

Characteristic Power Doppler Sonographic Imaging of Nodular Fasciitis from a Dermatological Perspective: Another Case and Review of Three Cases

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Abstract

To clarify the characteristic ultrasonographic findings of nodular fasciitis (NF) will help to avoid unnecessary operation. The availability of high-resolution ultrasonography (US) has enabled the discrepancies of imaging features between intradermal and subcutaneous cases, furthermore, studies of NF on power Doppler US have not been bibliographically reported. We have reported one intradermal and two subcutaneous types of NF and reviewed their characteristic imaging features on US from a dermatological viewpoint. All nodules clinically represented rapid growing and self-limited and showed the proliferative findings of the margin on both US and pathology. From a dermatologic perspective, no significant differences of gray-scale US between two types were found, but blood-flow signal on power Doppler US was more detectable in intradermal type than subcutaneous one. These findings of US may be a diagnostic tool for NF.

Keywords: High-resolution ultrasonography; Power Doppler ultrasonography; Dermatological perspective; Subcutaneous nodular fasciitis; Intradermal nodular fasciitis

Introduction

To study the characteristic ultrasonographic features of NF will help to establish preoperative diagnostic criteria and to avoid unnecessary operation. We have reported a case of subcutaneous NF and reviewed the differences between intradermal and subcutaneous types on US including present case and previous two cases [1,2]. The usefulness of high-resolution US has enabled the differences of US findings between intradermal and subcutaneous lesions. NF shows a peculiar clinical behavior characterized by rapid growing, self-limited, spontaneous regression after a few weeks; this peculiar clinical presentation has come to cytogenetic attention. Erickson-Johnson et al. [3] have reported that NF is a novel model of transient neoplasia induced by MYH-USP6 (myosin heavy chain 9-ubiquitin-specific peptidase-6) gene fusion, suggesting that USP6 transcriptional upregulation may be the driving force behind the high proliferative activity and growth of NF.

On sonography, there are only a few case reports [4,5] that the lesions were described as oval or lobulated and hypoechoic or mixed echogenicity with irregular or lobular margin. There are also a few reports [4-6] concerning the imaging features on color Doppler US.

However, NF reports on power Doppler US have not been studied bibliographically. We think that proliferative findings on both US and histology may be caused by the cytogenetic nature of NF. When the lesion clinical shows rapid growth and self-limited course like a transient neoplasia, and shows irregular margin on US and pathology, the lesion is strongly suggested to be NF. From a dermatological viewpoint, no significant discrepancies of gray-scale US were recognized between intradermal and subcutaneous types and blood flow signal may be more detectable in intradermal type than subcutaneous one on power Doppler US. We will suggest that it is due to the reason why the dermal layer contains rich capillary vessels as previously described [7].

Case Report

Case 1

A 21-year-old female, having noticed a nodule in her upper arm, visited a nearby dermatologist in July 2012. The nodule was firm and slightly tender to touch. The clinical presentation was a 2-3 weeks history of a rapid growing mass and tended to regress. Nodule was considered as a NF. US was performed, using a US machine (ProSound SSD-3500: Aloka, Tokyo, Japan) equipped with a 10 MHz linear transducer attached to an echo coupler (MP-2463), with a water bag serving as a fluid offset. On gray-scale US showed a subcutaneous hypoechoic lesion located on the upper arm. The shape of nodule was oval with irregular and lobular margin, which partly showed tadpole-tail appearance. The direct contiguity of the lesion with the fascia was not identified. No substantial blood flow signals within the nodule on power Doppler US were detected (Figure 1a). Histopathological finding of the lesion was characterized by the infiltration of fibroblast-like spindle cells in the subcutaneous fatty tissue (Figure 1b). The inside of the nodule showed immature plump fibroblasts arranged in short irregular bundles and fascicles with a feather-like appearance as well as abundant myxoid changes. Cells tended to be mitotic, but with no sign of atypical mitoses. Mucin had deposited in the stroma and dilatation of blood vessels filled with erythrocytes was noted. Based on these findings, the tumor was diagnosed as fibrous type NF (Figure 1c).

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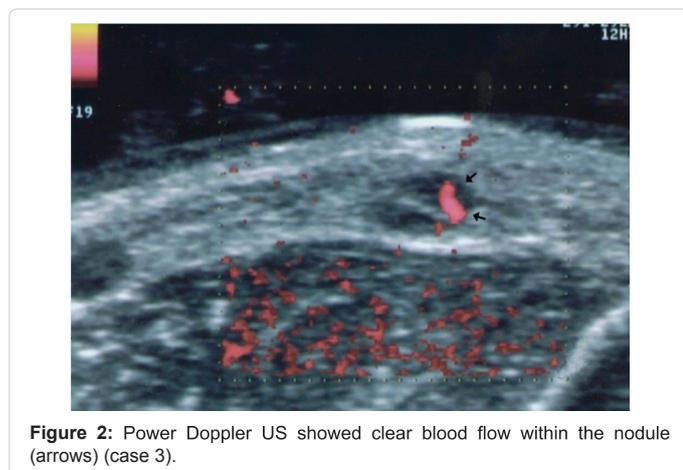
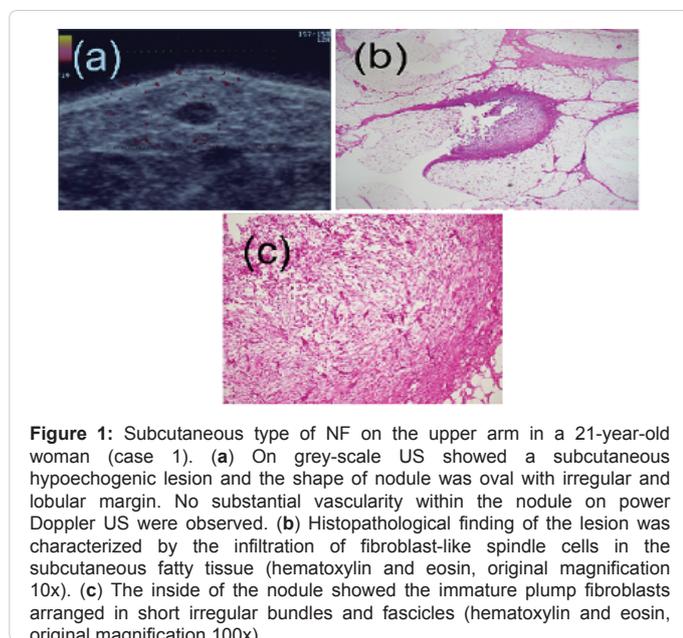
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Case	Age/ Sex	Location	Ultrasonographic feature							Histological feature			
			Size Shape	Margin	Echogenicity (Echotexture)	Fascial tail	Power Doppler flow	Margin	Fibroblast proliferation	Collagen Proliferation	Capillary Dilatation	Attached Fascia	Subtype
1	21/f	Subcutaneous, upper arm	7.8 mm Oval	Irregular and lobular, tadpole-tail	Hypoechoic (Homogeneous)	No	Absent	Poorly defined	Yes	Yes	Yes	No	Fibrous type
2	41/f	Subcutaneous adjacent of the fascia, thigh	17 mm Oval	Irregular and lobular	Hyperechoic with irregular hypoechoic area (Heterogeneous)	Compressed fascia	Absent	Poorly defined	Yes	Yes	Yes	Yes	Predominantly myxoid type
3	37/m	Primarily in the dermis, forearm	8.0 mm Oval	Irregular and lobular, string-like	Hypoechoic with hyperechoic streaks (Heterogeneous)	No	Present	Poorly defined	Yes	Yes	Yes	No	Cellular type

Table 1: Three pathologically confirmed cases of NF.



Cases 2 and 3

We have reported the issues of the ultrasonographic findings of subcutaneous and intradermal NFs [1,2].

Three pathologically confirmed cases of NF were summarized in Table 1. The lesion was in the subcutaneous (case 1), in the subcutaneous adjacent of the fascia (case 2) and primarily in the dermis (case 3). On sonography, all nodules were oval with irregular and lobular margin, averaging 10.9 mm (range, 7.8-17 mm). One case showed clear blood flow within the nodule on power Doppler US (Figure 2) (case 3). Pathologically, the margins of all nodules were poorly defined. Proliferations of fibroblast-like spindle cells without obvious mitotic changes were seen in all cases. All lesions showed myxoid change, collagen proliferations and capillary dilation.

Discussion

The aggressive clinical presentation of NF will usually prompt a biopsy for definitive diagnosis [4]. Due to the histopathology with its high cellularity and high mitotic activity, NF can be misdiagnosed as a malignant soft tissue tumor, especially fibrosarcoma or low-grade myxofibrosarcoma, often leading to unnecessarily aggressive therapy [8]. As NF shows a peculiar clinical behavior characterized by rapid growing, self-limited, spontaneous regression after a few weeks, this peculiar clinical presentation has come to cytogenetic attention. Erickson-Johnson et al. [3] have reported that NF is a novel model of transient neoplasia induced by MYH-USP6 gene fusion, suggesting that USP6 transcriptional upregulation may be the driving force behind the high proliferative activity and growth of NF.

On sonography, there are a few reports [4,5] that the lesions were described as oval or lobulated and hypoechoic or mixed echogenicity with irregular or lobular margin. There are also a few reports [4-6] concerning the imaging features on color Doppler US. Lee et al. [6] suggested that the type in the subcutaneous fat layer or outer muscle fascia between the subcutaneous fat layer and muscle, often shows no substantial blood-flow on color Doppler US.

However, NF reports on power Doppler US have not been studied bibliographically. Mehregan [9] has reported that NF is usually composed of a central solid mass with many irregular projections extending outward into the surrounding fat tissue thus resembling a highly invasive growth. These histopathological findings were seen in all cases.

The usefulness of high-resolution US has enabled the discrepancies of imaging features between intradermal and subcutaneous lesions. When the US and pathological findings in all cases were compared, irregular and lobular margin on US seemed to reflect histological proliferation of collagen and spindle-shaped fibroblasts. No significant different findings between the intradermal and subcutaneous types on

gray-scale US were detected. Concerning the imaging features on power Doppler US, the localized clear blood-flow signals in case 3 detected by power Doppler US also represent the pronounced dilatation of blood vessels and hypervascularity detected by the histological examination [2]. Blood-flow signals, however, were not recognized on power Doppler US in cases 1 and 2. This is possibly because NF in case 3 located in the relatively superficial dermal layer, and vascular dilatation in cases 3 was more abundant compared with cases 1 and 2. We will indicate that it is due to the reason why the dermal layer contains rich capillary vessels as previously described [7].

We think that proliferative findings on both US and histology may be caused by the cytogenetic nature of NF. When the lesion clinically shows rapid growth and self-limited course and shows the proliferative findings of the margin on both US and pathology, the lesion is strongly considered to be NF. From a dermatological perspective, blood-flow signal on power Doppler US may be more detectable in intradermal type than subcutaneous one. Because intradermal nodular fasciitis is in the superficial dermal layer, vascular proliferation in this type may be more abundant compared with subcutaneous one.

Conclusion

When the lesion showed the proliferative findings of the margin on both US and pathology, accompanying with clinical rapid growth and self-limited course, nodular fasciitis should be strongly suggested as one of the skin tumors. From a dermatological perspective, blood-flow

signal on power Doppler US may be more detectable in intradermal type than subcutaneous one.

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