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Tri-axial Biopsy Needle Cauterization During Splenic Biopsy

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To the Editor

Image guided splenic interventions are rarely performed due to concern for risk of hemorrhage leading to complications with risks often outweighing the benefits. The major complication rate for large core (14G) splenic biopsy has been reported as high as 13%^[1] likely due to the highly vascular nature of the organ. Smaller gauge core needle biopsy decreases this rate of major complications to approximately <2%.^[2] Although core needle biopsy has the highest tissue and diagnostic yield, fine needles (22G) have fewer bleeding complications.^[3] Many cystic or solid splenic lesions cannot be characterized well with imaging alone. For these patients, biopsy may be very useful, especially in malignant diseases that can have diffuse or localized splenic involvement like Hodgkin and non-Hodgkin lymphoma.^[2]

A 38-year-old female with history of Li-Fraumeni syndrome developed an enlarging 3 cm splenic lesion with high signal intensity on T2 weighted MRI. RF ablation of the needle track was performed without an RFA probe, with a small gauge active uninsulated 25G stylet (Covidien/Radionics) placed inside a 22G chiba needle, then placed inside the outer coaxial 19G cannula, with this all inside an insulating 18G Angiocath sheath (with the hub cut off). This RFA stylet is commonly used for neurolysis and is non-disposable and always used when contained within a larger needle. The tri-axial biopsy ablation system with a grounded thermochromic, tissue-mimicking phantom was tested prior to clinical use, as an estimate of the thermal damage diameter (Figure 1). The phantom was synthesized using

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Disclosure of conflicts of interest

The institution and Philips Healthcare have a Cooperative Research and Development Agreement (CRADA) related to fusion navigation and cone beam CT. Both the institution and Philips share intellectual property in the field.

Studies with human participants

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual patients for the procedures. Reporting and analysis were part of an Institutional Review Board-approved protocol which waived written informed consent requirements, given the retrospective nature of this report, as well as the use of FDA cleared devices.

polyacrylamide and a chromogenic, temperature sensitive dye (color change threshold is 60°C). The phantom provided important information in terms of determining thermal profiles to inform RFA parameters during cauterization. In addition, the phantom provided useful qualitative information with thermal damage diameter, in order to perform a safe ablation that minimized non-target ablation, while accomplishing the goal of cauterization of the needle tract.

Due to higher risk for radiation-induced cancers with Li Fraumeni syndrome, splenic biopsy was performed under ultrasound guidance. Coaxial 20G Core and FNA 22G needles were placed through a 19G outer needle for the biopsy, all of which was placed inside an 18G angiocath (Figure 2). Then, needle track cauterization was performed using a 25G nerve RFA stylet inside the outer needles as described, with 2 grounding pads/dispersive electrodes on the patient's thighs. The goal temperature was 90 degrees Celsius, with resulting RFA parameters of 66 ohms, 1.3 amps, and 120 watts. Deeper tract cauterization was initially performed for 28 seconds with the angiocath insulating the skin and superficial spleen. This was followed by superficial tract cauterization for 27 seconds, with the angiocath pulled all the way back to the skin, to insulate and prevent skin burn. RFA was performed for just under 30 seconds, or until the impedance rose suddenly. Hemostasis was achieved upon removal of the needle and ultrasound was used to monitor the echoes resulting from peri-needle heating (Figure 3). Pathology showed no evidence of malignancy, but the patient suffered no complications and reported no unexpected pain and required no post procedure analgesics.

Use of image guided percutaneous biopsy of the spleen has become more common with recent data showing safe and accurate diagnosis of suspected splenic metastases when using smaller gauge needles. Accuracy in terms of diagnostic yield from the biopsy reportedly ranges from 88%–98%^{[2][4][5][6]}. However, the most common and feared major complication following splenic intervention is hemorrhage, which accounts for 90% of the major complications.^[2]Track cauterization post procedure was performed successfully in one case, although no high-level data exists to validate its use in reducing the risk of post biopsy hemorrhage. Preclinical animal studies have proven the value of this approach however.^[2] The use of thermochromic, tissue-mimicking phantom before proceeding with the new system is a useful tool to plan for safe cauterization and determining appropriate RF parameters. A tri-axial biopsy cauterization system was created from common equipment with low cost or non-disposable devices, with the intent to decrease the risk of post-biopsy bleeding.

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References

1. McInnes MDF, Kielar AZ, Macdonald DB. 2011; Percutaneous image-guided biopsy of the spleen: systematic review and meta-analysis of the complication rate and diagnostic accuracy. *Radiology*. 260:699–708. DOI: 10.1148/radiol.11110333 [PubMed: 21693659]
2. Sammon J, Twomey M, Crush L, et al. 2012; Image-guided percutaneous splenic biopsy and drainage. *Semin Intervent Radiol*. 29:301–10. DOI: 10.1055/s-0032-1330064 [PubMed: 24293803]
3. Singh, aK; Shankar, S; Gervais, Da; , et al. 2012; Image-guided Percutaneous Splenic Interventions. *Radiographics*. 32:523–534. DOI: 10.1148/rg.322115135 [PubMed: 22411947]
4. Patel N, Dawe G, Tung K. 2015; Ultrasound-guided percutaneous splenic biopsy using an 18-G core biopsy needle: our experience with 52 cases. *Br J Radiol*. 88:20150400.doi: 10.1259/bjr.20150400 [PubMed: 26337505]
5. Civardi G, Vallisa D, Bertè R, et al. 2001; Ultrasound-guided fine needle biopsy of the spleen: high clinical efficacy and low risk in a multicenter Italian study. *Am J Hematol*. 67:93–9. DOI: 10.1002/ajh.1085 [PubMed: 11343380]
6. Cavanna L, Lazzaro A, Vallisa D, et al. 2007; Role of image-guided fine-needle aspiration biopsy in the management of patients with splenic metastasis. *World J Surg Oncol*. 5:13.doi: 10.1186/1477-7819-5-13 [PubMed: 17274814]

Figure 1. Thermachromic phantom study showing nerve stylet in place with ablation zone (in pink). The stylet was connected to RF generator (Radionics) to test for electrical compatibility and to estimate the thermal damage diameter.

Figure 2. Biopsy needle cauterization system with multiple coaxial needles housed inside an angiocath. A. small gauge active uninsulated 25G stylet (Covidien/Radionics) B. 22G chiba needle C. outer coaxial 19G cannula D. 18 G Angiocath sheath (with the hub cut off)

Figure 3.
Intra-procedural ultrasound images showing needle placement and echogenic ablation zone immediately surrounding the needle (arrow).