






Robotic-assisted Bronchoscopy with Endobronchial Ultrasound for the Diagnosis a of Peripheral Lung Nodule with Lymphadenopathy: A Case Report

Lenfadenopati Periferik Akciğer Nodülünün Tanısında Endobronşiyal Ultrason ile Robotik Yardımlı Bronkoskopi: Olgu Sunumu

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Abstract

Some 95% of all detected lung nodules are benign, although it is essential to determine the underlying cause, given that lung cancer is the leading cause of oncological death in the United States. When choosing a diagnostic tool, reducing the number of procedures without compromising the diagnostic value is essential. This case report focuses on the successful use of the latest robotic-assisted bronchoscopy in combination with existing radial and linear endobronchial ultrasound-guided transbronchial needle aspiration for the biopsy of a peripherally located lung nodule and mediastinal lymph nodes. Combining the two procedures allowed the peripheral nodule and lymph nodes to be sampled with no complications in a single procedure. The nodule showed no cancerous growth, although the lymph nodes showed granulomas consistent with Histoplasma.

Key words: *Peripheral lung nodule, Robotic-assisted bronchoscopy, Endobronchial ultrasound.*

Öz

Akciğer nodüllerinin yaklaşık %95'i iyi huylu olmakla beraber, ABD'de onkolojik ölümlerin önde gelen en sık nedeni akciğer kanseri olduğu için akciğer nodüllerin türünü belirlemek gerekmektedir. Bir teşhis aracı seçerken, teşhis değerinden ödün vermeden, yapılan işlem sayısını azaltabilmek önemlidir. Bu olgu sunumunda, periferik yerleşimli bir akciğer nodülü ve mediastinal lenf nodlarının biyopsisinde mevcut radyal ve lineer endobronşiyal ultrason rehberliğinde transbronşiyal iğne aspirasyonu ile beraber, robotik yardımcı bronkoskopinin başarılı bir şekilde birlikte kullanılması anlatılmaktadır. Tek bir işlem ile hem periferik nodül hem de lenf nodülü, komplikasyonsuz olarak örneklendi. Periferik nodülden malignite yoktu, ancak lenf nodülü Histoplazma ile uyumlu bulundu.

Anahtar Sözcükler: *Periferik akciğer nodülü, Robotik yardımcı bronkoskopi, Endobronşiyal ultrason.*

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Despite the continued advances in procedures, the diagnosis of peripheral lung nodules (PLN) remains challenging. Computerized Tomography-guided Transthoracic Needle Biopsy (CT-TTNB) has been the standard approach for many years, with diagnostic value of over 90% (1). The simultaneous sampling of lymph nodes for mediastinal staging is not possible with CT-TTNB, and there is a higher rate of pneumothorax than with biopsies done through bronchoscopy (2,3). The diagnostic yield of PLN through standard navigation bronchoscopy is 70%, which is low when compared to CT-TTNB (2,4). We report a here on a case of PLN with associated lymphadenopathy diagnosed as Histoplasmosis via robotic-assisted bronchoscopy (RAB) in combination with EBUS-TTNA. RAB allowed the difficult peripheral regions of lungs to be reached, while EBUS allowed the sampling of the lymph nodes in the mediastinum in a single procedure (5).

CASE

A 67-year-old female with post liver-transplant immunosuppression and with a past medical history of chronic kidney disease, squamous cell carcinoma of the helix in the left ear, hepatocellular carcinoma (HCC), diastolic heart failure, obstructive sleep apnea and pulmonary hypertension, presented for a routine checkup. A chest Computerized Tomography (C.T.) for HCC surveillance revealed a 9mm nodule in the subpleural lateral basal right lower lobe along the inferior aspect of the right major fissure (Figure 1). Other than a mild early-morning nonproductive cough, she referred to no other symptoms, recent travel or exposure to environmental agents. Tests for Histoplasma antigen, Blastomyces and coccidioidomycosis were negative. Due to the peripheral location and suspicion for malignancy, we used RAB and radial and linear EBUS to sample the nodule and mediastinal lymph nodes (Figure 2), without result. The sample from the nodule confirmed no cancerous growth. The biopsy results of one of the lymph nodes with GMS stain showed non-necrotizing granulomas, morphologically suggestive of yeast cell histoplasmosis (Figure 3). Bronchoalveolar lavage revealed one colony of a filamentous fungus. The patient was started on Voriconazole rather than Itraconazole due to her past diastolic heart failure. At 2-week follow-up, the patient was found to be tolerating the treatment well with no reported complications. The most recent CT revealed no considerable change in the size of the nodule (Figure 4).

DISCUSSION

Peripherally located lung nodules smaller than 10mm are often difficult to diagnose, but can be diagnosed by CT-TTNA or bronchoscopy-guided biopsy. CT-TTNA has a reported sensitivity of 90% and specificity of 97% in the diagnosis of lung cancer, although complications such as pneumothorax (25%), bleeding, infection and the risk of seeding the tumor are common (2). CT-TTNA prevents the staging of mediastinal lymph nodes, which is crucial for the diagnosis of lung cancer. When CT-TTNA is used, a second procedure is increased screenings result in more incidentally found lung nodules; it is essential to balance the potential harm from unnecessary procedures with the benefits of early diagnosis. In recent studies, RAB has been used for the diagnosis of actinomycosis, Loeffler syndrome and mycobacteria (2).

The lymph node biopsy in the present study yielded positive for Histoplasma – a dimorphic fungus causing a granulomatous infection that is endemic to the central and eastern parts of the United States, including Ohio and Mississippi, as well as South America, Africa, Asia and Australia. The infection can have a variable presentation, ranging from asymptomatic to severe disseminated disease. Disseminated infections are common in immunosuppressed patients. Diagnostic tests such as antigen detection and serology are routinely used, but can be non-diagnostic in the presence of pulmonary nodules. Fine needle biopsy or surgical resection is used for a definitive diagnosis. Nodules can closely resemble a malignant lesion on C.T. and show increased uptake on PET scans. There are a few reports of Histoplasma being misdiagnosed as cancer, as the giant cells in Histoplasma can be mistaken for malignant lymphoblastic cells. Itraconazole, Voriconazole and fluconazole are the preferred treatment approaches for mild to moderate infections, and amphotericin B for severe conditions.

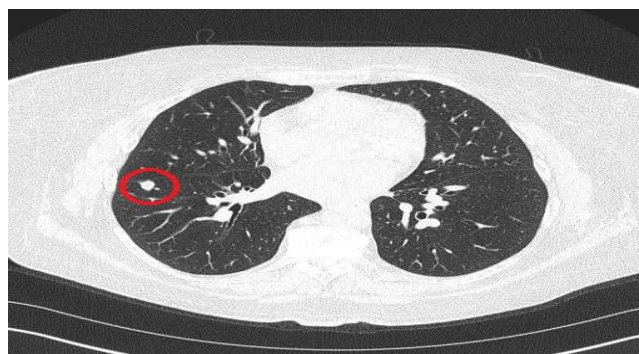


Figure 1: The red circled region represents the peripheral lung nodule in the right lung

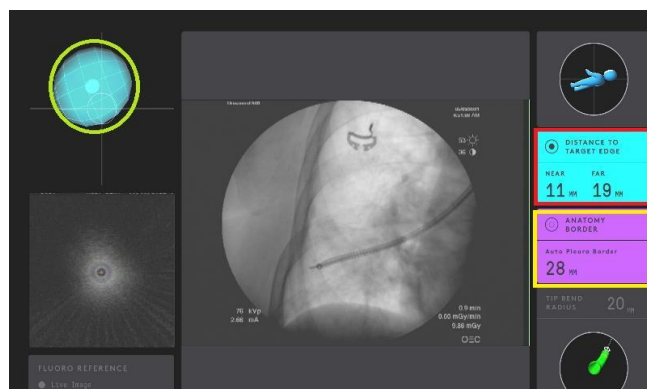


Figure 2: Image from the robotic-assisted bronchoscopy. The red box shows the distance of the scope from the target nodule, the yellow box shows the scope distance from the pleura, the green box is a 3D image of the lung nodule

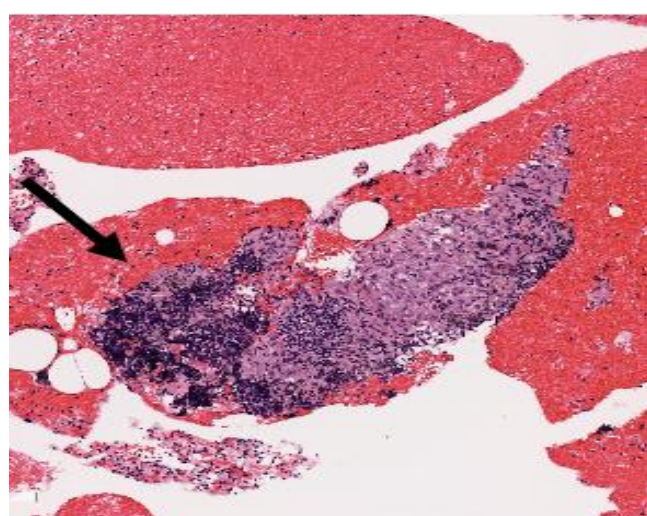


Figure 3: The marked area shows granuloma consistent with histoplasmosis



Figure 4: The circled area shows a nodule of the same size

RAB has the potential to be used in the future as a therapeutic tool for the delivery of ablative treatments, for the treatment of inoperable tumors or metastatic lesions with photodynamic therapy, and for microwave ablation, radiofrequency ablation and cryoablation. RAB could also be used to deliver direct anti-microbial drugs into the

lesion, although more studies are needed in this regard (1,5).

In our case, with the patient's previous cancer history, a newly diagnosed 9mm lung nodule raised a high suspicion for malignancy, although other infectious causes, however, could not be ruled out due to the patient's immunosuppressive status. Recent studies of robotic-assisted bronchoscopy have reported a diagnostic value of 90% in the diagnosis of peripherally located nodules, with a 3.6% risk of pneumothorax and 2.8% risk of bleeding. (2,5). Radial EBUS with RAB allowed us to visualize the peripherally located lung nodule before sampling, and linear EBUS-TBNA allowed the real-time sampling of mediastinal lymph nodes. Using RAB and EBUS, we accessed the peripheral nodules and the mediastinal and hilar lymph nodes during the same procedure, avoiding multiple procedures.

CONCLUSION

The challenges faced in the management of peripherally located lung nodules can be overcome through a comprehensive approach involving newer modalities in conjunction with more established approaches. Combining RAB with EBUS-TBNA can help in enhancing diagnostic yield, avoiding multiple procedures with reducing the potential for complications in the diagnosis of PLN. The approach has provided promising results in the diagnosis of infections that present with lung nodules, such as Histoplasma, which can be mistaken for malignancy.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - S.P.P., K.W., A.Y.L., S.F., D.H., R.C., D.A.; Planning and Design - S.P.P., K.W., A.Y.L., S.F., D.H., R.C., D.A.; Supervision - S.P.P., K.W., A.Y.L., S.F., D.H., R.C., D.A.; Funding - S.F., D.A.; Materials - S.P.P., K.W., S.F.; Data Collection and/or Processing - S.P.P.; Analysis and/or Interpretation - S.P.P.; Literature Review - S.P.P., K.W., A.Y.L., S.F., D.H., R.C., D.A.; Writing - S.P.P., K.W.; Critical Review - S.P.P., K.W., A.Y.L., S.F., D.H., R.C., D.A.

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