has been estimated to account for 14% of drug errors by anesthesia staff. We report the unusual case of a drug error by a patient.

A 51-year-old male engineer underwent resection of his left hepatic lobe for hepatocellular carcinoma in his transplanted liver. His medical history was positive for hepatitis C, alcoholism, and hemochromatosis, resulting in the liver transplant 2 years before. In 2002, the patient suffered a right frontal stroke because of subarachnoid hemorrhage. He was known to be hypertensive and polyneuropathic secondary to liver disease. His medication included famotidine, heparin subcutaneously, levothyroxine, atenolol, naproxen, acetaminophen, and cyclosporine. The liver resection was performed under combined general and epidural anaesthesia without any complications. For postoperative analgesia, a continuous epidural infusion of fentanyl 3 μg/mL and bupivacaine 0.1% was administered at 10 mL/h with good pain relief.

On postoperative day 1 in the intensive care unit, the patient became very apprehensive and anxious, necessitating a psychiatric consult. The report documented an underlying anxiety and obsessive disorder, a low pain threshold, and difficulty with absorbing new information. Lorazepam and oxazepam were prescribed.

On the second postoperative day at 1:20 AM, the anesthesia team received an emergency call from a nurse stating that, alerted by an alarm in the patient's room, she had found the epidural and intravenous tubings had been exchanged. Dextrose 5% in normal saline 0.45% was infused into the epidural catheter at a rate of 100 mL/h, prompting the infusion pump to send an obstruction alarm because of increased resistance. The epidural infusion was attached to the intravenous catheter. According to the nurse, only 1 hour before, she had inspected the intravenous and epidural tubing and found them to be properly connected. However, earlier in the evening the patient had verbally expressed interest in intravenous tubings and infusion pumps. At the time of our arrival, the patient seemed confused and unable to explain the situation. He was hemodynamically stable with a blood pressure of 171/103 mmHg, a heart rate of 72 beats/min, a respiratory rate of 18 per minute, and oxygen saturation 98% on room air. He was afebrile. His gown was wet, but there was no evidence of spilled water. We concluded, therefore, that the patient himself had exchanged the tubings and removed both catheters. At 4:00 AM, the patient again became disoriented trying to get dressed tk;2and leave the hospital. When questioned on the following day, he did not recall any of the events of the previous night. A neurologist was consulted and noted an awake patient with normal comprehension and repetition but also noted attention deficit and memory loss for events that had taken place longer than 5 minutes before. They concluded that this was most likely his baseline status and that the mild confusion was secondary to hepatic encephalopathy.

To our knowledge, this is the first published case of a drug error made by a patient. We propose that caution should be exercised when using continuous epidural analgesia in patients who are prone to or show signs of postoperative confusion.

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Course of the Spinal Accessory Nerve Relative to the Brachial Plexus

To the Editor:

Trapezius muscle contraction has been identified as a common problem during nerve-stimulation based interscalene brachial-plexus block.[1] Contraction of this muscle can appear similar to deltoid contraction and, therefore, confounds the block procedure. When trapezius contraction occurs, the block-needle placement is believed to be posterior to the brachial plexus. The spinal accessory nerve is primarily a motor nerve that innervates the sternocleidomastoid and trapezius muscles from their deep surface.[2] To elucidate the course of the spinal accessory nerve for evoked trapezius contraction, we used ultrasound imaging to scan the neck region of 18 healthy adult volunteers (mean age 31 years and mean body weight 73 kg) and measured the nerve position with respect to the brachial plexus.

After institutional review board approval and informed consent were obtained, sonography of the posterior triangle of the neck was performed, with the head positioned for interscalene block.[3] The position of the brachial plexus was estimated from that of the C5 ventral ramus contribution. The spinal accessory nerve was identified by its characteristic posterolateral course through the posterior triangle, with best nerve visibility when passing through or under the sternocleidomastoid muscle and at the edge of the trapezius muscle (Fig 1). External distances over the skin surface were measured by use of calipers and measuring tape.

At the level of the cricoid cartilage for interscalene block, the spinal accessory nerve is approximately 1.6 cm posterolateral to the brachial plexus (Table 1). Consistent with a previous report,[4] we found the nerve to be approximately 1 mm in diameter and monofascicular in sonographic appearance. When at the edge of the sternocleidomastoid muscle, the spinal accessory nerve was found 0.2 ± 0.6 cm (SD) cephalad to the cricoid cartilage.

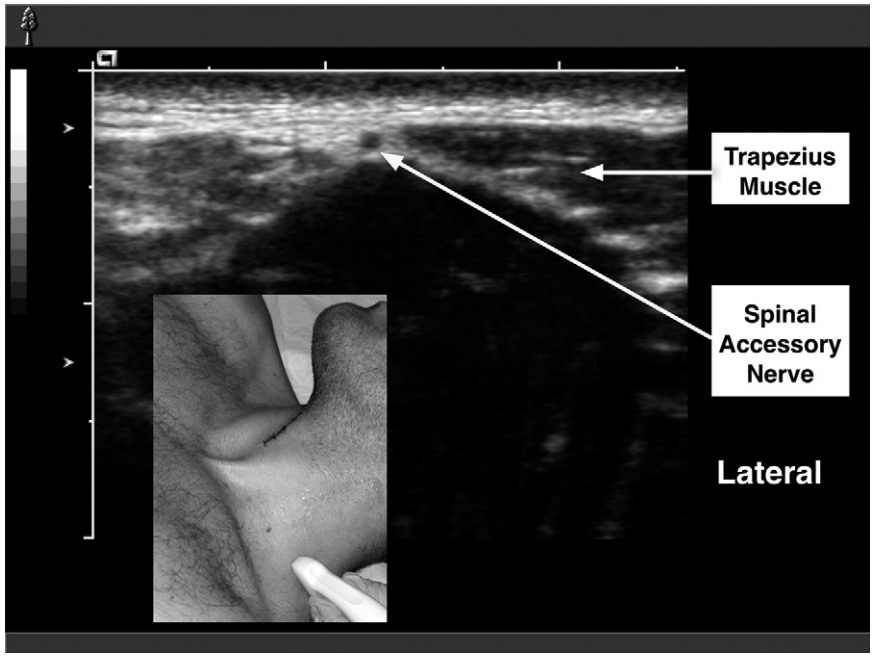

Fig 1. Sonogram of the spinal accessory nerve at the border of the trapezius muscle. The nerve is seen in short axis (transverse cross-section). Large tickmarks are 10 mm apart. Inset panel: The approximate ultrasound transducer position. The head is positioned for interscalene block.

When at the edge of the trapezius muscle, the spinal accessory nerve was found 2.7 ± 0.9 cm (SD) caudal to the cricoid cartilage. Our estimate of the nerve-path length across the posterior triangle was 3.5 cm, which is close to that estimated with anatomic dissections.[5] The spinal accessory nerve was 0.6 cm more posterolateral to the brachial plexus with each centimeter more caudal in the neck (linear-regression estimate of the slope).

Brachial-plexus block above the clavicle is conventionally performed within the posterior triangle of the neck. This region contains a number of other nerves, including the spinal accessory nerve, the dorsal scapular nerve, and nerves of the cervical plexus. Although communications between the cervical plexus and spinal accessory nerve have been demonstrated in some anatomic dissections, the functional significance of these communicating branches is not yet known.[2] One previous study has confirmed sonographic identification of the spinal accessory nerve with dye injections.[4]

Imaging both the brachial plexus and spinal accessory nerve in one field of view was difficult, primarily because optimal imaging required different rotation of the ultrasound transducer (as consistent with the different courses of the nerve paths). We, therefore, obtained independent sonograms to image both nerves. The depth of the C5 ventral ramus averages 0.6 cm in this region, and the depth of the spinal accessory nerve in the posterior triangle is less than 0.4 cm (Fig 1). Because the brachial plexus and spinal accessory nerve are close to the skin surface, our sonographic measurements accurately reflect nerve position. The separation distances in Table 1 may help guide block-needle redirection or reinsertion for nerve-stimulation based interscalene blocks.

Table 1. Course of the Spinal Accessory Nerve in the Posterior Triangle of the Neck

Level (cm)	Distance (cm)
1	1.0 (1.3)
0	1.6 (1.3)
−1	2.1 (0.9)
−2	2.8 (1.1)
−3	3.4 (1.0)

NOTE. Level = cephalocaudal distance relative to the level of the cricoid cartilage (negative values indicate caudal position). Distance = posterolateral distance between the spinal accessory nerve and the brachial plexus, as estimated by sonography (see text for details). Data are stated as mean (SD).

Cadaveric studies have revealed considerable variation in the course of the spinal accessory nerve within the posterior triangle.[2] In addition, head and shoulder position may influence the position of the spinal accessory nerve. The spinal accessory nerve path likely straightens as the head is turned to the side.[5] However, when we positioned our subjects to mimic interscalene block, we found a consistent relation between the spinal accessory nerve and brachial plexus, with the separation distance increasing at more caudal levels in the neck. Although direct stimulation of the trapezius muscle can occur during interscalene block, it would require even more lateral position of the block needle than for stimulation of the spinal accessory nerve in the posterior triangle.

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Intra-Articular Morphine in Acute Pain Trials

To the Editor:

We thank the editor for the chance to respond to the stimulating editorial by Professor Cristoph Stein, who commented on some issues concerning our article on intra-articular (IA) morphine.[1,2] In our study, we found no analgesic effect of 5 mg of IA morphine compared with placebo when given to patients with moderate or severe postoperative pain. Professor Stein disagrees with our interpretation.

We agree with Professor Stein that significant baseline pain is necessary when the efficacy of a single analgesic drug dose is compared with placebo in randomized clinical trials (RCT). A single-dose comparative analgesic RCT should include only patients with at least moderate pain, preferably moderate-to-severe pain.[3,4] Detection of statistically significant group differences in pain intensity (or pain relief) is the primary outcome measure. A significant problem with most published IA morphine RCTs is that the patients are included at the end of surgery, before any pain can be experienced or measured. This study design invariably will include many patients without pain. The fraction of patients who experience significant pain after knee arthroscopy was unknown until we documented that the incidence of at least moderate pain was only 57% in male and 84% in female patients,[5] a gender difference that is statistically and clinically significant.

The fact that the patients after knee arthroscopy fall into 1 of these 2 groups (1 group who never experience more than mild pain and 1 group who experience moderate pain or more) represents a serious methodological problem in studies in which the test medication is given before baseline pain can be assessed. Inclusion and randomization of all patients at the end of surgery may lead to a false-positive pain outcome if the sample size is small (most IA morphine RCTs have group size of 20 or less).[6] Trials that result in subsequent high mean pain intensity in the placebo group may indicate sensitivity, but they may also indicate that more patients with pain, by random variation, were randomized to the placebo group and fewer patients with pain were randomized to the treatment group. This action could have induced bias in IA morphine trials. Thus, pain intensity above 30 mm VAS in the placebo group *does not prove* assay sensitivity. This outcome is not a problem when only patients with at least moderate pain before the test intervention are included in RCTs.

In our last IA morphine RCT, we included only patients with moderate-to-severe pain before test drugs were administered.[1] This trial would have been one of the largest IA morphine trials with a pre-emptive design if we had included all 60 patients in the trial and injected the test drugs at the end of the arthroscopic procedure. Sample size is important, but it is not the only way to increase validity. Inclusion of patients with moderate-to-severe pain (and exclusion of patients with no or mild pain) has been documented to increase assay sensitivity.[7] Internal sensitivity has been proved in the study design used in our recent publication.[8] Excluding patients with no, or only mild, pain increases mean pain intensity, and variance (SD) is greatly reduced.

Patients with symptoms or clinical signs of acute arthritis (rheumatoid arthritis or acute inflammation after trauma) were not included in our trial. In the population screened for this trial, we did not encounter any patients with these conditions. The patients are representative of day-case arthroscopic patients in Norway and are probably not very different from day-case knee patients in the western part of the world. We had 1 patient with acute arthritis in a previous intra-articular morphine trial and excluded him from a subgroup analysis of synovial-fluid inflammatory mediators, but the patient was included in the analysis of analgesic efficacy and side effects.[9] Subgroup analysis of inflammatory mediators documents inflammation in all patients, and we found significantly higher levels of prostaglandin E_2 in patients with moderate pain compared with patients who experienced no pain or mild pain.[10] Thus, the population in the study is not in any way special, even in the degree of inflammation. The failure to reject the null hypothesis in this RCT is of course not evidence for equivalence between morphine and saline, but if any effect of IA morphine occurs, the effect size must be small and not clinically significant for acute pain after arthroscopic procedures. A possible role for peripheral opioids in chronic pain states should be studied further and is not contradicted by our study.

Professor Stein suggests that "to find the 'truth,' the reader will have to go back to the original literature and delve into details such as inclusion and exclusion criteria, raw pain scores, absolute dosages, type and combination of supplemental analgesics, and statistical analysis of the data." We fully agree.[6,11]

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