Managing Complications of ARTERIAL ACCESS

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Disclosures:

Boston Scientific – Consultant

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Nuvasive - Consultant

RISK FACTORS

Obesity
Diseased Artery
Local Scar Tissue
Larger access size
Anticoagulation
Antiplatelet medications
Hypertension
No US guidance

Continuum of Complications

Retroperitoneal hemorrhage

Expanding hematoma

Acute thrombosis

BLEEDING

THROMBOSIS

Pseudoaneurysm

AV Fistula

Stable hematoma

Dissection

Injury with stenosis

Retroperitoneal Hematoma

Retroperitoneal Hematoma

DIAGNOSIS

- Hypotension
- Pelvic, back pain
- Nausea, vomiting
- Diaphoresis
- Fall in Hgb/Hct

Retroperitoneal Hematoma

IMAGING

- CT Angiogram
- Formal arteriogram

Retroperitoneal Hematoma

TREATMENT

- Resuscitation (IV fluids, transfusion)
- Repair of arteriotomy if actively bleeding
- Covered stent
- Open surgical repair

Expanding Hematoma

Expanding Hematoma

DIAGNOSIS

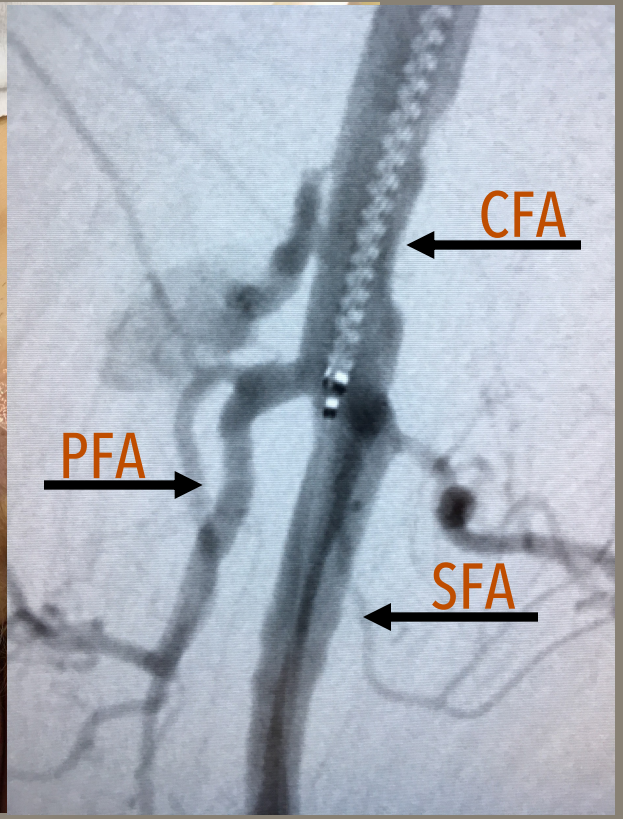
- Visible, palpable expansion
- Hypotension
- Diaphoresis
- Fall in Hgb/Hct

Expanding Hematoma

TREATMENT

- Direct manual compression
- C-clamp / Fem-Stop
- Open surgical repair
- Covered stent

- 89yo female s/p cardiac cath
- Severe AS
- Prohibitive operative risk (GA)
- 18hrs intermittent hypotension, requiring pressors, PRBC



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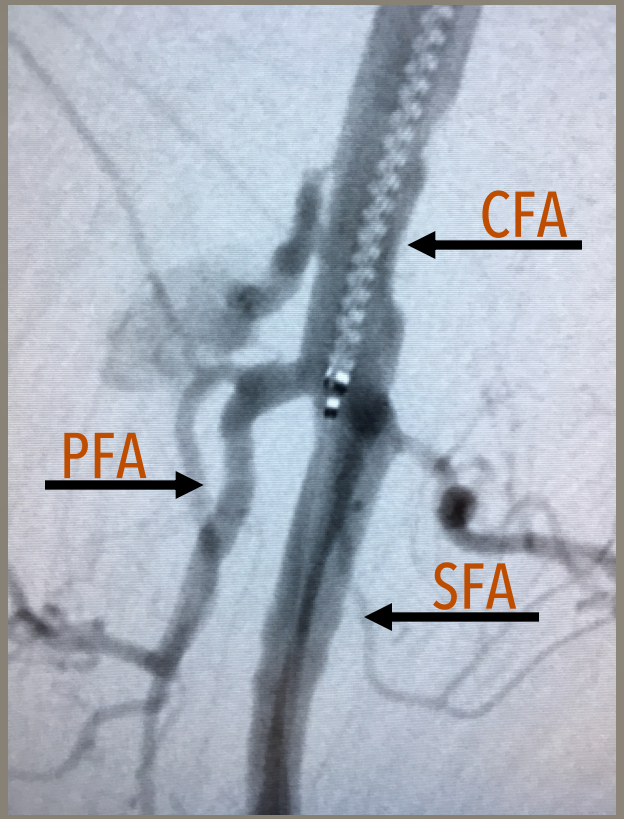
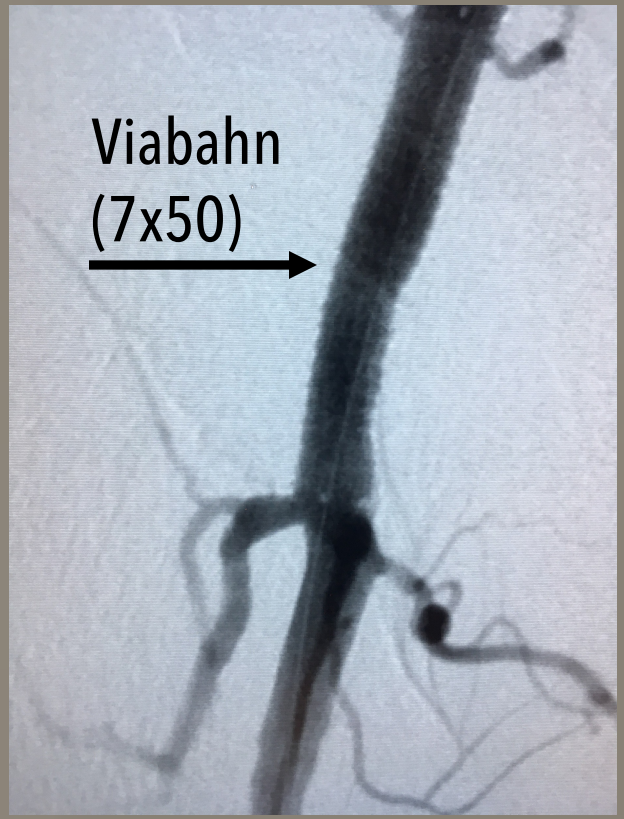
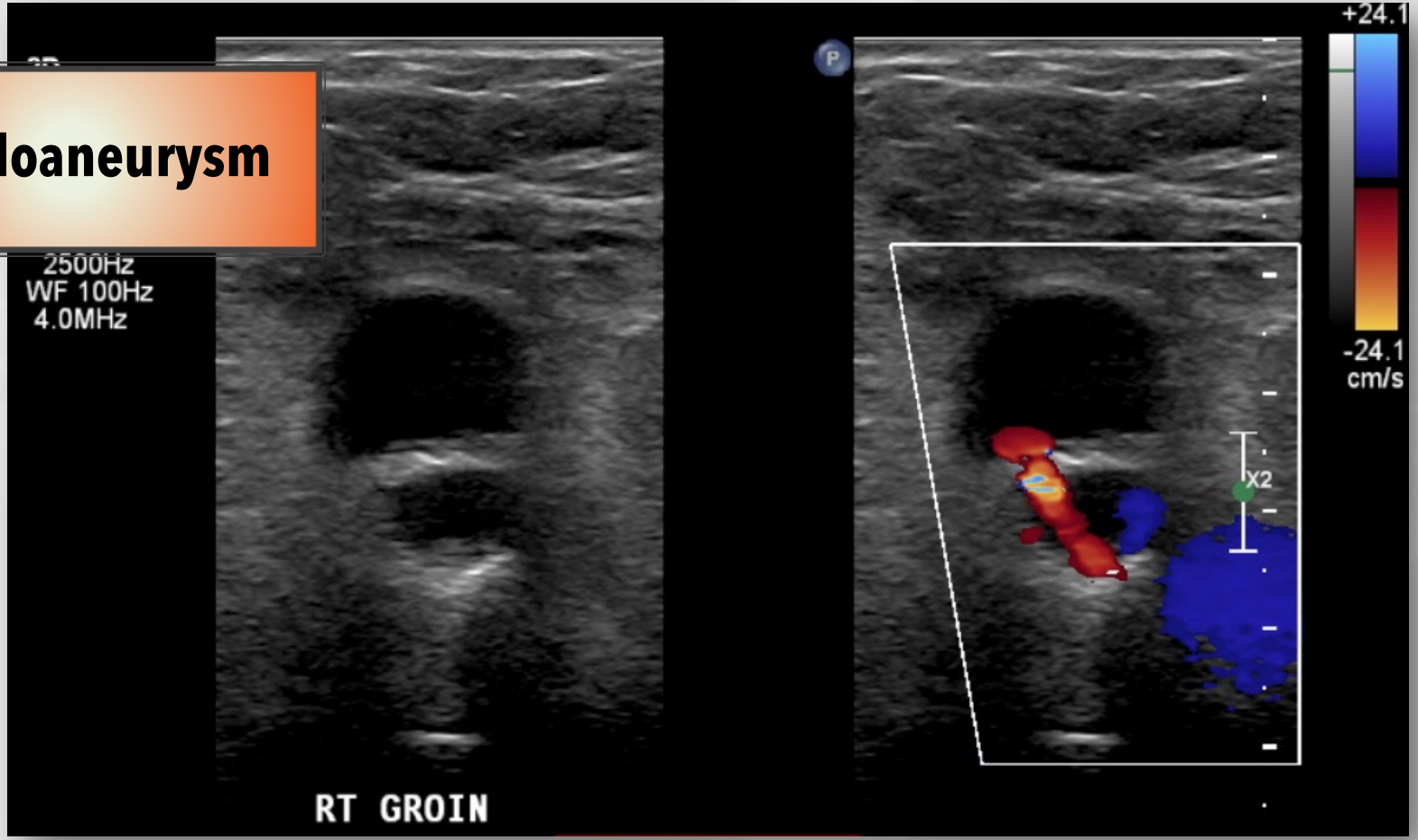




Pseudoaneurysm



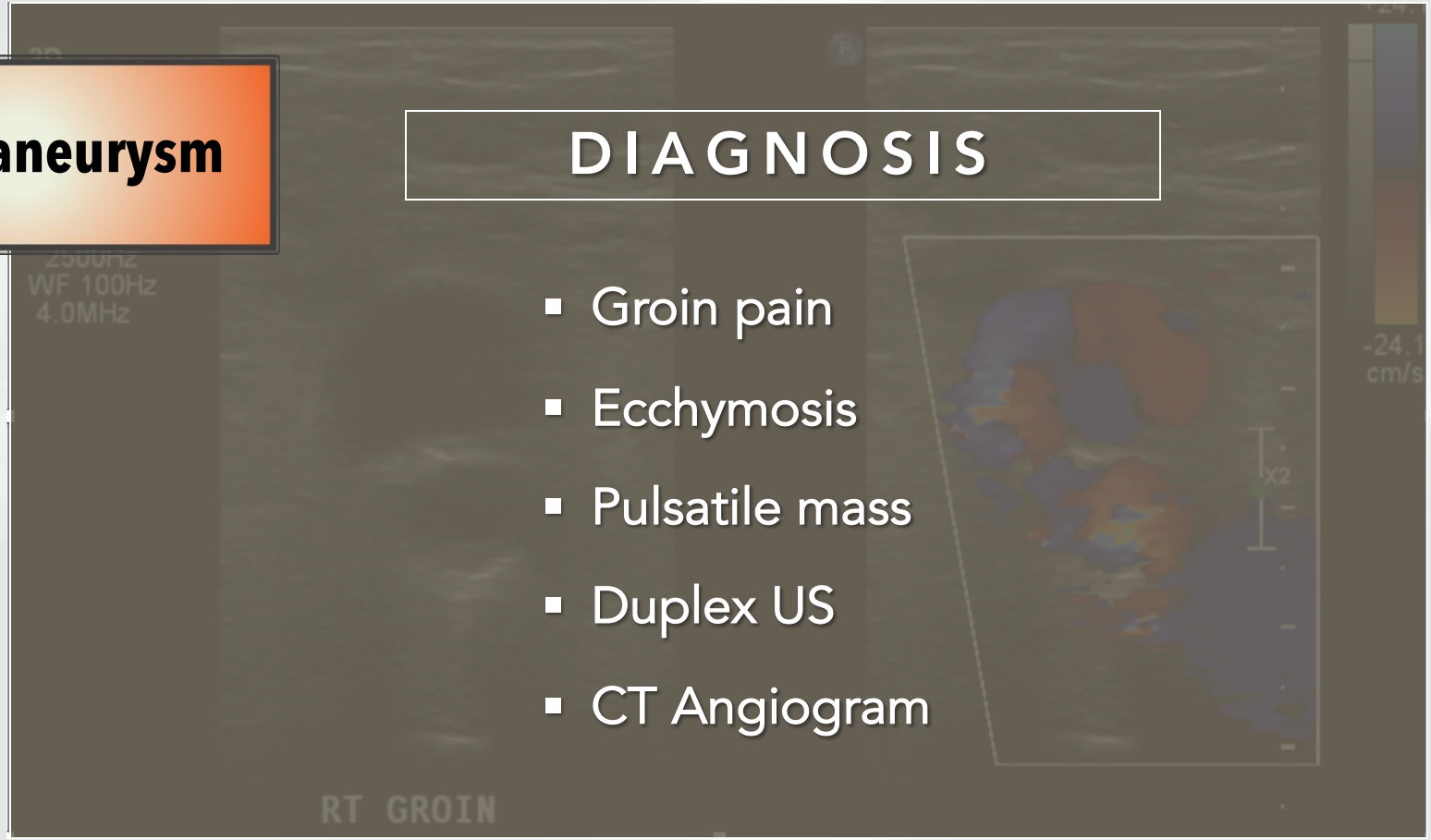
Pseudoaneurysm

"To and fro" flow

Pseudoaneurysm

DIAGNOSIS

- Groin pain
- Ecchymosis
- Pulsatile mass
- Duplex US
- CT Angiogram

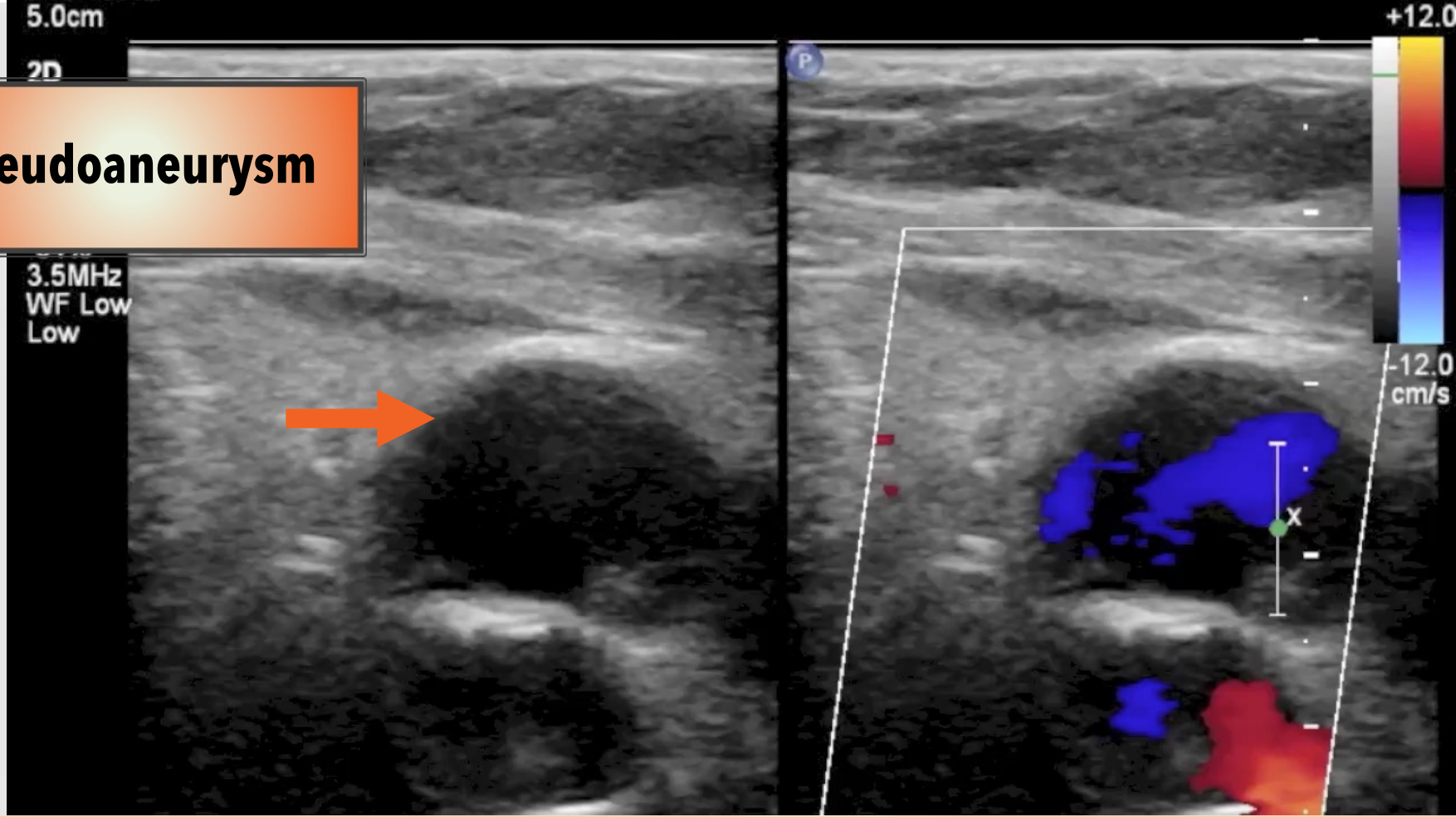


Pseudoaneurysm

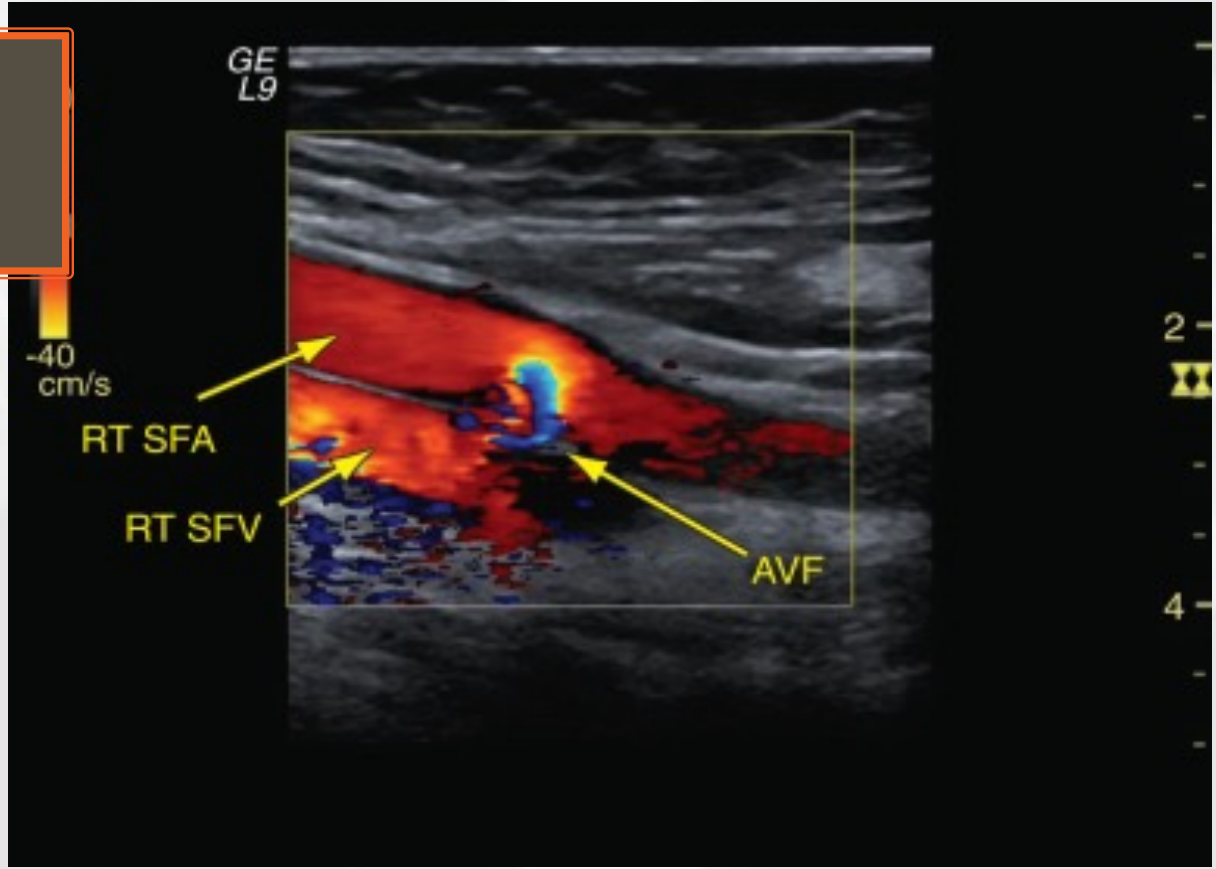
TREATMENT

- Observation of PSA <2cm
- US-guided thrombin injection if >2cm
- US-guided compression
- Open surgical repair

Pseudoaneurysm



Arteriovenous Fistula



Rutherford's Vascular Surgery and Endovascular Therapy, 9th Ed.

Arteriovenous Fistula

DIAGNOSIS

- Often asymptomatic
- Palpable thrill
- Audible bruit
- Duplex US

Arteriovenous Fistula

TREATMENT

- Observation if asymptomatic
- Surgical repair
- Covered stent

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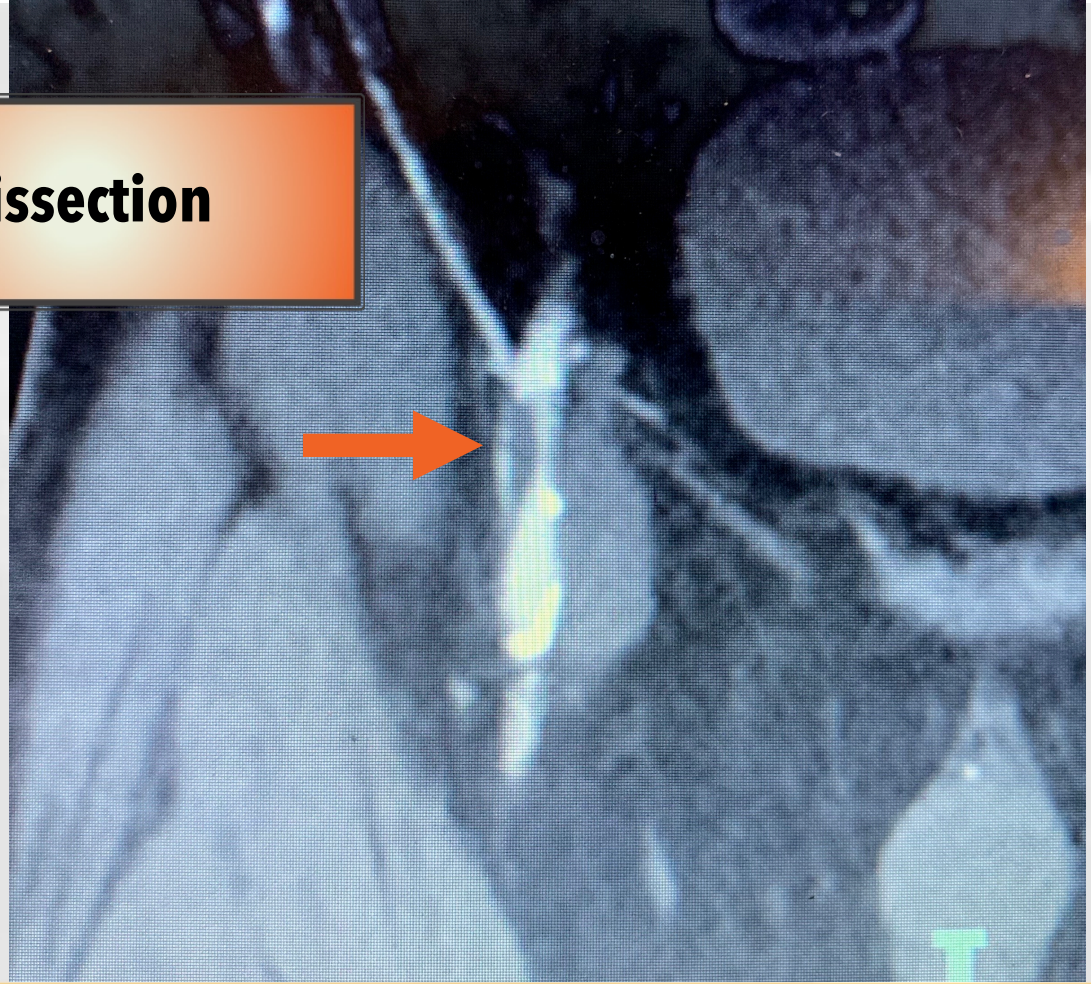


- 71yo male s/p R CFA Perclose
- New, severe claudication
- CTA reveals focal dissection
- Treated via femoral endarterectomy & patch angioplasty

Stenosis

DIAGNOSIS

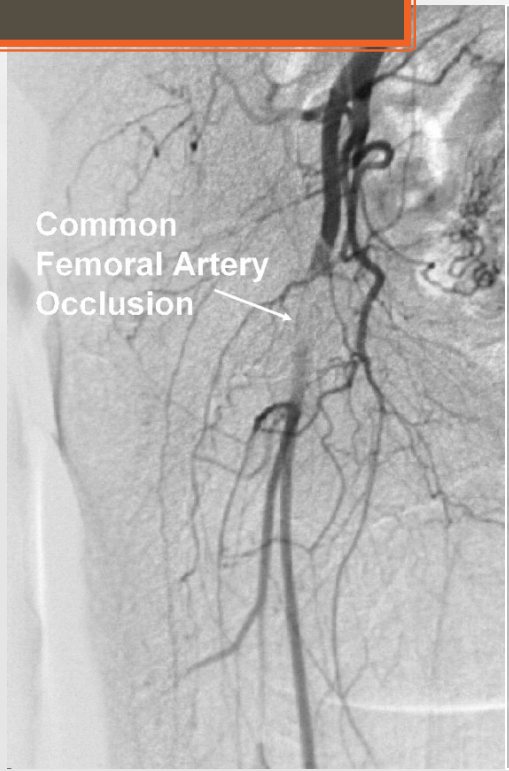
- Post-procedural claudication
- Reduced, absent pulses
- Reduced ABI
- Duplex US
- CT Angiography

Stenosis

TREATMENT

- Angioplasty
- Stenting
- Atherectomy
- Endarterectomy

Acute Thrombosis

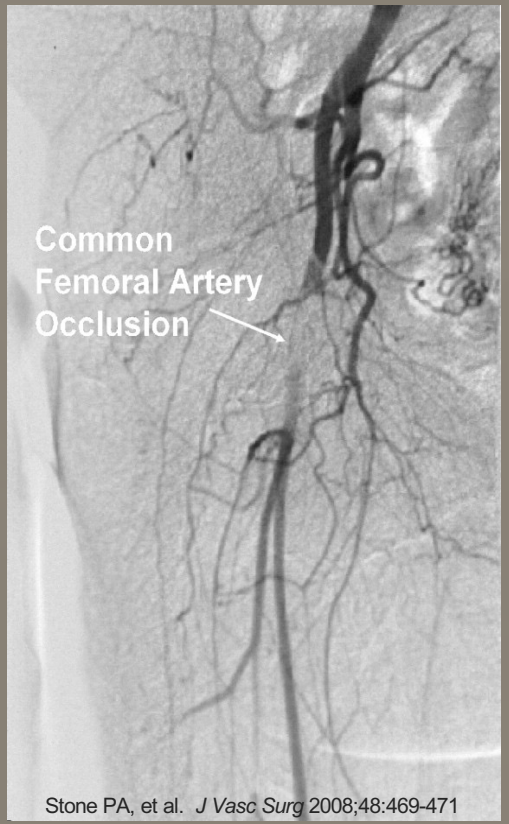


DIAGNOSIS

- Asymptomatic – acute ischemia depending on site
- Absent distal pulses
- Reduced ABI
- Duplex US
- CT Angiography

Stone PA, et al. *J Vasc Surg* 2008;48:469-471

- 51yo female s/p cardiac cath
- Cool R foot after StarClose of 5Fr CFA access
- Duplex – CFA occlusion
- Operative exploration & repair



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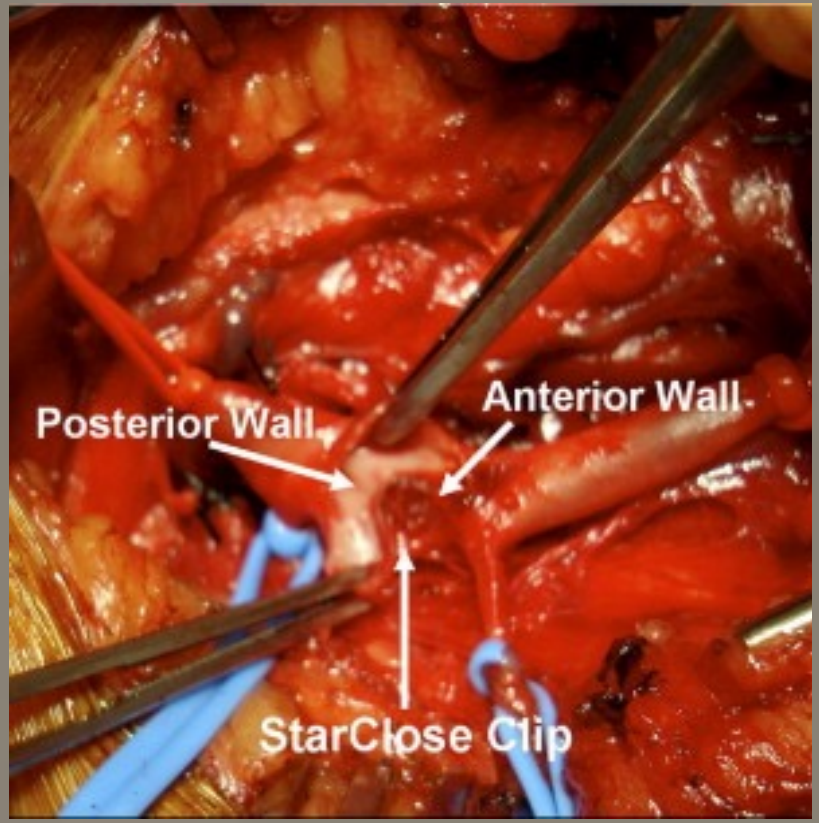

Continuum of Complications

Retroperitoneal hemorrhage

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BLEEDING

Complication Prevention **BEGINS** with **GOOD ACCESS**

THROMBOSIS

Pseudoaneurysm

AV Fistu

Injury with stenosis

"To ultrasound or not to ultrasound?"

US-Guidance Reduces Bleeding Complications

Routine use of ultrasound guidance in femoral arterial access for peripheral vascular intervention decreases groin hematoma rates

Jeffrey Kalish, MD,[a] Mohammad Eslami, MD,[a] David Gillespie, MD,[b] Marc Schermerhorn, MD,[c] Denis Rybin, PhD,[d] Gheorghe Doros, PhD,[d] and Alik Farber, MD,[a] on behalf of the Vascular Study Group of New England, *Boston and Fall River, Mass*

Background: Use of fluoroscopy and bone landmarks to guide percutaneous common femoral artery (CFA) access has decreased access site complications compared with palpation alone. However, only limited case series have examined the benefits of ultrasound to guide CFA access during peripheral vascular intervention (PVI). We evaluated the effect of routine vs selective use of ultrasound guidance (UG) on groin hematoma rates after PVI.
Methods: The Vascular Study Group of New England database (2010-2014) was queried to identify the complication of postprocedural groin hematoma after 7359 PVIs performed through CFA access. Hematoma (including pseudoaneurysms) was defined as minor (requiring compression or observation), moderate (requiring transfusion or thrombin injection), and major (requiring operation). Both procedure-level and interventionalist-level analyses were performed. Multivariable Poisson regression models were used to compare hematoma rates of interventionalists based on routine (≥80% of PVIs) and selective (<80%) utilization of UG in the adjusted overall sample and in multiple subgroups.
Results: The overall postprocedural groin hematoma rate after PVI was 4.5%, and the rate of combined moderate and major hematoma was 0.8%. Among 114 interventionalists with ≥10 PVI procedures, routine and selective UG was used by 31 (27%) and 83 (73%) interventionalists, respectively. Routine UG was protective against hematoma (rate ratio [RR], 0.62; 95% confidence interval [CI], 0.46-0.84; $P < .01$). Subgroup analysis revealed that routine UG was also protective against hematoma under the following circumstances: age >80 years (RR, 0.47; 95% CI, 0.27-0.85; $P = .01$), body mass index ≥30 (RR, 0.51; 95% CI, 0.29-0.90; $P = .02$), and sheath size >6F (RR, 0.43; 95% CI, 0.23-0.79; $P < .01$).
Conclusions: Routine UG may potentially protect against the complication of hematoma for both modifiable and nonmodifiable patient and procedural characteristics. Encouraging routine UG is a feasible quality improvement opportunity to decrease patient morbidity after PVI. (J Vasc Surg 2015;61:1231-8.)

Kalish J et. al. *J Vasc Surg* 2015;*61:1231-8*

- Retrospective review of 7359 common femoral accesses
- Overall rate of hematoma – 4.5%
- Routine US-guidance was protective against hematoma (RR 0.62; P<.01)
- Subgroups that benefited: Age >80, BMI >30, Sheath size >6Fr

US-Guidance Reduces Bleeding Complications

Ultrasound Guidance Facilitates Radial Artery Catheterization

A Meta-analysis With Trial Sequential Analysis of Randomized Controlled Trials

Wan-Jie Gu, MD; Xiang-Dong Wu, MSc; Fei Wang, MD, PhD; Zheng-Liang Ma, MD, PhD; and Xiao-Ping Gu, MD, PhD

BACKGROUND: Potential benefits and possible risks associated with ultrasound guidance compared with traditional palpation for radial artery catheterization are not fully understood.

METHODS: We searched PubMed, Embase, and the Cochrane Library through July 2015 to identify randomized controlled trials that evaluated ultrasound guidance compared with traditional palpation for radial artery catheterization. Primary outcome was first-attempt failure. Secondary outcomes included mean attempts to success, mean time to success, and hematoma complications. A random-effects model was used to estimate relative risks (RRs) with 95% CIs.

RESULTS: Twelve trials used dynamic two-dimensional (2-D) ultrasound guidance (N = 1,992) and two used Doppler ultrasound guidance (N = 666). Compared with traditional palpation, dynamic 2-D ultrasound guidance was associated with a reduced first-attempt failure (RR, 0.68; 95% CI, 0.52-0.87). Trial sequential analysis showed that the cumulative *z* curve crossed the trial sequential monitoring boundary for benefit establishing sufficient and conclusive evidence. Dynamic 2-D ultrasound guidance further reduced mean attempts to success, mean time to success, and hematoma complications. No evidence of publication bias was detected. Compared with traditional palpation, Doppler ultrasound guidance had no benefit on first-attempt failure (RR, 1.00; 95% CI, 0.87-1.15), which was confirmed by trial sequential analysis as the cumulative *z* curve entered the futility area.

CONCLUSIONS: The use of dynamic 2-D ultrasound guidance for radial artery catheterization decreases first-attempt failure, mean attempts to success, mean time to success, and the occurrence of hematoma complications. Dynamic 2-D ultrasound guidance is recommended as an adjunct to aid radial arterial catheterization.

CHEST 2016; 149(1):166-179

- Meta-analysis of 2402 patients
- US-guided radial access reduced 1st attempt failures (RR 0.68, P=.003)
- Reduced mean time to access and mean # of attempts
- Reduced bleeding complications (RR 0.39; P=.04)

☑ Ultrasound

☐ No Ultrasound

Ultrasound

THANK YOU!

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