

Arterial Injury from Bone Marrow Biopsy. Causes and Treatment

Keith Quencer MD, Claire Kaufman MD and Karen Brown MD
University of Utah, Department of Radiology, Division of Interventional Radiology

Learning Objectives:

- 1-Review indications, contraindications and techniques for bone marrow biopsy
- 2-Review pelvic arterial anatomy in relation to posterior iliac crest
- 3-Show 4 cases of arterial injury by CT, ultrasound and conventional angiography.
- 4-Review embolization techniques for superior gluteal artery injury

Bone Marrow Biopsy (BMBx):

Indications:

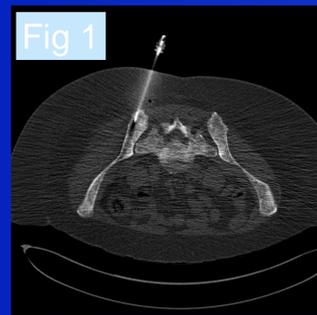
- Frequently performed procedure
- Hematologic diagnosis
- Treatment follow-up.

Contraindications:

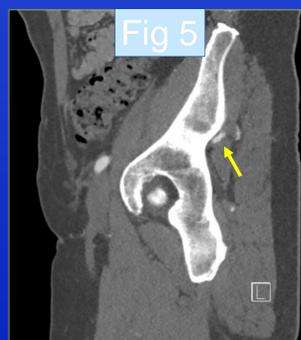
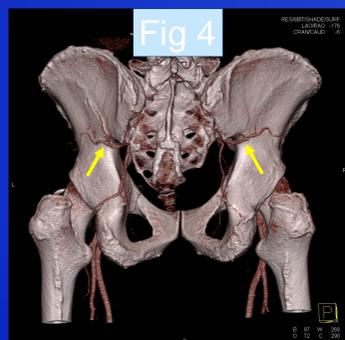
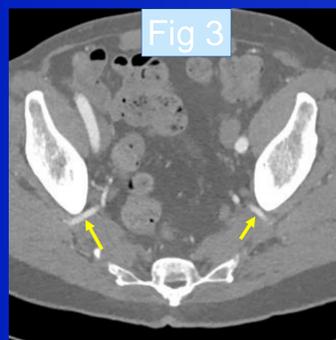
- Active infection over site of biopsy
- Severe coagulopathy/DIC
- Inability to palpate site or image site due to body habitus
- Considered low bleeding risk procedure
 - Performed even with severe thrombocytopenia (<10k/ul)
 - Performed on anticoagulation if there is risk of thrombosis with discontinuing these medications

Technique:

- Target active marrow in axial skeleton, most often posterior iliac crest
- Frequently done by palpation
- May also be done image guided
 - CT (figure 1) or Fluoroscopy (figure 2) targeting posterior iliac crest
- On fluoroscopy, image intensifier should be angled approximately 30° contralateral oblique. Middle 3rd of iliac crest is
- Typically done with 11G needle
- Aspirate with and without heparin followed by core

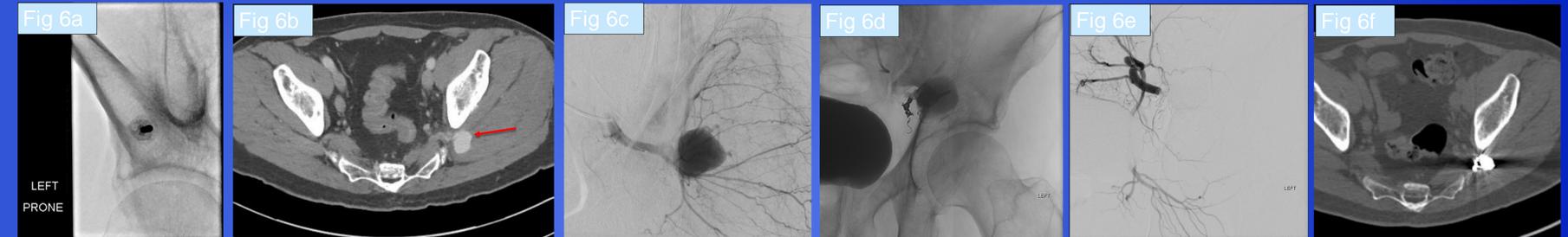


Anatomy:

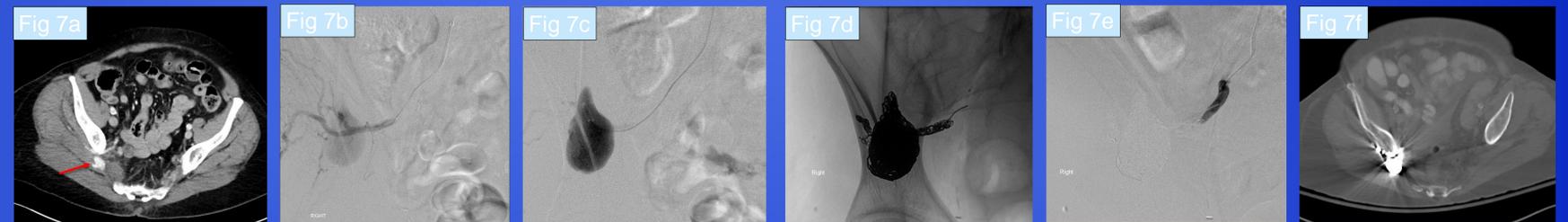


Cases:

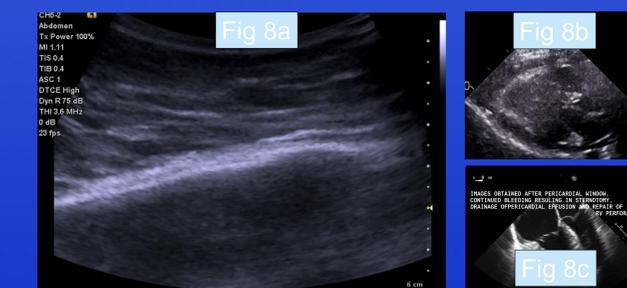
Case 1: 65 y/o M with multiple myeloma who underwent fluoroscopic BMBx. Ischium just above acetabulum was erroneously targeted (fig 6a). Platelet count at time of bx was 130. Patient was on Xarelto which was not held. Patient developed progressively severe left hip pain. CT was done showing pseudoaneurysm (PSA) arising from the left superior gluteal artery (red arrow fig 6b). Angiogram showed pseudoaneurysm (PSA) from superior gluteal artery (fig 6c). Coil embolization of outflow vessels was followed by Onyx embolization of PSA and main trunk of superior gluteal artery (fig 6d). Angiogram showed desired occlusion of the PSA (fig 6e). Follow-up PET 3 months later (fig 6f) showed embolic material at site of injury.



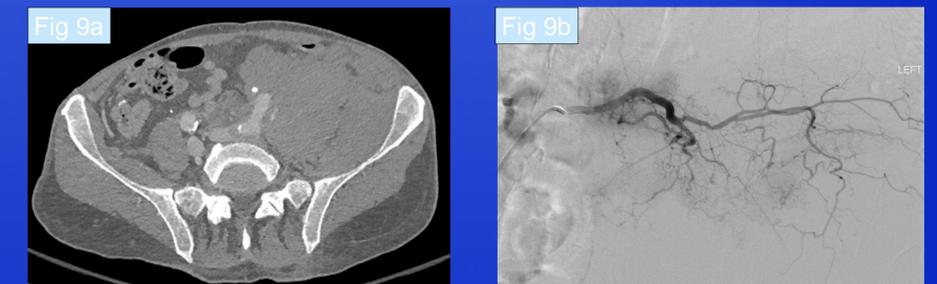
Case 2: 70 y/o F with hx of myelofibrosis who underwent bedside BMBx which patient described as painful with subsequent associated radicular pain. Exam showed swelling at the site. CT was done showing PSA arising from superior gluteal artery (fig 7a, red arrow). Angiogram and embolization were performed 1 month later showing PSA to be arising from superior gluteal artery (fig 7b) with interval 3 fold enlargement of PSA sac now measuring 4cm in greatest dimension. Embolization of outflow, sac and inflow was performed with coils.



Case 3: 33 y/o F with CML and morbid obesity. US guided sternal marrow biopsy (fig 8a) was complicated by pericardial tamponade necessitating emergent pericardiocentesis (fig 8b) followed by pericardial window and repair of RV injury (fig 8c). Patient expired 6 days post-op with right heart failure.



Case 4: 78 y/o M who underwent OSH BMBx for hematologic work-up. Post procedure, patient had pain and hypotension. CT showed large retroperitoneal hematoma. Angiogram showed some irregularity of the left L4 lumbar artery. Gelfoam embolization was performed with stabilization of HCT.



Discussion:

Bone marrow biopsy is considered a safe procedure with reported rate of adverse events of 0.07% (1). Rarely arterial injury can occur. In the current literature there are 7 case reports of arterial injury following bone marrow biopsy, 5 of which were treated with transcatheter embolization (2-5). The most commonly injured vessel is the superior gluteal artery (4,5). This vessel courses through the greater sciatic foramen just below the posterior iliac crest (case 1&2). Proper iliac crest entry in the mid portion of the posterior iliac crest and trajectory are paramount to avoid injury to this vessel. RP hematoma from lumbar artery injury (case 4) as well as median sacral artery also been reported (2). Transcatheter embolization is an effective treatment. Heart injury with pericardial tamponade has been reported (6) when sternal BMBx is performed (case 3).

References:

- 1-Bain BJ. Morbidity associated with bone marrow aspiration and trephine biopsy - a review of UK data for 2004. *Haematologica*. 2006;91(9):1293-1294.
- 2- Al Zahran Y, Peck D. Median sacral artery injury following a bone marrow biopsy successfully treated with selective trans-arterial embolization: a case report. *J Med Case Rep*. 2016;10:42. Published 2016 Feb 24. doi:10.1186/s13256-016-0827-5
- 3- Wojcieszowski A, Duckart M, Hartmann J, Bullinger L, Matzdorff A. Retroperitoneal Hematoma after Bone Marrow Biopsy: The First Cut Should Not Be the Deepest. *Oncol Res Treat*. 2019;42(5):283-288. doi:10.1159/000499743
- 4- Arellano-Rodrigo E, Real M, Muntalola A, et al. Successful treatment by selective arterial embolization of severe retroperitoneal hemorrhage secondary to bone marrow biopsy in post-polycythemic myelofibrosis. *Ann Hematol*. 2004;83(1):67-70. doi:10.1007/s00277-003-0683-4
- 5- Ge PS, Ng G, Ishaque BM, Gelabert H, de Virgilio C. Iatrogenic pseudoaneurysm of the superior gluteal artery presenting as pelvic mass with foot drop and sciatica: case report and review of literature. *Vasc Endovascular Surg*. 2010;44(1):64-68. doi:10.1177/153857440351990
- 6-Santavy P, Troubil M, Lonsky V. Pericardial tamponade: a rare complication of sternal bone marrow biopsy. *Hematol Rep*. 2013;5(3):e13. Published 2013 Sep 24. doi:10.4081/hr.2013.e13

Axial contrast enhanced CT (fig 3), 3D MIP image (fig 4) and sagittal projection (fig 5) show the superior gluteal artery. This vessel originates from the posterior division of the internal iliac artery and exists the greater sciatic foramen above the piriformis muscle. It has superficial and deep branches. The latter has superiorly coursing branches that course towards the sacroiliac joint