

TOTAL INTRAVENOUS ANESTHESIA WITH PROPOFOL IN ORTHOPAEDIC SPINE SURGERY AND THE WAKE-UP TEST

A. Arkan *, E. Gökel **, A. Kara **, E. Sağıroğlu ***,

E. Alıcı ****, F. Maltepe*****, Y. Erkin *****

To permit early, intra-operative recognition of neurologic deficits in Spinal surgery, the use of i'.I.V.A. (Total Intravenous Anesthesia) with Propofol (Diprivan), Fentanyl and N2O for the proposed wake-up test and availability for early post-operative neurologic examination is investigated in the study.

The investigation is carried on by Dokuz Eylül University Medical School, Anesthesiology and Orthopaedics Departments. 15 female and 5 male, a total of 20 patients are included in the study. Intra-operative wake-up test is performed with success and without a complication in all of the patients.

In-early post-operative period, following the last skin suture a complete neurologic examination was done in 5 to 13 minutes, in average $9,0 \pm 0.70$ minutes.

Consequently, it's concluded that this anesthesia technique is useful in spinal surgery and especially for the wake-up test.

Key Words : Orthopaedic Spine Surgery, Wake-up test, TIVA with Propofol.

Protection of the cord entirely is very important in spine surgery. Mechanical stretching due to the instrumentation, extreme hypotension and venous stasis which change spinal cord metabolism may cause spinal neurologic deficit (1,5).

Neurologic complications involving medulla spinalis can be avoided by early preoperative observations and these observations can be done either clinically or by electrophysiological methods. (1,3,4,8)

The influence of different anesthetic agents on electrophysiologic methods may cause incorrect results and/or makes them insufficient during the intra-operative period, so that their confidence is overshadowed. As a result intra-operative awakening and neurologic examination seems more reliable in the protection of the cord entirely.

Neurologic complications can also develop after the operation is over, the wound is covered and when the patient's position is benign changed, so to be able to awake the patient in any moment is very important.

Early awakening of the patient is required to perform their neurologic examination in the early post-operative period. (2,6,7)

With this study we planned to investigate the use of Propofol (Diprivan) which is recently introduced to clinical practice, and has a rapid recovery, in anesthesia for spine surgery and its suitability for the "Wake-up" test.

We compared advantages disadvantages of this method (T.I.V.A.) with the literature.

MATERIAL AND METHOD

The study is performed between January 1, 1990-March 31, 1990 in Dokuz Eylül University Medical School, Anesthesiology and Orthopaedics and Traumatology Departments.

20 patients is ASA I, II and III risk groups, (15 female and 5 male) aged 7-64 (average 28.8 ± 4.7) and weighing 20-90 kg (average 59.3 ± 5.4) who were scheduled for application of "Alici Spinal Instrument" are included in the study.

Patients with psychiatric and mental problems or those who were not cooperative are not included in the study.

Patients who were selected for the investigation are informed about the procedure in the pre-operative period. They were premedicated with Diazepam 0,2 mg/kg, Alpropinc 0,01 mg/kg 60 minutes before the surgical intervention. Peripheral and central venous routes were established in the operating room and arterial cannula was placed. Systolic-diastolic and mean arterial pressures and heart activation were monitored.

* Associate Professor, Dokuz Eylül University Medical School Anesthesiology Department.

** Specialist, Dokuz Eylül University Medical School Anesthesiology Department.

*** Professor, Dokuz Eylül University Medical School Anesthesiology Department.

**** Professor, Dokuz Eylül University Medical School Orthopaedics and Traumatology Department

***** Research Assistant, Dokuz Eylül University Medical School Anesthesiology Department.

Anesthesia was induced with Norcuron (test dosage) 10 mcg/kg, Fentanyl 2 mcg/kg, followed by Propofol 1,5 mg/kg. The patients were ventilated with 100 % O₂ using a face mask. Lysihenon 1,5 mg/kg is used for tracheal intubation. Propofol and Fentanyl were prepared for continuous administration; the infusions were arranged according to the patient's needs. After the initial dose for Norcuron was administered, the patient's position was changed. Respiration was controlled with 40 % Ch, 60 % N₂O. Fentanyl total bolus dose was completed to 7 mcg/kg before the incision. In all the patients lung auscultation was done with a precordial stethoscope and other ventilation parameters were monitored, an end tidal carbon dioxide analyser (Capnlog) was used, arterial blood gasses were analyzed once in 30 minutes.

Intra-operative wake-up test was performed without any preparation when the surgeon requested. When the operator wanted the patient to wake-up Propofol infusion and N₂O were discontinued at the same time and Fentanyl continued through the wake-up period. Discontinuation of Propofol and N₂O were considered the "O" point. Ventilation is controlled with 100 % O₂. The patients were given vowel stimulus once a minute. The time to open their eyes, the time a complete neurologic examination is performed and the extension time till patient went to sleep again was determined.

SAP, DAP, MAP and heart rate were registered to be evaluated before, during and after the wake-up test.

Fentanyl infusion is discontinued 15-20 minutes before the end of the operation, Propofol and N₂O are discontinued just after the last skin suture. The time when Propofol and N₂O were discontinued was taken as the "O" time for post-operative evaluation. The time to open the eyes, extubation time and the time to get a right answer to some questions, which we are sure that the patient knows, were determined.

The data were analysed using paired Student's t-test.

RESULTS

The wake-up test is performed in all of the patients involving in the "Propofol infusion" study plan, when the operator asked for it. Table 1 presents the biometric properties of the patients.

No. of patients	20 (5M + 15F)	Youngest	Oldest
Age	28,8 ± 4,7	7	64
Weight (Kg)	59,3 ± 5,4	20	90

Table 1. Biometric properties of the patients.

Table 2 gives a summary of the anesthesia technique.

Premedication	Atropine 10 mcg/kg Diazepam 20 mcg/kg
Induction of anesthesia	Vecuronium 10 mcg/kg Fentanyl 2 mcg/kg Propofol 1,5 mcg/kg Succinylcholin 1,5 mcg/kg or Vecuronium 90 mcg/kg
Endotracheal intubation and controlled ventilation (up to the incision)	O ₂ :N ₂ (33%-40%:60%-67%) Fentanyl bolus dose is completed to 7 mcg/kg.
Maintenance anesthesia	Propofol 1,5-3 mg/kg/hour Fentanyl 1,5-3 mg/kg/hour
During the wake-up test	N ₂ O and Propofol are discontinued Fentanyl infusion is continued at maintenance dose

Table 2. A summary of the anesthesia technique.

The test began when Propofol and N₂O were discontinued. Results gained during the wake-up period are given in Table 3 and Table 4. The time to open their eyes was at least 2 minutes, at most 8 minutes and 4,41 ± 0,57 in average. The neurologic examination was carried out in 4 to 10 minutes, 6,41±0,65 minutes in average.

The period for the test to be completed and the patient to be anesthetized again lasted from 5 to 12 minutes, 7,83 ± 0,61 minutes in average.

The haemodynamic parameters obtained during intra-operative neurologic examination were higher than those obtained at the beginning of the wake-up test. This increase was statistically meaningful, but all the results were within physiological limits. When compared, the mean of the results obtained 2 minutes after the patient went to sleep again, were not different from the mean haemodynamic parameters at the beginning of the test.

The extension time (minutes)	7,8 ± 0,61
Time to open the eyes (minutes)	4,4 ± 0,57
Time till the neurologic examination (minutes)	6,4 ± 0,61

Table 3. Results of the wake-up test.

	I	II	III
SAP	131,3 ± 3,87	145 ± 3, 80*	131,2 ± 2,56
DAP	76,7 ± 3,15	83,2 ± 3,88*	76,8 ± 2,47
Heart rate	73,5 ± 3,69	77,5 ± 3,99*	74,5 ± 3,18

Table 4. Haemodynamic parameters during wake-up test (* ± SEM)

- I. At the moment N2O and Propofol were discontinued.
- II. During neurologic examination
- III. 2 minutes after the patient was anesthetized.

At the end of the operation, the time from last skin suture up to the time they opened their eyes was 1 minutes to 8 minutes, or $3,33 \pm 0,57$ minutes in average. The results are given in table 5. extubation was performed between 4 and 11th minutes (average $7,83 \pm 0,67$ min.) Post operative neurologic examination was carried out between 5-13 minutes, (average $9,07 \pm 0,70$ min.)

Time to open eyes (minutes)	$3,3 \pm 0,57$	(1-8 minutes)
Extubation time (minutes)	$7,0 \pm 0,67$	(4-11 minutes)
Time for neurologic examination (minutes)	$9,0 \pm 0,70$	(5-13 minutes)
Control for vigilans	$9,3 \pm 0,63$	(6-12 minutes)
Anesthesia period	$194,2 \pm 10,6$	(135-255 minutes)

Table 5. Results of the recovery period.

For control of vigilans the right answer to the questions were given in 6 to 12 minutes, $9,33 \pm 0,63$ minutes in average.

During maintenance of anesthesia the average infusion rate for Propofol was 1,89 mg/kg/hour and for Fentanyl it was 1,28 mg/kg/h.

Arterial blood was analysed at post operative 30 and 120 minutes gave no result to think about ventilatory depression.

Two patients had urinary retention, one patient had a suspicious amnesia two had nausea and one had vomiting in the post-operative period.

DISCUSSION

In spinal surgery, probable neurologic complications can be prevented if recognized in the early reversible period. The entirety of M. Spinalis is controlled

continuously by electrophysiological methods. The effect of anesthetic agents and some non-physiologic conditions may often cause to wrong interpretations. (3,8)

As a result intra-operative awakening to monitor spinal cord function, is a very effective means of testing when electrophysiological methods cannot be used or they are not sufficient. (3,4)

Pain, spontaneous ventilation and complications due to prone position are some of the hazards of the wake-up test. (1,6)

Because Fentanyl infusion is continued during the wake-up period we observed no complaint of pain or any reaction due to pain in Propofol-Fentanyl (T.I.V.A.) technique. All patients had sufficient analgesia level. For prophylactic reasons the patients were not permitted to spontaneous ventilation, instead controlled ventilation with positive pressure was continued.

It was observed that the patient had enough sedation during the test and that they only obeyed to the commands, but it's appropriate to complete the test in the shortest period.

It's accepted that, the patients early recovery and that their early neurologic examinations to be performed are the superiority of the method.

Towards the end of the study and as the method was established it's observed that the extension times became shorter, so our mean values are higher than our real values.

A point for attention is that the test was carried as when the operator asked for and there was no preparation for it.

The wake-up test is performed with success and without any complication in all our patients, and twice in some of them.

According to our results, it's concluded that propofol-Fentanyl (T.I.V.A.) Anesthesia providing post-operative early recovery reducing bleeding and providing intra-operative test to be performed in confidence; is a suitable technique which can be recommended for high risk patients which have spinal surgery. It's planned to compare the method with electrophysiological methods in another study.

REFERENCES

- 1 . Bauer R. : Wirbelsäulen Chirurgie aus der Sicht des Chirurgen : Z.A.K. Innsbruck. 1989 Sy 12.1
- 2 . Destribats B., Maurette P., Castagnera L., Esposito J., Macoillard G., Cantin P., Heraut L.A., Propofol versus methohexital dans la chirurgie du canal rachidien ; Ann Fr. Reanim. 6: 301-305 (1987)
- 3 . Kalkman C.J., Van Rheineck Leyssius A.J., Zuurmand W.W.A., Anaesthesia for surgical procedures with spinal cord function monitoring using somato-sensory evoked potentials, Z.A.K. Innsbruck 1989 SY 12.4
- 4 . Koht A., Schutz W., Schmidt G. et al.: Effects of etomidate, midazolam and Thiopental and median nerve somatosensory evoked potentials and the additive effects of fentanyl and (N₂O) nitrous oxide Anaesth. Analg. 67: 435, 1988.
- 5 . Kreienbühl G., Siradovic A., Kontrollierte Hypotension motwending und Womit. Z.A.K. Innsbruck 1989 SY. 12.3
- 6 . Mcistclmann C. Dubousset J., Anaesthesia für skoliospatienten; pathophysiologische Überlegungen Z.A.K. Innsbruck 1989 SY. 12.2
- 7 . Peterson P.O., Drummond J.C., Todd M.M.: Effects of Halothane, enflurane and isoflurane and nitrous oxide on somatosensory evoked potential in man. Anaesthesiology 65 : 35-1986.
- 8 . Wedel D.J. : Monitoring in orthopaedic spine surgery. Z.A.K. Innsbruck 1989 SY. 12.5