Phakomatous Choristoma of the Eyelid

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This article describes the first report of phakomatous choristoma of the eyelid in Korea. A six-month-old boy underwent excision of a congenital inferonasal orbital mass arising from the left lower lid. A dermoid cyst was suspected, however a diagnosis of phakomatous choristoma was made following conventional histology. An immunohistochemical study of this rare benign congenital tumor was conducted. The cuboidal epithelial cells comprising this choristoma showed strongly positive cytoplasmic staining with S-100 protein and vimentin. They also showed focally positive staining with a neuron-specific enolase, while they showed no immunoreactivity to cytokeratin or epithelial membrane antigen. The results of the immunohistochemical study support the conclusion that this tumor is of lenticular anlage origin.

Key words: congenital tumor, eyelid, phakomatous choristoma

INTRODUCTION

Phakomatous choristoma is a rare congenital tumor, presumed to be composed of lenticular anlage. Zimmerman first reported three cases of this tumor in 1971.1 Since then, approximately 11 other cases have been reported in the literature.2-12 Microscopic evaluation reveals plump, cuboidal epithelial cells that resemble the “bladder cells” of the human lens.2-6 These features strongly suggest that this type of tumor is composed of lenticular anlage. Furthermore, the results of immunohistochemical study indicate that the cells of this tumor synthesize several types of lens-specific proteins.2,3,7,8

The purpose of this paper was to document one particular case of phakomatous choristoma, includ-

CASE REPORT

A two-month-old Korean boy was referred to the Department of Ophthalmology at Chungbuk National University Hospital for evaluation and management of a mass in the left lower eyelid (Fig. 1). The mass had been present since birth and had remained unchanged in size and character. The child was born at full-term without complications.

Results of an ophthalmic examination showed a firm, round, smooth-edged subcutaneous mass in the inferomedial aspect of the left lower eyelid. The lesion was nonfluctuant and was free from the overlying skin. No discharge or discoloration was noted in the overlying skin of the mass. No other ocular or systemic abnormalities were detected. The patient’s cycloplegic refraction was +0.50D sph = −1.00D cyl A180° in the right eye and −4.50D cyl A180° in the

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left. Computed tomography demonstrated a 10 × 10 mm (anterior-posterior × transverse) mass inferomedial to the left globe (Fig. 2). When enhanced with Ultravist-300 contrast (Schering, Berlin, Germany), the mass appeared relatively well-circumscribed, heterogeneous and solid. There was no evidence of bone erosion. The radiologic diagnosis made at the time was a dermoid cyst.

At six months of age, the patient underwent excision of the mass. During the operation, the mass was found to be firmly adherent to the tarsus and the palpebral conjunctiva of the left lower fornix, nasally. The mass was not encapsulated, but was completely excised. On gross examination, a pale, firm, rounded mass measuring 12 × 10 mm was observed. The cut surface of the tumor showed a faint reticulated pattern of white bands. Subsequent clinical procedures were unremarkable. One month after surgery, the patient’s cycloplegic refraction was −2.25D cyl A180° in the left eye.

The tumor was composed of dense, collagenous tissue containing cords and islands of cuboidal epithelial cells with round, centrally located nuclei, on microscopy (Fig. 3). The epithelial structures were surrounded by thick, irregular, PAS-positive basement membranes (Fig. 3). Many of the epithelial elements formed glandular structures that contained an amorphous, eosinophilic material. Some of the epithelial cells appeared bloated and tended to resemble the bladder cells or Wedl cells encountered in human cataracts (Fig. 3). Small foci of dystrophic calcification were present within the epithelial structure (Fig. 3).

Immunohistochemical testing was performed with antibodies against vimentin (V9; Novo, Newcastle, UK), S-100 protein (S1/61/69; Novo, Newcastle, UK), neuron-specific enolase (5E2; Novo; Newcastle, UK), cytokeratin (5D3 & LP34; Novo, Newcastle, UK), and epithelial membrane antigen (GP1.4; Novo, Newcastle, UK). The epithelial cells in the tumor showed intense immunoreactivity to vimentin (Fig. 4) and S-100 protein (Fig. 4). They demonstrated a focally positive reaction to neuron-specific enolase. They showed no immunoreactivity to cytokeratin or epithelial membrane antigen.

**DISCUSSION**

Tumors of the lens do not occur in humans, but lens anlagen has been reported to aberrantly develop in the lower lid nasally as a phakomatous choristoma.1-12 Up to now, a total of 14 cases of this unusual tumor have been reported. This is the second reported case of phakomatous choristoma in an Asian patient. All cases, including the present one, have shared several common features. All of the patients were under six months of age. The lesions were located in the inferomedial lid in the subcutaneous tissue. On computed tomography, frequent
extension into the anterior inferior orbit was detected. Therefore, the most frequent preoperative diagnosis was dermoid cyst,\textsuperscript{1,2,4,5,6} as in our case. During the neonatal period, the clinical differential diagnosis included hemangioma, rhabdomyosarcoma, and juvenile xanthogranuloma. Phakomatous choristoma of the eyelid should also be included in the clinical differential diagnosis of congenital tumors involving the nasal aspect of the lower lid.

In all cases, except one case of induced anisometropia reported by Rosenbaum et al.,\textsuperscript{2} the results of ophthalmologic examination were other-
wise unremarkable. Our patient showed anisometropia. Induced anisometropia may be associated with the age or size of the tumor at the time of surgery, as in the case reported by Rosenbaum et al.,\(^2\) in which the phakomatous choristoma of a 13-month-old-boy was excised. In that case, the tumor was larger than in previously reported cases.

The light microscopic features of the tumor in our case were similar to those of the previously reported cases.\(^{1-12}\) Therefore, we diagnosed the tumor in our patient as phakomatous choristoma. Small foci of dystrophic calcification were noted. Dystrophic calcification may occur in long-standing cataracts (cataracta calcarea). Most often this is due to secondary accumulation of granular calcareous material and crystalline bodies of calcospherites.

In the previous reports, immunoreactivity to S-100 protein was strongly positive in the epithelial tumor cells.\(^{2,3,7,8}\) This finding is consistent with our result. The recent detection of S-100 immunoreactivity in the lens of the rabbits supports the theory of the lenticular origin of this type of choristoma.\(^{13}\) There have been some differences in the results of immunohistochemical tests for some types of antigens. Sinclair-Smith et al.\(^3\) reported negative staining to vimentin, while intense immunoreaction to vimentin was noted in the epithelial cells in our case, as well as in the other reports.\(^{2,7,8}\) Rosenbaum et al.\(^2\) observed that focal cytoplasmic staining of the epithelial cells with a keratin cocktail reflected their origin from the surface ectoderm. However, negative staining was shown in several studies,\(^3,7,8\) including ours. It has been demonstrated that vimentin is a major intermediate filament in human lens epithelial cells.\(^{14}\) Cytokeratins are present in the lens during the early stage of development and disappear after the eighth week in the human embryo.\(^{15}\) Therefore, the finding of positive immunoreactivity to vimentin, and negative immunoreactivity to cytokeratins, in the epithelial cells of phakomatous choristoma is consistent with lenticular differentiation.

Kamada et al.\(^8\) reported the first evidence that the epithelial cells of phakomatous choristoma were positive for neuron-specific enolase. We also observed focially positive staining for this enzyme. The expression of neuron-specific enolase may be associated with the lenticular origin of the tumor cells because the lens epithelium showed moderate neuron-specific enolase activity during early development in the chicken embryo.\(^{16}\)

The above immunohistochemical evidence provides strong support for our conclusion that phakomatous choristoma is a tumor composed of lenticular anlage. In all cases, the mass was found at the inferomedial portion of the orbit. The lens develops
from the surface ectoderm of the embryo, following contact and interaction between the optic vesicle and the ectoderm. Therefore, the consistency of the location of such tumors may be clinical evidence that the tumor arises as a result of abnormal migration of activated cells or ectopic induction of ectoderm.

The therapy of choice for phakomatous choristoma is wide local excision. In two reported cases, the tumor was only partially excised. These patients were followed until 7 1/2 years of age and 16 months of age without evidence of any recurrent or residual tumors, or of ocular abnormality. These observations suggest the benign clinical nature of this tumor.

In conclusion, phakomatous choristoma of the eyelid should be included in the clinical differential diagnosis of tumors involving the nasal aspect of the lower eyelid.

REFERENCES