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Anesthesiology

Transient Anterior Spinal Cord Syndrome with Continuous Postoperative Epidural Analgesia

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An unusual case of an anterior spinal artery syndrome involving a single lower limb is described. The differential
diagnosis, management, and possible causes are described.

CASE REPORT

A 59-yr-old, 157-cm tall, 45-kg woman underwent an ileal loop uri-
nary diversion because of a 19-yr history of urinary incontinence. The
cause of incontinence was unknown, there were no abnormal neuro-
logical signs, and the voiding urothrogram was normal.

There had been no problem with general anesthetics for two bladder
suspensions, cesarean section, or total abdominal hysterectomy for fi-
broids. Spinal anesthesia for a second cesarean section was also un-
eventful.

Laboratory tests of renal function and coagulation were normal, as
were the chest x-ray and electrocardiogram.

In the operating room, an epidural catheter was inserted via the L2-
3 interspace using a 17-G Touhy needle with the patient in the lateral
position. No evidence of intrathecal or iv injection was detected follow-
ing a 3-ml test dose of 1.5% lidocaine with 1 in 200,000 epinephrine.

General anesthesia was induced with sodium thiopental (300 mg) and
succinylcholine (80 mg), and following tracheal intubation, anesthesia
was maintained with nitrous oxide (60%), oxygen, and isoflurane (0.5–
1% delivered concentration). Controlled ventilation (normocapnia) was
facilitated by pancuronium. Analgesia was provided by 5-ml incremen-
ts of 0.5% plain bupivacaine to a total of 25 ml during the anesthetic
time of 5.25 h. Preoperative blood pressure was 130/80 mmHg and
was approximately 100 mmHg systolic intraoperatively, decreasing
two times to 90 mmHg, lasting a total of 10 min. Oxyhemoglobin
saturation throughout remained at or above 98%. Surgery proceeded
uneventfully, but blood loss was estimated to be 500 ml, and she received
3,500 ml of lactated Ringer’s solution. Tracheal extubation occurred
following reversal of muscle relaxation. Forty-five minutes after surgery,

review by the staff anesthesiologist revealed that she was moving all
her limbs and verbalizing coherently. Fentanyl 100 μg in 10 ml of
preservative-free normal saline was administered via the epidural cat-
heter. Following transfer to the ward, continuous epidural analgesia
was maintained with an infusion of fentanyl 10 μg/ml in preservative-free
normal saline at a rate of 40 μg/h. At 2 h postoperatively she was
reviewed by the anesthesiology resident from the Acute Pain Service.
She was pain free, oriented, moving all limbs, and had regained sen-
sation in her legs.

At 2 A.M., approximately 12 h after surgery, the patient awoke and
complained to the nurse of numbness and weakness of the left leg. She
was immediately reviewed neurologically and was lucid, oriented, and
denied any pain. There was sensory loss to touch, pinprick, and cold
involving the entire left leg from the inguinal ligament distally. Tone
and power of the left leg were markedly reduced with only some very
weak knee extension possible. The other limb was normal and anal

Tone was moderate. The epidural site appeared normal and nothing
could be aspirated through the catheter.

A provisional diagnosis was made of epidural nerve root compression,
probably due to an epidural hematoma. The epidural injection was
discontinued and an emergency neurorugal consultation was ob-
tained. The physical signs were confirmed and an anterior-posterior
"ray of the lumbar spine and computerized tomography were per-
formed (figs. 1 and 2). These showed a scoliosis, convex to the right
caused by an L4 hemivertebra (two right pedicles and foramina and
one left pedicle and foramen). Intravenous contrast enhancement failed
to show the epidural catheter or a space-occupying lesion, and therefore,
a few ml of contrast medium were injected through the catheter. It
was seen to enter the spinal canal just above the lamina of L3 and
coursed along the left anterolateral aspect of the canal (fig. 2) in a
cephalad direction. Its tip entered a left-sided intervertebral foramen,
probably T12–L1. No hematoma or space-occupying lesion were de-
monstrated; in fact, there was ample space around the lumbar nerve
roots and there was free flow of contrast out into the intervertebral
spaces (fig. 2).

With the exclusion of epidural nerve root or spinal cord compression,
the patient was transferred back to the ward, the catheter was removed
intact, and her neurological state reassessed. At this examination, ap-
approximately 15 h after surgery, position sense was tested for the first
time and found to be present at the great toe and the ankle. Unfor-
nately, vibration sense was not tested. The physical signs were,
therefore, compatible with a lesion in the distribution of the anterior
spinal artery on the ipsilateral side to the monoparesis.

A neurologic consultation was obtained, the diagnosis of a probable

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Received from the Department of Anesthesiology, The Oregon
Health Sciences University, Portland, Oregon. Accepted for publi-
cation December 4, 1989.

Key words: Analgesics, epidural; fentanyl. Anesthetic technique:
epidural. spinal cord: complication.

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anterior spinal artery thrombosis was confirmed, and an expectant policy was adopted.

Approximately 2 h after removal of the epidural catheter, rapid improvement was noted. Over the course of the next 6 h her motor strength returned, and at approximately 12 h since her first complaint, all abnormal neurologic signs had resolved.

Six weeks following surgery she remained neurologically intact.

**DISCUSSION**

Transient neurologic abnormalities following lumbar epidural blockade are, fortunately, much more common than permanent lesions, 0.1% in one series of 32,718 patients compared with 0.02% in a review of 780,000 cases.2

Upon initial examination it was thought this patient was exhibiting physical signs consistent with epidural nerve root compression, most likely due to a hematoma, but possibly due to a localized collection of fentanyl. Epidural hematoma is a known complication of epidural anesthesia due to needle or catheter3 damage of the multiple thin-walled epidural veins. Anticoagulation or a coagulopathy are often associated with the most neurologically devastating outcomes, but these factors are absent in approximately two-thirds of cases.5

Other possible causes of a space-occupying lesion in this case could have been an epidural abscess, a tumor, or a collection of unabsorbed saline associated with the fentanyl infusion.

Such a mechanism has been invoked to explain a case of paraplegia in a woman in labor who was given 40 ml of 0.9% saline via an epidural catheter.5

Our patient had an abnormality of the 4th lumbar vertebra that may well have been associated with a spinal stenosis. Skoven et al. have recently reviewed a number of cases of paraplegia associated with epidural anesthesia in the presence of spinal stenosis.4

Following exclusion of a space-occupying lesion by a normal epidurogram, a diagnosis of anterior spinal artery occlusion was considered the most likely explanation for her clinical signs, even though these were unilateral. The anterior two-thirds of the spinal cord supplied by the anterior spinal artery contains the anterior and lateral spinothalamic tracts, the anterior horn cells, and the pyramidal tracts. Disruption of the blood supply of this area gives rise to loss of pain and temperature sensation, flaccid paralysis, and later spasticity due to involvement of the pyramidal tracts, but with preservation of position, joint sense, and vibration (carried in the dorsal columns). There is usually retention of urine and feces in the early stages, but automatic bladder and bowel control may eventually be achieved. Obstruction to one or more feeding or radicular arteries causes weakness and sensory impairment that may be restricted to one limb or may be asymmetrical in the two lower limbs.7 In these cases, considerable or even complete recovery may subsequently take place. In our patient, the mechanism of injury may have been either

![Fig. 1. Anterioposterior view of the lumbar spine. A scoliosis is shown, convex to the right caused by an L1 hemivertebra.](image1)

![Fig. 2. Computerized tomography of the lumbar spine. Contrast medium is present within the epidural catheter in the epidural space, and some is seen in the paravertebral space. The catheter courses along the anterolateral aspect of the spinal canal.](image2)
venous obstruction or catheter irritation and spasm of the radicular vessels within the intervertebral foramen. The tip of the epidural catheter was seen lying in a left-sided intervertebral foramen where the radicular vessels enter and leave the spinal canal, ipsilateral to the physical signs, and at approximately the appropriate spinal level. Meningeal irritation and radiculitis have been described due to the prolonged presence of an epidural catheter.† This was reversed upon catheter removal. The presence of an epidural catheter in close proximity to the radicular vessels in the intervertebral foramen might give rise to changes in blood flow within these vessels. Occlusion of one of these vessels can give rise to the signs of an anterior spinal artery syndrome in one limb only.

We do not believe that the fentanyl was responsible for causing an alteration in flow, as we are unable to find any information referable to vasospasm with this drug. Although seizures have been reputed with fentanyl,8 a direct neurotoxic effect has never been suggested, and the dissociation of the sensory loss suggests the lesion in our patient was within the substance of the spinal cord where these modalities are separated, not within the nerve roots in the epidural space where the fentanyl was infused.

In conclusion, we believe our patient suffered a unilateral transient anterior spinal cord syndrome due to irritation by the epidural catheter tip of the radicular vessels in their intervertebral foramen.

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