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Review Article

Role of a forward-viewing echoendoscope in fine-needle aspiration

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A B S T R A C T

A prototype forward-viewing echoendoscope has been developed for therapeutic endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA). The hard tip of the forward-viewing echoendoscope, which is shorter than that of the convex type echoendoscope, can be maneuvered flexibly. Using the forward-viewing echoendoscope, the gastrointestinal wall can be vertically punctured along the same axis as the scope, and this process is done more easily than with an oblique-viewing echoendoscope. The diagnostic accuracy of EUS-FNA with the forward-viewing echoendoscope is 97.4%, which is not significantly different to that of the oblique-viewing echoendoscope. The forward-viewing echoendoscope may be useful in situations where the location and procedure are difficult with the oblique-viewing scope, The forward-viewing echoendoscope is able to puncture the gastrointestinal wall vertically with minimal effort, therefore allowing therapeutic EUS procedures such as pseudocyst and abscess drainage, biliary drainage, and pancreatic duct drainage to be performed easily. However, a significant difference between the forward-viewing and oblique-viewing echoendoscopes in pseudocyst drainage has been reported recently. In the future, the forward-viewing and oblique-viewing echoendoscopes will probably be selectively used depending on not only lesion site but also the procedure required in individual patients, thereby facilitating various processes including puncture, tissue collection, and diagnosis, as well as therapeutic procedures.

Keywords: Endoscopic ultrasound-guided fine-needle aspiration, Forward-viewing echoendoscope, Therapeutic endoscopic ultrasound

Introduction

During the past 20 years, endoscopic ultrasound (EUS)-guided fine-needle aspiration (FNA) has become an essential examination procedure because of its high diagnostic accuracy and acceptable low incidence of complications. EUS-FNA was first reported by Vilmann et al in 1992.[1] In the same year, Grimm et al described EUS-guided pseudocyst drainage.[2] These procedures have been widely used clinically and are now essential tools for diagnosis and therapy. The rate of correct diagnosis with EUS-FNA generally ranges from 70% to 100%.[3] Therapeutic EUS has been used to perform a wide range of procedures, including pancreatic pseudocyst drainage, biliary drainage, and pancreatic duct drainage, celiac plexus neurolysis, immunologic therapy with dendritic cells, and gene therapy by local injection of TNFerade. The indication range of therapeutic EUS continues to expand.[4–9] A convex or linear type echoendoscope, which can guide the puncture needle along the desired route, is usually used to perform diagnostic and therapeutic EUS-FNA. While therapeutic EUS-FNA has widened its use in various applications, a prototype forward-viewing echoendoscope has been developed. Its clinical usefulness for diagnostic as well as therapeutic procedures are described in this article.

Basic specifications

A prototype forward-viewing convex type echoendoscope (maximum diameter, 14.2 mm) with a forceps channel (3.7 mm; Olympus Co. Ltd., Tokyo, Japan) was developed in order to perform therapeutic EUS. The ultrasonographic view angle of the forward-viewing echoendoscope is 90°, which is narrower than that of the oblique-viewing echoendoscope (180°). The scope is equipped with a color Doppler function to permit electronic scanning, allowing blood vessels with flow to be identified (Table 1, Fig. 1). The direction of puncture is along the scope axis and can be directly viewed. The prototype of the forward-viewing echoendoscope offers several important advantages over the oblique-viewing echoendoscope. Because the gastrointestinal wall can be vertically punctured along the same axis as the scope, puncture is easier than with the oblique-viewing echoendoscope (Fig. 2). Moreover, the hard tip of the forward-viewing echoendoscope, which is

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Table 1 Specifications of XGIF-UCT160J-AL5 (comparison with GF-UC, UCT)

		XGIF-UCT160J-AL5	GF-UCT240-AL5	GF-UC240P-AL5
Optical	Direction	0°(Forward)	55°(Oblique)	55°(Oblique)
	Field of View	120°	100°	100°
Insertion part	Max Diameter	φ14.2 mm	φ14.6 mm	φ14.2 mm
	Diameter	φ11.8 mm	φ12.6 mm	φ11.8 mm
Channel	Diameter	φ3.7 mm	φ3.7 mm	φ2.8 mm
	Minimum distance	4 mm	6 mm	6 mm
Angluration	Up/Down	180°/100°	130°/90°	130°/90°
	Right/Left	100°/100°	90°/90°	90°/90°
Elevator		−	+	+
Second water filling channel		+	−	−
Ultrasonography	Field of view	90°	180°	180°
	Balloon	−	+	+

GF-UC, diagnostic scope; UCT, therapeutic scope.

shorter than that of the convex type echoendoscope, can be maneuvered flexibly. The forward-viewing echoendoscope may therefore be better suited for therapuetic EUS.

Diagnostic applications

The newly developed forward-viewing echoendoscope with a 90° view angle is different from the oblique-viewing echoendoscope (180°). Therefore, some familiarity is required to understand the anatomic characteristics of the surrounding structures. However, ultrasonographic images similar to those produced with the oblique-viewing echoendoscope could be obtained by slightly bending the tip of the forward-viewing echoendoscope. Clinically, such images are not very difficult to interpret for endoscopists with some knowledge about ultrasonographic anatomy.[10] Iwashita et al also conducted a comparison study between the forward-viewing and oblique-viewing echoendoscopes, in which he performed EUS-FNA in 21 patients, and concluded that there were no differences between the two echoendoscopes in visualization or image quality of upper EUS, except for the superior image quality of the common hepatic duct with the forward-viewing echoendoscope.[11]

According to the literature, the rate of correct diagnosis using EUS-FNA performed with the conventional convex type echoendoscope generally ranges from 70% to 100%.[3] We have reported that 97.4% (37/38) of cases were correctly diagnosed by EUS-FNA with the forward-viewing echoendoscope, and there were no significant differences in the results compared with the conventional convex echoendoscope (Table 2).[10] Clinically, our results were considered satisfactory, although the study group was small and performed at a single center. Furthermore, puncture of regions that are usually difficult to access with the conventional convex echoendoscope (such as the uncinate process, head of the pancreas, fornix of the stomach, and greater curvature of the gastric body) could be punctured easily with the forward-viewing echoendoscope (Fig. 3).

Fusaroli et al also reported that EUS-FNA using the forward-viewing echoendoscope was performed in cases that were difficult to perform with the conventional convex echoendoscope, and diagnosed 77% (10/13) of cases.[12] Larghi et al also investigated the usefulness of the forward-viewing echoendoscope in evaluating hilar biliary strictures.[13] They concluded that EUS-FNA using the forward-viewing echoendoscope could become a valid complement to the standard EUS-FNA particularly in tertiary centers. Diel et al reported the usefulness of the forward-viewing echoendoscope in diagnosing gastrointestinal submucosal lesions.[14] We have tried EUS-FNA using the forward-viewing echoendoscope with a special cap in cases of submucosal lesions; tissue sampling was easier because of suction of target lesions into the cap. Nguyen-Tang et al and Uchida et al also investigated the usefulness of the forward-viewing echoendoscope in evaluating right colonic subepithelial lesions.[15,16]

In the future, the oblique-viewing and forward-viewing echoendoscopes will probably be selectively used depending on lesion site in individual patients, thereby facilitating puncture, tissue collection, and diagnosis.[10]

Therapeutic applications

Since the first report of EUS-guided pseudocyst drainage by Grimm et al, therapeutic EUS have been widely used in clinical studies and its indications has been expanded.[2,4–9] In order to perform such therapeutic procedures, the forward-viewing echoendoscope was developed. Using the forward-viewing echoendoscope, we found that it was easy to facilitate vertical puncture of the gastrointestinal wall for procedures as such as pseudocyst drainage and biliary drainage, which was consistent with the results of previous studies.[12,13,17,18] Puncture could be accomplished with less effort with that required with the oblique-viewing echoendoscope, confirming the advantages of the forward-viewing echoendoscope[10] (Fig. 2).

After Grimm et al's report,[2] EUS-guided pseudocyst and abscess drainage have been widely employed in clinical fields. The indications of EUS-guided pseudocyst are as follows: infectious (indicative of abscess), symptomatic, and a pseudocyst >5–7 cm in

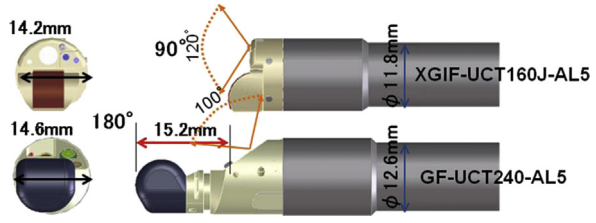

Fig. 1. Differences between UCT160 and UCT240 echoendoscopes.

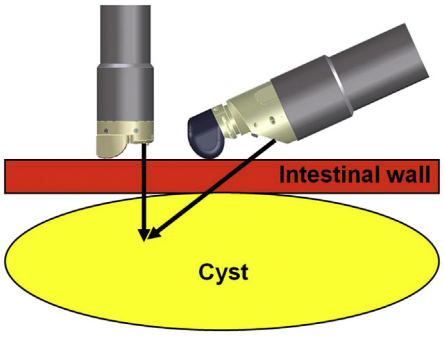

Fig. 2. Comparison of the forward-viewing and the oblique-viewing echoendoscopes.