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esmolol^{17,18} have been demonstrated to attenuate ECT-induced hypertension and tachycardia. Labetalol, however, has α -adrenergic blocking properties in addition to its β blockade, which is more ideal, given the α -adrenergic stimulation accompanying ECT. Although esmolol, which is a β -1-selective agent, would not block α -adrenergic mediated responses, it does not have significant peripheral β blockade, so it would not be expected to lead to unopposed peripheral α activity. Our patient, receiving propranolol, a nonselective β blocker, may have been at increased risk because of unopposed α stimulation exacerbating the cardiac and pulmonary responses after the ECT. Clinicians should be aware that patients undergoing ECT who are receiving nonselective β -adrenergic blockers may be at increased risk for hemodynamic instability.

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Transient Muscular Spasm after a Large Dose of Intrathecal Sufentanil

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INTRATHECAL sufentanil produces analgesia without motor or sympathetic blockade. When used as sole spinal agent, it can relieve labor pain at intrathecal doses of between 5 and 15 μg .^{1,2} However, a report of muscular spasm in the lower limbs after administration of intrathecal solution containing epinephrine added to sufentanil³ suggests that irritative effects can occur.

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Seven of 13 women receiving 10 μ g sufentanil and 200 μ g epinephrine exhibited painless contraction of muscles in the lower extremities.³ The authors of this report stated, "The phenomenon is mediated by the α_1 -adrenoreceptor system and is neither a toxic manifestation of sufentanil nor a variant of opioid-induced rigidity." For these authors, epinephrine was responsible for irritative symptoms, and such effects have not been reported after intrathecal use of sufentanil without epinephrine^{1,2} or in epidural use.⁴

Studies of the neurotoxicity of intrathecal sufentanil are controversial⁵⁻⁷ but suggest that a direct effect cannot be excluded. Yaksh *et al.* found no abnormal histologic effects after acute or chronic administration in cats,⁵ and Sabbe *et al.* reported no neurotoxicity after repeated injections of 5–50 μ g in dogs.⁶ Conversely, Rawal *et al.* found that large doses induced whole-body muscular rigidity associated with severe inflammatory changes (arachnoiditis and meningitis) and some neuronal chromatolysis and axonal swelling (due to accumulation after injections every 6 h for 3 days), whereas only moderate changes were observed after small doses in sheep.⁷

We routinely use 10 μ g sufentanil in addition to 5 or 10 mg hyperbaric bupivacaine for endoscopic urologic procedures, such as transurethral resection of the prostate or of bladder tumor, under spinal anesthesia. Sufentanil can decrease the total dose of local anesthetic and prolong its effect after spinal anesthesia. The case reported here involved muscular spasm after accidental intrathecal injection of a large dose of sufentanil (40 μ g).

Case Report

A 74-yr-old man (ASA physical status 2), 170 cm in height and weighing 80 kg, was scheduled for endoscopic control and urinary bladder biopsies. He had a nonmalignant bladder tumor and had undergone endoscopic urologic surgery 3 times before. Premedication consisted of 10 mg oral diazepam and 1 g intravenous cefazolin. Spinal anesthesia was proposed, consisting of a 4-ml mixture containing 5 mg hyperbaric bupivacaine and 10 μ g sufentanil diluted with 0.9% saline, prepared in the operating room. After sterilizing the skin and with the patient in sitting position, a 27-G Quincke needle was inserted into the L2–L3 interspace and its position confirmed by free flow of cerebrospinal fluid. Unfortunately, a mistake between two syringes lead us to inject a 4-ml mixture containing 40 μ g sufentanil (Sufenta, Janssen, Boulogne-Bifancourt, France) diluted with 0.9% saline. When the patient was in dorsal decubitus within 2 min after intrathecal injection, he complained of a burning sensation in both legs. Five minutes after intrathecal injection and while the patient was in the lithotomy position, painting of the perineal area with antiseptic at room temperature (but not the abdomen or internal

area of the thighs) induced muscular spasm with lifting of the patient from the operating table. This phenomenon disappeared after 3 min. Anesthesia to pinprick had a level of T9 on both sides. No motor blockade nor any change in heart rate or blood pressure were observed. The surgical procedure was begun 20 min after intrathecal injection and completed successfully in 20 min. A decrease in hemoglobin oxygen saturation from 98% to 91% within 20 min and pruritus occurred 30 min after intrathecal injection. Inhalation of oxygen *via* a face mask and continuous naloxone infusion (μ g \cdot min⁻¹) were begun and continued for 12 h. No neurologic abnormalities were observed at evening, the day after, or 1 month later.

Discussion

We report a case of muscular spasm after accidental administration of 40 μ g intrathecal sufentanil. A similar effect was reported previously only after intrathecal epinephrine was added to 10 μ g sufentanil.³

Meperidine is the only opioid considered adequate for surgery when used alone by the spinal route.⁸ In our case, surgery was performed with sufentanil as the sole spinal agent after premedication with oral diazepam. The sedative effects of intrathecal sufentanil apparently were added to those of diazepam. Because cystoscopy and bladder biopsies are not painful forms of surgery, the analgesia induced by intrathecal sufentanil is sufficient to perform such procedures.

The muscular effects observed could have been due to muscular rigidity induced by the opioid or radicular irritation. Opioid-induced rigidity, a systemic side effect,⁹ seemed unlikely because the symptoms were localized to the lumbar and sacral nerves. Because the symptoms occurred early after injection and lasted no more than 3 min, they probably were unrelated to high plasma concentrations. Moreover, a previous pharmacokinetic study of intrathecal sufentanil in humans demonstrated a delayed plasma peak at around 30 min.¹⁰ Although large doses of intrathecal opioids could induce myoclonic seizure, such signs are secondary to migration of drugs into the brainstem after repeated injections.¹¹ Similar symptoms have been reported after large doses (70 then 80 mg per day) of intrathecal morphine for long-term treatment of cancer pain, and antagonism of postsynaptic glycine and GABA inhibition at the spinal level were evoked.¹² Muscular spasms associated with a burning sensation in the legs are comparable to the transient radicular irritation observed after hyperbaric lidocaine.¹³ In previous reports of transient nerve irritation, factors such as dextrose¹³ and epinephrine³ were regarded as possible irritative adjuvants to anesthetics. Dextrose does not appear to be

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involved in neurotoxicity,¹⁴ and no data are available for epinephrine. In our case, none of these incriminated agents were injected with sufentanil. The burning sensation occurred within 2 min after intrathecal injection and probably was due to nerve contact with the large dose of sufentanil.

The position of the patient on the operating table, type of surgery,¹⁵ needle size, and injection speed¹⁶ have been considered as possible causes of nerve irritation after local anesthesia. We injected sufentanil within 30 s. The needle caused no apparent discomfort to our patient, and there were no irritative symptoms during puncture and injection of the anesthetic solution. Although a surgical position such as lithotomy could stretch the sacral or lumbar nerves, our patient described a burning sensation before he was in lithotomy position, and muscular spasms occurred preoperatively.

One concern regarding the use of intrathecal anesthetics in humans is the potential neurotoxicity reported in animal studies. Correlations between different animal species and humans are difficult and continually debated. Lesions after large doses of intrathecal sufentanil have been observed in sheep⁷ but not in dogs.⁶ Small doses have induced only mild histologic damage in sheep⁷ and none in dogs⁶ or cats.⁵ Drug distribution may differ among species, and the subtle neurologic signs described in humans may not be present or detectable in animals. Large doses of sufentanil are rare but clinically relevant because they can be accidentally injected intrathecally (as in our case) or pass unintentionally by the intrathecal route when administered epidurally.

Our patient completely recovered from the irritative side effects he experienced after injection of a large dose of intrathecal sufentanil used alone. This case indicates the interest of continuing toxicologic studies in different animal species and with different doses.

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