

A Teachable Moment in Minimizing Morbidity with Bone Marrow Biopsy Procedures

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ARTICLE INFO	ABSTRACT
<p>Article type: Brief Report</p> <hr/> <p>Article History: Received: 10 Sep 2024 Accepted: 10 Nov 2024</p> <hr/> <p>Keywords: Biopsy; Lymphoma; Myeloma; Near miss; Quality improvement</p>	<p>For adults, the iliac crest is the preferred site for bone marrow biopsy and aspiration. Attention to detail in the placement of the incision are necessary to obtaining an adequate specimen and avoiding injury in patients. In addition, awareness of the height and rotational position of the patient's hips is important to prevent injury and need for repositioning during the procedure. We report a case where the biopsy needle was at an unusual angle that placed the patient at risk for retroperitoneal bleeding. Uniquely, the patient also had a Positron Emission Tomography (PET) scan done the next day and was noted to have an awkward trajectory that could have led to a hematoma or retroperitoneal bleeding. It was clear that if the operator continued to use this approach, it would put future patients at greater risk for morbidity. This unique case led to identification of a "near-miss" event and motivated the re-training of bone marrow biopsy operators.</p>
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Introduction

An older man noted an enlarged lymph node on his neck. CT confirmed the presence of a 5.2 cm heterogeneously enhancing mass posterior to the right submandibular gland. A needle core biopsy of the mass revealed a B-cell non-Hodgkin lymphoma. A staging bone marrow biopsy and aspiration (with a powered bone marrow device) were performed before the patient underwent a PET scan. The patient tolerated both procedures without difficulty.

Materials and Methods

Information for this case was obtained by chart review.

A consent form was signed by the patient.

Results

Incidentally, the PET scan identified the bone marrow biopsy tract. The tract passed through the iliac crest, the sacroiliac joint, and the sacrum (Figure 1a).

It approached the retroperitoneal space but did not cross into it. Histologic sections corroborated these findings, showing bone marrow and extensive amounts of cartilage (Figure 1b).

A follow-up interview with the patient revealed that he did not develop any abdominal or retroperitoneal pain.

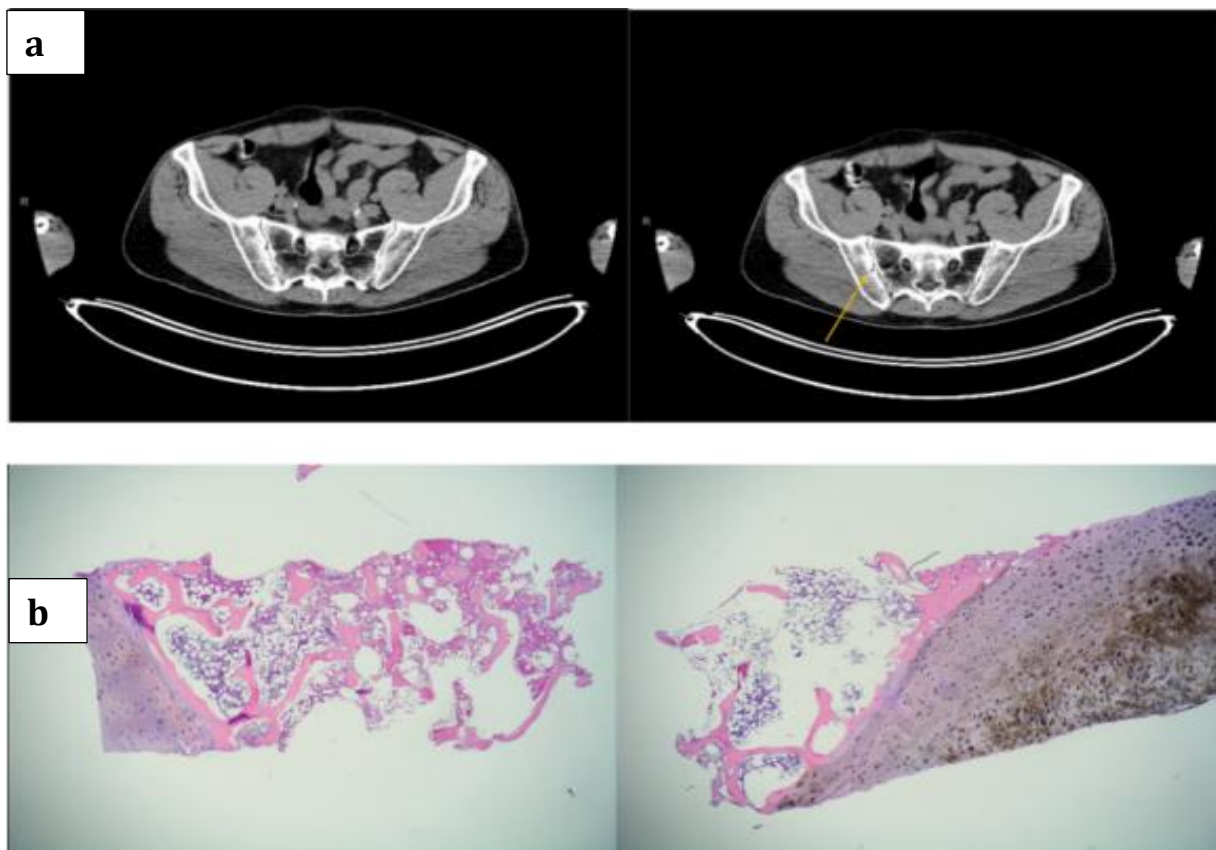


Fig 1a: CT scan of the biopsy tract entering (left) lateral to the posterior superior iliac crest and extending obliquely through the bone and into the sacroiliac joint (right). It pierces the cortex of the sacrum, a few inches from the retroperitoneal space. 1b: Corresponding histology showing the beginning (left) and end (right) of the bone marrow biopsy, including the copious amount of nearby cartilage (furthest on the right side) that the biopsy needle went through.

Discussion

The iliac crest is the preferred site for adults for bone marrow biopsy and aspiration (1). Patients are often positioned on their side in the fetal position (as at our

institution), sitting down or prone. Once the patient is positioned, palpation of the crest is critical to determine the site of an incision, allowing the shortest and most direct approach to the iliac crest. In our experience,

patience and attention to detail in the incision placement are critical in obtaining an adequate specimen and saving the operator considerable time and energy repositioning the biopsy needle. For patients positioned on their side, the operator must also be aware of the height and rotational position of the patient's hips, as this may affect the angle at which the biopsy needle enters the iliac crest. In this case, the biopsy needle was placed at an unusual angle, possibly placing the patient at risk for retroperitoneal bleeding.

Nevertheless, there were no bleeding complications in this case, and we were fortunate that the radiologist reading the PET scan noticed the awkward trajectory of the biopsy tract and relayed that information to the bone marrow biopsy service. Subsequently, there was a discussion with the operator regarding the patient biopsy technique. During the discussion, it became clear that the operator's preference for positioning patients on their side and at a relatively low vertical height (to gain more leverage) likely led to the downward trajectory of this biopsy.

Furthermore, it was also clear that if the operator continued to use this approach, future patients undergoing bone marrow biopsies would be at greater risk for retroperitoneal bleeds. The operator was retrained to raise the patient to the elbow level, encouraging perpendicular insertion of the biopsy needle into the lower back and iliac crest. It is noteworthy that the operator has caused no retroperitoneal bleeds after doing dozens of bone marrow biopsies since the case in point. Another noteworthy detail is that this biopsy entered the pelvis through the lateral wing of the iliac crest rather than the standard posterior aspect. It is somewhat surprising because the lateral wing has a very hard surface that is difficult to penetrate with a manually driven biopsy needle (e.g., Jamshidi). The operator used a powered bone marrow device (Arrow® OnControl®) comparable to a hand-held "drill." This powered device may allow entry into the pelvis in a way that a manual device could not, facilitating the awkward trajectory of the biopsy tract. It is also possible, however, that this region of the

patient's pelvis was unusually soft due to osteoporosis, and penetration could have occurred with any device.

Complications after bone marrow biopsy at the posterior iliac crest are rare (<0.1-0.5%) and typically minor (i.e., pain or infection at the incision site) (2,3).

post-procedure hematomas have also been reported, but the precise incidence is unclear (4-5). Risk factors for hemorrhage include myeloproliferative disorder, platelet dysfunction, and thrombocytopenia. We would add suboptimal patient positioning to this list, although this is a solitary case report, and we need to know how prevalent poor positioning is and how often it leads to retroperitoneal hematomas. Our case is notable because the biopsy tract and its precarious trajectory were identified on subsequent imaging. To our knowledge, no guidelines recommend the assessment of bone marrow biopsy tracts in post-biopsy imaging. However, in this case, identification of the tract led to the recognition of a "near miss" event and an opportunity for quality improvement through education and retraining.

Based on this experience, we recommend that bone marrow biopsy and radiology services maintain open lines of communication, particularly when bone marrow biopsies and imaging studies occur in close succession. In addition, it is reasonable to include biopsy tract information in radiological reports, as this information helps bone marrow biopsy services improve the quality and success of their procedures.

References

1. Foucar, K. (2020). Bone Marrow Pathology (4th ed., pp. 49-61). ASCP Press.
2. Bain, B. J. (2006). Morbidity associated with bone marrow aspiration and trephine biopsy: A review of UK data for 2004. *Haematologica*, 91(9), 1293-1294.
3. Le Dieu, R. (2003). Complications of trephine biopsy. *Br J Haematol*, 121(6), 822.
4. Neese, A. (2009). Clinical management of massive retroperitoneal hemorrhage after bone marrow biopsy. *Leuk Lymphoma*, 50(3), 475-477.
5. Bain BJ. Bone marrow biopsy morbidity: review of 2003. *J Clin Pathol* 2005; 58:406-408.