- ² Heller L. Parenteral nutrition in obstetrics and gynaecology. In: Greep JM, Soeters PB, Wesdorp RIC, *et al*, eds. *Current concepts in parenteral nutrition*. The Hague: Nijhoff Medical Division, 1977:179-86.
- ³ Di Costanzo J, Martin J, Cano N, Laffargue F, Noirclerc M. Total parenteral nutrition and pregnancy. In: Howard AN, Baird IMcL, eds. *Recent advances in clinical nutrition*. Vol I. London: John Libbey, 1981: 133-5.
- ⁴ Main NH, Shenkin A, Black WP, Russell RI. Intravenous feeding to sustain pregnancy in patients with Crohn's disease. *Br Med J* 1981;**283**: 1221-2.
- ⁵ Cox KL, Byrne WJ, Ament ME. Home total parenteral nutrition during pregnancy: a case report. *JPEN* 1981;**5**:246-9.

(Accepted 18 November 1982)

University Departments of Surgery and Medicine and Department of Obstetrics and Gynaecology, Hope Hospital, Salford M6 8HD

J C TRESADERN, FRCS, surgical tutor
G F FALCONER, MRCOG, consultant obstetrician and gynaecologist
L A TURNBERG, MD, FRCP, professor of medicine
M H IRVING, MD, FRCS, professor of surgery

Successful pregnancy in a renal transplant recipient taking cyclosporin A

There have been several reported successful pregnancies in renal transplant recipients receiving conventional immunosuppressive agents. A recent multicentre trial, however, suggested that cyclosporin A is more effective than conventional immunosuppression in these patients.¹ We report the first case of a pregnancy in a renal transplant recipient taking cyclosporin A as the only immunosuppressive agent.

Case report

A 27 year old patient had a successful renal transplant operation in February 1981 when treated with cyclosporin A. Two previous transplant operations in 1977 and 1979 with conventional immunosuppression had failed. She conceived in November 1981 when receiving cyclosporin A 450 mg daily, which was continued at the same dose throughout the pregnancy. She remained normotensive with no proteinuria. Concentrations of serum creatinine (mean $98.5 \pm SD 6.0 \mu\text{mol/l}$; $1.1 \pm SD 0.1 \text{ mg/100 ml}$) and urea (mean $7.8 \pm SD 1.5 \text{ mmol/l}$; $46.7 \pm SD 9.2 \text{ mg/100 ml}$) remained stable, and the white cell count (mean $7.4 \pm SD 1.3 \times 10^9/\text{l}$) and platelet count were within normal limits. Haemoglobin concentration varied between 9.6 and 12.2 g/dl.

Serial ultrasound cephalometry confirmed satisfactory fetal growth, and regular antenatal fetal heart tracings were normal. A placental lactogen estimation at 33 weeks of gestation was 9.4 mg/l, but serial 24 hour urinary oestriol estimations carried out from 32 weeks were persistently below normal limits. Labour was induced at 38 weeks of pregnancy and a healthy boy weighing 2980 g delivered vaginally. The fetal heart rate remained stable throughout labour, and the Apgar score at five minutes was 9. The baby had a haemoglobin concentration of 15.9 g/dl and a white cell count of $23.4 \pm 19^9/\text{l}$, and careful clinical examination showed no hirsutism or congenital abnormality. Bilirubin concentration did not rise above $155 \mu\text{mol/l}$ (9.1 mg/100 ml) and aspartate transaminase activity was normal (56 IU/l). The patient was advised against breast feeding because of the possible transfer of cyclosporin A into the breast milk. Mother and baby were allowed home on the seventh postpartum day.

Cyclosporin A was not detected in specimens of liquor obtained at amniocentesis at 36 weeks and at amniotomy, but this was not surprising given the very low water solubility of the drug. The drug was present in the maternal and cord blood at delivery in concentrations of 86 and 54 $\mu\text{g/l}$, respectively. Cyclosporin A was also detected in samples of breast milk obtained on days 2 (101 $\mu\text{g/l}$), 3 (109 $\mu\text{g/l}$), and 4 (263 $\mu\text{g/l}$) post partum. Maternal blood samples were not taken simultaneously with the milk samples, however, so that we could not calculate the distribution ratio between blood and milk.

Comment

Reports indicate that women with a well functioning renal transplant have a reasonable chance of delivering a healthy infant. There is, however, a small risk of congenital abnormality and fetal adrenal suppression when the mother is taking steroids² and azathioprine.³ The fungal peptide cyclosporin A has a selective action against T cells, particularly those concerned in allograft rejection, and reports

on the use of the drug in clinical renal transplantation have confirmed its powerful immunosuppressive properties.⁴

Studies in animals have not shown any teratogenicity of cyclosporin A, and the results in our case confirm that although the drug crossed the placenta there was no evidence of immunosuppression or congenital abnormality in the baby.

Interestingly urinary oestriol concentrations were persistently low while other parameters of fetal wellbeing were satisfactory. This has been reported in other renal transplant recipients and was presumed to be due to fetal adrenal suppression caused by steroid administration to the mother. We found that oestriol concentrations in urine specimens of other pregnant women were not reduced when mixed with urine from patients taking cyclosporin A, thus indicating that this drug does not interfere with urine oestriol determinations. The low urinary oestriol excretion in pregnant renal transplant recipients may therefore be due to a relatively lower glomerular filtration rate.

Studies in animals show that cyclosporin A is excreted in breast milk in a maximum amount of 2% of the maternal dose (M Lemaire, unpublished Sandoz internal document, 1982), and this was confirmed by the detection of appreciable quantities of the drug in the breast milk of our patient. We therefore suggest that mothers taking cyclosporin A should avoid breast feeding.

Our findings suggest that we can be reasonably optimistic about the outcome of pregnancy in patients with a well functioning renal transplant receiving cyclosporin A, and because there is no evidence of teratogenicity cyclosporin A may be the drug of choice in renal transplant recipients contemplating pregnancy. We recommend that patients should avoid pregnancy for two years after transplantation because of the increased risk of graft rejection during this period, and by two years patients will have reached their lowest immunosuppressive maintenance doses.

¹ European multicentre trial. Cyclosporin A as sole immunosuppressive agent in recipients of kidney allografts from cadaver donors. Preliminary results of a European multicentre trial. *Lancet* 1982;ii:57-60.

² Gethens JH, Rosenkrantz JG, Tunnock SM. Teratogenic effects of azathioprine. *J Pediatr* 1965;**66**:959-61.

³ Bongiovanni AM, McPadden AJ. Steroids during pregnancy and possible fetal consequences. *Fertil Steril* 1960;**11**:181-6.

⁴ Clane RYC, White DJG, Thiru S, *et al*. Cyclosporin A in patients receiving renal allografts from cadaver donors. *Lancet* 1978;iii:1323-7.

(Accepted 25 November 1982)

Department of Obstetrics and Gynaecology, St Mary's Hospital, Portsmouth PO3 6AD

G J LEWIS, MB, MRCOG, senior registrar
C A R LAMONT, MB, FRCOG, consultant obstetrician and gynaecologist

Wessex Regional Renal and Transplant Unit, St Mary's Hospital, Portsmouth PO3 6AD

H A LEE, BSC, FRCP, professor of renal medicine
M SLAPAK, MS, FRCS, consultant transplant surgeon

Carbon monoxide poisoning in a former mining community

Many accidental cases of carbon monoxide poisoning result from the incomplete combustion of household gas.¹ We describe an unusual cause of carbon monoxide intoxication affecting several elderly neighbours in a former mining town.

Case histories

Case 1—A 72 year old woman complained of lassitude on the day before she was found by neighbours in a semiconscious state. Her condition rapidly improved in hospital, and subsequent analysis of her blood showed 35% saturation of haemoglobin by carbon monoxide.

Case 2—A 64 year old woman, who lived in the neighbouring bungalow to the patient in case 1, was admitted to hospital on the same day. Also found unconscious, she was pale with flaccid limbs and several skin vesicles at pressure sites. Cerebrospinal fluid was normal, but an electrocardiograph showed transient T wave inversion. Carboxyhaemoglobin concentration was 50%. Signs of extrapyramidal rigidity developed, and she died of bronchopneumonia four months later. At necropsy ischaemic cerebral softening was particularly severe in the basal ganglia.

Cases 3 and 4—A 70 year old man and his 60 year old wife were found dead by the police in a bungalow adjoining those of the patients in cases 1 and 2. It was reported that the couple had previously and simultaneously complained of headache, nausea, and dizziness. Their skin and mucosa showed pink discoloration. At necropsy the heart and great vessels were engorged by blood whose carbon monoxide saturation was 75%. Multiple pinpoint haemorrhages were observed in the cut surfaces of their oedematous brains.

Case 5—The 72 year old husband of the patient in case 2 had been admitted to hospital in a neighbouring town three days before his wife and with a similar presentation. Carbon monoxide analysis was not performed. Though semiconscious and showing periodic respirations on admission, he made a full neurological recovery. A retired miner, he realised in retrospect that the prodromal symptoms that he had suffered had resembled those experienced years earlier when he was exposed to carbon monoxide.

Case 6—A 71 year old woman, who had been a previous occupant of the bungalow in which the patients in cases 3 and 4 were found, had experienced intermittent headaches and dizziness while living there. Her granddaughter had been similarly affected at each visit to the bungalow.

Further inquiries ordered by the coroner indicated that the gas fired, ducted air central heating system in each bungalow was functioning satisfactorily with no evidence of incomplete combustion of natural gas, which contains no carbon monoxide.

More detailed investigation showed that carbon monoxide was intermittently present at the points where service pipes and cables entered the bungalows. The concentration of carbon monoxide increased as the atmospheric pressure fell, and its source was traced to an old mine shaft some distance from the bungalows and sunk in 1780. Coal mining had stopped in 1933, and the shaft had been filled with rubble. Industrial waste had recently been burned outside a nearby factory, however, and the fire had spread to the materials in the mine shaft. Analysis of the gases in the mine confirmed that carbon monoxide was present. This was seeping down the shaft and through fissures and faults in the porous sandstone underlying the area before passing up intermittently into the bungalows. The shaft was reopened and the gas extracted before refilling. The bungalows were demolished.

Comment

In 1981 in a circular to health authorities the medical officers of British Gas reminded doctors of the vague symptoms of carbon monoxide poisoning. Old people with pre-existing cerebral, cardiac, or pulmonary disease are at particular risk from incomplete combustion of household gas especially if confined to badly ventilated houses in adverse weather. An alternative explanation emerged in the cases reported here, but this must be regarded as a rare cause of carbon monoxide intoxication even in former mining communities.

We are grateful to Her Majesty's Coroner for Gateshead and South Tyneside for allowing us to quote information from the necropsy reports in cases 2, 3, and 4.

¹ Matthew H, Lawson AAH. *Treatment of common acute poisonings*. Edinburgh and London: Churchill Livingstone, 1972.

(Accepted 16 November 1982)

Queen Elizabeth Hospital, Gateshead, Tyne and Wear NE9 6SX

C T A JONES, MSc, MRCP, consultant physician

Birtley, Tyne and Wear

H A F MACKAY, MB, FRCP, general practitioner

Percutaneous transfemoral lumbar aortography as an outpatient procedure

Peripheral vascular disease accounts for 4-5% of general practitioner consultations by patients aged over 65¹ and for about 6% of deaths from circulatory disease.² Since the advent of transluminal angioplasty as an alternative method of treatment the demand for arteriography has been increasing. In many centres translumbar aortography under general anaesthesia is still performed as the standard examination. We use the transfemoral percutaneous approach under local anaesthesia and mild sedation, a thin walled 5.3 French catheter (William Cook, Europe) proving as satisfactory as the 7 or 8 French catheters. It has been standard practice for the patient to remain in bed for 24 hours

after femoral arterial puncture, the average hospital stay being three days. Occasionally hospital admission may be prolonged until surgery can be undertaken.

We decided to assess the feasibility of early mobilisation after routine transfemoral arteriography using the small catheter technique and to determine whether uncomplicated cases could be managed as an outpatient procedure.

Method and results

Forty eight patients with peripheral vascular disease who were being routinely investigated were included in the trial. The age range was 41 to 74 years. We also included in the trial two other patients, who were being assessed after renal transplantation.

We used a standard Seldinger technique and a 5.3 French thin walled polyethylene pigtail catheter, which has six side ports and is 65 cm long. The catheter may be introduced over a 0.035 in (0.89 mm) guide wire and was routinely used with a 4 French dilator. Contrast medium was injected at a rate of 10 ml/s. At the end of the procedure the catheter was removed and compression applied for 10 minutes. No dressings or pressure pads were placed over the puncture site. Standard observations of pulse, blood pressure, and puncture site were recorded every 15 minutes for one hour and then every 30 minutes for three hours. After four hours the puncture site and condition of the patient were assessed and if satisfactory the patient allowed to mobilise gently, avoiding strenuous exertion. The standard management of bed rest for 24 hours was reinstituted if there were any problems during the initial four hours. All patients were further assessed in the evening and next morning.

Forty five of the 50 patients were mobilised. Three patients had transient hypertension (systolic pressure 170-180 mm Hg, diastolic 105-120 mm Hg) during the initial assessment on returning to the ward. These blood pressures quickly returned to normal and did not rise after mobilisation. A fourth patient developed transient hypertension after 24 hours, suggesting that this was unrelated to the arteriogram or early mobilisation. Nausea and vomiting occurred in four patients in the initial period and two patients within 12 hours, one of these requiring antiemetics.

Five patients were not mobilised. One of these felt generally unwell, and another had such severe peripheral vascular disease that mobilisation was thought inadvisable. A third patient developed a respiratory tract infection, and the others were inadvertently kept in bed. None of the patients developed any complication from the arterial puncture site.

Comment

Of the 50 patients in this study, 45 were mobilised after four hours. The decision to manage the remaining patients by 24 hours of bed rest was made during the four hours before mobilisation. No untoward sequelae resulting from early mobilisation were detected in any patient.

The low incidence of minor complications associated with aortography under local anaesthesia has been confirmed by other studies.³⁻⁵ The complications associated with translumbar aortography are well known⁶ and may in part be avoided by the percutaneous transfemoral route.

We believe that angiography under local analgesia using the 5.3 French catheter may be safely performed as a day case procedure; and the reduced hospital stay and percutaneous transfemoral route are more acceptable to the patients.

We thank Freda Cole, Sarah Mitchell, and the nursing staff; Carmen Ramjohn for secretarial help; and William Cook Ltd.

¹ Office of Population Censuses and Surveys. *Morbidity statistics from general practice (1970-1972)*. London: OPCS, 1974.

² Chilvers C, Adelstein AM. Interpreting patterns of mortality from circulatory disease in the regions of England and Wales: results from the Decennial Supplement on Area Mortality (1969-1973). *Health Trends* 1981;13:28-31.

³ Hessel SJ, Adams DF, Abrams L. Complications of angiography. *Radiology* 1981;138:273-81.

⁴ Hessel SJ, Schreiber MH. Translumbar aortography as an outpatient procedure. *AJR* 1981;137:1287.

⁵ Schreiber MH. Complications of angiography: incidence and prevention. *Tex Med* 1971;67:68-71.

(Accepted 7 December 1982)

Department of Radiology, Guy's Hospital, London SE1 9RT

P J SHAW, DMRD, MRCP, senior registrar

J F REIDY, FRCP, MRCP, consultant

M R SALARI, DMRD, FRCP, senior registrar