ORIGINAL ARTICLE

EUS-guided liver biopsy using a novel hydrostatic stylet technique

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INTRODUCTION

EUS-guided liver biopsy (EUS-LB) has become increasingly used for the diagnostic evaluation and staging of hepatic pathologies. Compared to alternatives such as percutaneous or transjugular liver biopsy, EUS-LB produces samples of similar or superior quality while offering additional advantages because of its minimally invasive nature, broader access to all hepatic lobes, and the ability to be performed simultaneously alongside other endoscopic procedures.[1] Despite these advantages, EUS-LB is largely limited to tertiary care centers and its use is not yet widespread. This may be because, since its inception, numerous variations in needle shape, needle size, and, most notably, sampling techniques have been adopted. However, no consensus protocol for acquisition has been recognized, leading to poor procedural standardization and wide ranges of reported outcomes in sample quality and diagnostic yield. As such, there is a substantial need for a uniform technique that will safely maximize diagnostic performance with minimal needle passes. Herein we present a novel EUS-LB hydrostatic stylet technique resulting in a high-quality core sample with minimal fragmentation or blood contamination for the evaluation of hepatic tissue.

PROCEDURE

Prior to the case, the stylet of a 19-gauge fine biopsy needle is removed, and the channel is flushed with sterile saline to purge air (Fig. 1A). The stylet is then partially reinserted, allowing 30 cm of stylet to remain outside the needle to reduce friction between the stylet and the needle within the articulating portion of the endoscope and to preserve a hydrostatic column of fluid between the stylet and needle tip (Fig. 1B). After endosonographic evaluation of the target liver, color Doppler is used to confirm the absence of significant vascular structures within the needle path. The projected needle path is then visualized and the anticipated needle travel distance is estimated. While an assistant braces their arm against a fixed object and holds the stylet motionless relative to the patient, the needle is advanced with a single sharp thrust through the liver capsule and into the liver parenchyma (Fig. 2A and B). After needle puncture, the assistant releases the stylet as the needle and stylet are withdrawn together to the liver capsule (Fig. 2C). Additional actuations can be performed within the same needle pass by withdrawing the needle to the liver capsule and adjusting the needle trajectory under EUS guidance. After withdrawal, local bleeding at the puncture site is checked via color Doppler. Finally,

Abbreviation: EUS-LB, EUS-guided liver biopsy.

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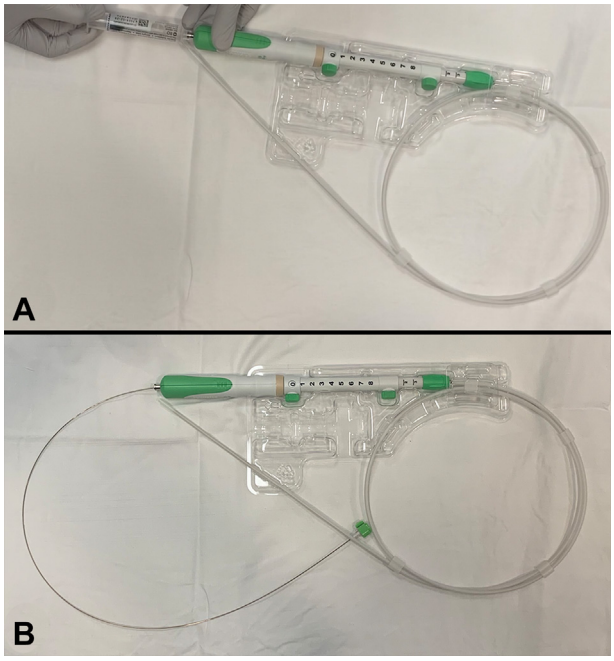

Figure 1. Needle setup. **A,** Pre-flushing the 19-gauge fine biopsy needle with sterile saline. **B,** Partial reinsertion of the stylet.

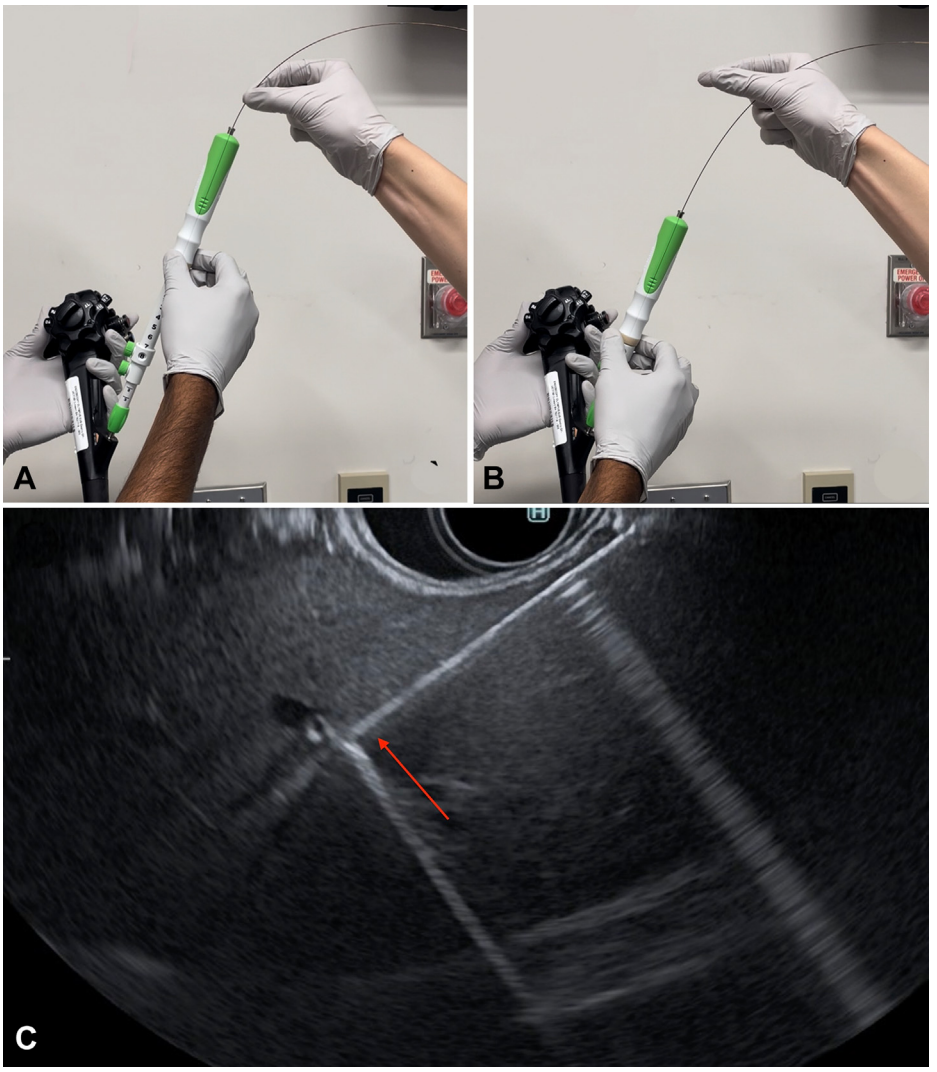

Figure 2. EUS-guided liver biopsy hydrostatic stylet sampling technique**. A,** Assistant's arm in bracing position and motionless stylet grip. **B,** Assistant releases stylet as actuation motion is completed and needle is withdrawn. **C,** EUS view of needle puncture within liver ***(arrow)***.

the stylet and residual water column within the needle are advanced to express the specimen directly into formalin. We show that this sampling technique produces a high-quality biopsy sample with a visible tissue core and minimal blood contamination (Fig. 3). The large tissue yield of this technique prevents disintegration upon processing and frequently enables the ancillary testing and conclusive histologic diagnosis of focal and parenchymal liver pathologies.

DISCUSSION

While several randomized trials have evaluated the relative sample quality and diagnostic performance of differing EUS-guided tissue acquisition techniques, the ideal puncture technique remains uncertain.[2-4] We describe a novel EUS-LB technique in which a needle is pre-flushed with saline, a stylet is partially reinserted, and a synchronous puncture method is used to preserve a hydrostatic fluid column within the needle and increase biopsy sample yield. By avoiding the use of suction and frequently requiring only a single needle pass, this hydrostatic stylet technique overcomes previously described limitations of conventional methods such as specimen fragmentation, blood contamination, and risks of multiple needle passes.[5] This technique is also applicable to various echoendoscope positions throughout the GI tract, including left lobe liver biopsies obtained with the echoendoscope in a straight position from the proximal stomach and right lobe biopsy specimens obtainable with a more angulated tip from the duodenum. Despite greater echoendoscope angulation in these cases, we have not had issues with introducing the needle or holding the stylet motionless, in part because

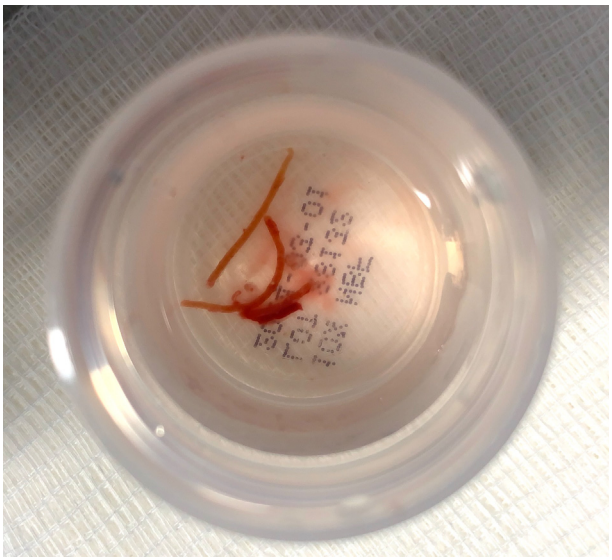

Figure 3. Obtained specimen with a visible tissue core and minimal blood contamination.

of lubrication with water in the needle channel and by avoiding the stylet traversing the angulated portion by only partially reintroducing it.

Based on internal institutional quality assurance data, the diagnostic adequacy rate (defined as the proportion of biopsy samples with sufficient tissue to support a histopathological diagnosis) of the hydrostatic stylet technique for both liver parenchymal and solid lesion biopsy is 97% based on more than 180 procedures over the past 2 years. For liver biopsies specifically within this time frame, we are yet to have an inadequate specimen using this technique in 44 cases. Furthermore, the rate of adverse events using the hydrostatic stylet technique (including both liver parenchymal and solid lesion biopsy) is 1.5%, which is similar to our institutional rates using the widely accepted stylet slow-pull technique and a systematic review of 31 EUS fine-needle biopsy prospective trials.[6] With minimal passes needed to obtain high sample adequacy, the hydrostatic stylet technique offers a novel approach for the procurement of high-quality liver biopsy samples (Video 1, available online at www.gjejournal.org).

DISCLOSURE

Dr Carr-Locke is a consultant for Boston Scientific and receives royalties from Steris Corporation. Dr Sharaiha is a consultant for Boston Scientific, Olympus, and Cook Medical. Dr Mahadev is a consultant for Boston Scientific and Conmed. All other authors disclosed no financial relationships.

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