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In conclusion, this report describes a rare hypotensive response to intravenous injection of IC, with no other symptoms such as cutaneous changes or bronchoconstriction. Following the report of this response, the Center for Drug Evaluation and Research of the Food and Drug Administration plans to add to the drug package that hypotension is a possible side effect of IC.

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Is It Time to Correct the Dermatome Chart of the Anterior Scrotal Region?

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DERMATOME charts are valuable aids to performing regional anesthesia, especially spinal, epidural, and nerve root blocks. In using these charts, it is important to remember the considerable sensory overlap of ad-

acent dermatomes, particularly when anatomically adjacent structures have sensory innervation from non-adjacent nerve roots. The scrotum is one such area.¹⁻⁴ We present a case in which spinal anesthesia was inadequate to explore the scrotum.

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Case Report

A 73-yr-old debilitated patient was scheduled for exploration of a scrotal abscess. The patient consented to spinal anesthesia. With the patient in the left lateral decubitus, a 25-G spinal needle was directed toward the L5-S1 interspace using a paramedian (Taylor) approach. Subarachnoid placement of the needle tip was confirmed by free flow and by easy aspiration of cerebrospinal fluid. The patient was given 50 mg hyperbaric lidocaine (5% lidocaine in 7.5% dextrose) into the subarachnoid space. He then was immediately and carefully turned to the supine position. The operating table was placed in 20°

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reverse Trendelenburg's position for 5 min. During this period, the patient experienced minimal changes in heart rate and blood pressure. Testing the level of anesthesia revealed loss of dorsiflexion at the ankles but intact extension at the knee. Sensation to pinprick was diminished or absent on the posterior and lateral leg, posterior thigh, and penis. Sensation to pinprick appeared to be intact on the anterior scrotum. The cephalad level of the spinal anesthesia appeared to be at L4-L5. Fifteen minutes later, the patient did not complain of pain during the rectal examination or catheterization of the urethra. He did complain, however, when scrotal sensation was checked with forceps. Satisfactory scrotal anesthesia did not develop over the next 10 min. When we repeated the spinal at the L3-L4 level with 45 mg isobaric lidocaine, satisfactory anesthesia of the scrotum developed within 10 min. The final level of sensory anesthesia was approximately T11. Surgery proceeded without further complications.

Discussion

The inadequate spinal anesthesia of the anterior scrotum described in this report resulted from the mistaken belief that the entire scrotum receives sensory innervation from only the sacral nerve roots.

The complex innervation of the genital region has been better delineated in recent years. Sensory innervation of most of the penis is from the dorsal nerve of the penis, a branch of the pudendal nerve (S2, S3, S4). A small area at the root of the penis may receive innervation from anterior cutaneous branches from both the iliohypogastric (L1) and the ilioinguinal (L1) nerves.¹⁻⁴ Both the iliohypogastric and the ilioinguinal nerves may have small contributions from T12.^{3,4}

Sensory innervation of the scrotum is primarily from the lateral and medial scrotal branches of the perineal nerve, which is a branch of the pudendal nerve (S2, S3, S4). There may be a small contribution from the inferior pudendal branch of the posterior femoral cutaneous nerve (S2, S3). The anterior and lateral aspects of the scrotum receive sensory contributions from the genital branch of the genitofemoral nerve (L1, L2) and the anterior cutaneous branches of both the iliohypogastric (L1) and the ilioinguinal (L1) nerves.¹⁻⁴ Analogous areas of the female anatomy are innervated by the corresponding nerves.³ The contents of the scrotum, testis, vas deferens, and epididymis are innervated by roots T10 through L1.^{2,3}

In contrast to this description of the scrotal innervation, a review of the dermatome charts found in seven textbooks of anesthesiology,⁵⁻¹¹ a well known anatomy atlas,¹² and a popular dermatome poster (Astra Pharmaceutical, Westboro, MA) that is widely distributed yielded the results presented in table 1. These sources indicate that all innervation to the skin of the scrotum and penis is derived solely from sacral nerve roots.

Table 1. Innervation of the Male Genital Region as Depicted on Various Dermatome Charts

Source	Scrotum	Penis
Poster*	S2	S3
Covino ⁷	S2, S3	S2
Cousins ⁵	S3	S4
Covino ⁶	S2, S3	S2
Netter ¹²	S2, S3	S2, S3
Raj ⁹	S4	S4
Helfar ⁸	S2	S2
Scott ¹⁰	S2, S3	S2
Stoelting ¹¹	S2	S3
Correct dermatomes*	T12†, L1, L2, S2-S4	T12†, L1, S2-S4

* The precise contributions of S2, S3, and S4 to the innervation of the scrotum and penis are not known.

† T12 innervation is variable.

To evaluate the general knowledge of the scrotal and penile innervation, we conducted a poll of 64 anesthesiology residents and staff members who regularly perform regional anesthesia techniques. We asked the following questions: (1) Which nerve roots supply sensation to the skin of the genitourinary region, in particular, the penis and scrotum (sacral, lumbar, or both)? (2) What is your primary source for this knowledge (dermatome chart, anatomy textbook, or anesthesia textbook)? Nearly 75% (46 of 64) responded that the sensory innervation to the skin of the scrotum and penis was entirely from sacral nerve roots. The remaining 18 responses (28%) correctly indicated that both sacral and lumbar nerve roots contribute to the innervation of the scrotum and penis. Forty-four of the 46 incorrect responders indicated that a primary source of their knowledge was a dermatome chart. Nearly 90% of the correct responders indicated that a textbook was an important source of their understanding of the innervation. Interestingly, more than 90% of those surveyed indicated that, if they had doubts, they would consult a dermatome chart first.

Our small, informal survey suggests that dermatome charts significantly influence anesthesiologists' knowledge of the cutaneous innervation. Although text descriptions of the scrotal innervation clearly indicate sensory contributions from L1, L2, and possibly T12, popular dermatome maps persist in depicting the entire anterior scrotal innervation as exclusively sacral. Based on our case results, our survey, and a review of the anatomy literature and dermatome maps, we believe it is time to redraw the dermatome chart.

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Diagnosis of Myocardial Injury by Real-time Recording of ST Segments of the Electrocardiogram in a Patient Receiving General Anesthesia for Electroconvulsive Therapy

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ELECTROCONVULSIVE therapy (ECT) is associated with short-lasting but important changes in autonomic nervous system activity.^{1–3} The autonomic response to ECT is characterized by initial parasympathetic stim-

ulation immediately followed by subsequent sympathetic stimulation. Typically, transient bradycardia is first seen immediately after the seizure, after which sinus tachycardia and arterial hypertension are observed, frequently associated with cardiac arrhythmias.^{2–4} Though these changes usually are self-limited, a hyperdynamic state in most elderly patients represents an important risk factor.⁵ Hypotension after ECT warrants an immediate search for a cause. In this case report, we present arterial hypotension immediately after ECT with subsequent refractory myocardial failure and subendocardial infarction. We made the initial diagnosis of myocardial injury because a tabulated record of real-time ST-segment data was available at the bedside, allowing immediate decisions about appropriate pharmacologic support measures. To validate the observations in this patient, we also present data on ST segments of the electrocardiogram (ECG) and hemodynamic variables recorded during the first treatment in a comparison group of ten patients with the admission diagnosis of depression who presented for ECT.

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