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ANESTHESIA MANAGEMENT IN ADULT SCOLIOSIS PATIENTS

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ABSTRACT

Introduction: Adult scoliosis surgery management is challenging procedure for both orthopedic surgeons and anesthetists because of the long duration of surgery, difficulties in cannulation and intubation and serious bleeding. In this retrospective study, the anesthesia records of 25 adult patients who underwent scoliosis surgery under general anesthesia between 2010 and 2013 were evaluated in the light of current literature.

Material and Methods: Twenty-five adult patients who underwent scoliosis surgery between January 2010 and December 2013 were included in the study. Demographic data, American Society of Anesthesiologists (ASA) classification, Mallampati (MP) score, duration of anesthesia, duration of operation, amount of blood loss data were recorded.

Results: The mean age of 25 patients who underwent scoliosis surgery was 26.6 ± 8.80 years. 2 (8 %) of the patients were classified as ASA I, 19 (76 %) ASA II and 4 (4 %) ASA III. MP score was I in ten (40 %) patients, and was recorded as II in 10 (40 %) patients and III in 5 (20 %) patients. The mean duration of anesthesia was 289.80 ± 81.01 minute, the mean amount of blood loss was recorded as 1162 ± 466.72 ml. Twenty (88 %) patients underwent peroperative blood transfusion.

Conclusion: Anesthesia management is important in scoliosis surgery due to many complications that may develop especially because of blood loss. Detailed preoperative evaluation should be performed and appropriate preparations should be planned before surgery.

Key words: Anesthesia management, adult scoliosis, spinal surgery, kyphoscoliosis

Level of evidence: Retrospective clinical study, Level III.

INTRODUCTION

Scoliosis is a disease that progresses with age, shows abnormal angulation of a spinal segment sideways or backwards, and has clinically significant results [(7)]. It is more common in female than male [(2)]. The incidence of scoliosis in Turkey was reported to be 1.3 % [(6)]. Scoliosis surgery is often performed by multiple levels of instrumentation and correction of spinal curve. Although most of the scoliosis are idiopathic, many diseases such as mesenchymal disorders, trauma, surgery and infection can cause scoliosis. Patients should be evaluated in terms of airway difficulties, respiratory, cardiovascular and neurological system disorders in the preoperative evaluation [(3)]. Particular attention should be paid to important cardiac problems and congenital anomalies. Cardiac pathologies such as atrial septal defect (ASD) may be most common [(5)].

Because of the long duration of surgery, difficulties in cannulation and intubation and serious bleeding, anesthesia management is important in scoliosis surgery. Increasing the number of instrumented levels increases both the duration and the complications of surgery such as bleeding. In these patients, in addition to standard anesthesia monitoring (electrocardiography, noninvasive blood pressure, end-tidal carbon dioxide pressure, peripheral oxygen saturation, temperature) invasive interventions (radial artery cannulation, central vein cannulation, bladder probe) and neurophysiological monitoring (depth of anesthesia and spinal

cord functions) techniques are applicable. Intermittent blood count and blood gas analysis can be used to assess the acid base balance and the need for blood. In this retrospective study, the anesthesia records of 25 adult patients who underwent scoliosis surgery under general anesthesia between 2010 and 2013 were evaluated in the light of current literature.

MATERIAL AND METHODS

After the approval of the University Ethics Committee, 25 patients who underwent scoliosis surgery under general anesthesia in the central operating room of our hospital between January 2010 and December 2013 were included in the study. Demographic data (age, gender, weight, height, body mass index (BMI)), American Society of Anesthesiologists (ASA) classification, Mallampati (MP) score, duration of anesthesia, duration of operation, amount of blood loss, history of medication and operation, comorbid systemic diseases, the number of instrumented levels, Cobb angle of curves, amount of blood transfusion and mortality data were recorded.

SPSS (Statistical Package for the Social Sciences Inc., Chicago IL, USA) 22.0 package program was used for statistical analysis. Number, percentage, mean and standard deviation values were used to define the data. The recorded data were obtained by complete counting sampling.

RESULTS

The mean age of 25 patients who underwent scoliosis surgery was 26.6 ± 8.80 years, the male / female ratio was 11/14 (44 % / 56 %), the average body weight was 68.16 ± 7.88 kg, the mean height was 164.16 ± 8.47 cm, and the mean BMI was 25.24 ± 2.10 kg / m^2. Two (8%) of the patients were classified as ASA I, 19 (76 %) ASA II and 4 (4 %) ASA III. MP score was I in ten (40 %) patients, and was recorded as II in 10 (40 %) patients and III in 5 (20 %) patients (Table-1).

Table-1. Demographic data of the patients. (mean ± SD)

Gender (M/F) (n,%)	11(%44) / 14 (%56)
Age (years)	26.6 ± 8.80
Weight (kg)	68.16 ± 7.88
Height (cm)	164.16 ± 8.47
BMI (kg/m^2)	25.24 ± 2.10
ASA I/II/III (n,%)	2(%8) / 19(%76) / 4(%4)
Mallampati score (I/II/III)	10(%40) / 10(%40) / 5(%20)

SD; standard deviation, M; male, F; female, BMI; Body Mass Index, ASA: American Society of Anesthesiology, n;number.

The mean duration of anesthesia was 289.80 ± 81.01 min, and the mean operation time was 313.20 ± 81.54 min. The mean amount of blood loss was recorded as 1162 ± 466.72 ml. While 3 (12 %) patients had a history of medical drug use, 21 (84 %) patients had a history of previous surgery. When systemic diseases were evaluated, 2 (% 8) patients had ASD, 1 (4 %) had Arnold-Chiari syndrome, 1 (4 %) had epilepsy, 1 (4 %) had asthma and 3 (12 %) had hypertension. The mean number of instrumented vertebrae was 11.26 ± 4.74. Thoracolumbar surgery was performed in 22 (88 %) patients, thoracic in 2 patients (8 %) and lumbar in 1 (4 %) patient. The mean Cobb angle was 78.5 ± 9.1°. Twenty (88 %) patients underwent peroperative blood transfusion. No mortality occurred in any patient during hospital stay (Table-2).

Table-2. Surgical procedure data.

Anesthesia time (min)	289.80 ± 81.01
Surgery time (min)	313.20 ± 81.54
Blood loss (ml)	1162 ± 466.72
Medication history (n,%)	3 (%12)
Operation history (n,%)	21 (%84)
Systemic diseases (n,%)	
ASD	2 (%8)
Arnold-Chiari Syndrome	1 (%4)
Epilepsy	1 (%4)
Asthma	1 (%4)
Hypertension	3 (%12)
Instrumented Level	11.26 ± 4.74
Surgical Zone (T/L/TB) (n,%)	2(%8) / 1 (%4) / 22 (%88)
Cobb angle (°)	78.5 ± 9.1
Blood transfusion (n,%)	22 (%88)
Mortality (n,%)	0 (%0)

ASD; atrial septal defect, T; thoracic, L; lumbar, TB; thoraco-lumbar

In this study, total intravenous anesthesia (propofol and remifentanil infusion) was chosen as anesthesia management and inhalation anesthetics were not preferred [8]. Surgery was applied prone position with posterior approach in all patients. Neuromonitoring (Somatosensory Evoked Potentials and Motor Evoked Potentials) and bispectral index (BIS) monitoring were performed. No Wake Up test (intraoperative wake-up test) was performed. All patients were admitted to the intensive care unit postoperatively and were extubated one day later. An epidural catheter was placed and postoperative analgesia was provided with local anesthetic infusion.

DISCUSSION

Anesthesia management is important because of anatomical defects and surgical difficulties in scoliotic patients. According to many anesthesiologists, blood transfusion due to serious blood loss and related complications are the most important problems [3]. In addition to hemodynamic changes, changes in bleeding diathesis are changes that may lead to an increase in mortality [4,9]. Increased number of vertebrae surgery and prolongation of these surgery may increase the amount of bleeding. Therefore, careful surgical technique and alternative strategies to reduce the amount of bleeding (correct patient position, controlled hypotension, preoperative autologous blood transfusion, acute normovolemic hemodilution, preoperative erythropoietin administration, tranexamic acid application) must be selected in these patients. In recent years, cell-saver methods, which provide the reuse of blood after bleeding, have also gained popularity [1]. In our cases, the mean amount of bleeding was around 1200 ml. In two patients, the amount of bleeding was over 2500 ml, which is an indication of the extent of the bleeding. For this reason, it is important to make preoperative blood preparation and to ensure peroperative bleeding control. According to our clinical experience, the application of methods that can reduce bleeding, such as controlled hypotension, by experienced anesthesiologists especially helps to reduce the complications due to blood transfusion. The studies on the effect of different doses of tranexamic acid on bleeding have been continuing in our clinic.

Scoliosis surgery is a long-term surgical treatment and anesthesia management is difficult due to duration of surgery. It can make it more difficult to have additional diseases. As seen in our study, blood transfusion was required in most of the cases due to the high amount of bleeding. The mean surgical instrumented vertebral level was 11, which led to an increase in the amount of peroperative bleeding and the duration of surgery. Considering that many of these cases were operated previously due to scoliosis, drugs used in anesthesia management and methods to reduce bleeding would be necessary. In addition, it should be kept in mind that difficult airway may be seen in these cases because of high MP score and the fact that neck movements may be restricted and alternative airway vehicles such as laryngeal mask airway (LMA), fiberoptic bronchoscope or videolaryngoscope should be available to provide airway if necessary [5]. The patients who were included in our study did not develop difficult airway and all patients were intubated at one attempt with orotracheal route.

In addition to the clinical features of scoliosis surgery patients, it may be necessary to provide advanced monitoring methods as it is a long-term and bleeding surgery. In these patients, in addition to standard anesthesia monitorization (electrocardiography, noninvasive blood pressure, end-tidal carbon dioxide pressure, peripheral oxygen saturation, temperature), invasive monitoring techniques (radial artery cannulation, central vein cannulation, bladder catheter) are almost always necessary [1]. In addition, near-infread spectroscopy (NIRS) and BIS monitoring may be preferred to evaluate cerebral oxygen saturation and the depth of anesthesia, repectively.

CONCLUSION

Due to the fact that scoliosis surgery is a major surgical procedure, anesthesia management is important in scoliosis surgery due to many complications that may develop especially for bleeding. In these cases, a detailed preoperative evaluation should be performed and appropriate preparations should be planned for bleeding. Care must be taken because of difficult airway and interventional procedures. The presence of an experienced anesthesia team in scoliosis surgery may help to reduce complications and accelerate postoperative recovery. This can be achieved by coordinated work by the orthopedist, anesthesiologist and intensive care professional.

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