Immunohistological and electron microscopical study of nodular fasciitis of the orbit

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Abstract
We report the case of a 7-year-old Japanese girl with nodular fasciitis which was investigated by immunohistological and electron microscopical methods. An excised nodular lesion in her right orbit showed characteristic histological features of the disease. The fibroblastic cells showed myofibroblastic characteristics, such as immunohistochemically positive reactions against muscle specific actin and vimentin and characteristic electron microscopical appearances. The multinucleated giant cells did not react against any histiocytic markers, including HLA-DR, antimacrophage antigen, lysozyme, and S-100 protein, but the myofibroblastic markers and the electron microscopical study did reveal myofibroblastic characters.

Nodular fasciitis is a proliferation of fibroblastic cells and is one of the commonest tumours of fibrous tissue.1 Its exact cause is still unknown. However, the disease is benign and does not recur after simple excision.1 It is most frequent in the upper limbs, but it is rare in the ocular region and its adnexa.2-10

Histologically the lesion has been reported to consist of plump fibroblastic cells, some multinucleated giant cells, and a small amount of mature collagen bundles.1,11 Many authors have reported that these fibroblastic cells are myofibroblasts,1,11 but the origin of the multinucleated giant cells is still not clearly understood.2,11,12

We report a case of orbital nodular fasciitis, having used histological, immunohistological, and electron microscopic techniques to study the origins of the fibroblastic cells and multinucleated giant cells.

Case report
In October 1989 a healthy 7-year-old Japanese girl noticed a slightly painful mass in the right inner canthus of two months’ duration. By March 1990 the lesion had grown rapidly and the mass measured 25×15 mm (Fig 1, arrow). Magnetic resonance imaging showed a solitary nodular mass in the anterior medial part of the right orbit, the hypointense mass on a T1 weighted image, the hyperintense mass on a T2 weighted image (Fig 2, arrow).

On 20 March 1990 the lesion was excised under general anaesthesia. It was a small nodular mass located in the orbit subcutaneously in the right upper eyelid. Six months after the operation the wound had healed well, leaving only a small remnant of the original mass.

MICROSCOPIC EXAMINATION
The excised mass was cut in half and promptly fixed with neutralised formalin. The paraffin embedded sections were stained with haematoxylin and eosin.

IMMUNOHISTOCHEMICAL EXAMINATION
Immunostaining was performed on slides prepared from formalin fixed, paraffin embedded tissue by routine avidin-biotin complex (ABC) methods11 using commercially available polyclonal or monoclonal antibodies with Vectastain ABC kits (Vector Laboratories, Buringame, California, USA). Peroxidase activities were developed in 3,3'-diaminobenzidine tetrahydrochloride medium (Dojin, Tokyo, Japan). The source and dilution of the antibodies used were as follows: Vimentin: (Dakopatts, Glostrup, Denmark, dilution 1:10); keratin: (MA-902; Enzo Biochem, New York, USA); muscle specific actin: (HHF35; Transformation Res, Framingham, Massachusetts, USA, 1:8000); S-100 protein: (Dakopatts, 1:500); HLA-DR: (Dakopatts, 1:40); antimacrophage: (MA935; Enzo Biochem, 1:8000); α-1-
antitrypsin: (Dakopatts, 1:400); and lysozyme: (Dakopatts, 1:400). Anti-S-100 protein antibody, antilysozyme antibody, and alpha-1 antitrypsin antibody were rabbit polyclonal antibodies, while the others were mouse monoclonal antibody.

**ELECTRON MICROSCOPIC EXAMINATION**

A small fragment of the resected tissue was fixed with 4% buffered glutaraldehyde solution, post-fixed in 1% osmium tetroxide, dehydrated, and embedded in epoxy resin. Thin sections were stained with uranyl acetate-lead citrate and examined with an electron microscope (JEM-100CX, Tokyo, Japan) at an accelerated 80 K voltage.

**Results**

**LIGHT MICROSCOPIC FINDINGS**

The lesion was composed of plump stellate or spindle-shaped fibroblastic cells, arranged in a parallel haphazard fashion (Fig 3). The nuclei of the fibroblastic cells were round to oval, without atypia. Mitotic figures were only rarely observed. An extravasation of the red blood cells was present, and multinuclear giant cells (Fig 4, arrows) were also noticed in the myxomatous stroma.

**IMMUNOHISTOCHEMICAL FINDINGS**

The fibroblastic cells reacted positively with antivimentin and antimuscle specific actin antibodies (Fig 5a), while acting negatively with antimacrophage, anti-HLA DR, antikeratin antibodies, and anti-S-100 protein antibodies. Multinuclear giant cells showed a positive reaction against the antivimentin and antimuscle specific actin antibodies (Fig 5b) but showed a negative reaction to the other markers.

**ELECTRON MICROSCOPIC FINDINGS**

The fibroblastic cells had many endoplasmic reticula (Fig 6a). Parallel bundles of actin-like filaments with fusiform densities (Fig 6a, arrows) were present under the plasma membrane. Desmosome-like plaque was noticed between the cells (Fig 6b, arrow).

The multinuclear giant cells had an irregular margin with finger-like processes. A rough endoplasmic reticulum, numerous microfilaments, and dense bodies were also noted in the cytoplasm.

**Discussion**

The histopathological study of this case revealed the characteristic findings of nodular fasciitis, such as proliferation of plump spindle-shaped cells located haphazardly within the mucoid...
matrix and admixed with many multinuclear giant cells. These findings have often been mistaken for a sarcomatous lesion or other benign spindle cell lesions. A sarcomatous lesion was ruled out because of the lack of any mitotic figures and cellular atypia. In addition, other benign spindle cell lesions could be excluded by clarifying the characteristics of the cells as follows. The major cells of this case were spindle shaped cells which gave an immunohistologically positive reaction to muscle specific actin and vimentin but a negative reaction to other markers, and we demonstrated dense patches electron microscopically in the cytoplasm and desmosome-like plaques. These appearances were identical with those of the myofibroblasts.

On the other hand the presence of multinuclear giant cells was one of the histological features of the disease, and these cells were believed to have originated from histiocytes. Recently Okaye and Watanabe reported from electron microscopical findings that multinuclear cells in this lesion originated from myofibroblasts. Diaz-Flores et al also suggested that both fibroblastic cells and multinuclear cells originate from vascular pericytes. However, the exact origin of these cells has yet to be elucidated. Immunohistochemically the multinucleate giant cells showed a positive reaction against the antisem specific actin and vimentin but a negative reaction against anti-macrophase, α-1-antitrypsin, lysozyme and HLA-DR antibodies, which usually reacted with macrophages. The lack of any positive immunohistochemical staining might sometimes be due to poor fixation and embedding procedures, though a positive reaction of the macrophages in the same section further suggested a negative reaction of those giant cells. Electron microscopically the giant cells showed numerous peripheral microfilaments with dense bodies and endoplasmic reticulum, which are a feature of smooth muscle cells.

It might be true that some giant cells showed different immunohistological reactivities (antismuscle specific actin negative) so these possibilities still do not exclude the fact that multinuclear giant cells may have various other different origins. However, in considering both the immunohistochemical and electron microscopic findings together, we could say at least that some of the multinuclear giant cells originated from the myofibroblasts.