Assessment of Intraoperative Blood Loss at Different Surgical Stages During Posterior Spinal Fusion Surgery in the Treatment of Adolescent Idiopathic Scoliosis

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Study Design. Prospective clinical study.

Objective. To analyze the amount of blood loss at different stages of Posterior Instrumented Spinal Fusion (PSF) surgery in adolescent idiopathic scoliosis (AIS) patients.

Summary of Background Data. Knowing the pattern of blood loss at different surgical stages may enable the surgical team to formulate a management strategy to reduce intraoperative blood loss.

Methods. One hundred AIS patients who underwent PSF from January 2013 to December 2014 were recruited. The operation was divided into six stages: stage 1—exposure, stage 2—screw insertion, stage 3—release, stage 4—correction, stage 5—corticotomy and bone grafting, and stage 6—closure. The duration and blood loss at each stage was documented. The following values were calculated: total blood loss, blood loss per estimated blood volume, blood loss per minute, blood loss per vertebral level fused, and blood loss per minute per vertebral level fused.

Results. There were 89 females and 11 males. The mean age was 17.0 ± 5.8 years old. Majority (50.0%) were Lenke 1 curve type. The mean preoperative major Cobb angle was 64.9 ± 15.0°. The mean number of levels fused was 9.5 ± 2.3 levels. The mean operating time was 188.5 ± 53.4 minutes with a mean total blood loss 951.0 ± 454.0 mLs. The highest mean blood loss occurred at stage 2 (301.0 ± 196.7 mL), followed by stage 4 (226.8 ± 171.2 mL) and stage 5 (161.5 ± 146.6 mL). The highest mean blood loss per minute was at stage 5 (17.1 ± 18.3 mL/min), followed by stage 3 (12.0 ± 10.8 mL/min). The highest mean blood loss per vertebral levels fused was at stage 2 (31.0 ± 17.7 mL/level), followed by stage 4 (23.9 ± 18.1 mL/level) and stage 5 (16.6 ± 13.3 mL/level).

Conclusion. All stages were significant contributors to the total blood loss except exposure (stage 1) and closure (stage 6). Blood loss per minute and blood loss per minute per level was highest during corticotomy (stage 5), followed by release (stage 3). However, the largest amount of total blood loss occurred during screw insertion (stage 2).

Key words: adolescent idiopathic scoliosis, blood loss, posterior spinal fusion, stages, surgery.

Level of Evidence: 2

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Patients with adolescent idiopathic scoliosis (AIS) undergoing posterior instrumented spinal fusion (PSF) are at risk of significant blood loss even with adequate precautions taken preoperatively, intraoperatively, and postoperatively. This subjects them not only to the complications of blood loss itself but also to higher incidence of allogeneic blood transfusion which carries the risks of infections and hemodynamic complications.

There are many factors that may be associated with the amount of blood loss in AIS patients undergoing PSF. These factors may be patient-related: sex, Risser sign, preoperative Cobb angle, preoperative kyphosis magnitude, activated partial thromboplastin time level and fibrinogen level and menstruation cycle phase or surgery-related; number of fused vertebras, operative time, stages of surgery, number of osteotomy and surgical approach. Factors that affect the incidence of allogeneic blood transfusion in AIS...