CASE REPORT

Aspergillosis complicating a microwave ablation cavity

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SUMMARY

We present a case of a patient who following chemotherapy developed semi-invasive pulmonary aspergillosis and an aspergilloma in a lung cavity previously formed by microwave ablation (MWA). A 55-year-old woman presented with cough and shortness of breath after finishing three cycles of chemotherapy for a metastatic nerve sheath tumour. She had been treated by MWA for pulmonary metastases 2 years previously which resulted in a residual right apical lung cavity. Postchemotherapy imaging showed that this cavity had enlarged, developed a thicker wall and contained lobulated soft tissue with a crescent sign on coronal reformats. In addition, the patient's *Aspergillus*-specific IgG was markedly raised. Treatment with itraconazole improved the symptoms and reduced the cavity size and wall thickness. This case shows that persisting lung cavities after MWA are a potential site for semi-invasive aspergillosis and has implications for the timing of chemotherapy in patient with metastatic lung disease.

BACKGROUND

Image-guided percutaneous microwave ablation (MWA) can be used to treat primary and metastatic lung tumours in patients who are poor surgical candidates.¹ It is considered a safe technique with a specific mortality of between 0.4% and 2.6% and a major complication rate reported between 9.8% and 17.1%.¹ Although cavitation after MWA is common at the site of treatment, chronic cavities are rare.² Herein we present the first case of a chronic cavity formed by MWA being complicated by aspergillosis following chemotherapy.

CASE PRESENTATION

A 55-year-old Caucasian woman with a background of neurofibromatosis type 1 presented with a 3-week history of cough, breathlessness, night sweats and lethargy. One week before presentation, she had recently completed three cycles of systemic chemotherapy with doxorubicin for recurrence of a malignant peripheral nerve sheath tumour (MPNST). She was diagnosed with this malignancy 12 years previously, after excision of a right posterior thigh swelling. The initial tumour was staged by American Joint Committee on Cancer (AJCC) stage III (T2b N0 M0, grade III). Despite further chemotherapy and adjuvant radiotherapy, 5 years later she developed right-sided pulmonary metastases which were surgically excised and confirmed as MPNST metastases on histology. However, further pulmonary lesions developed and were treated with MWA (figure 1) in 2012 percutaneously under CT

guidance (Somatom Sensation 64, Siemens, Germany). Treatment consisted of a 2 min exposure at 2.45 GHz, allowing 140 W to be delivered to the tumour via a single 1.8 mm-diameter applicator (Acculis MTA System, AngioDynamics, USA). There were no significant immediate complications and the patient was discharged after an overnight stay. Follow-up imaging 3 months after MWA showed a thin-walled right apical cavity (figure 1).

INVESTIGATIONS

On presentation, there were no new signs. Initial investigations showed raised white cell count of $19 \times 10^9/L$ and raised neutrophil count of $11.73 \times 10^9/L$. The sputum culture for bacteria (including mycobacteria) and fungi was negative. The chest radiograph showed opacification in the right upper zone at the site of the previous post-MWA cavity. Contrast-enhanced CT of the thorax demonstrated a right apical cavitating lesion measuring 5.1×3.3 cm on coronal reformats. The cavity had a thick wall with a lobulated soft tissue component and a crescent of air at its inferior margin (figure 2).

DIFFERENTIAL DIAGNOSIS

The differential diagnoses of a thickened cavity include local tumour recurrence, new primary malignancy, infection (bacteria or fungi) and rarely non-infective granulomatous disease. In this case, the two most likely differentials were recurrence of the tumour and an infection; the changes over time of the cavity, raised inflammatory and the acute nature of the symptoms made infection considerably more likely. Therefore, follow-up imaging was arranged and *Aspergillus* serology was performed.

TREATMENT

The serology was positive at >200 mgA/L, but repeated sputum for fungal culture were negative. The CT imaging findings in conjunction with positive *Aspergillus* serology suggested a diagnosis of semi-invasive aspergillosis rather than recurrence. The patient was started on oral itraconazole 200 mg two times per day and a repeat CT was organised.

OUTCOME AND FOLLOW-UP

After 1 month of treatment, the patient's symptoms had improved with reduced shortness of breath and sputum production, and the white cell count had fallen to $12 \times 10^9/L$. Reimaging by CT scan showed that the cavity had reduced in size to 4.3×3.8 cm with a thinner wall but stable appearances of the mycetoma.

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Figure 1 Multidetector CT axial image of the thorax (patient 1) post-MWA but prior to presentation with new respiratory symptoms after the chemotherapy. (A) Microwave applicator at the site of a right apical lesion. (B) Immediately after ablation an area of ground glass opacification is seen encompassing the lesion. (C) Thin-walled empty cavity present 3 months after MWA. MWA, microwave ablation.

Figure 2 Multidetector CT image of the thorax at presentation 2 years post-MWA with cough, malaise and shortness of breath. (A) Coronal image of the right apical aspergilloma. (B) Axial image of a heterogeneous mass within the right apical cavity, which is now thick walled. The nodule in the left lung is a MPNST metastasis. MPNST, malignant peripheral nerve sheath tumour; MWA, microwave ablation.

DISCUSSION

Prompted by this case, we reviewed our cohort of 156 patients treated with MWA from June 2012 to November 2015. We found that no other patients had developed semi-invasive aspergillosis of a post-MWA cavity. *Aspergillus* is a ubiquitous fungus and causes a spectrum of lung disease depending on the interaction of the fungus and host.³ A range of semi-invasive forms of aspergillosis have been described, including infections in pre-existing cavities.³ The diagnosis of these forms of semi-invasive aspergillosis is based on radiology. Findings include expanding thick-walled cavities sometimes containing a mycetoma and positive *Aspergillus* IgG associated with new respiratory and systemic symptoms. Fungal cultures of respiratory samples are often negative. The clinical presentation and response to itraconazole therapy confirmed the diagnosis in our case.

Cavitation of the ablation zone is a common finding in follow-up imaging obtained 1 month after radiofrequency ablations, reported to occur in 24–31% of ablated lesions.^{2–4} This cavitation rate is said to be similar for MWA.⁵ Cavities usually involute and disappear leaving minor architectural distortion of the surrounding lung after 2 months.⁵ Semi-invasive aspergillosis has previously been reported as a complication of MWA, but in those cases, this was an immediate complication developing within 2–4 weeks.⁶ However, in this case, the MWA cavity preceded the infection by 2 years and semi-invasive aspergillosis developed after three cycles of doxorubicin. Persisting cavitation following thermal ablation is rare.⁵ It has been observed that ablation zones near segmental bronchi are more susceptible to cavitation.⁷ It is possible that these may form a fistula between the treated area and the bronchial tree, allowing cavity formation and the potential for colonisation by *Aspergillus*. Neutropaenia is a well-known risk factor for invasive *Aspergillus* infection,³ and the transient neutropaenia caused by chemotherapy likely led to semi-invasive disease. Retrospective analysis of 156 cases of MWA showed that this was the only case of semi-invasive aspergillosis, suggesting that this is a relatively rare

complication of MWA. However, early initiation of antifungal therapies is important in preventing life-threatening complications of semi-invasive aspergillosis such as massive haemoptysis;⁸ hence, semi-invasive aspergillosis needs to be considered as a potential complication of chemotherapy for patients with persisting lung cavities post-MWA.

Learning points

- ▶ Lung cavities can form after microwave ablation of lung tumours but normally resolve.
- ▶ Chronic lung cavities are rare after thermal ablation.
- ▶ First case of aspergillosis complicating a chronic lung cavity formed by MWA.
- ▶ Aspergillosis may have been triggered by immunocompromise caused by chemotherapy.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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