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Strategic Perioperative Blood Conservation for Transfusion-Free Cardiac Surgery in Jehovah's Witnesses in Japan: A 10-Year Institutional Experience

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Abstract

Background

Transfusion-free cardiac surgery for Jehovah's Witness (JW) patients has become increasingly feasible; however, outcome data from Japanese institutions remain limited.

Methods

We retrospectively reviewed 49 consecutive cardiac surgeries in 45 JW patients performed between 2014 and 2024 at Shin-Tokyo Hospital, Japan. The institutional approach emphasized a comprehensive, multidisciplinary perioperative blood conservation strategy encompassing preoperative hematologic optimization, intraoperative techniques to preserve platelet function and minimize hemodilution, and postoperative management focused on blood conservation.

Results

All procedures were successfully completed without allogeneic transfusion throughout the entire perioperative course. In-hospital mortality was 6.1% (3/49), all following technically complex elective operations. Major morbidity occurred in 22.4% (11/49). No death was related to anemia. After excluding early deaths (≤3 days), Kaplan–Meier analysis of 46 patients demonstrated 1-, 3-, and 5-year survival rates of 97.8%, 97.8%, and 93.2%, respectively.

Conclusions

Transfusion-free cardiac surgery can be safely performed in JW patients in Japan through a multidisciplinary, perioperative blood conservation program integrating preoperative optimization, intraoperative biocompatible perfusion, and structured postoperative care. No patient required transfusion at any perioperative stage, demonstrating the feasibility and reproducibility of bloodless cardiac surgery within the Japanese healthcare context.

Keywords: Jehovah's Witness, Patient Blood Management, Blood Conservation, Cardiac Surgery, Reoperation.

Introduction

Transfusion-free cardiac surgery in Jehovah's Witness (JW) patients has evolved from a clinical challenge into a model of comprehensive Patient Blood Management (PBM). Multiple single-center studies in Western countries have demonstrated that, when multidisciplinary optimization and meticulous hemostatic control are applied, cardiac surgery can be performed safely without allogeneic transfusion, with hospital mortality

comparable to transfused populations [1-4].

Despite these advancements, clinical data from Japan remain limited. Most reports originate from Western centers, and only a few small studies have addressed outcomes in Asian JW cohorts [5]. The Japanese surgical environment poses unique challenges due to the aging population, high prevalence of dialysis, and frequent reoperations.

Additionally, the management of JW patients in Japan is complicated by ethical and medico-legal considerations arising from their categorical refusal of transfusion on religious grounds. Physicians must balance patient autonomy with surgical safety through transparent communication and institutional support [6].

In response, our institution developed a comprehensive, multidisciplinary blood conservation program designed to optimize hematologic status, reduce intraoperative blood loss, and support postoperative recovery without transfusion. This study presents our 10-year experience of transfusion-free cardiac surgery in JW patients in Japan, evaluating outcomes and lessons learned from implementing a continuous perioperative management framework [7].

Methods

Study Population

Between August 2014 and August 2024, 49 transfusion-free cardiac operations were performed in 45 JW patients at Shin-Tokyo Hospital, Chiba, Japan. Three patients underwent two procedures during the study period. The cohort included complex cases such as reoperations (26%), aortic surgeries (22%), and dialysis-dependent patients [8].

Ethical Considerations

This study was approved by the Institutional Review Board of Shin-Tokyo Hospital (approval number 0301, approved on February 22, 2024).

All patients provided written informed consent explicitly refusing allogeneic blood transfusion and acknowledging the associated risks. The study was conducted in accordance with the Declaration of Helsinki [9-10].

Perioperative Blood Conservation Strategy

Our institutional protocol was a multidisciplinary, continuous blood conservation program covering preoperative, intraoperative, and postoperative phases:

- Preoperative Phase: Optimization of hemoglobin (target ≥13 g/dL when feasible) using erythropoiesis-stimulating agents and intravenous iron; correction of reversible anemia causes.
- Intraoperative Phase: Use of PMEA-coated cardiopulmonary bypass circuits to minimize platelet activation and protein denaturation; acute normovolemic hemodilution and cell salvage where appropriate; meticulous surgical hemostasis.
- Postoperative Phase: Minimization of blood sampling; continued erythropoietic support and volume management to promote recovery without transfusion.

Data Collection and Survival Analysis

All data were obtained from surgical and hospital records. Early deaths within 3 postoperative days were excluded from survival analysis. Kaplan–Meier survival analysis was performed for the remaining 46 patients, with survival time calculated in years.

Results

Transfusion and Mortality

No allogeneic transfusion was administered at any stage of the perioperative course (pre-intra-or postoperative). In-hospital mortality was 6.1% (3/49), all after technically complex elective procedures. Causes included right heart failure after redo aortic surgery, intraoperative rupture in a dialysis patient, and uncontrollable bleeding during redo valve surgery. None were due to anemia.

Morbidity

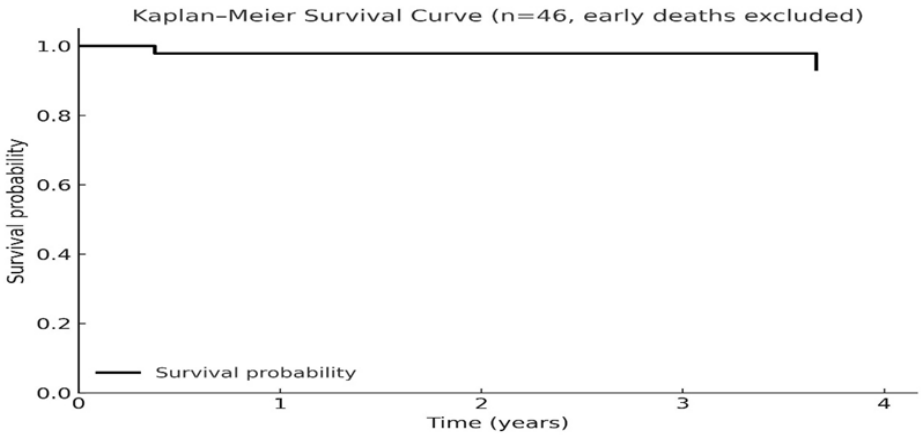
Major morbidity occurred in 22.4% (11/49): stroke (1), reoperation for bleeding (2), temporary dialysis (2), prolonged ventilation >48 h (4), and postoperative infection (2). All survivors were discharged without transfusion.

Hematologic Course

Preoperative hemoglobin was maintained at 13–15 g/dL. Postoperative nadir values decreased but recovered spontaneously within several days without transfusion or blood product use.

Survival Analysis

After excluding early deaths (≤3 days), 46 patients were included in the Kaplan–Meier survival analysis (Figure 1). Estimated survival rates were 97.8% at 1 year, 97.8% at 3 years, and 93.2% at 5 years



Discussion

This 10-year experience demonstrates that transfusion-free cardiac surgery can be performed safely in JW patients in Japan when supported by a consistent, multidisciplinary perioperative blood conservation strategy. Mortality (6%) and morbidity (22%) were comparable to international JW benchmarks (2–6%), with no anemia-related deaths.

PMEA-coated CPB circuits served as one component of this integrated program, designed to minimize platelet dysfunction and mechanical coagulopathy. Although no direct comparison was conducted, their use likely contributed to hemostatic preservation within the broader blood conservation framework.

The success of our program was driven by multidisciplinary collaboration across all perioperative stages—surgeons, anesthesiologists, perfusionists, and intensivists—ensuring adherence to conservation principles and achieving complete avoidance of transfusion.

Limitations

This retrospective, single-center study had a limited sample size and lacked a comparative control group. Quantitative analysis of blood loss and coagulation parameters was not included.

Clinical Implications

These findings reinforce the value of continuous, institutional blood conservation programs not only for JW patients but also as a scalable model for broader Patient Blood Management in cardiac surgery.

Conclusions

Transfusion-free cardiac surgery can be safely and reproducibly performed in Jehovah's Witness patients in Japan through a continuous, multidisciplinary perioperative blood conservation strategy extending from preoperative optimization to postoperative recovery.

In this 10-year, 45-patient (49-operation) series, no patient received allogeneic transfusion at any stage, and no deaths were related to anemia. Kaplan–Meier analysis excluding early deaths demonstrated 1-, 3-, and 5-year survival rates of 97.8%, 97.8%, and 93.2%, respectively.

This experience provides a practical institutional model for implementing bloodless cardiac surgery within the Japanese clinical and ethical framework.

Acknowledgments

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Figure Legend

Figure 1: Kaplan–Meier survival curve for 46 Jehovah's Witness patients undergoing transfusion-free cardiac surgery in Japan after exclusion of early deaths (≤3 days).

The x-axis represents years of follow-up, and the y-axis indicates cumulative survival probability. One-, three-, and five-year survival rates were 97.8%, 97.8%, and 93.2%, respectively.

Key Findings

- This 10-year Japanese single-center experience demonstrates that a continuous, team-based perioperative blood conservation program can ensure safe, transfusion-free cardiac surgery in Jehovah's Witness patients.
- All 49 cardiac operations in 45 patients were performed without allogeneic transfusion during any phase of care.
- Observed 1-, 3-, and 5-year survival rates (97.8%, 97.8%, and 93.2%) confirm reproducible long-term safety.
- Implementation success depended on multidisciplinary collaboration among surgeons, anesthesiologists, perfusionists, and intensivists.
- The institutional program provides an educational framework applicable to broader Patient Blood Management in cardiac surgery.

Potential Impact

- Provides one of the first long-term institutional reports from Japan on transfusion-free cardiac surgery in Jehovah's Witness patients.
- Offers a reproducible and ethically sound model for institutional Patient Blood Management programs.
- Highlights team-based perioperative coordination as a core element of successful bloodless surgery.

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