μg/kg, or approximately 11 × ED_{95}.[4] The patient was also undergoing continuous peritoneal dialysis for renal failure induced by cholesterol emboli sustained during preoperative cardiac catheterization. His preoperative serum creatinine concentration was 7 mg/dl. Anesthetic and surgical courses were uneventful, with no observed hemodynamic difficulties related to the pipecuronium.

Postoperatively, the patient remained paralyzed for 3 days. Attempted reversal of neuromuscular blockade with neostigmine and pyridostigmine at 28, 37, and 43 h postoperatively produced only finger movement, one twitch on train-of-four stimulation, and no measurable inspiratory force. During this postoperative time period, the patient received ten peritoneal dialysis exchanges without detectable improvement. Finally, the patient started moving his extremities 70 h postoperatively, and his trachea was extubated without reversal agents 74 h after his last dose of pipecuronium.

The duration of action of pipecuronium is less than 1 h in most studies[4,5] and less than 2 h when given at 2 × ED_{95} and combined with balanced anesthesia.[6] Caldwell *et al.* measured a mean time of 103 min from injection of 70 μg pipecuronium to 25% recovery of twitch tension in patients with end-stage renal disease.[3] In addition, these authors reported that the duration of action of pipecuronium was more variable in renal-failure patients than in normal patients and reported a maximum duration of 267 min. Wierda *et al.* administered 200 μg/kg to patients undergoing cardiopulmonary bypass without apparent difficulty. They found 41% of the administered drug excreted unchanged in the urine and 15% excreted as a hydroxylated metabolite.[2]

Our experience demonstrates that high-dose pipecuronium does not produce deleterious hemodynamic effects, but that it can last a very long time and is poorly dialyzable.

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Treatment of Pain on the Surgical Ward Using Epidural Morphine

To the Editor:—Ready *et al.*[1] conclude "that postoperative pain can be safely and effectively treated with epidural morphine on the surgical ward." We also use epidural morphine to treat postoperative pain on the surgical ward, and we agree with their conclusions.

However, we are surprised that they use epidural morphine alone in a bolus technique. We use a continuous-infusion technique (with facilities for patient-controlled analgesia) for both preservative-free morphine and bupivacaine. Although nursing education regarding epidural analgesia remains important, the use of a continuous-infusion technique obviates the need for education in epidural dosing protocols.

At our institution for the 18 months prior to December 1990, epidural catheters were inserted in 1,289 patients on the acute pain service, with an incidence for severe nausea (unresponsive to standard antiemetics) of 1.1% and severe pruritus (unresponsive to diphenhydramine) of 5.4%. As in Ready *et al.*'s[1] report, respiratory depression (respiratory rate < 10 breath/min) was rare (0.4%), and no case led to clinical sequelae.

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