Clinical Case Report

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Desmoid fibromatosis in the foot

A case report and literature review

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Abstract

Rationale: Desmoid fibromatosis is a rare benign neoplasm arising from musculoaponeurotic structures with the potential to infiltrate local tissues and recur locally. While the commonly affected regions are the shoulder, chest wall and back, thigh, head and neck, localization in the foot is rare and only a few cases have been reported. Deep-seated lesions of foot tend to spread along the fascia and nerve or tendon sheaths.

Patient concerns: We present a case of a 41-year-old female with a 3 years history of a slowly enlarging painful mass in the right foot.

Diagnoses: Desmoid fibromatosis was diagnosed based on clinical manifestations, imaging findings and pathological examinations.

Interventions: The patient was treated by local incomplete resection.

Outcomes: The patient recovered well postoperatively and was well followed up at our outpatient department with no evidence of recurrence during 16 months of follow-up after local excision.

Lessons: Surgical excision is recommended for symptomatic lesions located in the foot. However, it is difficult to excise thoroughly and periodic follow-up is needed to monitor for recurrence. Further study is warranted to determine whether patients benefit more from function preservation instead of complete resection.

Abbreviations: EMA = epithelial membrane antigen, MRI = magnetic resonance imaging, SMA = smooth muscle actin.

Keywords: desmoid fibromatosis, desmoid tumors, extra-abdominal, foot, therapy

1. Introduction

Desmoid fibromatosis also called aggressive fibromatosis, is a rare locally aggressive tumor characterized by proliferation of fibroblasts with an incidence of 2 to 4 per million population per year.[1,2] Desmoid tumors can be intra-abdominal, in the abdominal wall, or extra-abdominal. And the extra-abdominal desmoid fibromatosis usually affects the shoulder, chest wall and back, thigh, and head and neck.[3] The disease is rare in the foot. The general clinical manifestation is an enlarging painless mass and patients may complain of symptoms related to the compression of adjacent anatomical structures. Currently, magnetic resonance imaging (MRI) is considered a reliable imaging method to evaluate the extent of the disease and the possible involvement of surrounding structures. Definitive diagnosis often requires incisional biopsies instead of core-needle biopsy.[4] Histologically, lesions comprise monoclonal spindle-shaped cells with collagenous matrix. Positive beta-catenin staining is characteristic in fibromatosis, but it is not disease specific.[1]

Although desmoid fibromatosis does not metastasize, it has a tendency of local invasion and recurrence.[5] The surgical excision is generally the preferred treatment. However, the local recurrence rates with local excision of primary lesions vary from 13% to 77%.[1] The impact of surgical margin status on local recurrence has been debated in the literature.[2] Many alternative or adjuvant treatments for desmoid fibromatosis such as chemotherapy, radiotherapy, and endocrine therapy have been tried, but the efficacy is unclear.[6]

Herein, we presented a rare case of foot desmoid fibromatosis and provide an overview of diagnosis and management of desmoid fibromatosis. The West China Hospital administration and the ethics committee authorized the study and informed consent was obtained from the patient for reporting this case report.

2. Case presentation

A 41-year-old female was admitted to our institution due to a 3-years history of a slowly enlarging painful mass in the right foot. The physical examination showed a firm fixed mass on the dorsal foot with dyskinesia. The ultrasound revealed a $5.8 \times 5.0 \times 4.3$ cm heterogeneous weak-echoed mass with irregular shape and unclear boundary. Contrast-enhanced MRI scans demonstrated a $6.1 \times 5.7 \times 4.8$ cm soft-tissue mass with significant heterogeneous enhancement on T2-weighted image and low signal intensity on T1-weighted image, which had close associations with surrounding muscles and tendons and metatarsals. (Fig. 1) Then the patient underwent a surgical

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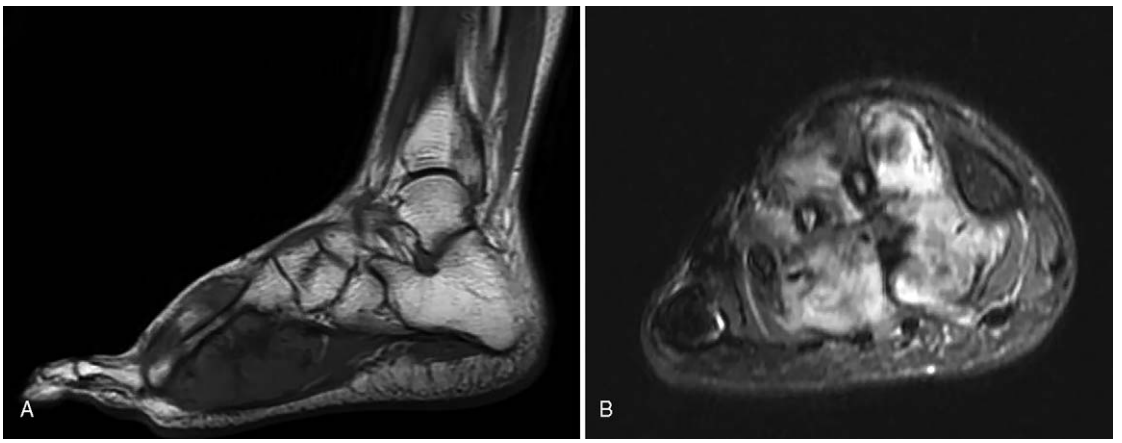

Figure 1. MRI showed the images of the neoplasm in sagittal plane (A, T1-weighted image) and coronal plane (B, T2-weighted image). MRI= magnetic resonance imaging.

excision. Owing to progressive size of the lesion, surgical excision was performed through dorsal and plantar approach in the surgery. Intraoperative findings showed that an irregular mass tightly adhered to the surrounding muscles, tendons and encased the second to the fourth metatarsals, and even bent the second metatarsal. With meticulous dissection, near-total mass was removed without macroscopic residual disease. The intraoperative histological examination reported mesenchymal tumor and resection margin is positive. The tumor showed a solid, firm and appearance with ill-defined borders. (Fig. 2) Histological examination showed the tumor composed of uniform spindle cells and abundant collagenous stroma. (Fig. 3A) The immunohistochemical findings revealed that it was nuclear positive for catenin (Fig. 3B) but were negative for TLE-1, CD34, desmin, S-100, smooth muscle actin (SMA), epithelial membrane antigen (EMA), myogenin, and MIB-1(Ki-67 index,2%). The immunohistochemical and histological findings provide a diagnosis of desmoid fibromatosis. Although the mass was incompletely resected, the patient recovered well postoperatively and was well followed up at our outpatient department with no signs of local recurrence for 16 months.

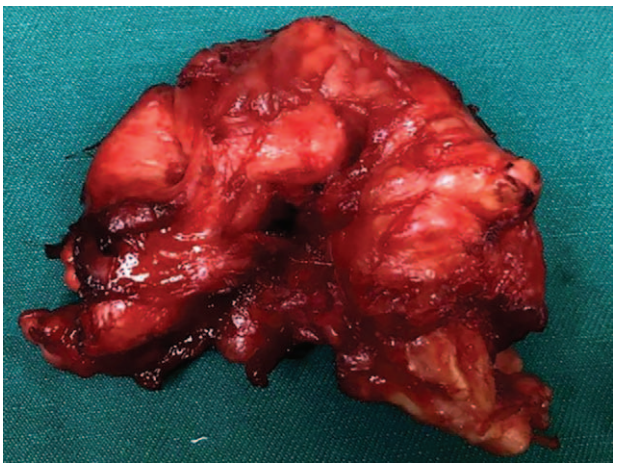

Figure 2. Surgical specimen of the right foot mass.

3. Discussion

Desmoid fibromatosis is a rare benign neoplasm accounting for 3% of all soft-tissue tumors[7] and its most common locations are the shoulder, followed by the chest wall, back, thigh and head and neck. The tumor often affects females aged 25 to 35, suggesting an underlying hormonal factor in tumor growth. Rare cases reported malignant transformation of extra-abdominal fibromatosis to fibrosarcoma.[2] Despite lacking metastatic potential, the tumor has a tendency to invade adjacent structures and relapse. The underlying pathogenesis of desmoid fibromatosis remains poorly understood. The genetic mutations in adenomatous polyposis coli gene or beta-catenin gene has been indentified.[8] The gene mutations were associated with nuclear accumulation of beta-catenin leading to the of fibroblastic proliferation.[9] Estrogen and antiestrogen binding sites have been found in desmoid tumors and anti-estrogen therapy has been proved to be effective.[10] Additionally, the initiation of desmoid tumors may be associated with trauma and surgery.[11]

MRI is a mandatory examination for desmoid tumors, though it seems variable and nonspecific. A comprehensive imaging assessment revealed the tumor characteristics, such as the shape, size, location, density, margins, and anatomical association with neighboring tissues, providing useful information for diagnosis and treatment. The varying signal intensity and enhancement are influenced by varying proportions of spindle cells and collagen of the lesions.[1] On MRI, lesions demonstrate low signal intensity on T1-weighted images and high signal intensity on T2-weighted images. High signal intensity on T2-weighted images reflected increased cellularity, whereas low signal intensity areas correlate with abundant collagen.[12] Nevertheless, MRI imaging of the foot is useful for surgical planning, disease progression and evaluation of treatment response. The surgical or core biopsy is always necessary in for diagnosis. The ultimate diagnosis was confirmed by the histopathological and immunohistochemical examinations. It consists of uniform bundles of spindle cells separated by collagen fibers with positive nuclear beta-catenin staining. Beta-catenin nuclear positivity is significant for differential diagnosis but not disease specific.

To date, there are only a few reports of desmoid fibromatosis in the foot. One[13] documents a woman presenting with a large, painful mass on the dorsum of her foot. She received incomplete excision of mass with positive surgical margins. No evidence of

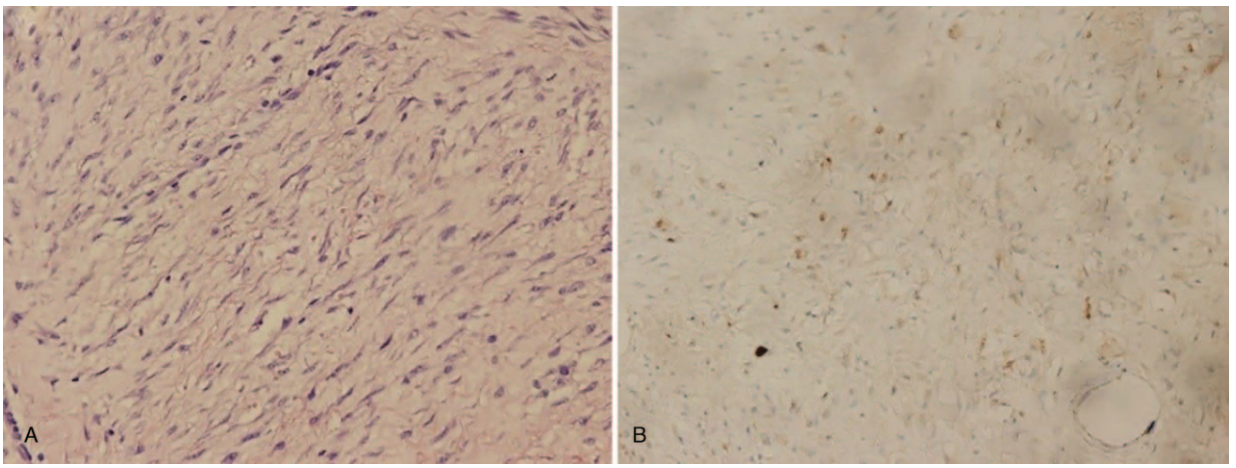

Figure 3. Histology. (A) histopathology showed spindle cells arranged in collagenous background (X100 magnification). (B) Immunohistochemistry showed nuclear positivity for beta-catenin (X100 magnification).

recurrence was noted for 28 months after excision of the lesion. Another report[14] presented 36 cases of desmoid fibromatosis in the extremities and 2 patients of them were located in the foot. They were treated by surgical excision and surgical margins were positive in both cases. One was lost to follow-up and another had a local recurrence in 12 months after surgery. Extra-abdominal desmoid fibromatosis may be multicentric. Watanabe et al[15] presented exceptional familial cases of extra-abdominal desmoid fibromatosis, 1 of which exhibited extensive multicentric lesions after the excision of the primary lesion on the dorsum of her right foot. In another case, Kohli et al[16] described a 19-year-old man with desmoid fibromatosis in the left thigh. Two months after the resection of primary tumor, recurrent multicentric, synchronous lesions including the lesion at the same site and 2 more lesions in the foot were observed. Desmoid fibromatosis in the extremities has a high propensity for local recurrence. Stengel et al[17] reported a young woman with a relapsing desmoid tumor in the left foot treated by multiple surgeries and radiotherapy. Stable disease was achieved until therapy with pegylated interferon alfa-2b was adopted. Barbella at al[18] presented a recurrent desmoid tumor of foot. The second surgery included a wide excision with no clinical evidence of recurrence for 20 months. Our patient is the oldest with the large tumor in the foot. Despite incomplete excision with positive margins, she did not have a recurrence for 16 months

Nowadays, the optimal management of desmoid fibromatosis is still controversial because the natural history of the disease is unpredictable. Some cases progressed rapidly but others remained stable or even regressed spontaneously without intervention in 28% to 50% of the extra-abdominal desmoid fibromatosis.[19,20] For patients with desmoid fibromatosis in critical anatomical sites, a policy of active observation is recommended.[21] However, definitive treatment should be adopted in terms of tumor rapid growth, tumor compression, life-threatening locations, function deficits, and a failed trial of observation. Surgery is the appropriate treatment in cases that tumor progression would lead to significant morbidity and function loss. Influence of the surgical margin status on the post-operative recurrence has been disputed.[22] Duggal et al,[2] in their series of 35 cases, reported a recurrence of 47% of patients with a positive surgical margin compared to 10% of patients with a negative surgical margin. Van Broekhoven et al[22] observed 132 patients with desmoid fibromatosis and concluded that the 5-year local recurrence is not influenced by microscopically clear resection margins or adjuvant radiotherapy. Moreover, complete surgical resection was challenging and may lead to severe functional impairment.[23] Thus, it is necessary to put more emphasis on function preservation and less on microscopically negative margins.[24] The radiotherapy may be an alternative for unresectable desmoid tumors and an effective adjuvant treatment for residual or recurrent tumors in local control.[24] The chemotherapy of vinblastine and methotrexate has shown beneficial results in local control, though associated with toxicities. Several studies reported that endocrine therapy with tamoxifen, non-steroidal antiinflammatory drugs and tyrosine kinase inhibitors are effective for desmoid fibromatosis, but the results are limited by the small sample size and non-randomized controlled trials.[25] The anatomy of the foot is very complex with many bony and soft tissue structures. It is difficult to achieve complete resection with relatively small space of foot and extensive spread of tumor. In our case, despite potential microscopic residual disease, we adopted a conservative approach after surgical resection to avoid unnecessary morbidity.

4. Conclusion

The foot desmoid fibromatosis is a locally aggressive proliferative soft tissue tumor. MRI plays an important role in the diagnosis and appropriate clinical and surgical management. Surgical excision remains the mainstay of treatment for symptomatic lesions; however, it is of great importance to emphasize function preservation and active conservative observation. Further prospective studies are required to establish optimal treatment of the disease.

Author contributions

Resources: Lu Fang.
Writing – original draft: Qinqin Liu.
Writing – review & editing: Qinqin Liu, Bo Li.

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