Macroscopic on-site quality evaluation of biopsy specimens to improve the diagnostic accuracy during EUS-guided FNA using a 19-gauge needle for solid lesions: a single-center prospective pilot study (MOSE study)

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Background: Although rapid on-site cytologic evaluation provides high efficacy of EUS-guided FNA (EUS-FNA), its availability is limited. Alternatively, macroscopic on-site quality evaluation (MOSE) may increase the efficacy of EUS-FNA.

Objective: To assess the efficacy of MOSE in estimating the adequacy of histologic core specimens obtained by EUS-FNA using a standard 19-gauge needle (19GN) for solid lesions.

Design: A prospective pilot study.

Setting: Tertiary-care referral center.

Patients: One hundred patients with solid lesions (n = 111 lesions).

Interventions: EUS-FNA using 19GN

Main Outcome Measurements: The relation of a macroscopic visible core (MVC) in the FNA specimens on MOSE with histologic core and the diagnostic yields were studied.

Results: The feasibility of EUS-FNA using a 19GN was 99%. The final diagnoses were malignancy in 83 lesions and benign in 28. MOSE revealed MVC in 91.1% with the median length of 8 mm. Histologic core was confirmed in 78.9%. The receiver-operating characteristic curve of the length of MVC for the presence of histologic core showed the cut-off MVC length of 4 mm with area under the curve of .893. Comparisons of per-pass diagnostic yields showed significantly superior histologic, cytologic, and overall diagnostic yields in MVC $\geq$ 4 mm as compared with $<$4 mm. The multivariate analysis for false-negative pass identified lesion in the pancreas and MVC $<$ 4 mm as significant risk factors. No adverse events were seen.

Limitations: Single center, limited operators

Conclusion: MVC of $\geq$4 mm on MOSE can be an indicator of specimen adequacy and can improve diagnostic yield; however, additional FNA may be recommended for pancreatic lesions. (Clinical trial registration number: UMIN000010417.) (Gastrointest Endosc 2015;81:177-85.)

Abbreviations: 19GN, 19-gauge needle; CI, confidence interval; EUS-FNA, EUS-guided FNA; IQR, interquartile range; LN, lymph node; MOSE, macroscopic on-site evaluation; MVC, macroscopic visible core; PT-INR, prothrombin time-international normalized ratio; ROC, receiver-operating characteristic; ROSE, rapid on-site cytologic evaluation.

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EUS-guided FNA (EUS-FNA) has been used as a safe and less-invasive method for obtaining pathologic specimens from intra- or extraluminal lesions, such as pancreatic tumors, submucosal tumors, and abdominal or mediastinal lymph nodes (LNs).[1-3] Although the reported diagnostic accuracy of EUS-FNA is high, it remains imperfect because of diverse reasons, including technical difficulty during FNA, specimen inadequacy for the pathologic evaluation, or sampling error associated with the lesions. The use of various methods has been reported to improve the diagnostic yield of EUS-FNA, including certain puncture techniques during FNA[4-6] or modification of the size and shape of the FNA needle.[7,8]

One attempt to improve the efficacy of EUS-FNA is rapid on-site cytologic evaluation (ROSE), in which rapid feedback on the specimen's adequacy is provided by the on-site cytopathologist during the procedure. ROSE can potentially prevent the inadequate specimen for pathologic analysis and reduce the number of FNA passes, which consequently improves the diagnostic yield and safety of FNA. However, ROSE is unavailable in many centers because of limited financial or human resources. In our previous reports and daily practice, the number of FNA passes was decided on the basis of the macroscopic evaluation of the FNA specimen obtained using a standard 19-gauge needle (19GN) as the initial needle, because ROSE was unavailable at our center. Although a higher diagnostic yield of EUS-FNA was obtained by the examination of the macroscopic findings of the FNA specimen, its exact efficacy has not been studied. In this study, we assessed the efficacy of macroscopic on-site evaluation (MOSE) to estimate the adequacy of a core specimen for histologic diagnosis during EUS-FNA using a 19GN for solid lesions.

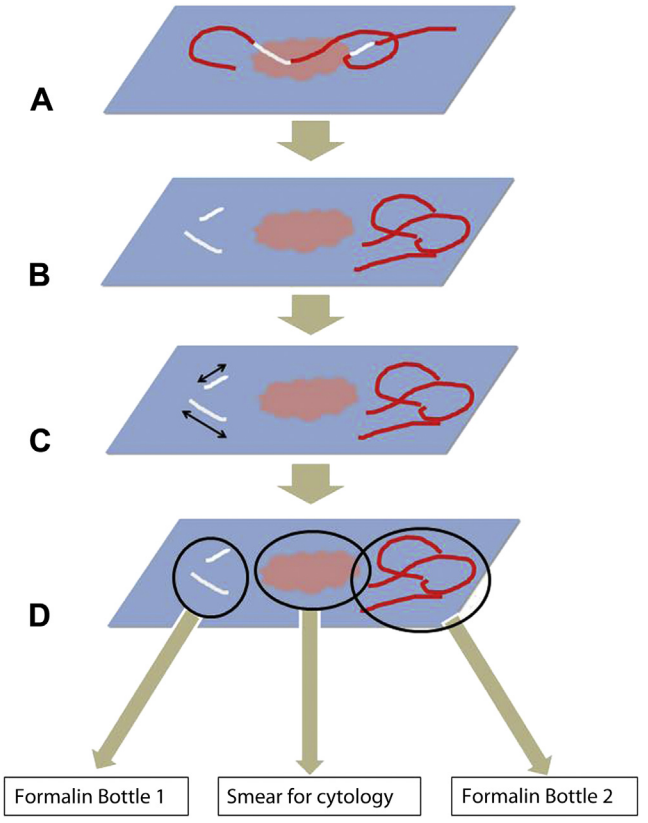

Figure 1. The flow in handling of FNA specimen for MOSE. **A,** The FNA specimen was expelled entirely onto a glass slide. **B,** The specimen was carefully examined for the presence of MVC specimen. **C,** The total length of MVC was measured with a ruler on the slide. **D,** The MVC was removed into a formalin bottle. Blood clots, if present, were removed into a formalin bottle separately from the MVC. Smears were subsequently made from the residual specimen for cytologic analysis.

METHODS

Patient eligibility

In this prospective pilot study, we consecutively recruited all patients who underwent EUS-FNA for solid tumors from April 2013 to November 2013 at the First Department of Internal Medicine, Gifu University Hospital, if they met the following inclusion criteria: (1) solid tumor, measuring $\geq$ 10 mm, around or inside the upper intestine and (2) no previous history of surgery for the upper intestine. However, patients were excluded if they met the following criteria: (1) age $<$ 20 years; (2) performance status of 4; (3) life expectancy $<$ 4 weeks; (4) bleeding tendency (platelet $\leq$ 50,000, prothrombin time-international normalized ratio (PT-INR) $\geq$ 1.5) or taking antiplatelet agents; (5) cardiac, respiratory, or renal failure; and (6) possible or current pregnancy.

All patients provided written informed consent for enrollment in the study and for undergoing EUS-FNA. This pilot study was approved by the Institutional Review Board and registered at http://www.umin.ac.jp (UMIN000010417).

EUS-FNA

EUS-FNA was performed by 2 experienced endoscopists (T.I. and I.Y.) with the patient under moderate sedation using midazolam and pentazocine. An oblique-viewing linear scanning video echoendoscope (GF-UCT260 or GF-UC240P-AL5, Olympus Medical Systems, Tokyo, Japan) connected to a processor featuring the color Doppler function (Pro-Sound Alpha10 or Pro-Sound F75; Hitachi Aloka Medical, Tokyo, Japan) was used in the present study. The lesion, including the regional vasculature, was examined with EUS by using the color Doppler function followed by puncture with a 19GN (Echotip Ultra, Cook Medical, Bloomington, Ind, USA) from the upper intestine under EUS guidance. Three to 5 to-and-fro movements of the needle inside the lesion were performed after complete removal of the stylet from the needle and application of 10 mL suction with a syringe. The needle was withdrawn from the lesion into the outer sheath after release of the negative pressure. The whole needle was subsequently removed