

EFFECT OF INDUCED HYPOTENSION AND TOTAL INTRAVENOUS ANESTHESIA (TIVA) ON BLOOD LOSS DURING WAKE-UP TEST IN SPINAL SURGERY

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ABSTRACT:

Although spinal surgery carries a risk of neurological complication of less than 1 percent, the resulting disability is so devastating that it necessitates monitoring to avoid permanent injury. In spinal surgery, perioperative blood loss is significant during both exposure and decortication of bone. Hypotensive anesthesia is recommended to reduce blood loss. In this study, the effect of both TIVA and INDUCED HYPOTENSION techniques on total blood loss and blood loss during wake-up test were determined.

Key Words : Induced Hypotension, Total Intravenous anesthesia, Bloodloss, Wake-up test, spine surgery

INTRODUCTION

Although spinal surgery carries a risk of neurological complication of less than 1 percent, the resulting disability is so devastating that it necessitates monitoring to avoid permanent injury. Nowadays, for early recognition of such complications, function of medulla spinalis can be observed with clinical and/or electrophysiological methods. Clinical evaluations can be performed using intraoperative "wake-up" test (1). This test is described to determine voluntary motor power of the limbs following the application of distracting rods to spinal column. During the procedure, patients must be awake enough to follow the orders. Total Intravenous Anesthesia (TIVA) technique with propofol and fentanyl provides the opportunity for early and smooth awakening (2).

In spinal surgery, perioperative blood loss is significant during both exposure and decortication of bone. Hypotensive anesthesia is recommended to reduce blood loss (3). Although TIVA technique permits to manipulate the level of anesthesia easily it may be insufficient to provide a decrease in MAP to reduce blood loss by itself.

In this study, the effect of both TIVA and INDUCED HYPOTENSION techniques on total blood loss and blood loss during wake-up test were determined.

METHODS

31 patients (aged 15-68) undergoing spinal surgery

were studied. The patients were premedicated with meperidine and ranitidine i.m. 30 min. before surgery.

The TIVA technique was used as described below:

ANESTHESIA

	INDUCTION	MAINTENANCE
Fentanyl	(2-3 mic. gr/kg)	(2-4 mic. gr/kg/min)
Propofol	(2 mg/kg)	(4-6 mg/kg/min)
Vecuronium	(0.1 mg/kg)	(0.03-0.05 mg/kg/min)
N ₂ O		60 %

MONITORIZATION EKG, Sao₂, temperature, Neuromuscular transmission (NMT), invasive arterial pressure. CVP, urine output, intragastric and intramuscular pH, blood gases.

21 patients were also received Sodium Nitropruside infusion in addition to TIVA, just after surgical incision to maintain mean arterial pressure (MAP) between 55-65 mmHg during the procedure. The initial and loading dose was established by an average rate of 1 mic. gr./kg/min. (0.5-2 mic. gr/kg/min). When desirable a mean pressure level is achieved, a maintenance rate of administration was sought by titration of dose to response.

WAKE-UP TEST:

- Vecuronium infusion is terminated approximately 30 min. before wake-up test or neuromuscular blockade is reversed according to the result of NMT monitor.

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- Propofol and fentanyl infusions and N₂O inhalation are discontinued 10 min. before the test.

- The patient is awakened with verbal stimulus and asked to squeeze the clinicians hand to test a clear communication and to move both upper and lower extremities.

- After dorsi -and plantar flexion, anesthesia is immediately re-established with propofol 1 mg/kg and maintained with the infusions of propofol, fentanyl and vecuronium, N₂O inhalation at the doses used before the test.

Blood loss was calculated in different periods of surgery in two groups of patients who were administered TIVA with Induced Hypotension (TIVA + IH Group - 21 patients) and who were received TIVA technique alone (TIVA Group - 10 patients).

If required, whole blood is transfused to maintain Hb levels above 10 mg/dl through out the operation.

The results were analyzed and the groups were compared with Student's t-test. A p-value of less than 0.05 was considered significant.

RESULTS

There was no statistical significance in age, sex and mean operation time between the groups.

Beta blocker treatment was used in 7 patients to prevent reflex tachycardia and to obtain desired level of hypotension.

Blood loss in different periods of surgery in the groups was illustrated in Figure 1. The blood loss during incision and instrumentation, wake-up and closure periods were seen 6.1 ± 5.3 , 8.2 ± 5.4 , 4.8 ± 2.5 ml/min. in TIVA group and 2.6 ± 1.3 , 2.9 ± 1.7 and 2.2 ± 1.9 ml/min. in TIVA + IH group respectively. Total blood loss was 2.7 ± 1.8 ml/min. in TIVA + IH group and 5.6 ± 4.3 ml/min in TIVA group.

Wake up test was successfully performed in all patients between 7-25 min. (15.3 ± 7.2 min.). No complication related the anesthetic technique was observed during the postoperative period.

DISCUSSION

Induced Hypotension is an anesthetic technique that permits the clinician to lower arterial pressure electively in order to decrease blood loss during surgery and to provide try surgical field for the surgeon (3).

Numerous techniques and drugs have been developed to lower arterial blood pressure. SNP is a vasodilator most commonly used to produce IH during

surgery. Onset of hypotension is rapid and pressure begins to steadily fall within 1 to 2 minutes. It de-

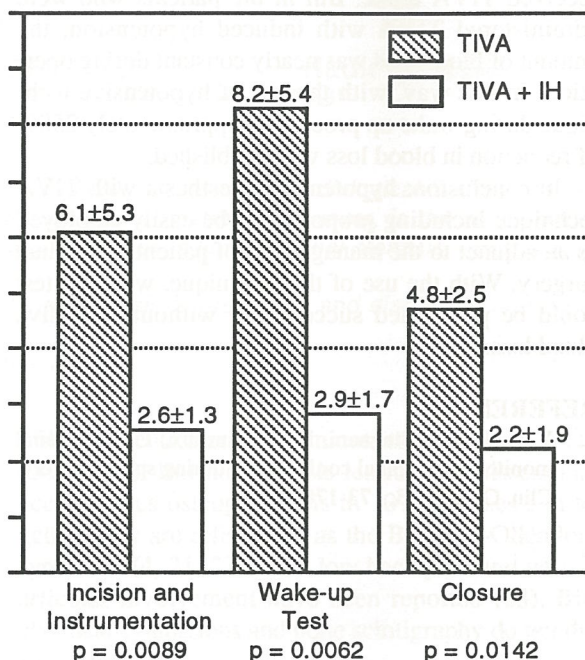


Figure 1: Blood loss (ml/min.) in different period of spinal surgery and p-values.

creases peripheral resistance with variable changes in heart rate and stroke volume, the onset of its action is rapid and of short duration and is readily controllable.

The most important factor determining the extent of intraoperative haemorrhage is the mean arterial blood pressure. This is directly related both to cardiac output and to total peripheral resistance (4).

Usually, a mean arterial pressure of 50 to 65 mmHg is considered an acceptable range and is defined as induced hypotension. It is reported that when MAP was decreased to 55 mmHg by SNP a 50 percent reduction in blood loss would be established (5).

Our results in total blood loss is similar to latest records. 50% reduction in blood loss was achieved in TIVA + IH group.

With the use of TIVA technique including propofol, wake-up tests were performed easily to evaluate neurological functions of spinal cord after surgical instrumentation. Although our mean wake-up period is longer than previous studies (6). It could be related to the use of vecuronium infusion to achieve a smooth muscle relaxation beside the TIVA technique.

Because of the light anesthetic level during wake-up procedure, blood loss was increased in the patients received TIVA alone. But in the patients who were administered TIVA with induced hypotension, the amount of blood loss was nearly constant during operation. In this way, with the use of hypotensive technique during wake up procedure, approximately 250% of reduction in blood loss was established.

In conclusion: hypotensive anesthesia with TIVA technique including propofol can be easily employed as an adjunct to the management of patients for spinal surgery. With the use of this technique, wake-up test could be performed successfully without excessive blood loss.

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