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Skeletal Muscle Metastasis Secondary to Cancer – A Report of Seven Cases

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ABSTRACT

Cancer metastasis to the skeletal muscle is very rare. In this report, we describe 7 cases (6 males, 1 female, age 55–76, mean 66 y.o.) with unusual presentation of cancer metastasis to the skeletal muscle, illustrating the principal clinical, radiographic and histologic features. The primary tumors were lung cancer in 4 cases (3 adenocarcinomas, 1 squamous cell carcinoma) and renal cell carcinoma, esophageal carcinoma, hepatocellular carcinoma in each one. The metastatic sites were the adductors, iliopsoas, rectus femoris, biceps bracii, triceps bracii, deltoid, and paravertebral muscle in each one. The unusual sites of metastases were visualized by CT and/or MRI and confirmed by needle or trocar biopsy. Five patients died in 2 to 24 months with the average of 8 months after initial examination.

INTRODUCTION

Metastatic carcinoma to skeletal muscle is very rare [1–4, 6–8, 10, 12–14, 18–23, 25–28, 30, 31, 33–39, 42, 43, 45–53]. The presence of a soft tissue mass caused by metastatic carcinoma is misdiagnosed easily as a soft tissue sarcoma by both physical examination and imaging investigations [2, 6, 39, 42, 50, 52]. Clinically it is important that metastatic carcinoma is strictly differentiated from soft tissue sarcoma as the treatment and the prognosis are markedly different [5, 11, 21, 27, 42, 45]. We report 7 cases of metastatic carcinoma to skeletal muscle with emphasis put on the clinical course, radiological and histological features.

PATIENTS AND METHODS

A retrospective review was done on the records of all patients referred to the authors' institution for evaluation and treatment of a mass that subsequently was proven to be metastasis from a distant primary carcinoma. Each of these patients

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was treated at the authors' institution from 1996 through present. All charts were reviewed to determine the history, presenting symptoms, anatomic location of metastasis, histology of the primary tumor, type of biopsy, treatment, and survival. The examinations performed by computed tomography (CT) and/or magnetic resonance imaging (MRI) were also reviewed.

RESULTS

Patients

There were 7 patients (6 men, 1 woman, age 55–76, mean 66 y.o., Table 1). Before presentation, 5 cases had been diagnosed as carcinoma 1 month to 14 years earlier. Two patients (#1 and #2) presented without a previously known malignancy and were diagnosed as carcinoma 1 and 2 months, respectively, after initial presentation. All patients presented with a primary complaint of the presence of a painful mass; 3 had resting pain and 4 had pain during limb-motion. Six patients presented with a clinically palpable mass with tenderness and 1 patient (#7) with a groin mass had an associated femoral nerve neuropathy.

Anatomical sites of metastatic and primary lesions

Three metastatic lesions occurred in the upper extremity muscles (deltoid, biceps brachii, and triceps brachii), 3 in the lower extremity muscles (iliopsoas, adductors,

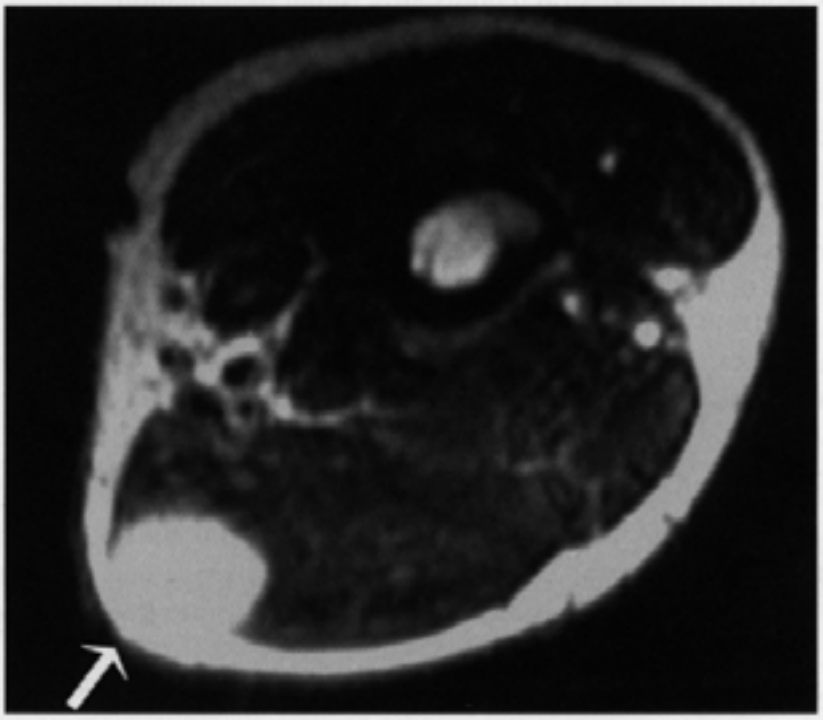

Fig. 1. Axial MRIs of 66 year-old male, revealing a tumor (arrow) in the biceps brachii muscle. The mass had a high intensity on a T2-weighted image.

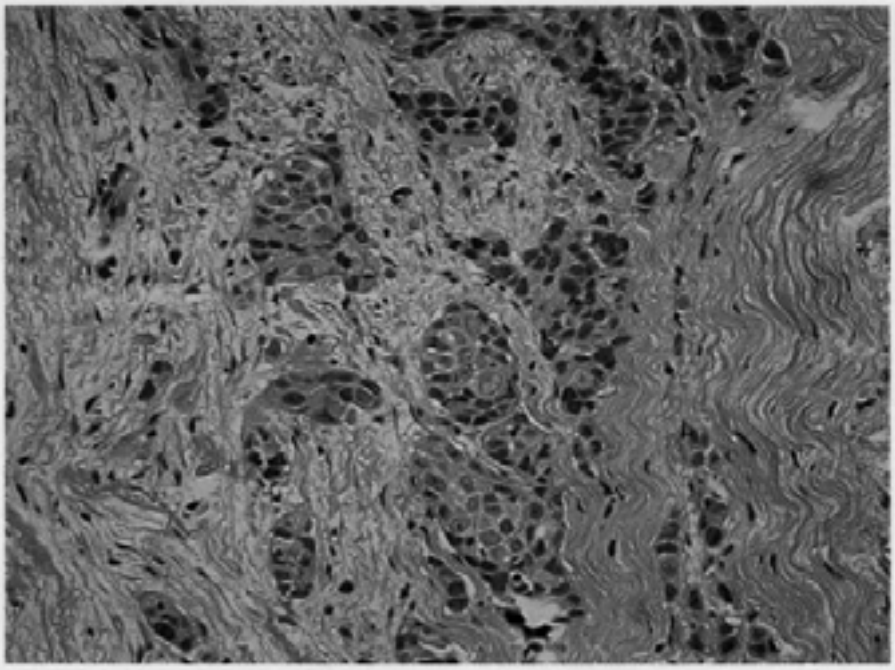

Fig. 2. Micrographs of metastatic lesion of 66 year-old male, showing an infiltration of viable skeletal muscle with lamellar nest of abnormal squamous cells with large bizarre nuclei. Haematoxylin-eosin, original magnification; ×200.

and rectus femoris), and 1 lesion occurred in the paravertebral musculature. The primary tumor location was identified in all cases. A pulmonary source was identified in 4 cases. In 3 of those 4 cases chest x-ray detected abnormal mass in the lung. A liver, esophagus, and kidney source was identified in 1 case each.

Images

The metastatic lesions were imaged by CT scan in 3 cases: all cases had well circumscribed margins and in all cases the lesions showed no calcification. In 2 of those 3 cases, the lesions were less intense than the muscles surrounding the lesions while in 1 case the intensity of the lesion was equal to those of muscles. Along with CT, the metastatic lesions were imaged by MRI in 6 cases: on T1-weighted images, the lesions showed lower signal intensity in 2 cases and in 4 cases the lesions were isosignal intensity compared with the muscles surrounding the lesion. On T2-weighted images, the lesions in all 6 cases had high signal intensity (Fig. 1). The lesions in all 6 cases showed high signal intensity on gadolinium-diethylene-triamine-pentacetic acid (Gd-DTPA) enhanced T1-weighted images. In 2 of 6 cases the lesion had a high signal ring-like intensity on Gd-DTPA-enhanced T1 weighted images [19].

Biopsy

As a primary diagnostic procedure, fine needle aspiration biopsy [5, 42] was performed in 2 patients and trocar biopsy [5] in 4 patients. Those two types of biopsy

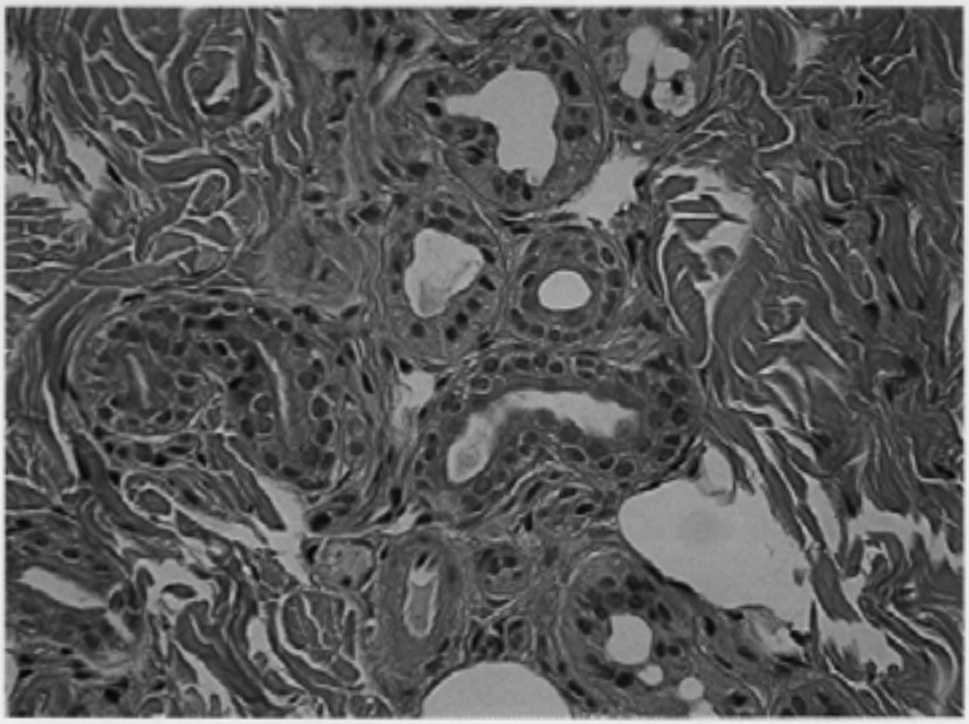

Fig. 3. Micrographs of metastatic lesion of 58 year-old male, showing an infiltration of viable skeletal muscle with nests of glandular neoplasm with a pleiomorphic cell population arranged in epithelial nests or in columns Haematoxylin-eosin, original magnification; ×200.

technique were efficient to differentiate carcinoma from sarcoma in all cases. Incisional biopsy [5] was performed in one patient because the lesion was deeply located.

Histologic diagnosis

There were 3 adenocarcinomas, 2 squamous cell carcinomas, 1 hepatocellular carcinoma, and 1 renal cell carcinoma. The histologic examination of the squamous cell carcinoma showed lamellar nest of abnormal squamous cells with large bizarre nuclei (Fig. 2). In the adenocarcinoma cases, the tissue showed infiltration of viable skeletal muscle with nests of glandular neoplasm with a pleiomorphic cell population arranged in epithelial nests or in columns (Fig. 3).

Treatments

Three patients had radiation therapy to the tumor followed by en-block excision. Four patients received radiotherapy to the metastatic lesion as their only treatment for local disease control.

Survival

Five patients have died of their disease. Survival duration from the diagnosis of skeletal muscle metastasis to the death ranged from 2 to 24 months (mean 8

months). Two patients were alive with their disease 4 and 6 months after the diagnosis of skeletal muscle metastasis.

CASE REPORT

A 66-year-old male noticed a right arm mass with motion-pain in September 1998. The lesion enlarged and pain increased progressively 2 months later. At the initial examination, a 70 mm × 70 mm elastic hard mass with mild tenderness was palpated on the anterior side of the right arm. MRI examination clearly revealed a lesion in the biceps brachii muscle. The signal intensity of the lesion was low on T1 weighted images, high on T2 weighted images, and showed enhancement after Gd-DTPA injection (Fig. 1). Histologic examination followed by a fine needle aspiration biopsy showed an infiltration of viable skeletal muscle with lamellar nests of abnormal squamous cells with large bizarre nuclei (Fig. 2). Keratinization was observed in some area on high-power views. The lesion was diagnosed as squamous cell carcinoma. A tumorous lesion was shown in the right lung on chest plain x-ray films. Cytological examination of sputum showed atypical cells with nuclear condensation and coarse granular chromatin. Muscle metastasis secondary to lung cancer was diagnosed. In spite of 30-Gy irradiation to the mediastinum and right arm lesion, the patient died of multi-organ failure 8 months after the initial examination.

DISCUSSION

Hematogenous limb skeletal muscle metastasis is extremely rare, even in autopsy studies. Willis [53] found skeletal muscle metastases in only 4 cases in the 500 autopsy cases of cancer patients. Although the reasons for its rarity are not well established, some factors that might account for the infrequency of skeletal muscle metastases have been postulated. First, skeletal muscles that are constantly used for movement might present a difficult site for the implantation and growth of metastatic cancer cells. During exercise, the capillaries dilate and the amount of blood flow to the skeletal muscle increases [41]. Blood turbulence may also play a role by destroying circulating tumor cells [15]. Second, there is a release of lactate into skeletal muscle creating an acidic environment, rendering metastatic cancer cell proliferation [40]. Third, lymphocytes and/or natural killer cells, which play a major role in the inhibition of tumor metastasis, may be active in skeletal muscle [15, 54]. In view of the large aggregate blood-supply to the entire musculature of the body, this paucity of metastatic tumors represents the unsuitability of muscular tissue as a soil for the growth of arrested tumor emboli.

The main symptom of our cases was the presence of a painful mass. This finding is consistent with that in other reports [10, 20]. This may be an important clue in arousing clinical suspicion of metastasis when compared with the more common soft tissue sarcoma, inasmuch as the latter typically presents as enlarging, painless soft tissue masses [5].

Intramuscular metastases frequently develop in the trunk musculature (including

paravertebral and iliopsoas) as well as lower leg muscles [1–4, 8, 10, 12, 13, 20, 21, 25, 28, 31, 33, 34, 37, 50]. There have been some papers inferring the influence of trauma in the development of intramuscular metastases [9, 16]. However, there was no history of trauma in our cases. Rather, large mass of the thigh, pelvic girdles, iliopsoas, and paravertebral muscles [20, 40] seems to attribute the high frequency of intramuscular metastases in the trunk and lower leg muscles.

As for the location of primary tumor which caused metastasis to skeletal muscle, the primary tumor was found in the lung in half of our cases (4/7). This finding is consistent with other reports: pulmonary source has been reported in 29 cases [1, 10, 14, 18, 19, 20, 26, 28, 31, 38, 42, 45], colorectal in 11 [3, 4, 6, 8, 10, 22, 23, 49], kidney in 8 [7, 12, 27, 30, 37] °C gastroenteric in 6 [2, 35, 36, 45], uterus in 2 [45, 48] °C prostate in 1 [51], bladder in 4 [10, 20, 25], skin (melanoma) in 4 [10, 20, 27], hypopharyngeal in 2 [10, 45], and thyroid [10], tongue [13], nasopharyngeal [13] and cranium [46] in 1 case each D. To search for the primary tumor location, special attention should be paid for the pulmonary lesion. In fact, plain chest x-ray detected abnormal mass in the lung in our 3 cases.

To complement the clinical assessment and provide further characterization of soft tissue tumors, CT and MRI have been commonly used [2, 5, 6, 10, 39, 47, 52]. CT provides an accurate means of evaluating and defining the extent of tumors in the skeletal muscle and their relationship to adjacent bones, fascial planes, vessels, and fat [5, 6, 39]. In CT of metastases to skeletal muscle from adenocarcinoma of the colon, Caskey et al. [6] reported a decreased attenuation and calcifications. Schultz et al. [39] pointed that the CT findings consisted of muscle enlargement with the masses containing low density and loss of normal fat and vascular planes. In our 3 CT scans, the tumor with well circumscribed margins could be differentiated from surrounding skeletal muscles. However, the intensity of the tumor varied and no specific findings of metastatic tumors were observed. MRI also detected metastatic lesions in skeletal muscle, where the lesion in our cases showed low or iso signal intensity on T1-weighed sequences and high signal intensity on T2-weighed sequences [2, 47, 52]. In all 6 cases, the lesion showed high signal intensity on Gd-DTPA enhancement, in 2 of them the lesion had a high signal ring-like enhancement. We believe Gd-DTPA enhanced MRI would be useful for estimating the tumor size as well as its location as the enhancement allowed clear differentiation between the metastatic lesion and the surrounding skeletal muscle. However, again, it was impossible to differentiate the intramuscular metastasis and primary soft-tissue sarcoma.

Therefore, for the differential diagnosis, we carried out examinations using a biopsy. Several methods of biopsy have been reported for possible malignant soft tissue tumor, including trocar biopsy, incisional biopsy, and fine needle aspiration biopsy [5, 42]. Fine needle aspiration biopsy is the least traumatic and least likely to contaminate tissue planes [5, 42]. Trocar biopsy can obtain cores of tissue of 3–6 mm of diameter, which can be embedded and sectioned for histology. The incidence of false negative is low [5]. In 6 cases we carried out either fine needle aspiration or trocar biopsies and could differentiate carcinoma from sarcoma in each case. We believe that the fine nee-

dle biopsy or trocar biopsy is efficient for the differential diagnosis of carcinoma from sarcoma in most cases. Difficult histologic diagnosis may include the differentiation of adenocarcinoma and malignant hemangioendthelioma [24], undifferentiated carcinoma and malignant hemangiopericytoma [32], spindle cell carcinoma and epithelioid sarcoma [29], or pleomorphic carcinoma and malignant fibrous histiocytoma [17].

The treatment options of skeletal muscle metastaisis may include radiotherapy [10, 11, 19, 42], chemotherapy [11, 45], interferon [27], high-energy underwater shock wave [21] and surgical excision [11, 19, 51]. For the painful mass in the context of widespread metastatic disease, a total tumor dose of 3600 to 4200 cGy of radiation in fractions of 300 cGy, 5 days a week, is recommended in palliation of swelling and pain [42]. Surgical excision may be indicated for carefully selected, isolated soft tissue metastases particularly after a long disease-free interval [11, 19, 44]. Success in eliminating disease and providing extended survival has been reported anecdotally after excision of solitary soft tissue masses of renal cancer [44]. However, such factors of the primary tumor, other organs involved, extent of involvement, symptoms attributable to the various sites, and patient's overall health should affect the prognosis.

In 30 patients reported by Damron [10], 80% (24/30) died no longer than 12 months after diagnosis of skeletal metastases. The prognosis of our cases was also poor: mean survival duration from the diagnosis of skeletal muscle metastasis to the death was only 8 months. This poor prognosis associated with skeletal muscle metastasis may attribute the fact that skeletal muscle metastasis generally occur as a results of systemic spread.

In conclusion, we describe 7 cases with metastatic cancer to the skeletal muscle, illustrating the clinical, radiographic, and histologic features. The unusual site of metastasis was visualized by CT and/or MRI. We could differentiate metastatic carcinoma from primary sarcoma using either fine needle aspiration or trocar biopsy. Five patients died in 2 to 24 months with the average of 8 months after initial examination.

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