Cardiac dynamic magnetic resonance of a giant lung carcinoma invading the left atrium: do not let the imaging fool you

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Abstract

This study aimed to report on a non-small-cell lung cancer (NSCLC) originating from the right lung lower lobe and circulatory extension into the left atrium. Atrial involvement is an uncommon feature of advanced NSCLC, occurring in up to 10% of patients with bronchogenic carcinoma. In this case, the neoplastic mass was enormous and diagnosed as a lung pleiomorph carcinoma, staged T4N2M0 and so far considered irresectable. Conventional static imaging (chest CT-positron emission tomography scan; cardiac MRI) failed to rule out any direct invasion into surrounding structures. Surgery is the gold standard treatment for the local control of NSCLC without distant metastasis. Finally, preoperative cardiac dynamic magnetic resonance imaging and transoesophageal echocardiography were crucial to assess resectability, showing the absence of tumour invasion inside the pulmonary circulation and in the left atrium, supporting the decision-making for a radical, curative, surgical resection.

Keywords: Lung cancer • Valve disease • Extracorporeal circulation • Pleiomorph carcinoma

CASE REPORT

A 70-year-old man with a persistent cough and dyspnoea since a few days ago was referred to the University Medical Center Groningen. He had a positive family history of lung cancer and a history of smoking. Physical examination showed no abnormalities and no signs of cardiopulmonary failure were found. Laboratory studies were unremarkable, with a normal inflammatory state (C reactive protein and leucocytes). The chest X-ray showed a conspicuous right pleural effusion and was followed by a chest computed tomography (CT), which revealed an enormous tumour originating from the lower lobe of the right lung extending into the left atrium of the heart. The first probable diagnosis was non-small-cell lung cancer (NSCLC) from the right lower lobe with direct invasion, through the pericardium and atrial wall, into the atrium and which was hence unresectable. Cytology from needle biopsy confirmed NSCLC: pleiomorph carcinoma of the lung. On whole-body positron emission tomography scan, there was no evidence of distant metastasis (Fig. 1A), hence it was staged as local advanced disease. The pulmonologist was hesitant to administer chemotherapy because of the high risk of massive tumour embolization, hence local control by surgery was considered, with the hypothesis: ‘direct “mushroom-like” growth of the tumour from the lower lobe through the lower pulmonary vein, into the left atrium’.

Although static CT offered high-definition images, these were insufficient for decision-making (Fig. 1B). Therefore, dynamic cardiac magnetic resonance was performed. This clearly showed the absence of tumour invasion into the wall of the pulmonary vein and the left atrium (Supplementary Video 1), and the patient was accepted for surgery. The transoesophageal echocardiography (TEE) performed in the operating room showed the left atrium completely occupied by the tumour protruding through the mitral valve. The presence of Doppler colour flow, between the mass and the wall of the left atrium, also suggested the existence of a virtual space but could not rule out any other possible invasion into the wall of the chamber and pulmonary veins (Fig. 1C).

Surgery was performed through a median sternotomy with cardiopulmonary arrest of the heart, in a one-stage operation. The roof of the left atrium was opened with extension into the interatrial septum to consider resectability. The hypothesis was confirmed. The tumour extended ‘mushroom-like’ from the right lower pulmonary vein with macroscopical extension through the atrial wall towards the upper right pulmonary vein (Fig. 1D). For local control, a right pneumonectomy had to be performed with careful luxation of the tumour mass (diameter 7.8 cm), from the lower pulmonary vein and the left atrium. The postoperative period was uneventful, and the patient was discharged 10 days after surgery, and accepted for adjuvant chemotherapy. Postoperative staging was pT4N2M0 (Stage 3b).

DISCUSSION

To the best of the authors’ knowledge, this is the first case reported in the literature in which a dynamic magnetic resonance imaging made the difference in decision-making for
surgical resectability of NSCLC with circulatory extension into the heart. Static imaging like CT and MRI did not provide reliable information concerning the growth of the tumour within the heart, which is a dynamic organ. In this challenging clinical case, static imaging only would have led to refusal of surgical treatment, while surgical treatment is still the treatment of choice for NSCLC without distant metastasis [1, 2].

SUPPLEMENTARY MATERIAL

Supplementary material (Video 1) is available at EJCTS online.

Video 1: The dynamic MRI confirms the mushroom-like growth with high possibility for local control by surgery.

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REFERENCES


Figure 1: (A) FDG (fluorodeoxy-glucose-18) PET-CT scanning (transverse section, four-chamber view) revealed hypermetabolic uptake of FDG in the tumour, consistent with malignancy. (B) Static cardiac MRI imaging did not provide complete information concerning the attachment of the tumour (T) along its tracking into the wall of the pulmonary vein. RL: right lung, LV: left ventricle. (C) The presence of flow at Doppler between the mass and the wall of the left atrium (white arrows) suggests the absence of tumour invasion. (D) The intraoperative detachment of the tumour (T) from the inferior pulmonary vein (*), at the level of the ostium in the left atrium.