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Title: Analyzing images of endobronchial ultrasonography (EBUS) using histogram to assist in the diagnosis of lung cancer

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Body: Background Recently, brushing and biopsy techniques of EBUS using a Guide Sheath (EBUS-GS) is available for the diagnosis of lung cancer. Obstetrics and gynecology fields have previously reported that quantification of sonographic echogenicity with histogram were useful for the diagnoses of tissue. Aim To evaluate whether histogram data collected from EBUS-GS images can contribute to the diagnosis of lung cancer or not. Methods Fifty clear EBUS images (25 lung cancer and 25 inflammatory disease) were included in this study. The region of interest (ROI), was set within a 5mm radius from the EBUS probe with 400 pixels (20×20). Histograms were created and compared using imageJ software, with a width of the histogram: (maximum – minimum gray scale) / 256 (full gray scale) × 100 (%), height of the histogram: (maximum pixel counts), and the standard deviation of the histogram. Results The diagnosis yield by the width of the histogram were sensitivity of 84%, specificity of 88%, and positive predictive value of 87% when the cut-off level was 22 for lung cancer. Standard deviation of histograms also contribute to diagnosis of lung cancer, sensitivity of 80%, specificity of 88%, and positive predictive value of 87% when the cut-off level was 10.7. Height of the histogram was not useful due to low sensitivity. Conclusion The width and standard deviation of EBUS image histograms were useful in differentiating lung cancer from inflammatory lesion.