Results of biochemical investigations were normal except for plasma bilirubin concentration $41 \mu\text{mol/l}$ (2.4 mg/100 ml); conjugated bilirubin $20 \mu\text{mol/l}$ (1.2 mg/100 ml), serum alanine aminotransferase 279 U/l , serum γ -glutamyltranspeptidase 339 U/l , serum alkaline phosphatase 1329 U/l , and serum $5'$ -nucleotidase 31 U/l . Concentrations of α -fetoprotein and immunoglobulins G, A, and M were normal. Autoantibody screen and hepatitis B surface antigen were negative. An electrocardiogram was normal. Haemoglobin concentration was 10.3 g/dl , white blood cell count $6.4 \times 10^9/\text{l}$ ($6400/\text{mm}^3$; leucoerythroblastic picture), platelet count $18 \times 10^9/\text{l}$ ($18000/\text{mm}^3$), reticulocytes 3% , erythrocyte sedimentation rate 12 mm in first h, plasma viscosity 1.54 mPa s (cp) , and leucocyte alkaline phosphatase score 174 ; serum vitamin B_{12} , folate, and iron concentrations, and serum total iron-binding capacity, were normal. Ham's test and direct Coombs test were negative; kaolin-cephalin clotting time was 37 s , prothrombin time British ratio 1.42 , and serum fibrinogen concentration 2.8 g/l . Bone-marrow aspirate taken on three occasions from different sites (sternum and both posterior iliac crests) showed classical changes of bone-marrow necrosis (figure). Examination of core biopsy specimen confirmed this, and no malig-

potentially curative. Q fever should be considered in undiagnosed cases of bone-marrow necrosis.

We thank Dr G B White for performing the serological tests and for helpful discussion, and Dr A H Rowson and Dr G P Sechiari for referring the patient.

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Photomicrograph of bone-marrow aspirate obtained from posterior iliac crest, stained with May-Grunwald-Giemsa stain. Nuclei are intensely basophilic, recognisable features of all cell types are obscured, and cells are surrounded by amorphous acidophilic material. (Original magnification $\times 6000$.)

nant tissue or intracellular organisms (Giemsa and Macchiavelli's staining) were seen in the samples.

The patient was treated empirically with steroids (without response) and required regular blood and platelet transfusions. He died three weeks later from a combined cerebral and gastrointestinal haemorrhage. Permission for necropsy was refused.

A search for malignancy—which included plain radiography of chest, abdomen, and skeleton; excretion urography; barium meal and enema; ultrasound scanning of hepatic and renal areas; and isotope scanning of liver and spleen—gave negative results. Cultures of blood, sputum, urine, faeces, and throat swab, and tuberculosis cultures of sputum and bone marrow were negative. The result of a Heaf test was grade one. Serological tests for viral antibodies showed a rise in Q fever phase II titre from less than $1/10$ to $1/640$, while titre to phase I had risen to only $1/20$. Mumps V titre had also risen to $1/640$ while mumps S titre remained unchanged at less than $1/10$. Other viral titres were negative. Serological reagents were obtained from the Division of Microbiological Reagents and Quality Control, Colindale.

Comment

The diagnosis of Q fever was based on a significant rise in titre to phase II antigen, which is considered diagnostic of recent infection.³ A false-positive result was excluded by testing against normal yolk sac and chlamydia B antigen. The clinical findings of pneumonia with prostration and hepatitis also support the diagnosis. The source of infection was not identified. Although we are reasonably sure from clinical evidence that malignancy was not present, this was not confirmed by necropsy.

The only bone-marrow lesion recorded in Q fever has been granuloma.⁴ We believe that the association between Q fever and bone-marrow necrosis has never been described. Antemortem diagnosis of bone-marrow necrosis in the absence of sickle-cell disease carries serious connotations of underlying malignancy, with a median survival of 22 days.⁵

Although our patient did not benefit from the diagnosis of Q fever, as the results were obtained after death, the treatment is simple and

New system for single-needle dialysis

In regular haemodialysis two needles are usually inserted into forearm veins through which blood flow has been increased by an arteriovenous fistula. One needle supplies blood to the dialyser, the other returns it to the patient. A system in which blood is alternately taken from and returned to the patient through the same needle is theoretically preferable, because the number of needle insertions would be halved, patients would prefer it, dialysis would be possible when suitable needling sites are limited, and fistula life would possibly be longer. Low blood flow rates and recirculation from afferent to efferent dialyser blood lines, however, cause comparatively low dialyser clearances. Fluctuating high venous pressures necessitate the use of a compliant dialyser and predispose to excessive ultrafiltration. Systems using continuous flow via a single needle with a double lumen are less acceptable because the large needles required are difficult to insert and recirculation may be high if blood flow through the fistula is low. For these reasons single-needle dialysis has not gained wide acceptance. One of us (A H) has developed a simple system in an attempt to overcome these problems, and we have compared its performance with that of conventional two-needle dialysis.

Method and results

The system is illustrated in the figure. There are two blood pumps separated by a 50-ml compliant sac. Pump A extracts blood from the fistula and fills the sac. When the sac is full the pressure sensor C simultaneously switches pump A off and pump B on and opens the line clamp D, allowing blood to be pumped through the dialyser and back to the patient. When the sac is empty the sensor C reapplies the line clamp D and switches

The single-needle dialysis system. Dialysis monitor not shown.

pump B off and pump A on, thus restarting the cycle. Dialyser blood compartment pressure fluctuates by less than 10 mm Hg during the cycle.

Six patients were studied. They were dialysed for six hours thrice weekly using Meltec Multipoint 1.0 m² dialysers, Dylade DII monitors able to produce positive dialysate pressure, and standard 15G needles with back eye. Dietary protein, sodium, potassium, and fluid intake were defined for each patient and remained constant. When conditions were stable single-needle dialysis was used for four weeks followed by two-needle dialysis for four weeks. During the first four-week period pump A was adjusted to give the maximum possible rate of inflow to the sac and pump B to provide a venous line pressure of 200 mm Hg. During two-needle dialysis maximum achievable blood flow was used.

All patients preferred the single single-needle system and no technical problems were encountered. Mean ($\pm$ SEM) blood flow rate was only slightly lower during single needle dialysis (191.9 ± 2.1 ml/min) than during two needle dialysis (212.1 ± 2.2 ml/min) ($p < 0.01$, Student's *t* test for paired data). The mean ($\pm$ SEM) predialysis plasma concentrations at the end of single-needle and two-needle treatment periods respectively were as follows: urea 20.1 ± 0.9 and 19.9 ± 1.5 mmol/l (121 ± 5 and 120 ± 9 mg/100 ml); creatinine 785 ± 31 and 771 ± 41 μ mol/l (8.9 ± 0.4 and 8.7 ± 0.5 mg/100 ml); potassium 4.75 ± 0.21 and 4.58 ± 0.21 mmol (mEq)/l. These differences were not significant. Haemoglobin concentration did not change significantly during the study. Ultrafiltration during single-needle dialysis was easily controlled by adjusting the dialysate pressure.

Comment

This single-needle system is as effective as conventional two-needle dialysis. It is easy to use, safe, and preferred by patients. The design allows comparatively high blood flow rates to be maintained, obviates distension of the dialyser, and prevents excessive pressure fluctuations in it, thus permitting the safe application of positive dialysate pressure to control ultrafiltration. We have also used this system with good effect in patients with acute renal failure, gaining circulatory access through a single percutaneous femoral vein catheter.

We thank the technical and nursing staff of Hanbury Dialysis Unit for their help with the development of this system.

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Oestrogen-like effect of ginseng

Ginseng has been known for thousands of years in the Far East as a stimulant. In recent years it has attracted interest in western countries. Its primary action, however, remains uncertain. We report an oestrogen-like effect of ginseng on the vaginal epithelium and competition by ginseng saponines with 17-oestradiol and R5020 for binding to human myometrial receptor proteins.

Case report

The patient was a 62-year-old woman who, 14 years before, had undergone supravaginal uterine amputation and bilateral ovariectomy for uterine myomas. Generally she had been in good health. A vaginal smear showed a strong oestrogenic effect with a maturation index of 0/65/35 (parabasal/intermediate/superficial cells). She had never taken oestrogens. During the past year, however, she had taken Rumanian ginseng and Gerovital alternatively, each for periods of two weeks. The treatment was stopped and after three weeks the vaginal smear showed a maturation index of 0/95/5. Two weeks later the index was 0/100/0 and the serum concentration of oestrone was 0.32 nmol/l (86.5 pg/ml), of oestradiol 0.03 nmol/l (8.2 pg/ml), and of oestriol < 0.01 nmol/l (< 2.4 pg/ml) measured by radioimmunoassay.¹ Gerovital was then given again for two weeks, when the maturation index was 0/99/1 and the serum concentrations of oestrone 0.33 nmol/l (89.2 pg/ml), oestradiol 0.02 nmol/l (5.4 pg/ml), and oestriol < 0.01 nmol/l (< 2.9 pg/ml). Gerovital was stopped and ginseng given instead for two weeks. The maturation index after the two weeks on ginseng was 0/90/10 and the serum concentrations of oestrone 0.40 nmol/l (108.2 pg/ml), oestradiol 0.03 nmol/l (8.2 pg/ml), and oestriol < 0.01 nmol/l (< 2.9 pg/ml). The vaginal and cervical epithelium looked normal and there were no atrophic changes. The spinnbarkeit was about 5 cm and there was no arborisation. Gas chromatography analysis of

the tablets the patient had taken showed no oestrogens. We found, however, that the crude methanolic extract of ginseng competed very strongly with 17-oestradiol and R5020 for the oestrogen and progesterone binding sites in the human myometrial cytosol (figure).

Effect of ginseng saponines on binding of 17-oestradiol and R5020 to human myometrial oestrogen and progesterone receptors.

Comment

Despite the oestrogenic effect evident in the vaginal smear we found no oestrogens in ginseng. Likewise the serum concentrations of oestrone, oestradiol, and oestriol did not change during treatment with ginseng. Many of the reported effects of ginseng are similar to those of oestrogens. Both are stimulants and give a feeling of well being.² Mastalgia with diffuse nodularity has been reported in postmenopausal women after taking ginseng and after taking oestrogens.³ Ginseng also seems to stimulate corticotrophin secretion and to increase RNA and protein synthesis in the liver.⁴ This stimulation of liver RNA and protein synthesis is said to be due to the hormone-like effect of the saponine glycosides in ginseng.⁵ It is well established that the response of steroid target cells depends on the binding of the hormone to specific cytoplasmic receptor proteins. The subsequent nuclear translocation of the hormone-receptor complex and the binding to the chromatin results in gene activation and increased RNA biosynthesis. Can the ginseng saponines interact with hormone receptor proteins in a similar way to ovarian steroids?

Panax ginseng contains at least 13 different saponine glycosides, with a nucleus that resembles the steroid nucleus. The main functional groups of the steroids are the 3-OH and 17-OH groups. A highly positive contribution to the binding is also provided by the steroid nucleus. The binding of hormones to their receptors, however, is complex. Thus the uterine cytosol receptors also bind non-steroid molecules such as diethylstilboestrol, benzoestriol, and cyclophenyl. Whether or not the oestrogen-like effects of ginseng are mediated through a mechanism that includes receptor proteins has to be elucidated. At present we are studying more closely the interaction of the different saponine glycosides with uterine receptor proteins.

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