A Retrospective Review of Different Methods of Endobronchial Ultrasound-guided Transbronchial Needle Aspiration

A Preliminary Study

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Summary: **Transbronchial needle aspiration (TBNA) is a 30 year old procedure for diagnosing and staging of lung cancer. There has been renewed interest in TBNA due to the development of a curvilinear array endobronchial ultrasound (EBUS) scope for TBNA. Reports indicate an increased diagnostic yield compared to standard TBNA. In 9 of 11 patients EBUS-TBNA is performed with the second generation Olympus EBUS scope (BF-UC180F) and the ViziShot (NA-201SX-4022) needle in addition to the standard WANG™ TBNA needle. Three punctures were made by the ViziShot needle. The first puncture, the guidewire is partially retracted and without suction the needle is moved back and forth inside the lesion. The second puncture, the guidewire is completely removed and suction is applied during needle movement. The third puncture is without the guidewire but with suction. In five patients with a positive diagnosis of cancer, the first punctures were all positive with a better quality and quantity of tumor cells. Three patients, standard TBNA needle was used, all were positive. Four patients with standard TBNA preceded the EBUS-TBNA were all positive. We conclude, EBUS TBNA is highly effective and dependable and suggest the use of EBUS needle can be simplified. Standard TBNA needle can be used for EBUS-TBNA and standard TBNA in relation to EBUS-TBNA needs to be further investigated.**

Key Words: TBNA, EBUS, flexible bronchoscopy, transbronchial needle aspiration, endobronchial ultrasound

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Transbronchial needle aspiration (TBNA) is an important methodology for diagnosing and staging diseases with intrathoracic lymphadenopathy and lung cancer.[1] Despite having been used for over 3 decades, it remains an underused technique. There has been renewed interest in TBNA because of the recent development of an ultrasound-equipped flexible bronchoscope that incorporates a curvilinear array endobronchial ultrasound (EBUS).[2] Reports indicate an increased diagnostic yield compared with conventional TBNA, despite a steep operator learning curve and multistep needle assembly attachment to the bronchoscope to allow deployment of the needle and sampling of a lymph node.[3] The following preliminary study shows the use of standard needles in the performance of conventional and EBUS-TBNA with an intention to improve diagnostic yield.

METHODS

Eleven patients who had computed tomography findings that were suspicious for malignancy were consented for bronchoscopy and biopsy as per institutional protocol. After obtaining the informed consent, the patients underwent moderate sedation, with bronchoscopy performed using an Olympus BF-UC180F (ultrasound) bronchoscope with a 2.2 mm working channel. TBNA sampling was carried out using either standard technique with an Olympus ViziShot aspiration needle (NA-201SX-4022) and/or the WANG MW-322 and MW-319 transbronchial needles (Table 1).

During sampling with the ViziShot needle:

(A) The first sample was obtained by embedding the needle into the target and then withdrawing the guidewire by 5 cm without using suction. Biopsy was then performed by moving the needle back and forth in the lesion approximately 3 to 5 times. The needle was then withdrawn and the guidewire advanced to push the specimen onto a glass slide for analysis.

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TABLE 1. TBNA Results

Patient Name	Station	ViziShot Technique A	ViziShot Technique B	ViziShot Technique C	MW322 + EBUS	MW319 + EBUS
Case 1 adenocarcinoma	11R	+	+	+	X	+
Case 2 adenocarcinoma†	11R	+	+	+	X	+
TENA station 7 positive for CA						
Case 3 adenocarcinoma†	7	+	+	-	+	X
Case 4 squamous cell†	4R	+	Atypical	L	X	X
Case 5 melanoma (diagnosed by TBFB of RUL spur)†	7	+	+	+	X	X
Case 6	4R	X	X	X	+	+
Small cell LC	11L	X	X	X	+	X
MW322 with/without suction, both positive	7	X	X	X	X	+
Case 7 adenocarcinoma (Only positive from TBFB RUL)	11R	X	X	X	L	X
MW322 with/without suction						
Case 8 lymphoid tissue only	11L	No L	L	L	L	L
Case 9 lymphoid tissue only	11R	L	X	L	X	L
	7	L	X	L	X	L
Case 10 lymphoid tissue only	7	No L	L	L	L	X
Case 11 lymphoid tissue only	4R	L	L	L	L	X

+ indicates positive for malignancy; CA, cancer; EBUS, endobronchial ultrasound; L, lymphocytes; LC, lung cancer; RUL, right upper lobe; TBFB, transbronchial fiberoptic biopsy; TBNA, transbronchial needle aspiration; TENA, transesophageal needle aspiration; X, aspiration not performed.

†Standard TBNA performed before EBUS-TBNA.

(B) The second sample was obtained by the ViziShot needle, with the needle-guide assembly being advanced into the target; the guidewire was then removed and suction was applied. Biopsy was then performed as in A to obtain a specimen.

(C) The third sample was obtained by the ViziShot needle, with the guidewire removed throughout the procedure; the needle was embedded in the target and suction was applied. The sample was biopsied as above.

In addition, 9 of 11 patients underwent EBUS-TBNA using an MW-319 needle or an MW-322 needle through the working channel of the same scope. After insertion of the standard TBNA needle into the target, guidewire retraction and suction were applied as per the technique described earlier in the literature.[4]

The specimen that was obtained was smeared on a glass slide and fixed with 90% ethanol or sent for cell block if it was a bloody aspirate. Tissue fragments were sent for histologic examination in formalin solution.

RESULTS

Nine of 11 patients underwent biopsy with the Olympus ViziShot needle, with 5 of the 9 (55.5%) patients being diagnosed with malignancy. Technique A resulted in a positive diagnosis of malignancy in all 5 cases. Techniques B and C were diagnostic of malignancy in 4 (80%) and 3 (60%) cases, respectively. The first sample was consistently of better quality and quantity of tumor cells as it had less blood.

Three of these 5 patients underwent EBUS-guided TBNA through the UC180F (ultrasound) bronchoscope using a standard TBNA needle as well. Two TBNAs were performed with the MW-319 needle and 1 with the MW-322 needle. All 3 patient samples obtained with these standard needles were diagnostic for malignancy. Of the remaining patients, 2 underwent EBUS-TBNA using only standard TBNA needles. The first aspiration was with partial guidewire retraction and without suction. The second aspiration used suction after the guidewire was partially retracted. The first patient was diagnosed with small cell carcinoma with both paired aspirates. The second patient had lymphoid tissue on both aspirations with the MW-322 needle. Subsequently, the patient was diagnosed with adenocarcinoma in a right upper lobe peripheral lesion with transbronchial forceps biopsy.

DISCUSSION

Overall, 5 patients with malignancy in whom the ViziShot needle was used, the first aspiration (method A) was positive, but false negatives were noted with the second and third techniques as described above. The first aspirate was also a superior cytologic sample. Four of the 11 patients with malignant aspirates had EBUS-TBNA with either the MW-322 or MW-319 needles. These needles have the advantage of a mechanism that prevents tissue plugs when puncturing the bronchial wall. The MW-322 has a beveled stylet that is partially retracted after puncture. The MW-319 has a 21-G inner needle that also acts as a trocar, which is retracted after puncture and provides a 19 G tissue core for histologic analysis. With the above-noted observational experience, we recommend the guidewire to push the specimen out of the needle onto the glass slide for examination, rather than using the ViziShot guidewire to unplug the needle after it has entered the lesion.[2] In addition, higher quality specimens were obtained using the method in which no suction was applied as detailed above.

CONCLUSIONS

These cases show that when using the ViziShot needle, the guidewire need not be completely removed to diagnose malignancy. We find that it is the depth of the needle and the number of back and forth movements in the lesion that are the most important factors rather than the application of suction.[5] Standard TBNA needles can be used with an EBUS bronchoscope with a minimum of a 2.2-mm diameter working channel. These needles are easier to use because of greater flexibility and seem to be just as effective as the Vizishot needle. If needle plugging by bronchial tissue is a concern, the MW-322 and MW-319 needles can be used as described above. The use of a MW-319 histology needle with EBUS may enhance the ability to diagnose mediastinal and hilar malignancy with a greater quantity of tissue that can be used for molecular analysis. In 4 patients (cases 2 to 5), a conventional TBNA was performed before EBUS-TBNA, and all were diagnostic for malignancy, raising the question for the necessity of ultrasound guidance in the performance of TBNA. This suggests that an intimate knowledge of lymph node location in reference to endobronchial anatomy combined with a proper TBNA technique can have a very high diagnostic yield even in the absence of EBUS. However, the value of EBUS in TBNA goes beyond diagnostic yield. Its role in relation to standard TBNA needs further investigation. Its instrument and methodology will be continuously improved. Larger prospective studies are required.

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