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REVIEW

Malignant Fibrous Histiocytoma/Undifferentiated High-Grade Pleomorphic Sarcoma of the Maxillary Sinus

Report of a Case and Review of the Literature

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Abstract Malignant fibrous histiocytoma (MFH) also known as undifferentiated high-grade pleomorphic sarcoma (UHPS) is a soft tissue sarcoma, composed of undifferentiated mesenchymal tumors possessed fibrohistiocytic morphology without definite true histiocytic differentiation. Head and neck localization is very rare, showing an incidence ranging from 4 % to 10 % in different series of investigations. The most frequent involved sites in UHPS are the neck and parotid, followed by the scalp, face, anterior skull base and orbit. Upper aerodigestive tract, lateral skull base and ear are rare locations. The incidence of the lymphatic metastases is also rare. The aim of this article is to report a case of UHPS in the maxillary sinus with palatal, orbital and ethmoidal involvement, with lymphatic metastasis and its surgical treatment. In addition, we review the literature of similar cases of the past 12 years.

Keywords Malignant fibrous histiocytoma · Undifferentiated high-grade pleomorphic sarcoma · Orbito-ethmoidal spread · Young age · Lymphatic metastasis

Abbreviations

CHT	Chemotherapy
CT	Computed tomography
FNAB	Fine needle aspiration biopsy
MFH	Malignant fibrous histiocytoma
RT	Radiotherapy
UHPS	Undifferentiated high-grade pleomorphic sarcoma
WE	Wide excision

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Background

Malignant fibrous histiocytoma (also known as undifferentiated high-grade pleomorphic sarcoma) is a soft tissue sarcoma without definable line of differentiation. Historically it was first described in 1963 by *Ozzello,* who obsereved a tumor with storiform (cartwheel-like) growth pattern, with pleomorphic and giant tumor cells from tumoral cell-culture. The tumor displayed ameba-like movement and feature of phagocytosis was also seen. These cells had features similar to histiocytes and fibroblasts (due to their elongated shapes). Based on his observations, *Ozzello* called these tumor cells "facultative fibroblasts" [1] because of their overlapping features between histiocytes and fibroblasts. He used the term 'malignant fibrous histiocytoma' to describe this tumor. From the morphologic characteristics, it was divided into five subtypes: storiform-pleomorphic, myxoid (myxofibrosarcoma), giant cell (malignant giant cell tumor of soft parts), inflammatory and angiomatoid [2].

During the mid 1980s, an increasing number of diagnosed MFH began to cause problems to pathologists, because the morphologic patterns of MFH may be similar to many other sarcomas. In 1992, many of previously diagnosed MFH tumors were re-analysed using the up to date available immunohistochemical and electron microscopic techniques [3–5]. Only one tenth of the cases were re-diagnosed as MFH. In 2002, a similar survey of MFH histological cases showed only a 27 % concordance rate. So it was time to update the nomenclature and classification of MFH.

The 2002 WHO-classification considered the alternative name of old nomenclature of MFH as it gave a more accurate description of the origin of the tumor cells [6].

In the new classification the former 'storiform-pleomorphic MFH' diagnosis was modified to the term "undifferentiated high-grade pleomorphic sarcoma" (UHPS). The classification has been modified as well along with the nomenclature (Table 1). According to the present criteria in order to

Table 1 The comparison between the old nomenclature of MFH and the new one

Old nomenclature of MFH subtype	Current nomenclature of MFH subtype (2002, WHO)
Storiform-pleomorphic MFH	Undifferentiated high-grade pleomorphic sarcoma
Giant cell MFH	Undifferentiated pleomorphic sarcoma with giant cells
Myxoid MFH	Myxofibrosarcoma
Inflammatory MFH	Undifferentiated pleomorphic sarcoma with prominent inflammation
Angiomatoid MFH	Angiomatoid fibrous histiocytoma

diagnose UHPS, no definable line of differentiation should be demonstrated by current technology, and therefore it may be possible in the future this term may be disappeared [7–10].

Case Presentation

A 47-year-old man was referred to our department by his dentist due to a non-healed wound (unsuccessfull sinus closure) after an upper left second molar extraction. The medical history and general physical examination of this patient were unremarkable.

Extraoral examination revealed a solid swelling of the left infraorbital region. No enlarged cervical lymph nodes were palpable. During the oral examination an open sinus was observed in the left molar maxillary region with an aperture of 10×5 mm. The biopsy of the tumor was performed during the second closing of the oroantral fistula and the pathological diagnosis was: undifferentiated high-grade pleiomorphic sarcoma (storiform-pleiomorphic MFH). Histology showed spindle and histiocyte-like tumor cells with marked cytological and nuclear pleomorphism (Fig. 1). They displayed in some areas storiform pattern. Extended necrosis was obvious, but less than 50 %. Extensive immunohystochemistry was done but only vimentin positivity could be detected. Other reactions, such as alpha smooth muscle actin, desmin, h-caldesmon, S100, CD34, CD31, keratin (AE1-AE3) and EMA (Epithelial Membrane Antigen) were all negative.

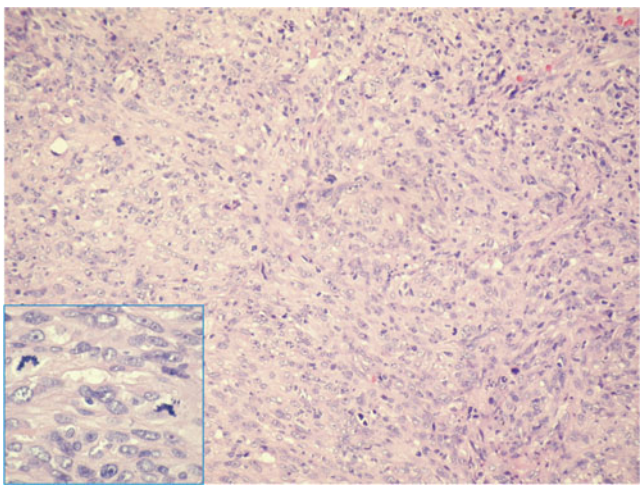

Fig. 1 Spindle and rounded histiocyte–like tumor cells displaying slightly storiform pattern. Insert: note prominent nucleoli and mitotic forms

During the preoperative radiological survey, computed tomography (CT) demonstrated a tumor with homogeneous low signal intensity, with bone destruction of the left maxillary alveolar process, with osteolysis on the anterior and lateral wall of the maxillary sinus and partially on the hard palate. The disease had also involved the ethmoid region with well-demarcated margins. The floor of the orbit was also affected (Fig. 2). The CT couldn't detect any lymph node or other metastasis.

Taking into account the age of the patient, the extension of the tumor, the controversial case reports about the surgical therapy and the rare incidence of lymph node metastases, we decided neck dissection would be appropriate. Therefore, left partial maxillectomy was combined with selective neck dissection (regions I-III, V/a).

Postoperative histology showed free surgical margins and lymph node metastasis could be detected in only one of the 16 lymph nodes. The metastasis was attributed to the prevascular lymph node.

The postoperative course was uneventful. Adjuvant radiotherapy and chemotherapy were launched 4 weeks after surgery. This is now completed, and the patient was still free of tumor at the 6 month follow up.

Conclusions

Squamous cell carcinoma and lymphoma are the most common malignancies in the head and neck (80–90 %). Sarcomas are relatively rare, accounting for 1 % to 11 % of all neoplasms in this area. Historically the most common soft tissue sarcoma is the MFH/UHPS. Head and neck localization of this disease is rare, with the incidence ranging from 4 % to 10 % [11].

Based on the literature the most common presenting symptom is a mass, which is present in the vast majority of patients. Other non-specific symptoms such as pain and paresthesia indicate that diagnosis of the tumor by clinical symptoms is difficult. The CT and MRI features of the MFH/UHPS in head and neck region are also non-specific, showing large lobulated soft-tissue mass, which has a similar appearance to muscle [12].

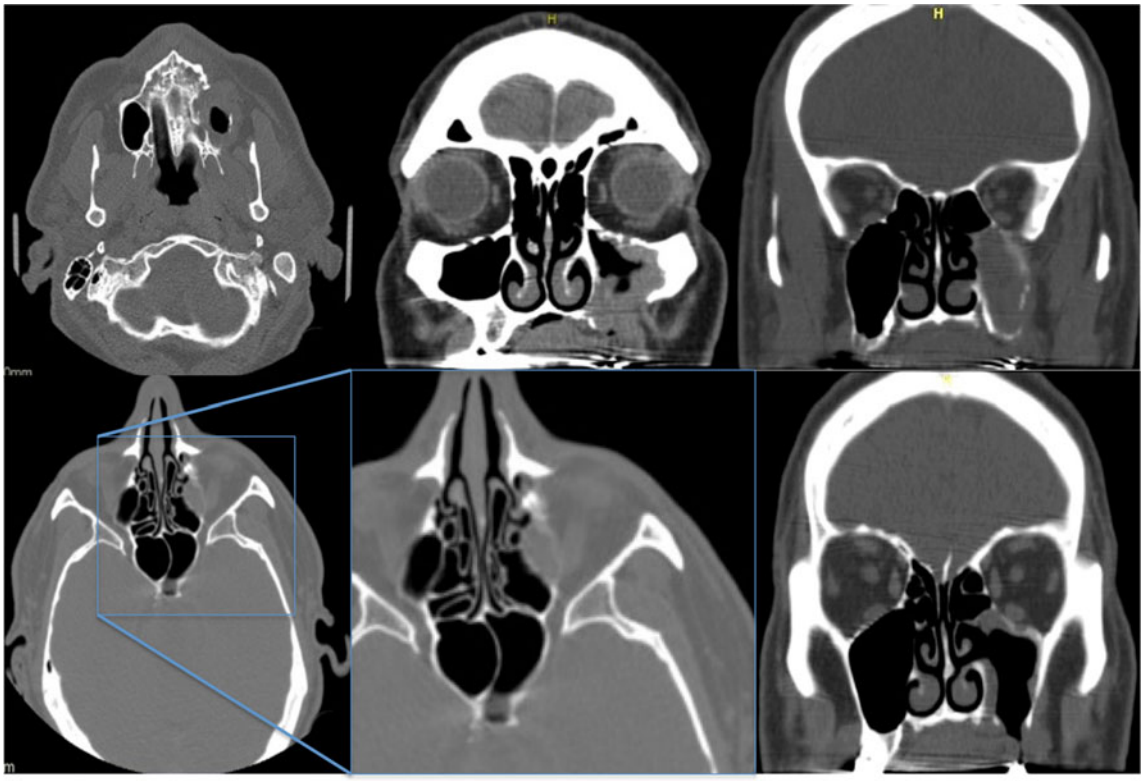

Fig. 2 CT images showing the extent of the tumor

The definitive diagnosis of MFH is based on the histopathological examination of the biopsy samples. Less invasive techniques, such as fine needle aspiration biopsy (FNAB) demonstrated a poor sensitivity ranging from 60 % to 80 % [13]. This is mainly due to the inability to achieve immunhistochemical stains on most FNAB samples. Incisional biopsy performed through small incision yields a sufficient amount of tissue for both routine histology as well as special immunhistochemical stains. This technique has been found to have an accuracy of 94 % with no false positive diagnosis for MFH/UHPS. The other advantages of incisional biopsy include low cost and ease of performance [14, 15].

Most MFH/UHPS recur locally. Regional metastases are rare. Distant metastases are common and the most frequent site is the lung. The main therapy of this tumor is surgery followed by adjuvant chemotherapy and radiotherapy. The combined therapy seems to be crucial for successful treatment. The expansion of resection is arguable, but most surgical guidelines prefer wide function-sparing excision

Table 2 Review of the literature accroding to the treatment of maxillary MFH

Reference	Release date	Case no.	Localization	Treatment	Neck dissection
Wu T.H.	2012	1	Max. sinus	WE + RT	No
Satomi T.	2011	1	Max. sinus	WE	No
Yumi M.	2010	2	Max. alv., sinus	WE + CHT	No
Yanagi Y.	2010	1	Max. sinus	WE + RT	Yes
Agnihotri R.	2008	1	Max. ging.	WE	No
Seper L.	2007	1	Max. face	WE	Yes
Sabesan T.	2006	15	Maxilla	WE	No
Chan Y.W.	2004	1	Max. sinus	WE + RT	No
Yamaguchi S.	2004	4	Maxilla & max. sin.	WE + RT, WE + RT + CHT	No
Sato T.	2001	2	Max. alv.	WE + CHT	No
Mardinger O.	2001	1	Max. alv.	WE	No
Pandy M.	2003	1	Max.sinus + zygoma	WE + RT	No

with negative histological margins whenever possible. Adjuvant radiotherapy (RT) is advised for all soft tissue sarcomas, including MFH/UHPS. This is based on randomized trials comparing surgery with or without radiotherapy which demonstrate the efficacy of radiotherapy as an adjuvant treatment in decreasing the rates of local recurrences Chemotherapy (CHT) is generally reserved for distant metastatic cases [16]. The most frequently used protocol is CYVADIC (cyclophosphamide, vincristine, adriamycin).

Cervical lymph node metastases are rare and are presented in between 3.2 % and 18 % of the cases [16–18]. In addition we have found a controversial study in which the incidence of the regional lymph node metastases was 57 % [19].

Few studies have reported MFH/UHPS localized in the maxillary sinus or arising from the maxillary gingiva or facial soft tissues. Table 2 shows the literatures of the past 12 years [20–30]. Among these, there was no report about cervical lymph node metastasis related to MFH/UHPS of the region.

All authors favored wide, radical excision (WE) for surgical treatment but only four of them combined it with adjuvant radiotherapy (RT) and two of them used adjuvant chemotherapy (CHT). Only two authors completed the surgical excision with radical neck dissection although they have not found any cervical metastases. In our further investigation, we could found only a few articles reporting a cervical lymph node metastasis related to head and neck MFH/UHPS. According to the literature, the prognosis by each morphologic subtype but the overall 5-year survival-rate is approximately 50–60 % for the MFH/UHPS of the head and neck.

A consistently therapeutic strategy for MFH/UHPS of the head and neck remains to be established, due to the low numbers of patients with this disease. Only retrospective studies of treatment can be conducted and there are few reported cases of MFH/UHPS. Initial radical surgery is usually the effective treatment for achieving long-term survival. In our case we reported a lymph node metastasis as well, which is very rare in this type of tumor. The neck dissections may contribute to a higher survival rate in the future. More time and cases will be needed to establish the standard protocol and the feasibility for the radio- and chemotherapy.

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Authors' contributions

VD took part in the surgical procedure, participated in the sequence alignment and drafted the manuscript. BS and CSK participated in the surgical procedure. SZ carried out the histopathological examinations, participated in the sequence alignment and drafted the manuscript. NZ carried out the surgical procedure, conceived the study, and participated in its design and coordination and helped to draft the manuscript.