

RESEARCH ARTICLE

Tumors Involving Skin, Soft Tissue and Skeletal Muscle: Benign, Primary Malignant or Metastatic?

Chi-Ying Hsieh^{1&*}, Huang-Wen Tsai^{2&}, Chih-Chun Chang^{3*}, Tsuo-Wu Lin¹, Ke-Chung Chang¹, Yo-Shen Chen¹

Abstract

Background: Metastatic cancer with invasion of skin, soft tissue and skeletal muscle is not common. Examples presenting as soft tissue masses could sometimes lead to misdiagnosis with delayed or inappropriate management. The purpose of current study was to investigate clinical characteristics in the involvement of metastatic cancer. **Materials and Methods:** A total of 1,097 patients complaining of skin or soft tissue masses and/or lesions were retrospectively reviewed from January 2012 to June 2013. Tumors involving skin, soft tissue and skeletal muscle of head and neck, chest wall, abdominal wall, pelvic region, back, upper and lower extremities were included in the study. **Results:** Fifty-seven (5.2%) patients were recognized as having malignancies on histopathological examination. The most common involvement of malignancy was basal cell carcinoma, followed by cutaneous squamous cell carcinoma, sarcoma and melanoma. The most common anatomical location in skin and soft tissue malignancies was head and neck (52.6% of the malignancies). Four (0.36%) of the malignant group were identified as metastatic cancer with the primary cancer source from lung, liver and tonsil and the most common site was upper extremities. One of them unexpectedly expired during the operation of metastatic tumor excision at the scalp. **Conclusions:** Discrimination between benign and malignant soft tissue tumors is crucial. Performance of imaging study could assist in the differential diagnosis and the pre-operative risk evaluation of metastatic tumors involving skin, soft tissue and skeletal muscle.

Keywords: Skeletal muscle tumor - skin tumor - soft tissue metastasis - subcutaneous tumor

Asian Pac J Cancer Prev, 16 (15), 6681-6684

Introduction

Metastatic cancer with the invasion of skin, soft tissue and skeletal muscle had been rarely reported before. It was also an extremely rare condition in which metastatic cancer mimicking benign soft tissue masses clinically and hence could lead to diagnostic confusion for clinicians (Molina-Garrido et al., 2011). However, it was not infrequent for metastatic cancer presenting as benign soft tissue tumors (Plaza et al., 2008). Because of the remarkable difference of treatment and outcome, it was important to distinguish the metastatic soft tissue cancer from benign soft tissue tumors (Luba et al., 2003) and even primary malignancies involved with skin, soft tissue and skeletal muscle (Molina-Garrido et al., 2011; Uysal-Sonmez et al., 2013). Although a large quantity of single case reports were available (Hasegawa et al., 2000; Khaw et al., 2001; Nava et al., 2009; Lohiya et al., 2013; Kaur et al., 2014), there were limited systemic studies in regard to the clinical characteristics of metastatic cancer in skin, soft tissue and skeletal muscle.

Here, we conducted a retrospective investigation of the prevalence and characteristics of tumors involved with

skin, soft tissue and skeletal muscle. Our study was aimed to describe the clinicopathological feature of primary and metastatic cancers invading skin, soft tissue and skeletal muscle in the Taiwanese population.

Materials and Methods

A total of 1,097 patients complaining of skin, soft tissue masses and/or lesions visited the outpatient clinic of plastic surgery at Far Eastern Memorial Hospital, New Taipei, Taiwan, from January 2012 to June 2013. The clinical data were retrospectively reviewed and the information including initial presenting symptoms, anatomical site of the soft tissue tumor, histopathological report of the soft tissue tumor and primary cancer, treatment and outcome were collected. Individuals would be excluded if there was unavailable for biopsy-proven and well-documented reports. The skin or soft tissue tumors were categorized into benign and malignant groups according to the histopathological examination. The benign groups were further classified as epidermal cyst/ epidermoid cyst, ganglion cyst, hemangioma/ glomus tumor, fibroma/ dermatofibroma, keloid, lipoma, neuroma/ neurofibroma/

¹Division of Plastic and Reconstructive Surgery in the Institution, ²Division of General Surgery, Department of Surgery, ³Department of Clinical Pathology, Far Eastern Memorial Hospital, New Taipei City, Taiwan [&]Equal contributors *For correspondence: hchiwen@hotmail.com

Table 1. The Clinical Characteristics of Patients with Metastatic Cancers Involving the Skin and Soft Tissue

Patient No.	Age (years) and gender	Duration (Months)* of	First detection of cancer	Primary cancer			Soft tissue metastasis			Outcome
				Site	Pathology	Treatment	Site	Size (cm3)	Treatment	
1	84/F	0	Metastatic	Liver	HCC	None	Scalp	4x3x1	Excision	Expire
2	56/M	4	Primary	Lung	SCC	Chemo and RT	Thumb	4x3x3	Amputation	Alive
3	55/F	1	Metastatic	Lung	Adeno	Resection	Axilla	8x5x3	Excision	Alive
4	67/M	21	Primary	Tonsil	SCC	Resection and CCRT	Forearm	6x3x2	Excision	Alive

*Duration between primary tumor resection and the detection of metastasis; HCC, hepatocellular carcinoma, SCC, squamous cell carcinoma; Adeno, adenocarcinoma; Chemo, systemic chemotherapy; RT, radiation therapy; CCRT, concurrent chemoradiotherapy.

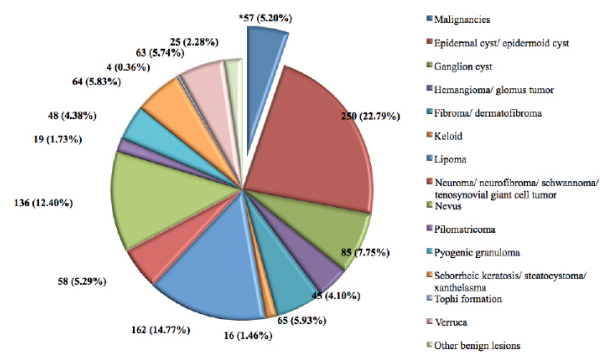


Figure 1. The Distribution of Skin, Soft Tissue and Skeletal Muscle Tumors on The Basis of Histopathological Examination.* The malignancies involved with the skin and soft tissue

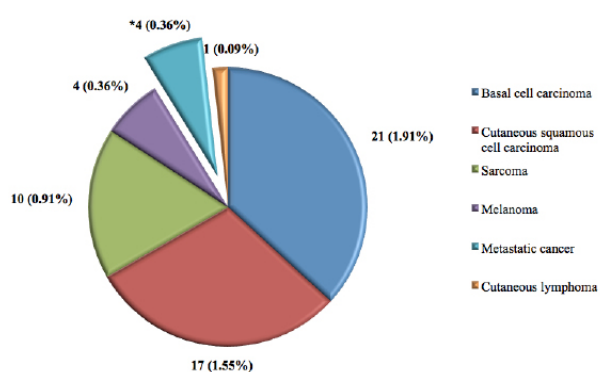


Figure 2. The Distribution of Malignancies Skin, Soft Tissue and Skeletal Muscle on the Basis of Histopathological Examination.* The metastatic cancer invading the skin and soft tissue

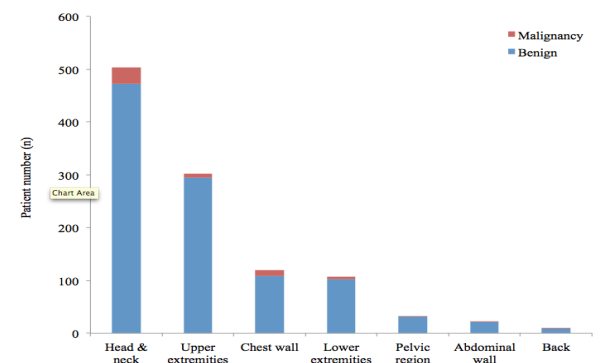


Figure 3. The Distribution of Anatomical Location of Skin, Soft Tissue and Skeletal Muscle Tumors on the Basis of Histopathological Examination

schwannoma/ tenosynovial giant cell tumor, nevus, pilomatricoma, pyogenic granuloma, seborrheic keratosis/steatocystoma/ xanthelasma, tophi formation, verruca and other benign lesions. On the contrary, the malignant groups were classified into basal cell carcinoma, cutaneous squamous cell carcinoma, sarcoma, melanoma, cutaneous lymphoma and metastatic cancers. The anatomical location of cutaneous or subcutaneous soft tissue tumor was categorized into head and neck, chest wall, abdominal wall, pelvic region, back, upper and lower extremities.

For statistical analysis, data were expressed as the mean±standard error or number with percentage. The statistical software used for all analyses was SPSS (version 15.0; SPSS Inc., Chicago, USA).

Results

Among the 1,097 patients with skin, soft tissue tumors, 57 (5.20%) had malignancies involved with skin and soft tissues on the basis of histopathological examination (Figure 1). The most common benign soft tissue tumor was the epidermal cyst/ epidermoid cyst (250 cases, 22.8%), followed by lipoma (162 cases, 14.8%) and nevus (136 cases, 12.4%). There were also ganglion cyst (85 cases, 7.75%), fibroma/ dermatofibroma (65 cases, 5.9%), seborrheic keratosis/ steatocystoma/ xanthelasma (64, 5.8%), verruca (63 cases, 5.74%), neuroma/ neurofibroma/ schwannoma/ tenosynovial giant cell tumor (48 cases, 4.38%), pyogenic granuloma (48 cases, 4.38%), hemangioma/ glomus tumor (45 cases, 4.10%), pilomatricoma (19 cases, 1.73%), keloid (16 cases, 1.46%), tophi formation (4 cases, 0.36%) and other benign lesions (25 cases, 2.28%) identified. Among the malignancies involved with skin and soft tissues, the most common was basal cell carcinoma (21 cases, 1.91%), followed by cutaneous squamous cell carcinoma (17 cases, 1.55%), sarcoma (10 cases, 0.91%), melanoma (4 cases, 0.36%), metastatic cancers (4 cases, 0.36%) and cutaneous lymphoma (1 case, 0.09%) (Figure 2). The most common distribution of anatomical site was head and neck (30 cases, 52.6% of the malignancy), followed by lower extremities (11 cases, 19.3% of the malignancy), upper extremities (7 cases, 12.3% of the malignancy) and back (5 cases, 8.77% of the malignancy) (Figure 3). The malignancies in skin, soft tissue and skeletal muscle invading chest wall, abdominal

wall and pelvic region were not common.

The clinical characteristics of patients with metastatic cancers involved with skin and soft tissues were summarized in Table 1. The age of these four patients (two male, two female) ranged from 55 to 84 years. The duration between primary tumor resection and the detection of metastasis ranged from 0 to 21 months. Two were found the primary cancer first and the other two were noticed the metastatic cancer initially. There were hepatocellular carcinoma (No.2), lung squamous cell carcinoma (No.2), lung adenocarcinoma (No.3) and tonsillar squamous cell carcinoma (No.4) proven by pathological examination as the primary malignancies. Additionally, most cases with involvement of metastatic tumor were located at upper extremities (No.2, 3, 4) and one was located at the scalp (No.1). The size of metastatic tumor ranged from 4x3x1 to 8x5x3 cm³. All metastatic cancers in these 4 patients underwent tumor excision. However, one (No.1) unfortunately expired according to the unexpected hemorrhagic shock with difficulty of ceasing tumor bleeding and cardiac arrest occurred despite the performance of cardiopulmonary-cerebral resuscitation during operation for the metastatic cancer on the scalp. Most of the patients received appropriate management with well recovery after surgical intervention and follow-up at outpatient clinic regularly.

Discussion

Our main findings included that prevalence of metastatic tumor invading soft tissues and skeletal muscle was 0.36% in overall skin, soft tissue and skeletal muscle tumors and the most common site of involvement was the upper extremities. The primary source of malignancies originated from lung, liver and tonsil. One of the four cases with metastatic tumor involved with the scalp unfortunately expired during the operation of scalp tumor excision. Hemorrhagic shock with difficulty of ceasing tumor bleeding should be responsible for the death.

As previously reported, malignancies in lung and gastrointestinal tract were the primary cancer that most frequently metastasize to skin, soft tissues (Koike et al., 2005; Haygood et al., 2012). Besides, a recent study indicated that skeletal muscle metastasis occurred most commonly in patients with carcinoma of the ovary, cervix and uterus (0.29%), followed by gastrointestinal (0.25%) and urological tumors (0.19%) (Surov A et al., 2010). Meanwhile, the prevalence of metastatic tumor invading skin, soft tissues and skeletal muscle in patients with colorectal cancer was reported to be 0.03% (Hasegawa et al., 2000). Additionally, the prevalence of metastatic tumor invading skin, soft tissue and skeletal muscle ranged from 0.4 to 3.4% in patients with renal cell carcinoma (Nabeyama et al., 2001). One recent study also indicated that prevalence of metastatic tumor involved with skeletal muscle in patients with metastasized solid malignant tumors was 1.18% (Surov et al., 2010). In contrast, it was reported that skin metastasis encountered in 0.7 to 9% of cancerous patients (Hussein et al., 2010). These results were somehow different from our epidemiological data, and the phenomenon could be explained by the different

clinical perspectives of metastatic cancer involved with skin, soft tissue and skeletal muscle. In comparison with the previous analyses, our results were analyzed in light of overall skin, soft tissue and skeletal muscle tumors, including benign, primary malignant and metastatic cancers.

There was accumulating evidence revealing that incidence of skin cancer varied in different ethnic backgrounds (Capell et al., 2009; Lin et al., 2011). Among these malignancies, basal cell carcinoma was known as the most frequent type of skin cancer (Rajabpour FV et al., 2014). The following malignancies in skin were cutaneous squamous cell carcinoma and melanoma. The distributive trend of frequency was similar to our results.

For the risk evaluation of excising tumor involved with skin, soft tissue and skeletal muscle, pre-operative image examination was suggested especially in high suspicion of metastatic cancer or lesions located nearby around the vital organs. The computed tomography (CT) scan was able to clearly discriminate the lesions with abnormal density from subcutaneous fat and soft tissue. On the contrary, positron emission tomography (PET) was sensitive in detection of metastatic lesion of skeletal muscle, according to its performance of metabolic imaging. Magnetic resonance imaging (MRI) was also sensitive in detection of malignant soft tissue masses, but not specific for the involvement of metastatic tumor. It was reported that detection rate of both subcutaneous and skeletal muscle metastases using PET/CT was significantly sensitive in comparison with that of PET or CT alone (Qiu DS et al., 2014). Therefore, pre-operative image investigation was indispensable for the differential diagnosis of in metastatic tumor involved with skin, soft tissue and skeletal muscle.

In summary, although it was not common in metastatic cancer involved with skin, soft tissue and skeletal muscle, it was crucial for the discrimination between benign and malignant soft tissue tumors. It was estimated that 0.36% of patients complaining of skin, soft tissue tumor had metastatic cancer in our study. Performance of imaging study could help in the differential diagnosis and the pre-operative risk evaluation of metastatic tumor involvement with skin, soft tissue and skeletal muscle.

References

- Capell BC, Tlougan BE, Or low SJ (2009). From the rarest to the most common: insights from progeroid syndromes into skin cancer and aging. *J Invest Dermatol*, **129**, 2340-50.
- Hasegawa S, Sakurai Y, Imazu H, et al (2000). Metastasis to the forearm skeletal muscle from an adenocarcinoma of the colon: report of a case. *Surg Today*, **30**, 1118-23.
- Haygood TM, Wong J, Lin JC, et al (2012). Skeletal muscle metastases: a three-part study of a not-so-rare entity. *Skeletal Radiol*, **41**, 899-909.
- Hussein MR (2010). Skin metastasis: a pathologist's perspective. *J Cutan Pathol*, **37**, 1-20.
- Kaur R, Kwatra KS, Masih K, Calton N. (2014). Metastatic squamous cell carcinoma of the lung masquerading as a soft tissue tumor. *J Cytol*, **31**, 117-8.
- Khaw P, Ball D, Duchesne G (2001). Carcinoid tumor of the orbital muscle: a rare occurrence. *Australas Radiol*, **45**, 179-81.

- Koike Y, Hatori M, Kokubun S (2005). Skeletal muscle metastasis secondary to cancer - a report of seven cases. *Ups J Med Sci*, **110**, 75-83.
- Lin JS, Eder M, Weinmann S (2011). Behavioral counseling to prevent skin cancer: a systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med*, **154**, 190-201.
- Lohiya V, Lohiya S, Windsor K (2013). A large thigh mass: a blood clot or a rare skeletal muscle metastasis from renal cell carcinoma. *Springerplus*, **2**, 399.
- Luba MC, Bangs SA, Mohler AM, et al (2003). Common benign skin tumors. *Am Fam Physician*, **67**, 729-38.
- Molina-Garrido MJ, Guillén-Ponce C (2011). Muscle metastasis of carcinoma. *Clin Transl Oncol*, **13**, 98-101.
- Nabeyama R, Tanaka K, Matsuda S, Iwamoto Y (2001). Multiple intramuscular metastases 15 years after radical nephrectomy in a patient with stage IV renal cell carcinoma. *J Orthop Sci*, **6**, 189-92.
- Nava G, Greer K, Patterson J, Lin KY. (2009). Metastatic cutaneous breast carcinoma: A case report and review of the literature. *Can J Plast Surg*, **17**, 25-7.
- Plaza JA, Perez-Montiel D, Mayerson J, et al (2008). Metastases to soft tissue: a review of 118 cases over a 30-year period. *Cancer*, **112**, 193-203.
- Qiu DS, Xu LY, Shames S (2014). The value of 18F-fluorodeoxyglucose positron emission tomography combined with computed tomography in the detection and characterization of soft tissue metastasis. *Mol Clin Oncol*, **2**, 761-6.
- Rajabpour FV, Raoofian R, Youssefian L, et al (2014). BMI1 and TWIST1 Downregulated mRNA Expression in Basal Cell Carcinoma. *Asian Pac J Cancer Prev*, **15**, 3797-800.
- Surov A, Hainz M, Holzhausen HJ, et al (2010). Skeletal muscle metastases: primary tumours, prevalence, and radiological features. *Eur Radiol*, **20**, 649-58.
- Uysal-Sonmez O, Tanriverdi O, Esbah O, et al (2013). Multicenter evaluation of patients with cutaneous malignant melanoma in Turkey: MELAS study. *Asian Pac J Cancer Prev*, **14**, 533-7.