



Needle Navigation Proves Valuable for Image-Guided Biopsy

Freehand Biopsy Guided by Electromagnetic Needle Tracking: A Phantom Study

C. Ewertsen, K. Rue Nielsen, M. Bachmann Nielsen, Department of Radiology, Copenhagen University Hospital, Rigshospitalet Copenhagen, Denmark

Ultraschall in Med, 2011; 32: 614-618

Summary and Methods

In this phantom study, the authors evaluate accuracy and time required to perform a free-hand electromagnetic needle tracked biopsy using a traditional in-plane and out-of-plane approach compared to standard needle guided technique with an attached steering device. A LOGIQ E9 ultrasound system (GE Healthcare, Chalfont St. Giles, UK) 16-gauge eTRAX™ Needle Tip Tracking System (CIVCO Medical Solutions, Kalona, IA) and a semi-automatic needle (Ranfac, MA) was used to perform 20 in-plane and out-of-plane biopsies on a custom phantom. (Dansk Fantom Service, Denmark) Time was recorded for each attempt and macroscopic investigation of the retrieved core samples determined the presence of red dye from the 1cm lesions. This process was repeated using the standard mounted needle guide technique.

Discussion and Results

Time required to set-up the equipment needed to perform the electromagnetic needle guided procedure was approximately 5-minutes.

The overall success rate was 87% for in-plane needle tip tracking, 92% for out-of-plane needle tip tracking and 88% for in-plane standard needle guided biopsy technique.

The average time spent to perform the needle guided technique was 14.5 seconds faster than the electromagnetic techniques. The authors expect time to biopsy decreases with user experience. Additionally, this method offers out-of-plane biopsy to facilitate several degrees of freedom compared to conventional biopsy.

Conclusions

The authors successfully demonstrated effective in-plane and out-of-plane biopsy using electromagnetic needle tip tracking.

Key findings using this technique include:

- Proven as an accurate alternative to traditional needle guided techniques
- Enables the use of ultrasound for biopsy of pulmonary lesions when coupled with fusion imaging
- On-screen graphically marked needle tip and ease of re-direction enables precise needle tip placement.

Author Commentary

"We believe electromagnetic needle tracking will be relevant in several clinical settings: for intervention in air-containing cavities especially in combination with image fusion and for intervention in diagnosing small lesions to ensure accurate placement of the needle tip."

"It enables off-plane biopsy for instance in areas with limited access due to ribs and it adds the possibility of targeting specific lesions."

