Anaesthetic Management with Thromboelastography in a Patient with Glanzmann Thrombasthenia

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Glanzmann thrombasthenia (GT) is a rare disease of an autosomal recessive inheritance characterized with fatal bleeding tendency. The anaesthesiologist should be cognizant of the risk involved and be prepared with necessary measures. In this paper, we present a GT case of a 9-year-old male with hypospadias, which was successfully repaired after platelet transfusions according to the thromboelastography tracings.

Key Words: Glanzmann thrombasthenia, anaesthesia, thromboelastography

Introduction

Glanzmann thrombasthenia (GT) is a rare (1/1,000,000) disorder with autosomal recessive inheritance and is characterized by deficiency or functional defect of glycoprotein IIb/IIIa (GP IIb/IIIa), which acts as a fibrinogen receptor on thrombocyte surface (1). GP IIb/IIIa receptors play a basic role in thrombocyte adherence and aggregation. Thrombocytes of such patients fail to bind fibrinogen and aggregation does not occur (2). Patients are at a high lifetime risk of severe bleeding, particularly during surgical procedures. Typically, such patients have normal thrombocyte count, normal prothrombin time, normal partial prothrombin time, prolonged bleeding time, and impaired platelet aggregation (prolonged modified clot retraction) (3).

The disease is usually diagnosed in young ages after epistaxis or mucocutaneous bleeding. Complaints such as easy bruising, muscle hematomas, haemarthrosis gastrointestinal bleeding, menorrhagia, and haematuria appear in further stages of life (4). The disease has no specific treatment. Such patients require specific treatment regimen in the perioperative period for adequate functioning of coagulation system (5).

Thromboelastography (TEG) technology measures viscoelastic and mechanical features of developing clot and is able to evaluate all phases of haemostatic efficacy using a single blood sample. In addition, efficacy of the treatments can also be evaluated (6).

Herein, perioperative management in a patient with GT who was planned to undergo hypospadias repair under the guidance of TEG is presented.

Case Presentation

A 9-year-old boy patient (38 kg), who was diagnosed with GT at the age of 1 year, was preoperatively evaluated before hypospadias surgery. Complaints of the patient, who admitted to the Paediatric Haematology Polyclinic with urinary bleeding, tonsil bleeding, and gastrointestinal bleeding in the last few months, were improved with thrombocyte suspension (TS) and tranexamic acid therapy. There was no pathological finding on his physical examination. Preoperative haematological laboratory findings revealed a thrombocyte level of $372,000 \mu\text{L}^{-1}$, haemoglobin level of 10.9 g dL^{-1} , activated partial thromboplastin time (aPTT) of 29.4 seconds, international normalized ratio (INR) of 1.08, and white blood cell (WBC) count of $8,640 \mu\text{L}^{-1}$. Hepatic and renal function tests were within the normal ranges.

Figure 1. Preoperative thromboelastography tracing. Normal onset of clotting together with decreased alpha angle and reduced maximum amplitude (MA), which indicate low clot strength

Based on the consultation with the Paediatric Haematology clinic, anti GP IIb/IIIa alloantibodies were negative; however, recombinant factor VIIa (rFVIIa; NovoSeven, Novo Nordisk, Denmark) and 25-75 mg kg⁻¹ day⁻¹ tranexamic acid (Tranamin®) therapy were recommended suspecting the presence of inhibitor antibody in the event of perioperative bleeding.

Preoperative preparation included rFVIIa, 2 Units (U) of TS, 1 U of erythrocyte suspension (ES), and 1 ampoule Ankaferd blood stopper (ABS; Ankaferd Drug Inc., Istanbul, Turkey). Coagulation profile was assessed by TEG. The initial TEG tracing revealed normal onset of clotting together with decreased alpha angle (α : 31.3°) and reduced maximum amplitude (MA: 18.9), which indicate weak clot strength (Figure 1). Based on the interpretation of TEG tracing, it was decided to administer 1 U of apheresis TS. After the administration of 1 U of TS, re-evaluation 1 hour before the anaesthesia induction revealed that TEG parameters were within the normal ranges (α : 31.3°, MA: 43.2; Figure 2).

After standard monitorization (pulse oximeter, electrocardiography, non-invasive arterial blood pressure, body temperature) of the patient, who was transferred to the operating room, peripheral vascular access was established on the dorsal aspect of the right hand using 22-gauge cannula. Midazolam (1 mg), fentanyl (50 µg), propofol (70 mg) and rocuronium (20 mg) were administered for anaesthesia induction. No complication was encountered during intubation procedure. Considering probability of bleeding after intubation, additional peripheral vascular access was established on the dorsal aspect of the left hand using a 22-gauge cannula. Maintenance of anaesthesia was provided by remifentanyl infusion (0.1-0.25 µg kg⁻¹ min⁻¹) and 0.5-1 MAC (minimum alveolar concentration) sevoflurane. The surgery lasted for 140 minutes. No uncontrolled bleeding occurred over the course of surgery. rFVIIa, Ankaferd or ES was not used. Haematological laboratory findings on the postoperative 24th hour revealed a thrombocyte level of 370,000 µL⁻¹, a haemoglobin level of 11.3 g dL⁻¹, aPTT of 27.4 seconds, an INR of 1.11, and a WBC count of 14,940 µL⁻¹. The patient was discharged on the postoperative day 8 without any problem and polyclinic control was recommended him 10 days later. Necessary written informed consent form concerning that patient infor-

Figure 2. Improved coagulation parameters on the thromboelastography tracing after thrombocyte transfusion

mation would be used for academic purposes was obtained from his parents.

Discussion

Today, knowledge on the perioperative management of GT is limited. Such patients are at high risk for the development of anti-thrombocyte antibody (7). Therefore, treatment with thrombocyte transfusion alone is not adequate. Alloantibody against the human platelet antigens (HPA) may develop due to alloimmunization resulting from repeated thrombocyte transfusion (4). Thus, perioperative monitoring of haemostasis is of great importance. Treatment modalities such as removal of antibodies via plasmapheresis and human leukocyte antigen-matched thrombocyte transfusion from a single donor have been used in the event antigen development (8). In the present patient, thrombocyte transfusion could be performed because anti-thrombocyte antibody was negative.

Recombinant factor VIIa improves thrombocyte functions by stimulating thrombin production on thrombocyte surface. It bypasses factor VIIIa and IXa and provides production of factor X, which activates coagulation system, and thereby provides haemostasis (9). Therefore, rFVIIa can be used in coagulation cascade defects (e.g., acquired haemophilia), thrombocyte dysfunctions (e.g., Glanzmann) or Bernard-Soulier syndrome (GP Ib-V-IX thrombocyte receptor disorder) (10, 11). Tranexamic acid has antifibrinolytic activity; it suppresses plasmin production by decreasing plasminogen function and improves haemostasis in patients diagnosed with GT (5).

Uzunlar et al. (12) reported severe postoperative nasopharyngeal bleeding after inserting nasogastric tube in a patient with GT undergoing emergency laparotomy. They reported that bleeding, which continued despite rFVIIa administered together with thrombocyte transfusion in the preoperative period, occurred due to the development of anti-HPA-1a antibody. Bleeding could be controlled on the postoperative second day with tampon and repeated rFVIIa therapy (12). Therefore, entire surgery team should consider the risk of bleeding during interventional procedures.

Thromboelastography can be easily applied and provides evaluation of coagulation in many aspects in 20-30 minutes,

which is the total duration of test (6). TEG analysis of the present patient performed to monitor coagulation revealed normal reaction time, low alpha angle, and reduced MA. MA is a value that indicates consistent thrombocyte function and an increase in MA after thrombocyte transfusion indicates that treatment is successful (13). TEG enables the anaesthesiologist to be fully informed about rapidly altering haemostatic profile during perioperative period and thereby anaesthesiologist can use appropriate blood compounds and pharmacological agents. INR, aPTT, fibrinogen, thrombin time, and thrombocyte count may be normal in a case with thrombocyte dysfunction. In the present patient, although preoperative haematological laboratory findings were normal, thrombocyte dysfunction was considered because of low MA on TEG. Therapeutic effect of rFVIIa and thrombocyte transfusion can also be assessed by TEG in a patient with GT.

In the present patient, general anaesthesia was preferred considering risk of bleeding. Göksu et al. (14) reported successful intravenous regional anaesthesia performed in a patient with GT. In the literature, we encountered no patient with GT undergoing central or peripheral nerve blockade. After prophylactic treatment regimens, regional anaesthesia option may be considered in a patient who is unavailable for general anaesthesia by taking the risks and benefits of the patient into account following detailed examination.

Conclusion

Patients diagnosed with GT are at high risk for severe bleeding during and after surgical procedures. Necessary therapeutic options among thrombocyte replacement, rFVIIa, and antifibrinolytic therapies can be implemented during perioperative period taking haematological features of patients and the surgical method into account and the results can be monitored via TEG, when necessary. In addition, anaesthesiologists must be precise and kind during invasive procedures. TEG is used for the diagnosis of bleeding-coagulation disorders and in determining efficacy of treatment by providing evaluation of coagulation parameters in many aspects in a short time. Herein, we intend to highlight that TEG guidance would allow effective anaesthesia management by preventing unnecessary treatment implementations.

Informed Consent: Written informed consent was obtained from patients' parents who participated in this case.

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