

**To the Editor:**

I read with interest and dismay the excellent paper by Drs. Houten and Errico regarding paraplegia after lumbosacral nerve root blocks, with report of three cases [1]. I am aware of 27 additional cases of profound neurological deficits, including some brain stem infarctions and deaths, from selective nerve root blocks and transforaminal epidural steroid injections. The purported mechanism of injury has either been needle injury to one of the segmental arteries or artery of Adamkiewicz or injection of particulate steroid into the radicular artery, producing instantaneous ischemia and infarction of the spinal cord, with magnetic resonance imaging (MRI) scans 24 to 48 hours later showing myelomalacia and infarction of the cord in the distribution of the anterior spinal artery.

Most of the cases that I am aware of have involved Depo-Medrol, which is the most particulate of commonly used steroid preparations. Celestone is less particulate. The report of Houten and Errico is the first, to my knowledge, of a neurological deficit after injection of betamethasone or Celestone. It is interesting that their patient improved clinically and showed resolution of edema on the MRI scan, suggesting that the less particulate steroid may have caused less ischemia and embolization of the segmental artery to the spinal cord.

In an editorial in the newsletter of the International Spinal Injection Society, Drs. Robert Windsor and Frank Falco discussed paraplegia after selective nerve root blocks, especially in the left lower thoracic area [2]. The artery of Adamkiewicz is left-sided in 80% to 85% of patients and can be located from the T4-T5 area to as low as L4. Obviously, after injury or embolization of that artery, neurological outcome will depend, to some extent, on the flow from collateral lumbar radicular arter-

ies. Drs. Windsor and Falco comment that corticosteroids that are commercially available in the United States are suspensions, with Depo-Medrol having the largest particulate size and Celestone the least. Browsers et al. [3] reported, in the February 2001 issue of *Pain*, a case of cervical anterior spinal artery syndrome and quadriplegia after a diagnostic blockade of the right C6 nerve root. One phenomenon that seems common to all of these incidents is a lack of a vascular blush in the hub of the needle, when placing a small-gauge needle into the segmental artery and failing to aspirate blood. In several of these cases, the dye injection appeared to be periradicular and nonvascular; and in at least a couple of cases, during the process of putting the local anesthetic and steroid syringe on the needle, the needle may have moved, unrecognized, into one of the segmental arteries. The problem occurs during the contrast to local anesthetic syringe transfer.

Several colleagues and I have tried to think of a way to avoid this devastating complication. A paper published in *Regional Anesthesia* in 1995 by Dr. Berger, describes the use of an 18-gauge blunt-tipped needle for celiac plexus block in order to avoid injury to the artery of Adamkiewicz, citing that there have also been reports of paraplegia from celiac plexus block either from needle injury to the artery or the effects of alcohol or phenol on the artery of Adamkiewicz causing vasospasm and ischemia [4]. Dr. Berger describes trying over 100 times to puncture the renal artery of a dog with an 18-gauge blunt needle and not being able to do so. He also had minimal bleeding with renal parenchymal puncture and difficulty puncturing the barium-filled bowel of the dog.

Many injection specialists now use blunt needles to prevent canalization of segmental arteries during transforaminal and celiac splanchnic procedures. Whether a 22-gauge blunt needle will behave the same as an 18-gauge blunt needle remains to be shown, but there are several manufacturers now making curved steerable blunt needles, such as the 20- and 22-gauge blunt curved needles manufactured by Epimed International. Another alternative to transforaminal injection is translaminar injection using a radio-opaque spring-tipped catheter, such as the RACZ (Epimed International, Gloversville, NY) catheter, also made by Epimed, to get into the ventral lateral epidural space.

The case described by Houten and Errico is the first that I am aware of in which an S1 transforaminal injection caused infarction of the conus and spinal cord and the first complication of this kind that I am aware of where betamethasone (Celestone) was the corticosteroid used.

This is a phenomenon that needs to be looked at carefully. Dr. Windsor and Dr. Falco suggested a more posterior or inferior placement of the needle tip in the foramen for thoracolumbar injections, because the segmental artery of Adamkiewicz tends to follow the nerve root [2]. A blunt-tipped needle may provide additional protection. Some practitioners have gone to a betamethasone solution compounded by pharmacists to avoid use of the more particulate steroids. Whether that is a long-term solution to this problem again is not known. More research needs to be done.

Meanwhile, it is interesting that in the article by Houten and Errico, the patient who made some improvement had the least particulate steroid, which was Celestone.

## References

- [1] Houten JK, Errico TJ. Paraplegia after lumbosacral nerve block: report of three cases. *Spine J* 2002;2(1):70–5.
- [2] Windsor RE, Falco JE. Paraplegia following selective nerve root blocks. *Scientific Newsletter of the International Spinal Injection Society* 2001;4:53–4.
- [3] Brouwers P, Kottink E, Simon M, Prevo R. A cervical anterior spinal artery syndrome after diagnostic blockade of the C6 nerve root. *Pain* 2001;91:397–9.
- [4] Berger J. Coeliac plexus block—use of a blunt-tip needle [abstract]. *Reg Anesthesia* 1995;20(25):397–400.

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## To the Editor:

I read with interest the report “Iatrogenic vertebral artery injury during anterior cervical spine surgery,” by Drs. Burke, Gerszten and Welch [1]. I would suggest that when the vertebral artery is injured during an anterior approach, the surgeon should consider calling an interventional radiologist, who could immediately pass a catheter to study the vertebral artery. That would also determine which vertebral artery is in fact the dominant one, which is extremely important. Modern techniques might also permit stenting the area of damage, thereby obviating attempts at repair or ligation.

## References

- [1] Burke JP, Gerszten PC, Welch WC. Iatrogenic vertebral artery injury during anterior cervical surgery. In: *Proceedings of the 16th Annual Meeting of the North American Spine Society*. *Spine J* 2002;2(suppl 2S):5S.

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## Authors' reply to Dr. Cooney

We agree that interventional radiology might be successful at occluding or stenting an injured vertebral artery and that this is a good approach, if time permits. Alternatively, a direct surgical approach may be more effective when time is of the essence.

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