

Case Report

High-sensitivity to heparin associates with cell salvage transfusion in adolescent idiopathic scoliosis patient undergoing posterior spinal fusion

Li Du^{1*}, Jianqiao Zheng^{2*}, Yumin Tang¹

¹Department of Anesthesiology, Sichuan Cancer Hospital, No. 55, People's South Road, Chengdu 610041, Sichuan, China; ²Department of Anesthesiology, West China Hospital of Sichuan University, No. 37, Guoxue Alley, Chengdu 610041, Sichuan, China. *Equal contributors.

Received June 12, 2014; Accepted July 12, 2014; Epub August 15, 2014; Published August 30, 2014

Abstract: A 16-year-old male with adolescent idiopathic scoliosis was scheduled for the posterior spinal fusion (PSF) under general anesthesia. The cell saver was routinely prepared preoperatively and 400 ml of salvaged red blood cells were transfused during the surgery. After the cell salvage transfusion, the oozing of blood in surgical wounds occurred and the activated coagulation time (ACT) of the arterial blood was 999 s, considering the possibility of the residual heparin in the cell salvage, 30 mg of protamine was injected intravenously, 5 min later the ACT dropped to 125 s. After the therapy, the surgical procedure was performed successfully. After the procedure was over, the patient went back to the ward with normal coagulation function indicators. 11 days later, the patient was discharged home without complications. We present this case of coagulopathy caused by minor cell salvage transfusion and wish to highlight the importance of the blood coagulation monitoring that can be overlooked in these situations.

Keywords: Cell saver, coagulopathy, heparin hypersensitive, posterior spinal fusion, adolescent idiopathic scoliosis

Introduction

Cell salvage is beneficial to reduce allogeneic blood transfusion in the surgery [1]. Various meta-analyses have indicated a significant decrease in allogeneic transfusion with the use of cell salvage [2]. In the posterior spinal fusion (PSF) for adolescent idiopathic scoliosis (AIS), the rate of cell salvage transfusion has been documented to be as high as 89% [3]. The effect of residual heparin from the cell saver on the coagulation function would be negligible in most circumstances in exception of massive cell salvage transfusion [4, 5]. However, whether minor cell salvage transfusion may also lead to coagulopathy has not been reported yet. We presented a case of coagulopathy caused by minor cell salvage transfusion during the posterior spinal fusion (PSF) for adolescent idiopathic scoliosis (AIS), and tried to highlight the importance of blood coagulation monitoring that may be overlooked in these situations. The consent was obtained from the patient's family prior to this submission.

Case report

A 16-year-old male with adolescent idiopathic scoliosis underwent posterior spinal fusion surgery. The patient weighed 60 kg and was 155 cm tall. Routine preoperative examination findings were unremarkable. Besides the routine monitors, a left radial arterial line was inserted for the invasive blood pressure monitoring. After the surgery initiated under general anesthesia, the cell saver was routinely prepared preoperatively and the concentration of the anticoagulant heparin solution was 25,000 IU/L. 1 g of tranexamic acid was used to reduce blood loss during the surgery. The amount of intraoperative blood loss was nearly to 800 ml. Packed red blood cells were not used. Only 1000 mL of crystalloid solution and 500 mL of colloid solution were administered to stabilize the hemodynamic parameters. 400 ml of salvaged red blood cells were transfused from the washing program. After the cell salvage transfusion, the oozing of blood in surgical field occurred. Then 400 mL of fresh frozen plasma

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was administrated, but it had no effect. Considering the possibility of the residual heparin in the cell salvage, we monitored the activated coagulation time (ACT) of the arterial blood with standard procedure, and the value was 999 s. Given the ACT was >999 s, 30 mg of protamine was administrated intravenously, and 5 min later the ACT dropped to 125 s. After the therapy, the surgical procedure was performed successfully. The patient went back to the ward with normal coagulation function indicators. 11 days later, the patient discharged without any complications and well on follow-up.

Discussion

In most circumstances, the effect of residual heparin from the cell saver on the coagulation function would be negligible [4]. Dose of heparin in the autologous blood varies and depends on transfusion volume, concentration and drip rate of anticoagulant heparin solution. Previous study has confirmed that the red cell suspension that is transfused back to the patient may contain about 0.002% of the pre-wash heparin after spilling blood by the system [4]. The concentration of the anticoagulant heparin solution was 50,000 IU/L, even 30,000 IU/L in some report [6]. However, in our hospital, 25,000 IU/L of the anticoagulant heparin solution is safe and effective during the cell salvage. The estimation of the dose of heparin from the cell saver is very cumbersome in clinical practice. Heparin anticoagulation is commonly monitored with the activated clotting time (ACT) [7]. 300-400 IU/kg of heparin is commonly used to make the ACT > 480 seconds and reach the adequate systemic heparinization before cardiopulmonary bypass (CPB) [8]. In this case, only 400 ml of salvaged red blood cells were transfused and the ACT was 999 s. Even 400 ml of 25,000 IU/L heparin solution was transfused, only equal to 165 IU/kg heparin was given. The ACT can't reach to 999 s in normal situation.

Heparin anticoagulation is commonly monitored with the activated clotting time (ACT) [9, 10]. The ACT may be prolonged by hemodilution, but it still provides an extremely useful, fairly reliable and fast bedside test of the coagulation status and the adequacy of anticoagulation [11, 12]. So, we speculate that this patient was high sensitive to the residual heparin from

the salvaged red blood cells, which was confirmed by the effective antagonism of heparin using protamine to normalize ACT.

Conclusion

Although high-sensitivity to heparin in patient after cell salvage transfusion was rare, and none comprehensive clinical studies on high-sensitivity to heparin were found, more attention should be focused on the patients' coagulation function after the autologous blood transfusion. We recommended that it is necessary to monitoring the ACT value before and after the autologous blood transfusion as to avoiding the coagulopathy caused by high-sensitivity to heparin.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Yumin Tang, Department of Anesthesiology, Sichuan Cancer Hospital, No. 55, People's South Road, Chengdu 610041, Sichuan, China. Tel: +86-28-8542-0157; Fax: +86-28-8542-0442; E-mail: yumin_tang@sina.com

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