Anesthetic Test Dose and Seizure Risk with Cervical Transforaminal Epidural Steroid Injection

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**Myth:** Administering anesthetic test dose in cervical transforaminal epidural steroid injections may precipitate seizures.

**Fact:** Epidural administration of local anesthetic does not precipitate seizure; but inadvertent intra-arterial injection of anesthetic can precipitate seizure.

Severe neurological complications from cervical transforaminal injection of steroids (CTFIS) have been attributed to inadvertent injection of particulate steroids into a radicular artery or a vertebral artery [1-5]. The complications include spinal cord infarction, brainstem infarction, cerebral infarction, and death [3]. Two measures have been advocated to prevent these complications. One is to use a test-dose of local anesthetic, and the other is to use non-particulate steroids.

The rationale for the local anesthetic test-dose is that, if placement of the needle into an artery has not been recognized during injection of contrast medium, injecting a test-dose of local anesthetic will cause only temporary side-effects, but will avert permanent effects that would be caused if particulate steroids were to be injected [6]. The utility of the test-dose was established in a study of 678 CTFIS procedures, in which the test-dose was positive in 4 patients (0.59%) [7]. Although small, this yield ostensibly prevented catastrophic complications that could have occurred had steroids been injected in these 4 patients. However, a case has been reported of grand mal seizure after a local anesthetic test-dose [8]. Although the patient was resuscitated, and recovered without residual deficit, this case raises concerns about the safety of the local anesthetic test.

In the case reported of seizure following a test-dose of local anesthetic, only 15mg of lidocaine was injected; but later review of the images showed that the needle had been placed in a vertebral artery, which was not recognized when contrast medium was injected [8]. Consequently, the complication was caused by injection of local anesthetic into an artery. The irony of this case is that the test-dose did what it was designed to do: detect erroneous needle placement; but the cost was a temporary but disturbing complication.

Experience with other procedures in the cervical spine shows that intra-arterial injection of local anesthetic can cause cardiovascular complications, seizure, and even death [10,11,12,13]. The dose required to precipitate a seizure varies depending on location and size of the artery violated, as well as the speed of injection. However, very low doses of local anesthetic into the vertebral artery can cause grand mal seizure [14].

Meanwhile, studies of the mechanism of severe neurological complications from CTFIS have examined particle size [15] and the effects of intra-arterial injection of steroids in animal models [16,17]. In these models, particulate steroids consistently produced neurologic damage, but non-particulate steroids did not. These data provided circumstantial evidence that particulate steroids were responsible for the complications of CTFIS in patients. Consequently, in May 2015, the Multisociety Pain Workgroup published the recommendation that particulate steroids should not be used in therapeutic cervical transforaminal injections [5].
This pronouncement raises a conundrum about the use of the local anesthetic test-dose. The risks of the local anesthetic test-dose are rare, but the benefits may be superfluous. If the complications of CTFIS can be avoided by using non-particulate steroids, there is arguably no need for the local anesthetic test-dose. For physicians performing CTFIS, the choice between using the test-dose and abandoning it rests on how confident they are that non-particulate steroids will do no harm if inadvertently injected into an artery.

Conclusion

The most important factor in avoiding irreversible neurologic complications during CTIS is the use of non-particulate steroid. An anesthetic test-dose may cause neurological complications when inadvertently administered into the vertebral artery; and the provider should be prepared for such complications should they arise. The risks and benefits of the anesthetic test dose should be weighed carefully; and careful consideration should be given as to whether an anesthetic test dose is needed if non-particulate steroid is administered.

References