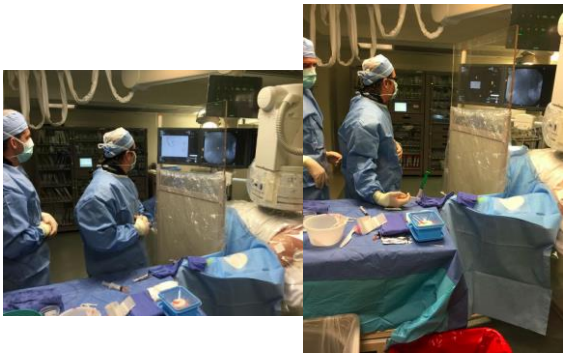
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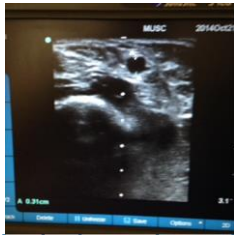
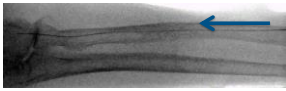
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### RADIAL ACCESS – ALL SET UP?



•Check the BP. IV bolus of saline?

•Devices handy

•Arm positioned correctly. Hand palm gently taped



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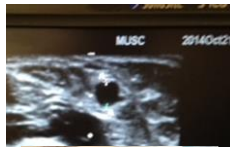
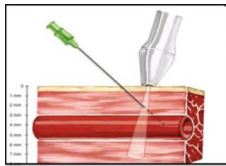
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### Material for radial access

- Ultrasound



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### Material for radial access

- Micropuncture kit
- ✓ Introducer sheath
- ✓ Needle
- ✓ 0.021" wire

Shorter needle:

- standard needle
- "jelco"



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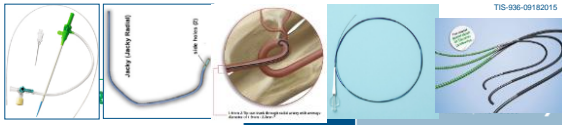
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### Material for TR visceral interventions

- Ultrasound
- Micropuncture kit
- Radial sheath 5-Fr (4-Fr)
- Jacky catheter 5-Fr 110cm
- 1.5 mm J GLIDEWIRE 0.035"
- Progreat Microcatheter 2.8 Fr, 130 cm
- Progreat 150 cm + Advantage microwire 0.018" 180cm




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### VASOSPASM AND THROMBOSIS PREVENTION

#### Medications

##### Heparin:

IV Bolus + additional doses as needed (3-4,000 units, 1,000 units in 30 min)

Hand warmer? Nitro paste?



Vasodilator: via radial sheath (beginning / end of the case)

✓ Nitroglycerine, 200 ug each time




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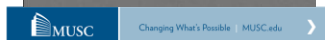
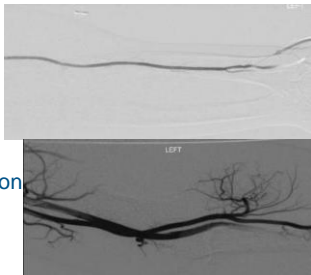
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### Importance of forearm angiograms at the beginning and end of the case

Radial arteriogram after vasodilator:

- Hand injection
- 5-6 cc
- Forceful hand injection
- Catheter at the level of the brachial?




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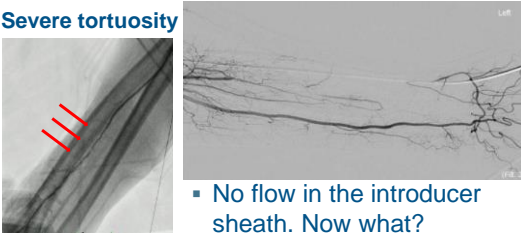
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### Importance of forearm angiograms at the beginning and end of the case

- Arterial size, spasm
- Anatomic variants
- Severe tortuosity



- No flow in the introducer sheath. Now what?



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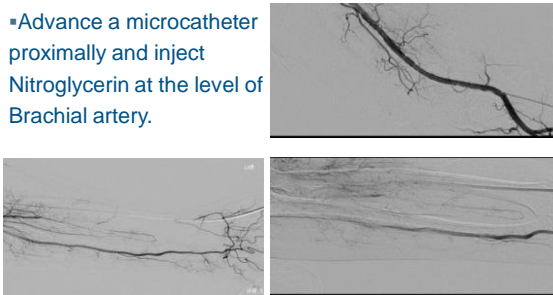
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### Importance of forearm angiograms at the beginning and end of the case

- Advance a microcatheter proximally and inject Nitroglycerin at the level of Brachial artery.



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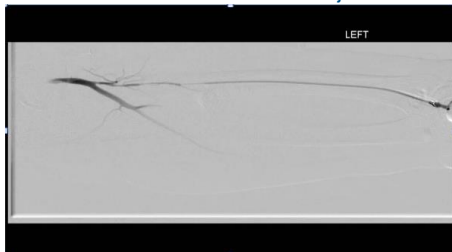
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### Importance of forearm angiograms at the beginning and end of the case

- Resistance encountered during the aspiration of the sheath lateral check flow. Gentle hand injection...



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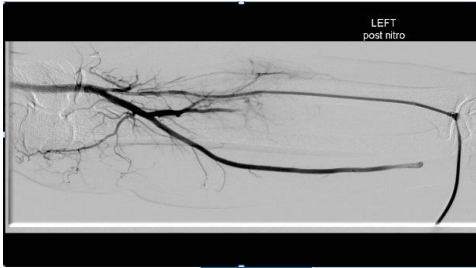
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### Importance of forearm angiograms at the beginning and end of the case

- Nitroglycerin injection through the sheath...



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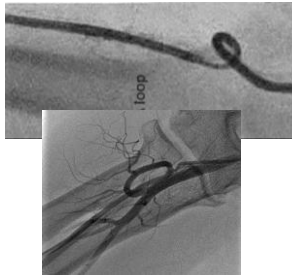
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### Importance of forearm angiograms at the beginning and end of the case

- Variations of the anatomy
- Difficult anatomy



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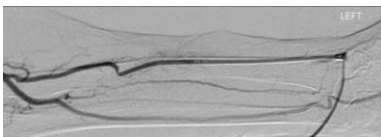
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### Tips & Tricks

Difficulty to advance the guidewire towards the shoulder?



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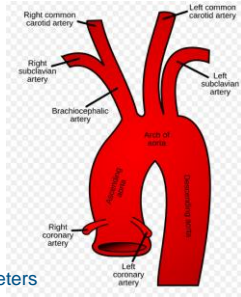
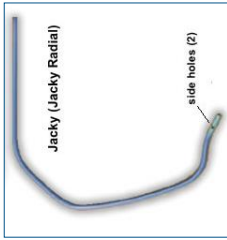
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**SMOOTH RIDE TO THE DESCENDING AORTA...**



5-Fr Jacky or Sarah diagnostic catheters




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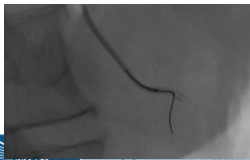
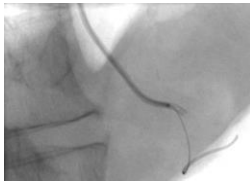
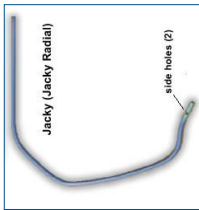
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**SMOOTH RIDE TO THE DESCENDING AORTA...**



5-Fr Jacky catheter




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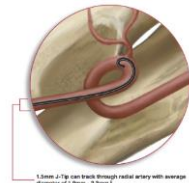
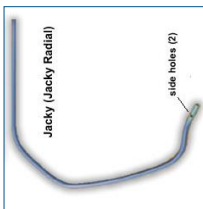
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**SMOOTH RIDE TO THE DESCENDING AORTA...**



1.5mm J-Tip GLIDEWIRE					
Product Code	Max. Len.	Weight	Max. Pull	Max. Push	Max. Bend
070200	200	0.02	100	100	180°
070201	200	0.02	100	100	180°

5 Fr Jacky catheter

0.035" 1.5m J-tip GLIDEWIRE




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**SMOOTH RIDE TO THE DESCENDING AORTA...**

\$ 39.70



\$ 50.33



View Details

Product Code	Product Name	Quantity	Unit Price	Order Qty	Order Total
07000	Hydrophilic	1.000	39.70	1	39.70
07001	Wholey	1.000	50.33	1	50.33

0.035" 1.5mm Hydrophilic wire

0.035" Wholey wire




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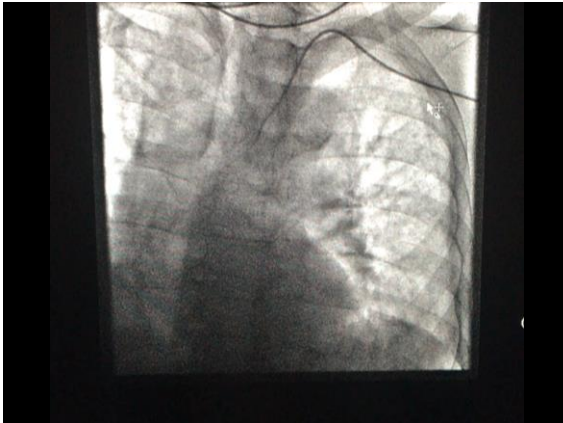
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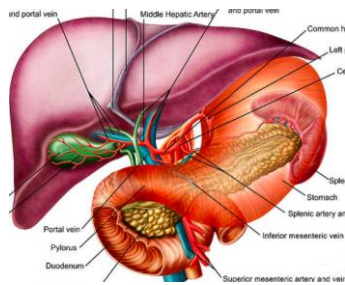
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**TRI - liver directed therapies**

- Bland embolization
- Chemoembolization
- Radioembolization




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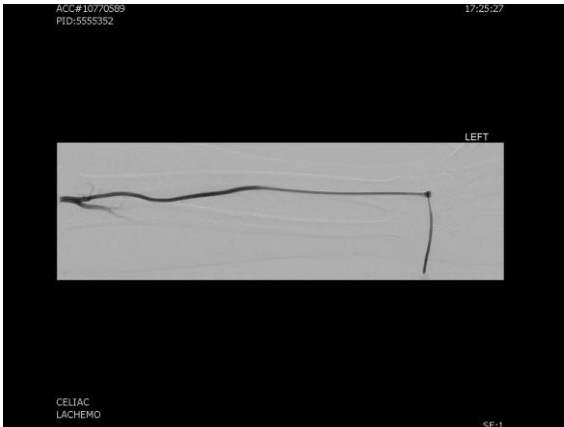
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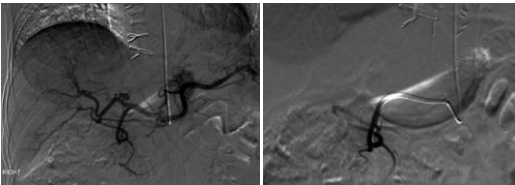
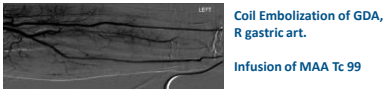
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### Y – 90 Work-up, Infusion of MAA Tc 99



Devices: 5 Fr Jacky catheter  
Progreat 2.8 Fr, 130 cm with pre-loaded wire

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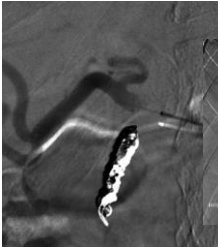
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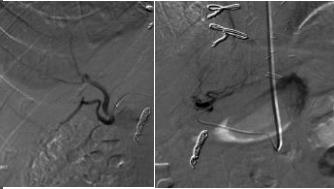
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# Y – 90 Work-up, Infusion of MAA Tc 99

Embolization of GDA, R gastric arteries



Infusion of MAA Tc 99 (simulator)  
SPECT nuclear medicine exam



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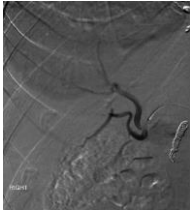
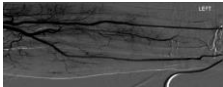
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## 7 days later... Radio-embolization: Y – 90 Infusion



Devices: 5 Fr Jacky catheter  
Progreat 2.8 Fr, 130 cm with pre-loaded wire



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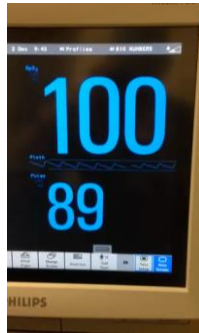
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## Radial sheath removal

Low Pressure Hemostasis to maintain flow through the artery




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## MUSC - Nursing Protocols

- 5-Fr : patient is discharged in 2h
- Observation for 1 h
- Within the 2<sup>nd</sup> hour: deflation of 3-4 cc every 15'
- Full deflation should be completed in 1 h
- Observation, reinflate as needed
- Alternative: deflation within the 1 h.




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## MUSC – DISCHARGE INSTRUCTIONS

The following are instructions your doctor would like you to follow regarding your activity, diet, and follow up care.

Your procedure was done by making a small puncture in your wrist. You must observe that area for bleeding and swelling once you are discharged from the hospital. Be careful not to over-stimulate the affected wrist for 24 hours.

1. Do not strenuously flex the wrist for 24 hours.
  2. Occlusive bandage (Tegaderm) may be removed after 24 hours.
  3. At 24 hours after your procedure, remove Tegaderm bandage and leave puncture site open to air. If minor oozing, apply adhesive bandage (Band-Aid®) and remove after 12 hours.
  4. No driving for 24 hours.
  5. No soaking wrist for 2 days. Gently wash site with soap and water. Dry well. Do not apply powders, lotions or ointments. No tub baths, whirlpool or swimming for 48 hours.
  6. No lifting more than 3-6 pounds with affected wrist for 7 days.
  7. For general discomfort at site, you may take 1 or 2 acetaminophen (Tylenol®) 325mg tablets every 4 hours as needed. Do not exceed 4000 mg of acetaminophen in a 24 hour period. If you cannot take acetaminophen, take the pain medication that has been prescribed by your doctor.
  8. Restart your usual diet and medications with appropriate changes as dictated by your doctor.
  9. For any bleeding, hold pressure with thumb against puncture site and finger against back of wrist.
  10. If you see fresh bleeding, bright red blood or a lump that is getting bigger at puncture site, apply pressure to the area as instructed above and call 843-792-2300 and ask to speak to the interventional radiology fellow on-call.
  11. If you are unable to control the bleeding, call 911.
- If you are unable to control the bleeding, call 911.
- Call the interventional radiology fellow on-call at 843-792-2300 with any concerns or any of the following:
- Swelling, redness, discharge from the site, large bruise or increasing pain, numbness or tingling at the site
  - Temperature of 101° F or higher
  - Shortness of breath




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## Radial Access Training Program

Transradial Interventions Course  
Med University of South Carolina  
Charleston / SC  
[guimarae@musc.edu](mailto:guimarae@musc.edu)



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