a light surgical plane of anaesthesia has been reached" shows a poor grasp of their pharmacology. Muscle relaxants do not wait 120 sec before working. There is a gradual onset of muscle relaxation which reaches its maximum at around 120 sec for vecuronium. To give an awake infant this muscle relaxant and expect him to breathe sufficiently to deepen anaesthesia prior to intubation is unrealistic.

We routinely induce anaesthesia with an inhalational agent, such as halothane in 50% O_2/N_2O and know that it takes several minutes to achieve surgical anaesthesia.

We would expect inhalational induction to be impossible with the infant partially paralysed as he would not be able to breathe enough to inhale the anaesthetic.

So we can assume that the infants are being paralysed and intubated whilst awake. We would consider this ethically unacceptable as alternative methods of inducing and maintaining anaesthesia safely are available.

U. Hodges BScHons MBBS FCAnaes
E. Sumner MA BM BCh FFARCS
Anaesthetic Department
Great Ormond Street Hospital
Great Ormond Street
London WC1N 3JH
England.

REFERENCE

1 *Warner LO, Martino JD, Davidson PJ, Beach, TP.* Negative pressure pulmonary oedema: a potential hazard of muscle relaxants in awake infants. Can J. Anaesth 1990, 37: 580–3.

REPLY

Thank you for the opportunity to respond to the letter by Drs. Hodges and Sumner, which is, we hope, an isolated case of misinterpretation of the modified inhalational induction technique utilized in our case report on negative pressure oedema referred to above.

It was not our intent to recommend *the sequence of administering non-depolarizing muscle relaxants to awake infants, but merely to point out a potential serious problem (note to word "hazard" in the title) associated with it. Our discussion recounted most induction techniques in common use and stated that "an inhalational technique with gradually increasing concentrations of gaseous agents is preferred at our institution." The administration of non-depolarizing muscle relaxants at the* beginning *of an inhalational induction rather than* after *anaesthesia has been partially or totally induced is simply one variation, the object being to "facilitate control of the airway and ventilation during the early stages of induction" by allowing the insertion of an oral airway earlier than could otherwise be accomplished. At this time, gentle assistance of respiration can either be assumed or continued, and respiration controlled as paralysis sets in. (Obviously, a partially paralyzed infant will need assistance in breathing!) When a light surgical plane of anaesthesia has been reached, intubating conditions should be favourable. If the technique is properly executed, the infants are not "being paralysed and intubated whilst awake." In our two cases, problems arose because of lack of recognition and correction of airway obstruction. As the different onset times of diaphragmatic paralysis and paralysis of muscles protecting the upper airway were not well-described we did not anticipate an airway problem developing within seconds after the administration of a non-depolarizing relaxant.*

Actually, the above-described technique is seldom used at our institution, since most infants either do not present with an intravenous line in place, or are at risk for gastric aspiration, and thus are not candidates for this approach. As physicians in a teaching hospital, we feel an obligation to expose trainees to a variety of induction techniques.

It is unfortunate that our London colleagues chose to criticize an induction technique that they did not fully comprehend, while ignoring the broader educational aspects of the discussion.

Louise O. Warner MD
Department of Anesthesiology
Children's Hospital
700 Children's Drive
Columbus OH 43205

TURP syndrome

To the Editor:

I was pleased to read the excellent review article on TUR syndrome by Dr. Jensen in the Journal (Can J Anaesth 1991: 38: 90–7).

I would like to know if Dr. Jensen encountered any patients exhibiting aberrant symptoms during TUR. Over the past six years I have seen six patients who had TURP under tetracaine spinal with small doses of diazepam for sedation. Twenty minutes after start of resection the patients complained of "burning in the ears" (two also complained of burning on the face). They had no other complaints. I discussed this with the surgeon and he said that he had heard similar complaints which went on to a full blown TUR syndrome.

Blood samples were drawn and analyzed in two of the patients and were found to have serum sodium concentration of 120 $mM \cdot L^{-1}$. All the patients were treated with 20 mg of jurosemide. There were no further complications.

Chidambaram Ananthanarayan MD FRCPC
University of Toronto
Department of Anaesthesia
Mount Sinai Hospital

REPLY

I wish to thank Dr. Ananthanarayan for introducing the topic of aberrant symptoms during transurethral resection

of the prostate (TURP) in which he referred to "burning in the ears" and "burning on the face" during TURP.

I have not encountered any patients with these symptoms; however, similar symptoms have been reported in conjunction with the TURP syndrome. "A tight feeling in the throat",[1] "numbness and tingling of the arms",[2,3] "numbness of the mouth",[4] "paraesthesias of jaws and shoulders",[4] and "facial warmth"[5] have been reported. The acute alterations in electrolyte concentrations that occur with intravascular absorption of irrigating fluid will influence chemical and electrical gradients across cell membranes, leading to changes in behaviour of excitable tissue.[6] Paraesthesias are not common with hyponatraemia alone, but the earliest symptoms of hypocalcaemia are frequently sensory.[6] Tingling and burning are felt in the extremities and about the lips and tongue.[6] Spasm of the laryngeal muscles frequently accompanies hypocalcaemia[6] and could explain the feelings of throat tightness. A decrease in serum calcium concentration has been noted in association with hyponatraemia during TURP.[7] I have not found a report in which the patient had paraesthesias in whom the ionized calcium concentration was measured and determined to be decreased. One patient complained of "numb arms" and was found to have a 45% decrease in serum albumen;[2] likely the ionized calcium concentration was decreased concurrently.

When glycine was infused into normal volunteers, nausea, vomiting, headache and fever were reported, but not paraesthesias.[8] The differential diagnosis of these aberrant symptoms should include the auditory and ocular symptoms associated with spinal anaesthesia, and the skin changes associated with allergy.

My conclusion is that the acute electrolyte concentration changes of the TURP syndrome may lead to aberrant symptoms.

Valerie Jensen MD
Department of Anasthesia
University of Alberta

REFERENCES

1 *Hurlburt BJ, Wingard DW.* Water intoxication after fifteen minutes of transurethral resection of the prostate. Anesthesiology 1979; 50: 355–6.
2 *Hahn RG.* Dilution of blood proteins due to irrigant absorption in transurethral protstatic resection. Scand J Urol Nephrol 1989; 23: 97–102.
3 *Ovassapian A, Joshi CW, Brunner EA.* Visual disturbances: an unusual symptom of transurethral prostatic resection reaction. Anesthesiology 1982; 57: 332–4.
4 *Kay MC, Kay J, Begun F, Yeung JE.* Vision loss following transurethral resection of the prostate. J Clin Neuro Ophthalmol 1985; 5: 273–6.
5 *Russell D.* Painless loss of vision after transurethral resection of the prostate. Anaesthesia 1990; 45: 218–21.
6 *Epsten FH.* Signs and symptoms of electrolyte disorders. *In*: Maxwell MH, Kleeman CR (Eds.). Clinical disorders of fluid and electrolyte metabolism. New York: McGraw-Hill Book Company, 1979: 499–530.
7 *Malone PR, Davies JH, Standfield NJ, Bush RA, Gosling JV, Shearer RJ.* Metabolic consequences of forced diuresis following prostatectomy. Br J Urol 1986; 58: 406–11.
8 *Doolan PD, Harper HA, Hutchin ME, Alpen EL.* The renal tubular response to amino acid leading. J Clin Invest 1956; 35: 888–96.

Paediatric epidural catheter connector problems

To the Editor:

Until recently the Alberta Children's Hospital, Department of Anaesthesia Pain Service, had been plagued with many unnecessary troubleshooting calls. Leaking or blocked epidural catheters at the level of the infusion connector were often the problems requiring attention. The "Snap Connector" and "Tuohy Borst Adaptor" styles of connectors supplied by the catheter manufacturer (Preferred Medical Products) were found to be prone to leakage or to occlusion by crimping the catheter when tightened. The probability of finding the happy medium between leakage and occlusion has been frustratingly low.

We have found that carefully threading the end of the epidural catheter onto the needle of an appropriately sized "butterfly" style winged infusion set has all but eliminated any connector-related problems. A 27-gauge and a 25-gauge butterfly needle are used successfully with a 24-gauge and a 20-gauge catheter respectively. Replacing the protective needle cover sheath from the butterfly set over the catheter-needle connection (threading the catheter through the sheath and then onto the needle, Figure) protects the catheter from shearing by the needle if lateral tension occurs at the connection. The relatively flat configuration of the winged infusion set allows it to be secured nicely with a clear occlusive dressing to the patient.

We have had good success with this technique and would invite comments for improvement of this or on any other successful technique.

D. R. McIntyre RRT
B. Kuwahara MD FRCPC

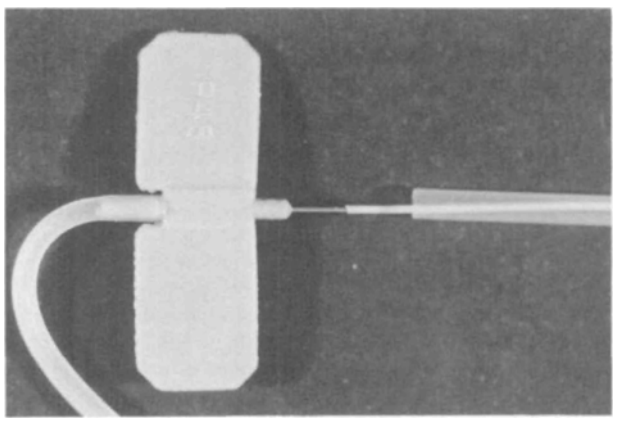

FIGURE Butterfly needle, 27 gauge, inserted into 24-gauge catheter. Needle cover slides up to protect the catheter from shearing.