

ANESTHESIOLOGY

■ Modeling the Transition between Consciousness and Unconsciousness. Schneider *et al.* (page 934)

In this issue, Schneider *et al.* describe construction of a model derived from electroencephalogram and auditory evoked potentials recorded from induction to emergence to general anesthesia in 40 adult patients scheduled for elective surgery. None of the patients received premedication. During remifentanyl infusion, consciousness was assessed by response to verbal commands given every 30 s. Patients were randomized to receive either sevoflurane or propofol until loss of consciousness. After intubation, anesthesia was withdrawn until patients returned to consciousness (as evidenced by again following verbal commands). The anesthetic was started again until loss of consciousness, and surgeries proceeded.

Blood pressure, heart rate, oxygen saturation, inspiratory oxygen concentration, end-tidal carbon dioxide concentration, sevoflurane concentration, and respiratory parameters were obtained throughout the study period. Electroencephalograms and auditory evoked potentials were recorded using a specially designed amplifier. The research team selected data from immediately before and after transitions to consciousness and unconsciousness. Using logistic regression, the authors identified possible models for predicting loss and regaining of consciousness. The best combination model had a prediction probability of 0.89, sensitivity of 72.2%, and a specificity of 85.3%, and contained 15 parameters calculated from the auditory evoked potential and four parameters calculated from the electroencephalogram. The best minimal model, with a prediction probability of 0.87, contained two auditory evoked potential and two electroencephalogram parameters. Although the parameters used by the investigators have not been tested for their ability to monitor the complete range of anesthesia, the authors believe their models can be used to differentiate between consciousness and unconsciousness. The minimal model, for instance, has a higher prediction probability than bispectral index for the separation between consciousness and unconsciousness.

■ When Can Patients Safely Return to Driving after Ambulatory Surgery? Chung *et al.* (page 951)

In a prospective and comparative but nonrandomized study, Chung *et al.* compared the driving simulation

performance of surgical and nonsurgical patients. After recruiting 20 patients scheduled for left knee arthroscopic surgery, the research team measured their driving simulation performance and electroencephalographic parameters of sleepiness and performed subjective assessments of sleepiness, fatigue, alertness and pain 2 h before surgery and 24 h postoperatively. The same measurements were conducted in a matched control group of 20 healthy volunteers.

Driving skills were measured using a simulator consisting of a personal computer, 15-in monitor, and peripheral steering wheel, accelerator, and brake accessories. The driving scenario simulated monotonous highway driving meant to induce or exacerbate soporific conditions. On the day of surgery, patients received a 10-min driving simulator practice session. They then used the simulator for 30 min, following instructions to "stay in the right lane to avoid passing cars in the left lane." The program sampled several performance variables, including reaction time, mean velocity, and mean variability of road position, 10 times per second. Study authors administered various sleepiness and alert scales to participants prior to and 2 h after surgery. Participants returned to the sleep research laboratory 24 h after their surgical procedures, where driving simulation performance, alertness, and pain were again evaluated.

Results showed that patients had attention lapses, lower alertness, and poor lane accuracy 2 h before their surgeries, and that their sleepiness and driving performance were at their worst 2 h after surgery. Subjective levels of sleepiness, fatigue, and alertness, as well as driving performance, returned to normal levels by 24 h. Returning to driving 24 h after general anesthesia may be safe, although further studies addressing judgment and risk-taking behavior in the postoperative period would shed more light on this issue. And, based on measurements 2 h before surgery, it may be advisable for patients not to drive to the hospital preoperatively.

■ Defining the Anatomy of the Deep Cervical Fascia. Nash *et al.* (page 962)

To understand the underlying mechanism of regional anesthetic block of the cervical plexus requires more extensive knowledge of deep cervical fascia configuration. Accordingly, Nash *et al.* examined 10 adult human cadavers using a combination of dissection, E12 sheet plastination, and confocal microscopy to establish or negate the existence of the investing layer of the deep

cervical fascia. Cervical specimens from seven of the cadavers were processed as sets of epoxy resin slices laminated between two 50- μ m-thick plastic sheets (E12 plastination technique). The translucent plastinations were examined using a stereoscopic dissecting microscope. Gross anatomical dissections were performed on the remaining three cadavers in a layer-by-layer dissection, with special attention given to fascia-like structures in the anterior cervical region and around the sternocleidomastoid fascia.

Contrary to previous general belief, results from this study show that the investing cervical fascia does not exist. The use of confocal microscopy revealed that the connective tissue sheet underneath platysma was not a continuous single structure. In the upper cervical region, the fascia of strap muscles in the middle and the fasciae of the submandibular glands on both sides formed a dumbbell-like fascia sheet which had free lateral margins but did not continue with the sternocleidomastoid fascia. In the lower cervical region, no single connective tissue sheet extended directly between the sternocleidomastoid muscles. The authors believe that their study will aid anesthesiologists in placing cervical plexus blocks, noting that anesthetic delivered within the impenetrable connective tissue sheet may only affect branches of the cervical plexus that closely run on the muscle's surface. It is still unclear whether superficial cervical plexus block can affect the roots of the plexus covered by the prevertebral fascia.

■ Comparison of Traditional Epidural and Combined Spinal-Epidural Techniques in Labor Patients. Thomas *et al.* (page 1046)

Thomas *et al.* recruited 251 healthy laboring parturients for their study to compare catheter function when

using combined spinal-epidural technique without subarachnoid drug administration or traditional epidural technique. Study participants were randomized to either the DP group (combined spinal-epidural technique with 27-gauge Whitacre needle dural puncture without subarachnoid drug administration) or NoDP (traditional epidural technique).

Patient controlled epidural analgesia was initiated with bupivacaine and fentanyl, with top-up doses of bupivacaine in 5-ml increments administered when needed. There were 107 patients in the DP group and 123 patients in the NoDP group who completed the study. Overall, the combined incidence of vaginal delivery for both groups was 88%. The epidural catheter manipulation rate was 37% for patients in the DP group and 25% in the NoDP group, and this was not statistically significant. A subgroup of 18 patients did not have cerebrospinal fluid return with the attempted dural puncture during the combined spinal-epidural technique. The study authors surmise that their study might have shown higher manipulation rates due to an institution-specific low threshold of replacing catheters with less than optimal analgesia. The higher incidence of patients with no cerebral spinal fluid return might have been due to use of a smaller gauge needle, techniques being performed by residents, or lack of attempts to manipulate needles when fluid did not return—that is, acceptance of loss of resistance as confirmation of the epidural space. The combined spinal-epidural technique did not improve the function of epidural catheters or the quality of labor analgesia when compared to traditional epidural technique.

Gretchen Henkel