Anaesthesia for spinal surgery in adults

Editor—I read with interest the comprehensive review by Raw and colleagues on anaesthesia for spinal surgery. Unfortunately, it contains a number of inaccuracies.

The assertion that ‘left untreated, idiopathic scoliosis rapidly progresses and is often fatal by the fourth or fifth decade of life, as a result of pulmonary hypertension, right ventricular failure, or respiratory failure’, is incorrect. The reference for this statement actually concludes that the mortality (for untreated scoliosis) was significantly increased only in infantile and juvenile scoliosis but not in adolescent scoliosis. Moreover, later long-term studies of untreated adolescent idiopathic scoliosis have confirmed the essentially benign physiological nature of this disease, unless the projected curve is a thoracic apical curve of >100°. Studies suggesting otherwise have included spinal deformities other than adolescent idiopathic scoliosis. This is not to say that the surgery should not be done in adolescent idiopathic scoliosis or to trivialize the deformity, but to emphasize that it is essentially cosmetic surgery.

The discussion of spinal cord monitoring techniques is also misleading. False negative tests with somatosensory evoked potential (SSEP) monitoring may be rare but they are devastating. Continued reports of false negative tests led Winter in his review (1997) to state ‘SSEP monitoring alone does not appear adequate in view of the large number of false negatives that have been obtained, the best available motor monitor is the wake up test but hopefully a good electronic monitor will become generally available.’ SSEP monitoring may be ‘currently the mainstay of spinal cord monitoring techniques’, but it is not the accepted standard of care and needs to be replaced by or combined with a monitor of motor pathways.

The false negative tests using motor evoked potentials (MEPs) alluded to is also misleading. The report quoted to substantiate this used neurogenic MEPs. Neurogenic MEPs may not be true MEPs but may in part be obtained from sensory pathways and subject to the same false negative problems as SSEPs. False negatives have not been reported with transcranial MEPs where the myogenic responses are recorded. The reference to MEPs being less reliable in patients with pre-existing neurological deficit refers to a series where magnetic stimulation was used to generate the evoked response, a technique now rarely used intraoperatively.

Monitoring of MEPs where myogenic responses are recorded does require a specialized anaesthetic technique. We use high dose remifentanil with sub-MAC sevoflurane and no or minimal neuromuscular blocking agents and have obtained reliable recordings in >300 patients including all but two patients (one paraplegic, one with spinal muscular atrophy) with pre-existing neurological disease. (Dr Jim Lagopoulos PhD, neurophysiologist CHW, personal communication.) Others have had similar results using remifentanil and low dose propofol. Using this anaesthetic technique and close cooperation between anaesthetist, surgeon and neurophysiologist, there are very few technical difficulties.

The problem with ‘complementary SSEP and MEP monitoring’ is that this requires epidural lead placement, as it is not possible to measure simultaneously cortical SSEPs and stimulate transcranially for MEP monitoring. Epidural electrodes create their own difficulties. They reduce the epidural space, and clutter the surgical field. Placement involves extending the surgical field above and below the intended surgical sites. Accidental dislodge ment results in loss of presurgical baseline. Moreover, epidural recordings are less sensitive to the effects of ischaemia and change later than myogenic recordings. The gain from this combined monitoring would appear to be theoretical and has not been demonstrated clinically.

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Editor—we read with interest the review by Raw and colleagues on anaesthesia for spinal surgery. We were disappointed that while stating that the ‘potential for difficulty in airway management must always be considered’, no mention was made of possible postoperative airway complications. The need for postoperative artificial ventilation is discussed, but specific airway problems are not mentioned. Although rare, we think that they are important. We would like to describe two patients who underwent posterior cervical spine surgery and suffered from postoperative airway complications of sufficient severity to delay extubation and require admission to the ICU. A search of the literature revealed that although such airway complications have been reported in orthopaedic and spinal journals, we could find no similar reports in anaesthesia journals.

The first case was a 62-yr-old woman who underwent a posterior cervicothoracic fusion at C5–7 and T1–2 for metastatic disease in the body of T2. The second patient was a 40-yr-old man who had a posterior cervical decompression at T2–3, and posterior stabilization at C5–T5, for a T2 lesion with destruction and cord compression.

Both patients were easy to intubate. They were placed in the prone position with head up tilt and the neck in the neutral position. Surgery lasted 6 h for patient 1, with an estimated blood loss of 5500 ml (122 ml kg−1). The patient was given 9500 ml of crystalloid, 1000 ml of colloid, 7 units of blood, and 1000 ml of fresh frozen plasma. Surgery in the second patient lasted 6.5 h with an estimated blood loss of 2500 ml (29.5 ml kg−1); 8500 ml of crystalloid, 1000 ml of colloid, and 2 units of blood were transfused. In both cases, transfusions of blood and fluid were guided by monitoring haemoglobin and haematocrit values on arterial blood gas samples and by measuring the urine output.

At the end of surgery, there was marked facial and oropharyngeal oedema in both patients, with deterioration in the laryngoscopic view from grades 1 and 2, respectively, to grade 3. It was therefore decided to electively ventilate these patients in the ICU until the oedema had subsided sufficiently to allow safe extubation.

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In both patients, the oropharyngeal oedema was worse the following day, when the view at laryngoscopy had deteriorated to grade 4. The first patient required a percutaneous tracheostomy in order to facilitate weaning from the ventilator. She was eventually decannulated on day 14 and was discharged home on day 20. The second patient was successfully extubated on the second postoperative day and was subsequently discharged from hospital a few days later.

We have identified a number of risk factors for postoperative airway complications after posterior spinal surgery—an operative time >5 h, exposing more than three vertebral bodies, the prone position, large blood loss, and transfusion of large volumes of fluid. At the conclusion of surgery, before extubation, it is wise to perform a thorough airway assessment, in order to avoid a ‘can’t intubate, can’t ventilate’ situation. This can be done by direct laryngoscopy, fiberoptic evaluation, and by performing a ‘cuff test’. Even after the patient has been successfully extubated, he or she may still be at risk, as airway oedema may develop several hours later. It would therefore be wise to care for such patients who have had very major surgery in a high dependency area postoperatively.

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Editor—We found the review by Raw and colleagues interesting; however, we have a couple of points we would like to raise. The authors discuss the use of induced hypotension intraoperatively. While this may be appropriate for patients undergoing scoliosis surgery, it is not appropriate for those who have disordered autoregulation of spinal cord blood flow, as may occur in patients with trauma. In these patients, hypotension may result in decreased spinal cord blood flow resulting in ischaemia of the spinal cord, making neurological deterioration more likely. As it is impossible to identify those patients with disordered autoregulation preoperatively, blood pressure should be maintained at or near preoperative values in all patients where this may have occurred.

Second, we would agree with the authors that awake fiberoptic intubation will be required in patients wearing stabilization devices or where other difficulty is anticipated. The article mentions the intubating LMA as a useful alternative, but makes no mention of the Bullard laryngoscope which has been shown to be an excellent aid to intubation in patients with difficult airways. It has been shown to cause less movement of the cervical-spine than conventional laryngoscopes.

In addition, although the article covered anaesthesia and monitoring for scoliosis surgery very well, little was mentioned about patients presenting for spinal surgery with degenerative diseases. This group presents particular problems for the anaesthetist, especially those with rheumatoid arthritis.

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Editor—We thank Dr Gibson for his interest in our review article. He is correct to point out that there are subdivisions of idiopathic scoliosis based upon the age of onset, and that scoliosis with an onset in adolescence runs a more benign pathological natural history than those with an earlier onset. The reference he cites for this was published after our review had been submitted for publication. However, Dr Gibson’s assertion that correction of adolescent idiopathic scoliosis is ‘cosmetic surgery’ does not fully convey the importance of surgery for this condition. Other studies have shown adolescent idiopathic scoliosis to be associated with a restriction of daily activities, and surgery for adolescent scoliosis improves functional outcome scores, level of activity, and self-image scores, outcomes for which patients are willing to undertake considerable risks of morbidity and mortality.

We agree that SSEP monitoring is not ideal, and we believe we made the point clear in our article that false negative tests do occur and that these may result in paraplegia; a catastrophic outcome for the patient. The question of whether SSEP monitoring is currently the mainstay of monitoring or the ‘accepted standard of care’ is one of semantics. In the UK and USA at least, SSEP monitoring is the most common method of spinal cord monitoring.

Dr Gibson rightly points out that to date no false negative results have been reported using trancranial MEP monitoring. However, technical difficulties have been reported in recording transcranial MEPs by electrical means, in one series in 16 of 126 patients, even using multiple-pulse stimulation. Combined monitoring of sensory and motor pathways has a number of potential advantages over single modality methods, including the ability to monitor patients in whom evoked potentials of one or other modality cannot be recorded, and increased accuracy of a system to detect spinal cord damage from two independent monitoring methods so reducing false negative results. Although we have no experience of combined cortical MEP and SSEP monitoring, we would refer Dr Gibson to publications from groups that have. Although Dr Gibson reports successful MEP recording in 300 of his patients, it is unclear how many of those patients had pre-existing neurological deficits.

Drs Lum Hee and Vadodaria make an important point that procedures involving multilevel cervical spine surgery, in the prone position, particularly for malignant disease and with considerable blood loss, carry a risk of postoperative airway obstruction. For procedures involving multiple cervical-spine levels, we do not commonly encounter such large blood losses, but when we do, we usually provide for a short period of artificial ventilation in our postoperative critical care unit, to allow for correction of hypothermia, fluid shifts, and other complications of prolonged surgery with large blood losses.

With regard to the letter by Drs Goutcher and Jackson, we make the point in our article that induced hypotension may be used to reduce blood loss during major spinal surgery, and we agree that for certain patients, such as those who have sustained trauma, in whom autoregulation of blood flow to the spinal cord may be impaired, induced hypotension is not appropriate. However, there are many other relative contraindications to induced hypotension, and it is a technique which always carries an element of risk. The risk must always be carefully considered against possible advantages for each individual patient.

Our airway algorithm was intended to highlight important decisions to be made which determine the management of the airway for spinal surgery, such as whether direct laryngoscopy, by whatever means, is expected to be difficult. We did not consider it appropriate to make a comprehensive list of every piece of equipment which may be useful. Anaesthetists experienced in difficult airway management will have particular preferences for certain items of equipment, of which the Bullard laryngoscope is one. We would have liked to have covered some issues in greater depth in the article, but could not be so comprehensive. Similarly, we would refer the interested reader to reviews written exclusively about the implications for anaesthesia of rheumatoid arthritis, as we could not hope to cover this topic in such depth.

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