

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original research

Bloodless surgery in geriatric surgery



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ARTICLE INFO

Article history:

Received 15 May 2014

Accepted 15 June 2014

Available online 23 August 2014

Keywords:

Bloodless surgery

Elderly

ABSTRACT

In bloodless surgery a series of measures has to be implemented to reduce the perioperative need for transfusion of whole blood or its components. Jehovah's Witness are the most representative group of patients opting for bloodless surgery as their faith follows strict believes that prohibits receiving blood.

Geriatric patients requiring bloodless surgery are even more delicate and represent a challenge for surgeons. The physiological response of the over 65 year population to decreased hemoglobin level is slower and less effective than in young and adult patients.

Herby we describe the perioperative protocol implemented in our surgical Department offered to geriatric Jehovah's Witness patients. Preoperative optimization of the patients is the key step in the preparation period. Intraoperative anesthetic and surgical measures are also required along with a strict postoperative follow-up.

From our experience, bloodless surgery is feasible in the geriatric population as long as it is performed in specialized centers where a multidisciplinary team is prepared to specifically manage this scenario. Rigorous patients selection and preparation are mandatory.

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1. Introduction

The term 'bloodless surgery' refers to a series of measures in the pre-, peri- and postoperative care of patients that aim to reduce the need for allogeneic blood transfusion, and improve patient outcomes in patients refusing blood tranfusion.

In some patients this is not an option but an obligation due to religious believes.

Jehovah's Witnesses (JW) are a Christian faith that had its modern beginnings in the 1870s in USA. Presently the number of Witnesses is about 6.3 million worldwide, having doubled since 1980s [1].

Abbreviations: JW, Jehovah's Witnesses; USA, United States of America; ECG, Electro Cardio Gram; ASA, American Society of Anesthesiologists; ANH, Acute normovolemic hemodilution.

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Jehovah's witnesses believe that the entire Bible was written under inspiration from God and it is beneficial in every aspect of life.

Witnesses believe that blood transfusion is prohibited by Biblical passages such as Acts 15:19–21, which say "Abstain ... from fornication and from what is strangled [unbled meat] and from blood."

Although these verses and others are not stated in medical terms, Witnesses see them as precluding the transfusion of allogeneic whole blood and its four chief components (ie, red blood cells, white cells, platelets, and plasma) [2].

As a rule, Jehovah's Witnesses will accept most medical treatments, surgical procedures and administration of fluids such as crystalloids, colloids and starch [3]. The treatments that are viewed as unacceptable are the transfusion of whole blood, packed red cells, platelets, white cells or plasma [4].

Table 1 [5] shows in details the acceptable and unacceptable treatments by JW and those that are still debated.

Regarding the use of a patient's own blood in the course of a medical procedure or therapy, many Witnesses do not consider this to conflict with Biblical principles provided there is no advance storage. Witnesses generally consent to blood management techniques and procedures involving temporary diversion of autologous blood if no allogeneic blood prime is used (eg,

Table 1

List of treatments accepted and unaccepted by Jehovah's Witness.

Unacceptable procedures
- Transfusion of allogeneic whole blood, RBCs, WBCs, PLTs, or plasma
- Preoperative autologous blood donation (PAD or predeposit)
Acceptable procedures
- Most surgical and anesthesiologic blood conservation measures
- Most diagnostic and therapeutic procedures (e.g., phlebotomy for laboratory testing, angiographic embolization)
- Synthetic oxygen therapeutics (e.g., perfluorochemicals)
- Non-blood volume expanders (e.g., saline, lactated Ringer's, hydroxyethyl starches)
- Pharmacologic agents that do not contain blood components or fractions such as
• Drugs to enhance hemostasis (e.g., tranexamic acid, ϵ -aminocaproic acid, aprotinin)
• Hematopoietic growth factors and hematinics (e.g., albumin-free EPO, iron)
• Recombinant products (e.g., albumin-free coagulation factors)
• Topical hemostatic agents (e.g., collagen, gelatin-based hemostats, oxidized cellulose)
Personal decision (Acceptable to some, declined by others)
- Blood cell salvage (intraoperative or postoperative autotransfusion)
- Acute normovolemic hemodilution (ANH)
- Intraoperative autologous blood component sequestration† (including intraoperative plateletpheresis, preparation of fibrin gel, PLT gel, PLTrich plasma)
- Cardiopulmonary bypass
- Apheresis
- Hemodialysis
- Plasma-derived fractions (e.g., immune globulins, vaccines, antivenins, albumin, cryoprecipitate)
- Hemostatic products containing blood fractions (e.g., recombinant factor VIIa [‡] , coagulation factor concentrates, prothrombin complex concentrate, fibrin glue and/or sealant, hemostatic bandages containing plasma fractions, thrombin sealants)
- Products containing plasma-derived blood fractions such as human serum albumin (e.g., some formulations of EPO, streptokinase, G-CSF, vaccines, recombinant clotting factors, nuclear imaging products)
- Oxygen therapeutics and other products containing a blood cell-derived fraction, whether from a human or an animal source (e.g., iron supplements, hematin, interferon alfa-N3 (leukoderived))
- Epidural blood patch
- Blood cell scintigraphy (e.g., radionuclide tagging for localization of bleeding)
- Peripheral blood progenitor cell transplantation (autologous or allogeneic)
- Transplants (organ, marrow, bone)

cardiopulmonary bypass and hemodialysis). Some patients may request that external equipment be arranged so that continuity is maintained with their vascular system [2].

The rationale behind bloodless surgery is to implement a protocol for those patients refusing blood product transfusion in order to allow a risk free surgery.

The problems of the bloodless surgery are magnified in elderly who require major elective procedures entailing significant blood loss. Elderly compensate with more difficulty the blood loss. The physiological response of the over 65 year population to decreased hemoglobin level is slower and less effective than in young and adult patients.

In the present study we present our experience with “bloodless surgery” in the geriatric Jehovah's Witness population.

2. Methods

2.1. Our protocol

2.1.1. Preadmission

All our patients planned for surgery were seen in the pre-admission clinic where they were assessed by a member of the surgical team along side with an anesthetist.

Blood tests, pulmonary function tests, ECG and cardiologist assessment were performed in order to detect comorbidities and to

assign the patients an ASA score to stratify the operative risk and to achieve a preoperative optimization with respect to blood count and coagulation function.

A multidisciplinary meeting including surgeons, anesthetists, oncologists followed by discussion with patients and patients' relatives was mandatory to carefully evaluate the surgical risk in a scenario of bloodless surgery.

2.1.2. Improve hematopoiesis

All the patients who were planned to have surgery were given a preoperative dose of Erythropoietin, generally one week before surgery. Erythropoietin is a glycoprotein hormone normally produced in response to tissue hypoxia. Its function is to increase circulating red cell mass [6,7]. Typically one to three preoperative doses of recombinant human erythropoietin were enough to increase the Hemoglobin level of 1–3 gr/dl.

2.1.3. Planning

Careful planning of the surgical procedure is vital. It is extremely important to establish a multidisciplinary coordination between the surgical team along with the anesthetists and paramedics (theatre staff) to discuss in advance the preparation for a blood less procedure to facilitate blood conservation strategies (e.g. cell salvage).

2.1.4. Intraoperative measures

- Surgical technique: extra care has to be paid to hemostasis. Diathermy dissection, the use of harmonic scalpel and of absorbable cellulose or collagens have all been ascribed to achieve a better blood loss control [1,8,9].
- Anesthetic technique: Controlled hypotension is a well recognized technique whereby the mean arterial pressure is maintained at a low level during surgery, to minimize intra-operative bleeding [1]. We believe that this technique represent a risk for brain and heart ischemic injuries and may mask or underestimate a source of bleeding, for this reason this is a technic not used in our practice.
- Autologous blood transfusion: Cell salvage machines can be used during surgery and are able to collect and filter blood removed by suction and in swabs, which can then be given back to the patient [10]. This is a safe technique with low risk and it is well accepted by most of Jehovah's Witness as in the procedure there is no discontinuity in the process of suction, filtering and reinfusion of the autologous blood.

2.1.5. Postoperative measures

- Reducing blood loss: strict postoperative vigilance to early detect postoperative hemorrhage is mandatory. Postoperative daily full blood count is advised.
- Increase hemopoiesis: Iron, vitamin B12 and folate should be adequately supplemented, and recombinant erythropoietin can be used if necessary. [9,11]

2.2. Our experience

From 2008 to May 2014 we have retrospectively reviewed the paper and electronic notes of all surgical patients operated in our Department of Surgical Sciences.

3. Results

We have identified 45 patients of Jehovah's Witness faith and of age >65. Of these 15 were female and 30 male. The age range was between 65 and 80 with a mean of 69.

The type of operation performed ranged from minor to major surgery and are showed in Table 2. All of the patients treated underwent the protocol described. The patients who received the indication for surgery were all operated by the same surgical team with a long-lasting experience in managing JW surgical patients.

All of the patients were discharged from our department after an uneventful recovery period. None of them required nor received blood (or of its components) transfusion.

4. Discussion

A patient's rejection of a procedure does not relieve the physician of the duty to provide other essential and acceptable medical management or emergency treatment [12]. Based on this principle, surgeons have the moral duty to offer the same level of surgical treatment also to patients refusing blood transfusion.

In the scenario where blood components cannot be used as life saving procedures, transfusion-alternative strategies have to be implemented. These strategies consist in the use of medical devices, pharmaceutical supports and particular surgical techniques to overcome the inability to offer traditional treatment.

The objective of such strategies, tailored to each clinical situation, is to minimize blood loss, optimize autologous blood management, and enhance hematopoiesis [9].

Recombinant erythropoietin is available in a biosynthetic form and it is normally used for patients with renal disease at risk for pure red-cell aplasia. Bloodless surgery adopted this pharmaceutical support to stimulate the hematopoiesis in the preoperative preparation but also in the postoperative period, where a certain amount of blood has been lost during surgery. For elective surgery 600 units/kg of erythropoietin administered subcutaneously once a week for 3 weeks before surgery can increase the hemoglobin level by 30 g/L or more [13]. In our experience we limited to 1–2 injection preoperatively. Regarding the surgical technique used, extreme importance is given to hemostasis during and at the end of the surgical procedure. Ligation tie is preferred to the use of energy source devices especially on mid and large caliber vessels. Cell salvage machines can be used during surgery and are able to collect and filter blood removed by suction and in swabs, which can then be given back to the patient. When these type of devices are used, two different suction handles are used during the procedure: one for the suction of dirty fluids that will be discarded and one for the suction of blood addressed to the filtering and re-transfusion

machine. This technique is generally accepted by JW patients, as there is no discontinuity in the circulation device.

Acute normovolemic hemodilution (ANH), in which the blood is in a continuous circuit with the patient, may provide a workable alternative [14].

In the specific case of geriatric patients, extra care has to be taken considering that the compensation mechanisms to anemia are slower and less effective [15,16].

It is been demonstrated that the postoperative mortality rises as the Hb falls [17]. In a large series of postoperative anemic patients refusing blood transfusion the authors reported a risk of mortality increasing of 2.5 times for every gram of Hb decrement [15].

In case of need, especially in emergency situation, the physician in charge may still give blood transfusion after having informed the official authorities of the life-saving plan and receive a Court order.

It is important to recognize the correct timing to transfer a patient to a specialized transfusion alternative center if the physician is not comfortable in the management of these patients.

5. Conclusion

Bloodless surgery in geriatric population is safe and feasible in selected cases and in specialized centers. Physicians with no experience in managing patients refusing blood components are advised to transfer these to specialized centers. The implementation of a specific "bloodless" surgery protocol is important to minimize the risk and to offer to these patient the same quality of care offered to traditional surgery patients.

Ethical approval

This is a retrospective study based only on the analyses of recorded data and then no Ethical Approval was necessary.

Funding

All Authors have no source of funding.

Author contribution

Salvatore Guarino: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Filippo Di Matteo: was the co-writer of the manuscript. He looked after mainly the discussion section.

Salvatore Sorrenti: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Roberto Greco: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Matteo Nardi: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Pasqualino Favoriti: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Angelo Filippini: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Table 2

The list of procedures performed in the elderly population of Jehovah's Witness faith.

Intervento	Numero
AAA	1
Prostatectomia	6
Resezione del retto	7
Emicolectomia destra	1
Emicolectomia sin	1
Gastrectomia	1
Colecistectomia	1
Nefrectomia	4
Procedure proctologiche minori	3
Tiroidectomia	10
Altre procedure	10

Enrico De Antoni: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Antonio Catania: supervised the whole process and contributed to the final version of the manuscript by editing the final paper.

Conflicts of interest

All Authors have no conflict of interests.

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