impair mineralisation may limit the hypocalcaemic effect. The ease with which diphosphonates may be used and the absence of appreciable side effects⁴ make this an attractive treatment not only for immobilisation hypercalcaemia but also for the more commonly observed hypercalciuria and bone loss.

We thank Gentili for the clodronate used in these patients.

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Department of Human Metabolism and Clinical Biochemistry, University of Sheffield Medical School, Sheffield S10 2RX

ASHLEY J P YATES, BMEDSCI, MRCP, Medical Research Council clinical research fellow

T HUGH JONES, BSC, MB, medical registrar

KEITH I MUNDY, MRCP, medical registrar

ROBERT V HAGUE, MRCP, consultant physician

COLIN B BROWN, BSC, MRCP, consultant physician

DIANE GUILLAND-CUMMING, PhD, research assistant

JOHN A KANIS, FRCP, MRCPATH, reader

Correspondence to: Dr J A Kanis.

Hyperviscosity syndrome in IgE myeloma

Only 11 cases of IgE myeloma were reported during 1967-81.¹ The disease differs from classic myeloma in that patients affected are younger and predominantly male. Anaemia is severe (several patients have either presented with or developed plasma cell leukaemia), and overall survival is short (<24 months). Hypercalcaemia, renal failure, osteolytic lesions, and osteosclerosis^{2,3} are rare. We report on a patient with a classic hyperviscosity syndrome, a previously unrecognised complication of IgE myeloma.⁴

Case report

A 66 year old woman was diagnosed as having a light chain myeloma in December 1980, when her serum IgG, IgA, and IgM concentrations were all low, Bence-Jones protein was present in serum and urine, and cryoglobulin was noted in the serum. The diagnosis was confirmed by a bone marrow biopsy showing >50% plasma cells. Skeletal survey and renal function were normal. Cyclophosphamide 50 mg twice daily and prednisolone 20 mg daily were given, and she progressed satisfactorily.

In April 1982 she developed generalised weakness and became semi-comatose. The hyperviscosity syndrome was diagnosed as she had the classic fundal haemorrhagic changes of hyperviscosity (figure). Plasma viscosity could not be measured accurately because of the presence of a cryoglobulin, which was found to consist of IgE κ monoclonal protein. Gross antigen excess made measurement by radioimmunoassay difficult, but densitometry gave a serum IgE paraprotein concentration of 3 g/l. Other serum concentrations were: total protein 64 g/l, IgG 3.0 g/l (normal 9-16 g/l), IgA 0.6 g/l (normal 0.9-4.5 g/l), and IgM 0.2 g/l (normal 0.65-2.0 g/l). Haemoglobin concentration was 10.9 g/dl; white cell count 6.3×10^9 /l (77% neutrophils, 15% lymphocytes, 5% monocytes, 3% eosinophils, and no plasma cells); and platelet count 329×10^9 /l. The marrow had 50% plasma cells, which contained IgE κ , and the remaining marrow elements were remarkably well preserved.

She immediately underwent plasmapheresis, receiving two exchanges of three litres at a 12 hour interval. The replacement fluid, which was purified protein fraction, was returned using a warming coil, thus avoiding flow problems. Rapid clinical improvement followed and, although the reduction in serum paraprotein concentration was not assessed, the measured titre of cryoglobulin fell dramatically.

Subsequent treatment was with CHOP (cyclophosphamide 750 mg/m², doxorubicin 30 mg/m², and vincristine 2 mg all intravenously on day 1, and prednisolone 40 mg daily by mouth for five days) for four courses at six-weekly intervals. This produced a good partial response, reducing plasma cells in the marrow to below 10%, and treatment was stopped.

Her clinical condition began to deteriorate in January 1983, when further treatment with CHOP was ineffective. She died of marrow failure associated with infection 27 months after presentation. Necropsy was not performed.

Retinal photograph showing papilloedema and haemorrhage associated with hyperviscosity caused by IgE paraprotein acting as a cryoglobulin.

Comment

The hyperviscosity syndrome occurred when the serum IgE concentration was 3 g/l and was caused by the physical property of the protein acting as a cryoglobulin. On relapse the concentration was 2 g/l, but this was not associated with clinical hyperviscosity. Further biochemical analysis of the protein showed that the molecular size and molecular weight of the heavy chain were consistent with those of IgE. Results of further enzymatic dissection of the protein are awaited. The initial response to plasmapheresis and lack of technical problems were gratifying, and we recommend this treatment for cryoglobulinaemia with hyperviscosity.

The CHOP chemotherapy regimen was used because previous treatment with an alkylating agent and steroids at low dose had ceased to be effective. We were pleasantly surprised by the response to treatment, and are uncertain whether prolonged chemotherapy may have caused additional improvement. The fundal appearances returned to normal six weeks after plasmapheresis. Of the 11 patients studied by Endo *et al.*,¹ only two survived for longer than 24 months, but details of their treatment were not discussed. We consider plasmapheresis and the CHOP regimen to be valuable alternative treatment for this unusual form of myeloma.

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Haematology Department, Royal Victoria Infirmary, Newcastle upon Tyne NE1 4LP

S J PROCTOR, MRCP, MRCPATH, consultant and senior lecturer in medicine and haematology

Radiotherapy Department, South Cleveland Hospital, Middlesbrough TS4 3BW

S L CHAWLA, BSC, FFR, consultant radiotherapist and oncologist

Newcastle General Hospital, Newcastle upon Tyne NE4 6BE

A G BIRD, MRCP, MRCPATH, consultant immunologist and senior lecturer in immunology

J STEPHENSON, FIMLS, senior chief in haematology

Correspondence to: Dr S J Proctor.