

## WAKE-UP TEST DURING SCOLIOSIS REPAIR SURGERY UNDER DEXMEDETOMIDINE AND FENTANYL BALANCED ANAESTHESIA

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### ABSTRACT

Damage to spinal cord and subsequent neurological deficit is a recognised complication of scoliosis repair surgery.<sup>[1]</sup> Wake up test is simple, safe and reliable method of recognition of such complication. Dexmedetomidine and propofol infusion were main anesthetic for a 12 year old girl, who underwent scoliosis repair surgery with intra operative wake-up test, hemodynamic stability. To achieve maintainance of anesthesia, dexmedetomidine and propofol were administered. The dexmedetomidine dose ranged from 0.9 to 1.2  $\mu\text{g}/\text{kg}$  (microgram per kilogram) per hour throughout case and propofol dose ranged from 0.1 to 0.15  $\text{mg}/\text{kg}$  (milligram per kilogram) per hour. The analgesic property of dexmedetomidine was complimented by the continuous fentanyl infusion at 1 to 2  $\mu\text{g}/\text{kg}$  per hour. This anesthetic regimen, as well as 60% nitrous oxide and 40% oxygen, produced satisfactory conditions for intra operative hemodynamic stability and wake-up test.

**KEYWORDS:** Dexmedetomidine, Propofol, Fentanyl, Scoliosis Repair Surgery, Wake up Test

### INTRODUCTION

Kyphoscoliosis is a spinal deformity often requiring surgical correction. A major complication of this corrective surgery is spinal cord trauma leading to paraplegia. In this regard, intra operative neurological monitoring is performed to rule out spinal cord injury in the form of wake up test, SSEP (somatosensory evoked potential) or MEP (motor evoked potential).<sup>[2,3]</sup>

In our case report we gave total intravenous anesthesia with a new promising drug, dexmedetomidine along with propofol and fentanyl to induce sedation, analgesia, ventilatory stability during wake up test.

### Case History

A 12 year old girl, weighing 35 kg, physical status ASA I (American society of anesthesiologist) posted for posterior thoraco lumbar fusion for kyphoscoliosis of thoracolumbar spine (figure 1). Her medical history showed kyphoscoliotic deformity of thoracic and lumbar vertebra at D2-L1 levels since birth. During preoperative visit patient was explained about the wake up test. Preoperative laboratory investigations were normal. 2D echo, pulmonary function tests, arterial blood gases were normal. On Chest X ray and MRI spine, severe scoliotic deformity at thoracic level with concavity towards left was seen. Cobb's angle was  $55^{\circ}$  (figure 2).<sup>[4]</sup> Focal syringomyelia at C4-C5 level with low lying tonsil s/o cerebellar chari -I malformation. Neurosurgeons advised no active management for the focal syringomyelia. High risk consent, post operative ventilatory consent, paraplegia consent were taken in view of major surgery on spine. Preoperatively two 18G intracath secured in both upper limb, one ringer lactate started, monitors electrocardiogram, blood pressure, pulse oxymeter attached. We again explained about the wake up test before pre medication. Pre medication with

inj.(injection) glycopyrrolate 0.15mg intramuscularly, inj. ondansetron 2.8 mg i.v (intra venous), inj. hydrocortisone 70 mg and inj. dexamethasone 0.7 mg i.v. given. Sedation with inj. midazolam 1 mg and analgesia by inj. fentanyl 60 µg i.v. given. Induction with inj. propofol 100 mg i.v. and inj. succinylcholine 70 mg i.v. was given. Bag and mask ventilation for 1 min, laryngoscopy was accomplished and patient was intubated with 6.5 number cuffed armoured portex tube. Correct placement of endotracheal tube was verified with positive end tidal carbon dioxide and bilateral equal breath sounds. A 14G nasogastric tube placed, throat packing done and soft bite block placed. Arterial cannulation was done in left radial artery and central venous cannulation done under all aseptic precautions in right internal jugular vein. After prone position on operation table, i.v. lines attached, monitors attached, vitals monitored, bilateral air entry confirmed. Maintenance on oxygen and nitrous oxide mixture (40:60) and infusion of inj. propofol 100 µg/kg/hour, inj. dexmedetomidine 1 µg/kg/hour, inj. fentanyl 1 µg/kg/hour started and intermittent vecuronium top up at regular intervals of thirty minutes. Intermittent positive pressure ventilation was given with bair circuit. Procedure involved 17 pedicular screws with rods to correct the deformity. Thirty minutes before wake-up test, inj. fentanyl stopped. Inj. diclofenac 50mg given intramuscularly. Inj. dexmedetomidine and propofol stopped 15 minutes prior to test. After 10 to 15 minutes, patient awakened, she moved her hands, clenched her fist and moved her feet up and down on commands i.e. Ramsay sedation scale - 3. Following successful completion of wake-up test, inj. propofol 40 mg i.v. bolus, inj. midaz 1 mg i.v. bolus given. Infusion of inj. dexmedetomidine 1 µg/kg/hour, inj. propofol 100 µg/kg/hour and inj. Fentanyl 1 µg/kg/hour restarted. Total surgical time was approximately 6 hours with estimated blood loss 1,000 ml. Patient received 500 ml hexastarch; 2,000 ml ringer lactate; 500 ml dextrose saline; 3 unit packed cell volume of blood. Urine output was 2,000 ml. Intra operative 2 times arterial blood gases were sent, correction of acidosis was given. After completion of surgery and dressing, supine position was given. Inj. fentanyl and inj. propofol infusion stopped inj. dexmedetomidine at 1 µg/kg/hour continued. In view of major surgery and moderate blood loss, patient was shifted to intensive care for overnight ventilation. In intensive care unit, inj. dexmedetomidine 0.5 µg/kg/hour was continued. Patient was extubated on next morning after she was fully awake and obeying verbal commands, moving hands and legs. Post extubation, visual analogue score was "0" with no recall of intra operative events.

## DISCUSSIONS

The incidence of neurologic deficits associated with scoliosis repair surgery is 0.3% to 1.89% , increasing to 4% when spinal fusion combined with segmental fixation.<sup>5,6</sup> Electro physiologic monitoring of the sensory mediated tracts in the spinal cord has been available since the 1970's, but the only way to monitor motor function was the wake-up test.<sup>[7]</sup>

The intraoperative wake-up test was first introduced by stagnara and vauzelle in 1973 to assess motor function.<sup>[8]</sup> To this day, the wake-up test remains gold standard for assessment of motor function after application of corrective forces to a rigid spinal canal.<sup>[9]</sup> However, neurologic injury can occur any time intra operatively from surgical maneuvers, instrumentation, vascular injury or ischemia secondary to hypo perfusion to spinal cord which remains undetected until wake-up test performed. Risks associated with the intra operative wake-up test include damage to the spinal cord, dislodgement of instrumentation, accidental extubation, hypoxia, venous air embolism as a result of deep inspiratory efforts.<sup>[10]</sup>

Intravenous anesthetic agents produce effects by altering neuronal excitability through changes in synaptic and axonal functional activities.<sup>[11]</sup> Propofol acts by enhancing inhibitory effects of  $\gamma$ -amino butyric acid (GABA), which increases chloride conduction, hyperpolarises the membrane and produces synaptic inhibition. Propofol has very rapid

metabolism that allows for rapid adjustment of both anaesthetic depth and effects on wake-up test.<sup>[12]</sup> Dexmedetomidine is a relatively selective  $\alpha_2$  adrenoreceptor agonist 8 times more selective than clonidine.<sup>[13]</sup> The receptors modulate norepinephrine release through a negative feedback. There are 3  $\alpha_2$  adrenergic subtype receptors:  $\alpha_{2a}$ ,  $\alpha_{2b}$ ,  $\alpha_{2c}$ .  $\alpha_{2a}$  stimulation responsible for sedation, analgesia, and sympatholysis, where as  $\alpha_{2c}$  subtype responsible for anxiolysis and contributes to spinal anti nociception.<sup>[14]</sup> Stimulation of  $\alpha_{2b}$  subtype causes vasoconstriction and responsible for transient hypertension.<sup>[15]</sup> A meta analysis performed by Kida et al<sup>[16]</sup> concluded that intra operative administration of Dexmedetomidine improved post operative pain status after major and minor surgeries. In this case, Dexmedetomidine infused at 1  $\mu\text{g}/\text{kg}/\text{hour}$  concomitantly with propofol 0.1 to 0.15  $\text{mg}/\text{kg}/\text{hour}$  allowed successful intra operative wake-up test. Analgesic properties of dexmedetomidine were complimented by continuous infusion of fentanyl.

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