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Removal of Infected Posterior Spinal Implants: Be Prepared to Transfuse

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Abstract

Study Design: Single-center retrospective review of spinal deformity patients undergoing removal of infected posterior spinal fusion implants over a 10-year period.
Objective: To evaluate the intraoperative blood loss and perioperative complications of implant removal in posterior spinal fusions.
Summary of Background Data: To our knowledge, no studies examine blood loss or complications associated with removal of infected spinal implants in spinal deformity.
Methods: A retrospective review of 28 consecutive cases of infected posterior spinal fusion implant removal from 2003 to 2012 was performed. Exclusion criteria were patients with ≤6 levels of instrumentation, a partial removal of implants or a bleeding disorder.
Results: The average estimated blood loss was 465 mL (range 100–1,505 mL). Average estimated blood volume was 3,814 mL (range 1,840–9,264 mL). The average percentage of estimated blood loss was 14.2% (range 1.9%–43.5%). On postoperative labs obtained at the conclusion of the procedure, there was an average loss in hematocrit of 6.6 from preoperative values. Seventy-one percent of patients (20/28) received a blood transfusion; 39% (11/28) of these received a transfusion intraoperatively and 54% (15/28) received a transfusion postoperatively. Forty-six percent of patients (13/28) experienced an associated medical complication in the postoperative period. Among these 13, there were 16 total complications, with the most common being seizures (4/16), pneumonia (2/16), and sepsis (2/16). Average hospital stay was 14 days (range 4–52).
Conclusion: Seventy-one percent of patients undergoing removal of infected spinal implants received a blood transfusion. We recommend having blood products available when removing posterior spinal instrumentation >6 levels. Patients and families should be counseled on the high risk of complications and expected hospital stay in these cases.
Level of Evidence: Level III.

Keywords: Posterior spinal fusion; Perioperative complications; Blood loss; Transfusion; Infection

Introduction

Analysis of surgical site infections after spinal fusions for spinal deformity in pediatric populations have demonstrated an incidence ranging from around 1% in idiopathic scoliosis to 6% to 13% in neuromuscular scoliosis [1,2]. When these infections are deep, they necessitate operative management and in many cases implant removal. Although numerous studies have focused on evaluating the index

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IRB Approval from Children's Hospital Los Angeles has been obtained for this study.

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instrumentation procedure and risk factors for surgical site infections [1-10], we are not aware of any studies focusing on the blood loss or complications associated with the removal of infected spinal implants. The objective of this study was to review cases of implant removal after posterior spinal fusion and report on the intraoperative blood loss and perioperative complications associated with this procedure.

Materials and Methods

A single-center retrospective review of all consecutive cases of implant removal for infected posterior spinal fusions with proven or suspected infection from 2003 to 2012 was performed at our children's hospital. Exclusion criteria were patients with a short fusion (≤6 levels), those who had only a partial removal of implants or patients with a known bleeding disorder.

Patient demographics, the medical history, and surgical data were reviewed. Operative time, blood loss, blood products transfused, changes in hematocrit, implant type, and levels involved were obtained from the surgical data. In cases in which there was a discrepancy between the anesthesia record and the surgeon's estimate of blood loss, the anesthesia estimate was used. Estimated blood volume was calculated using 80 mL per kilogram according to the patient's weight on the day of surgery. In one case, the patient's weight at the time of surgery had not been entered when their medical record was converted from paper to electronic. In this case, the weight used from the patient's clinic visit the following year was used. Length of hospital stay and perioperative complications were recorded.

Results

There were 28 patients who met the inclusion criteria. Of these, 19 patients were female and 9 were male. The mean age at the time of index surgery was 14.0 years (range 10.3–20.7). The mean age at the time of implant removal was 17.1 years (range 14.2–22.7). The etiologies of spinal deformity for these cases are listed in Table 1. Neuromuscular (50%; 14/28) and idiopathic patients (29%; 8/28) made up the majority of the cohort (79%; 22/28). Of the neuromuscular patients, 86% (12/14) were fusions to the pelvis. The mean time from index surgery to removal was 3.3 years (range 0.9–9.3 years; standard deviation 2.35). When comparing time to removal with EBL and incidence of transfusion, there was no significant correlation (EBL: $p = .79$; transfusion: $p = .54$).

Table 1
Etiology of spinal deformity for which the posterior spinal fusion was initially performed.

Diagnosis	Number of patients
Neuromuscular	14
Idiopathic	8
Congenital	3
Syndrome	2
Scheuermann kyphosis	1
Total	28

Intraoperative blood loss, transfusion and complications

The mean estimated blood loss intraoperatively for the total group (n = 28) was 465 mL (median = 425 mL; range 100–1,505 mL). Average estimated blood volume was 3,814 mL (median = 3,480; range 1,840–9,264 mL). The average percentage of estimated blood loss (estimated blood loss/estimated blood volume) was 14.2% (median: 11.6%; range 1.9%–43.5%).

Thirty-nine percent (11/28 patients) received a blood transfusion intraoperatively. All 11 of these patients received at least one unit of packed red blood cells (PRBCs). The largest amount of blood products transfused intraoperatively was 5 units of packed red blood cells. This patient also received 1 unit of fresh-frozen plasma (FFP) intraoperatively. The mean operative time was 132 minutes (range 33–206 minutes). One patient had a dural tear during implant removal. There were no other intraoperative complications.

Among neuromuscular patients (n = 14), average estimated blood loss was 530 mL (range 200–1,000 mL) and mean estimated blood volume was 2,870 mL (range 1,840–4,096). This resulted in a mean percentage blood loss (estimated blood loss/estimated blood volume) for neuromuscular patients of 20.0% (range 7.4%–43.5%). Six of these (43%; 6/14) received intraoperative transfusions of PRBCs ranging from 1 to 3 units. There was no association between operative time and estimated blood loss for implant removal ($p = .2914$) in the neuromuscular patients.

For the patients with idiopathic scoliosis (n = 8), the average estimated intraoperative blood loss was 488 mL (range 100–1,505 mL). The mean estimated blood volume was 4,924 mL (range 3,960–6,192 mL) for these idiopathic patients, resulting in a mean percentage of blood loss (estimated blood loss/estimated blood volume) of 9.4% (range 2.4%–25.4%). Three of the 8 idiopathic patients (37.5%) received an intraoperative transfusion. All of those who had an intraoperative transfusion received at least one unit of PRBCs with the most received being 5 units. The patient who received 5 units also received 1 unit of FFP. The operative time and estimated blood loss for implant removal were positively correlated in this subgroup of idiopathic patients ($p = .001$).

Immediate postoperative hemoglobin and hematocrit

On postoperative labs obtained at the conclusion of the procedure for the total group (n = 28), there was an average decrease in hemoglobin of 2.2 from preoperative values (see Table 2). The average decrease in hematocrit from preoperative values was 6.6. There was one case in which