ORIGINAL ARTICLE

Bloodless Cardiac Surgery in Jehovah's Witnesses: Outcomes Compared With a Control Group

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Introduction and objectives. Some patients, such as Jehovah's Witnesses, refuse to use blood products, which can make it difficult to achieve the same outcomes as in the general population. The objective of this study was to determine whether clinical characteristics and surgical outcomes in Jehovah's Witnesses undergoing cardiac surgery are similar to those in other patients.

Methods. Paired-group retrospective cohort study. All Jehovah's Witnesses undergoing cardiac surgery between January 1998 and September 2006 were included (n=59). Cases were matched on a 1:1 basis according to sex, age (5) years, year and type of surgery, and need for repeat surgery. Preoperative, intraoperative, and postoperative data were analyzed.

Results. The mean age of cases was 62.5 (11.1) years with 57.6% being female. Some 30.5% had had at least 1 previous cardiac intervention. The clinical characteristics of the 2 groups were similar. Hemoglobin and hematocrit levels were higher in Jehovah's Witnesses both before (13.6 g/dL vs 12.9 g/dL; *P*=.01, and 40.7% vs 39%; *P*=.09) and after (11 g/dL vs 10 g/dL; *P*=.003, and 34.2% vs 30.7%; *P*=.001) surgery. Jehovah's Witnesses experienced significantly less bleeding, were intubated for fewer hours, and had shorter stays in both intensive care and the hospital. There was no difference in the rate of postoperative complications or mortality.

Conclusions. The clinical characteristics of Jehovah's Witnesses were similar to those of the control group. The complication rate was also similar in these patients, though the number of hours of mechanical ventilation was less, 24-hour bleeding was less, and the hospital stay was shorter. Mortality was similar in the 2 groups.

Key words: *Surgery. Complications. Bloodless surgery. Jehovah's Witnesses. Matched-pair cohort study.*

Cirugía cardiaca sin sangre en testigos de Jehová: resultados frente a grupo control

Introducción y objetivos. Algunos pacientes, como los testigos de Jehová (TJ), rechazan el uso de hemoderivados, lo cual podría ser un inconveniente para ofrecerles los mismos resultados que a la población general. El objetivo es comprobar si las características de los TJ intervenidos de cirugía cardiaca y su morbimortalidad son similares a las del resto de pacientes.

Métodos. Estudio retrospectivo de cohortes con grupos emparejados. Entre enero de 1998 y septiembre de 2006 se seleccionaron todos los TJ intervenidos de cirugía cardiaca (n = 59). Se empleó una técnica de emparejamiento 1:1 a partir de las siguientes variables: sexo, edad ± 5 años, año y tipo de cirugía y reintervención o no. Se analizaron las variables preoperatorias, intraoperatorias y postoperatorias.

Resultados. La edad media de los casos fue de 62,5 ± 11,1 años, con un 57,6% de mujeres. El 30,5% de los pacientes presentaba una reintervención. Las características clínicas de ambos grupos fueron similares. Las concentraciones de hemoglobina y hematocrito preoperatorias (13,6 frente a 12,9 g/dl; p = 0,01; 40,7 frente a 39%; p = 0,09) y postoperatorias (11 frente a 10 g/dl; p = 0,003; 34,2 frente a 30,7%; p = 0,001) fueron mejores en los TJ. Éstos presentaron significativamente un menor sangrado, un menor número de horas de intubación y una menor estancia en la unidad de vigilancia intensiva y hospitalaria. No hubo diferencias en cuanto a la incidencia de complicaciones y mortalidad.

Conclusiones. Las características de los pacientes TJ fueron comparables con las del grupo control. La incidencia de complicaciones en estos pacientes fue similar, con un menor número de horas de intubación, un menor sangrado a las 24 horas y una menor estancia hospitalaria. La mortalidad en ambos grupos fue similar.

Palabras clave: *Cirugía. Complicaciones. Cirugía sin sangre. Testigos de Jehová. Estudio cohortes emparejadas.*

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Received November 13, 2006.
Accepted for publication March 15, 2007.

ABBREVIATIONS

JW: Jehovah´s Witnesses

INTRODUCTION

Cardiac surgery is a specialty that often requires the use of blood products. For this reason, cardiac surgery in patients who refuse to use these products, such as Jehovah´s Witnesses (JW), can be a huge challenge for health personnel. These patients' refusal to have blood transfusions stems from a strict interpretation of certain Biblical passages ("Only flesh with its soul –its blood– YOU must not eat;" Genesis 9:3-4). This situation may lead to conflict between the 2 basic principles of patient independence and a physician's duty to preserve the patient's life (right to life).

At present a number of medical and surgical approaches can be taken to reduce postoperative transfusion needs.[1] The experience in a small number of JW patients undergoing cardiac surgery in Spain has been recently reported.[2] Our hospital is a reference hospital for bloodless surgery in many specialties, including cardiac surgery, and more than 100 JWs have had cardiac surgery at our institution since 1982, with patients included in our database since 1998. Using this database, we designed a paired-group cohort study to compare JW patients who underwent cardiac surgery to all other patients.

The objectives of the study were: *a*) to investigate whether the characteristics of JW patients who underwent cardiac surgery were similar to those of the control, and *b*) to compare the surgical outcomes of both groups.

METHODS

All patients who underwent cardiac surgery between January 1998 and September 2006 and absolutely refused to use blood products because they were JWs (n=59) were selected. This accounted for about 1.5% of all patients who had an operation in our unit during this period.

All JW patients signed a specific written consent stating their desire to undergo bloodless surgery. All patients had completed a lab workup before surgery and, based on the complete blood count, received iron or erythropoietin according to our protocol (erythropoietin 300-500 U/kg every 24 h for 7 days if the hematocrit <36% and 3 days after surgery along with oral or intravenous ferric therapy). Aprotinin or tranexamic acid were used in all patients in the operating room. In addition, blood recovery or "cell-saver" systems were used in all JW patients during the surgical procedure.

A search of our department database was performed to create a paired (control) group. Cases were matched on a 1:1 basis (n=59) according to sex, age (5) years, year and type of surgery, and need for repeat surgery. Surgeries performed in the JWs and used to match the patients were coronary (8 cases), valve repair (43 cases), combination procedures (4 cases), aortic (2 cases), and congenital heart disease surgery in adults (2 cases).

Statistical Analysis

For the descriptive study, quantitative variables were expressed as the mean (standard deviation) and qualitative variables, as percentages. The analytical study was done using 1:1 pairing techniques. The quantitative variables were analyzed by Student *t* test for paired data, and qualitative variables were analyzed using the Fischer test. A *P* value less than .05 was considered significant. The statistic analysis was done using SPSS version 12.0 (SPSS Inc., Chicago, Illinois, USA).

RESULTS

A total of 59 patients underwent bloodless surgery (cases) between January 1998 and September 2006. The mean age was 62.5 (11.1) years and women accounted for 57.6% (n=34); 30.5% (n=18) of patients had already undergone cardiac surgery previously (13 patients once, 2 patients twice, 2 patients 3 times, and 1 patient 4 times).

Table 1 shows the statistical analysis for categorical variables and Table 2 contains the results for the quantitative variables.

Mortality was 6.8% (n=4) in the JW group and 8.5% (n=5) in the control group. The causes of mortality were rupture of the atrioventricular groove due to massive calcification of the mitral annulus in 2 cases and primary cardiac arrest in another 2. The complications were similar in both groups (Table 3). A logistic regression study was performed to rule out that the higher proportion of diabetics and smokers could significantly influence the incidence of complications in the control group (*P*=NS).

Hematocrit and hemoglobin losses following surgery were analyzed, without finding any differences between the JWs and the control group (hematocrit loss: 7.2% [6.7] vs 8.8% [5.9]; *P*=.32; hemoglobin loss: 2.9 [2] vs 3 [2] g/dL; *P*=.92).

DISCUSSION

In our patients, it has been shown that JWs who require cardiac surgery present similar clinical characteristics to those in the paired cohort group. The JW group had better

TABLE 1. **Statistical Analysis of Categorical Variables Between the Jehovah´s Witness Group and the Control Group***

	Jehovah´s Witness Group	Control Group	*P*
Diabetes	20 (33.9%)	9 (15.3%)	.05
Hypertension	31 (52.5%)	28 (47.5%)	.70
Smoking	0	6 (10.2%)	.02
Dyslipidemia	17 (28.8%)	20 (33.9%)	.66
COPD	4 (6.8%)	1 (1.7%)	.38
Preoperative stroke	3 (5.1%)	7 (11.9%)	.13
Preoperative AF	24 (40.7%)	26 (44.1%)	.85
Severe PH (>60 mm Hg)	7 (11.9%)	4 (6.8%)	.55
Ventricular dysfunction (<50%)	12 (20.3%)	9 (15.3%)	.63

*AF indicates atrial fibrillation; COPD, chronic obstructive pulmonary disease; PH, pulmonary hypertension.

TABLE 2. **Statistical Analysis of Quantitative Variables Between the Jehovah´s Witness Group and the Control Group***

	Jehovah´s Witness Group	Control Group	*P*
Preoperative hematocrit, %	40.7 (5.1)	39 (4.8)	.09
Preoperative hemoglobin, g/dL	13.6 (1.7)	12.9 (1.6)	.01
ECC time, min	110.3 (39.3)	111.8 (41.0)	.79
Ischemia time, min	77.7 (25.1)	74.3 (29.2)	.56
Hours of intubation	17.1 (30.1)	48.5 (97.8)	.10
24h drainage, mL	446.8 (326.6)	813.2 (476.4)	<.001
Postoperative hematocrit	34.2 (4.5)	30.7 (3.7)	.001
Postoperative hemoglobin	11 (1.5)	10 (1.2)	.003
Days in ICU	2.1 (2.4)	3.7 (6.0)	.09
Postoperative days	12.2 (8.4)	17.3 (15.7)	.05
Additive EuroSCORE	5.4 (2.4)	5.4 (2.6)	.97
Logistic EuroSCORE, %	6.6 (4.6)	5.9 (5.5)	.64

*AF indicates atrial fibrillation; ECC, extracorporeal circulation; ICU, intensive care unit.

hemoglobin and hematocrit values before and after surgery, fewer hours of intubation, less blood loss at 24 hours, and shorter intensive care unit (ICU) and hospital stays. In every other regard, the complications and mortality were similar in both groups.

Bernal et al[2] reported that about 50 JW patients will need to undergo heart surgery every year. These authors describe a series composed of 10 cases that had been successfully treated, but does not mention if the patients were low-risk or high-risk. Our series covers practically all types of surgeries in our specialty; there were a high number of repeat surgeries (30.5%), more than 1 in some patients, thus increasing the complexity and surgical risk.[3]

TABLE 3. **Postoperative Complications in the Jehovah´s Witness Group and the Control Group***

	Jehovah´s Witness Group	Control Group	*P*
Repeat surgery due to bleeding	3 (5.1%)	2 (3.4%)	NS
Perioperative AMI	2 (3.4%)	1 (1.7%)	NS
Postoperative stroke	3 (5.1%)	3 (5.1%)	NS
Renal failure	1 (1.7%)	1 (1.7%)	NS
Postoperative AF	4 (6.8%)	6 (10.2%)	NS
In-hospital mortality	4 (6.8%)	5 (8.5%)	NS

*AF indicates atrial fibrillation; AMI, acute myocardial infarction; NS, nonsignificant.

Our strategy to control bleeding is based primarily on intensive prevention. All JW patients are treated intensively with iron and recombinant erythropoietin until they reach clearly optimal concentrations (hematocrit >36%). This explains why the hemoglobin and hematocrit values were higher in these patients' than in the non-JW group. The use of antifibrinolytics is also part of our protocol when managing JWs, with aprotinin the drug of choice. Although the possible benefit of this agent has been called into question recently,[4] we feel its benefits in patients who cannot use blood products far outweigh its potential problems. The use of these products explains the lower blood loss in these patients, as compared to the control group. As in most institutions, antifibrinolytics are not routinely used in cardiac surgery in our unit, but are reserved for patients at a high risk of bleeding, for instance, patients with repeat surgeries, long surgeries, and aortic surgery.

The incidence of complications was similar in both groups, although the JW group presented a clear trend toward fewer hours of intubation, which could explain the lower number of days in the ICU and, consequently, the shorter hospital stay. The lengthier intubation in the control group may be justified by the use of blood products, as transfusion is known to be associated with more hours of mechanical ventilation and a longer ICU stay.[5,6]

The prevalence of repeat surgeries due to bleeding was similar in both groups. To prevent severe anemia difficult to manage without any kind of blood product, it is sometimes necessary to check patients with unusually low blood loss in the operating theater. In this regard, our policy of repeat surgery due to bleeding in JW patients is very aggressive: we consider that patients with a blood loss of nearly 200 mL/h in 1 hour

should be reassessed. Removing mediastinal clots may significantly reduce diffuse bleeding. Recombinant factor VII, a synthetic agent of proven efficacy in cardiac surgery that can be used in JWs, is also currently applied.[7]

A study by Stamou et al[8] compared 49 JW patients to a control group of 196 patients with similar characteristics. These authors do not routinely use aprotinin and concluded that the outcomes achieved in JW patients were comparable to those of the control group, as in our study. However, there are some differences between the 2 studies. None of Stamou's 49 JW patients had undergone surgery previously (compared to 30.5% in our series), and we found a trend in JW patients toward fewer hours of intubation and shorter ICU stays. Additionally, Sotiris' group selected 49 JW patients over a 14-year period, whereas our series presents 59 patients over an 8-year period.

Refusal by JW patients to receive transfusions may lead to medical-legal conflicts in which the physician´s obligation to preserve the patient's life clashes with the principle of the patient´s independence in making their own decisions. Operating on these patients requires that a number of specialists agree to respect the patient's wishes. If any of the specialists are not in agreement, surgery is not possible. We are well aware that the patient's wishes must prevail and must be respected, provided the public health is not endangered. We never question the patients' decisions, but simply explain the potential risks involved in their decision. Surgeons, anesthetists, and intensive care specialists presently have a broad enough therapeutic armamentarium to provide some assurance to patients who need cardiac surgery.[1] The development of minimally invasive techniques and the possibility to perform coronary artery bypass grafting without extracorporeal circulation, obviating the necessary hemodilution this produces in the patient, allow us to offer these patients more resources to avoid the use of blood products.[9]

All strategies presently available should be capable of managing urgent or emergency cardiac surgery needs in patients who refuse the use of blood products. Emergency operations in cardiac surgery are an important risk for the patient, and the risk may be greater if there is insufficient time for hematocrit optimization before surgery. An attempt should be made to postpone emergency coronary surgery by medical treatment in patients under clopidogrel therapy. However, alternative treatments often do not exist. If the patient refuses the use of blood products and is aware of the situation, our hospital's policy is to offer surgery. If the patient is unconscious, then the decision should be made by relatives or by a judge if a close family member is not available or the patient is a minor.[1]

Our group defends the need to offer patients the possibility of bloodless surgery, regardless of the disease for which they were referred. We feel it is important for cardiologists to understand that their cardiac patients can undergo surgery and achieve the same outcome as other patients with similar characteristics. Under certain conditions, such as aortic dissections or liver abnormalities, the need for blood products is so common in these surgeries that the medical practitioner should make an effort to ensure that the patient understands the potential risk involved.

Our mortality is similar to that of other patients, with the same number of complications. Therefore, the same outcomes are achieved in JW patients at our hospital as in other patients. Interestingly, the Parsonnet score, a predictor of surgical mortality, assigns 10 points to the fact of being JW, the same number as for aortic dissection or active endocarditis.[3,10,11] In contrast, the EuroScore system does not include any points for being JW.

CONCLUSIONS

The characteristics of JW patients who require cardiac surgery were similar to those of the control group and the incidence of complications in these patients was similar, with fewer hours of intubation, less blood loss at 24 h, and a shorter hospital stay. Mortality in both groups was similar. Patients who demand bloodless cardiac surgery can achieve the same outcomes as patients with similar characteristics who do not refuse the use of blood products.

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