A Case Report of Minimally Invasive Surgical Resection for Pulmonary Mucosa-associated Lymphoid Tissue

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Title: A Case Report of Minimally Invasive Surgical Resection for Pulmonary Mucosa-associated Lymphoid Tissue

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Central Message: A patient with pulmonary MALT lymphoma who was admitted to the hospital due to fever underwent complete resection and final diagnosis by minimally invasive VATS surgery.

Central Picture legend: CT image of a 57-year-old male patient with a lung lesion of 27 x 29 x 50 mm in the LLL.

Glossary of Abbreviations:

BAL: Bronchoalveolar Lavage

CT: Computed Tomography

EMZL: Extranodal Marginal Zone Lymphoma

FB: Fibreoptic Bronchoscopy

LND: Lymph Node Dissection

MALT: Mucosa-associated Lymphoid Tissue

MDT: Multidisciplinary Team

VATS: Video-assisted Thoracoscopic Surgery

LLL: Left Lower Lung
Case Presentation

A 57-year-old man presented with fever for one day with a maximum temperature of 37.9 degrees C. The patient had no other clinical discomfort and no associated exacerbating factors for remission. The patient has a smoking history of more than 30-pack-year, with no known medical conditions, recent travel history, or relevant family history. Physical examination revealed pharyngeal congestion, follicular hyperplasia of the posterior pharyngeal wall, and some wet rales in both lower lungs, but no other abnormalities were observed.

The patient underwent chest computed tomography (CT) scans without and with contrast on the first and third days of hospitalization, respectively. The examination results showed a 27mm × 29mm × 50mm solid shadow with poorly defined margins in the left lower lung (LLL) hilar region, along with a superficial lobar sign and a vacuolar sign, and uniformly mild enhancement (Figure 1). No other abnormalities were found in the rest of the hilar region and mediastinum.

On the 4th and 10th days of hospitalization, the patient underwent fibreoptic bronchoscopy (FB), bronchoalveolar lavage (BAL) and CT-guided lung biopsy respectively. Pathological examination of the lavage fluid showed no abnormalities. Lung biopsy results showed proliferating lymphoid tissue without cancerous tissue. Immunohistochemical results were as follows: LCA+++; CD3+; CD20+; Bc-2++; Bcl-6+; p53 wild type; Ki-67(+):5%. On day 15 of hospitalization, a PET-CT scan revealed an irregular soft tissue mass (2.7 cm × 2.5 cm × 3.2 cm) in the LLL (mainly in the basal
This mass had a uniform density with indistinct borders, elevated metabolism (SUV max=6.2), and a high probability of granulomatous inflammation. There were no obvious hypermetabolic enlarged lymph nodes in the bilateral hilum and mediastinum, and no signs of malignant tumors were found in other parts of the body. After admission, the patient received three weeks of anti-infection treatment including oral co-trimoxazole and intravenous levofloxacin, and then re-examination CT showed no significant change compared with the initial one.

The patient’s diagnosis of a malignant lung mass was thought to be likely after thorough multidisciplinary team (MDT) discussions between the thoracic surgeon, imaging specialists, and respiratory physicians. They also had a discussion with the patient and relevant family members about the MDT evaluation and relevant indications for surgery since the patient's lung function was sufficient to tolerate surgery and there were no severe contraindications. On day 30 of hospitalization, the patient underwent VATS LLL lobectomy and station 7.10.11 lymph node dissection (LND). Combined with postoperative genetic recombination and immunohistochemistry, the patient's final diagnosis is LLL MALT lymphoma (EMZL) with a stage of pT2aN0M0 stage IB. On the fourth postoperative day, the patient was discharged with no significant discomfort or surgery-related complications.

Discussion
This case report follows the CARE guidelines. Written informed consent was obtained from the patient for publication of this case report and any accompanying images, along with ethical approval from our center (ZSXL-LL2023-006, May 24, 2023).

The complexity and difficulty of the diagnostic process is the clinical importance of this case, which culminated in a minimally invasive surgery to achieve complete resection of the lesion and a final definitive diagnosis. Patients are admitted with unexplained fever, and in previous reports, about 60-70% of MALT lymphoma patients presented with non-specific clinical features (cough and fever, etc.), which make it challenging to distinguish from other cancers, infections or inflammatory lung diseases1. The patient's age of onset was 57 years, which is generally consistent with the average age of onset of 60 years1,2. The patient has a long history of smoking, which may also be a risk factor for disease development3.

Pulmonary MALT lymphoma cannot be diagnosed by imaging findings alone, as demonstrated in this case. This entity can be easily misdiagnosed due to its non-specific clinical symptoms and heterogeneous imaging findings4-6. A previous study7 showed that MALT lymphoma lesions often had a mildly elevated SUV max value (0-6), which was consistent with the SUV max value in this case report (6.2).

In this rare case, we can see that the entire diagnostic procedure was challenging. The preliminary FB/ BAL and CT-guided lung biopsy findings cannot make an accurate pathological diagnosis for the patient. Previous studies have illustrated that the diagnostic value of fiberoptic bronchoscopy and CT-guided aspiration biopsy for the
diagnosis of pulmonary MALT lymphoma may be limited\textsuperscript{8-10}, which is consistent with the reality of this case. This may be related to the small specimens obtained by biopsy. However, this step should not be ignored or omitted in clinical practice, and when multiple or disseminated lesions are present, the biopsy is a reasonably desirable approach to minimize patient trauma.

On the other hand, invasive pathological methods combined with postoperative genetic and immunohistochemical support are still necessary to diagnose MALT lymphoma\textsuperscript{11}. In this case, immunohistochemistry played an important role in the final and accurate diagnosis (See Figure 2). Follicular dendritic cell markers CD21 and CD23 help to demonstrate the invasion of tumor B cells into the germinal center and IgD-rich coat membrane region. Abnormal B-cell expression of CD43 is observed in 16% to 50% of MALT lymphomas and is important in distinguishing MALT lymphoma from pulmonary nodular lymphoid hyperplasia.

The current treatment for MALT lymphoma is multimodal, however, the best treatment for pulmonary MALT lymphoma remains unproven. Surgery can include diagnostic resection and treatment for complete resection. Previous studies \textsuperscript{2,12} showed that surgical treatment of patients with early MALT can provide a long-term clinical benefit. Minimally invasive radical resection combined with lymph node dissection was adequate for this early-stage case. The prognosis is comparatively good for patients with pulmonary MALT lymphoma\textsuperscript{1,3}. Patients do not need postoperative adjuvant therapy and should adhere to a specific routine of postoperative CT follow-up due to
the natural property of inert tumors in MALT lymphoma and the early pathological
staging.

The role of MDT in diagnosis and treatment should be emphasized. Malignancy was
determined to be more probable following discussion in the MDT\textsuperscript{13}, and the post-
operative pathology was also consistent with the diagnostic expectations of the MDT.
The MDT team in this case, therefore, considers it reasonable to perform minimally
invasive surgery on this patient.

\section*{Conclusion}

In rare cases of pulmonary MALT lymphoma, a complete preoperative examination
and MDT discussions are required. Minimally invasive thoracic surgery using the
VATS technique can be performed in suitable patients to achieve a radical resection of
the tumor with a more rapid recovery and a higher level of safety.
Reference


Figure Legends

Figure 1. CT image of a 57-year-old male patient with a lung lesion of 27 x 29 x 50 mm in the LLL.

Figure 2. Histological examination of the lesion in the LLL. A large number of small lymphocytes infiltrated lung lesions. The combination of gene rearrangement and immunohistochemical findings is consistent with pulmonary MALT lymphoma (EMZL). Immunohistochemical results were as follows: CD20, CD79a, Pax-5 diffusely positive; CD3, CD5 showed scattered positive T cells, CD43 many cells are positive; Bc-2+; Ki-67: 10%; Vimentin-, Bcl-6-, p53 wild type. CD10-, Cycl inD1-, kappa: a few are positive, Lambda: a few are positive; EBER-.

Supplementary Appendix: Additional references
Supplementary Material (Additional reference)


