Case Report

Vintage meets contemporary: Use of rigid TBNA in the era of real-time imaging - first report from India

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ABSTRACT

In the modern era, real-time imaging-guided transbronchial needle aspiration (TBNA) has completely replaced the traditional surgical approaches to sample the mediastinal lesions for diagnosis and cancer staging. However, there is a limited role of these innovations in the presence of critical airway narrowing due to a further decrease in cross-sectional area of the airway proportionate to the outer diameters of the scope. Rigid TBNA with airway control by rigid bronchoscopy is one alternative which can be used for mediastinal sampling when modern technique is impracticable. Herein, we report the use of rigid TBNA, an underutilized old method to sample the mediastinal lesion in a patient with severe orthopnea secondary to tracheal compression by mediastinal mass.

KEY WORDS: Real-time imaging-guided transbronchial needle aspiration, rigid bronchoscopy, rigid transbronchial needle aspiration, transbronchial aspiration

INTRODUCTION

The first description of rigid transbronchial needle aspiration (TBNA) by Schieppati in 1958 changed the perspective of sampling mediastinal lesions from mediastinoscopy or surgical technique to simple, less invasive, nonsurgical approach.[1] However, despite the breakthrough innovation, only a few centers adopted this technique. With the progressive technological refinement of the flexible instrument and guided approach to real-time image assistance widened the scope of TBNA to replace the invasive procedures completely.[2-4] Furthermore, the major limitation of insufficient materials by the smaller needle is negated by the widespread availability of transbronchial aspiration histology needles.[5] Not infrequently, less invasive methods are not technically feasible, especially when the airway is critically narrowed or the patient is in respiratory failure. In such situations, the availability of modernized technique does not exempt the operator to revisit the skills of rigid TBNA technique before selecting an invasive alternative. Herein, we describe the use of rigid TBNA to obtain a histological specimen in a case of mediastinal mass, wherein airway control with rigid bronchoscopy was warranted to avoid procedure-related rapid and fatal loss of airway.

CASE REPORT

A 57-year-old previously healthy female presented with worsening dyspnea of 2-week duration associated with an inability to lie down supine. She also had a fever, weight loss, and recurrent episodes of severe nocturnal cough. On physical examination, significant tachypnea and orthopnea...
were present with a temperature of 101°C on several occasions. Cardiovascular examination and other systemic examination were normal. Chest radiograph showed large mediastinal mass occupying the upper and mid-zone of the lung fields. Arterial blood gas analysis showed PaO\textsubscript{2} of 42 and PaCO\textsubscript{2} of 34 mmHg. Complete blood counts and biochemical reports including lactate dehydrogenase were within normal limits. After an initial stabilization with supplemental oxygen and noninvasive ventilatory support, multidetector contrast-enhanced computed tomography of the thorax revealed anterior mediastinal mass with critical airway narrowing (maximum luminal diameter of 3.9 mm at lower trachea) [Figure 1a]. Due to significant airway narrowing and severe orthopnea, less invasive modalities such as bronchoscopic needle aspiration with or without images guidance were not feasible. Considering a possible lymphoma in the differential diagnosis, low-dose steroid for tumor debulking was started, but the patient showed no response and continued to worsen. Assuring patient safety along with the best clinical outcome, the patient was taken up for rigid bronchoscopy. A limited videobronchoscopy using ultra-slim pediatrics scope with a distal end outer diameter of 3.1 mm (BF-XP 190, EVIS Exera III, Olympus Medical Systems Corp., Japan) was performed to visualize the airway before the actual procedure [Figure 1b].

Under general anesthesia with airway block and spontaneous respiration, intubation was carried out using 12-mm rigid tracheobronchoscope with Hopkins telescope (Karl Storz, GMBH and Co., KG Germany). With the scope just above the carina, the predetermined area was punctured using the 18-gauge rigid needle with stylet (Karl Storz, GMBH and Co., KG Germany) [Figure 2a] and the needle was flushed with the stylet and few drops of saline to avoid bronchial contamination. The needle was jabbed to and fro in multiple directions while maintaining the continuous negative pressure by the retracted piston of the attached syringe. After terminating the suction, the needle was withdrawn from the lesion and the samples were divided for cytological, histopathological, and immunohistochemical evaluation [Figure 2b]. Postsampling, temporary customized studded silicone “Y” stent was placed to stabilize the airway for interim symptomatic relief [Figure 1c]. Appropriate positioning, adequacy of airway palliation with distal patency, and stability of the stent were ensured with check bronchoscopy after the procedure. Based on the cytological confirmation of lymphoma, debulking chemotherapy was initiated using low-dose cyclophosphamide plus vincristine in the hematology unit.

Histopathological section demonstrated diffuse infiltration by medium-to-large atypical lymphoid cells having round-to-irregular nuclei, coarse chromatin, and inconspicuous nucleoli [Figure 3a and b]. On immunohistochemistry, tumor cells were positive for leukocyte-common antigen, PAX-5, and CD20 while negative for cytokeratin, CD3, and terminal deoxynucleotidyl transferase. Ki-67 labeling index was 95%–100% [Figure 3c-f]. These features were consistent with a diagnosis of Burkitt’s lymphoma and a dose-adjusted chemotherapy comprising of etoposide, prednisolone, vincristine, cyclophosphamide, doxorubicin, and rituximab was given. A significant clinical response was observed on review evaluation after the first cycle of chemotherapy prompting removal of the stent.

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**Figure 1:** (a) Computed tomography images in axial and sagittal planes showing critical narrowing of the trachea, (b) bronchoscopic image at the level of lower trachea and carina showing critical narrowing, (c) computed tomography images in axial plane showing opening of the airway with silicone stent *in situ*.

**Figure 2:** (a) Rigid transbronchial needle aspiration needle with the distal and proximal end, (b) Core biopsy and a cytological smear.
on last follow-up after six cycles of chemotherapy is free of symptoms with no evidence of disease.

DISCUSSION

The index case highlights a safe and effective use of rigid TBNA, an underutilized technique, in a critically narrowed airway where routinely used less invasive procedures were impracticable. Conventional blind TBNA, real-time imaging-guided TBNA, and large bore histological needle to get larger samples adequate for histological evaluation is the modern era approach to the mediastinal lesions. However, these procedures require a scope with large enough outer diameter to carry these needles which limits their applicability in the presence of significant airway narrowing. A decrease in cross-sectional area of the airway proportional to the outer diameter of the scope leading to 10–20 mmHg drop in arterial oxygen pressure, a rise in airway resistance and increase in work of breathing are the few physiological changes recognized during the process of inserting the bronchoscope in the airway. Consequently, severe hypoxemia is a contraindication for bronchoscopy and related procedures unless noninvasive or invasive ventilation provides airway support for oxygenation. Thus, besides the empirical therapy, only limited options are available for diagnostic sampling when patients with central airway obstruction present with respiratory failure. In situations, where traditional approaches are not feasible, and tissue is the issue, rigid TBNA is a viable alternative to establish the diagnosis before subjecting the patients to more invasive procedures such as mediastinoscopy or thoracoscopic surgery. Rigid bronchoscopic airway control for rigid TBNA not only provides a diagnostic material but also offers an opportunity to stabilize the airway with a prosthesis for immediate relief from the obstruction as described in our patient. To the best of our knowledge, this is the first case from India to report the use of rigid TBNA.

Despite the landmark description of rigid TBNA by Schieppati as “free of great risks” in 1958, for almost two decades, only scattered report appeared in the literature. Later in 1978, Wang et al. in a series of five patients described the sampling of paratracheal masses using an esophageal varix needle passed through a rigid bronchoscope. Using a rigid TBNA, Vansteenkiste et al. in a study of eighty patients with proven malignancy found the specimen of histological quality in 74% and if cytological samples were also added then 90% of them had an adequate mediastinal staging. Their results are comparable to the diagnostic yield of 71% by Wang et al. who also provided insight into the safety and usefulness of 18-gauge needle during rigid bronchoscopy. Similarly, Bilaçoğlu et al. showed comparable results with the 21-gauge flexible needle and 18-gauge rigid needle (76% vs. 79%) while staging 138 consecutive patients and applying the proper technique and following anatomical landmarks. With the introduction of flexible needles and continued improvisation in the TBNA techniques, the bulk of the initial experience of rigid TBNA is almost forgotten. However, irrespective of the modernized technology, quite often a lesion may be unreachable with flexible scopes due to critical narrowing of the airway. As confirmed by our case in all such condition, the skills of rigid TBNA are invaluable to avoid surgical approaches. Real-time imaging-guided TBNA through the rigid bronchoscopy was not feasible in our patients due to the mass compressing the lower trachea and major bronchi. To use a 6.9-mm outer diameter endobronchial ultrasound, scope of a minimum luminal diameter of more than 4.5 mm is required, but the maximal diameter at the compression site was 3.9 mm in our patient. Use of a rigid bronchoscope allowed for an efficient control of the airway while using rigid TBNA with an opportunity to place a temporary tracheobronchial stent to stabilize the airway. However, this technique is not a...
surrogate marker of modernized imaging-guided methods for sampling mediastinal lesions and should be used when more straightforward methods are impracticable.

CONCLUSIONS

The essence to perform rigid TBNA in our patient was to utilize this long-forgotten procedure for obtaining accurate diagnosis while assuring patient safety along with the best clinical outcome. However, rigid TBNA technique requires dedicated centers with trained personnel and adequate infrastructure to deal with potentially lethal complications.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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