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Large-sized desmoid-type fibromatosis presented in left nuchodorsal region and managed with surgical excision: A case report and review of literature.

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Abstract

Background: Desmoid-type fibromatosis is defined as an intermediate tumor that rarely occurs in the nuchodorsal region. There is no doubt as to the value of complete surgical excision for desmoid-type fibromatosis. However, surgeons may often be concerned about making a wide excision because of the potential for functional morbidity. Some studies have reported a lack of correlation between margin status and recurrence.

Case presentation: We report an unusual case of a 55 y old male who prior to presenting at our hospital underwent debulking surgery. We performed a nuchodorsal tumor resection and achieved incomplete resection. We also reviewed available literature of desmoid-type fibromatosis.

Conclusions: We described successful treatment for the refractory case of desmoid-type fibromatosis. The review results showed that some microscopic incomplete resections of tumors in patients with desmoid-type fibromatosis tended to be acceptable with surgical treatment.

Keywords: Desmoid-type fibromatosis, Resection, Pathology.

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Introduction

Desmoid-type Fibromatosis (DF), also referred to as "desmoid tumor" or "aggressive fibromatosis", is an intermediate malignancy that is defined by the WHO as a "clonal fibroblastic proliferation that arises in the deep soft tissues, characterized by infiltrative growth and a tendency toward local recurrence without metastasis". The terminology "desmoid" was first defined by Müller in 1838 from the Greek word "desmos" which means "tendon-like", following the initial description of the disease by McFarlane in 1832 [1].

Histopathologically, DF is characterized by bland-like spindled cells back-grounded by abundant matrix collagen. The nucleoli are inconspicuous with few or no mitoses [2,3]. According to the initiation of disease, DFs can be categorized into "sporadic" and "FAP-related" types. The former is often associated with somatic mutations on *CTNNB1* gene that is located on chromosome 3 and encodes β-catenin [4-7]. The latter, which is often comorbid with Familial Adenomatous Polyposis (FAP), is initiated by germline mutations on Adenomatous Polyposis Coli (*APC*) gene which is located on the chromosome 5 [8,9] and encodes the protein that facilitates the degradation of β-catenin [10]. Therefore, mutations on *CTNNB1* and *APC* gene can both result in stabilization and accumulation of β-catenin, and play a key role in the pathogenesis of DF [10]. Thus, positive β-catenin in the tumor cells evaluated by Immunohistochemical (IHC) staining is a diagnostic feature of DF [10,11], when combined with the histopathological characteristics mentioned above.

According to a nation-wide study conducted in the Netherlands in 2011 [12], sporadic DF is rarely seen with an incidence of about 3.42 per million in the general population, about 12 times of FAP-related DF. However, the risk of developing DF is over 800 times in the population with FAP. These two types of DF are also different regarding the demographic and clinical characteristics. First, sporadic DF has a sexual predilection towards women, especially those who have a recent history of pregnancy [13], with a ratio of female to male (F:M) being about 2:1-3:1 [9,12-16], compared with that being close to 1:1 in FAP-related DF [9,12]. Second, the mean age of patients with sporadic DF is slightly younger than that of patients with FAP-related DF (both fall in the range of 30~40 y), but the significance of difference is contradictory in different reports [9,12]. And third, the propensity of intra-abdominal presentation is significantly lower in sporadic DF than that in FAP-related DF (11~13% *vs.* 51~67%) [9,12], which could partially explain that the mortality rate is relatively high in FAP-related DF due to delayed detection and extensive surgery.

The head and neck region (including the nucha) is a rather uncommon primary site of sporadic DF accounting about 5%~15% of the cases reported in literature [13,15,16],

compared with other sites such as the trunk and the limbs. However, DF in the head and neck can cause great functional and aesthetic problems because of the anatomic complexity and the exposed status of this specific region. Management of head-neck DF is relatively risky (e.g. with a decrease of 3 y event-free survival rate by 30% compared with DF in the abdominal/chest wall) [16] and even life-threatening (with a reported patient who died during surgery) [14], so that care must be taken in both the assessment and the approach of treatment. In this study, we present a case of a middle-aged male patient who was surgically treated in our department for a large-sized mass located in the left nuchodorsal region that was finally diagnosed as desmoid-type fibromatosis with a further discussion on the clinical management of this rare type of disease.

Case Report

A 55 y old man presented to our out-patient office with a huge mass located in his left nuchodorsal region. The mass had been initially noticed 1 year earlier in his left shoulder and experienced rapid progression in size with extension to the nucha and the back during the last 6 months. Except impaired motion range of the neck, the patient presented no pain, no dyspnea (either inspiratory or expiratory), no numbness or impaired movement of the arm and no systemic symptoms such as fever, fatigue or weight loss. He had sought consultation in other 2 hospitals. In the first hospital, an ultrasound-guided core needle biopsy (CNB, with a 16$^{\#}$ gauge) was performed with a consequential pathological diagnosis as "spindle cell tumor". He then transferred to the second hospital where he underwent MRI examination and another CNB followed by a pathological diagnosis as "intra- or intermuscular lipoma". However, he was not given any treatments in either of these two hospitals before he was finally hospitalized in our department 3 months later.

Physical examination showed that the patient was in a good nutrition status with normal vital signs. There was a large-sized mass located in the left nuchodorsal region with an estimated size of about 30 × 10 × 10 cm, extending vertically from the level of the atlas down to the level of the 11th thoracic vertebra and transversely from the left axillary midline to the left border of the spine (Figure 1). The mass was solid to palpation with poor motility and the covering skin was normal in color and texture. No other lumps, masses or lymphadenopathies were found in the neck or anywhere else. A thorough examination of the ear, nose, throat and oral cavity was carried out and displayed no abnormalities.

MR was undertaken in the second hospital 3 months before the patient's hospitalization into our hospital (Figure 2). The tumor had a generally homogenous isotense signal on T1WI and a heterogenous hypertense signal on T2WI and STIR sequence with well-defined margins on most of the slices. On some of the images, the margins were obscured with the adjacent structures. This could be some artifacts on the chest slices due to respiratory movement or invasion and adhesion of the tumor to the adjacent structures. No contrast was used during MR imaging.

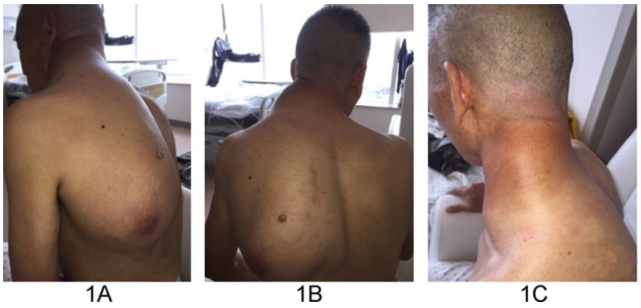

Figure 1. *Presurgical observation of the patient: a large-sized mass located in the left nuchodorsal region with an estimated overall size of about 30 × 15 × 10 cm.*

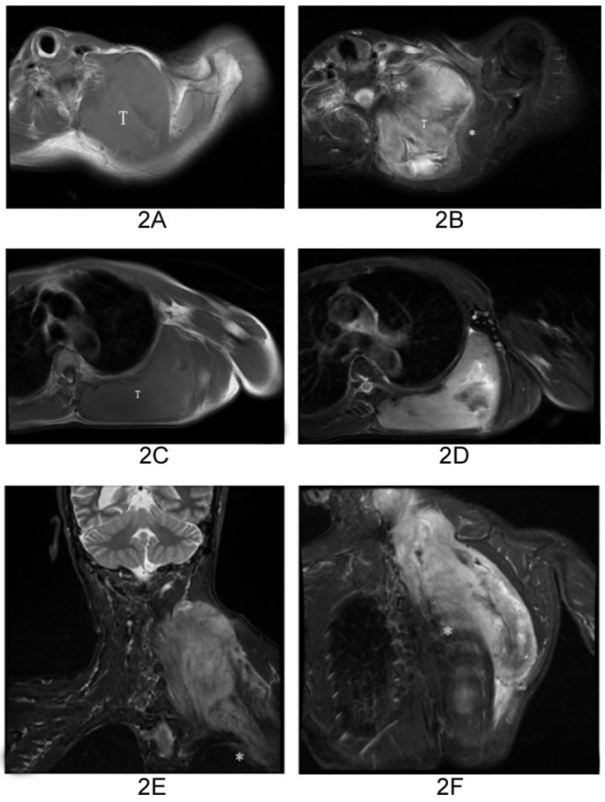

Figure 2. *MRI evaluation of the Tumor (T). The tumor has a generally homogenous isotense signal on T1WI (A and C) and heterogenous hypertense signals on T2WI (B and D) and STIR sequence (E and F). Ill-defined margins (*) are observed on some of the images probably due to respiratory movement or tumor invasion and adhesion to the adjacent tissues.*

CT images (Figure 3) undertaken in our hospital showed a soft-tissue mass with moderate attenuation. The margins on most of the sections were recognizable although the inferior edge was vague with the adjacent soft tissues (but it is clear on T2WI MR images). Following the injection of contrast, mild to moderate, heterogenous enhancement was seen in the mass. The adjacent bones including the vertebrae, the ribs and the scapula were all intact. Systemic auxiliary examinations revealed no evidence of any suspected metastasis.

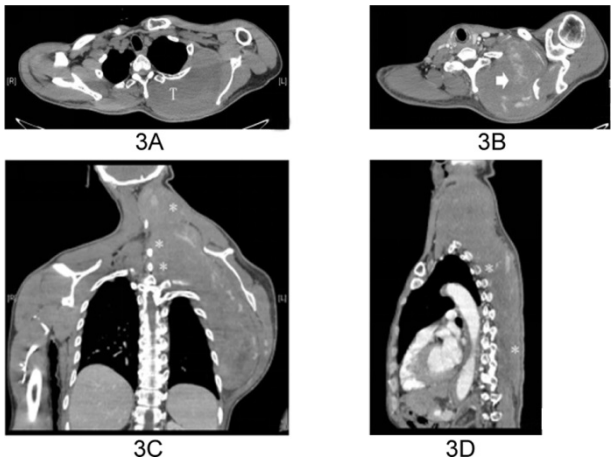

Figure 3. *CT images of the tumor. The Tumor (T) has a heterogenous moderate attenuation on the plain film (A) from mild to moderate, heterogenous enhancement after injection of contrast (B arrow). The margins are not well defined from the adjacent soft tissues on some sections (*). No bone or intravascular invasion was found.*

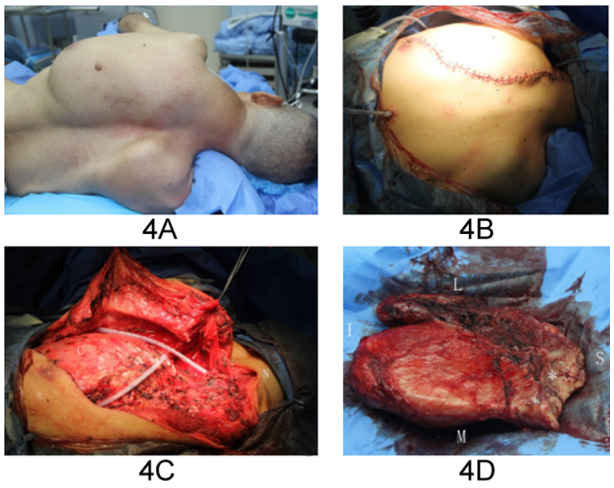

Figure 4. *Surgery. The patient was placed in a right lateral supine position with his left arm stretched forward (A). A S-shaped incision was made from the nucha down to the back (B shows the sutured incision at the end of the surgery). The tumor was removed in pieces, leaving a large surgical cavity (C: N for neck, C for chest and S for scapula). The biggest portion of the tumor was located on the back, with a size of about 20 × 15 × 10 cm (D: S for superior, I for inferior, M for medial and L for lateral; *shows the cutting end of tumor from its nuchal part).*

A multidisciplinary consultation was carried out to discuss the possible diagnosis and treatment for this patient. Although it was previously diagnosed as a "lipoma" in the second hospital, the rapid progression, solid texture, poor motility and an earlier pathological diagnosis as "spindle cell tumor" by the first hospital made the tumor under the suspect of a malignancy. In view of the fact that CNB had been conducted twice without a confirmed pathological diagnosis and that the tumor had not been metastasized despite of its aggressive local growth pattern, surgery was suggested with a clinical diagnosis as "left nuchodorsal tumor under suspect of malignancy". The operation was cooperatively performed by thoracic and head-neck surgeons, through which the mass was found deep to the trapezius, the latissimus dorsi and the subscapularis with limited adhering to the deeper soft tissues. Although en-bloc resection was not achieved because of its huge size, the tumor was macroscopically completely resected in pieces (Figure 4). However, further extensive resection was not indicated by the frozen section pathology of "spindle cell tumor requiring further determination by paraffin embedded sections", in order to avoid unnecessary functional damage.

The postoperative course was carried on uneventfully and the patient was discharged 12 d later with a final pathological diagnosis as desmoid-type fibromatosis (Figure 5), and he declined any further adjuvant therapies such as radiotherapy as recommended. The patient did not return for postoperative follow-up assessment because of personal reasons. However, he claimed on telephone to be "well without any newly developed mass" one year after the surgery.

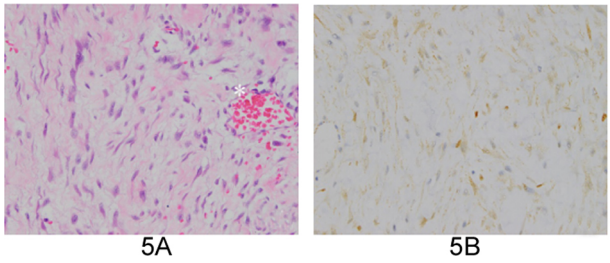

Figure 5. *Pathology. A. Bands of spindled cells distributed in the collagen on H and E staining (40X), with dilated vessels scattered in the matrix (*). B. The tumor cells are β-catenin positive as assessed by immunohistochemical staining.*

Discussion

Clinical characteristics

According to a systemic review by Astrid et al. [17], head-neck DF patients have a much younger mean age (16.87 y) with over a half of them under the age of 11 y. Additionally, there is no obvious sexual propensity. The most frequently involved site by DF is the mandible followed by the neck (including the submandibular area). Patients with DF often present asymptomatic masses [18]. However, pain is not uncommonly complained with progression of tumors [14]. With DF presented in the head and neck region, site-related symptoms such as displacement of teeth [19], dyspnea and dysphagia [20], limited movement of the neck [21] can also be seen.

Radiology

As for imaging evaluation, Magnetic Resonance Imaging (MRI) has been advocated by many authors to be the first choice of radiologic assessment of DF [3,18,22-25]. In summary, DF is often in an infiltrative growth pattern that is characterized by ill-defined margins and extrafacial spread without central necrosis. Isotense signal on T1WI with mild to avid enhancement with gadolinium and hypertense signal on T2WI with low signal intensity bands are typically seen. The use of STIR sequence based on T2WI can provide the

differences among fat-abundant tumors such as lipoma, which was the CNB-based diagnosis of our patient. Compared with Computed Tomography (CT), MRI has a superior soft tissue resolution that provides a better diagnostic accuracy, better delineation of the tumor relationship with the adjacent structures as well as a better prediction of resectability [18,23]. However, the enhanced CT scanning also has great values in the assessment of head-neck DF for its better delineation of bone and great vessel invasions. Besides, it can provide images with thinner reconstruction layers without being obscured by artifacts due to swallow or respiratory movements which are often seen on MRI images of the pharynx, larynx and chest (with notice to the artifacts on chest MRI in our case).

Biopsy taking

Appropriate biopsy performance serves as the foundation of accurate pathologic diagnosis. Commonly used biopsy methods include radiologic-guided Fine Needle Aspiration (FNA) or Core Needle Biopsy (CNB) and open surgical biopsy, of which the last one has the best concordance of 100% with final pathologic diagnosis based on completely resected surgical specimens [26]. Although CNB has a higher overall accuracy rate in distinguishing the differences between malignant and benign tumors compared with FNA, none of them has an accuracy rate as high as 50% in the determination of an accurate pathology diagnosis [26]. Our patient underwent 2 CNB procedures. However, neither of them revealed a confirmed diagnosis that was concordant with the final pathology based on the complete surgical specimen. In other cases such as mandibular tumors [19], it is almost impossible to obtain adequate tissues by either CNB or FNA. Thus, open surgical biopsy, either incisional or excisional, should be considered when CNB failed or is infeasible.

Treatment

The optimal treatment is still controversial because of the unpredictable biological behaviors of DF. Indeed, the clinical course of DF is relatively indolent with a very low tumor-related mortality rate ranging from 0~5% [15,25,27,28]. However, there are reports on patients who died because of treatment-related complications [14]. The long-term outcome is favorable with an overall median follow-up time ranged between 33 to 135 months [13,16,25,27,29-32] and a 5 y overall survival rate of 35%~97.6% [13,15,29,31] regardless of the management approaches. Wait-and-see (also termed "active surveillance") has been advocated by some authors as a "trend of treatment" based on an observed Spontaneous Regression (SR) rate which is as high as 19%~28% [15,27] and a Stable-Disease (SD) rate of 20%~65% [13-15]. However, a Progression-of-Disease (PD) rate of 20%~40% under wait-and-see for primary (not recurrent) DF [13,15,27,29] must not be overlooked. Meanwhile, the clinicopathological prognostic factors which can predict the possible outcome of an untreated DF have yet to be well established. Furthermore, this recommendation is mainly based on non-head-neck DF cases (mostly trunk or limbs otherwise) in the aforementioned reports, which could not actually reflect the specific functional and aesthetic concerns of the head and neck as a special anatomical region. In reports focused on head-neck DF, instead, surgery is still the mainstay of initial treatment [2,19,33]. From our point of view, the progression of head-neck DF is often "unaffordable" because even a slight variation in tumor size or subregion involvement can often greatly alter the surgical approaches and outcomes. Thus, head-neck DFs, when "operable", should be removed as early as possible to achieve a complete resection. The postoperative Relapse-Free Survival (RFS) is reported to be as high as 75%~80% [29,34,35] at 5 y and 60%~80% at 10 y [30,32,34], with local recurrence as the main reason for relapse. Although microscopically complete resection seems "favorable" to most surgeons, the prognostic value of surgical margin for local recurrences and long-term survival is still controversial [30,36-38]. With respect of the indolent clinical course of DF, surgery should not be carried out at the cost of sacrificing organ functions and proper reconstruction procedures should also be employed for aesthetic and/or functional restorations [2,39]. For incompletely resected and unresectable DF, either primary or recurrent, non-surgical treatment such as radiotherapy [31,40], chemotherapy [2], hormonal therapy [28] and therapy with Non-Steroid Anti-Inflammatory Drugs (NSAIDs) [41] should be appropriately used either adjuvantly or primarily. Nevertheless, the adverse and toxic effects of these therapies must also be monitored and treated.

In conclusion, surgery should be carried out as the initial treatment for head and neck desmoid-type fibromatosis as early as possible, in order to achieve a complete resection. Adjuvant therapies such as radiotherapy and chemotherapy should be performed for incompletely resected or unresectable lesions. Wait-and-see management is, however, not recommended for this specific group of patients.

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