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HEMOLYSIS FOLLOWING INTRAOPERATIVE CELL SALVAGE REPLACEMENT IN A SCOLIOSIS PATIENT WITH SICKLE CELL TRAIT: A CASE REPORT

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Structured Abstract

Study Design

Case Report.

Objective

To describe a novel presentation of acute renal failure associated with hemolysis following intraoperative cell salvage (ICS) in a neuromuscular scoliosis patient with sickle cell trait (SCT).

Summary of Background Data

Hemolysis associated acute renal failure following ICS in patients with SCT has not been previously reported. Sickle cell disease is regarded as a relative contraindication for ICS due to the risk of red blood cell sickling in the hypoxic cell saver reservoir. A previous case series demonstrated successful ICS reinfusion following elective caesarean section in two patients with SCT. However, a decision to not reinfuse ICS collected blood due to increased sickling after blood processing was reported in general surgery.

Methods

A 14-year-old female with Group I neuromuscular scoliosis underwent a navigated T3-S1posterior spinal instrumentation fusion. 300-ml of blood collected by ICS was reinfused intraoperatively along with two units of packed red blood cells.

Results

Post-operatively, the patient had delayed emergence from the general anesthetic and gross hematuria was observed in the urinary catheter bag. The patient was transferred to the intensive care unit and was treated successfully for hemolysis induced renal failure

Conclusions

Given the potential seriousness of hemolysis associated acute renal failure associated with ICS, we recommend against the use of ICS in patients with SCT.

Key Words

spinal fusion, sickle cell trait, intraoperative cell salvage, neuromuscular scoliosis, haemolysis, orthopaedic

Level of Evidence:5

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INTRODUCTION

Significant blood loss is a major risk in neuromuscular scoliosis spinal fusion (1). Various strategies including hypotensive anesthesia, intraoperative cell salvage (ICS), blood products, antifibrinolytic drugs and skull-femoral traction have been used to reduce intraoperative blood loss during spine surgery (2,3). ICS is a safe practice with very low rates of patient-related adverse events associated with its use (4). Nevertheless, reported complications with ICS in the pediatric population include altered homeostasis, electrolyte imbalances and transient hematuria (5).

At our institution, we encountered a novel presentation of hemolysis leading to acute renal failure following ICS during posterior spinal instrumentation fusion (PSIF). To our knowledge, this is the first reported case in the literature of acute renal failure associated with hemolysis following ICS in a neuromuscular scoliosis patient with sickle cell trait.

CASE

A 14-year old female with neuromuscular scoliosis secondary to perinatal hypoxic ischemic encephalopathy resulting in choreo-athetoid cerebral palsy amenable to PSIF was seen in clinic and consented for surgery. Figure 1a demonstrates a Group I neuromuscular scoliosis pattern. Previous sickle cell screen was positive for sickling hemoglobin consistent with sickle cell trait. Routine pre-operative bloodwork showed normal blood count and renal function.

A navigated T3-S1 PSIF was performed under skull-femoral traction (Fig 1b). Intraoperative blood loss management techniques included ICS with Dideco Electa® (Sorin Group, Electa, Italy), tranexamic acid and controlled hypotension. No neuromonitoring concerns were reported during the operation. 300 ml of blood was salvaged and transfused intraoperatively along with two units of packed red blood cells.

Postoperatively, the patient had delayed emergence from the general anesthetic and gross hematuria was observed in the urinary catheter bag. CBC revealed low hemoglobin (6.4 g/dL), low hematocrit (20 mL/dL), low platelets ($107x10^3/\mu L$) with hyperkalemia (6.8mmol/L) and elevated creatinine (17.6 mg/dL). Urinalysis demonstrated hematuria (6-10 rbc/hpf). She was transferred to the paediatric intensive care unit (PICU). Specific lab tests ruled out blood transfusion reaction and kidney ultrasounds showed no abnormalities. She was diagnosed with hemolysis induced renal failure. It was believed that ICS processing led to increased

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hemolysis of her sickled cells. She was successfully discharged on post-operative day seven after treatment of her renal failure.

DISCUSSION

Scoliosis incidence in the neuromuscular disease population is as high as 90%. Currently, PSIF is the most common technique, especially in cases of skeletally mature patients with good curve flexibility, concomitant pelvic obliquity, and limited lung function (3). Despite advances in PSIF, significant blood loss > 50% of their estimated total blood volume remains a common complication in these patients (6). Previous studies suggest abnormal platelet aggregation,depletion of clotting factors, seizure medications, low preoperative weight and greater number of vertebrae fused as risk factors (7,8).

Indications for ICS include anticipated blood loss more than 20% of total blood volume (9). In scoliosis surgery, ICS has been shown to reduce allogenic blood transfusion perioperatively by 47.3% mitigating the risk of infection and transfusion reactions associated with allogenic transfusions (10). Relative contraindications to ICS include use of clotting agents, bone chips, fat and carbon monoxide from electrocautery use, which are all encountered during spinal fusion (11). Additionally, the skimming technique used to aspirate blood in orthopedics has been shown to cause significantly more hemolysis (12). Excess Free hemoglobin is nephrotoxic and can lead to acute renal failure.

To date, minimal evidence is available for ICS in patients with sickle cell trait (SCT). Brajtbord et al. (13) questioned the efficacy of ICS for patients with SCT after they revealed a 50% incidence of sickling after processing blood from the cell saver reservoir in a 22-year old black female who underwent hepatic transplantation. They decided not to reinfuse the collected blood. More recently, Okunuga and Skelton (14) published a case series of two patients undergoing elective caesarean section with SCT who received successful ICS transfusion and recommend ICS use where clinical circumstances justify its use despite evidence of sickled cells after processing. Sickle cell disease (SCD) is regarded as a relative contraindication for ICS use as the hypoxic environment in the cell saver reservoir could predispose to sickling of red bloods cells and reinfusion could precipitate sickle cell crisis (11,13).

Currently, there are no published clinical trials addressing the safety of ICS use in patients with SCT. Given the seriousness of the hemolysis associated acute renal failure, we recommend against the use of ICS in patients with SCT. At this time, ICS continues to be included as part of the standard protocol in

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neuromuscular scoliosis spinal fusion at our institution as the reported benefits continue to outweigh the risks.

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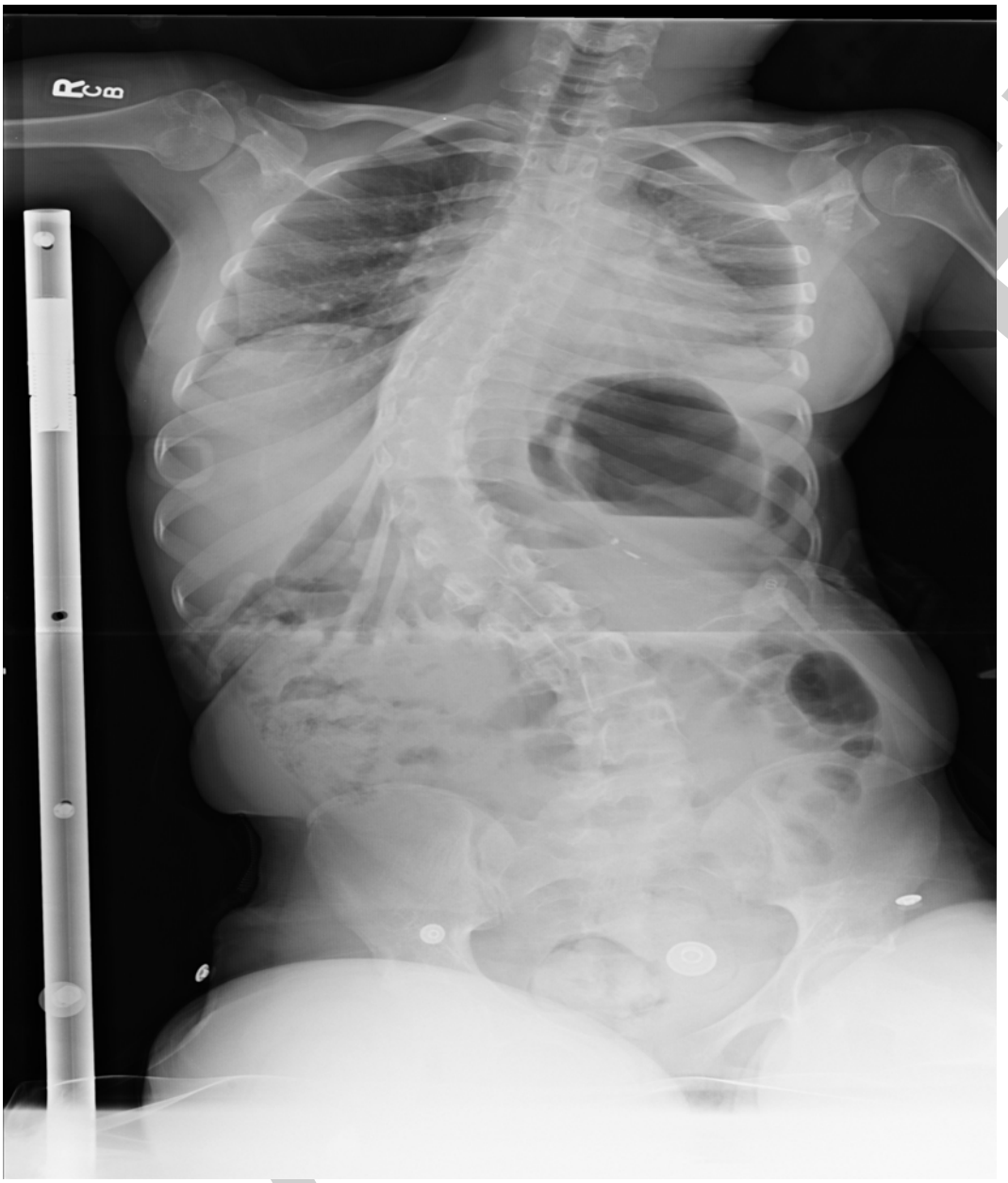
FIGURE LEGEND

Figure 1.1A. Preoperative PA scoliosis film showing S-shaped neuromuscular scoliosis with a double curve involving T5-L2, Cobb angle = 65º and L2-L5, Cobb angle = 33º. Figure 1Bis a post-operative PA scoliosis film showing the correction of T2-S1 with posterior spinal instrumentation fusion.



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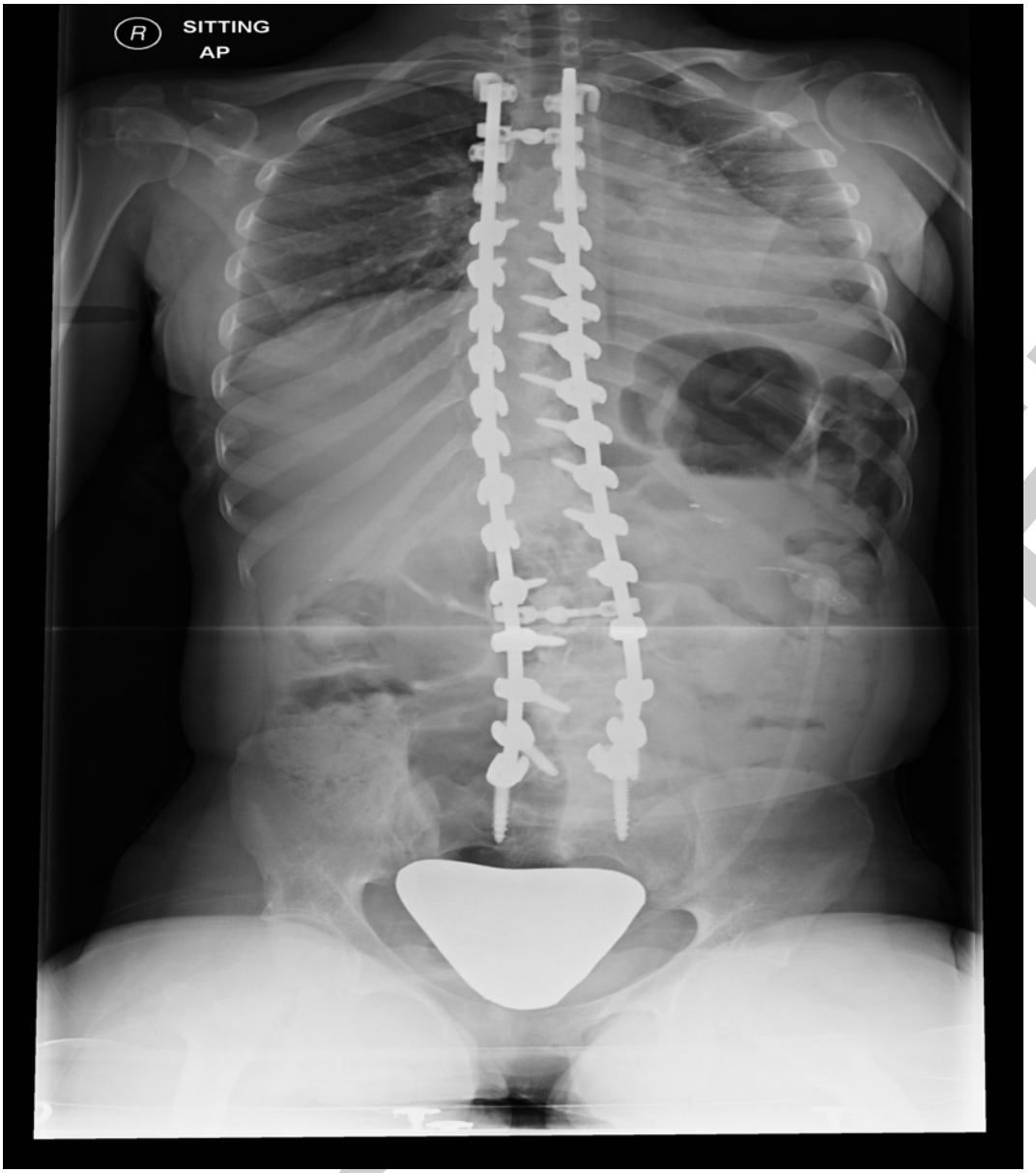

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