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Thromboelastography to guide the decision making in transfusion therapy in post-tonsillectomy bleeding secondary to pseudoaneurysm

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SUMMARY

We report a case of a patient without significant medical records, who presented massive bleeding in the late post-operative period due to an amygdalectomy that caused hemodynamic instability and coagulation disorders. It was used thromboelastography on the patient as an additional tool in order to evaluate the coagulation state and the approach of a proper and different therapy from the one that had been taken when following the traditional tests (thrombin time [TT], prothrombin time [PT], platelet and fibrinogen count). An adequate hemostasis was achieved. For the definite control of the bleeding, it was practiced an arteriography and a posterior embolization of the left lingual artery with «platinum coils» secondary to the initial surgical procedure.

Key words: Coagulation, thromboelastography, post-operative bleeding, pseudo aneurysm.

RESUMEN

Reportamos el caso de una paciente de 25 años de edad sin antecedentes médicos significativos, quien presentó sangrado masivo en postoperatorio tardío de amigdalectomía que le ocasionó inestabilidad hemodinámica y trastorno de la coagulación, en quien se utilizó la tromboelastografía como herramienta adicional para la valoración del estado de coagulación y enfoque de una terapia adecuada y diferente a la que se hubiera tomado si se siguen las pruebas tradicionales (tiempo de trombina, tiempo de protrombina, recuento plaquetario y fibrinógeno) lográndose una adecuada hemostasia. Para el control definitivo del sangrado se le realiza arteriografía y posterior embolización de un pseudoaneurisma de la arteria lingual izquierda con «coils de platino» secundario al procedimiento quirúrgico inicial.

Palabras clave: *Coagulación, tromboelastografía, sangrado postoperatorio, pseudoaneurisma.*

INTRODUCTION

The use of thromboelastography (TEG) to monitor the coagulation process since its development in Germany in 1948 by Hartert has gained, over time, clinical acceptance in different fields of medicine such as liver transplantation, cardiovascular surgery, obstetric anesthesia, and anesthesia in traumatized patient, as well as platelet mapping and more. It is a test that can be done in the patient's headboard offering valuable information on the status of coagulation[1-3], wherewith transfusion therapy can be initiated earlier and more targeted toward specific disorders such as decreased clotting factors, altered platelet (number and/or function). All of the above makes it

a dynamic examination of the viscoelastic properties of clot formation and lysis[2].

The first clinical applications of TEG in liver transplantation were described in 1985 by Dr. Kang in Pittsburgh and in cardiac surgery in 1995, since these procedures has a high probability of massive bleeding and tissue injury associated with significant alterations in coagulation[2].

Given the influence of tissue injury on the coagulation, since 1997 it has been used as a tool in trauma transfusion therapy[2], many reports of diseases have subsequently been published, they have been associated with massive bleeding or blood clotting disorders with adequate results, where transfusion therapy was based in the use of TEG.

REPORT OF A CASE

This is a female patient, 25 years old, without medical or surgical history, who on tonsillectomy-postoperative day 19 had severe oral bleeding, she was assessed and reviewed by ENT specialist (otorhinolaryngologist) who put the stitches on left tonsillar fossa to control bleeding.

Three days later, the patient attended again because of a severe bleeding episode which she had while she was resting. Upon arrival to the Emergency Department, she was alert and had signs of hypovolemic shock. Her vital signs at admission were: blood pressure (BP): 60/40 mmHg; mean arterial pressure (MAP): 46 mmHg; heart rate (HR): 120 beats per minute; respiratory rate (RR): 32 breaths per minute; body temperature: 36 degrees Celsius; marked mucocutaneous paleness; no evidence of active bleeding in the oropharynx, but there were stigmata of bleeding and blood clots in the left tonsillar bed.

Initial management in the emergency department consisted of 4,000 cc 0.9% saline crystalloid solution (SSN) and 50% oxygen by Venturi mask achieving 100% saturation by pulse-oximetry, and improving PA values to 113/53 mmHg, HR values to 90 bpm, and RR values to 24 rpm. Laboratory tests were requested and transfusion of 2 units of globular packages (GP) was administrated.

After 5 hours of observation in the Emergency Department, she had a new episode of bleeding in the oropharynx with the following parameters: BP: 120/58 mmHg; HR: 119 beats per minute; RR: 22 breaths per minute. She was stabilized with 2,000 cc of SSN and an additional unit of GP was given.

After 15 minutes she had a new episode of diffuse bleeding from mouth and nose, she had had clinical deterioration and was stuporous, so 2,000 cc of SSN were given, she was transferred to the Intensive Care Unit (ICU) under conditions of hemodynamic instability.

While the patient was awake, the airway was secured by intubation without complications, controlled assisted mechanical ventilation in controlled mode was applied, and invasive monitoring of blood pressure, central venous catheter and control of laboratory tests for prothrombin time (PT) of 10/10 were used. It were found the following parameters: Thromboplastin time (TPT) greater than 120 seconds, fibrinogen concentration of 194.5 mg/dL, 484.000 platelets/ $mm^{3,}$ hemoglobin: 10.3 g/dL, hematocrit values of 30.1%, electrolytes with hypomagnesemia and hypocalcemia.

The blood gas analysis reported pH 7.11, PO_2 117 mmHg, PCO_2 46 mmHg, HCO_3 = 14, base deficit of 15, with severe uncompensated metabolic acidosis. Signs of fluid overload were observed in the chest radiograph.

In a new assessment performed by an ENT specialist (otorhinolaryngologist), bleeding blood vessel was found in the lower pole of the left tonsil, and oropharynx was ligated and packed using clogged wick.

Moreover, 6 units of globular packages and 6 units of fresh frozen plasma (FFP) were transfused for suspected diagnosis of dilutional coagulopathy, thromboelastogram was requested and inotropic support with dopamine up to a maximum of 7 μg/kg/min was required.

A short r time less than 4 min was observed in TEG, showing that there is no need to administrate more units of plasma. Additionally, it were found the following values: a time k greater than 4 minutes with an angle less than 27 degrees, which is related to deficiency of fibrinogen; a maximum amplitude less than 55 mm which corresponds to thrombocytopenia or platelet dysfunction (initial platelet count of 484,000); and values of coagulation index (CI) and clot strength (G) diminished without the presence of fibrinolysis (LY 30). These findings caused that 10 units of cryoprecipitate and one unit of platelets obtained from a single donor were transfused (equivalent to 6 units of platelets conventional) (Figure 1).

After performing these actions, hemodynamic stabilization was achieved and inotropic support was discontinued. Thromboelastogram control after instituted therapy (cryoprecipitates and platelets) evidences normalization of stroke without the need to administer plasma, which would be indicated if the routine testing that have a PTT greater than 120 sec and normal platelet count and fibrinogen slightly decreased was been followed (Figure 2).

With clinical improvement and thromboelastographic correction, carotid arteriography was performed through right femoral access, finding pseudoaneurysm of the left lingual artery, , it was embolized with two «platinum coils», this procedure did not have complications (Figures 3 and 4).

In her outcome, the patient improved her acid-base status through blood gas control: pH 7.47, PO 115 mmHg, PCO_2 27 mmHg, HCO_3 19.8, Hb control of 7.5, platelets: 93,000, prothrombin time of 11.4/10.5, TPT: 29.2/25.6, and one transfusion of 2 additional units of GP was performed, as well as an orotracheal extubation after a review of the oropharynx day later.

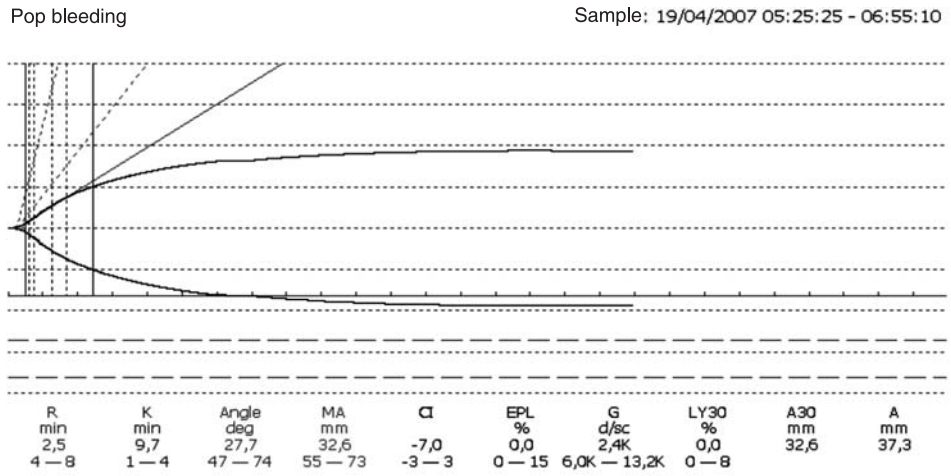

Figure 1. Thromboelastogram 1. See R shortening, K lengthening, decreased alpha angle, maximum amplitude decreased, coagulation index (CI) decreased and clot firmness (G) decreased without fibrinolysis LY30 0%.

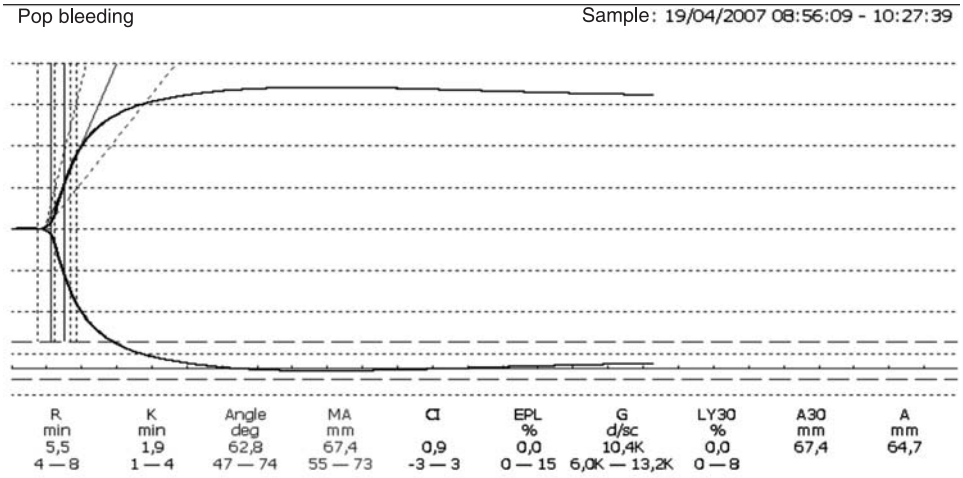

Figure 2. Thromboelastogram 2. See normalization of values previously found altered, patient achieve proper adjustment of its clotting disorder presented.

The patient was assessed by hematology, VII, VIII, IX, XI factors and Von Willebrand factor were requested, which were reported as normal, and Willebrand disease or hemophilia was discarded. Invasive monitoring was removed. At the time of discharge from the unit, the patient had adequate outcome, and so remained until 24 hours later.

DISCUSSION

This case is particularly unique due to the presence of massive bleeding in the later postoperative period of a tonsillectomy in an adult patient, in which there is no record of intraoperative complications or severe bleeding during surgery. The patient had three episodes of bleeding, the first of these on the 15th day, which was controlled by passage of stitches. Three days later, patient had two episodes that generated hemodynamic decompensation, which carried to the angiographic study of the patient.

Tonsillectomy is the most common surgical procedure performed in otolaryngology. Fortunately, there are few life-threatening complications in the patient, there are reports of cases of pseudoaneurysms of the external carotid artery and its branches (lingual artery) [4,5]. The secondary postoperative bleeding (> 24 hours) is very rare and it is reported within the first 10 days after surgery, in this case, the patient had bleeding on 15th day. The higher incidence of postoperative bleeding has been reported within the first 24 postoperative hours (primary bleeding) which corresponds to about 80% of cases[6]. There are patients with subclinical coagulation disorders with von Willebrand disease, factors XI and XIII deficiency, which are evident only against a surgery such as in tonsillectomy. This did not have previous bleeding history and preoperative exa-

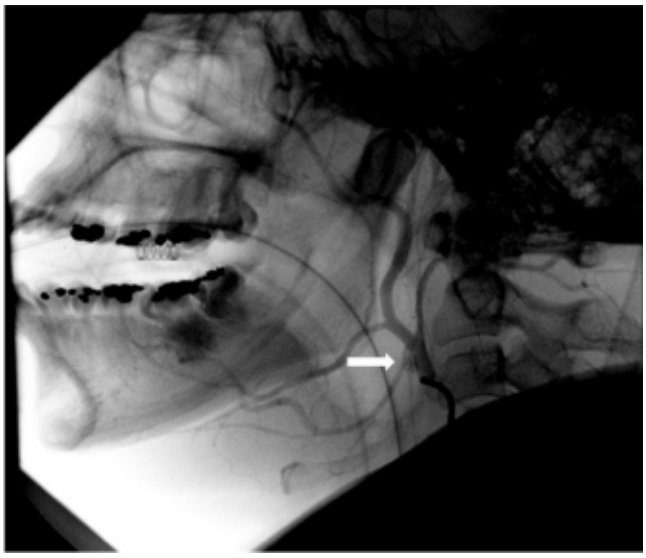

Figure 3. Image of bleending pseudoaneurism of lingual artery.

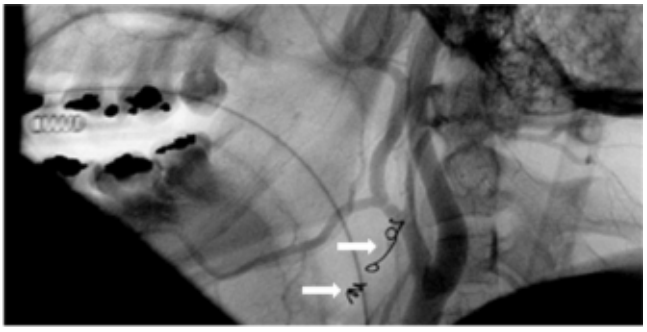

Figure 4. Image placement of coils in the lingual artery.

minations were normal. The presence of pseudoaneurysms is recorded as a complication of tonsillectomy in the literature. They may occur as early as 4 postoperative hours or until 8 months later. Reports in literature have been about the lingual, facial and internal carotid arteries with records of massive bleeding at a mean of 5, 14, and 15 postoperative days, respectively[7]. Previously, management done was necessarily surgical[4]; with the advent of technology, the placement of «coils» appears as a management alternative with good results[7-9]. For the proper monitoring of transfusion therapy of this patient, it was considered to use the TEG for analysis of coagulation status, abnormalities present and as a management guide to find the kind of blood products and how many units of blood products were needed to be replaced[10]. About half of patients admitted to the ICU had received a transfusion[11], they frequently suffer from anemia, thrombocytopenia and coagulopathy. These problems require a careful management to achieve optimal recovery.

There are clinical conditions that warrant a brash management on blood transfusions, but also must weigh the need for them and especially the potential risk that they can generate, especially in the transmission of infectious diseases[12]. There are clinical conditions deserving a meticulous management regarding blood transfusions. Additionally, the need of these transfusions and especially the potential risk that they can generate should be considered, especially in the transmission of infectious diseases[12]. Having available the TEG as a complementary technology for assessing the viscoelastic properties of blood has facilitated the identification of different clotting problems that may arise. These same advantages are obtained by administrating a blood component replacement closer to the actual needs of the patient. Above-mentioned and the strictly necessary use of these blood products has made possible the cost reduction[13].

This patient required transfusion of 6 units of GP, which was considered as a massive transfusion, as over 50% of blood volume in a period of 3 hours was replaced[14]. Often cases of coagulopathies, especially dilutional coagulopathies, were observed during massive transfusions, which becomes treatment of these patients even more difficult. Among the factors frequently related to the development of coagulopathy, the following has been found: delay in the control of massive bleeding or trauma, delay in the onset of transfusion therapy, improper control of an euthermic state, and lack of access to laboratory results and testing in a timely manner[14].

The maintenance of hemoglobin and hematocrit levels helps to achieve a better cellular oxygenation status, particularly in disorders with high metabolic consumptions and in patients who fail to offset the adverse effects of an anemic condition[15], our patient had a state of hypovolemic shock associated with severe metabolic acidosis, it was properly controlled using a established management; additionally, diagnostic and therapeutic assistance of interventional radiology was provided.

A short r time less than 4 min was observed in TEG, showing that there is no need to administrate more units of plasma. Additionally, it were found the following values: a time k greater than 4 minutes with an angle less than 27 degrees, which is related to deficiency of fibrinogen; a maximum amplitude less than 55 mm which corresponds to thrombocytopenia or platelet dysfunction (initial platelet count of 484,000); and values of coagulation index (CI) and clot strength (G) diminished without the presence of fibrinolysis (LY 30). These findings caused that 10 units of cryoprecipitate and one unit of platelets obtained from a single donor were transfused (equivalent to 6 units of platelets conven-

tional). After performing these actions, hemodynamic stabilization was achieved and inotropic support was discontinued. Thromboelastogram control after instituted therapy (cryoprecipitates and platelets) evidences normalization of stroke without the need to administer plasma, which would be indicated if the routine testing that have a PTT greater than 120 sec and normal platelet count and fibrinogen slightly decreased was been followed.

In the TEG's first control, we observed the shortening of r = enzymatic hypercoagulability (probably conditioned by the previous transfusion of fresh frozen plasma), elongation of K = decrease in fibrinogen levels, decreased alpha angle and maximum amplitude = decrease in fibrinogen and platelet, decreased clot strength and firmness (which demonstrated in IC), and decreased gelation (G). The following values were found in the laboratory report: PT= normal, prolonged TPT > 120 sec, 484.000 platelets/mm^3, and fibrinogen concentration of 194.5 mg/dL. What makes us think that the patient is suffering from alteration in the coagulation factors or an heparine effect, which would determine the administration of more units of fresh frozen plasma. However, the findings of the TEG showed us an alteration of the very different coagulation, where the administration of fibrinógeno and platelets was needed, in spite of having a previous report of normal count.

In the TEG's second control, the normalization of the values, which were previously altered, was observed. Coagulation disorder was remedied in the patient, and subsequently an improvement in her overall clinical status was observed.

In this case the thromboelastography served as a management guide in transfusion therapy, achieving the proper control of clotting disorder. Thus stabilizing the patient to perform arteriography, with which full control of bleeding was achieved through the placement of «coils».

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