Utility of Digital Subtraction Angiography in Cervical Transforaminal Epidural Steroid Injections: Does Digital Subtraction Improve Safety Over Live Fluoroscopy?

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Introduction

Cervical transforaminal epidural steroid injections (CTFESI) have been used for many years in the conservative management of cervical radicular pain. Reports of severe neurological complications from CTFESI often implicate accidental intravascular injections as the mechanism of injury. In order to reduce the risk of serious injury during CTFESI, our ability to reliably identify intravascular needle placement is paramount.

Materials and methods (NA for case report)

IRB approval was obtained. We reviewed records from CTFESIs performed in an academic outpatient clinic from November 2008 to June 2015. Over 385 studies were performed; however, only 382 patients had complete documentation available for review. These injections were performed or supervised by fellowship trained pain physicians. When aspiration revealed blood, the event was documented and the needle was immediately repositioned. Contrast dye flow studies were performed only if aspiration was negative.

Results/Case report

Flow studies detected 52 intravascular needles despite negative aspiration of blood. Of the 52 positive cases, 20 were detected with standard real-time fluoroscopy without need for DSA. An additional 32 cases were found to be positive for intravascular flow using DSA despite negative blood aspiration and negative flow study using live fluoroscopy. Of the positive flow studies reviewed, DSA nearly doubled the total number of intravascular needles (32) detected by live, real-time fluoroscopy (20) following negative aspiration. Furthermore, the rate of intravascular detection for live fluoroscopy (5.2%) (95% CI: 3.2% - 8.0%) and DSA (13.6%) (95% CI: 10.3% - 17.5) were significantly different (p<0.0001) when analyzed utilizing a test of marginal homogeneity, which suggests that the likelihood of detecting intravascular uptake is not the same between these two flow studies.

Discussion

Intravascular needle placement during CTFESI is not uncommon and inadvertent injection into the arterial blood supply of the cervical spine may create major morbidity. An early article by Furman MB, et al concluded through a prospective study of 504 cervical transforaminal epidural steroid injections that the overall rate of confirmed intravascular contrast injections was 19.4% when using real-time fluoroscopy. Another larger study by Nahm et. al., a total of 2145 transforaminal injections at different spine levels were performed with the overall incidence of intravascular injection being 10.5%. Of these intravascular injections, the most frequent incidence occurred with CTFESI at 20.6%. These studies used negative aspiration and contrast injection with
real-time fluoroscopy, but not DSA, to determine if intravascular injection had occurred.

In a recent prospective study by El Abd, et. al. of 150 patients receiving TFESI at the cervical, lumbar and sacral levels, DSA detected an additional 2.25% of intravascular needles over aspiration and real-time fluoro, all of which were detected in the sacral region.xvi

Digital subtraction angiography (DSA) is a technique that is widely available, but the use of this technology to enhance visualization of image-guided injections performed in pain clinics has been reported only intermittently. Based on the results of our study, one may speculate that the detection rate of intravascular needle placement could be significantly improved with DSA.

References


xii. James P. Rathmell et al., Injury and Liability Associated with Cervical Procedures for Chronic Pain. Anesthesiology 2011; 114:918-26


Tables/images

Right C6-7 Transforaminal epidural: Antero-posterior fluoroscopic imaging (left) and its corresponding digital subtraction image (right).

Disclosures

I declare that there are no conflicts of interest or support that may cause bias in my presentation.