Subepithelial corneal deposits in IgG λ myeloma

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SUMMARY A 46-year-old female presented with disseminated IgG λ myeloma and unusual, translucent, subepithelial deposits in the periphery of both corneas. Electrophoretic studies showed that the deposits consisted of an IgG λ paraprotein identical to that found in the serum. Minute amounts of the paraprotein were also present in the tears.

Corneal crystals are well documented in patients with hypergammaglobulinaemia.¹⁻⁷ The crystals may be found at various depths in the cornea and are composed of immunoglobulin similar to that found in the serum.^{3,4,6,7} In two patients non-crystalline stromal deposits of immunoglobulin have been reported^{8,9}; in one case⁹ the deposits extended into the epithelium. We report on a patient with large subepithelial deposits of immunoglobulin in the periphery of both corneas—a presentation that has not been previously described.

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Fig. 1 Clinical photograph of the right cornea showing translucent peripheral deposits.

Case report

A 46-year-old female presented in October 1985 with a history of bilateral mild ocular irritation and photophobia. Corrected visual acuities were 6/6 in both eyes. Translucent subepithelial deposits were present in the periphery of both corneas, with a lucid zone of normal cornea separating them from the limbus. The deposits were larger in the upper and

Fig. 2 Slit-lamp photograph of the right cornea showing subepithelial location of the deposits with extension into the stroma. Note region of normal cornea between lesion and limbus.

Fig. 3 Medium power haematoxylin and eosin stained section. Amorphous eosinophilic material separates epithelium and Bowman's layer (B) and extends (arrow) into anterior stroma (S).

lower regions of the cornea (Figs. 1 and 2). The remainder of the ocular findings were normal apart from a small pterygium on the left eye.

Physical examination showed an obese woman with mild angina and hypertension. She had been followed up since February 1984 with a high erythrocyte sedimentation rate of 120 mm/h and an unexplained IgG λ monoclonal gammopathy of approximately 40 g/l with associated immunoparesis. Repeated skeletal surveys and bone marrow examinations had shown no evidence of myeloma.

Bence Jones protein was subsequently found in the urine, and renal biopsy confirmed a λ chain nephropathy. Electromyographic studies showed extensive denervation in the intrinsic muscles of both hands and feet with normal proximal muscles, in keeping with a myeloma induced polyneuropathy. A diagnosis of disseminated myeloma was made, and treatment with upper and lower half body irradiation was given in early 1987.

The patient remains well but her paraprotein levels are high and the corneal deposits are unchanged. She has, however, developed granular deposits beneath the anterior and posterior lens capsules in a sunflower distribution. Her visual acuities have dropped to 6/9.

Material and methods

A corneal lamellar biopsy was taken and the specimen fixed in 10% buffered formalin. Routine histological stains including those for amyloid were employed as well as a battery of immunoperoxidase stains for immunoglobulins. A further small piece of

Fig. 4 Agarose gel electrophoresis. Lane 1=control serum; lane 2=patient's serum; lane 3=solubilised corneal lesion; lane 4=patient's tears; lane 5=control tears. A cathodally migrating paraprotein is present in the patient's serum and corneal lesion (closed arrow) with a faint band in the patient's tears (open arrow).

tissue was fixed in glutaraldehyde and submitted for electron microscopy.

A corneal scrape of the lesion in one eye was performed. The epithelium and deposit were removed as a plaque, which separated easily from Bowman's layer. The scrapings were solubilised in 0.9% NaCl and electrophoresed on agarose gel by the Paragon system and on polycarylamide gel.¹⁰ Immunofixation electrophoresis was performed on agarose gel by the method of Johnson¹¹ with minor modification.

Tears were collected from the medial canthal region with capillary tubes.

Results

Light microscopy showed large amounts of amorphous eosinophilic material between Bowman's layer and the epithelium, with some extension into the superficial stroma (Fig. 3). The amorphous material did not stain for amyloid. Immunoperoxidase stains showed some staining for IgG and IgA, but staining for κ and λ light chains did not differentiate between the two. Electron microscopy showed no evidence of the distinct fibrillar ultrastructure typical of amyloid.

Agarose gel electrophoresis (Fig. 4) showed the patient's serum to contain a cathodally migrating paraprotein. The solubilised corneal lesion contained a similarly migrating protein. Immunofixation electrophoresis (Fig. 5) showed the protein to be an IgG λ paraprotein identical to that found in the serum.

Fig. 5 Immunofixation electrophoresis of solubilised corneal deposits. Lane 1=standard electrophoresis; lane 2=anti- γ ; lane 3=anti- γ ; lane 4=anti- μ ; lane 5=anti- κ ; lane 6=anti- λ . Staining in lanes 2 and 6 identify the paraprotein as IgG λ .

On sodium dodecyl sulphate (SDS)-polyacrylamide gel electrophoresis the paraproteins in the serum and the cornea were shown to be of a similar molecular weight, namely, +150 000 Daltons (data not shown). Electrophoresis of the tears showed only a trace of the paraprotein.

Discussion

The patient was hypergammaglobulinaemic for over 20 months before her ophthalmic examination. Her ocular symptoms were mild, without the severe photophobia⁹ or loss of visual acuity¹⁸ reported by other workers.

Corneal crystals are a well documented finding in hypergammaglobulinaemia.¹⁻⁷ Only two patients have been reported as having non-crystalline deposits.^{8,9} In both the deposits were located in the stroma. By means of immunohistological techniques the crystals and deposits have been shown to consist of immunoglobulins. In our patient the deposits were predominantly subepithelial, and the large amounts of tissue obtained by scraping enabled us to perform electrophoretic studies. The corneal deposits consisted almost entirely of IgG λ paraprotein identical to that found in the serum.

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