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Title: Optical coherence tomography for increasing the diagnostic yield of TBNA

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Body: Introduction: Bronchial biopsy techniques of peripheral nodules are associated with poor diagnostic yields. Optical coherence tomography (OCT) can be used to assess tissue microstructure in vivo, however is typically restricted to airway or pleural-based approaches. The aim of this study was to develop a transbronchial OCT catheter, and to investigate the potential of OCT to differentiate nodules from parenchyma with the goal of increasing the TBNA diagnostic yield of peripheral nodules. Methods: We developed a narrow diameter OCT catheter compatible with standard 21-gauge TBNA needles. Safety and feasibility was demonstrated in 3 swine, in vivo. To determine the accuracy of OCT for differentiating nodules from surrounding parenchyma, OCT was conducted in 55 surgically resected tissue specimens. 2 OCT experts, 2 pathologists, and 2 pulmonologists interpreted the OCT data offline. Results: Successful imaging was conducted in all swine. Image criteria for differentiating parenchyma from nodule included signal void spaces corresponding to alveoli, and linear regularly spaced specular reflections representing collapsed alveoli. Nodules were found to have a generalized homogeneous appearance. Blinded readers diagnosed the OCT images as nodule or parenchyma with an average accuracy of 95.6%. Conclusions: We have developed the first transbronchial OCT catheter that is compatible with standard 21-gauge TBNA needles, and have demonstrated that OCT can accurately differentiate nodules from surrounding parenchyma. We anticipate that transbronchial OCT may be useful in increasing the diagnostic yield of TBNA by confirming the needle placement within the target nodule prior to biopsy.