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Cryo-bronchoscopy Breakthrough: A Rare Bronchial Mucoepidermoid Carcinoma Success Report

ABSTRACT:

Background: Bronchial Mucoepidermoid Carcinoma (MEC) is an extremely rare malignancy, accounting for only 0.1–0.2% of primary lung cancers and <1% of primary bronchial tumors. It often presents with airway obstruction symptoms such as cough, dyspnea, and wheezing, mimicking common respiratory conditions like pneumonia. Due to its rarity, optimal management strategies remain unclear.

Case presentation: We report a rare case of a 32-year-old male with bronchial MEC who presented with chronic cough, weight loss, and exertional breathlessness for two months. Imaging revealed an endobronchial lesion obstructing the right mainstem bronchus. Bronchoscopy with cryo-biopsy confirmed the diagnosis of MEC through histopathological and immunohistochemical analysis. Given the tumour's localized nature (pT1N0M0), a minimally invasive approach was pursued. The patient underwent successful cryo-bronchoscopy, achieving complete airway recanalization without requiring traditional surgical interventions such as sleeve lobectomy. A three-month follow-up bronchoscopy showed no recurrence, with the patient remaining symptom-free.

Conclusion: This case highlights the potential of cryo-bronchoscopy as an effective and minimally invasive therapeutic option for early-stage bronchial MEC, potentially avoiding the need for major surgery. Given the rarity of this condition, further studies are needed to establish optimal diagnostic and treatment protocols.

KEY WORDS: Mucoepidermoid carcinoma (MEC), Bronchoscopy, Cryotherapy, Endobronchial tumor

Background:

Mucoepidermoid carcinoma (MEC) is a rare tumour of the lung that accounts for 0.1 to 0.2% of all primary lung carcinomas, however, MEC of the salivary gland is relatively common. [1] Pulmonary MEC is extremely uncommon with a bronchial localization making it a rarity. Bronchial MEC usually presents as an intraluminal mass causing luminal occlusion. It can arise from the bronchial glands of the main, lobar or segmental bronchus. MECs are known to be classified as low or high grade, with the former being easily managed by surgical resection alone. The precise nature of these neoplasms is not yet clear and little is known about the pathogenesis of the disease. [2] Symptoms are usually due to airway obstruction because of luminal occlusion such as cough, dyspnoea, wheezing, hemoptysis and obstructive pneumonia. This article here aims to present a rare case of a bronchial MEC with a detailed pathological, immunohistochemical, and molecular analysis which was diagnosed and treated by cryo-bronchoscopy instead of traditional surgical methods or sleeve lobectomy achieved using open or video-assisted technique.

Case presentation:

A 32-year-old male patient presented with complaints of dry cough, loss of appetite and significant weight loss of about 15 kg in the past year, along with on and off hemoptysis and exertional breathlessness for 2 months. A history of exposure to petro chemicals was noted, with no history of smoking. On presentation, general examination revealed tachypnea (respiratory rate of 30/min), tachycardia (120 beats/min) and hypoxia with oxygen saturation of 89% at room air. On physical examination there was reduced vocal fremitus and vocal resonance over right side of chest with decreased air entry on the right side on auscultation. Routine blood tests were within normal limits. Chest radiograph showed homogenous opacity over right lower zone and silhouetting present (Figure 1)**.** Subsequently a contrast enhanced computed tomography (CECT) of chest was performed which showed soft tissue mass lesion in the right main stem bronchus causing mild expansion of right main stem bronchus (measuring ~ 19x17 mm) and showing mild heterogeneous enhancement on post contrast study (Figure-2**)**. There was evidence of subsegmental collapse and consolidation of right lower lobe involving postero-basal and medial basal segments with air bronchogram seen on lung window (Figure-3). Bronchoscopy was performed, revealing a smooth, well-circumscribed endobronchial lesion originating from the right upper lobe orifice and occluding 90% of the distal airway. [Figure-4] During the procedure multiple cryo-biopsy fragments were taken for histopathological examination following which he underwent complete recanalization of airway using 1.9 mm cryoprobe and haemostasis achieved. Histopathology report showed a tumour arranged in the form of nest and glands. The nest comprises of tumour cells that have hyperchromatic nuclei, inconspicuous nucleoli and scanty cytoplasm. Mitoses were < 4/10 high power fields. (Figure-5) The tumour showed infiltrative borders with majority of tumour cells being mucoid in nature suggestive of bronchial mucoepidermoid carcinoma. Immunohistochemistry was positive for P40, cytokeratin (CK5/6), monoclonal carcinoembryonic antigen (mCEA) and cytokeratin (CK7) while being negative for thyroid transcription factor (TTF1). (FIG-6) Ki67 index was 8%. The staging process was completed with a positron emission tomography (PET) scan which showed no lymphatic or distant metastasis. The histopathological examination of the specimen confirmed the preoperative diagnosis and stage (pT1N0M0), as well as the oncological radicality of the bronchoscopic procedure. No further therapies were employed, given the stage of the disease. On 3 months follow-up a check bronchoscopy was performed which showed no intraluminal mass or growth with resolution of symptoms and a disease free state (Figure- 7).

Discussion and conclusion

The two most common types of primary salivary gland tumours are pulmonary mucoepidermoid carcinoma (PMEC) and pulmonary adenoid cystic carcinoma (PACC). Among all PACCs, 55% are seen in the trachea and main stem bronchus, while 85% of all PMECs are seen in the peripheral lung. There has been no clear sex predilection or familial predisposition [3]. These neoplasms mainly involve the lobular or segmental bronchi, often causing complete or partial atelectasis, with subsequent obstructive irritation and inflammation. This leads to the typical clinical manifestations like cough, wheezing, haemoptysis, fever, and pneumonia [4]. Grossly, the tumour size at diagnosis ranges from 0.5 to 6 cm in diameter with an average size of ~2.2 cm in the reported literature. They are soft,

polypoid and pink-tan in colour, often with cystic changes and a glistening mucoid appearance [5]

MEC of the tracheobronchial tree is histologically similar to MEC of salivary glands and these are categorised into low-, intermediate-, and high-grade tumours based on level of nuclear pleomorphism, necrosis, type of cell (mucous, intermediate, and epidermoid), and degree of mitotic activity. Histologically, MEC is comprises a mixture of different cell types, including mucin-secreting glandular cells, squamous cells, and intermediate cells. Histological grade is an important prognostic indicator, with high-grade MECs demonstrating a greater risk for metastases, tumour recurrence, and death [6]. Low-grade tumours predominantly contain cystic changes and solid areas typically comprising of small glands, tubules and cysts of mucin secreting and columnar epithelial cells with infrequent mitotic activity. High-grade MEC is very rare and demonstrate nuclear atypia with brisk mitotic activity and a high nuclear to cytoplasmic ratio [4]. Low-grade tumors are slow-growing and are generally managed by surgery alone, whereas high-grade tumors have poor prognosis due to greater chance of recurrence and metastasis, often requiring multimodal treatment [6].

Immunohistochemistry analysis for TTF-1 was positive in primary lung adenocarcinomas whereas cytokeratin (CK-7), Muc5Ac, p40, and p63 were positive in MECs, all of which may provide a method for differentiating between the two carcinomas [7]. While surgical resection remains the standard therapy for patients with pulmonary MEC, different operative approaches have been used just like in our case [8]. Long-term cure has been achieved with complete resection in low grade MEC patients in most of the studies. MEC can be treated with different surgical approaches including thoracotomy with conventional lobectomy, sleeve lobectomy, and lobectomy, with bronchoplastic closure. The goal of surgery is to obtain a complete resection with negative surgical margins [9]. Flexible bronchoscopy represents the main diagnostic tool for MECs, as it may allow direct visualization of the lesions and biopsies. The fibre-optic bronchoscopy view of a MEC tumor usually appear as pedunculated, polypoidal, smooth, exophytic mass with rich vascularity [10]. Bronchoscopic intervention has attracted extensive attention in the treatment of MEC patients over the past few years. Multiple bronchoscopic interventions including rigid bronchoscopy, argon plasma coagulation, CO_2 cryotherapy, and electric loop can be conducted to remove the mass. For more serious cases, one-fifth of the patients need bronchoscopic intervention as a bridge therapy before surgery because of respiratory distress. Moreover, there were several case reports indicating the promising effect of interventional bronchoscopy for treatment of bronchial MEC [10]. In our case, we found that interventional bronchoscopy using cryo therapy could successfully eradicate the neoplasm and provide good prognosis for the patient without significant trauma. We consider that, for low-grade MEC, since it is usually superficial and restricted to the bronchus, bronchoscopic intervention can completely eradicate the mass with few complications, preserve lung function and provide good prognosis similar to that of surgery. For high-grade bronchial MEC, interventional bronchoscopic therapy could quickly relieve life-threatening obstruction as a bridge therapy prior to surgery. For bronchial MEC with distant metastasis, bronchoscopic intervention can provide significant palliative relief of patients' respiratory distress and improve life quality.

Bronchial Mucoepidermoid carcinoma (MEC) is extremely rare, comprising only 0.1–0.2% of the primary lung malignancies and <1% of primary bronchial tumours. Our case presents a rare case of a bronchial MEC which was successfully managed by cryo-bronchoscopy instead of surgical removal by traditional methods. Thus, proving cryobronchoscopy a breakthrough success for treating bronchial MECs.

Abbreviations:

MEC: Mucoepidermoid carcinoma

CECT: contrast enhanced computed tomography.

CK5/6: cytokeratin 5/6,

mCEA: monoclonal carcinoembryonic antigen

CK7: cytokeratin 7

TTF: thyroid transcription factor

PET: positron emission tomography

PMEC: pulmonary mucoepidermoid carcinoma

PACC: pulmonary adenoid cystic carcinoma

Declarations:

Ethics approval and consent to participate: Approval was obtained from the ethical committee of Chandan Hospital.

Consent for publication: Written and informed consent for publication of this case report and the corresponding images were taken from the patient.

Availability of data and materials: Not applicable

Competing interests: We have declared that there are no competing interests.

Funding: No funding.

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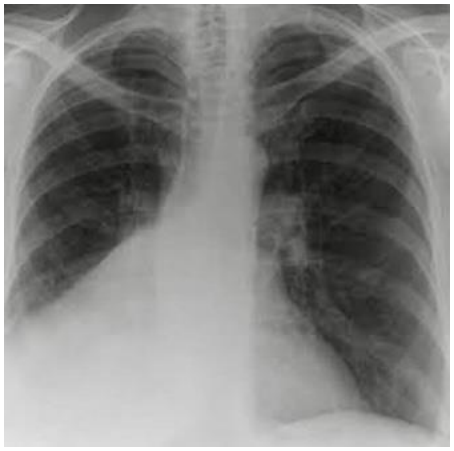

FIGURE 1- Chest radiograph showing homogenous opacity over right lower zone and silhouetting present

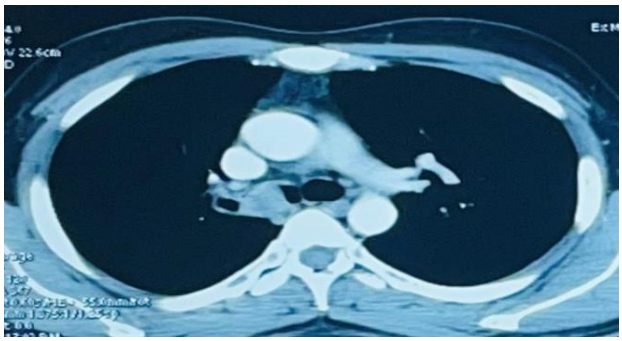

FIGURE 2- CECT Thorax shows soft tissue mass lesion in the right main bronchus causing expansion of right main bronchus

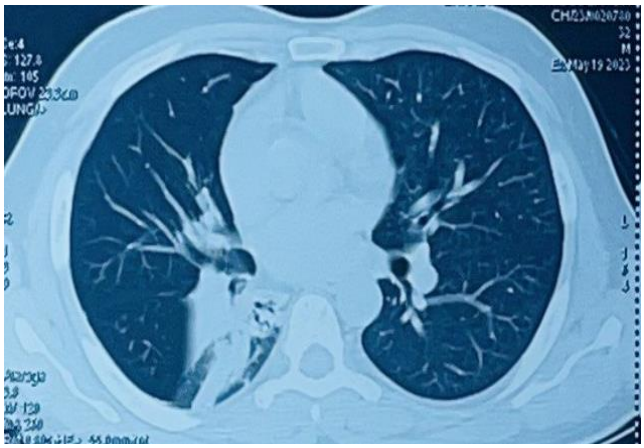

FIGURE 3- CECT Thorax shows sub segmental collapse / consolidation of right lower lobe involving posterior and medial basal segments with air bronchogram.

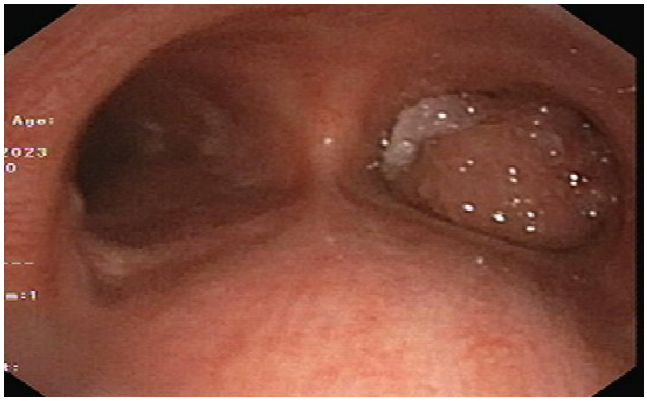

FIGURE 4 – Bronchoscopy reveals a well circumscribed endobronchial lesion at the level of carina which is originating from the right upper lobe orifice and occluding 90% of the right main stem bronchus.

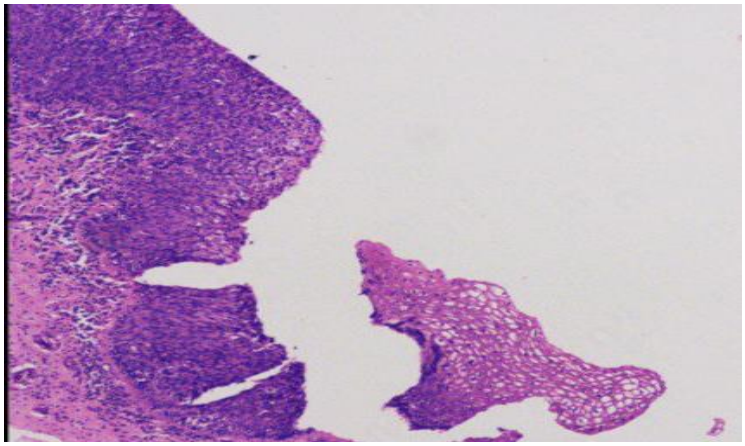

FIGURE 5- Histology shows a tumor arranged in the form of nest and glands. The nests comprise of tumor cells with hyperchromatic nuclei, inconspicuous nucleoli and scanty cytoplasm. Mitoses are < 4/10 high power fields.

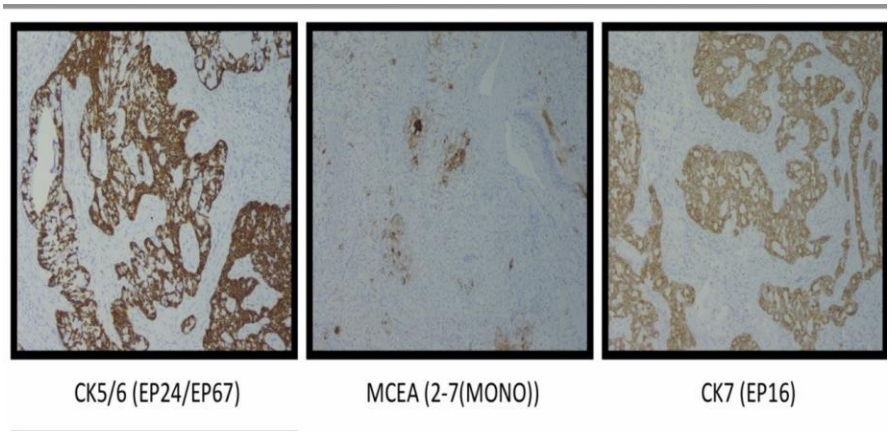

FIGURE 5 - Immunohistochemistry, positive for P40, CK5/6, mCEA and CK7 while being negative for TTF1. Ki67 index was 8%.

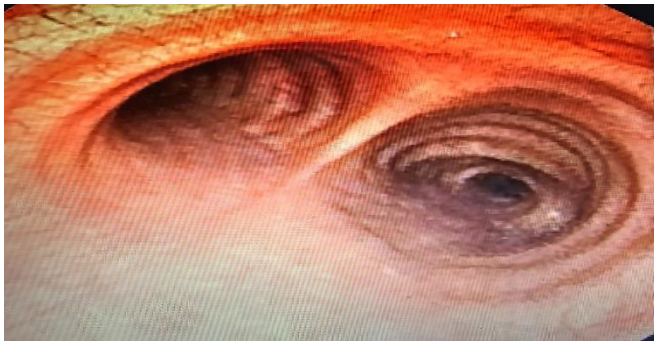

FIGURE -6- Post bronchoscopy image at the level of carina after 3 months showing no intraluminal growth or mass.