every injection of a large dose of sufentanil, it was considered inappropriate to proceed with the large-dose protocol. Therefore, these animals received a total of only two to four injections of intrathecal sufentanil. Thus, neurotoxicity clearly was not related to the frequency of drug administration.

We would like to emphasize that opioid neurotoxicity also may be route-dependent. Our study has shown that drugs that are harmless in the epidural space may be neurotoxic when administered intrathecally by accident or by design. Several case reports of accidental administration of a variety of solutions in the epidural space resulting in only minor or transient symptoms demonstrate the remarkable efficacy of the dura as a barrier to the deleterious effects of drugs.[3,4] Thus, the lack of neurotoxicity in patients receiving very large doses of epidural sufentanil for cancer pain is not strictly relevant.

It should be noted that in one 80-yr-old healthy patient scheduled for cystoscopy, intrathecal sufentanil caused severe respiratory depression and cardiac arrest. No motor weakness was reported in this patient. The patient had accidentally been administered 100 μg sufentanil instead of the intended 10 μg. He was successfully resuscitated; however, he became disorientated and agitated. The disorientation and amnesia lasted several days. The patient was discharged from the hospital without any sequele 6 days after surgery.[5]

We agree with Van Deun *et al.* that species differences may exist and that one must be careful in extrapolating animal data to humans. However, we cannot ignore data that shows that very large doses of intrathecal sufentanil are neurotoxic in rat and cat[2] and in sheep.[6] Our study has shown that a drug that may be safe in the epidural space may not be safe intrathecally. We believe that large doses of intrathecal sufentanil may have a neurotoxic potential in humans. Clearly, further studies are necessary. We have not studied the new isotonic sufentanil solution and therefore have no views on its safety.

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Retrograde Wire-guided Direct Laryngoscopy in a 1-month-old Infant

To the Editor:—Passing a wire retrograde through the cricothyroid membrane and cords and into the pharynx to serve as a guide for an endotracheal tube is an option for airway management in both adults and children in whom tracheal intubation is difficult.[1–5,*] Audenaert *et al.* recently described retrograde-assisted fiberoptic tracheal intubation in children, including several small infants.[3] Since a small-diameter flexible laryngoscope was not available to us, we used a modification of this technique to intubate the trachea of a 1-month-old infant.

A 1-month-old 3.6-kg girl required a gastrostomy tube and Nissen fundoplication because of poor feeding and gastroesophageal reflux. The child was known to have a chromosomal abnormality (2q−). On physical examination, microphthalmia, a recessed chin, anterior larynx, cleft palate, and systolic murmur were noted. The child's surgery was originally scheduled 1 week earlier but had to be cancelled after several attending anesthesiologists were unsuccessful in performing an awake, oral intubation. Most reported that they could not see normal airway structures. On the day of surgery, while the infant was still in the neonatal intensive care unit, awake oral intubation was attempted by an attending neonatologist, who was also unsuccessful. Because of these multiple unsuccessful attempts at awake oral intubation by skilled personnel, we decided to try a retrograde approach.

The child was brought into the operating room, where monitors were placed and intravenous access started. Intravenous glycopyrrolate 0.05 mg was given to dry oral secretions, while intravenous ketamine 5 mg and midazolam 0.1 mg were given for sedation. Spontaneous breathing was maintained throughout the procedure, while oxygen was insufflated over the child's face. A roll was placed under the shoulders to extend the head slightly. The skin over the cricothyroid membrane was cleaned with alcohol; a 1% lidocaine wheal was raised; and an 18-G needle inserted through the membrane with the bevel pointing cephalad. Tracheal placement was confirmed by aspirating air with a 3-ml syringe, after which 0.25 ml 1% lidocaine was injected to anesthetize the vocal cords. The syringe was then removed, and an Arrow

* Schmidt DI, Hasewinkel JV: Retrograde catherter-guided direct laryngoscopy. Anesthesiology Rev 16:49–50, 1989

0.025-inch flexible guide wire was threaded retrograde through the needle and cords and brought out through the mouth. Multiple attempts were then made to pass first a 3.0 and then a 2.5 endotracheal tube over the wire into the larynx (blind initially, and then under direct vision with laryngoscopy); none of these attempts was successful. It appeared that the endotracheal tube was impinging on a laryngeal structure and was not stiff enough to pass into the trachea. Rotating the tube did not help.

A 2.5 endotracheal tube into which a stylette had been inserted was then, under direct vision, placed along the side of the guide wire that led directly to the larynx. The tube was successfully passed into the trachea on the second attempt. Breath sounds were confirmed; the wire was removed from the trachea; anesthesia was begun with halothane; and the surgery proceeded without complication. The child was taken to the neonatal intensive care unit postoperatively with the endotracheal tube in place, and the trachea was extubated the following day.

The options available for obtaining airway control in an infant with a difficult airway include awake intubation ("blind" or with direct visualization), fiberoptic laryngoscopy, retrograde techniques, and awake tracheostomy. In the case we describe, multiple unsuccessful attempts were made at awake intubation. Unfortunately, we did not have available to us a fiberoptic laryngoscope small enough for a 3.0–3.5 endotracheal tube (2.8 ID), so direct fiberoptic laryngoscopy and retrograde wire-assisted fiberoptic laryngoscopy were not possible. We placed a wire retrograde through the cricothyroid membrane but were not able to pass an endotracheal tube over the wire and through the cords. Benumof points out that in this instance the tube is generally impacted upon a vocal cord or the epiglottis and that 90° rotation may alleviate the problem.[1] In our case, rotation of the tube over the wire did not help, and under direct vision we advanced a 2.5 endotracheal tube with a stylette along the course of the wire, which led to the glottic opening and facilitated oral tracheal intubation. We should point out, however, that this technique is not without risks. Cannulation of the trachea of an infant could conceivably lead to bleeding or airway injury. If a smaller wire is available (Arrow 0.018-inch) then a 22-G needle can be used to puncture the cricothyroid membrane.

This case demonstrates the usefulness of retrograde catheterization with direct vision for intubating the trachea of a very small infant. The inability to pass an endotracheal tube over a retrograde wire should not lead to total abandonment of the technique. If a small fiberoptic laryngoscope is not available, the wire may prove an invaluable guide to intubation by direct visualization.

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More on: Improving the Clinical Utility of Anesthetic Drug Pharmacokinetics

To the Editor:—In a recent editorial,[1] we recommended using computer simulations to interpret pharmacokinetic results. In response to requests from several investigators and clinicians, we have revised the software used to create the graphs shown in the editorial to make it user-friendly. The software will run on any MS-DOS computer and is available, at no charge, to all interested individuals.

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