Perioperative care of a Jehovah’s Witness with a leaking abdominal aortic aneurysm

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Summary
We describe a Jehovah’s Witness patient who survived emergency repair of a leaking abdominal aortic aneurysm. In accordance with his beliefs, the patient expressed a wish not to be given blood and this was respected. At completion of surgery, his haemoglobin was 2.8 g dl\(^{-1}\) and his albumin was 8 g l\(^{-1}\). He was kept heavily sedated in the intensive care unit and treated with i.v. iron, folic acid and s.c. epoetin alfa. He was discharged to the high dependency unit approximately 14 weeks after surgery, (Br. J. Anaesth 1998; 81: 256–259)

Keywords: surgery, abdominal aortic aneurysm; religion, Jehovah’s Witness; blood, refusal; epoetin alfa; ferric hydroxide sucrose

There are currently about 130,000 Jehovah’s Witnesses in the United Kingdom. Their beliefs do not permit them to receive whole blood or packed cells. The use of other blood products or cell salvage techniques may be allowable. For an elective procedure, guidance for both doctors and patients can be sought from the Jehovah’s Witness hospital liaison committee. Ultimately, the decision to accept or refuse blood or blood products rests upon the conscience of each individual member.

Case report
A 67-year-old Afro-Caribbean male who was a Jehovah’s Witness collapsed in the street and was brought to the emergency department in a shocked state with a systolic arterial pressure of 80 mm Hg, a tachycardia of 120 beats per minute and poor peripheral perfusion. A clinical diagnosis of a leaking abdominal aortic aneurysm was made. An ultrasound scan confirmed the diagnosis; it revealed a fusiform dilatation of an infra-renal aneurysm with signs of acute haemorrhage and a large retro-peritoneal haematoma. The patient received gelatin (Gelofusine) 1.5 litres before transfer to the operating theatre.

On arrival in the operating theatre, the patient was alert and orientated. The risks and benefits of the procedure and the particular risk inherent in refusing blood were explained to the patient. Fully understanding the implications of his decision, the patient reaffirmed his beliefs and asked that he not be transfused with blood. The patient was aware of the possibility of cell salvage but it was not available at the hospital.

The patient was transferred to the operating table, intra-arterial monitoring was commenced, a urinary catheter was inserted and the patient was prepared for surgery. The patient was pre-oxygenated and cricoid pressure applied. Anaesthesia was induced with fentanyl 250 μg, thiopental sodium 150 mg and succinylcholine 100 mg. The trachea was intubated and anaesthesia was maintained with isoflurane in oxygen (50%) and nitrous oxide. Further neuromuscular block was obtained using rocuronium bromide. Central venous access was obtained peroperatively with a triple lumen catheter and a “Swan sheath” introducer. During the operation, the patient received hetastarch (Hespan) 1.5 litres, Hartmann’s solution 1 litre, saline 0.9% 4 litres, and mannitol 10% 500 ml. Intra-operative blood loss into the suction jars was 1.6 litres.

The aorta was clamped within 5 min of commencement of surgery. A straight 20-mm graft was sutured with blood. The patient was aware of the possibility of cell salvage but it was not available at the hospital.

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On arrival in the ICU, the patient was kept heavily sedated with morphine and propofol 1% and the lungs artificially ventilated. Midazolam, was substituted for propofol the next day in view of the anticipated long ICU stay. No neuromuscular blocking drugs were required to facilitate ventilation. Total

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Care of a Jehovah’s Witness with a leaking abdominal aortic aneurysm

Parenteral nutrition (TPN), i.v. iron, folic acid 15 mg per day and s.c. epoetin alfa 1000 units per day were started immediately in an attempt to maximally stimulate the bone marrow and provide the optimal conditions for haemopoiesis. Vitamin K 10 mg three times a day was given i.v. to promote production of coagulation factors.

The patient’s axillary temperature was 34°C on admission to the ICU. A decision was taken not to rewarm the patient actively as this may have increased tissue oxygen requirements, nor was he actively cooled as this may have exacerbated any coagulopathy. The $P_{O_2}$ was maintained at 0.6 for the duration of his ICU stay to increase oxygen delivery to the tissues whilst minimizing the risk of oxygen toxicity to the lungs. Although the dissolved oxygen content remained fairly constant, it initially contributed up to 19% of the total oxygen transported in the blood (fig. 1).

Blood tests were kept to a minimum; no blood was taken at all on the fifth to ninth postoperative days and blood was sent in bottles used in paediatric practice whenever possible. Haemoglobin on admission to the ICU was 2.8 g dl$^{-1}$ on the blood-gas machine (Radiometer ABL 510) and 3.0 g dl$^{-1}$ in the laboratory. The plasma albumin was 8 g litre$^{-1}$. The international normalized ratio (INR) was 2.9 and the partial thromboplastin time (PTT) was 63 s (normal range 27–37 s). The INR was normal by day 5 and the APTT and platelet count were within normal range by day 10. Daily coagulation checks were not performed as we had no therapeutic intervention to offer and the patient showed no signs of active haemorrhage.

Lactate concentrations (Radiometer EML 105) were normal by 10 h postoperatively and the standard base excess was within normal limits by 72 h.

Considerable thought was given as to whether or not to insert a pulmonary artery catheter to assist in fluid and inotrope management. In the hours immediately after the operation, the patient had occasional ventricular ectopics, but arterial pressure was not compromised. In view of the patient’s adequate arterial pressure, acceptable urine output, improving acid-base balance (fig. 2) and dependence on a low dose of just one inotrope, we could not clinically justify the use of a pulmonary artery catheter, although we appreciated that the data obtained would have been useful. We therefore relied on CVP readings to guide fluid requirements and tried to maintain the right heart filling pressure at 12–14 mm Hg. This was achieved in the first 48 h postoperatively with additional crystalloid 2.5 litres, Gelofusine 1 litre, Hespan 1.5 litres and the maintenance fluid provided by the TPN. Clinically, there was no overt evidence of left or right heart failure.

By the fourth postoperative day, the norepinephrine had been discontinued and enteral feeding had commenced. The patient maintained a good diuresis and towards the end of his stay in the ICU, his cumulative fluid balance became slightly negative (fig. 3).

By the 10th day, there was some green sputum on tracheal aspiration. This was sent as part of our weekly multi-resistant staphylococcus aureus (MRSA) screening programme. Gram staining revealed Gram positive staphylococci which were initially treated...
with ciprofloxacin and vancomycin. Two days later, the organism was identified as MRSA and the antibiotics were changed, according to drug sensitivities, to rifampicin and gentamicin. There was no clinical or radiological evidence of pneumonia, however.

On the 12th day, a surgical tracheostomy was performed because of gross glossal oedema caused by tongue biting. The patient was weaned from full artificial ventilation to continuous positive airway pressure (CPAP) and positive pressure support, without difficulty on the 14th postoperative day. Three days later the patient was breathing spontaneously on a "T piece". The following day the tracheostomy tube was changed to a size 6.0-mm non-cuffed tube before transfer of the patient to the high dependency unit (HDU). Two weeks later, the uncuffed tube was substituted for a mini-tracheostomy and the trachea was finally decannulated one week later.

A blood film and reticulocyte count performed on the 15th day reported "basophilic stippling and polychromasia", suggesting accelerated erythropoiesis and the presence of a young red cell population. The reticulocytes represented 3.5% of the red cell count, the normal value being approximately 1%. The day before discharge to the HDU the haemoglobin was 6.4 g dl\(^{-1}\) and the albumin was 27 g l\(^{-1}\) (fig. 4). The patient was discharged to a rehabilitation ward eight weeks after admission to hospital. After six weeks of rehabilitation the patient was independent and finally discharged back to his own home, 14 weeks after admission.

![Figure 3](image-url) Fluid balance for the duration of stay in the intensive care unit. Drugs include sedation, analgesia, norepinephrine, antibiotics, i.v. iron, folinic acid and epoetin alfa.

![Figure 4](image-url) Changes in haemoglobin, albumin and total protein during the first 22 postoperative days. Symbols represent laboratory-measured haemoglobin (open triangle), haemoglobin measured using the blood-gas analyser (open squares), total protein (solid circles) and albumin (solid squares). No blood samples were taken from days 5–9.
Discussion

We believe that this is the first reported case of a Jehovah's Witness surviving an emergency abdominal aortic aneurysm repair. This patient's initial survival depended on his resuscitation, his physiological responses to the insult he received and the surgical team. As this was an emergency procedure, it was not possible to inquire in detail preoperatively if any blood products may have been acceptable to the patient. As a consequence, the patient may well have endured a more rigorous blood product exclusion policy than his conscience would have allowed.

To provide substrates for haemoglobin synthesis and to stimulate its production we used TPN, i.v. iron, folinic acid and s.c. epoetin alfa. We initially prescribed two litres of a proprietary parenteral feed providing nitrogen 14 g and 1590 kcal over 24 h. The hospital TPN team reviewed the patient and produced a formulation providing nitrogen 11.4 g and 2000 kcal per day in approximately two litres. By the fourth day, enteral feeding was established with proprietary enteral feed and TPN was discontinued.

There is currently no licensed i.v. iron preparation in the United Kingdom. The patient's iron deficit was estimated to be in the order of 1400–2300 mg. We gave i.v. iron saccharate (Venofer) 1600 mg, over the duration of the ICU stay. Venofer contains 100 mg of trivalent iron in each ampoule and has been available in the United Kingdom for the last three years on a named patient basis only. We gave epoetin alfa 1000 units per day, but we later became aware that this does contain a small amount of human albumin. A more suitable product may have been epoetin beta as this is free of human albumin. We had two unexpectedly high haemoglobin results from the laboratory that did not correlate with the general trend or the haemoglobin level from the blood-gas machine; we had two unexplainably high haemoglobin as low as 1.6 g dl$^-1$ after major trauma, he was significantly younger at 29 yr old than this patient of 67 yr. Other major elective procedures with large anticipated blood loss have been performed in Jehovah's Witness patients though with the benefit of preoperative optimization of haematocrit, cell salvage, and in some cases the use of platelets, factor concentrates and human albumin.

In acute haemodilution, oxygen transport and tissue oxygen consumption are critical. Various techniques have been used to either increase oxygen delivery to the tissues or to decrease the tissue requirements for oxygen. The body's own physiological response, the right shift of the oxygen dissociation curve, does not occur until the haematocrit reaches 8–10%; this correlates to a haemoglobin of approximately 2.8 g dl$^{-1}$. Some workers have used active cooling to achieve the twin goals of decreased metabolic requirement for oxygen and increased oxygen delivery, as the amount of oxygen dissolved in the plasma increases with decreasing temperature. There is evidence to suggest that active cooling causes a marked leftward shift of the oxygen dissociation curve, thus reducing the amount of oxygen released to the tissues. Another disadvantage to active cooling is that it impairs haemostasis. Perfluorochemicals have been used to augment oxygen transport in a Jehovah's Witness patient. These substances have a short circulatory half-life and their oxygen tension and partial pressure relationship is linear, thus requiring the use of 100% oxygen. Perfluorochemicals have been used to increase the yield of blood taken for autologous transfusion immediately before surgery. The use of hyperbaric oxygen has also been suggested to increase dissolved oxygen in the plasma. Fortunately, in this patient, there was an improvement in the global markers of tissue oxygenation and perfusion.

Although our patient did not suffer large postoperative blood loss, in retrospect, the administration of an anti-fibrinolytic drug such as tranexamic acid or aprotinin and the use of desmopressin to boost factor VIII levels may have been useful to reduce postoperative oozing.

Although a Jehovah's Witness has survived with a haemoglobin as low as 1.6 g dl$^-1$ after major trauma, he was significantly younger at 29 yr old than this patient of 67 yr. Other major elective procedures with large anticipated blood loss have been performed in Jehovah's Witness patients though with the benefit of preoperative optimization of haematocrit, cell salvage, and in some cases the use of platelets, factor concentrates and human albumin.

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