

ENT surgery, blood and Jehovah's Witnesses

S L WOOLLEY, D R K SMITH*

Abstract

Surgical procedures in otolaryngology are often associated with the need for blood transfusions. Homologous blood transfusions carry risks and may be unacceptable to some patient groups. The Jehovah's Witness Society is known to many because of its stance on blood products. Refusal of potentially life-saving treatment creates ethical dilemmas for treating clinicians. Throughout the world, Jehovah's Witnesses have fought for the right to refuse blood products. This article examines the need for blood in otolaryngological procedures, surgical strategies to reduce blood loss, the beliefs of Jehovah's Witnesses regarding the acceptability of blood, and procedures and legal stances adopted when treating Jehovah's Witnesses.

Key words: Otolaryngology; Jehovah's Witnesses; Surgery; Blood

Introduction

Jehovah's Witnesses are members of a Christian faith which believes that the Bible is the true word of God.¹ The Jehovah's Witness Society is the most rapidly growing religious organization in the western world,² with an estimated 6 000 000 active members³ (150 000 in the United Kingdom)⁴ and more than 9 000 000 associated individuals.³

To most healthcare professionals, the Society is best known for its refusal of blood products even in life-threatening situations. This refusal is based on the belief that transfused blood is a nutrient⁵ and that three biblical passages (Genesis 9:4, Leviticus 17:11–14 and Acts 15:20,29) allegedly forbid transfusion.⁶ Conscious acceptance of blood products means loss of Jehovah's favour and the chance of everlasting life.⁷

The refusal of potentially life-saving blood products creates ethical and legal dilemmas. For treating clinicians, conflict occurs between the desire to respect patient autonomy (it is morally prohibited to disrespect a first party refusal of treatment) and the need to provide good medical care (it is morally wrong to risk death for a patient whose life-threatening condition may be managed by suitable medical therapy). In otolaryngology, blood transfusions may be necessary because of acute haemorrhage or complicated operative procedures which require appropriate haemoglobin levels for systemic oxygenation, flap survival and wound healing. Refusal of standard therapy necessitates the use of alternative strategies.

This article examines the beliefs of Jehovah's Witnesses, the rights of individuals to refuse recommended medical therapy, the need for blood in head and neck surgery, and potential surgical strategies to obviate the need for blood.

Jehovah's Witness beliefs

The refusal of blood products was not a founding belief of the society's first 'leader' but developed over the years as a potential means of maintaining cohesiveness amongst a worldwide group. The ban was originally introduced in 1944 but acceptance of blood products did not become an offence until 1961. Based on the belief that blood is a nutrient, three Biblical passages allegedly forbid transfusion.⁶ Genesis 9:4 totally forbids transfusion, Leviticus 17:11–14 forbids storage of blood and Acts 15:19–21 appears to absolutely prohibit blood product usage.

Individual Jehovah's Witnesses vary in their view of what is acceptable. It is therefore crucial to discuss acceptability on an individual basis.⁸ The majority of Jehovah's Witnesses accept crystalloid solutions, colloid solutions, perfluorochemicals (blood substitutes) and erythropoietin. Although there is growing evidence⁹ that certain Jehovah's Witnesses will accept minor fractions (immunoglobulin, interferon, interleukins and albumin), the Watchtower and Bible Tract Society still widely opposes the administration of allogeneic whole blood and its major components (i.e. red cells, white cells, platelets and plasma).¹⁰ Other biblical

From the Emergency Department, Bristol Royal Infirmary/Bristol Children's Hospital, Bristol, and the *Otolaryngology Department, University Hospital of Wales, Cardiff, Wales, UK.
Accepted for publication: 21 July 2006.

passages (Leviticus 17:13, Deuteronomy 12:15,16 and 15:23)⁶ rule out pre-operative collection and storage of autologous blood. Some Jehovah's Witnesses will allow cardiopulmonary bypass, dialysis, plasmapheresis, intra-operative blood donation and intra-operative cell salvage, provided no allogeneic blood prime is used and the circuits are continuous.

The taboo is reinforced by members of the Society, and the penalty for accepting blood products without repentance is 'disfellowshipping', a type of excommunication with harsh consequences. Friends and family of the disfellowshipped individual must shun them completely or risk disfellowshipping themselves.¹¹ There are many myths surrounding forced transfusions. Children transfused against their will are not abandoned by their families; patients transfused when unconscious are not relieved of emotional turmoil and even if every effort is made to avoid blood products, the individual will still feel violated.³

Forced transfusion is seen as a violent assault on the individual and their beliefs.¹² Individuals and their families undergo emotional, spiritual and psychological trauma despite support from the Jehovah's Witness community.³ Patients may experience a sense of humiliation, injustice, guilt or severe depression. Memories of the forced transfusion may trigger intense psychological reactions.³ Baptised Jehovah's Witnesses are therefore likely to refuse all blood products even in life-threatening situations.

Ethical and legal considerations

The right to refuse treatment

Every human being of adult years and sound mind has a right to determine what shall be done with his own body; and a surgeon who performs an operation without his patient's consent commits an assault, for which he is liable in damages.¹³

This concept of self-determination is well established in courts around the world¹⁴ and extensively supported by case law.¹⁵ In refusing blood products, Jehovah's Witnesses are exercising their right to autonomous decision making, which should be free and voluntary, without external influence. In medicine, autonomy is a simple concept: physicians should at all times respect and promote the free choices of competent patients, even treatment refusal. It is crucial to note that this principle even applies to those who appear to have made the wrong decision¹⁶ and to individuals with non-terminal illnesses.¹⁷ Consequently,

[T]his right of choice is not limited to decisions which others might regard as sensible. It exists notwithstanding that the reasons for making the choice are rational, irrational, unknown or even non-existent.¹⁸

Adults

Despite the above, adult Jehovah's Witnesses have had to defend their right to refuse treatment in

court, with early cases raising a variety of arguments for transfusing them against their wishes.¹⁹ The matter was settled in 1985,²⁰ with the US appeal court stating:

Rights are subject to compromise only when they collide with conflicting rights vested in others... The right of free exercise of religion protects more than mere beliefs... Religiously grounded actions or conduct are often beyond the authority of the state to control...²¹

Subsequent cases²² have supported this view, and English law is very clear: competent adults can refuse unwanted medical treatment 'for reasons which are rational or irrational or for no reason'¹⁸ and 'even in circumstances where she is... certain to die in the absence of treatment'.²³ This situation also applies to a competent patient's anticipatory refusal of consent in the form of an 'advance directive' or 'living will'. Jehovah's Witnesses carry a Advance Decision to Refuse Specified Medical Treatment card, which is a form of 'advance directive'.

In an emergency, treatment that is perceived as being in the patient's best interests may be given under the doctrine of necessity. This doctrine, however, assumes that 'under normal circumstances, a reasonable person would consent and thus the probabilities are that the patient would consent'.²⁴ Jehovah's Witnesses would be unlikely to consent to treatment, and, although the two leading cases offer conflicting advice,²⁵ caution must be exercised if blood products are considered.

Young children and adolescents

Cases concerning children, in which parents have refused blood products on their child's behalf, have appeared in courts throughout the western world, with parental arguments focussing on the right to raise children as they see fit²⁶ and freedom of religion.²⁷ Parental rights are recognized, but these rights are not absolute.²⁸ Any decision made must be in the child's best interests and must not permanently harm or impair a child's healthy development.^{29,30} The courts are clear: when parents refuse blood on behalf of their children, based upon religious beliefs, consideration will be given to these beliefs and treatment moderated where possible. However, the child's welfare is paramount and, if conflict occurs, blood deemed to be essential can be given.³¹

Superficially at least, the position of adolescents appears to be less clear. However, in England and Wales, despite the Family Law Reform Act 1969, the Children Act 1989 and *Gillick vs West Norfolk and Wisbech Area Health Authority*,³² mature minors may consent to, but may not necessarily be able to refuse, treatment. The courts are likely to use the 'best interests' test to override the opinions of adolescents and to insist upon transfusions.³³ In Scotland, although the Age of Legal Capacity (Scotland) Act³⁴ does not specifically refer to treatment refusal, the implication is that competent children can both consent to and refuse treatment.

Surgical considerations

Blood transfusions in ENT surgery

What does an otolaryngologist do when faced with a Jehovah's Witness who may require blood during surgery? In the first instance, it is important to determine how likely it is that blood products will be required during a surgical procedure. In otolaryngology, haemorrhage (usually epistaxis) and surgery for head and neck malignancy are the two situations in which blood products are most likely to be required. The need for blood transfusion in cases of epistaxis is difficult to quantify, but one study suggests that 45 per cent of patients admitted to hospital with epistaxis will require blood transfusions, with or without surgery.³⁵

Studies on blood transfusions in head and neck malignancy surgery have focussed primarily on the relationship between tumour recurrence and blood transfusion. However, one 1998 study³⁶ specifically reviewed blood transfusion requirements in head and neck surgery. The authors found that head and neck cancer surgery could be divided into three main categories depending upon the likelihood of transfusion and that this could assist in planning surgery. This may be particularly important when treating Jehovah's Witnesses.

Jehovah's Witnesses rely on the Watchtower and Bible Tract Society booklet *How Can Blood Save Your Life?* for their information about blood products. Although some may argue that this pamphlet is selective in its information,³⁷ the medical risks described (i.e. blood transfusions hinder the immune system, are associated with a high risk of infectious complications and are fraught with diseases) are real. About 0.5 to 3 per cent of all transfusions result in an adverse event, but the majority of these are minor reactions with no significant consequences.³⁸

It is well known that head and neck cancer patients have a depressed immune system and that this has prognostic significance. Deficits include diminished lymphocyte proliferation,³⁹ delayed cutaneous hypersensitivity⁴⁰ and a decreased interleukin 2 producing subset of T helper inducer cells.⁴¹ The surgical procedures and radiotherapy used to treat these conditions potentiate immunosuppression.^{42,43} The immunosuppressive effects of blood transfusions were first described in 1973,⁴⁴ in patients undergoing renal transplantation. Those individuals who received blood transfusions appeared to have increased allograft survival. This effect was believed to be due to immunosuppression occurring as a result of exposure to antigens expressed by transfused white cells.

Subsequent studies in patients undergoing surgery for colorectal,⁴⁵ lung,⁴⁶ breast⁴⁷ and extremity malignancies⁴⁸ demonstrated an increase in tumour recurrence in those patients receiving blood perioperatively. In head and neck surgery, the evidence is not as clear cut. Four studies⁴⁹⁻⁵² have suggested that blood transfusions increase the risk of recurrence, and three⁵³⁻⁵⁵ have demonstrated that there are no adverse effects of transfusions on survival.

With the balance still in favour of an increased risk of recurrence, blood should be used prudently.

Paediatric considerations

The commonest causes of haemorrhage in paediatric ENT patients are epistaxis and post-operative haemorrhage. Despite an extensive literature search, no studies specifically assessing blood transfusion in paediatric otolaryngology patients were identified. A 10 year retrospective study published in 2004⁵⁶ assessed epistaxis admissions in healthy children. In 10 years, only 14 of these children (out of 545) were admitted, and only one child received a blood transfusion (following nasal trauma). Children who suffered post-operative epistaxis were excluded. This single study suggests that transfusions in children are rare following epistaxis.

A 2002 study⁵⁷ examining post-tonsillectomy haemorrhage in children and adults identified 2567 children (aged six months to 14.9 years) who had undergone tonsillectomy with or without adenoidectomy. Haemorrhage occurred in 16 (0.87 per cent) children undergoing adenotonsillectomy and in 23 (3.1 per cent) children undergoing tonsillectomy alone. Only one (0.04 per cent) child required a blood transfusion. Unfortunately, the studies cited within this paper varied considerably, and there is little absolute data on the incidence of paediatric post-operative haemorrhage requiring blood transfusion.

Why use blood at all?

With increasing knowledge of transfusion-related problems and the increasing availability of blood alternatives, it could be argued that blood should no longer be needed. Liberal versus restrictive transfusion strategies has demonstrated that a higher haemoglobin level is not necessarily better,⁵⁸ and clinical trials have demonstrated that bloodless surgery is effective.⁵⁹ The most important outcome of transfusion is the maximization of oxygen delivery in order to prevent tissue hypoxia. Transfusion simply to restore blood volume or to raise the haematocrit is inappropriate. Unfortunately, the critical limits for tissue oxygenation are not well defined, and, therefore, physical symptoms and signs, nutritional status, estimates of blood loss, and haemoglobin levels must be used as substitutes. Studies have demonstrated that, following acute haemorrhage, myocardial ischaemia develops at 5 g/dl, with death occurring from myocardial dysfunction at levels below 3 g/dl.⁶⁰ However, case reports demonstrate survival in patients with haemoglobins as low as 1.4 g/dl.^{8,61}

The trick, of course, is to prevent the haemoglobin falling to such levels. If it does, other strategies which avoid blood can be used. In the majority of patients undergoing head and neck surgery, pre-operative planning is possible. Regardless of whether a patient is a baptised Jehovah's Witness or not, a full discussion about the acceptability of blood products should be undertaken. A full history and examination should be performed. The clinical

history should include the specific features of any personal or familial history of bleeding disorders and identification of any medication increasing the risk of bleeding (e.g. aspirin, nonsteroidal anti-inflammatory drugs and anti-coagulants). Attention must be paid to haemoglobin concentration, platelets and clotting. In patients with malignancy, nutritional status should be optimized. This may necessitate the use of supplemental foods, vitamins and minerals (iron, folate, vitamin B12 and vitamin K), and even parenteral nutrition.

In certain circumstances, it may be necessary to use recombinant human erythropoietin. Erythropoietin, a hormone produced primarily in the kidney, is responsible for erythropoiesis and its production is stimulated by hypoxaemia. Recombinant human erythropoietin has been used for many years in renal patients and is now licensed for use pre-operatively and in patients using pre-operative autologous blood donation. Following the administration of recombinant human erythropoietin, erythropoiesis occurs within three days, with the equivalent of one unit of blood being produced within seven days and five units within 28 days.⁶² Side effects include hypertension, flu-like symptoms, seizures and thrombotic events. Concomitant iron supplementation maximizes the erythropoietic response in anaemic patients, particularly if given intravenously, but its effect in normal individuals is still under debate.⁶³ It is important to note that some formulations are stabilized in albumin, and acceptability to individual Jehovah's Witnesses must therefore be addressed.

In otolaryngology, the best way to avoid the need for blood is to prevent acute haemorrhage. Careful tissue handling, recognition and avoidance of potential bleeding sources, and rapid control of haemorrhage are the best ways to achieve this aim. Patient positioning, local vasoconstrictors, topical haemostats, direct control of bleeding and electrocautery are all useful methods of preventing profound blood loss. In addition, because of the length of some head and neck procedures, anaesthetic techniques such as controlled hypotensive anaesthesia, regional anaesthesia, maintenance of normothermia and blood cell salvage may also be employed.

Post-operatively, close surveillance for post-operative bleeding, adequate oxygenation, the avoidance of unnecessary intravenous fluids, early nutritional intake and minimization of phlebotomy all help to prevent post-operative blood loss. Following some head and neck procedures, parenteral nutrition may be required to maintain adequate nutritional stores of iron, folate and vitamin B12.

If acute, severe haemorrhage does occur, the primary goal is to stop the bleeding. In the first instance, direct pressure should be employed. Systemic haemostatic agents (tranexamic acid, aprotinin and vasopressin), drugs which augment clotting activity (desmopressin, vitamin K and recombinant clotting factors), topical haemostatic agents (fibrin glue, topical thrombin, oxidized cellulose haemostat, gelatine foam and calcium alginate)

and vasoconstrictors (adrenaline, phenylephrine and topical cocaine) can be tried. The use of these agents depends on the site of bleeding and the availability of the product.

Conclusion

Treatment of Jehovah's Witnesses poses ethical and legal dilemmas for treating clinicians, particularly in the emergency situation. Blood loss in ENT patients is not uncommon, and giving careful consideration to an individual's risk allows planning of surgery in order to prevent the need for blood transfusions. If the need for blood products arises, careful thought should be given to their use; competent Jehovah's Witness adults can refuse medical treatment, and, although parents cannot refuse treatment on behalf of their children, alternatives to blood should be considered first.

References

- Harrison BG. *Visions of Glory: a History and Memory of Jehovah's Witnesses*. New York: Simon & Schuster, 1978
- Stark R, Iannacone LR. Why the Jehovah's Witnesses grow so rapidly: a theoretical application. *Journal of Contemporary Religion* 1997;**12**:133–57
- Bodnaruk ZM, Wong CJ, Thomas M. Meeting the clinical challenge of care for Jehovah's Witnesses. *Transfus Med Rev* 2004;**18**:105–16
- Milligan LJ, Bellamy MC. Anaesthesia and critical care of Jehovah's Witnesses. *Continuing Education in Anaesthesia, Critical Care & Pain* 2004;**4**:35–9
- Anonymous Untitled. *The Watchtower* 1951;1 July:415
- Online Bible: New World Translation of the Holy Scriptures. www.watchtower.org/bible/index.htm [9 September 2006]
- Anonymous. Be guided by the living God. *The Watchtower* 2004;15 June:24
- Mann MC, Votto J, Kambe J, McNamee MJ. Management of the severely anemic patient who refuses blood transfusion: lessons learned during the care of a Jehovah's Witness. *Ann Intern Med* 1992;**117**:1042–8
- New Light on Blood. www.ajwr.org [13 September 2006]
- Watchtower and Bible Tract Society. Blood as medicine. *The Watchtower* 2004;15 June:21–7
- New York Jehovah's Witness Public Affairs Office. *Statement to the Media: 14/06/2000*. New York: Watchtower and Bible Tract Society, 2000
- Re LDK; Children's Aid Society of Metropolitan Toronto v K and K* (1985) 48 RFL (2d) 164
- Schloendorff v Society of New York Hospital* 105 NE 92, 93 (NY 1914)
- UNITED STATES: *Cruzan v Director, Missouri Dept of Health* 497 US 261 (1990), *Perna v Pirozzi* 457 A.2d 431 (NJ 1983); UNITED KINGDOM: *Sidaway v Governors of Bethlem Royal Hospital* [1985] AC 871, *Re F (Sterilisation: Mental patient)* [1992] 2 FLR 458, *Airedale NHS Trust v Bland* [1993] 2 WLR 316, *St George's Healthcare NHS Trust v S; R v Collins ex parte S* [1998] 3 All ER 673; CANADA: *Nancy B v Hotel-Dieu de Quebec* (1992) 86 DLR (4th) 385; AUSTRALIA: *Secretary of the DoH and Community Services v JWB and SMB* (1992) 175 CLR 218
- In Re C (Adult: Refusal of Treatment)* [1994] 1 WLR 290, *Smith v Auckland Hospital Board* [1965] NZLR 191, *Lane v Candura* 376 NE 2d 1232 (Mass, 1978), *Re Quackenbush* 383 A 2d 785 (NJ County Court, 1978)
- Sidaway v Governors of the Bethlem Royal Hospital* [1985] AC 871
- In re Quackenbush* 156 NJ Super 282, 383 A2d 785 (1978), *Lane v Candura* 6 Mass App Ct 373, 376 NE2d 1232 (1978),

- Bartling v Superior Court* 163 Cal App 3d 186, 209 Cal Rptr 220 (2d Dist 1984), *Satz v Perlmutter* 362 So 2d 160 (Fla 4th Dist Ct, 1978); *Re Farrell* 529 A 2d 404 (NJ 1987)
- 18 *Re T (An Adult) (Consent to Medical Treatment)* [1992] 2 Fam 458, 460
 - 19 *Powell v Columbian Presbyterian Medical Center* 267 NYS2d 450 (NY 1965), *John F Kennedy Memorial Hospital v Heston* 279 A2d 670 (NJ 1971), *In re Estate of Dorone* 517 Pa 3, 534 A2d 452 (1987), *Werth v Taylor* 475 NW2d 426 (Mich App 1991), *In the Matter of Alice Hughes* 611 A.2d 1148 (NJ SuperAD 1992), *In re Conroy* 98 NJ 321, 486 A.2d 1209 (1985), *Application of President and Dir of Georgetown College*, 331 F2d 1000 (DCCir1964), cert Denied 377 US 978 (1964), *Raleigh Fitkin-Paul Morgan Memorial Hospital v Anderson* 201 A.2d 537 (NJ 1964)
 - 20 *In re Brown* 478 So2d 1033 (MS 1985)
 - 21 *Ibid* at 1037
 - 22 *Public Health Trust v Wons* 500 So 2d 679 *Public Health Trust v Wons* aff'd 541 So 2d 96 (Fla 1989), *In re Duran* 769 A2d 497 (Sup Ct Penn 2001)
 - 23 *Re T (Adult: Refusal of Treatment)* [1993] Fam 95
 - 24 Ridley DT. Honoring Jehovah's Witnesses' advance directives in emergencies: a response to Drs Migden and Braen. *Acad Emerg Med* 1998;**5**:824–35
 - 25 *In re Estate of Darrell Dorone* 534 A2d 452 (Pa 1987), *Malette v Shulman* 72 OR2d 417 (Ont Ct App 1990)
 - 26 *Meyer v Nebraska* 262 US 390 (1923), *Wisconsin v Yoder* 406 US 205 (1972), *Stanley v Illinois* 405 US 645 (1972), *Santosky v Kramer* 455 US 745 (1982), *Planned Parenthood v Casey* 505 US 833 (1992), *Burge v City and County of San Francisco* 262 P2d 6 (Cal 1953)
 - 27 *In re Seithfert* 127 NE2d 820 (NY 1955), *In re Green* 292 A2d 387 (Pa 1972), *State v Lockhart* 664 P2d 1059 (Okla Cr 1983), *In re Hudson* 126 P2d 765 (Wash 1942), *Bradley v State* 79 So 651 (Fla 1920)
 - 28 Parental rights not absolute: *Newmark v Williams* 588 A.2d 1108 (Del 1991), *Jacobson v Massachusetts* 197 US 11 (1905), *Hawaii v Standard Oil Co.* 405 US 251 (1972); Rejection of the Free Exercise Clause: *Prince v Massachusetts* (1944) 321 US 158, *Walker v Superior Court* 763 P2d 852 (1988), *Commonwealth v Barnhardt* 497 A.2d 616 (Pa Super 1985), *Craig v State* 220 Md 590 (1959), *People v Pierson* 176 NY 201 (1903), *State v Norman* 808 P2d 1159 (Wash Ct App 1991), *Funkhauser v State* 763 P2d 695 (1988), *Commonwealth v Nickson* 718 A2d 311 (Pa Super Ct 1998), *In Re Custody of a Minor* 379 NE2d 1053 (Mass 1978), *Commonwealth v Twitchell* 617 NE2d 609 (Mass 1993)
 - 29 Dwyer JG. The children we abandon: religious exemption to child welfare and education laws as denials of equal protection to children of religious objectors. *North Carolina Law Review* 1996;**74**:1321–478
 - 30 Queensland Law Reform Commission. *Consent to Medical Treatment of Young People: Discussion Paper 34–35*. Brisbane, Qld: Queensland Law Reform Commission, 1995 (internal citations omitted)
 - 31 Wilson P. Jehovah's Witness children: when religion and the law collide. *Paediatric Nursing* 2005;**17**:34–7 (& see references cited in: Woolley S. Children of Jehovah's Witnesses and adolescent Jehovah's Witnesses: what are their rights? *Arch Dis Child* 2005;**90**:715–19)
 - 32 *Gillick v West Norfolk and Wisbech AHA* [1985] 3 All ER 402
 - 33 *Re R (A Minor) (Wardship: Consent to Medical Treatment)* [1992] Fam 11, *Re W (A Minor) (Medical Treatment: Court's Jurisdiction)* [1993] Fam 64, *Re S (A Minor) (Wardship: Medical Treatment)* [1994] 2 FLR 1065, *Re E (A Minor) (Wardship: Medical Treatment)* [1993] 1 FLR 386, *Re L (Medical Treatment: Gillick Competence)* [1999] 2 FCR 524, [1998] 2 FLR
 - 34 *Age of Legal Capacity (Scotland) Act 1991*
 - 35 Shaw CB, Wax MK, Wetmore SJ. Epistaxis: a comparison of treatment. *Otolaryngol Head Neck Surg* 1993;**109**: 60–5
 - 36 Dulguerov P, Quinodoz D, Allal AS, Tassonyi E, Beris P. Blood transfusion requirements in otolaryngology-head and neck surgery. *Arch Otolaryngol* 1998;**118**:744–7
 - 37 Louderback-Wood K. Jehovah's Witnesses, blood transfusions and the tort of misrepresentation. *Journal of Church and State* 2005;**47**:783–822
 - 38 Public Health Agency of Canada. <http://www.phac-aspc.gc.ca> [9 September 2006]
 - 39 Kragina F, Bolanca S. Recent theoretical and practical problems in cell-mediated immunological reactions in cases of laryngeal cancer. *Acta Otolaryngol* 1980;**89**:195–201
 - 40 Krause CJ. Characteristics of tumor associated antigens in squamous cell carcinoma. *Laryngoscope* 1979;**89**: 1105–20
 - 41 Dawson DE, Everts EC, Vetto RM, Burger DR. Assessment of immunocompetent cells in patients with head and neck squamous cell carcinoma. *Ann Otol Rhinol Laryngol* 1985;**94**:342–5
 - 42 Schantz SP, Romsdahl MM, Babcock GF, Nishioka K, Goepfert H. The effect of surgery on natural killer cell activity in head and neck cancer patients: in vitro reversal of a postoperatively suppressed immunosurveillance system. *Laryngoscope* 1985;**95**:588–94
 - 43 Gray WC, Chretien PB, Suter CM, Revie DR, Tomazic VT, Blanchard CL *et al.* Effects of radiation therapy on T-lymphocyte subpopulations in patients with head and neck cancer. *Otolaryngol Head Neck Surg* 1985;**93**:650–60
 - 44 Opelz G, Sengar DDS, Mickey MR, Teraski PI. Effect of blood transfusions on subsequent kidney transplants. *Transplant Proc* 1973;**5**:253–9
 - 45 Blumberg N, Agarwal MM, Chuang C. Relation between recurrence of cancer of the colon and blood transfusion. *BMJ* 1985;**290**:1037–9
 - 46 Tartter PI, Burrows L, Kirschner P. Perioperative blood transfusion adversely affects prognosis after resection of stage 1 (subset NO) non-oat cell lung cancer. *J Thorac Cardiovasc Surg* 1984;**88**:659–62
 - 47 Tartter PI, Burrows L, Papatestas AE, Lesnick G, Aufses AH. Perioperative blood transfusion has prognostic significance for breast cancer. *Surgery* 1985;**97**:225–9
 - 48 Rosenberg SA, Siemp CA, White DE, Wesley R. Perioperative blood transfusions are associated with increased rates of recurrence and decreased survival in patients with high grade soft tissue sarcomas of the extremities. *J Clin Oncol* 1985;**3**:698–709
 - 49 Johnson JT, Taylor FH, Thearle PB. Blood transfusion and outcome in stage 3 head and neck carcinoma. *Arch Otolaryngol Head Neck Surg* 1987;**113**:307–10
 - 50 Jackson RM, Rice DH. Blood transfusions and recurrence in head and neck cancer. *Ann Otol Rhinol Laryngol* 1989;**98**:171–3
 - 51 Bock M, Grevers G, Koblitz M, Heim MU, Mempel S. Influence of blood transfusions on recurrence, survival and postoperative infections of laryngeal cancer. *Acta Otolaryngol* 1990;**110**:155–160
 - 52 Woolley AL, Hogikyan ND, Gates GA, Haughey BH, Schechtman KB, Goldenberg JL. The effect of blood transfusion upon recurrence of head and neck carcinoma: retrospective review and meta-analysis. *Ann Otol Rhinol Laryngol* 1992;**109**:724–30
 - 53 Jones KR, Weissler MC. Blood transfusion and other risk factors for recurrence of cancer of the head and neck. *Arch Otolaryngol Head Neck Surg* 1990;**116**:304–9
 - 54 VonDoersten P, Cruz RM, Selby JV, Hilsinger RL. Transfusion, recurrence and infection in head and neck cancer surgery. *Otolaryngol Head Neck Surg* 1992;**106**:60–7
 - 55 Schuller DE, Scott C, Wilson KM, Freer R, Al-Sarraf M, Jacobs J *et al.* The effect of perioperative blood transfusion on survival in head and neck cancer. *Arch Otolaryngol Head Neck Surg* 1994;**120**:711–16
 - 56 Brown NJ, Berkowitz RG. Epistaxis in healthy children requiring hospital admission. *Int J Pediatr Otorhinolaryngol* 2004;**68**:1181–4
 - 57 Windfuhr JP, Chen Y-S. Incidence of post-tonsillectomy hemorrhage in children and adults: a study of 4,848 patients. *Ear Nose Throat J* 2002;**81**:626–8
 - 58 Hebert PC, Wells G, Blajchman MA. A multicentre, randomized, controlled clinical trial of transfusion requirements in critical care. Transfusion Requirements in Critical Care Investigators and the Canadian Critical Care Trials Group. *N Eng J Med* 1999;**340**:409–17

- 59 Laupacis A, Fergusson D. Erythropoietin to minimize perioperative blood transfusion: a systematic review of randomized trials. The International Study of Perioperative Transfusion (ISPOT) investigators. *Transfus Med* 1998;**8**: 309–17
- 60 Gilcreast DM, Avella P, Camarillo E, Mullane G. Treating severe anemia in a trauma patient who is a Jehovah's witness. *Crit Care Nurse* 2001;**21**:69–72
- 61 Rupp RE, Ebraheim NA, Saddemi SR, Wido T. Management of a multiply injured Jehovah's Witness with severe acute anemia. *Orthop Rev* 1993;**22**:847–50
- 62 Goodnough LT, Price TH, Rudnick S, Soegiarso RW. Preoperative red cell production in patients undergoing aggressive autologous blood phlebotomy with and without erythropoietin therapy. *Transfusion* 1992;**32**:441–5
- 63 Rohling RG, Zimmermann AP, Breyman C. Intravenous versus oral iron supplementation for preoperative stimulation of haemoglobin synthesis using recombinant human erythropoietin. *J Hematother Stem Cell Res* 2000;**9**:497–500

Address for correspondence:

Dr S L Woolley,
Consultant,
Emergency Department,
Bristol Royal Infirmary/Bristol Children's Hospital,
Upper Maudlin Street,
Bristol BS2 8HW,
UK.

Fax: +44 117 928 2713

E-mail: sarah.woolley@ubht.nhs.uk

Dr S L Woolley takes responsibility for the integrity of the content of the paper.

Competing interests: None declared
