



# Survey of current UK practice in use of fluoroscopy, contrast material and steroids in neuraxial injections

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Patients with chronic pain have received steroids in neuraxial blockade for many years. There has been recent controversy about their efficacy but also about the possibility of neurological complications associated with the use of particulate steroids such as methylprednisolone, triamcinolone and betamethasone. In particular, inadvertent intra-arterial injections of particulate steroids are thought possibly to lead to spinal cord ischaemia by blocking small arterioles and causing catastrophic neurological and other complications. The use of contrast has also been suggested to minimise inadvertent intravascular injection. The aim of this study was to investigate the current UK practice of the use of fluoroscopy, contrast medium and non-particulate steroids in neuraxial injections.

## Objectives

- To find out how many physicians performed facet joint injection (FJI), medial branch block (MBB), transforaminal epidural steroid injection (TFESI) or nerve root block (NRB) and interlaminar epidural injection (ILEI) in the cervical, thoracic and lumbar spinal levels, respectively.
- To find out how many physicians always used an X-ray image intensifier to confirm the position of the needle in the above procedures.
- To find out how many physicians always used a contrast medium to confirm position of the needle while performing the above procedures.
- To find out how many physicians used methylprednisolone, triamcinolone, betamethasone and dexamethasone in injections in the cervical, thoracic and lumbar spinal levels.
- To find out how many physicians would reconsider and use contrast

and non-particulate steroids after reading a given set of literature that emphasised the occurrence of inadvertent intravascular injection in cervical and lumbar injections and paralysis following use of particulate steroids in cervical and lumbar transforaminal epidural injections.

## Method

Clinicians were asked a set of questions about their practice of neuraxial injections in chronic pain. These questions were followed by a second set if the respondents chose to change their practice after reading abstracts of five articles focusing on the use of contrast-enhanced fluoroscopic guidance to prevent inadvertent intravascular injection and the use of water-soluble steroid preparation such as dexamethasone to prevent spinal cord infarction. There were 135 completed responses of which 85.8% (115) were by consultants.



## Results

More respondents performed injections in lumbar spinal level (around 85%) than in cervical or thoracic level (40%–60% depending on the type of injection).

We then derived the percentage of clinicians who used fluoroscopy and contrast material for a specific procedure at a spinal level. One hundred per cent of

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Table 1

## Type of steroid used by clinicians at different spinal levels

	Methyl-prednisolone	Triamcinolone	Beta-methasone	Dexa-methasone	Number of physicians responded
Cervical	31	36	1	62	105
Thoracic	52	53	2	27	110
Lumbar	69	76	2	24	131

respondents who performed FJI, MBB, TFESI or NRB at any spinal level always used X-ray image intensifier to position the needle. Only 80%, 76% and 67% used image intensifier for ILEI in the cervical, thoracic and lumbar spinal levels, respectively.

While more than 90% of clinicians used a contrast medium to confirm the position of the needle for a TFESI or NRB, less than 75% did the same for ILEI.

For the sake of simplicity, the clinicians were asked if they would use methylprednisolone, triamcinolone, betamethasone and dexamethasone at cervical, thoracic and lumbar levels instead of a specific procedure. They could choose more than one steroid at any spinal level (Table 1).

These results indicate that fewer physicians were injecting at the cervical and thoracic level at the time of the questionnaire. Since the clinicians could indicate more than one steroid used at a level of the spine, all one can surmise is that respondents were more likely to use dexamethasone in the cervical region (about 50% of total responses) than in the thoracic and lumbar region (about 20% of the responses). Due to the way this particular questionnaire was conducted it was impossible to tell whether, for example, respondents were currently using dexamethasone for NRB and particulate steroid for the MBB or FJI. This will be corrected in future study.

After the first set of questions, the respondents were asked to read the abstracts of the following publications:

1. Baker R, Dreyfuss P, Mercer S, Bogduk N. Cervical transforaminal injection of corticosteroids into a radicular artery: A possible mechanism for spinal cord injury. *Pain* 2003; 103: 211–15  
*'This observation warns operators to always perform a test injection of contrast medium, and carefully check for arterial filling using real-time fluoroscopy with digital subtraction.'*
2. Derby R, Lee S-H, Date ES, Lee J-H, Lee C-H. Size and aggregation of corticosteroids used for epidural injections. *Pain Medicine* 2008; 9: 227–34  
*'Until shown otherwise, interventionalists might consider using dexamethasone or another corticosteroid preparation with similar high solubility and negligible particle size when performing epidural injections.'*
3. Brouwers PJAM, Kottnik EJBL, Simon MAM, Prevo RL. A cervical anterior spinal artery syndrome after diagnostic blockade of the right C6-nerve root. *Pain* 2001; 91: 397–99
4. Sullivan WJ, Willick SE, Chira-Adisai W, Zuhosky J, Tyburski M, Dreyfuss P, et al. Incidence of intravascular uptake in lumbar spinal injection procedures. *Spine* 2000; 25: 481–6  
*'The overall incidence of intravascular uptake during lumbar spinal injection procedures as determined by contrast enhanced fluoroscopic observation is 8.5%. Preinjection aspiration failed to produce a flashback of blood in 74% of*

*cases that proved to be intravascular upon injection of contrast dye.'*

5. Lyders EM, Morris PP. A case of spinal cord infarction following lumbar transforaminal epidural steroid injection: MR imaging and angiographic findings. *American Journal of Neuroradiology* 2009; 30: 1691–3

The respondents were then asked if they would reconsider the use of contrast and steroids based on the information provided by the above articles. Only 21.5% (29) respondents changed their responses to the previous questions. Seven respondents who already used a contrast medium would now use it for other procedures as well. Three others who did not use a contrast medium before would consider using it for specific procedures in the future. Fourteen respondents said they would use dexamethasone only for procedures they performed; out of these, 11 had not used dexamethasone before. Of the nine who would use dexamethasone in addition to other steroids, five had not used it before.

## Discussion

Scanlon et al. (2007) noted that in the USA between 1998 and 2003, the number of cervical and thoracic TFESI almost doubled. They noted that at the time of their writing, 27 cases of brain and spinal cord infarction following TFESI were reported; their survey revealed a further 78 cases following a survey of around 1,400 physicians despite a response rate of approximately only

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21%. Depomedrone, a particulate steroid, was seven times more likely to have been used in cases where there was evidence of brain and spinal cord infarction than either triamcinolone or betamethasone. No cases were reported with dexamethasone; it could be argued this simply reflected a frequency of use rather than a propensity to cause problems. Tiso et al. (2004) showed that methylprednisolone and triamcinolone were more likely to aggregate than dexamethasone or betamethasone, sometimes up to 100µm in diameter on microscopic slides, which has the theoretical ability to block small arteries.

### Limitations

Only 135 clinicians responded to this survey, so the results of this survey are by no means a complete

representation of the practice all over the UK. In order to get a good number of responses, the questionnaire was simplified. We did not include caudal epidurals in the list of procedures, did not ask if real-time fluoroscopy was used and did not specify the procedures for choice of steroids. It is possible that the respondents could have interpreted the online questions differently, which would then affect the results. Multiple answers to several questions complicated data analysis.

### Conclusions

These brief results show that there is already a growing awareness of the possible problems associated with particulate steroids, which may explain the differential use of dexamethasone between the different areas of the spine. However, we can surmise that significant

numbers continue to use particulate steroids in the cervical region, including for TFESI or NRB, i.e. those procedures most implicated in causing problems.

The relatively small number of catastrophic neurological cases compared to the very large number of injections being performed, along with some laboratory and animal studies, has led to considerable controversy over whether clinicians should be using particulate steroids at all in their injections. However, the clinical efficacy of dexamethasone as an alternative non-particulate steroid has been questioned by some.

Should we be changing practice now or wait for clearer evidence of harm or otherwise from particulate steroids? Clearly this subject will continue to lead to clinical controversy and litigation for some time to come.

# Use of particulate steroids in neuraxial injections: a common but negligent practice?

Alice Nash *Barrister practising in clinical negligence at Hailsham Chambers*

The existence of a controversy over the efficacy and risks of a particular form of medical treatment raises the possibility that there may come a time when a practice that has been widespread is considered by the courts to constitute a breach of the clinician's duty of care to the patient. It seems likely that in the near future the courts will be asked to decide whether, in relation to the use of particulate steroids in neuraxial injections, that point has been reached.

Practitioners have a duty to keep up to date with developments in their field; they cannot cling blindly to a discredited practice. However, a clinician is not expected to read every article, nor immediately to put into practice every suggestion propounded therein.<sup>1</sup> In *Gascoine v Ian Sheridan & Co*<sup>2</sup> the judge

held that the defendant gynaecologist had a duty to keep himself informed of changes in practice through 'mainstream' literature, examples of which were 'leading textbooks' and the *Journal of Obstetrics and Gynaecology*. Demonstrating that a practice ought to be regarded as discredited, therefore, is

likely to depend not only upon the existence of studies calling its safety or efficacy into question, but on the extent to which those findings ought to have been known to the practitioner, who is not likely to have the same level of knowledge as a research scientist specialising in the field.