response to episodes of bradycardia. Over the next two to three days, the catheter tip position fluctuated between T1 and T4, which correlated with the requirement for intravenous analgesics.

Changes in patient position and degree of vertebral flexion, high compliance of the epidural space in infants, and high elasticity and stretchability of the Arrow FlexTip catheter may have been predisposing factors for catheter migration [1,2]. With position fluctuations of the catheter tip in the epidural space, physicians performing these procedures should maintain awareness of potential complications such as inadequate analgesia, bradycardia, Horner’s syndrome, and respiratory depression, as well as paralysis in patients receiving anticoagulants.

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LETTERS TO THE EDITOR

On the Spinal Cord Injury During Attempted Cervical Interlaminar Epidural Injection of Steroids

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Dear Editor,

I would like to share some thoughts after reading the article by Dr. Landers about accidental spinal cord injury [1]. There is no doubt that following guidelines for cervical epidural injection may help prevent serious complications. However, I think that rather than condemning the physician for not following these guidelines, it is far more beneficial to examine the underlying cause and learn lessons from it. I try to explain my point using a parallel with the aviation industry.

The airline industry’s outstanding safety record comes from decades of intense analysis of errors and crashes—and a determination to learn the lessons. One of the key elements in aviation is accident evaluation that focuses on cause rather than blame. As a pain practitioner who routinely performs cervical epidurals, while reviewing a complication described in the article, I wanted to find answers to the following questions: What went wrong? What brought this complication? And what could I do to avoid such a complication in my practice?

So what caused this complication? I’ll continue making a parallel with aviation where two major factors contributing to accidents are environmental and human, with the latter being much more prevalent. In medicine, we call it objective and subjective factors.

Objective factors that may predispose for spinal cord injury are:

• inherent risk of cervical epidurals due to the proximity of the spinal cord;

• visualization of the needle tip in the lateral view in the lower cervical and upper thoracic spine is often impaired due to shoulders obstructing the fluoroscopic view;

• the ligamentum flavum is not fused at midline up to 60–70%, thus making Loss of Resistance (LOR) unreliable [2];
• the ligamentum flavum is thinner at the cervical spine, and it is easier to miss the LOR;
• the epidural space is thinner at the neck compared with the lumbar spine.

Subjective factors, in my opinion, are:
• insufficient training and knowledge of the physician in the case.

By the way, the practitioner did something right. He recognized intracordial placement with contrast injection, did not proceed with medication injection, and withdrew the needle. The patient also got immediate magnetic resonance imaging evaluation and treatment (steroids). Otherwise, the consequences of the intracordial injection would have been much more serious for the patient and the doctor. In aviation, this is called a “near miss.”

I agree with Dr. Landers that the contralateral oblique (CLO) view is “a superior alternative to the lateral view, providing a more accurate indication of depth of needle insertion in relation to the associated lamina.” However, I will suggest 50 degrees instead of 45 degrees with CLO angulation and a paramedian approach [3, 4].

Addressing the insufficiencies of LOR at the cervical spine, I’ll recommend the contrast spread technique (CST) [5, 6]. Historically, the LOR technique has been the preferred method of epidural space identification when fluoroscopy is not available. With the introduction of fluoroscopy, LOR became the litmus test for epidural space recognition. However, with time, our understanding of imaging anatomy and x-ray technology has improved significantly. This is what aided in the discovery of CLO fluoroscopy about 10 years ago [7].

CST is a logical continuation of CLO fluoroscopy as both techniques depend on fluoroscopic visualization. CLO fluoroscopy allows us to follow the needle advancement toward the epidural space. So why not continue to employ fluoroscopic visualization for epidural space recognition? Unlike the LOR technique, which relies on the subjective feeling of the performing physician, the CST technique allows for an objective verification of the needle tip position inside or outside of the epidural space by visual assessment of the contrast spread that may also be observed and interpreted by the third party [6].

In my opinion, the cause of this accident was the physician’s incorrect assumption that he may get into the epidural space with LOR alone. He did not utilize fluoroscopy to its full potential. Despite multiple publications and the obvious superiority of CLO fluoroscopy for needle depth visualization, there are still many interventionists who do not employ this technique. Unlike the aviation industry, where new safe techniques and regulations may be implemented quickly by means of rules and guidelines, this is not always the case in medicine. Due to the nature of our specialty, we are conservative. It takes a long time for a practicing physician to change his/her routine and adopt a new technique.

The lesson I learned from the case in the article is that I need to visualize by means of fluoroscopy the needle position every single moment of the cervical epidural that I am performing. I call this “constant vision.” I would not advance the needle if I could not see where the needle tip is, and I would not hesitate to remove the needle and abort the procedure if I observed abnormal contrast spread.

I also suggest that a safe and friendly environment for reporting mistakes and near misses1 and further detailed analyses, reviews, and discussions, as are routinely done in aviation, may benefit us. They may improve our techniques, benefit doctors’ training, and help us to enhance our patients’ safety and our satisfaction with the job.

Note
1. By “near misses” in epidural injections, I mean accidental intravascular, subdural, subarachnoid, and even intracordial needle penetration with or without contrast injection that are recognized in a timely manner and do not cause any serious complications to the patient.

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