Fatal anaphylaxis in systemic mastocytosis

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SUMMARY A 42-year-old woman died after an episode of anaphylaxis associated with a raised serum histamine level. A diagnosis of systemic mastocytosis was established, with lymphadenopathy and hepatosplenomegaly, not associated with the usually pre-existing skin lesions of urticaria pigmentosa.

Mastocytosis is an uncommon disease characterised by abnormal proliferation of mast cells. It usually involves the skin alone, causing the typical pigmented macules of urticaria pigmentosa. In about 10% of such cases additional systemic involvement has been demonstrated (Sagher and Even-Paz, 1967) with infiltration predominantly of the reticuloendothelial system. This produces symptoms attributable both to direct tissue invasion and to release of histamine (Mutter et al., 1963). Rarely, the systemic component occurs without urticaria pigmentosa.

We report a case of systemic mastocytosis with lymphadenopathy, hepatosplenomegaly, marrow infiltration, and widespread osteosclerosis, but without skin lesions, which terminated in anaphylactic shock associated with a raised serum histamine level.

Case report

A 42-year-old woman was admitted in a shocked state to East Ham Memorial Hospital in October 1976. Five years previously she had suffered epigastric pain, and a diagnosis of a probable duodenal ulcer was made after a barium meal examination. She had a four-year history of intermittent flushing and pruritus affecting the face and limbs, and a two-year history of recurrent bouts of profuse watery diarrhoea. Two days before admission she developed a ‘flu-like’ illness associated with vomiting and diarrhoea, as well as flushing and pruritus of the face, limbs, and trunk. On the day of admission her condition suddenly deteriorated, she became rapidly dyspnoeic and collapsed, and on arrival at East Ham Hospital was pulseless with an unrecordable blood pressure. Her condition improved after treatment with intravenous fluids, antibiotics, and hydrocortisone but she remained anuric and was transferred to St Bartholomew’s Hospital for treatment of acute renal failure.

On examination at St Bartholomew’s she was pale and had mild icterus, periorbital oedema, purpura, and ecchymoses; the pulse was 100/minute and blood pressure 120/90 mm Hg; bilateral expiratory rhonchi were present. There was moderate cervical and axillary lymphadenopathy; the liver was enlarged to 10 cm, and the spleen to 5 cm, below the costal margin.

The haemoglobin was 11.5 g/dl, reticulocytes 0.1%, white cell count 6.5 x 10⁹/l, and platelets

Fig. 1 Abdominal x-ray October 1976: diffuse osteosclerosis affecting vertebral and pelvic bones.
Fig. 2 Mast cells in the bone marrow exhibiting typical, finely granular cytoplasm and central, frequently indented nuclei (arrow). (Haematoxylin and eosin × 640).

Fig. 3 Coarse, irregular bony trabeculae with mast cell infiltration of the marrow spaces. (H and E × 100).
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37.0 \times 10^9/l. The blood film showed moderate anisopoikilocytosis and a leucoerythroblastic picture (promyelocytes 3\%, myelocytes 2\%, metamyelocytes 1\%, neutrophils 66\%, lymphocytes 26\%, monocytes 2\% with 8\% nucleated red cells). A buffy coat preparation revealed occasional circulating mast cells. Repeated attempts at bone marrow aspiration were unsuccessful. Neutrophil alkaline phosphatase score was 210 (normal range 15-100). Prothrombin time was 20 seconds (control 15 seconds), partial thromboplastin time normal, fibrinogen titre normal, and fibrinogen/fibrin degradation products greater than 10 \(\mu g/ml\) but less than 40 \(\mu g/ml\). Blood cultures were consistently negative.

X-rays demonstrated a diffuse osteosclerosis affecting the vertebral column, pelvis, and limb bones (Fig. 1).

Marrow trephine biopsy from the iliac crest, which was difficult due to extreme hardness of the bones, showed replacement of normal marrow elements by mast cells and fibrous tissue. The bone trabeculae were thickened and irregular (Figs 2 and 3).

Postmortem percutaneous liver biopsy revealed a marked excess of mast cells, of varying degrees of maturity, within widened portal tracts, confirming the diagnosis of systemic mastocytosis (Fig. 4). The areas of mast-cell infiltration were associated with extensive fibrosis.

Despite effective peritoneal dialysis the patient died five days after admission. A full postmortem examination was refused.

Discussion

The histological diagnosis of systemic mastocytosis is frequently difficult, particularly if clinical suspicion of the disease is lacking. Examination of routine tissue sections stained with haematoxylin and eosin

Fig. 4 Portal tract containing numerous mast cells, the coarse metachromatic granules staining well with Giemsa stain (\(\times\) 1000).
has led to erroneous diagnoses in the past (Mutter et al., 1963), the cells exhibiting non-specific, finely granular, eosinophilic cytoplasm and elongate nuclei. Specific staining with Giemsa or toluidine blue is essential to demonstrate the coarse metachromatic granules that readily identify the cells, Giemsa stain being used in this patient to confirm the diagnosis. Alcian blue is also of use, staining the mast cell granules bright blue, reflecting their high mucopolysaccharide content.

Tissue fibrosis is a frequent accompaniment of mast cell infiltration, as seen in this case in liver and bone marrow, presumably related to the chemotactic activity of mast cell products, for fibroblasts. The fibrotic process was associated with a widespread osteosclerosis, which was remarkably homogeneous in many bones, with no obvious lytic areas. This is unlike the more commonly reported appearance of mixed lytic and sclerotic lesions suggested as typical of the disease (Gagnon et al., 1975).

The clinical course in this patient was typical, with a history of duodenal ulceration, intermittent diarrhoea, and skin flushing, but unusual in that no actual skin lesions were present. It was particularly interesting in its mode of termination. There have been few reported cases of systemic mastocytosis with fatal outcome (Sagher and Even-Paz, 1967). In the majority, death has followed extensive mast cell proliferation involving a variety of organs, leading to cachexia, marrow failure, or leukemic transformation.

In our case, anaphylactic shock occurred with cardiovascular collapse and bronchospasm, suggesting a catastrophic release of histamine by mast cells. This interpretation was later supported by the finding of a grossly elevated serum histamine level of 31.0 ng/ml (normal serum < 0.5 ng/ml), as estimated by enzymatic isotopic assay (Beavan et al., 1972). Previous workers have reported a variety of stimuli capable of causing histamine release in patients with this disease, including infection, radiation, and drugs (Mutter et al., 1963), but we have not found any reported case where the effect on the patient has been so profound.

It may be that the tissue eosinophilia, so often seen in association with mastocytosis, is protective, perhaps by virtue of the eosinophils' capacity to phagocytose mast cell granules (Welsh and Geer, 1959). The eosinophil granule also contains several enzymes which inactivate liberated vasoactive compounds, i.e., aryl sulphatase, which inactivates slow reacting substance of anaphylaxis (Wasserman et al., 1975), histaminase (Hubscher, 1975), and kininase (Melmon and Cline, 1967). In this case, no significant eosinophilia was found in blood or tissues, a situation which could have rendered the individual more susceptible to the effects of mast cell degranulation, thus resulting in the sudden death of a patient in whom the disease did not appear to have reached an advanced stage.

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References


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