

Anesthetic Management of Living-Donor Renal Transplantation in a Patient With Epstein Syndrome Using Rotational Thromboelastometry: A Case Report

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Epstein syndrome is a myosin heavy chain 9 (MYH9)-related disorder characterized by hearing loss and macrothrombocytopenia with renal failure, which usually requires platelet transfusion during surgery. We report the case of a 22-year-old man who underwent living-donor renal transplantation without platelet transfusion using rotational thromboelastometry (ROTEM) monitoring. His intraoperative laboratory coagulation findings were a platelet count of $28\text{--}31 \times 10^9/\text{L}$ based on microscopy and fibrinogen of 256 mg/dL. However, his extrinsic pathway evaluations by ROTEM were normal. The estimated blood loss during the operation was 150 mL, and the patient showed no bleeding complications without platelet transfusion. (A&A Practice. 2020;14:e01350.)

GLOSSARY

α = α angle; **A10** = clot firmness measured at 10 minutes after start of clot formation; **aPTT** = activated partial thromboplastin time; **CFT** = clot formation time; **CT** = clotting time; **EQUATOR** = Enhancing the Quality and Transparency of Health Research; **EXTEM** = evaluation of the extrinsic pathway; **FIBTEM** = evaluation of the contribution of fibrinogen to clot formation; **INR** = international normalized ratio; **INTEM** = evaluation of the intrinsic pathway; **MCF** = maximum clot firmness; **ML** = maximum lysis; **MYH9** = myosin heavy chain 9; **P2Y12** = P2Y purinergic receptor 12; **POD** = postoperative day; **PT** = prothrombin time; **ROTEM** = rotational thromboelastometry

Epstein syndrome is a hereditary myosin heavy chain 9 (MYH9)-related disorder, characterized by hearing loss and macrothrombocytopenia with renal failure, which often requires renal transplantation.¹⁻³ Perioperative management for thrombocytopenia is important for these patients, with most undergoing platelet transfusion.³

Here, we report a case of a patient with Epstein syndrome undergoing living-donor renal transplantation without platelet transfusion under coagulation monitoring using rotational thromboelastometry (ROTEM; TEM International GmbH, Munich, Germany). Written informed consent for publication was obtained from the patient. This article adheres to the applicable Enhancing the Quality and Transparency of Health Research (EQUATOR) guideline.

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CASE DESCRIPTION

A 22-year-old man (height, 175 cm; weight, 65 kg) was scheduled to undergo living-donor renal transplantation. The patient had been diagnosed with Epstein syndrome at the age of 9 years. He had renal failure, macrothrombocytopenia, and hearing loss due to Epstein syndrome and had started hemodialysis when he was 19 years old. Peripheral blood examination revealed a platelet count of $37 \times 10^9/\text{L}$ with giant platelets and neutrophils containing Döhle bodies.

Anesthesia was induced with fentanyl (2 $\mu\text{g}/\text{kg}$ body weight) and propofol (2.5 mg/kg). Rocuronium was administered. Anesthesia was maintained with isoflurane (1%–1.5%) and remifentanyl (0.2–0.3 $\mu\text{g}/\text{kg}/\text{min}$) with a 50% oxygen-air mixture. In addition to standard intraoperative monitoring, direct arterial and central venous pressures were monitored. Platelet counts, prothrombin time (PT), activated partial thromboplastin time (aPTT), and ROTEM findings were monitored.

Preoperatively, the white blood cell count was 5080/ μL ; hemoglobin concentration was 9.8 g/dL; platelet count was $17 \times 10^9/\text{L}$ based on automatic blood cell counting (MEK Nihon Kohden, Tokyo, Japan) and $37 \times 10^9/\text{L}$ based on microscopy; international normalized ratio (INR) was 1.06; aPTT was 30.4 seconds; and fibrinogen concentration was 359 mg/dL.

Intraoperative and postoperative laboratory coagulation and ROTEM findings are shown in the Table. Platelet counts were 0.0 (uncounted) to $17 \times 10^9/\text{L}$ based on automatic blood cell counting and $28\text{--}31 \times 10^9/\text{L}$ based on microscopy; INR was 0.9–1.0; fibrinogen concentration was 256 mg/dL. The α angle (α), clotting time, and maximum clot firmness (MCF)

Table. Coagulation Laboratory Data and ROTEM Findings

		Before surgery	Pretransplant	Posttransplant	After surgery	POD1
Laboratory test	Platelets, $\times 10^9/L$	37	33	28	59	48
	PT, s	10.3	11.4	11.8	11.3	12.3
	Fibrinogen, mg			256	261	256
EXTEM	CT, s	42	44	43	39	45
	CFT, s	106	138	155	117	103
	α , °	79	73	72	76	78
	A10, mm	53	48	46	51	54
	MCF, mm	64	59	59	62	64
	ML, %	2	2	3	1	2
INTEM	CT, s	146	139	137	129	146
	CFT, s	89	105	118	80	78
	α , °	52	50	49	56	55
	A10, mm	52	50	49	56	55
	MCF, mm	64	63	62	66	66
	ML, %	0	0	0	0	1
FIBTEM	A10, mm	19	17	14	15	19
	MCF, mm	19	18	15	16	21
	ML, %	0	0	0	0	0

Abbreviations: α , α angle; A10, clot firmness measured at 10 min after start of clot formation; CFT, clot formation time; CT, clotting time; EXTEM, evaluation of the extrinsic pathway; FIBTEM, evaluation of the contribution of fibrinogen to clot formation; INTEM, evaluation of the intrinsic pathway; MCF, maximum clot firmness; ML, maximum lysis; POD, postoperative day; ROTEM, rotational thromboelastometry.

in the evaluations of the extrinsic pathways (EXTEMs; TEM International GmbH, Munich, Germany), and contribution of fibrinogen to clot formation (FIBTEM; TEM International GmbH, Munich, Germany) were normal.

Operation time was 5 hours and 16 minutes, and anesthesia time was 6 hours and 47 minutes. Estimated blood loss was 150 mL during the operation with further bleeding on postoperative day (POD) 1. The patient received no blood transfusions and experienced no bleeding complications. The function of the transplanted kidney was stable, and the patient was discharged from the intensive care unit without complications except for ureteral reanastomosis surgery on POD 2.

DISCUSSION

Macrothrombocytopenia associated with Epstein syndrome is related to both bleeding and thromboembolic risk.^{1,4} Surgical interventions in patients with MYH9-related disorders may be associated with bleeding complications. However, it has been reported that a wide variety of surgeries, including dental extraction, tonsillectomy and adenoidectomy, cesarean delivery, orthopedic joint replacement, cardiopulmonary bypass surgery, and neurosurgical intervention, can be successfully conducted without severe hemorrhage.¹ Apart from bleeding, however, there are also concerns regarding thrombosis, especially in the postoperative period.¹

The recommended platelet count is $>50 \times 10^9/L$ for invasive procedures and $100 \times 10^9/L$ for high-risk surgeries according to the old guidelines⁵; however, these values were based on minimal evidence. Currently, there is still no consensus for platelet count in perioperative settings.⁶ In critical care patients, there has been no reported benefit but increased complication and mortality rates due to liberal platelet transfusion.⁷ An increased mortality rate associated with platelet transfusion has been shown in patients undergoing liver transplantation with platelet counts both higher and lower than $50 \times 10^9/L$.⁸ There is also no consensus on what platelet count is safe for surgery in patients with MYH9-related disorders. Several reports

have suggested safe platelet counts for renal transplantation in patients with MYH9-related disorders with macrothrombocytopenia. Renal transplantation was successfully performed when the platelet count was maintained $>100 \times 10^9/L$ with transfusions, but bleeding complications and intracranial hemorrhage occurred at platelet counts higher than $50 \times 10^9/L$.⁹ Intraperitoneal hemorrhage on POD 19 and POD 25 occurred at platelet counts of 27 and $36 \times 10^9/L$, but patients recovered when platelet counts were $>50 \times 10^9/L$.¹⁰ These case reports and a recent case series suggest that a safe platelet count for living-donor renal transplantation is at least $100 \times 10^9/L$ with platelet transfusion.^{3,10}

Hemostasis coagulation monitoring, especially the monitoring of platelet function, is limited in operating rooms. Platelet counting, a standard coagulation test, is difficult to perform using automated blood cell counters and should therefore be conducted using a microscope. In our case, platelet counts based on microscopy were higher than those based on automated blood cell counting. Because automated blood cell counters measure pulse height values resulting from minute voltage changes, counts may be lower if large platelets are present. Platelet counts therefore need to be determined by visual inspection. In our case, we used ROTEM in addition to standard coagulation monitoring of platelet counts, fibrinogen concentration, PT, and aPTT. While ROTEM is a viscoelastic hemostatic assay that provides point-of-care monitoring using whole blood, it does not allow for the evaluation of platelet aggregation ability. For example, patients on an antiplatelet agent such as clopidogrel (P2Y₁₂ purinergic receptor inhibitor) will often have normal tracings. Platelet aggregation ability can be evaluated at the point of care with ROTEM platelet or Multiplate (Roche, Switzerland) even in patients with a low platelet count and in the field of organ transplantation.¹¹ These devices have been reported to be effective in determining platelet deficiency in clinical practice.¹² It has been shown that clot firmness in ROTEM has a superior accuracy for predicting bleeding compared to platelet counts in thrombocytopenic

children as well as in those undergoing liver transplantation.¹³ Despite low platelet counts, 70%–80% of patients can be managed safely without platelet transfusion, if guided by thromboelastometry.¹⁴ In the current case, the α , clotting time, and MCF in EXTEM and FIBTEM were normal, which suggests that the coagulation ability and function via activated platelets were normal. The MCF of FIBTEM was high, which may compensate for the relatively low platelet counts, a situation often observed in liver transplantation and reported in patients on dialysis who qualified for kidney transplantation.¹⁵ In addition, because we observed no excess bleeding in the surgical field, we did not transfuse platelets even when the count was $26\text{--}33 \times 10^9/\text{L}$ during the perioperative period. We measured ROTEM up to POD 1 and observed no bleeding complications.

To summarize, we could manage the patient with Epstein syndrome characterized by macrothrombocytopenia undergoing living-donor renal transplantation without inappropriate platelet transfusion despite low platelet counts under careful coagulation monitoring using ROTEM. ■■

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DISCLOSURES

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