Needle-in-Needle Technique for Percutaneous Retrieval of a Fractured Biopsy Needle during CT-Guided Biopsy of the Thoracic Spine

HAMZA SHAIKH, JAYESH THAWANI, BRYAN PUKENAS

Hospital of the University of Pennsylvania; Philadelphia, PA, USA

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Summary

Common complications related to CT-guided percutaneous thoracic bone biopsy procedures include pneumothorax and muscular hematoma. Serious, but rare complications include paralysis, nerve injury, CSF leak, and aortic injury. Device failure has not been well documented in the literature. We discuss our experience with biopsy needle breakage during retrieval of a core specimen and the technique used to help retrieve an embedded needle using a CT fluoroscopic-guided, needle-in-needle approach.

A 43 year-old man with Stage IIIa NSCLC was found to have a T11 vertebral body lesion as seen on PET, CT, and MR imaging. The patient underwent a CT-guided biopsy in the prone position. The T11 vertebral body was localized and cannulated using the percutaneous Bonopt[®] (Apriomed, Upsala, Sweden) needle device. After fine needle aspiration samples were obtained, a core needle biopsy was attempted with a 16-gauge device. The needle fractured 4 cm deep to the skin during removal of a sclerotic lesion, leaving a retained portion within the pedicle and vertebral body.

Using CT-guided fluoroscopy, a large diameter Murphy M2 needle was advanced over the distal portion of the fractured Bonopt needle. The Murphy M2 needle was advanced distal to the tip of the Bonopt needle and removed, capturing the broken Bonopt penetration needle along with a core specimen. Larger-bore biopsy needle systems and/or a coaxial system should be used to perform core biopsies in sclerotic lesions to

prevent device fracture. If there is device fracture, a larger-bore needle may be used to help capture the fractured needle and prevent open surgery.

Introduction

CT-guided percutaneous bone biopsy of spinal lesions is a well-established procedure with minimal risks and complications. This procedure is not only simple and safe, but is excellent in localizing lesions precisely to accurately obtain a high pathology yield. Percutaneous biopsies also save costs related to hospitalization and can be performed on an outpatient basis¹. The common complications related to thoracic spine procedures include pneumothorax and muscular hematoma. Serious, but rare complications include paralysis, nerve injury, CSF leak, and aortic injury. Device failure has not been well described in the literature although it is a known problem described generally in series²⁻⁴. We discuss our experience with biopsy needle breakage during retrieval of a core specimen and the technique used to help retrieve the embedded needle using a CT fluoroscopic guided, needle-in-needle approach.

Clinical Presentation

A 43 year-old man closely followed for Stage IIIa NSCLC (pT2aN1Mx), status post neoadjuvant chemoradiation (recently completed Etoposide/Cisplatin and protons to 5040cGy)

Figure 1 A) Axial and sagittal non-contrast CT scan reformatted in bone algorithm windows demonstrating a sclerotic lesion within the left posterior T11 vertebral body. B) Axial and sagittal post contrast T1-weighted imaging demonstrated thick peripheral enhancement corresponding to the T11 vertebral body lesion seen on CT.

Figure 2 Axial, noncontrast CT scan obtained in bone algorithm windows after biopsy needle breakage demonstrating the proximal and distal tips of the broken needle.

Figure 3 A) The Murphy M2 needle sliding over the broken biopsy needle. B) The Murphy M2 needle embedded within the vertebral body over the broken biopsy needle. C) The cast formed after removal of the broken biopsy needle and Murphy M2 needle were removed.

Figure 4 Picture of the broken Bonopty biopsy penetration needle.

followed by left thoracotomy with left upper lobectomy, thoracic lymphadenectomy, and lower lobe wedge resection presented with a new FDG avid, sclerotic T11 vertebral body lesion which was thought to be a metastatic lesion based on both follow-up CT chest and PET scan (Figure 1). Therefore, the patient was referred for a CT fluoroscopic guided percutaneous bone biopsy. Pre-biopsy assessment demonstrated a normal neurologic examination.

The patient was placed in the prone position on the CT scanner and received monitored sedation provided by the anesthesiology team. The patient was prepped and draped in sterile fashion. 1% Xylocaine was utilized for superficial and deep local anesthesia. Utilizing CT and CT-fluoroscopic guidance, an 18-gauge, 3.5 inch spinal needle was advanced in a parapedicular fashion to the T11 vertebral body and deep anesthesia was administered. The 18-gauge spinal

needle was removed, and a 16 cm, 15 gauge Bonoptoy penetration needle was advanced into the densely sclerotic portion of the lesion within the superior aspect of the T11 vertebral body. The inner stylet was removed, and in order to obtain a core biopsy the hollow penetration needle was slowly advanced into the lesion under intermittent CT fluoroscopy. Due to the sclerotic nature of the lesion the needle started to angle and forward pressure was stopped. However, during removal of the needle, it fractured with the distal portion remaining embedded 4 cm deep to the skin in the deep paravertebral muscles and the T11 sclerotic lesion (Figure 2). Therefore, an 11-gauge, 15cm Murphy M2 needle was advanced over the distal portion of the broken Bonoptoy penetration needle under CT fluoroscopic guidance. The Murphy M2 needle was slowly advanced over the Bonoptoy penetration needle and into the sclerotic lesion of the T11 vertebral body. Then, it was further advanced past the sclerotic portion of the bone into the normal portion of the T11 vertebral body. The Murphy M2 needle was then removed, capturing the broken Bonoptoy penetration needle along with a core specimen containing sclerotic bone and normal bone. (Figures 3 and 4) Core biopsies from the Murphy needle in the bone the needle were placed in formalin. The patient tolerated the procedure well, without immediate complications. The patient was also prophylactically given 1 gram of Ancef after the procedure ended. The core biopsy specimen demonstrated a metastatic lesion.

Discussion

Image-guided percutaneous bone biopsies have become the standard of care for spinal lesions. They are safe, accurate, cost-effective, and give good diagnostic results. Complication rates

are low and are most commonly treatable and local. Device failure is a rare complication and has not been discussed extensively in the literature. The management of this complication as described has not been published in the literature.

The Bonoptoy® biopsy system has been used by our group for multiple years. This system utilizes an outer penetration needle that is embedded within the bone using two different drill bits within the inner stylet. After the penetration needle is embedded in the lesion, the inner stylet is removed and either a longer penetration needle is screwed into the lesion coaxially or the penetration needle within the lesion is further screwed in and removed with the core specimen.

We describe a case of needle fracture during removal of a Bonoptoy penetration needle after core biopsy. This case illustrates the importance of utilizing a larger bore needle when targeting sclerotic lesions and using a coaxial technique for more support when using the Bonoptoy set to prevent needle angulation and potential breakage.

In cases where needle breakage does occur, guiding a larger-bore biopsy needle (such as the Murphy) over and through the retained, fractured needle can help to remove it and ultimately obviate the need for an open surgical retrieval.

Conclusion

Larger bore biopsy needle systems and/or a coaxial system should be used to perform core biopsies in sclerotic lesions to prevent device fracture. If there is device fracture, a larger bore needle may be used to help capture the fractured needle and prevent a need for open surgery.

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Hamza Shaikh, MD
Hospital of the University of Pennsylvania
3400 Spruce Street. 2 Dulles Rm. 219
Philadelphia, PA 19104 USA
Tel.: 215-662-6865
Fax: 215-662-3283
E-mail: Hamza.shaikh@gmail.com