Bilateral abdominal lipohypertrophy after continuous subcutaneous infusion of insulin

Continuous subcutaneous infusion of insulin has brought about smooth control of blood glucose concentrations in many patients with brittle diabetes, and few local complications after long-term treatment have been reported. We describe a patient who developed appreciable bilateral abdominal lipohypertrophy at sites of insulin infusion within five months of the start of treatment. To our knowledge this is the first report of this complication.

Case report

A 58-year-old diabetic woman was referred for stabilisation of diabetes. She had presented initially in 1951 at the age of 27 with ketoacidosis and started on twice-daily injections of insulin. In 1976 diabetic retinopathy was noted, and in 1979 widespread peripheral neuropathy. She developed penetrating ulcers of the left hallux in 1979, and in 1980 required enucleation of the left eye after hypopyon and panophthalmitis. She developed repeated infected ulcers of both feet; the toes were dusky in spite of adequate pedal pulses. A femoral arteriogram in August 1981 confirmed that there was no disease of the large vessels, thereby confirming the clinical impression of the presence of diabetic microvascular disease. One of her toes was amputated. Throughout this period her diabetic control was erratic and characterised by frequent hypoglycaemic episodes, often presenting as coma.

In view of the inadequate diabetic control continuous subcutaneous infusion of insulin was started (monocomponent Actrapid, Novo) via a battery-operated pump (Mill Hill infusor). Insulin was delivered subcutaneously via a butterfly needle (Venisystems Abbott, gauge 25). This resulted in excellent control of her blood glucose concentrations, and her haemoglobin A_1 concentration fell from 12% to 9%.

During the six months after subcutaneous insulin infusion was started she had no further hypoglycaemic episodes. In early May 1982 diabetic control remained good, but she noted soft, painless swellings 10×7 cm at the sites of the insulin infusion—one on each side of her abdomen (figure). Diabetic control continued to be excellent despite this appreciable lipohypertrophy.
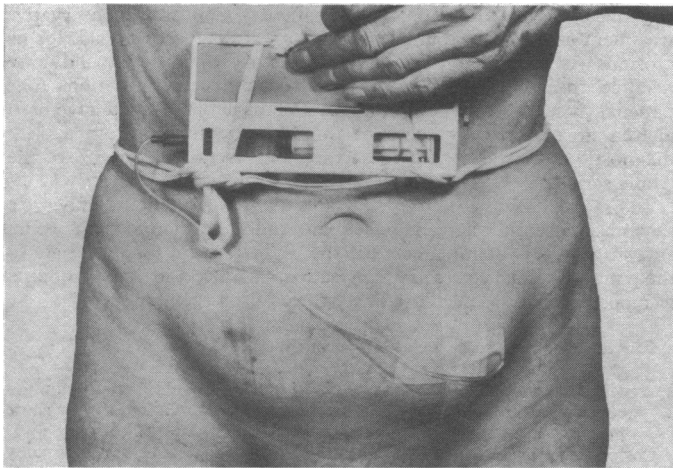
Bilateral abdominal lipohypertrophy due to subcutaneous insulin infusion. The patient was extremely thin.

Comment

Three important points emerge from this case study. Firstly, subcutaneous insulin infusion is extremely useful and effective in managing insulin-dependent diabetics with recurrent hypoglycaemia. The quality of diabetic control was not altered by the appearance of lipohypertrophy. Secondly, low-dose continuous delivery of insulin does not protect against the development of local lipohypertrophy. In the past it was believed that the injection of boluses of insulin, and the progressive accumulation of an altered or native form of this hormone might play a part in the pathogenesis of lipohypertrophy.[1] One of the potential advantages of subcutaneous insulin infusion is that clearance of insulin from the site of infusion is closely related to the rate of infusion, thus ensuring smooth control of blood glucose concentrations on the one hand and lack of accumulation of insulin at the infusion site on the other. Thirdly, the rapid development of bilateral lipohyper-

trophy within a short time of the start of subcutaneous insulin infusion points to an extraordinary sensitivity of this patient's abdominal subcutaneous fat to insulin. It is noteworthy that this patient had not developed local cutaneous changes during the previous 30 years of her diabetes, when she injected herself in her thigh. Clearly, the sensitivity of subcutaneous fat to insulin in her abdomen and thigh were appreciably different, unless it is argued that it was the combination of insulin and the indwelling butterfly needle that resulted in lipohypertrophy. We are at present investigating the sensitivity to insulin of fat from various sites in this patient.

[1] Renold AE, Marble A, Fawcett DW. Action of insulin on deposition of glycogen and storage of fat in subcutaneous tissue. *Endocrinology* 1950; **46**:55-61.

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Acute colitis due to Plesiomonas shigelloides

The complexity of infective colitis is gradually becoming unravelled as more pathogens capable of causing colonic inflammation are identified. *Salmonella, Campylobacter, Clostridium difficile,* and, more recently, *Aeromonas hydrophila*[1] have been recognised for their potential to cause colitis. There are still cases of self-limiting acute colitis with negative findings on bacteriology but which otherwise behave like infective colitis,[2] clearly indicating the presence of other agents unrecognised for their ability to cause colitis. We report a case of acute colitis associated with *Plesiomonas shigelloides*, an agent long suspected to be a cause of acute diarrhoea in man.

Case report

In late September 1981, a 41-year-old Englishman developed acute diarrhoea and vomiting. The stools were of small volume, green and slimy, mixed with blood, and averaging 10 to 15 a day. He had colicky abdominal pains relieved by defecation. His wife also had loose motions at about the same time but her symptoms abated after two days. The man had not been abroad recently. He was a keen fisherman and was fishing downstream from a sewage farm two days before the onset of his illness. He had had no previous bowel problems.

After nine days of unremitting symptoms he was admitted to hospital. On examination the abdomen was generally tender but soft. Sigmoidoscopy revealed an inflamed oedematous rectal mucosa that bled easily. Rectal biopsy showed acute inflammatory infiltration in the lamina propria, somewhat patchy in character, and occasional crypt abscesses. There was hyperplasia of crypts but the architecture was not distorted. The features were consistent with infective colitis. Stool cultures grew *P shigelloides* in almost pure culture, but no other recognised bowel pathogens could be identified and virological study gave negative results.

The patient's symptoms settled spontaneously four days after admission and he has remained well since. Mucosa appeared normal on repeat sigmoidoscopy two months later, but the rectal biopsy showed persisting patchy inflammation and crypt abscesses and a rather heavy infiltration of the lamina propria by mononuclear cells, mainly plasma cells. The overall appearance was of infective colitis. A barium enema performed at that time showed no abnormalities. Histological examination of a further rectal biopsy specimen in March 1982 showed no abnormality.

Comment

P shigelloides has interested medical microbiologists since 1947, when it was discovered that the organism had an O antigen that was identical with that of phase 1 *Shigella sonnei*.[3] Since then it has been implicated as an aetiological agent in sporadic cases and outbreaks of diarrhoea in various parts of the world. *P shigelloides* was isolated in pure culture of stools of patients with diarrhoea but otherwise healthy. A recent ecological study from Tokyo revealed wide distribution with not infrequent isolations from dogs, cats, freshwater fish, river water,

and sludge from wet river beds but only rarely from healthy persons.[4] The infection is reported rarely in Britain and during 1981 24 isolations from cases of diarrhoea were recorded by Communicable Disease Surveillance Centre (personal communication). It is, however, possible to overlook the presence of the organism if identification is orientated to recognition of the known pathogens from deoxycholate citrate agar—that is, Shigella and Salmonella. The organism being a late lactose fermenter may, under those circumstances, not be processed. If the Analytical Profile Index 10S system is used for identification, a preliminary oxidase test must be carried out otherwise the organism may be wrongly identified as Escherichia coli.

The pathogenetic mechanism of P shigelloides in humans has not yet been defined. Production of a heat-stable enterotoxin has recently been reported from India.[5] The present case indicates its invasive ability, and P shigelloides should be added to the growing list of organisms able to produce acute colitis.

[1] Rahman AFM, Willoughby JMT. Dysentery-like syndrome associated with Aeromonas hydrophila. Br Med J 1980;281:976.
[2] Mandal BK, Schofield PF, Morson BC. A clinico-pathological study of acute colitis: the dilemma of transient colitis syndrome. Scand J Gastroenterol 1982;17:865-9.
[3] Ferguson WW, Henderson ND. Description of Strain C27: a motile organism with the major antigen of Shigella sonnei phase I. J Bacteriol 1947;54:179-81.
[4] Arai T, Ikejima N, Itoh T, Sakai S, Shimeda T, Sakazaki R. A survey of Plesiomonas shigelloides from aquatic environments, domestic animals, pets and humans. J Hyg (Lond) 1980;84:203-11.
[5] Sanyal SC, Saraswathi B, Sharman P. Enteropathogenicity of Plesiomonas shigelloides. J Med Microbiol 1980;13:401-9.

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Accuracy of early endoscopy in acute upper gastrointestinal bleeding

The accuracy of early endoscopy in acute upper gastrointestinal haemorrhage has been established mainly with reference to the results of barium meal examination.[1] In small series, comparison of findings at endoscopy with those at surgery or necropsy has suggested that endoscopy may miss up to 8% of peptic ulcers.[2-5] We compared the findings at endoscopy in patients with acute upper gastrointestinal bleeding with those at surgery or necropsy, as this has not been reported previously.

Patients, methods, and results

A total of 104 (34%) of 308 consecutive patients referred for early endoscopy for acute upper gastrointestinal bleeding came to surgery (99) or necropsy alone (5). The endoscopies were performed by 11 endoscopists of varying experience, though all had sufficient experience to perform endoscopy without direct supervision and all had access to help from more experienced endoscopists. All endoscopies were performed with end-viewing instruments; side-viewing instruments were also used occasionally.

The main bleeding lesions in the 104 patients (65 men, 39 women aged 16-88 (mean 58) years) were duodenal ulcers (41), gastric ulcers (28), and oesophageal varices (16). Gastric erosions, gastric carcinoma, jejunal ulceration, and Mallory-Weiss tears accounted for the remaining lesions. Endoscopy correctly identified the bleeding lesion in 76 (73%) patients. The sites of bleeding were identified correctly in a further 12 patients but the lesions causing the bleeding (nine duodenal ulcers, one gastric carcinoma, one gastric ulcer, and one Mallory-Weiss tear) could not be seen. Lesions were misinterpreted in two cases; a gastric ulcer proved to be a gastric carcinoma, and an erosion was found at operation to be an acute gastric ulcer. Blood prevented an adequate examination in three patients found subsequently to be bleeding from chronic gastric ulcers. Endoscopy gave incorrect findings in 11 cases (see table). Five of the gastric ulcers (18%) were misdiagnosed, one (4%) was not seen, though

the site of bleeding was identified, while in three (11%) the sites were obscured by bleeding. Five of the duodenal ulcers (12%) were misdiagnosed and nine (22%) were not seen, though the sites of bleeding were identified.

Lesions diagnosed incorrectly at endoscopy

Final diagnosis*	Diagnosis at endoscopy
Gastric erosions	Gastric ulcer
Gastric ulcer	No lesion found
Gastric ulcer	No lesion found
Gastric ulcer	Gastric erosions
Gastric ulcer	Haemorrhagic gastritis
Gastric ulcer	Duodenal bleeding
Duodenal ulcer	No lesion found
Duodenal ulcer	Gastric bleeding
Duodenal ulcer	Antral lesion (?carcinoma)
Duodenal ulcer	Bleeding from gastrojejunal anastomosis
Duodenal ulcer	Antral ulcer (bleeding) and duodenal ulcer

*At surgery, necropsy, or both.

Comment

Endoscopy identified the bleeding site or the bleeding lesion correctly in 85% of our patients, and in a further two patients the errors could not be regarded as serious, for benign and malignant gastric ulcers, and gastric erosions and acute gastric ulcers cannot be differentiated reliably at endoscopy. Severe bleeding prevented adequate examination in three cases (3%), which is consistent with previous experience.[3] Our failure to diagnose 18% of gastric ulcers and 12% of duodenal ulcers suggests that early endoscopy for gastrointestinal bleeding may not be as accurate as previously supposed. Most of the endoscopies were performed with older, less flexible panendoscopes, which made retrograde examination of the stomach difficult; some of the gastric lesions might have been seen if a more modern panendoscope had been used. We think it unlikely, however, that newer panendoscopes would have given a higher yield in the duodenal cap.

There is no way of knowing what effect our mistakes had on the management of patients. It is unlikely that operation was delayed where bleeding was thought to be coming from a specific site or lesion (table, five patients) or with recurrent or continued bleeding with a negative finding at endoscopy (three patients). Continued conservative treatment could have resulted from incorrect diagnoses of gastritis or erosions (two patients), and an unnecessary operation could have resulted from diagnosing a gastric ulcer rather than erosions (one patient). It seems likely, therefore, that management would have been altered greatly in only three of the 11 patients in whom a clear diagnostic error was made; these three representing only 3% of the whole series.

In practical terms our study indicates that patients should undergo a second endoscopy after an inadequate endoscopy if bleeding recurs and surgery is contemplated or if the findings seem inappropriate to the patient's clinical state and that patients with considerable amounts of blood in their stomach are likely to require urgent surgery.

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[1] Stevenson GW, Cox RR, Roberts CJC. Prospective comparison of double-contrast barium meal examination and fibreoptic endoscopy in acute upper gastrointestinal haemorrhage. Br Med J 1976;ii:23-4.
[2] Cotton PB, Rosenberg MT, Waldram RPL, Axon ATR. Early endoscopy of oesophagus, stomach and duodenal bulb in patients with haematemesis and melaena. Br Med J 1973;ii:505-9.
[3] Forrest JAH, Finlayson NDC, Shearman DJC. Endoscopy in gastrointestinal bleeding. Lancet 1974;ii:394-7.
[4] McGinn FP, Guyer PB, Wilken BJ, Steer HW. A prospective comparative trial between early endoscopy and radiology in acute upper gastrointestinal haemorrhage. Gut 1975;16:707-13.
[5] Dronfield MW, McIllmurray MB, Ferguson R, Atkinson M, Langman MHS. A prospective randomised study of endoscopy and radiology in acute upper gastrointestinal-tract bleeding. Lancet 1977;ii:1167-9.

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