- 10 Rissanen V, Romo M, Siltanen P. Pre-hospital sudden death from ischaemic heart disease—a post mortem study. *Br Heart J* 1978;40:1025-33.
- 11 Friedman M, Manwaring JH, Rosenman RH, Donlon G, Ortego P, Grube SM. Instantaneous and sudden deaths. Clinical and pathological differentiation in coronary artery disease. *JAMA* 1973;225:1319-28.
- 12 Goldstein S. The necessity of a uniform definition of sudden coronary death: witnessed death within 1 hour of the onset of acute symptoms. *Am Heart J* 1982;103:156-9.
- 13 Kannel WB, Doyle JT, McNamara PM, Quickenton R, Gordon T. Precursors of sudden coronary death: factors related to the incidence of sudden death. *Circulation* 1975;51:606-13.
- 14 Goldstein S, Landis JR, Leighton R, et al. Characteristics of the resuscitated out-of-hospital cardiac arrest victim with coronary heart disease. *Circulation* 1981;64:977-84.
- 15 Hallstrom AP, Cobb LA, Ray R. Smoking as a risk factor for recurrence of sudden cardiac arrest. *N Engl J Med* 1986;314:271-6.
- 16 Wilber DJ, Garan H, Finkelstein D, et al. Out-of-hospital cardiac arrest: use of electrophysiologic testing in the prediction of long-term outcome. *N Engl J Med* 1988;318:19-24.
- 17 Northcote RJ, Flannigan C, Ballantyne D. Sudden death and vigorous exercise—a study of 60 deaths associated with squash. *Br Heart J* 1986;55:198-203.
- 18 Rosman HS, Goldstein S, Landis JR, et al. Clinical characteristics and survival experience of out-of-hospital cardiac arrest victims without coronary heart disease. *Europ Heart J* 1988;9:17-23.
- 19 McLaren CJ, Gersh BJ, Sugrue DD, et al. Out-of-hospital cardiac arrest in patients without clinically significant coronary artery disease—comparison of clinical, electrophysiological and survival characteristics with those in similar patients who have clinically significant coronary artery disease. *Br Heart J* 1987;58:583-91.
- 20 Skale BT, Miles WM, Heger JJ, Zipes DP, Prytowsky EN. Survivors of cardiac arrest: prevention of recurrence by drug therapy as predicted by electrophysiologic testing or electrocardiographic monitoring. *Am J Cardiol* 1986;57:113-9.
- 21 McLennan JM, Henderson E, Morris KI, Dargie HJ. Ventricular arrhythmias in patients with hypertensive left ventricular hypertrophy. *N Engl J Med* 1987;317:787-92.
- 22 Kannel WB, Schatzkin A. Sudden death: lesions from subsets in population studies. *J Am Coll Cardiol* 1985;5:141-9B.
- 23 Levy D, Anderson KM, Savage DD, Balkus SA, Kannel WB, Castelli WP. Risk of ventricular arrhythmias in left ventricular hypertrophy: the Framingham heart study. *Am J Cardiol* 1987;60:560-5.
- 24 Boudoulas H, Kligfield P, Wooley CF. Mitral valve prolapse: sudden death. In: Boudoulas H, Wooley CF, eds. *Mitral valve prolapse and the mitral valve prolapse syndrome*. Mount Kisco, NY: Futura, 1988:591-605.
- 25 Maron BJ, Savage DD, Wolfson JK, Epstein SE. Prognostic significance of 24 hour ambulatory monitoring in patients with hypertrophic cardiomyopathy: a prospective study. *Am J Cardiol* 1981;48:252-7.
- 26 McKenna WJ, England D, Doi YL, Deanfield JE, Oakley CM, Goodwin JF. Arrhythmia in hypertrophic cardiomyopathy. I. Influence on prognosis. *Br Heart J* 1981;46:168-72.
- 27 Thiene G, Nava A, Corrado D, Rossi L, Pennelli N. Right ventricular cardiomyopathy and sudden death in young people. *N Engl J Med* 1988;318:129-33.
- 28 Maxwell JD, Knapman P. Effect of coroner's rules on death certification for alcoholic liver disease. *Br Med J* 1985;291:708.
- 29 Randall B. Fatty liver and sudden death. *Hum Pathol* 1980;2:147-53.
- 30 Panos RJ, Sutton FJ, Young-Hyman P, Peters R. Sudden death associated with alcohol consumption. *PACE* 1988;11:423-4.
- 31 Voigt J. Reflections on the value of histological examination of the cardiac conduction system in cases of natural unexpected death. *Forensic Sci* 1976;8:29-31.
- 32 James TN. Normal variations and pathologic changes in structure of the cardiac conduction system and their functional significance. *J Am Coll Cardiol* 1985;5:71-8B.
- 33 Bharati S, Lev M. Congenital abnormalities of the conduction system in sudden death in young adults. *J Am Coll Cardiol* 1986;8:1096-104.

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Lesson of the Week

Hyperinfection with strongyloides after treatment for adult T cell leukaemia-lymphoma in an African immigrant

A Pagliuca, D M Layton, S Allen, G J Mufti

Strongyloides hyperinfection is frequently fatal but potentially treatable; patients at risk should be screened before beginning immunosuppressive treatment

Infection with the intestinal nematode *Strongyloides stercoralis* is prevalent in tropical and subtropical latitudes, particularly west Africa, the Caribbean, and South East Asia. Once acquired, strongyloides infection may be perpetuated by virtue of the unique autoinfection cycle of the organism. In immunocompromised hosts this process may be enhanced, culminating in dissemination. Up to 77% of these cases prove fatal.¹ We report a case of strongyloides hyperinfection that developed after treatment of adult T cell leukaemia-lymphoma.

Case report

A 27 year old Ghanaian man recently arrived in the United Kingdom presented in November 1987 complaining of bone pain, thirst, and polyuria with widespread lymphadenopathy and an enlarged liver and spleen. Investigations disclosed leucocytosis ($53.4 \times 10^9/l$) with numerous large pleomorphic T cells showing multilobed nuclei, hypercalcaemia (5.1 mmol/l), and multiple osteolytic lesions. Fluorescence cytometry showed the T cells to be of helper (CD4) phenotype with expression of interleukin 2 receptor (CD25) and HLA-DR antigens characteristic of adult T cell leukaemia-lymphoma. Seropositivity to human T cell lymphotropic virus type I (HTLV-I) was confirmed by enzyme linked immunoadsorbent assay (ELISA).

Combination chemotherapy, including high dose corticosteroids, led to rapid reduction in white cells and resolution of the hypercalcaemia. One week after beginning treatment, however, he developed fever, meningism, abdominal pain, and distension with radiological evidence of paralytic ileus. Bacteriological examination showed *Streptococcus faecium* meningitis

and *Escherichia coli* bacteraemia. Chest x ray examination showed extensive reticulonodular shadowing (figure). Strongyloides larvae were seen in faeces, sputum, and duodenal aspirate. He was treated with thiabendazole 25 mg/kg daily and antibiotics, nutrition was maintained parenterally, and chemotherapy was stopped. Severe hypoxia (arterial oxygen tension 2.6 kPa) due to intra-alveolar haemorrhage developed before recovery ensued. Clearance of strongyloides larvae was confirmed after 10 days. Results of repeated stool examination were negative.

In January 1988 the patient suffered meningeal recurrence of adult T cell leukaemia-lymphoma, which

Diffuse reticulonodular shadowing associated with strongyloides hyperinfection

Academic Department of Haematology, King's College School of Medicine and Dentistry, London SE5 8RX

A Pagliuca, MRCP, registrar
D M Layton, MRCP, lecturer
S Allen, MB, registrar
G J Mufti, MRCPATH, senior lecturer

Correspondence to: Dr Mufti.

was treated successfully with intrathecal cytarabine and methotrexate in conjunction with cranial irradiation. When he was last seen his partial remission was being maintained with deoxycoformycin. Prophylaxis with thiabendazole was continuing.

Discussion

Hyperinfection with strongyloides occurs primarily though not exclusively in the setting of immunosuppression due to disease or drugs.^{2,4} As in our patient, there is often accompanying Gram negative bacteraemia and meningitis attributable to mucosal disruption or active transport of enteric bacteria across the gut mucosa by strongyloides larvae. The temporal relation of hyperinfection to immunosuppressive chemotherapy including corticosteroids in this case suggests that this was the triggering factor. Local immune and mucosal protective mechanisms, however, may also play a part in containing strongyloides infection, and the reduction in gastric acidity consequent on H₂ receptor blockade may have contributed.⁵

This case illustrates the need for prospective identification of carriers of strongyloides among patients requiring immunosuppressive treatment for malignant or non-malignant disease.⁶ Adult T cell leukaemia-lymphoma is linked aetiologically to the retrovirus HTLV-I, whose range of pathogenicity includes lymphopoeitic malignancy and chronic progressive myelopathy.⁷ HTLV-I infection is endemic to Japan, the Caribbean basin, Africa, and the south eastern United States. Sporadic cases of adult T cell leukaemia-lymphoma, however, have been described among Caribbean immigrants in Europe.⁸ In common with the distantly related human immunodeficiency viruses, HTLV-I is tropic for T cells of helper phenotype and associated with loss of cytotoxic and helper function in vitro. Epidemiological data show a

high prevalence of filarial infection with strongyloides among people seropositive for HTLV-I, possibly reflecting retrovirally mediated immune defects.⁹

Repeated examination of stool specimens concentrated in formaldehyde solution and ether may prove necessary to detect strongyloides infection. When delay in diagnosis is unacceptable duodenal aspiration or the "enterotest" (string test) may be preferable. Alternatively, in view of the high mortality from strongyloides hyperinfection, empirical treatment before starting immunosuppressive treatment may be justified in patients from areas of endemic infection. Standard treatment with a three day course of thiabendazole may be inadequate to clear the infection in immunocompromised patients, and prolonged treatment and prophylaxis should be considered.^{10,11}

- 1 Igra-Siegmán Y, Kapila R, Sen P, Kaminski ZC, Louiria BD. Syndrome of hyperinfection with *Strongyloides stercoralis*. *Rev Infect Dis* 1981;3: 387-407.
- 2 O'Doherty MJ, Van de Pette JE, Nunan TO, Croft DN. Recurrent *Strongyloides stercoralis* in a patient with T-cell lymphoma-leukaemia. *Lancet* 1984;i:858.
- 3 Smallman LA, Young J, Shertland-Webb WR, Carey MP, Michael J. *Strongyloides stercoralis* hyperinfection syndrome with *Escherichia coli* meningitis: report of two cases. *J Clin Pathol* 1986;39:366-70.
- 4 Maayan S, Warmser GP, Widershern J, Sy ER, Kim YH, Ernst JA. *Strongyloides stercoralis* hyperinfection in a patient with acquired immune deficiency syndrome. *Am J Med* 1987;83:945-8.
- 5 Ainley CC, Clark DG, Timothy AR, Thompson RPH. *Strongyloides stercoralis* associated with cimetidine in an immunosuppressed patient: diagnosis by endoscopic biopsy. *Gut* 1986;27:337-8.
- 6 Cook GC. *Strongyloides stercoralis* hyperinfection syndrome: How often is it missed? *Q J Med* 1987;64:625-9.
- 7 Anonymous. HTLV-1 comes of age [Editorial]. *Lancet* 1988;i:217-9.
- 8 Catovsky D, Greaves MF, Rose M, et al. Adult T-cell leukaemia-lymphoma in blacks from the West Indies. *Lancet* 1982;i:639-43.
- 9 Nakada K, Kohakura M, Kamoda H, Hinima Y. High incidence of HTLV antibody in carriers of *Strongyloides stercoralis*. *Lancet* 1984;i:633.
- 10 Bush A, Gabriel R. Recurrent hyperinfection with *Strongyloides stercoralis* in a renal allograft recipient. *Br Med J* 1983;286:52.
- 11 Shelhamer TH, Neva FA, Finn DR. Persistent strongyloidiasis in an immunodeficient patient. *Am J Trop Med Hyg* 1982;31:746-51.

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BOOKS RECEIVED

Addiction

Drug Misuse: a Practical Handbook for GPs. A Banks, T A N Waller. (Pp 360; £12.95 paperback.) Oxford: Blackwell Scientific, 1988. ISBN 0-632-02059-8.

Foul Play: Drug Abuse in Sports. T Donohoe, N Johnson. (Pp 216; figs; £6.95 paperback.) Oxford: Basil Blackwell, 1988. ISBN 0-631-14845-0.

Alternative medicine

The New Self Help Series: Diverticulitis. A White. (Pp 112; £1.50 paperback.) Wellingborough: Thorsons, 1988. ISBN 0-7225-1549-9.

Biology

The Wonderful Mistake. Notes of a Biology Watcher. Incorporating The Lives of a Cell and The Medusa and the Snail. L Thomas. (Pp 304; £6.95 paperback.) Oxford: Oxford University Press, 1988. ISBN 0-19-283064-3.

Cardiology

Mitral Valve Prolapse and the Mitral Valve Prolapse Syndrome. Ed H Boudoulas, C F Wooley. (Pp 688; figs; \$80.) Mount Kisco: Futura, 1988. ISBN 0-87993-319-4.

Community medicine

Bridging the Gap. Case Management and Advocacy for People with Physical Handicaps. Ed D J Hunter. (Pp 126; £7.75 paperback.) London: King Edward's Hospital Fund for London, 1988. ISBN 1-870551-83-4.

Computers in medicine

Computing for Clinicians. T Chard. (Pp 144; figs; £18 paperback.) London: Elmoro-Chard, 1988. ISBN 0-9512981-0-0.

Dermatology

Difficult Diagnoses in Dermatology. Ed M Lebowitz. (Pp 472; figs; £50.) New York: Churchill Livingstone, 1988. ISBN 0-443-08460-2.

Ear, nose, and throat

Colour Aids: ENT. N D Stafford, R Youngs. (Pp 111; colour plates; £5.95 paperback.) Edinburgh: Churchill Livingstone, 1988. ISBN 0-443-03198-3.

Otologic Medicine and Surgery. Ed P W Alberti, R J Ruben. (Pp 1992; figs; £195, 2 volume set.) New York: Churchill Livingstone, 1988. ISBN 0-443-08275-8.

Endocrinology

The Melanotropins: Chemistry, Physiology and Mechanisms of Action. A N Eberle. (Pp 576; figs; £145.) Basel: Karger, 1988. Distributed by John Wiley and Sons. ISBN 3-8055-4678-5.

Genetics

Genetic Engineering. Catastrophe or Utopia? P R Wheale, R M McNally. (Pp 352; figs; £10.95 paperback.) (Hemel Hempstead: Harvester/Wheat-sheaf, 1988. ISBN 0-7450-0011-8.

Heterochromatin, Molecular and Structural Aspects. Ed R S Verma. (Pp 320;

figs; £30.) Cambridge: Cambridge University Press, 1988. ISBN 0-521-33480-2.

Nutrition

Boost Your Child's Brain Power. How to Use Good Nutrition to Ensure Success at School. G Roberts. (Pp 144; £3.99 paperback.) Wellingborough: Thorsons, 1988. ISBN 0-7225-1752-1.

Diets to Help Control Cholesterol. R N Turner. (Pp 48; £1.50 paperback.) Wellingborough: Thorsons, 1988. ISBN 0-7225-1757-2.

Oncology

Cancer Treatment and Research. "Immunologic Approaches to the Classification and Management of Lymphomas and Leukaemias". Ed J M Bennett, K A Foon. Series editor W L McGuire. (Pp 304; figs; £54.75.) Boston: Kluwer, 1988. ISBN 0-89838-355-2.

IARC Scientific Publications. No 91. "Trends in Cancer Incidence in Singapore 1968-1982." H P Lee, N E Day, K Shanmugaratnam. (Pp 176; £25 paperback.) Lyon: International Agency for Research on Cancer, 1988. Distributed by Oxford University Press. ISBN 92-832-1191-X.

Perinatal care

Prenatal and Perinatal Biology and Medicine. In two volumes. Vol 1. "Physiology and Growth." Ed N Kretschmer, E J Quilligan, J D Johnson. (Pp 360; figs; \$70.) Chur, Switzerland: Harwood Academic Publishers, 1987. ISBN 3-7186-0344-6.

Pharmacology—clinical

Diamorphine. Its Chemistry, Pharmacology and Clinical Use. Ed D B Scott. (Pp 136; figs; £27.50.) New York: Woodhead-Faulkner, 1988. ISBN 0-85941-381-0.

Psychiatry

Handbook of Behavioural Family Therapy. Ed I R H Falloon. (Pp 496; £30.) London: Hutchinson, 1988. ISBN 0-09-182262-9.

Institute of Psychiatry Maudsley Monographs. No 32. "Sentenced to Hospital. Offenders in Broadmoor." S Dell, G Robertson. (Pp 184; £20.) Oxford: Oxford University Press, 1988. ISBN 0-19-712156-X.

Psychiatry: Diagnosis and Therapy '88/ '89. Ed J A Flaherty, R A Channon, J M Davis. (Pp 432; £9.95 spiral bound paperback.) Connecticut: Appleton and Lange, 1988. Distributed by Prentice-Hall. ISBN 0-8385-8011-4.

Ultrasonics

Clinics in Diagnostic Ultrasound. Vol 23. "Gastrointestinal Ultrasonography." Ed A B Kurtz, B B Goldberg. (Pp 312; figs; £35.) New York: Churchill Livingstone, 1988. ISBN 0-443-08574-9.

Vascular surgery

A Colour Atlas of Surgical Management of Venous Disease. C V Ruckley. (Pp 128; figs and colour plates; £35.) London: Wolfe Medical, 1988. ISBN 0-7234-0898-X.

Miscellaneous

A Century of Change. The Story of the Royal National Pension Fund for Nurses. C Maggs. (Pp 184; figs; paperback, free to members of the medical and allied professions.) London: The Royal National Pension Fund for Nurses, 1987. ISBN 0-9512615-0-9.

Chernobyl: the Real Story. R F Mould. (Pp 276; figs; £9.95 paperback.) Oxford: Pergamon, 1988. ISBN 0-08-035719-9.

Coming of Age. J Havard. (Pp 288; £10.95.) London: Heinemann, 1988. ISBN 0-434-31392-0.

Dictionary of Symptoms and Diseases. R B Fisher. (Pp 480; £5.95 paperback.) London: Corgi, 1988. ISBN 0-552-99226-7.

Drought Relief in Ethiopia: a Practical Guide to the Planning and Management of Feeding Programmes. Compiled by J Appleton with the SCF Ethiopia Team. (Pp 192; figs; £10 plastic cover, plus postage and packing £1 UK and Europe, £1.50 all other places. Cheques payable to Save the Children Fund, in pounds sterling.) 1987. Available from Overseas Information, Save the Children Fund, 17 Grove Lane, London SE5 8RD. ISBN 1-870322-04-5.

Health, Society and Culture. "Encounters with Biomedicine: Case Studies in Medical Anthropology." Volume and series editor H A Baer. (Pp 376; \$89.) New York: Gordon and Breach, 1987. ISBN 2-88124-195-6.

Ranji. A Ross. (Pp 264; figs; £6.95 paperback.) London: Pavilion, 1988. ISBN 1-85145-223-0.