PRIMARY SOFT TISSUE GIANT CELL TUMOUR OF THE NECK. CYTOLOGICAL AND HISTOLOGICAL CHARACTERISTICS OF THE TUMOUR AND DIFFERENTIAL DIAGNOSIS

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Giant cell tumour of soft part is a very rare neoplasm. The majority of these tumours are located superficially (in subcutaneous tissue) and occur in the proximal parts of the extremities. The deep-situated giant cell tumours of the neck are extremely rare. That is why we report a case of primary giant cell tumour of soft part localized in the trapezius muscle of a 19-year-old woman. We present both cytological and histological picture of the neoplasm. The cytological image of the smear is so representative that the proper diagnosis can be settled basing on the fine-needle aspiration cytology.

Key words: giant cell tumour, fine needle aspiration biopsy, histology

Introduction

Giant cell tumours of soft part (GCTSP) are a spectrum of morphologically different neoplasms of probably fibroblastic or myofibroblastic origin. The benign and low malignant potential tumours are now generally classified as giant cell tumours (GCTSP), whereas the designation of giant cell MFH is reserved for high-grade sarcomas [1]. After the first publications concerning GCTSP in 1972 [2, 3] about 100 cases were presented in English-language literature [4-21], so the histological characteristics of the neoplasm is well known. On the contrary, the cytology of GCTSP was reported only occasionally [10, 11].

Case report

A 19-year-old woman was admitted to our hospital because of a painless mass of the neck. The patient reported that the lesion had been noticed 6 months before. Physical examination revealed a subcutaneous tumour, 2.5 cm in diameter, located in soft tissues of the neck. The skin over the mass was unchanged. The MRI study revealed a tumour 23 mm in diameter, located in the soft tissues of the nape. The tumour was well demarcated from the surrounding tissues and it had no connection with the skin as well as the cervical vertebral column (Fig. 1). The fine needle aspiration biopsy (FNAB) was done and a diagnosis of giant cell neoplasm was made. Because of neoplastic nature of the aspirate, the tumour was completely excised. There was no evidence of recurrence after 4 months of follow-up.

Cytological findings

Fine-needle aspirates were hypercellular and consisted of two main populations of cells: mononuclear spindle stromal cells and multinucleated giant cells (Fig. 2). Mononuclear cells were either arranged in multiple three-dimensional

clusters (Fig. 2 *asterisk*) or dispersed. At higher magnification they resembled stromal histiocytes and demonstrated oval nuclei with discrete nucleoli and densely eosinophilic cytoplasm (Fig. 3). Multinucleated giant cells were similar to osteoclasts, but contained many more nuclei (Fig. 4). The average number of nuclei was 20 per cell and ranged from ten to several dozen. The nuclei within giant cells as well as the nuclei of mononuclear stromal cells were nearly identical in size and appearance. In a few cells the typical mitoses were found (Fig. 5). Scattered lymphocytic cells and neutrophils were also present (Fig. 3), but there were no xanthoma cells (lipid containing histiocytes).

Macroscopic and histological findings

The specimen consisted of a skin fragment, subcutaneous adipose tissue and skeletal muscle removed in one block. On cross section, a 2.2 × 1.7 cm well circumscribed, gray-yellow nodule was noticed. Light microscopy showed that the tumour was surrounded by a thin, fibrous pseudocapsule and a rim of skeletal muscle tissue. However, high power magnification revealed focal infiltrative pattern of tumour growth, and the nests of neoplastic cells were noticed between muscle bundles (Fig. 6). What is more, the invasion of vessels on the tumour border was also indicated (Fig. 7). Microscopically, the tumour was characterized by a multinodular growth pattern with osteoclast–like giant cells admixed with short spindle or histiocytoid mononuclear cells. The spindle cells were partially arranged in short whirling fascicles or created haphazard pattern (Fig. 8). The second population of the tumour cells consisted of classic osteoclast-like giant cells uniformly dispersed throughout the mass. They presented from 10 (Fig. 9a) to several dozen (Fig. 9b) round to oval nuclei per cell. Both mononuclear and multinuclear tumour cells generally lacked nuclear atypia, however, a few mononuclear cells with moderate atypia were noticed. The mitotic activity differed in various parts of the nodule, with an average of 5/10 HPF, but focally counted as high as 3 mitoses per HPF (Fig. 10). However, atypical mitotic figures as well as foci of tumour necrosis were not found. There were also scattered areas of lymphocytes between spindle cell fascicles.

Tumour cells were immunoreactive for vimentin, CD68 and factor XIIIa; the CD68 immunoreactivity was characteristically strong and diffuse in the osteo-

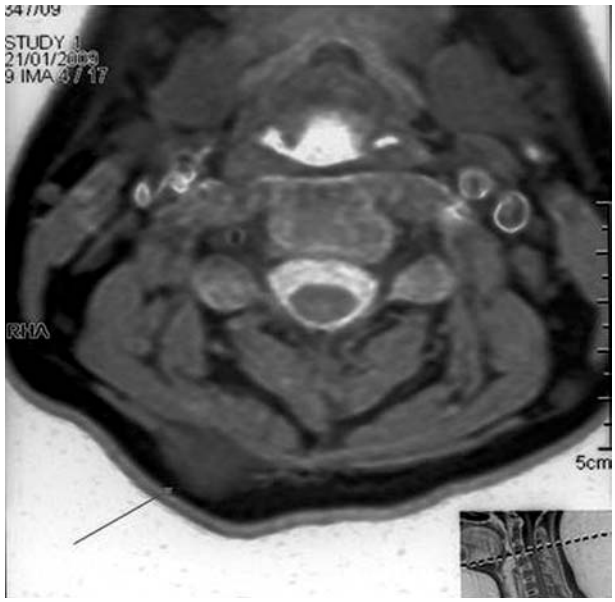

Fig. 1. The MRI study revealed a tumour 23 mm in diameter, located in the soft tissues of the nape

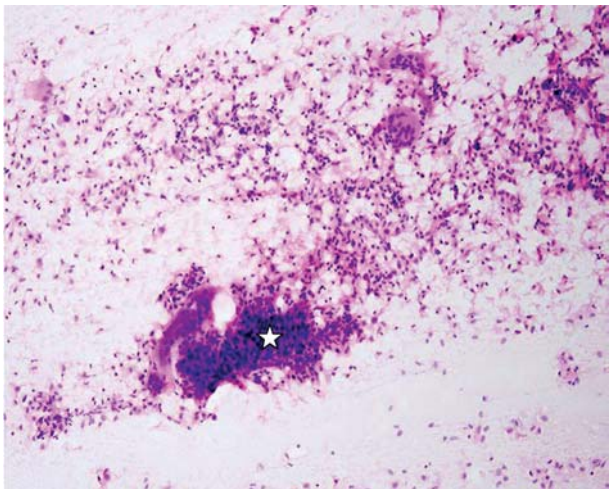

Fig. 2. Hypercellular aspirate consists of mononuclear spindle cells and multinucleated giant cells. *Asterisk*: three-dimensional cluster of mononuclear spindle cells

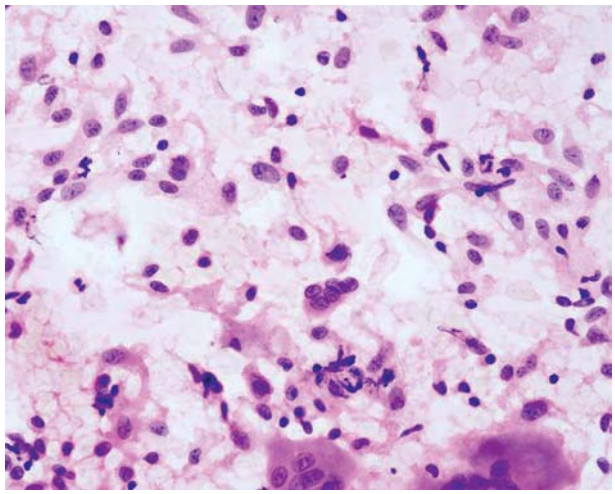

Fig. 3. Mononuclear spindle cells, scattered lymphocytic cells and neutrophils at higher magnification

clast-like giant cells and focal in the mononuclear stromal cells. On the contrary, the reaction against factor XIIIa was strongly positive in nearly 100% of mononuclear cells and focally present in the nuclei of selected osteoclast-like cells. Whereas, the reactions against cytokeratins (AE1&AE3), EMA, CD34, CD45 (LCA), S100 protein, desmin and smooth muscle actin (SMA) gave negative results.

Flow cytometry analysis revealed a clear diploid pattern of the neoplasm (DI = 1.0) and low both S-phase and G2M-phase fractions of tumour cells (1.4% and 1.1%, respectively).

Discussion

The differential diagnosis of GCTSP on both histological and cytological level is depicted in Tables I and II, respectively. GCTSP is most often confused with tenosynovial giant cell tumour (GCTTS) and plexiform fibrohistiocytic tumour (PFT) [1, 6].

Apart from the significant difference in locations, GCTTS usually has uninodular rather than multinodular growth pattern [22-24], prominent stromal hyalinization, and more heterogeneous population of cells, including xanthoma cells (lipid-containing histiocytes), siderophages, and lymphocytes [5, 22]. In contrast to GCTSP, GCTTS exhibits more clustered distribution of osteoclast-like giant cells and its mononuclear cells occasionally present nuclear grooves and intracytoplasmic inclusions. GCTTS also typically has more even distribution of extracellular collagen that outlines individual cells or clusters of cells, in contrast to the broad bands of collagen that result in the multinodular growth of GCTSP. Lastly, cystic change and reactive bone are common in GCTSP but extremely rare in GCTTS [6].

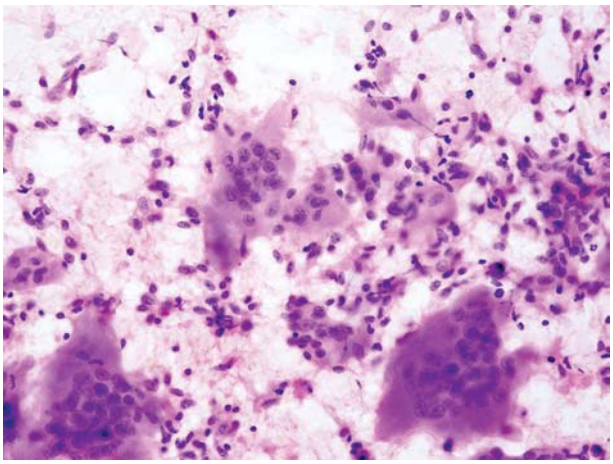

Fig. 4. Multinucleated giant cells

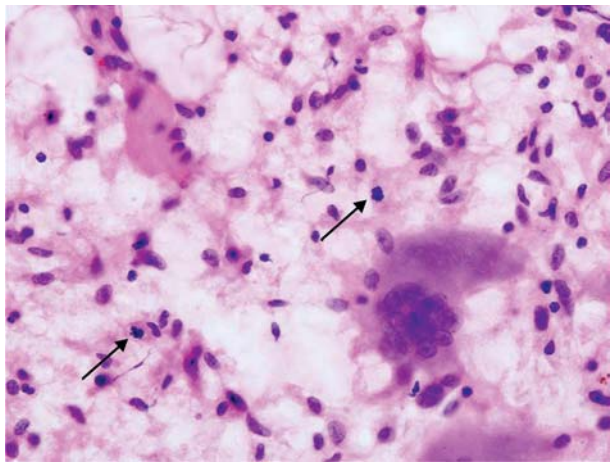

Fig. 5. Mitotic figures in tumour cells (*arrows*)

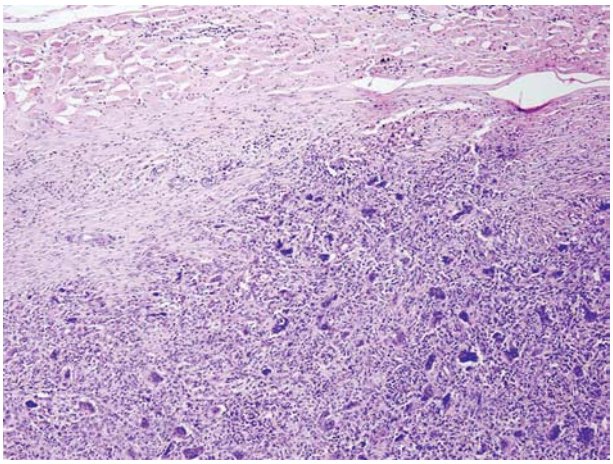

Fig. 6. Infiltrative pattern of tumour growth between muscle bundles

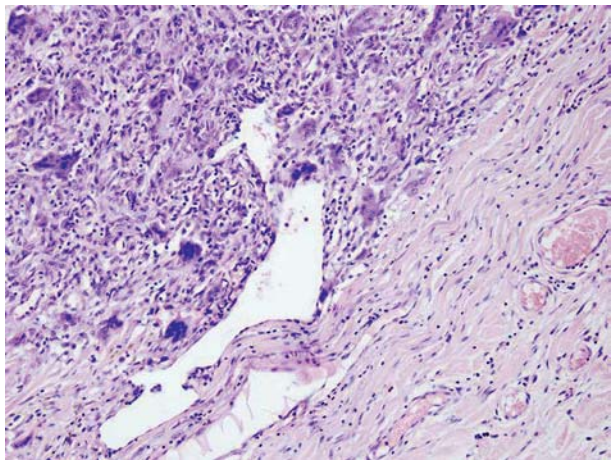

Fig. 7. Invasion of vessels on the tumour border

PFT is a recently described entity, that affects children and adolescents preferentially, mainly females. It has predilection to subcutaneous adipose tissue and the dermis of distal upper extremities [25, 26]. Areas of plexiform fibrohistiocytic tumour bear a startling resemblance to the texture of GCTSP [1]. However, GCTSP is differentiated from PFT mainly by the larger size of nodules, lack of plexiform growth pattern [5, 6], as well as lack of easily identified collagen-rich spindle cells bundles resembling fibromatosis [6]. The uniform distribution of multinucleated, osteoclast-like giant cells is the histological feature that is not found in PFT. Other histological features frequently present in GCTSP and absent in PFT include metaplastic bone formation, and aneurismal bone cyst-like changes [5].

From the clinical point of view, the most important is the differentiation between GCTSP and malignant tumours presenting multinucleated giant cells, that means giant cell type of pleomorphic sarcoma (so-called MFH) [3, 27] and giant cell-rich osteosarcoma [28, 29]. In contrast to GCTSP, these both tumours are characterized by the presence of highly atypical pleomorphic, both mononuclear and multinuclear giant cells. The spindle cell component of both malignant tumours form easily recognized fascicles. In pleomorhic sarcoma the spindle cells create the characteristic storriform pattern which can be recognized even in smear from FNAB, if the tissue fragments are aspirated. The diagnostic key feature for giant cell-rich osteosarcoma is osteoid formation.

Of the 16 patients described by Oliveira *et al*. (in whom follow-up data was available), only one patient experienced local recurrent disease, developed pulmonary metastasis, and died of tumour. This patient was an 80-year-old woman with a large mass in her thigh. Her death was attributed to respiratory failure

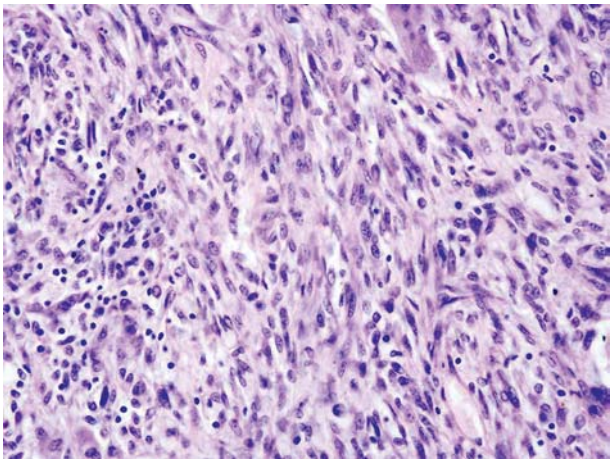

Fig. 8. Short whirling fascicles and haphazard pattern of spindle cells

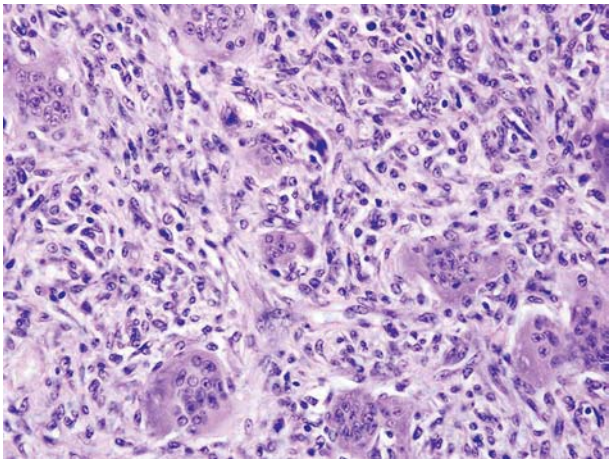

Fig. 9a. Osteoclast-like giant cells with about 10 nuclei

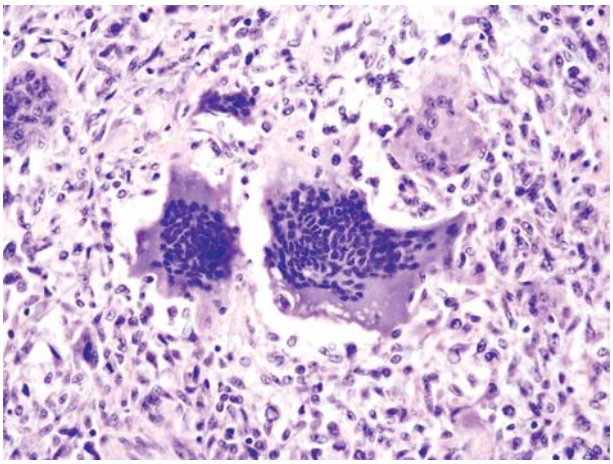

Fig. 9b. Osteoclast-like giant cells with several dozen of nuclei

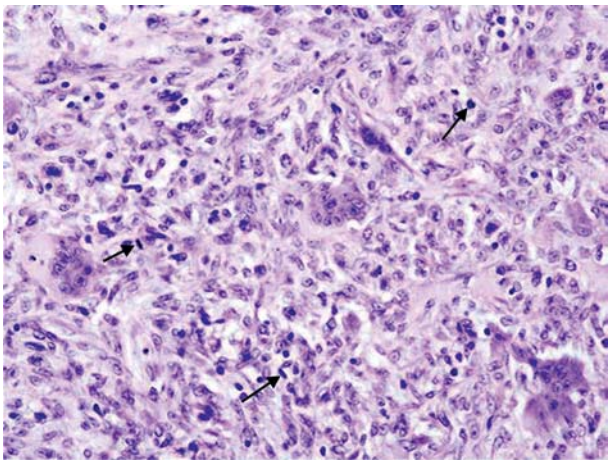

Fig. 10. Focal mitotic activity of tumour cells (*arrows*)

Table I. Differential diagnosis of giant cell tumour of soft part (part 1 – clinics and histology)

	Giant cell tumour of soft part*	Tenosynovial giant cell tumour localized type	Plexiform fibrohistiocytic tumour	Giant cell malignant fibrous histiocytoma	Giant cell-rich osteosarcoma
sex	female : men = 6 : 4	female : men = 2 : 1	mainly female	2/3 cases occur in men	men slightly predominate
age	any (mainly 40-60 years) mean 47.9, median 55.5	any (mainly 30-50 years)	children and adolescents	older adults	10-20 years
mean size (cm)	2-5	1-3	1-3	5-10	5-10
preferential localization	proximal part of extremity (arm, thigh, trunk)	hand (mainly fingers)	distal part of extremity upper extremity in > 60% of cases	lower extremity (mainly thigh)	distal metaphysis of femur
tumour depth	superficial (subcutaneous)	deep (periarticular)	deep-dermal or subcutaneous	deep (skeletal muscles)	bone
macroscopic features	well circumscribed, lobulated mass with fibrous septa dividing tumour into cellular lobules	well-circumscribed, lobulated mass	ill-defined mass	multilobulated mass with foci of necrosis and haemorrhages	variable
growth pattern	multinodular	uninodular	plexiform	multinodular	variable
histological findings	cellular nodules composed of mononuclear, short spindle cells and multiple osteoclast-like giant cells and separated by bands of collagenous tissue	lobules composed of ovoid and epithelioid cells surrounded by dense fibrous septa, hemosiderin deposits in fibrous septa	histiocytic cells and giant cells forming the nodules circumscribed by short fascicles of fibroblastic cells	mixture of spindled, rounded and osteoclast-type giant cells	extensive spindling of highly atypical mononuclear cells, with the presence of lace-like osteoid
nuclear atypia	no	no	no	significant	high
mitotic activity per 10 HPF	1-30 figures (mean 3)	3-5 in average but may reach up to 20	< 3	>10	>10
atypical mitoses	no	no	no	often	often
necrosis	no	very rarely and only focal	no	often	often
immunohisto-chemistry	CD68(+), FXIIIa(+), SMA(–/+), DES(–), LCA(–), S100(–)	CD68(+), FXIIIa(+), SMA(–/+), DES(+) in dendritic cells, and LCA(+) in giant cells only, S100(–)	CD68(+), FXIIIa(–), SMA(+) in fibroblast-like cells, DES(–), LCA(–), S100(–)	CD68(+), FXIIIa(+), SMA(+), DES(–), LCA(–), S100(–)	CD68(–), FXIIIa(n/a), SMA(+/–), DES(+/–), LCA(–), S100(+)

* *Above mentioned clinico-morphological features are based on the review of 99 cases described in literature (4-21).*

Table II. Differential diagnosis of giant cell tumour of soft part (part 2 – fine needle aspiration biopsy)

	Giant cell tumour of soft part	Tenosynovial giant cell tumour localized type	Plexiform fibrohistiocytic tumour	Giant cell malignant fibrous histiocytoma	Giant cell-rich osteosarcoma
cellularity of smear	moderate to hypercellular	moderately cellular	moderately cellular	hypercellular	hypercellular
cell populations	giant cells, histiocytoid mononuclear cells, short spindle cells, hemosiderin-laden macrophages	round and polygonal cells of various shapes, macrophages, usually containing brown cytoplasmic granules of hemosiderin, xanthoma cells (lipid containing histiocytes) and giant cells	spectrum of plump fibroblastic cells and histiocyte like cells within finely granular myxoid background scattered osteoclast-like cells	loosely cohesive groups and singly scattered large pleomorphic polygonal to spindle-shaped cells and multnucleated markedly atypical giant cells	spindle cells and bizarre giant cells
number and distribution of giant cells	numerous, uniformly distributed	scattered, evenly dispersed	scattered, evenly dispersed	variable, evenly dispersed	may be numerous, evenly dispersed
giant cell morphology	identical in size and appearance with 50 or more nuclei	bland-looking osteoclats-like cells that may contain up to 50 nuclei; some of giant cells resemble the so-called Touton giant cells	bland looking osteoclast-like cells with several nuclei	bizarre highly pleomorphic cells	mixture of bland - looking and bizarre, highly atypical cells
mononuclear cell morphology	spindle-shaped with bland nuclei and moderate amount of cytoplasm	round to spindle-shaped with bland, reniform nuclei	round to spindle shaped cells with regular round to oval nuclei, vacuoles and granules in cytoplasm	tumour cells of different size and shape with large, round, oval or bizarre nuclei	frankly malignant mesenchymal cells arranged in large clusters and smaller groups, or individually dispersed
nuclear atypia	no	no	no	high grade*	high grade*
additional key features	–	nuclear grooves and intracytoplasmic inclusions occasionally seen in mononuclear cells	–	– a storriform pattern recognized if the tissue fragments are aspirated – cellular debris reflecting tumour necrosis – brisk mitotic activiy	– osteoid (finely fibrillar or hyaline) material

** High grade atypia means the high nuclear/cytoplasmic ratio, irregular nuclear membrane, coarsely clumped chromatin, and prominent nucleoli.*

due to extensive pulmonary metastasis. The tumour was histologically and cytologically identical with the other 21 benign tumours. The metastatic disease was not documented histologically, so the authors cannot rule out the possibility that this elderly patient had a secondary malignancy [5]. In the report of O'Connell *et al*. [6] none of 11 patients with histlogically benign GCTSP recurred or metastasized in a period raged from 2-80 months (mean 26.1). According to the report of Folpe *et al.* [4], the follow-up information in 19 patients (mean 3 yrs; range 1-7 yrs) indicated recurrences in four patients, but none developed metastasis. That is why Folpe *et al.* proposed to term this neoplasm as "giant cell tumour of low malignant potential".

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