Pancreatic insufficiency following abdominal irradiation

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Summary

A case is reported of pancreatic insufficiency following abdominal irradiation for Hodgkin's disease in a man aged 47 years. The effects of radiation on the pancreas are discussed. It is suggested that post irradiation steatorrhoea may have a pancreatic as well as an enteric cause.

Introduction

Malabsorption, with steatorrhoea as a major feature, is a well recognized complication of abdominal radiotherapy (Duncan and Leonard, 1965). When steatorrhoea occurs radiation enteritis is commonly assumed to be the cause. A case is described of steatorrhoea occurring after abdominal irradiation which appears to be secondary to pancreatic rather than enteric damage.

Case history

A 47-year-old man presented in February 1977 with weight loss and lymphadenopathy. Investigations including a staging laparotomy showed that he had stage IV nodular sclerosing Hodgkin's disease involving cervical, mediastinal and abdominal nodes, spleen and bone marrow. He was treated with combination chemotherapy (chlorambucil, vinblastine, prednisone, procarbazine; and adriamycin, bleomycin, vinblastine, dacarbazine) with only partial response. In June 1978, because of persistent intrathoracic and abdominal disease, he was treated with mantle and inverted Y radiotherapy in 21 fractions over 43 days. The upper abdominal nodes received 3700 rad mid-plane dose. During the course of the radiotherapy he developed diarrhoea with 3-4 pale frothy stools daily.

In January 1979 he was investigated for steatorrhoea. His symptoms had not changed in the intervening 6 months. Physical examination revealed no abnormalities other than anaemia. Blood count showed Hb, 8g/dl; MCV, 120/fl; WBC, $4.2 \times 10^9/l$; platelets, $100 \times 10^9/l$; and reticulocytes, 4%. Bone marrow biopsy and haematological findings were consistent with marrow hypoplasia secondary to chemotherapy and radiotherapy. Blood urea and electrolytes were normal but liver function was

abnormal with SGOT, 42 i.u.; alkaline phosphatase, 750 i.u. ($n < 100$) (liver isoenzyme); and albumin, 25 g/l. After injection of sulphobromophthalein there was 13% retention at 45 min. Liver biopsy showed mild non-specific sinusoidal dilatation.

Steatorrhoea (38 mmol=13 g/day) was confirmed and he was investigated for radiation enteritis. However, all tests performed proved normal including barium studies of the upper and lower gut; jejunal biopsy; Schilling test; ^{14}C breath test; xylose tolerance test; and ^{51}Cr Cl_3 protein-losing enteropathy test. There was no evidence of malabsorption as judged by normal values for folate, iron, B_{12} , prothrombin time and glucose tolerance test. Pancreatic insufficiency was considered and confirmed by a 2-hr Lundh test which showed only one unit of tryptic activity in the first 30 min and no activity at all in the subsequent 3 30-min samples (normal, > 8 u./sample). The pH varied from 6.0-8.0 with a mean value of 7.0. An endoscopic retrograde cholangiopancreatogram showed no structural abnormality of the biliary or pancreatic ducts. He was treated with a low fat diet and oral pancreatic supplements which clinically abolished the steatorrhoea. He was last seen in December 1979 on the same regime. He was free of clinical steatorrhoea but had evidence of recurrent intra-thoracic Hodgkin's disease.

Discussion

The pancreas is a relatively radio-resistant organ and clinical pancreatitis or pancreatic insufficiency after radiotherapy is not recorded. There are reports, however, of functional and histological abnormalities occurring after abdominal irradiation in both animals and man. Kavin, Sobel and Dembo (1971) treated a case of pancreatic ascites with radiotherapy and showed a rapid decrease in enzyme content of the ascites within 24 hr. The Lundh test was still slightly abnormal 12 weeks later. Wachtfeldt and Vitez (1966) showed enzyme secretion to diminish within hours of pancreatic irradiation in patients with acute pancreatitis. Wellmann, Volk and Lewitan (1966) produced evidence of similar transient pancreatic insufficiency after irradiation

in animals. Permanent damage is rare but functional abnormalities were found in dogs 6 months after irradiation (Wellmann *et al.*, 1966).

In the case here reported, the possibility remains that the pancreatic insufficiency was unrelated to radiotherapy or that there was an abnormality of intestinal fat absorption not detected by the tests employed. However, the authors consider this unlikely and that the evidence strongly suggests the pancreatic insufficiency to be a consequence of radiotherapy. It is possible that the response of the pancreas to irradiation was conditioned by previous chemotherapy although there is no evidence in man to suggest that chemotherapy alone can cause pancreatic insufficiency. It has been shown, however, that an infusion of 5-fluorouracil suppresses secretion from isolated dog pancreas (Geewater, 1978). Further observations are required to establish the frequency of this therapeutic complication.

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References

- DUNCAN, W. & LEONARD, J.C. (1965) The malabsorption syndrome following radiotherapy. *Quarterly Journal of Medicine*, **135**, 319.
- GEEWATER, D.M.J. (1978) The effect of 5-fluorouracil on pancreatic pathophysiology. *Annals of the Royal College of Surgeons of England*, **60**, 141.
- KAVIN, H., SOBEL, J. & DEMBO, A. (1971) Pancreatic ascites treated by irradiation of pancreas. *British Medical Journal*, **2**, 503.
- VOLK, B.W., WELLMANN, K.F., & LEWITAN, A. (1966) The effect of irradiation on the fine structure and enzymes of the dog pancreas. *American Journal of Pathology*, **48**, 721.
- WACHTFIEDL, V. & VITEZ, M. (1966) X-ray therapy for acute pancreatitis. *American Journal of Surgery*, **116**, 853.
- WELLMANN, K.F., VOLK, B.W. & LEWITAN, A. (1966) The effect of radiation on the fine structure and enzyme content of the dog pancreas II. Long term studies. *Laboratory Investigation*, **15**, 1007.