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Case Report

Primary lung mesenchymal chondrosarcoma with kidney and intermuscular metastases: a case report and literature review

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Abstract: Mesenchymal chondrosarcoma (MCS) is an uncommon sarcoma which primarily occurs in the extremities but rarely originates from the lung. Herein, we report a case of a 29-year-old female who presented with a lung mass detected by the physical examination. The tumor was resected and the pathological examination revealed primary MCS of the lung. After the operation, the chemotherapy and radiotherapy were performed. However, the follow-up showed evidence of kidney and intermuscular metastases, and both of the lesions were excised with adequate margins. In addition, a review of the clinical knowledge regarding this rare disease is discussed.

Keywords: Mesenchymal chondrosarcoma, lung, immunohistochemistry, chemotherapy, radiotherapy

Introduction

MCS comprises 1-10% of all chondrosarcomas which can be divided into several subtypes including conventional, dedifferentiated, mesenchymal, and clear cell [1, 2]. First reported by Lichtenstein and Bernstein in 1959 [3], MCS is characterized histologically by the coexistence of primitive small blue mesenchymal cells and islands of differentiated cartilaginous substance [4, 5]. It has a slight female preponderance and mainly occurs in patients at age 40 or older [2]. MCS, which is most common in the bone and soft tissues, rarely originates from the lung [6, 7]. After review of the literature (online PubMed search), only 7 cases of primary MCS of the lung have been reported [5, 6, 8-12]. To the best of our knowledge, the present case of pulmonary MCS with the kidney and gluteus maximus metastases has never been reported before.

Case report

A 29-year-old woman was admitted to the Department of Cardio-Thoracic Surgery, The Second Xiangya Hospital of Central South University (Changsha, China) with a lung mass found by the routine X-ray. Computed tomography (CT) scan revealed a 6.0×5.0 cm mass with dense calcification in the upper lobe of the left lung (**Figure 1**). Subsequently, the intraoperative frozen section examination revealed unspecified sarcoma and the left upper lobectomy and systemic lymph nodes dissection were performed (first operation).

The resected lobe measuring 18×10×6 cm showed a well-defined reddish-gray tumor measuring 6.5×6.0 cm with scattered hard calcification areas on cut surface. Microscopically, the neoplasm was composed of undifferentiated small round tumor cells and islands of differentiated cartilaginous substance (**Figure 2A**). Immunohistochemistry revealed reaction to CD99 and vimentin in the small round cell areas and reaction to S-100 limited to the cartilaginous areas (**Figure 2B**). Besides, it was negative to cytokeratins, epithelial membranous antigen, and leukocyte common antigen. Since the comprehensive physical and image detec-

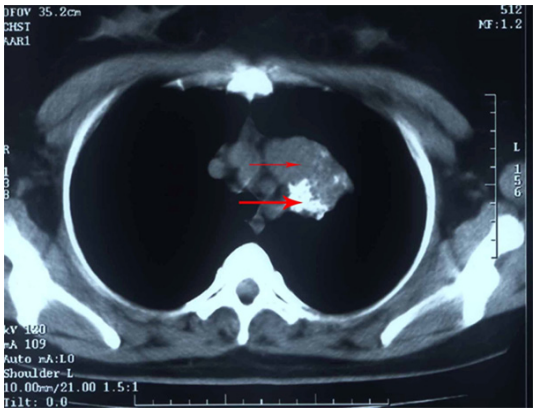

Figure 1. Computed tomography of the lung. The arrows indicate that the mass in the upper lobe of the left lung is a well-marginated lesion with scattered calcification.

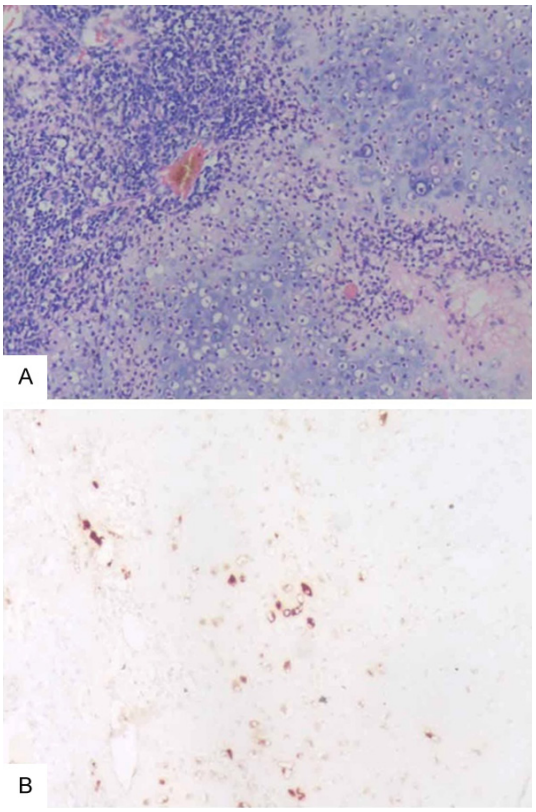

Figure 2. Pathologic results of the lung (magnification ×100). A. Hematoxylin and eosin stain shows the tumor is composed of undifferentiated small round tumor cells and islands of differentiated cartilaginous substance. B. Immunohistochemical staining for S-100 is positive.

tion showed no sign of other primary sites, the diagnosis of primary MCS of the lung was made. After the surgery, the patient was

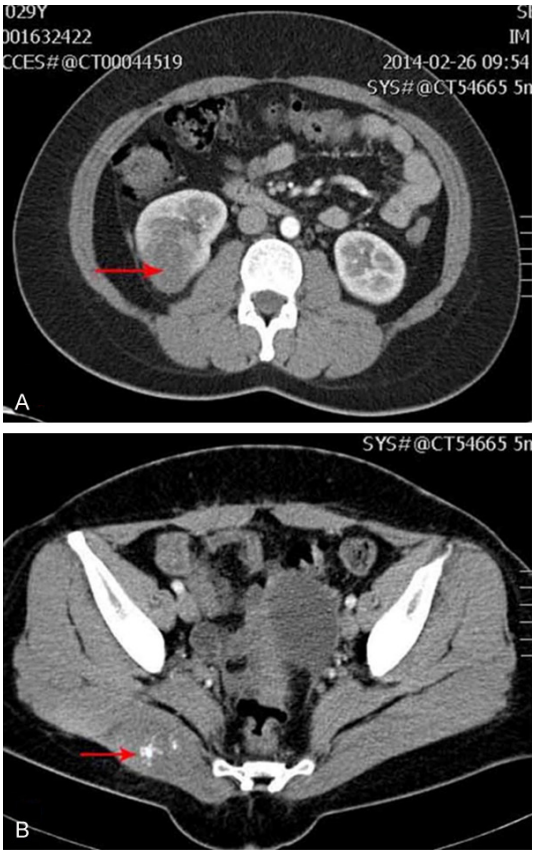

Figure 3. Computed tomography (CT) of the kidney and buttocks. A. Axial CT image shows a lesion in the inferior pole of the right kidney. B. Axial CT image demonstrates a well-defined lesion with scattered calcification in the right gluteus maximus.

referred for radiotherapy and chemotherapy. The patient recovered uneventfully and the follow-up continued every three months.

However, 21 months after the first operation, a 6×3.5 cm mass at the patient's right kidney was detected by CT scan which resembled a malignant neoplasm (**Figure 3A**). Consequently, nephrectomy and limph nodes dissection was performed (second operation). Nevertheless, the pathologic examination (**Figure 4A**, **4B**) revealed its similarity to the pulmonary MCS resects previously, which meant it was a metastatic neoplasm from the lung.

Three years after the first operation, the patient presented to our hospital again with a mass in the right *gluteus* maximus for 2 months. CT scan was suggested and it demonstrated high possibility of metastasis from the lung (**Figure 3B**). Subsequently, the mass was resected with

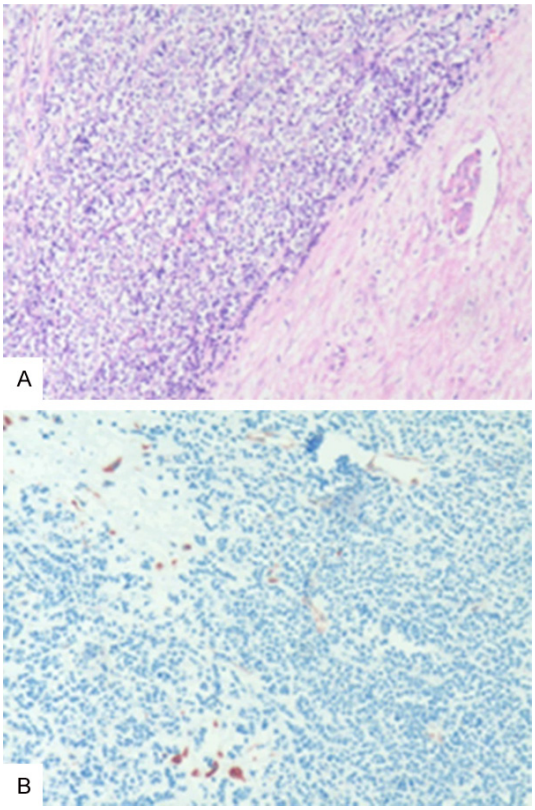

Figure 4. Pathologic results of the kidney (magnification ×100). A. Hematoxylin and eosin stain shows undifferentiated small round tumor cells. B. Immunohistochemical staining for vimentin is positive.

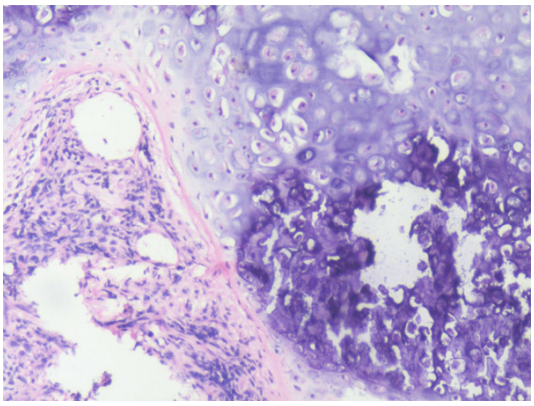

Figure 5. Pathologic results of the buttocks (magnification ×100). Hematoxylin and eosin stain shows undifferentiated small round cells and islands of differentiated cartilaginous tissue.

adequate margins (third operation) and confirmed to be a metastatic lesion (**Figure 5**). The patient had full recovery and the continued follow-up has shown no sign of recurrence and metastasis to date.

Discussion

MCS is a rare variant of chondrosarcoma and most common in the bone and soft tissues. It may occur in other sites such as the kidney, meninges, thyroid, and prostate, but rarely originates from the lung [6]. In the literature, there are only 7 cases of primary MCS of the lung (summarized in **Table 1**). However, pulmonary metastases of MCS from other primary sources are common [8]. Therefore, comprehensive clinical evaluation should be taken to exclude extrathoracic primary sources before the diagnosis of primary MCS of the lung, which was done in our case.

The CT may contribute to the diagnosis of MCS in the lung especially when it reveals dense and granular calcification [13, 14], but the definitive diagnosis is based on the histological results. Microscopically, the most common feature of MCS is a biphasic pattern composed of sheets of undifferentiated small round cells, as well as islets of well-differentiated cartilaginous tissue [5, 14]. Besides, immunohistochemical markers such as CD99, vimentin, and S-100 also aid the differentiation from other intrathoracic tumors characterized by small blue cells such as malignant lymphoma, small cell carcinoma, and Ewing's sarcoma, and so forth [8].

Surgery is an optimal treatment for MCS of the lung [15], but the adjuvant therapy remains uncertain due to the paucity of reported cases [16]. However, Xu Jie et al. recommended radiation as the salvage therapy to achieve better local control for patients with positive margins [2]. Furthermore, adjuvant chemotherapy yielded excellent local control according to the cohort survey by Bishop et al. [17], which was in accordance with the retrospective study by Cesari et al. [7]. In the present case, surgery and adjuvant therapy were performed and no local recurrence have been noted so far. As for metastases, surgery is significantly associated with improved outcome [16].

In addition, some researches in new therapeutics are under way. For instance, the chemoresistance of MCS could be overcome by using inhibition of Bcl-2 family members according to the study by van Oosterwijk et al. [18]. Other studies have investigated HEY1-NCOA2 rearrangement and expression of IDH1/2, p53, and

Table 1. Reported cases of primary MCS of the lung

Reference	Sex/Age (years)	Presenting symptoms	Location	Size (cm)	Treatment	Immunohistochemical features	Follow-up (years)
Kurotaki et al. [5]	F/45	Asymptomatic	RLL	4.5×3.5×3.0	Lobectomy	Vimentin/S-100/Leu-7 (+)	8 (Alive with metastases)
Samsonov et al. [11]	M/68	Hemoptysis, fever	RUL	3	Unknown	Unknown	Unknown
Huang et al. [8]	F/40	Asymptomatic	LLL	6.5×4.8	Bisegmentectomy	Vimentin/S-100 (+)	1 (well)
Geng et al. [9]	M/57	Cough, hemoptysis	RLL	4×4×3	Lobectomy	CD99/S-100/NSE/vimentin (+)	Unknown
Dubova et al. [12]	F/68	Unknown	Unknown	Unknown	Unknown	S-100/vimentin/NSE/CD99 (+)	Unknown
Cao et al. [10]	F/45	Chest pain	RLL	Unknown	Radical thoracotomy	Unknown	Unknown
Mei et al. [6]	F/20	Cough, cxhest pain	LLL	11.6×9.2×6.0	Pneumonectomy	vimentin/CD99/S-100 (+)	Unknown
Present case	F/29	Asymptomatic	LUL	6.0×5.0	Lobectomy	CD99/S-100/vimentin (+)	3 (alive with metastases)

M, male; F, female; RLL right lower lobe; RUL, left lower lobe; LLL, left lower lobe; LUL, left upper lobe; NSE Neuron-specific enolase.

retinoblastoma pathways which can be used as diagnostic markers but also potential for targeted therapies [1, 17].

The MCS of the bone and soft tissue has a poor prognosis, with 5-, 10-, and 20-year overall survival rates of 55.0%, 43.5%, and 15.7% respectively [2]. However, the prognosis of MCS originating from the lung remains poorly understood owing to its rarity. In the case reported by Kurotaki et al., the patient was still alive 8 years after the initial right lower lobectomy [5]. As for predictive factors, negative margins and the absence of metastases at diagnosis were reported to be significantly associated with improved overall survival [2, 7]. Furthermore, due to its strong tendency toward late local and metastatic recurrence, Frezza et al. suggested that the careful follow-up after diagnosis should last over 10 years [7].

In conclusion, the primary MCS of the lung is extremely rare and the diagnosis can only be made by excluding other primary intrathoracic sarcomas and MCS of extra thoracic sites. The surgery in conjunction with adjuvant therapy can be applied to the patient as we presented. Due to its high rate of recurrence and metastases in a long postoperative period, we suggest that long-term and frequent follow-up is needed.

Disclosure of conflict of interest

None.

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