

Case Report

Synovial sarcoma of the neck masquerading as a malignant second branchial cleft cyst

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Abstract: Synovial sarcoma is an uncommon, aggressive malignant tumor of the soft tissues primarily involving the extremities of young adults. Head and neck synovial sarcoma is rare, and its diagnosis and therapy are still challenging. We report a case of a young patient with synovial sarcoma, clinically masquerading as cystic mass of the neck and malignant second branchial cleft cyst. The pathological diagnosis of the sarcoma was confirmed by a multimodality diagnostic protocol, including histological, immunohistochemical and molecular genetic analysis. The patient underwent complete surgical excision followed by postoperative radiotherapy and recovered well.

Keywords: Synovial sarcoma, head and neck, branchial cleft cyst, molecular genetic testing

Introduction

Synovial sarcoma is a rare, malignant mesenchymal neoplasm that accounts for approximately 8% of all soft tissue sarcomas. It can occur at any site and age but primarily arises in the para-articular areas of the lower extremities of young adults, especially around the knee and ankle [1, 2]. Since the first case of head and neck synovial sarcoma reported by Jernstrom in 1954, only 3% to 5% of all cases were found in the head and neck region. In this region, the hypopharynx is the most common site [3]. Owing to rarity, non-specific imaging appearance and complex histological features of synovial sarcoma, its diagnosis is challenging both clinically and pathologically. This tumor may occasionally appear as a well-defined, cystic mass associated with intralesional necrosis or hemorrhage. Such changes have been observed in patients with neck synovial sarcomas [4, 5]. Once synovial sarcoma of the neck develops cystic degeneration, it could be easily confused with the common cystic diseases of the neck such as thyroglossal duct cyst and branchial cleft cyst. Here, we present a synovial

Here, we present a case of a 21-year-old male with a cystic lesion of the left-sided neck, clinically masquerading as a malignant second

branchial cleft cyst. With the assistance of histological, immunohistochemical and molecular genetic analysis, the diagnosis of synovial sarcoma was confirmed. We further discuss clinical manifestation, therapeutic options, and prognosis of the disease.

Case report

The present study was approved by the Institutional Review Board of Second Affiliated Hospital, School of Medicine, Zhejiang University. A 21-year-old male was admitted to our ENT department with a 2-month history of a painless, progressively enlarging mass in the left side of the neck. There were no symptoms of fever, hoarseness, pharyngalgia, dysphagia or dyspnea. Physical examination revealed a large (6 × 4 cm), elastic, mobile and well-defined mass, which was located on the anterior border and inner side of the middle sternocleidomastoid muscle and did not move up and down with deglutition (**Figure 1A**). The skin of the head and neck region was intact. On laryngoscopic examination, the pharyngeal and laryngeal mucous membranes were intact and bilateral vocal cords were normally mobile. A contrast-enhanced computed tomography (CT) scan of the neck showed a 6.0 × 3.4 cm, well-circum-

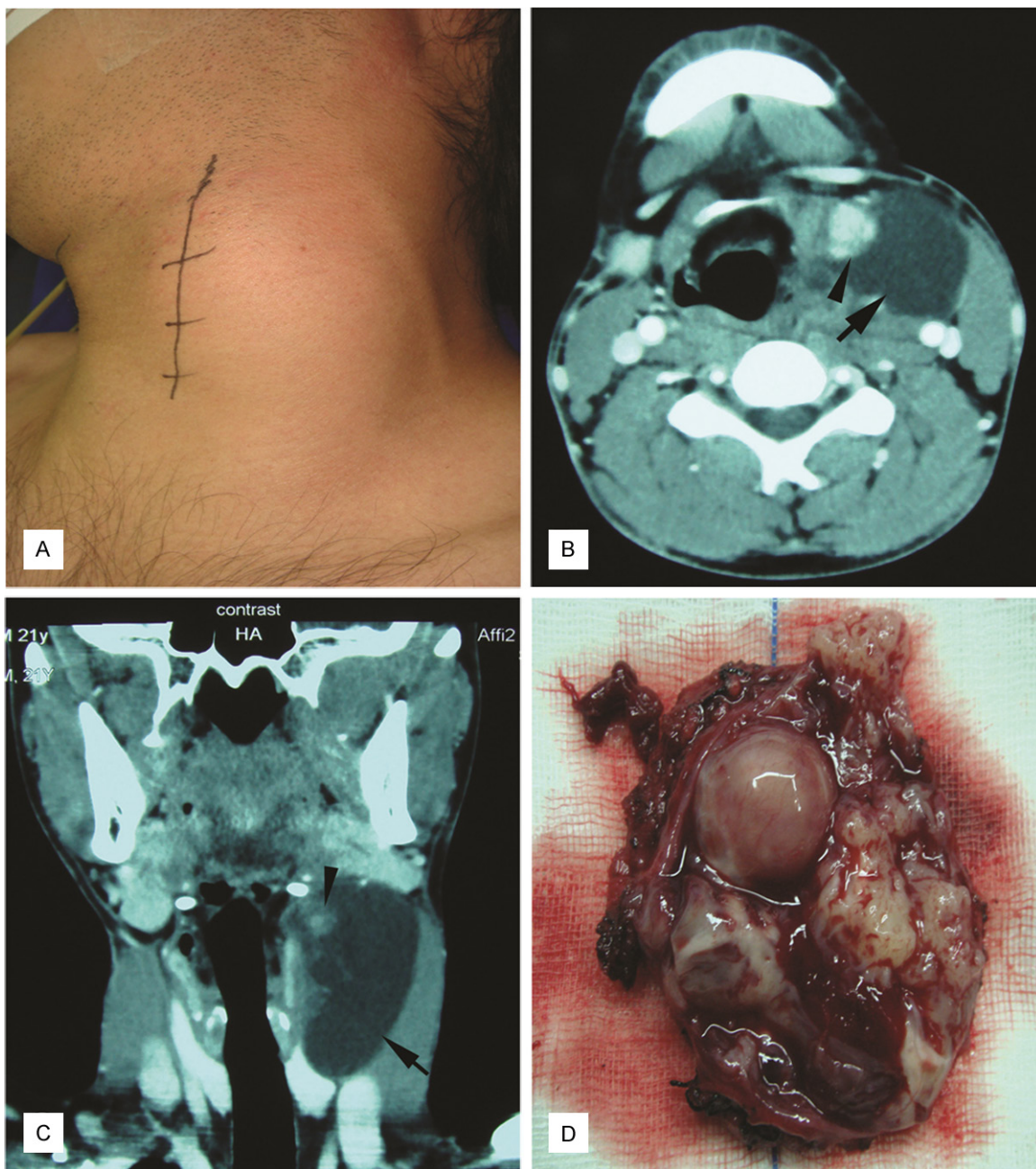


Figure 1. A: A large, mobile and palpable mass is located in the left-sided neck. The black line indicates the surface projection of the anterior border of the left sternocleidomastoid muscle. B and C: Axial and coronal contrast-enhanced CT scan images of the neck show a well-circumscribed, predominantly cystic mass (arrow) in the deep and anterior areas of the left sternocleidomastoid muscle, with a grossly enhancing solid component (arrowhead) in this mass. D: Cross-section of the surgical specimen displays some mural nodules and a large amount of thick bloodstained fluid within the mass.

scribed, predominantly cystic mass in the deep and anterior areas of the left sternocleidomastoid muscle. There was a grossly enhancing solid component within this mass. Adjacent vascular structures and cervical lymph nodes were not involved (**Figure 1B** and **1C**). Based on

the above observations, this case was highly suspected to be a malignant second branchial cleft cyst.

Under general anesthesia, a neck exploration was performed through an incision on the ante-

Synovial sarcoma of the neck

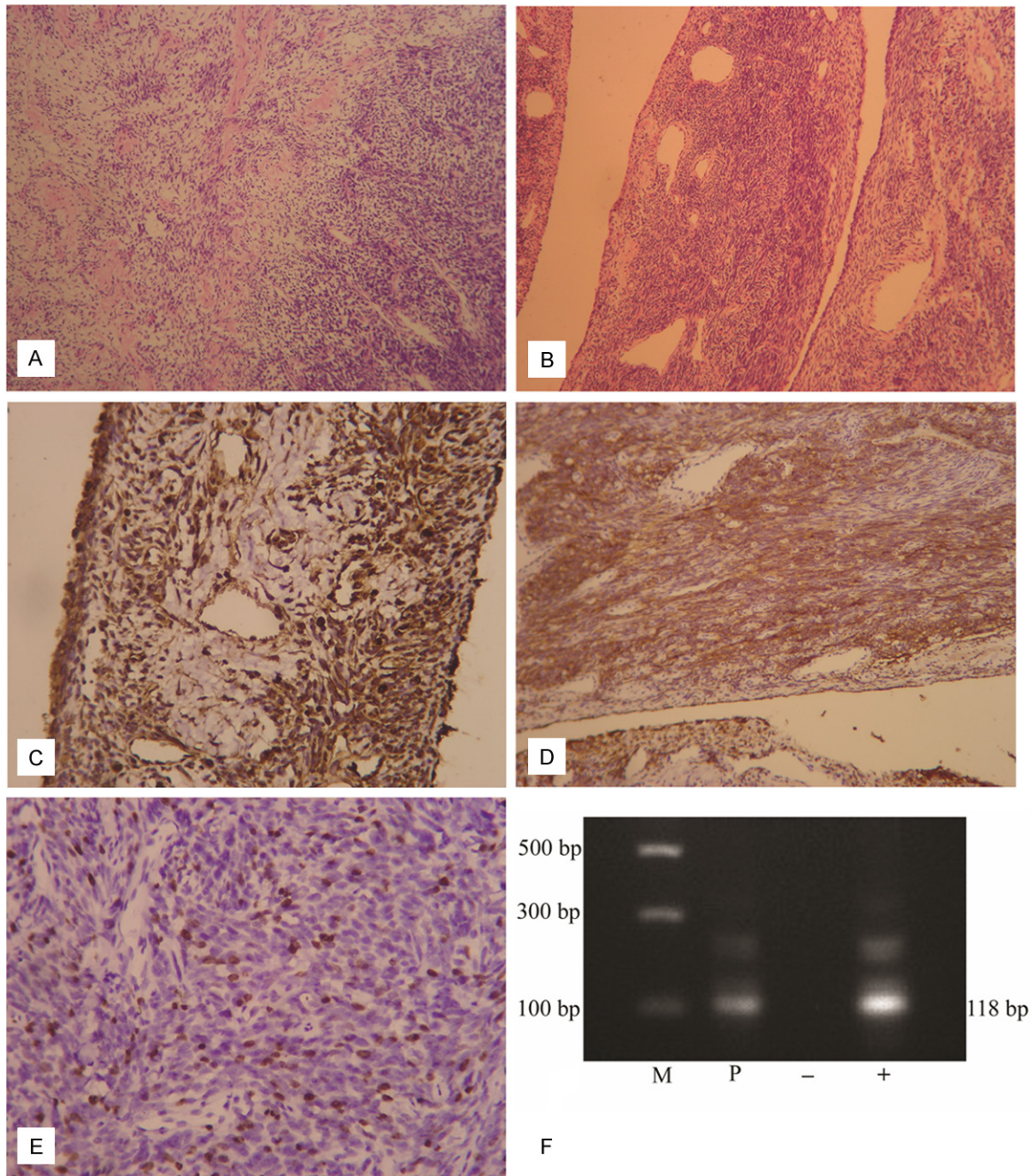


Figure 2. A-E: Microscopically, the tumor was composed of abundant spindle cells that were arranged either loosely or densely in the collagenized areas (A). Some cleft-like structures are identified (B). Immunohistochemical staining shows that the tumor cells are positive for vimentin (C) and EMA (D), and Ki-67 proliferation rate was approximately 30% (E) (A and B: hematoxylin-eosin, $\times 100$; C and E: $\times 200$; D: $\times 100$). F: The SYT-SSX1 fusion transcript is detected by RT-PCR. The size of the amplified fragment is 118bp (M, marker; P, patient; -, negative control; +, positive control).

rior border of the left sternocleidomastoid muscle. There was a relatively clear boundary between the mass and adjacent tissues. The lesion was completely removed en bloc. Grossly, the mass was multilobulated and well-encapsulated. On cross-section, there were

some mural nodules and a large cystic cavity filled with thick bloodstained fluid (**Figure 1D**). The histological examination of the surgical specimen demonstrated that the mass is a cystic tumor composed of abundant spindle cells with moderate nuclear pleomorphism and fre-

quent mitoses. The spindle cells in the clusters formed various cellular fascicles, which were arranged either loosely or densely in the collagenized areas (**Figure 2A**). Some cleft-like structures were identified in the tumor, but calcification was absent (**Figure 2B**). The surgical margins of resection were all negative.

Immunohistochemical staining revealed that the tumor cells were immunoreactive to vimentin, epithelial membrane antigen (EMA), CD99, CD56 and Collagen IV (**Figure 2C** and **2D**), whereas staining for S-100, CD34, Actin (SM) or Desmin was negative. Ki-67 proliferation rate was approximately 30% (**Figure 2E**). The SYT-SSX1 fusion transcript was detected by molecular genetic analysis using reverse transcription-polymerase chain reaction (RT-PCR) (**Figure 2F**). On the basis of the histological, immunohistochemical and RT-PCR findings, the pathological diagnosis of synovial sarcoma of the left-sided neck was confirmed. The patient received local radiotherapy (a total dose of 60 Gy) 1 month after the operation. Since the tumor was completely excised with negative margins in pathological examination, adjuvant systemic chemotherapy was not prescribed. During the 5-year follow-up period, the patient recovered well with no evidence of local recurrence or distant metastasis.

Discussion

Synovial sarcomas frequently affect the lower extremities of adults from the second to fourth decades of life [4]. A male/female ratio of this disease varies from 1.2:1 to 2.4:1 [6]. The histogenesis of synovial sarcomas remains unknown. However, it is generally believed that synovial sarcomas do not arise from cells in the synovial tissue, but rather from pluripotent mesenchymal stem cells capable of epithelial or mesenchymal differentiation [2]. Synovial sarcoma is extremely rare in the head and neck where the most commonly involved site is the hypopharynx. Other sites reported in the literatures include the parapharyngeal space, retropharyngeal space, larynx, masticator space, parotid gland, sinonasal cavity and thyroid gland [3, 7, 8].

Neck synovial sarcomas usually present as a slowly growing mass. Most patients do not display any early symptoms. However, when tumors compress or infiltrate into adjacent

structures, patients may complain of some non-specific symptoms, including pain, hoarseness, dysphagia and dyspnea. Imaging studies with CT and MRI are valuable in identifying the extent and location of synovial sarcoma of the head and neck. Images of these studies may show well-demarcated masses with smooth margins and homogenous or heterogeneous enhancement, and sometimes a cystic mass because of intralesional hemorrhage or necrosis of the tumors. Hence, synovial sarcoma, to some extent, is radiologically similar to benign lesions or other malignant neoplasms such as schwannoma, thyroglossal duct cyst, branchial cleft cyst and cystic cervical metastases [9]. In the present case, the patient was initially incorrectly diagnosed as malignant second branchial cleft cyst due to similar clinical features.

In monophasic or poorly differentiated synovial sarcomas, it could be difficult to use histological examination to establish the diagnosis. Immunohistochemical staining can be used to distinguish synovial sarcoma from other sarcomas such as fibrosarcoma, malignant peripheral nerve sheath tumor, hemangiopericytoma, and leiomyosarcoma [4]. Importantly, a characteristic chromosomal translocation $t(X;18)(p11.2;q11.2)$ is observed in 90% of head and neck synovial sarcomas that results in the presence of a SYT-SSX1, SYT-SSX2 or rarely SYT-SSX4 fusion gene transcript that can be used as the specific marker of synovial sarcomas. This marker can be easily detected by molecular genetic analysis using RT-PCR or fluorescence in situ hybridization (FISH) [10-12]. Therefore, this molecular analysis is especially valuable as a definitive diagnostic tool for synovial sarcoma, especially when histological and immunohistochemical findings are equivocal. In our case, despite the clinical features of the tumor were non-specific, the findings from histological, immunohistochemical and molecular genetic analyses were supportive of the diagnosis of primary synovial sarcoma.

Currently, information on the treatment for head and neck synovial sarcoma is limited, and there is no ideal and standard therapeutic strategy. It has been reported that a local recurrence rate is up to 80% after incomplete surgical excision without adjuvant radiotherapy [13]. A wide excision combined with postoperative radiotherapy is traditionally recommended to decrease the risk of local recurrence. Systemic

adjuvant chemotherapy remains debatable, but it may play important roles in preventing or postponing the occurrence of distant metastases, especially in high-risk patients with tumors > 5 cm in size or with positive surgical margins [14]. Due to the complex and vital anatomical structures in the head and neck region, a wide surgical excision is unlikely to perform without sacrificing to nearby structures. Thus, postoperative adjuvant chemoradiotherapy seems to be of more importance for synovial sarcoma of the head and neck than tumors in other locations. The synovial sarcoma in the current case appeared big, with the maximum diameter larger than 5 cm, but there was a large cystic cavity within the tumor. The tumor was excised completely using a wide local excision, leaving malignant negative margins. Thus, chemotherapy was not prescribed. Given the fact that neck lymph node metastases are observed in only 10% to 20% of patients with head and neck synovial sarcomas, prophylactic neck dissection is considered to be unnecessary [15]. Nevertheless, neck dissection is required for the node-positive neck. At 5 years follow up, the patient was alive and well without local tumor recurrence or distant metastasis.

Because of high local recurrence and distant metastases, patients with synovial sarcoma usually have poor long-time survival and prognosis. Combined modality therapy can provide relatively good outcomes. Nevertheless, the 5-year survival rate of head and neck synovial sarcoma has been reported to be 25-55% only [16]. In an effort to research the prognostic factors in synovial sarcoma, it has been found that favorable prognosis of head and neck synovial sarcoma may be associated with the following factors: young age, primary tumor size < 5 cm, intralesional calcification, low Ki-67 proliferation rate, SYT-SSX2 fusion transcript, and combined modality therapy [14].

In conclusion, although being rare, synovial sarcoma should be considered in the differential diagnosis of cystic lesions in the head and neck region. Multimodality diagnostic and therapeutic protocols are very essential for establishing a definitive diagnosis and achieving successful treatment of head and neck synovial sarcoma.

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Disclosure of conflict of interest

None.

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References

- [1] Nakahira M, Sugawara M and Morita K. Monophasic synovial sarcoma of the nasopharynx. *Auris Nasus Larynx* 2013; 40: 413-416.
- [2] Ferrari A, Bisogno G, Alaggio R, Cecchetto G, Collini P, Rosolen A, Meazza C, Indolfi P, Garaventa A, De Sio L, D'Angelo P, Tamaro P, Casanova M and Carli M. Synovial sarcoma of children and adolescents: the prognostic role of axial sites. *Eur J Cancer* 2008; 44: 1202-1209.
- [3] Soria-Céspedes D, Galvan-Linares AI, Oros-Ovalle C, Gaitan-Gaona F and Ortiz-Hidalgo C. Primary Monophasic Synovial Sarcoma of the Tonsil: Immunohistochemical and Molecular Study of a Case and Review of the Literature. *Head Neck Pathol* 2013; [Epub ahead of print].
- [4] Alberty J and Dockhorn-Dworniczak B. Monophasic synovial sarcoma of the neck in an 8-year-old girl resembling a thyroglossal duct cyst. *Int J Pediatr Otorhinolaryngol* 2002; 63: 61-65.
- [5] Morrison C, Wakely PE Jr, Ashman CJ, Lemley D and Theil K. Cystic synovial sarcoma. *Ann Diagn Pathol* 2001; 5: 48-56.
- [6] Meer S, Coleman H and Altini M. Oral synovial sarcoma: a report of 2 cases and a review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003; 96: 306-315.
- [7] Rigante M, Visocchi M, Petrone G, Mule A and Bussu F. Synovial sarcoma of the parotid gland: a case report and review of the literature. *Acta Otorhinolaryngol Ital* 2011; 31: 43-46.
- [8] Jang KS, Min KW, Jang SH, Paik SS, Tae K, Jang SJ and Park MH. Primary synovial sarcoma of the thyroid gland. *J Korean Med Sci* 2007; 22 Suppl: S154-158.
- [9] Rangheard AS, Vanel D, Viala J, Schwaab G, Casiraghi O and Sigal R. Synovial sarcomas of the head and neck: CT and MR imaging find-

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- ings of eight patients. *AJNR Am J Neuroradiol* 2001; 22: 851-857.
- [10] Sturgis EM and Potter BO. Sarcomas of the head and neck region. *Curr Opin Oncol* 2003; 15: 239-252.
 - [11] Geurts van Kessel A, de Bruijn D, Hermesen L, Janssen I, dos Santos NR, Willems R, Makkus L, Schreuder H and Veth R. Masked t(X;18) (p11;q11) in a biphasic synovial sarcoma revealed by FISH and RT-PCR. *Genes Chromosomes Cancer* 1998; 23: 198-201.
 - [12] Rong R, Duxtader EE, Tull J, de la Roza G and Zhang S. Metastatic poorly differentiated monophasic synovial sarcoma to lung with unknown primary: a molecular genetic analysis. *Int J Clin Exp Pathol* 2009; 3: 217-221.
 - [13] Skytting B. Synovial sarcoma. A Scandinavian Sarcoma Group project. *Acta Orthop Scand Suppl* 2000; 291: 1-28.
 - [14] Harb WJ, Luna MA, Patel SR, Ballo MT, Roberts DB and Sturgis EM. Survival in patients with synovial sarcoma of the head and neck: association with tumor location, size, and extension. *Head Neck* 2007; 29: 731-740.
 - [15] Kartha SS and Bumpous JM. Synovial cell sarcoma: diagnosis, treatment, and outcomes. *Laryngoscope* 2002; 112: 1979-1982.
 - [16] Khademi B, Mohammadianpanah M, Ashraf MJ and Yeganeh F. Synovial sarcoma of the parapharyngeal space. *Auris Nasus Larynx* 2007; 34: 125-129.