Rhabdomyolysis and acute renal failure in sickle cell anaemia

Acute renal failure due to striated muscle necrosis is well recognised in a wide range of conditions.¹ This report concerns a patient with homozygous sickle cell disease, in whom acute renal failure was associated with rhabdomyolysis during a severe sickling episode.

Case report

A 25 year old Nigerian man presented with a three day history of a painful right knee, abdominal pain, diarrhoea, vomiting, and fever. Previously healthy, he had been admitted to hospital only once before suffering from sickle cell crisis.

Examination showed he was drowsy but well orientated. His temperature was 38.5°C and he was moderately dehydrated with a blood pressure of 110/70 mm Hg, both erect and supine. The heart and lungs were normal. There was some upper abdominal tenderness on the right side but no signs of peritonism and normal bowel sounds. The right knee was clinically normal and there were no focal neurological signs. Haemoglobin was 6.4 g/dl, white cell count $11.3 \times 10^9/l$ with 92% neutrophils. Radiographs of the chest, abdomen, and right knee showed no abnormality.

Sickle cell crisis with possible biliary and bone sepsis was diagnosed, and he was given intravenous rehydration, penicillin, gentamicin, and analgesia. Six hours later his condition had deteriorated with persistent fever, confusion, and tachypnoea. There was pronounced right upper abdominal tenderness with reduced bowel sounds and signs of peritonism.

Serial changes in plasma creatinine, calcium, and phosphate.

No urine output had been charted since admission, and a urinary catheter was passed, producing a small volume of dark urine which contained blood and protein. Microscopy showed scanty red cells, but insufficient urine prevented further analysis. Blood urea was 21 mmol/l (127 mg/100 ml), potassium 3.0 mmol(mEq)/l, bicarbonate 21 mmol(mEq)/l, blood pH 7.31, P_{CO_2} 2.6 kPa (19.5 mm Hg), P_{O_2} 14.2 kPa (107 mm Hg), and blood glucose 8.0 mmol/l (144 mg/100 ml). Serum urate concentration was not measured.

An ultrasound scan of the abdomen showed multiple gall stones and a thickened gall bladder wall with fluid around the gall bladder bed, indicating possible gall bladder empyema and perforation. Antibiotics were modified to cover biliary pathogens including salmonellae. An exchange transfusion was performed to prevent further sickling. The patient's general condition precluded surgery.

Renal function rapidly deteriorated and haemodialysis was started. Subsequently, both blood and stool cultures revealed a group D salmonellae species. Creatine kinase activities were greater than 500 000 U/l (normal < 500 U/l). Laparotomy three days later showed an inflamed but intact gall bladder and a gangrenous segment of small bowel, which was resected. Renal function improved although hypercalcaemia developed during the recovery phase (see figure).

After operation the patient's fever resolved by lysis, and antibiotics were stopped 14 days after admission. Three days later a high swinging fever developed, and he had a fluctuant mass over the lower medial aspect of the right femur. Radiographs of the femur showed osteomyelitis, and 250 ml of sterile purulent material was drained from a subperiosteal abscess. A prolonged course of antibiotics completely resolved this problem, and the patient was discharged from hospital in good health 12 weeks after admission.

Comment

Exacerbation of sickle cell anaemia is precipitated by infection, dehydration, and hypoxaemia. The most common clinical symptoms are bone and abdominal ischaemic pain, due to microvascular occlusion by sickled cells, although any organ system may be affected. Other renal problems include haematuria due to papillary necrosis, water loss due to chronic nephropathy, nephrotic syndrome, and chronic renal failure.² Acute renal failure does not seem to be more common in sickle cell anaemia.

In this patient infection and dehydration clearly triggered a severe sickle cell crisis, which was exacerbated by the severe acidosis due to renal failure, sepsis, and tissue ischaemia. Although acute renal failure may be caused by septicaemia, the grossly raised creatine kinase activity, urinary findings, initial hypocalcaemia, and subsequent hypercalcaemia are typical of renal failure due to muscle necrosis (figure). Infection may provoke rhabdomyolysis but this is usually viral and rarely bacterial.³ In our patient the major pathogenic mechanism was probably muscle ischaemia induced by massive intramuscular sickling. Rhabdomyolysis has been reported in three patients with sickle cell trait.⁴ In each case, however, there was a clear history of abnormal muscle exercise, a recognised cause of muscle necrosis. We believe that sickle cell anaemia should be considered as an additional cause of non-traumatic rhabdomyolysis.

1 Grossman RA, Hamilton RW, Morse BM, Penn AS, Goldberg M. Non-traumatic rhabdomyolysis and acute renal failure. *N Engl J Med* 1974;291:808-11.

2 Wintrobe MM. *Clinical haematology*. Philadelphia: Lea and Febiger, 1981:840.

3 Kalish SB, Tallman MS, Cook FV, Blumen EA. Polymicrobial septicaemia associated with rhabdomyolysis myoglobinuria and acute renal failure. *Arch Intern Med* 1982;142:133-4.

4 George C, Brun-Buisson C, Amamou M, LeGall JR. Acute renal failure due to rhabdomyolysis in sickle cell trait. *Intensive Care Med* 1979;2:204-5.

(Accepted 28 January 1985)

Royal Free Hospital, London NW3 2QG

S DEVEREUX, MB, MRCP, registrar in haematology
S M KNOWLES, MRCP, MRCPATH, consultant haematologist

Correspondence to: Dr S Devereux, Edgware General Hospital, Edgware, Middlesex.

Accidental ingestion of sterilising tablets by children

Accidental ingestion of caustic substances is common,¹ particularly among children aged about two. Few patients develop severe sequelae—that is, oesophageal stricture—because generally the substance is not in contact with the mucosa for sufficient time to produce a burn, and any burns that are produced are not severe enough to result in stricture.² As the exact time of ingestion is rarely known most patients are treated with early oesophagoscopy, steroids, and antibiotics.^{1,2}

Sterilising tablets have been marketed in this country for the past 10 years, but as far as we know their accidental ingestion has not been reported previously. Even though they are wrapped in foil accidental ingestion is common: the National Poisons Information Service at New Cross Hospital received 119 calls about ingestion of sterilising tablets in the first eight months of 1984. We report on two patients seen in our unit recently.

Case reports

Case 1—A 1 year old boy presented with sudden onset of vomiting after swallowing a sterilising tablet. He was crying persistently, was not cyanosed, and did not have stridor. Air entry to both lungs was good. Endoscopy showed slough on a swollen right aryepiglottic fold. The vocal cords, trachea, and oesophagus were normal. The child was treated with steroids, antibiotics, and humidification and was discharged two days later. Endoscopy six days after ingestion showed normal results, and he subsequently remained well.

Case 2—A 7 month old boy developed a cough, vomited copious amounts of clear fluid, and then became drowsy after swallowing a sterilising tablet. On admission he was cold and cyanosed with pronounced stridor. He had supraclavicular and subcostal recession and a tachycardia of 180 beats/min with irregular respiration. Owing to vomiting, spasm, and local oedema intubation was achieved only with extreme difficulty. The supraglottis and hypopharynx were grossly oedematous and ulcerated, precluding extubation.

for nine days. The vocal cords were unaffected. Throughout this period resolution was monitored by serial endoscopies. The trachea and bronchi produced greatly increased amounts of mucus and were irrigated regularly with saline. Persistent aspiration due to neuromuscular incoordination prevented oral feeding for eight weeks. He was discharged after three months and subsequently remained well.

Comment

Sterilising tablets are 16 mm in diameter, and the severity of the reaction in case 2 was probably due to the tablet sticking in the supraglottis. Hawkins *et al* stated that solid caustic agents produce a higher incidence of oesophageal burns than liquids.³

The changes in the bronchi were probably due to inhalation of chlorine gas, which is generated when sodium dichloroisocyanurate is dissolved in water. Sodium dichloroisocyanurate is the active component of sterilising tablets, and the solution it produces is of about neutral pH. The mechanism of injury is assumed to be the oxidation of proteins, as it is after ingestion of liquid chlorine bleaches.¹

As the ingestion of sterilising tablets is relatively common and the consequences potentially fatal it would be prudent to package the tablets in childproof containers like other medications.

We thank the consultants concerned for allowing us to report these cases, Michael McGarvie of the National Poisons Information Service for his help, and Jacqueline Hunte for typing the manuscript.

- 1 Adam JS, Birk HG. Paediatric caustic ingestion. *Ann Otol Rhinol Laryngol* 1982;**91**:656-8.
- 2 Yarrington CT. The experimental causticity of sodium hypochlorite in the oesophagus. *Ann Otol Rhinol Laryngol* 1970;**79**:895-9.
- 3 Hawkins DB, Demeter MJ, Barnett TE. Caustic ingestion: controversies in management. A review of 214 cases. *Laryngoscope* 1980;**90**:98-109.
- 4 Weeks RS, Ravitch MM. The pathology of experimental injury to the cat oesophagus by liquid chlorine bleach. *Laryngoscope* 1971;**81**:1532-41.

(Accepted 2 February 1985)

Ear, Nose, and Throat Department, Hither Green Hospital, London SE13 6LH

M Z SODLAK, MB, FRCS, registrar
M J GLEESON, MB, FRCS, senior registrar
C L WENGRAF, MB, FRCS, consultant

Correspondence to: Mr M Siodlak.

Is repeated flushing of Hickman catheters necessary?

The successful management of many malignant diseases requires safe and frequent venous access for administering cytotoxic drugs, checking blood counts, performing biochemical analysis, and providing blood products. Venous access may be initially difficult in some patients and subsequently difficult in others, substantially impairing normal access and jeopardising treatment. The Hickman catheter has proved successful in this situation.¹ A Silastic catheter, it is inserted under a short anaesthetic into a central vein and brought through a subcutaneous tunnel to an exit site on the anterior wall of the chest. These catheters may be kept in position for many months. Conventional recommendations for their maintenance include daily or even twice daily "flushing," which is onerous and may give rise to complications in this often immunocompromised group. This report describes our experience with these catheters using minimal maintenance.

Patients, methods, and results

In one department between November 1979 and March 1983, 49 Hickman catheters were placed in 44 patients with malignant disease, of whom 33 had lymphomas, aged from 15 to 67 years (median age was 44.5 years). Patients were advised to shower briefly rather than bathe but no other restriction was placed on their activities. Two patients flushed their catheters once weekly at home, but the remainder carried out no maintenance at all. All routine blood sampling, cytotoxic therapy, or transfusions were performed using the catheter, after which all but two catheters were flushed with 5-10 ml of sterile physiological saline. Two patients insisted on sterile water as they experienced nausea and malaise after saline: these symptoms were unexplained but the use of water did not cause any problems.

Heparin was *not* added to the flush. Any sign of local infection at the insertion site was treated with 5% povidone-iodine (Betadine) spray twice daily and a dry dressing. Blocked catheters were treated with urokinase 5000 units in 2 ml sterile water, which was left in the catheter from 30 minutes to two hours after which irrigation was attempted.

The catheters were in place for a median of 187 days (range 4-786 days). In four patients catheters were replaced (twice in one patient) due to relapse,¹ malposition, accidental dislodgment, and kinking.

The mean interval between flushing the catheter was 21 days (range 1-56 days). The amount of access through the catheter was considerable: for each catheter a mean of 23 blood samples were obtained and 8.3 cycles of chemotherapy administered. Additionally, 63 whole blood transfusions were given to 24 patients and 88 platelet transfusions were administered to 10 patients.

Infections were classified as: Exit site (one or both of clinical and bacteriological evidence of infection at the exit site on the chest wall). Subcutaneous tunnel (similar evidence of infection along the subcutaneous track of the catheter). Exit site + septicaemia; subcutaneous tunnel + septicaemia (the occurrence of either in combination with systemic infection and positive blood cultures).

Catheter related complications

	No	Percentage of all 49 catheters
Infection		
Exit site	28*	57*
(Exit site and septicaemia)	(3)	(6)
Subcutaneous tunnel	2	4
(Subcutaneous tunnel and septicaemia)	(1)	(2)
Blockage	7	14

*Occurring in 15 patients with 15 catheters (34% of patients).

Thirty infective episodes related to the catheter occurred in a total of 9685 days of catheter function, giving a rate of one episode for 333 days of use. Most of these infections were limited to the catheter exit site on the wall of the chest (see table). In 29 of these 30 episodes the patient was neutropenic with a neutrophil white cell count $<0.8 \times 10^9/l$. All but two exit site infections and both subcutaneous tunnel infections resolved with antibiotic treatment. In only two cases did infection necessitate catheter removal. Blockage occurred in seven catheters and patency was restored in six. In the remaining case, unflushed for 56 days, the catheter was removed.

Comment

The median duration of insertion (187 days) in this study is the longest so far reported for patients with malignant disease. Nevertheless, the complication rate in this largely immunosuppressed group of patients was similar to that reported by others who have emphasised the need for daily cleansing of the exit site, and daily or twice daily flushing, often with heparin.²⁻⁴

Our results suggest that this frequency of attention, in addition to being troublesome for younger patients and difficult for solitary, elderly patients, is unnecessary. The catheters are safe and reliable and their wider and earlier use may prevent the great anxiety about venous access which many patients have.

- 1 Hickman RO, Buckner CD, Clift RA, *et al*. A modified right arterial catheter for access to the venous system in marrow transplant recipients. *Surg Gynecol Obstet* 1979;**148**:871-5.
- 2 Reed WP, Newman KA, de Jongh C, *et al*. Prolonged venous access for chemotherapy by means of the Hickman catheter. *Cancer* 1983;**52**:185-92.
- 3 Reilly JJ, Steed DL, Ritter PS. Indwelling venous access catheters in patients with acute leukemia. *Cancer* 1984;**53**:219-23.
- 4 Blacklock HA, Hill RS, Clarke AG, *et al*. Use of modified subcutaneous right arterial catheter for venous access in leukaemic patients. *Lancet* 1980;**i**:993-4.

(Accepted 18 February 1985)

Department of Clinical Pharmacology, Guy's Hospital, London SE1 9RT

H GILLIES, BSC, MRCP, lecturer
H J ROGERS, PHD, MRCP, professor

Department of Medical Oncology, Guy's Hospital, London SE1 9RT

J JOHNSTON, SRN, sister
P G HARPER, MRCP, consultant physician
C J RUDGE, FRCS, consultant renal transplant surgeon

Correspondence to: Dr Helen Gillies.