

Malignant primary cardiac tumours

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Abstract

OBJECTIVES: Management of malignant tumours of the heart remains a poorly investigated clinical area due to the scarcity of presentations. The purpose of this series and review is to present an outline of the management emphasized by our personal experience in a regional cardiothoracic centre.

METHODS: We reviewed all cases presenting with primary cardiac tumours in our institution within the last 10 years, looking at presentation, management and outcomes.

RESULTS: Of these, the records of 3 patients, who attended the Royal Victoria Hospital in Belfast and were treated for a cardiac sarcoma, were fully evaluated. A review of current literature was conducted through a search of Pubmed and Medline databases. A review of the presentation of these patients and the generally accepted management deterioration of patients diagnosed with cardiac sarcoma is discussed.

CONCLUSIONS: With reference to our case series, we want to draw attention to the rapid deterioration of these patients following presentation.

Keywords: Cardiac sarcoma • Carcinoma

INTRODUCTION

Primary cardiac tumours are rare and represent ~5–10% of all tumours of the heart, with an autopsy incidence between 0.002 and 0.3% [1]. About three-quarters of these primary lesions are benign, the other quarter being malignant, with sarcomas as the most common subtype [1, 2].

Compared with cardiac myxomas, which have high prevalence in woman and have familial lines, minimal epidemiological data have been collected on sarcomas [3]. The data we have collected are from a varied cohort of patients.

Complete surgical resection combined with chemotherapy continues to remain the fundamental strategy in sarcoma management. However, other strategies, such as orthotopic heart transplantation, have been described. Regardless of strategy, patients with cardiac sarcomas have an unfavourable prognosis with a mean survival of ~11 months [4, 5].

These malignant tumours are usually easily detectable with echocardiography. However, the diagnosis of sarcoma is rarely made, or suspected, until after surgical intervention, with the majority initially believed to be myxoma-type tumours.

Although now well described in literature, cardiac surgeons rarely encounter a primary cardiac sarcoma. This article describes our experience with the presentation and management of patients with primary malignant tumours of the heart.

MATERIALS AND METHODS

All primary cardiac tumours resected in the unit from January 2000 to January 2010 were included in this study. There were 13 operable primary cardiac tumours (11 female, 2 male); 10 (76.9%) of which were pathologically confirmed as cardiac myxomas (8 female, 2 male), two (15.4%) as primary cardiac sarcomas (2 female) and one (7.7%) primary cardiac carcinoma (1 female). A further primary cardiac sarcoma was evaluated in the unit, although co-morbidities deemed him not operable.

Ages of patients ranged from 25 to 72 years (mean of 53.1 years), at the time of surgery. The tumours were classified according to pathology results. The medical records, diagnostic tests and operative notes of all patients were reviewed. Any missing data were obtained either from general practitioner records or by referring physician notes.

CASE REPORTS

Case 1

This 61-year old lady presented acutely to our unit, following decompensation during a computed tomography (CT) scan, due to the mitral valve obstruction. She underwent an emergency excision of a left atrial tumour the same day. The tumour was seen

to be arising from the lateral wall of the left atrium and during diastole, prolapsed through the mitral valve. Due to the extensive nature of the tumour and to the anatomical site, it was not possible to fully resect the tumour; therefore, debulking surgery was performed and the attachment cauterized. The mitral valve was not involved with the lesion and post-resection transoesophageal echocardiogram (TOE) showed no significant mitral valve abnormality; the TOE also showed good left ventricular function and no evidence of any remaining tumour.

Given the nature of the acute presentation, a comprehensive assessment of the patient was not possible; however, in retrospect, she had no significant past medical history prior to her acute presentation.

A pathological analysis of this case showed a 6 × 6 × 4-cm tumour, consistent with a leiomyosarcoma, confirmed that surgical excision was not complete, despite echocardiographical appearance. She was referred for palliative chemotherapy with ifosfamide and doxorubicin, which she did not tolerate well.

She was closely monitored following her surgery. Six months later, a follow-up TOE, in July 2003, showed recurrence of the disease again as a large mass attached to the lateral wall of the left atrium. Positron emission tomography (PETCT) showed a diffuse bony metastatic spread.

AH was readmitted as an emergency in August 2003 with multiple episodes of symptomatic ventricular tachycardia and was successfully resuscitated with synchronized DC cardioversion. Her condition however continued to deteriorate and she died on 11 November 2003.

Case 2

This 64-year old lady presented with a 6-month history of shortness of breath, palpitations, general malaise and night sweats to her general practitioner (GP), who was initially treated for a lower respiratory tract infection. A subsequent CT chest showed a mass on the left atrium, and an angiogram showed normal coronary arteries. The patient's relevant past medical history includes endometrial carcinoma, which was managed by hysterectomy alone 6 years before. Clinical examination was unremarkable, with no murmur detected.

TOE showed a left atrial tumour in keeping with a myxoma, which was arising from the interatrial septum and prolapsing through the mitral valve, with a peak velocity of 0.8 m/s. She underwent resection through median sternotomy on 9 October 2007, again the mitral valve was not involved and the mitral valve did not require any form of repair.

A pathological analysis of this case showed a sausage-shaped tumour of 3 × 2 × 1 cm, which was sent to Royal Brompton Hospital, London for confirmation of diagnosis. This diagnosis showed a tumour consistent with a non-specific sarcoma, most likely angiosarcoma.

A follow-up magnetic resonance imaging on the 28 November 2007 showed a mass lesion again on the left side of the heart, predominantly in the atrioventricular groove. She received chemotherapy with gemcitabine and docetaxel. A follow-up PETCT showed no focal uptake to indicate the site of a primary tumour. An nuclear medicine bone scan showed no evidence of disseminated osteoblastic metastases. Unfortunately, her tumour did not respond to the chemotherapy and she died on 24 May 2009.

Case 3

This 25-year old lady presented acutely unwell with severe shortness of breath progressing over 6–8 weeks with atypical chest pain. She was being treated for Haemophilus influenza H1N1 although never serotypically confirmed. She had no past medical history of note. Examination showed a pansystolic murmur and right upper quadrant abdominal tenderness.

TOE showed a mass in the intra-atrial septum extending from, and prolapsing through, the anterior leaflet. Her right ventricle was significantly enlarged and she had moderate-to-severe pulmonary hypertension. CT showed bilateral pleural effusions.

She underwent surgical resection through a median sternotomy on 19 November 2009. Resected to include full thickness of atrial wall, and no residual tumour remained. She made a good recovery from surgery and underwent chemotherapy with adriamycin and ifosfamide. She has had a total of six cycles. Our initial pathology showed a white round tumour measuring 5 × 4 × 2 cm with morphological and immunohistochemical patterns in part consistent with a synovial-type cardiac sarcoma; given the scarcity of these lesions, the specimen was forwarded to the Royal Marsden Hospital, London for further analysis.

The lesion was macroscopically described as a white round tumour measuring 5 × 4 × 2 cm and weighing 25 cm. A small piece of muscle was attached measuring 2.5 cm, and further sections revealed a white homogenous tumour with a small haemorrhagic area.

Histologically, the features were of a malignant epitheloid and ovoid cell neoplasm. The differential diagnosis included mesothelioma, carcinoma and synovial sarcoma (although the presence of diffuse cytokeratin in the specimen made the diagnosis of synovial sarcoma unlikely). The tumour cells were positive for AE1/AE3, CAM5.2, MNF116 and INI-1 and there was patchy weak membranous staining for CD99 and CD56. A few cells appeared positive for SMA and there was a very weak focal staining in tumour cells is seen for bcl2. The results show a diagnosis of a primary cardiac carcinoma or primary cardiac mesothelioma.

Unfortunately, she presented with a new lesion on the anterior leaflet of her mitral valve and stenoses of both the right coronary artery and left anterior descending artery. She underwent successful resection of this lesion on the 19th June 2012, which required the replacement of mitral valve, combined with coronary artery bypass grafting.

DISCUSSION

The vast majority of cardiac sarcomas present in a way similar to cardiac myxomas with typical symptoms of dyspnoea, chest pain and a generalized fatigue. If a surgeon regularly performs resections for myxomas, it is inevitable that sarcomas will be encountered. Our series has shown that there are often differences in clinical presentation from those seen with myxoma, mainly with regard to severity. Two of the three cases presented following an acute decompensation, with a third case presenting in symptomatic ventricular tachycardia following recurrence of disease. This acute deterioration demonstrates a significant aspect of cardiac sarcomas, namely the aggressive rate of growth.

In line with standard practice, the diagnosis should be confirmed by a pathological analysis of the resected specimen. Unfortunately, due to the infrequency of primary cardiac sarcomas and their varying morphology, not all centres are equipped to expertly analyse the specimen and the sample may have to be sent for expert analysis. Cardiac sarcomas have a wide and varied histological appearance with many different subtypes; the most common being angiosarcoma, malignant fibrous histiocytoma, malignant mesotheliomas, rhabdomyosarcoma and lymphomas. Each variant has a pattern of presentation that is closely related to where they arise. For example, tumours arising in the left atrium will often lead to an incompetent mitral valve presenting with congestive cardiac failure.

One of the main pathological differentials for our third case was that of a synovial type sarcoma. This subtype has only very sparsely been described in literature to date as synovial sarcomas of the heart are exceptionally rare [6]. Looking at the Surveillance, Epidemiology and End Results (SEER), a recent study database found only 6 previous cases [7]. A synovial sarcoma is characterized histologically by two different cell types: the sarcomatous-spindle cell and the epithelial cell. Stereotypically synovial sarcomas contain both cell types; however, the more aggressive the sarcoma, the higher the proportion of sarcomatous-spindle type cells. Although the name 'synovial sarcoma' suggests an origin from the synovium of large joints, such as the knee, they are not related.

The standard treatment of cardiac sarcomas usually involves complete excision of the lesion, with margins, when distant metastases are not detected, or palliative debulking approach if the tumour is not resectable. A median sternotomy and cardiopulmonary bypass with typical open approach to the heart chambers is the routine approach. One of the major problems with complete resection of cardiac tumours is a distortion of the natural anatomy or a non-resectable tumour. Another possible approach to these difficulties is autotransplantation, removing the heart and performing a radical extracorporeal resection allows for both removal of extensive disease and anatomical reconstruction of the heart [8].

Orthoptic heart transplantation has also been used as a definitive treatment [9]. The evidence for this aggressive treatment as a routine management strategy is still controversial [10]. Due to the scarcity of donor hearts, it is imperative that only suitable candidates are chosen. All patients should have an extensive investigation to exclude extracardiac metastasis prior to consideration; however despite this, a series in 2000 showed 13 of 21 patients who underwent transplantation for malignancy died of metastatic or recurrent disease [10].

The difficulty in long-term treatment of cardiac sarcoma is prevention of recurrence. At present, the main follow-up

treatment strategy, post-resection, is chemotherapy. Our series demonstrates that although all patients were referred for chemotherapy, each received a different regimen using a combination of ifosfamide, doxorubicin, gemcitabine and docetaxel. Without any randomized control trials into the use or outcomes of chemotherapy agents, their overall advantage remains to be shown. Given the emergency scenario of each patient in our series, the option for preoperative chemotherapy was not available. Each patient should be considered individually and referred to an oncologist with a special interest in cardiac sarcoma [11]. Although a case report by Movsas *et al.* published in 1998 showed a complete recession of an inoperable tumour using only radiotherapy, its use is not often implemented [12]. The recent review of SEER by Hamidi *et al.* showed no statistically significant survival benefit for patients undergoing radiotherapy [7].

This series highlights the need for all cardiac surgeons who are involved in the resection of atrial myxomas to be aware of the current treatment and management strategies of cardiac sarcoma, which they will inevitably encounter.

Conflict of interest: none declared.

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