



A BULLET TO THE CHEST

Resident: Gustavo A. Elias, MD

Attendings: Gordon S. Morano, MD; Brian J. Strife, MD;

Daniel J. Komorowski, MD; Malcolm K. Sydnor, MD

Program/Dept: VCU Medical Center



CHIEF COMPLAINT & HPI

- Chief Complaint and HPI:
 - 20 year old male brought to Emergency Department (ED) with single gun shot wound (GSW) to right anterior chest.
 - Patient leaving party when he was shot once in the chest.
 - Noticed immediate numbness in the right hand.
 - Arrived stable but with expanding right chest wall and shoulder hematoma, tingling and numbness in the right hand suspicious for brachial plexus injury.

RELEVANT HISTORY

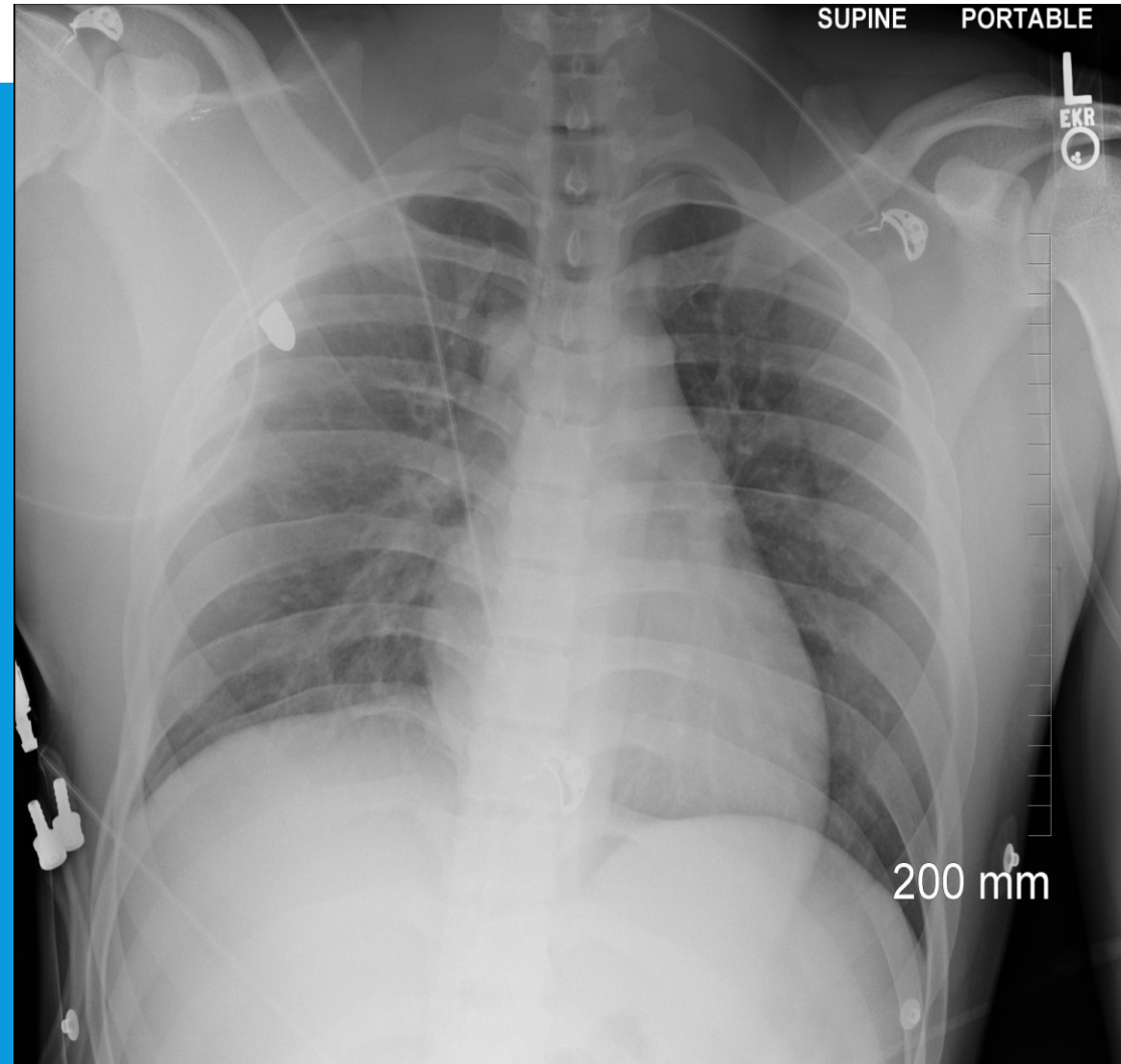
- Past Medical History
 - None.
- Past Surgical History
 - None.
- Medications
 - None
- Allergies
 - NKDA

DIAGNOSTIC WORKUP

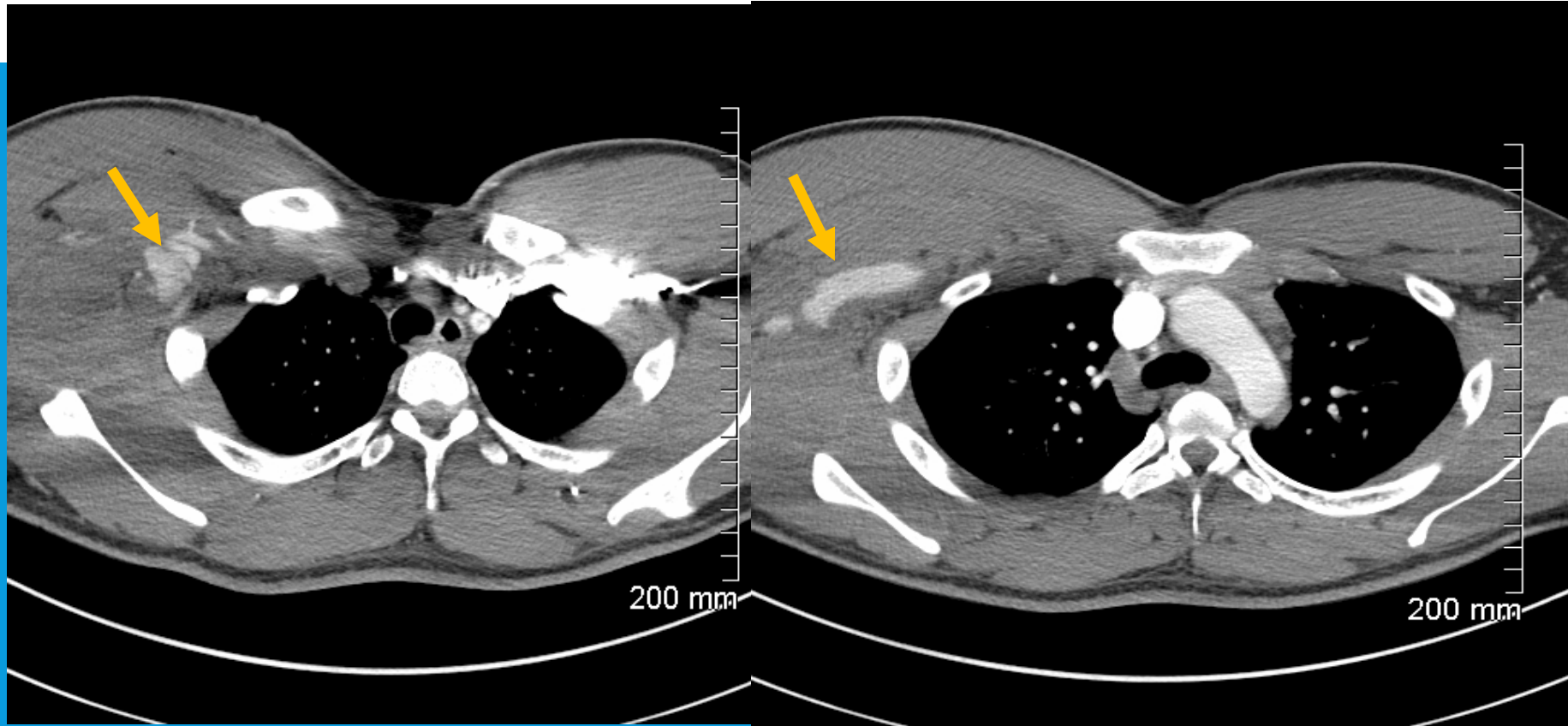
- Non-Invasive Imaging:
 - Chest radiograph
 - CT Chest

DIAGNOSTIC WORKUP – CHEST RADIOGRAPH

- Chest radiograph:
 - Initial CXR remarkable for retained bullet overlying the right scapula.
 - Increased soft tissue density over the right chest and shoulder consistent with hematoma.



DIAGNOSTIC WORKUP – CHEST CT



- Contrast enhanced chest CT (CECT):
 - large hematoma, irregular extravasation/pseudoaneurysm and early enhancement of right axillary vein (arrows).

DIAGNOSIS

- Traumatic AV Fistula
- Vascular surgery was consulted:
 - Palpable right radial pulse, but noticeable weaker than left side.
 - R to L brachial index 0.75.
 - Concern for brachial plexus injury due to loss of sensation.
 - Reduced grip strength.
 - After discussion between the patient, vascular attending, and IR, decision was made to bring patient emergently to the IR suite.

INTERVENTION - ARTERIAL

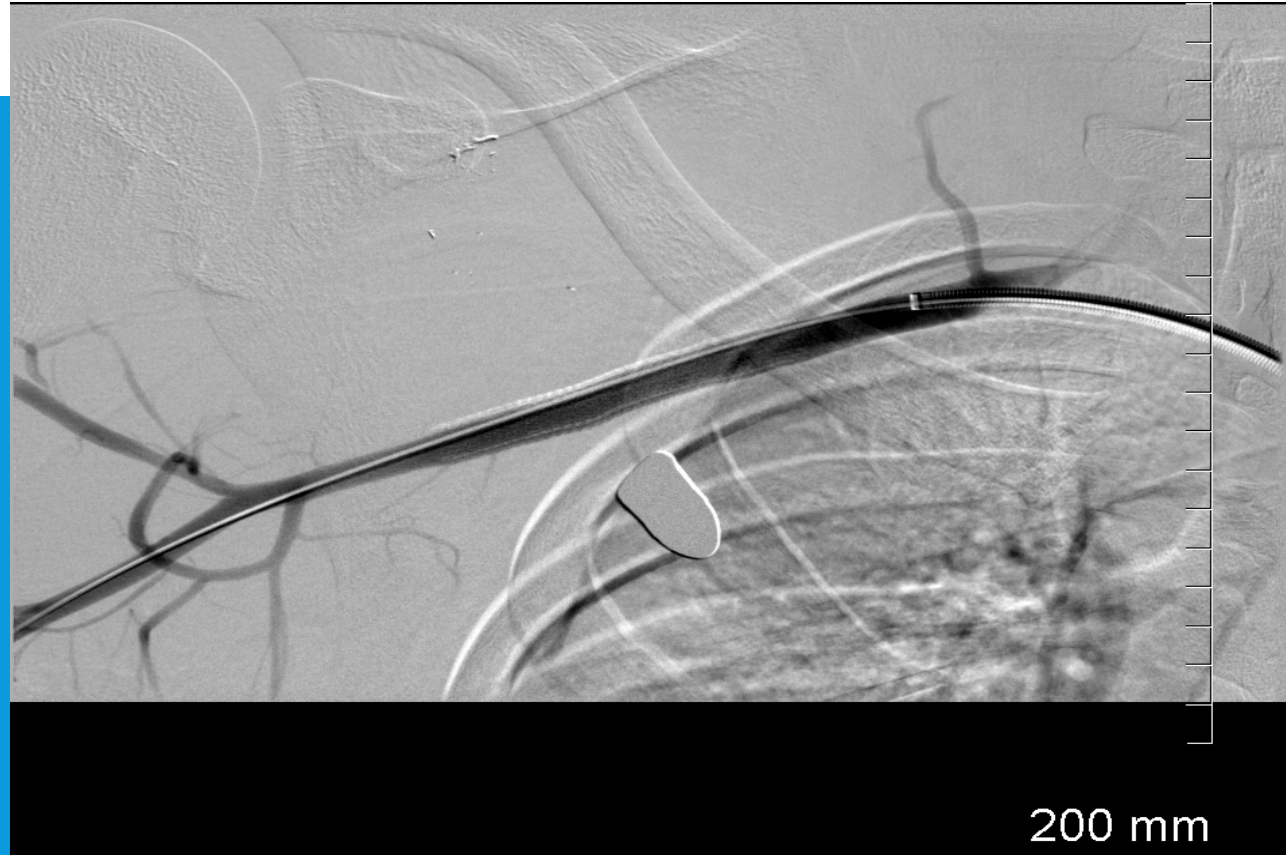


Initial aortogram confirms suspicion for vascular injury - an axillo-subclavian pseudoaneurysm with massive AV fistula is evident (circle).



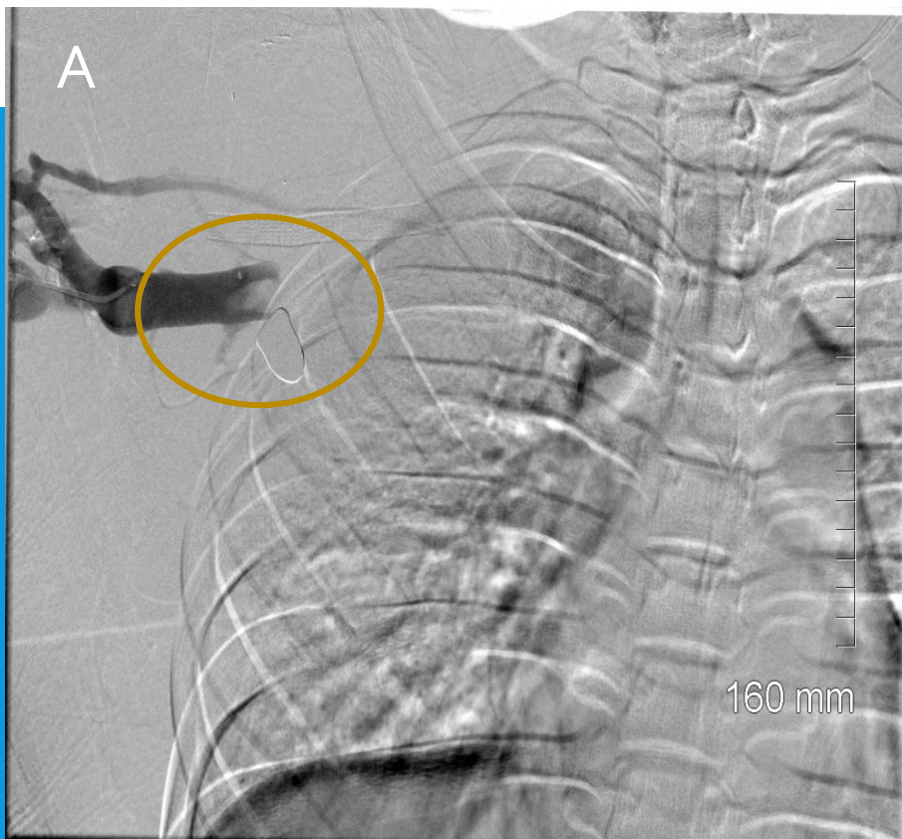
Selective injection from proximal right subclavian artery shows extent of injury; decision was made to repair with stent graft

INTERVENTION - ARTERIAL



A 7mm x 50mm .018 platform Gore Viabahn covered stent was deployed and extended proximally into right subclavian artery with overlapping 8mm x 50mm device to achieve adequate seal. Final angiogram showed complete exclusion of the pseudoaneurysm and AV fistula.

INTERVENTION - VENOUS



A: Right venogram was performed out of concern for accompanying major venous injury. It showed complete transection of the right axillary vein (circle). A wire/catheter was passed across the lesion. Filling defects and luminal irregularity was noted in right subclavian vein.

B: The right axillary and subclavian veins were recanalized with overlapping 14mm EV3 Protégé and 13mm Gore Viabahn self-expanding stents.

CLINICAL FOLLOW UP - QUESTION

- How should the patient in this case be followed up clinically? (Click one of the following)
 - Annual arteriogram and venogram to evaluate patency of the stent grafts.
 - Annual duplex ultrasound and physical exam to evaluate for ischemic and neuropathic symptoms.
 - Annual CT angiogram to evaluate patency of the stent grafts.
 - No follow-up is necessary.

CORRECT!

- How should the patient in this case be followed up clinically?
- A. ~~Annual arteriogram and venogram to evaluate patency of the stent grafts.~~
- B. Annual duplex ultrasound and physical exam to evaluate for ischemic and neuropathic symptoms.
- C. ~~Annual CT angiogram to evaluate patency of the stent grafts.~~
- D. ~~No follow-up is necessary.~~

CONTINUE WITH CASE

SORRY, THAT'S INCORRECT.

- How should the patient in this case be followed up clinically?
- A. ~~Annual arteriogram and venogram to evaluate patency of the stent grafts.~~
- B. Annual duplex ultrasound and physical exam to evaluate for ischemic and neuropathic symptoms.
- C. ~~Annual CT angiogram to evaluate patency of the stent grafts.~~
- D. ~~No follow-up is necessary.~~

CONTINUE WITH CASE

CLINICAL FOLLOW UP

- Patient tolerated procedure well and was discharged three days later.
- Started on dual antiplatelet therapy with Aspirin (ASA) and Plavix.
- On the last follow-up in Vascular Surgery/IR clinic:
 - Asymptomatic except for residual numbness in 4th and 5th digits.
 - 2+ right radial pulse.
 - No arm swelling; motor and sensation intact.
 - Plavix discontinued at 6 month visit, now on ASA 81mg indefinitely.

SUMMARY & TEACHING POINTS

- On non-invasive imaging, an arteriovenous fistula demonstrates intense arterial phase filling of adjacent veins.
- Arteriogram will demonstrate contrast filling of the adjacent vein.
- In the setting of trauma, a case by case evaluation of surgical repair vs. endovascular stent placement is suggested. The question of long term durability of stents to treat traumatic injury in young patients has not been answered to date.
- Clinical follow-up after endovascular stent placement consists of annual duplex ultrasound, as well as physical exam to evaluate for peripheral neuropathy and ischemic signs/symptoms.

RECOMMENDED FURTHER READING

- Dubose JJ, Rajani R, Gilani R, Arthurs ZA, Morrison JJ, Clouse WD, Rasmussen TE. Endovascular management of axillosubclavian arterial injury: a review of published experience. *Injury Int J Care* 2012; 43: 1785-1792.
- Hilfiker PR, Ravazi MK, Kee ST, Sze DY, Semba CP, Dake MD. Stent graft therapy for subclavian artery aneurysms and fistulas: single center mid-term results. *J Vasc Interv Radiol* 2000; 11(5): 578-584.
- Jeroukhimov I, Atlshuler A, Peer A, Bass A, Halevy A. Endovascular stent graft is a good alternative to traditional management of subclavian vein injury. *J Trauma* 2004; 57: 1329-1330.