

Can Radiofrequency Ablation Be Used as a Treatment Modality for the Management of Pulmonary Metastatic Ameloblastoma?

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We report the case of a 59-year-old woman who presented with metastatic ameloblastoma involving the lungs, 20 years after resection of the primary tumor in the mandible. The lesions were debulked on multiple occasions with radiofrequency ablation over an eight-year period with local response. There were no complications related to the procedures. We suggest that radiofrequency ablation is a possible treatment modality for the management and control of metastatic ameloblastoma.

Introduction

Ameloblastomas represent 1% of all odontogenic tumours. In the World Health Organisation classification of tumours, a distinction is made between ameloblastoma, metastasing (malignant) ameloblastoma and ameloblastic carcinoma [6]. Many authorities consider ameloblastoma to be locally invasive but not metastasing [1]. Metastatic ameloblastomas are rare occurring in 2-5% of cases with 80% of metastases involving the lung [2,3]. A literature search revealed only 42 cases of

ameloblastomas that had metastasised to lung. Metastatic deposits have also been seen in cervical lymph nodes (15%), spine (15%) and lower incidences in liver, brain and kidney. The tumours tend to be slow growing [3] so therapy can be carried out for tumour bulk reduction with a reasonable expectation of prolonged survival. Surgical excision of metastatic ameloblastoma is one mode of treatment but there is little evidence of successful outcome. Chemotherapeutic regimens have shown little or no clinical response. There are no morphological criteria to predict the potential for metastasis [7]. However the initial extent of the tumour and multiple recurrences seem to be associated with propensity to metastasise. There is considerable debate on the mode of spread of malignant ameloblastoma. Haematogenous and lymphatic are likely to contribute to extrapulmonary spread. Inhalation from the time of initial surgery has also been shown to be a cause for metastasis to the lung. The case report highlights the use of radiofrequency ablation as a possible treatment modality for the management and control of metastatic ameloblastoma.

We describe a case of a 59-year-old woman presenting with metastatic ameloblastoma, 20 years after

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Abbreviations: CT, computed tomography; RFA, radiofrequency ablation

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resection of the primary tumour in the mandible. This represents one of the longest period between initial diagnosis and lung metastasis. The longest period between initial diagnosis and lung metastasis 29 years after the primary tumour was resected, was reported in 2001 [4]. In this case report, we also highlight the use of radiofrequency ablation as a possible treatment modality for management and control of pulmonary metastatic ameloblastoma.

Case Report

A 59-year-old female was diagnosed with ameloblastoma of the mandible in 1980 which was treated with local marginal resection. The patient remained free of loco-regional disease for 20 years. At routine follow up in 2000 she presented with breathlessness and a chest radiograph showed bilateral lung lesions. CT guided biopsy confirmed these lesions as metastatic ameloblastoma. The CT showed four metastases in the left lung, the largest in the posterior aspect of the left lung measuring 66mm in diameter. There were 2 metastases in the right lung measuring 31mm and 44mm in size.

The patient had medical co-morbidities and owing to the extensive multiple pulmonary metastases, surgical intervention was not thought to be feasible.

Initial treatment in January 2004 consisted of debulking the four left lung metastases with a dual probe cool tip radiofrequency system under GA. Treatment was guided with CT scan and 90% necrosis was achieved. A post ablation CT scan showed all left lung lesions to have reduced in size. The largest lesion decreased in size from 66mm to 61mm. The second largest lesion decreased from 43mm to 28mm.

The untreated lesions in the rightlung, however had increased in size, from 31 to 40 mm and from 40mm to 48mm over 6 months. Radiofrequency ablation was carried out to these lesions in June 2005. A postoperative ablation scan showed reduction in size of both lesions in the right lung. One year post ablation CT scan of the left lung showed regrowth of the largest lesion. Radiofrequency ablation was repeated 2 further times over a 6 monthly period.

A CT scan in June 2006, showed focal enhancement in the smaller lesions, indicating residual tumour, but no significant progression.

Further radiofrequency ablation was carried out to

the dominant metastasis in the left lung in December 2006. A CT scan carried out in May 2007, revealed no major regrowth of the pulmonary metastases since the last treatment.

A CT scan October 2007 revealed good healing of the previously ablated areas and the overall bulk of the lung metastases had diminished significantly, although viable tumour was still present in both lungs. Further radiofrequency ablation was carried out to left lung in October 2007. A post operative scan in April 2008 showed a good result in terms of volume of tissue ablated. There was still some active tumour in the largest lesion in the left lung and in those areas of the smaller lesions immediately adjacent to the heart but the bulk of tumour had been destroyed in the left lung. There were no postoperative complications such as pneumothorax and all radiofrequency ablation treatments were CT-guided. Radiofrequency ablation had been well tolerated with minimal morbidity and was clinically effective in debulking the pulmonary metastatic lesions and preventing progression in this case.

Discussion

Radiofrequency ablation (RFA) is a relatively new and minimally invasive procedure which has been used for the treatment of solid tumours such as hepatocellular carcinoma in patients with co-morbidities or in cases where surgical resection was not possible. The first percutaneous RFA of lung lesions was reported in 2000 by Dupuy [12]. He successfully treated three patients palliatively.

Percutaneous RFA is performed with insertion of a needle electrode through an intercostal space into the lesion under image guidance. CT guidance is used in most cases. The electrode tip has a non-insulated portion connected to an RF generator that generates medium frequency electromagnetic waves of 400 – 500 kHz. The patient is transformed into an electrical circuit with adhesive grounding pads on the thighs or back. The mechanism of tissue heating for radiofrequency ablation is frictional caused by the motion generated by ionic current [14,15,16]. Alternating radiofrequency current agitates ions in the tissue surrounding the needle creating frictional heat, achieving a target temperature of about 90° C. This denatures and destroys tissue at predictable temperatures, in a relatively predictable volume

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leading to tissue heating. Radio frequency ablation is able to induce coagulative necrosis in a limited pulmonary area as large as 3-5 cm depending on the blood flow in the treated tissue [12]. The procedure lasts for a time ranging from 15 to 30 minutes according to the size of the tumour. When technically feasible, the ablation zone should include the whole lesion and one cm of the surrounding lung parenchyma to eradicate all possible microinvasions. A post-operative chest x-ray is carried out to exclude the occurrence of any complication (e.g. pneumothorax), before the patient is discharged. A ground glass opacity surrounding the target lesion is generally visible on CT scan just after RFA. Complete ablation is seen as a residual scar.

Malignant ameloblastoma is a different clinical condition from other metastatic pulmonary cancers in that debulking can be of clinical benefit. In the case report shrinkage of lesions by 12mm was achievable and therefore RFA could be a mode for control of pulmonary metastases. It is not without complications with a 40% incidence of pneumothorax [14,15,17,18] of which 50% require drainage. There is a long interval between diagnosis and metastasis of ameloblastomas and the rate of metastasis is only 1-3%, it is difficult to know whether routine evaluation should be carried out to diagnose metastasis. Goldenberg et al recommended that all patients with ameloblastomas should have annual chest xrays as lung is the most frequent site for metastases [8]. Annual evaluation of the neck with ultrasound should also be considered for possible regional recurrences.

Lung RFA is a minimally invasive, relatively safe, and promising treatment for unresectable metastases [13]. Clinical studies have shown it to be an effective and reproducible method for tumour ablation [13]. Tumor size is an important factor in achieving complete tumor necrosis [9]. The case report highlights the use of radiofrequency ablation as a possible treatment modality for the management and control of metastatic ameloblastoma. Clinical trials are required to evaluate RFA as an effective treatment for pulmonary metastases in patients where surgical resection may not be an option.

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