ORIGINAL ARTICLE

Impact of Dexmedetomidine on Intraoperative Wake-Up Tests in Patients Undergoing Spinal Surgery

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Purpose: *To evaluate the impact of dexmedetomidine (DEX) on intraoperative wake-up tests.*
Design: *American Society of Anesthesiologists category I or II patients were divided into two groups: a propofol-remifentanil group (group R, n = 20) and a DEX-propofol-remifentanil group (group D, n = 20).*
Methods: *The patients in group D received DEX, whereas the patients in group R received the same volume of saline. The other anesthetic methods and drugs (propofol and remifentanil) were the same in both groups. During the wake-up test, patients were repeatedly asked to move their fingers.*
Findings: *All the wake-up tests were successfully performed. There was no significant difference in the mean wake-up time between the two groups. Eighteen patients exhibited better wake-up quality in group D as did eight patients in group R. The patients in group D had a significantly better overall wake-up quality than those in group R (P <.05).*
Conclusions: *DEX did not affect the wake-up time and increased the wake-up quality.*

Keywords: *anesthetics, general, intravenous, dexmedetomidine, remifentanil, spinal disease.*

SPINAL CORD INJURY is one of the most serious complications in spinal surgeries.[1] To avoid such injuries, somatosensory-evoked potential (SEP) or motor-evoked potential (MEP) are monitored. However, these tests often have low specificity and sensitivity. The intraoperative wake-up test is one of the most direct methods of detecting spinal cord or nerve root injuries early on in spinal surgical procedures.[2] To perform the wake-up test, the depth of anesthesia must be reduced enough for the patient to respond to verbal commands. After the wake-up test, anesthesia is then deepened for completion of the surgery. Propofol and remifentanil are typically used during procedures that require a wake-up test because of their rapid onset and short duration of action. However, because of the short duration, the patients often display signs of pain, such as marked elevations in heart rate (HR) and blood pressure, resulting in a failure of the wake-up test because of severe discomfort. Dexmedetomidine (DEX) is a new highly selective α2-adrenoreceptor agonist that maintains the patient in a lighter state of anesthesia while still attenuating the pain response to the surgical manipulation and endotracheal intubation.[3] Patients often feel pain because of the increase in HR and blood pressure, which can result in involuntary movement that displaces the internal

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Conflict of interest: None to report.

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fixation devices, thus causing a failure of the wake-up test.[4,5] With DEX, the patient can be awakened without any adverse reactions to the endotracheal tube.[6,7] In the present study, we aimed to investigate the feasibility of its use for the intraoperative wake-up test and to provide a reference for its clinical use.

Materials and Methods

General Information

This study was approved by the Ethics Committee of Yantaishan Hospital, and written informed consent was obtained from the patients and their families. A total of 40 patients scheduled for posterior thoracolumbar surgery under general anesthesia were included in this study. The patients were aged 18 to 60 years, American Society of Anesthesiologists I to II, and were selected without restrictions on gender. Preoperative nerve conduction tests revealed no damage in the upper and lower limb pathways, no symptoms of intracranial hypertension, and demonstrated normal hearing and muscle strength in all subjects (muscle strength III to V according to canonical scales). Patients with neural disorders (eg, brain infarction, Parkinson disease, cerebral hemorrhage, depression) myasthenia gravis, or high cervical-level paraplegia (lower limb muscle strength 0 to I) were excluded.

Anesthetic Methods

The patients were randomly divided into two equal groups based on a random number table, group R and group D. Phenobarbital (0.1 g) and atropine (0.5 mg) were intramuscularly injected 30 minutes before the patients entered the operating room. After entering the operating room, the patients' electrocardiogram, peripheral capillary oxygen saturation, partial pressure of carbon dioxide, and bispectral index were monitored. An arterial line was placed to measure the invasive arterial blood pressure. Intravenous (IV) infusion of a crystalloid solution was used throughout the surgical procedure to deliver the IV anesthetics. The same anesthetic induction regimen was used for both groups: midazolam 2 to 3 mg, propofol (state usual dose), and remifentanil 1.5 to 2.0 mcg/kg, followed by cisatracurium 0.15 to 0.2 mg/kg for muscle relaxation. Once paralysis was achieved, a 7-mm oral endotracheal tube was placed using direct laryngoscopy visualization. Mechanical ventilation was performed throughout the induction and surgical phases, using tidal volumes of 7 to 8 mL/kg, respiratory rates of 12 to 14/minute, and 100% oxygen with a flow rate of 1 L/minute. Ventilation was accomplished using an inspiration to expiration ratio of 1:1, aiming for an end-tidal carbon dioxide reading of 35 to 45 mm Hg (1 mm Hg = 0.133 kPa).

The maintenance of anesthesia in group D was accomplished by IV administration of a DEX 0.5 mcg/kg bolus, followed by a continuous infusion of 0.2 mcg/kg/hour until the end of the surgery (type TCI to III, Beijing Slgo Medical Technology Co., Ltd., Beijing, China). During the surgery, the dosages of propofol (150 mcg/kg/minute) and remifentanil (batch no: 100402, Yichang Humanwell Pharmaceutical Co., Ltd., Hubei, China) were adjusted to maintain the bispectral index value within 45 to 55. No muscle relaxant was administered before the wake-up test. In group R, the anesthesia was maintained with a propofol and remifentanil infusion only. If the patient showed poor wake-up quality, the wake-up test was terminated immediately, and the SEPs and MEPs were monitored by an Endeavor CR neurophysiological monitor (Natus Medical Incorporated, Pleasanton, CA) to evaluate the spinal function.

Wake-Up Methods

For the patients in group D, propofol and remifentanil were discontinued immediately before initiating the wake-up test, but DEX was continuously infused throughout the test. For the patients in group R, propofol was discontinued immediately before the beginning of the wake-up test, and the dosage of remifentanil was adjusted to 0.05 mcg·(kg/minute). The same indicators were observed in both groups. The wake-up quality was classified as follows: *good*: the patients awakened rapidly and purposefully moved their hands and feet according to the given instructions; *acceptable*: the patients could move their hands and feet according to the instructions but exhibited involuntary activity of the limbs that did not endanger the internal fixation devices; and *poor*: the patients awakened suddenly, exhibited vigorous involuntary movement of the limbs, and needed to be restrained to avoid the displacement of the internal fixation devices. The wake-up