



The Use of Contrast in Caudal Epidural Injections under Image Intensifier Guidance: Is It Necessary?

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Background: We investigated the value of using contrast as an additional aid to confirm the accuracy of needle placement for caudal epidural injections under intraoperative image intensifier guidance.

Methods: A total of 252 consecutive patients were included in this study. Their mean age was 46.7 years (range, 32 to 76 years). There were 133 males (53%) and 119 females (47%) over a 12-month period.

Results: Of the 252 consecutive procedures, the contrast enhanced image intensifier confirmed accurate needle placement on first attempt in 252 cases (100%). Needle resiting following the infiltration of contrast was required in 0 case.

Conclusions: The results from this study demonstrate that a surgeon beyond the learning curve can accurately place caudal epidural injections using image intensification only, without the use of contrast.

Keywords: *Caudal anesthesia, Epidural injections, Spine, Fluoroscopy*

Chronic low back pain is a significant problem with a reported lifetime prevalence of up to 80%¹ and costs associated with disability, loss of function and treatments reaching tens of billions of United States dollars per annum.²

Epidural injections of local anaesthetic agents (with or without steroids) *via* the caudal, transforaminal or interlaminar routes are most widely used either as a treatment or as a diagnostic tool.¹ The procedure is commonly performed under sedation, with needle placement guided by intraoperative image intensification, with the use of contrast.

We propose that with an experienced clinician, needle placement for caudal epidural injections under intraoperative image intensifier guidance alone is of equal accuracy to insertion with the further aid of contrast.

METHODS

A prospective observational case series was conducted on 252 consecutive patients with low back pain referred to the Royal London Hospital (a tertiary orthopaedic referral centre) for a caudal epidural injection of corticosteroid. All patients who underwent the procedure in a 12-month period were included in this study.

All procedures were performed by an experienced orthopaedic spinal surgeon (AM) who was beyond the learning curve. The procedure was performed under sedation with the patient in the prone position, using chlorhexidine as skin preparation.

The skin folds of the buttocks were relied upon as the first guide in locating the underlying sacral hiatus which is usually 4 cm above the upper end of the natal cleft. With palpation, the clinician can feel the sacral cornua, and subsequently insert the needle into the required site.¹ This was performed by directing the needle 45° toward the skin and advancing the needle through the sacral hiatus until feeling of “give-away” was noted.³

Following this, an attempt of aspiration is performed and subsequently 1–2 mL of Omnipaque (GE Healthcare, Cork, Ireland) contrast is injected. Image intensifier X-ray is then taken to confirm the needle placement and distri-

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bution of contrast. If the needle was placed incorrectly, it would be adjusted or resited under image intensifier guidance.

For each procedure, we recorded the patient's demographics, the accuracy of needle placement and whether readjustment of the needle was required following the use of the image intensifier. The placement of the needle was considered accurate if the tip of the needle was within 2 cm of the distal end of the sacral canal.

We considered placing the needle tip within the epidural space of the distal sacral canal is sufficient to deliver the desired drug regardless of the direction of the needle tip.⁴⁾

RESULTS

The study included 252 consecutive patients with a mean age of 46.7 years (range, 32 to 76 years) There were 133 males (53%) and 119 females (47%) in this study conducted between September 2015 and September 2016. No patients were excluded from the study.

The contrast enhanced image intensifier confirmed that the position of the tip of needle is within the distal 2 cm of the sacral canal in 252 (100%) of the total consecutive patients. This was shown through contrast spread to L5-S1 disc level or above. Needle resiting was required in 0 case.

DISCUSSION

The image intensifier is a commonly employed device used with caudal epidural injections.

Needle placement without image intensifier guidance has been evaluated in several studies,^{5,6)} where incorrect placement was seen in 20%–38% of cases.⁷⁾ Since palpable landmarks alone has been shown to be inaccurate, experienced physicians require image intensifier guidance for resiting in up to 14% of cases.⁸⁾ Imprecise needle placement can account for inaccurate delivery of injectate,⁸⁾ inadequate analgesia, and thus procedure failure.⁹⁾ It is thought that the image intensifier will not only improve accuracy, facilitating improved outcomes, but also mitigate the complications associated with incorrect placement, which include subarachnoid puncture and an intrathecal or intravascular injection.

The use of contrast as an additional aid to confirm needle position is questionable. Experts argue the use of contrast further increases the accuracy of needle placement, and thus can improve procedure efficacy.⁹⁾

However, Manchikanti et al.⁷⁾ found correct needle

placement without contrast occurs with relative frequency, and similar results were supported by other studies.^{10,11)} Indeed this study has found no additional benefit to using contrast with the image intensifier. The disadvantages of using contrast are twofold; physiological and financial.

A number of complications have been reported with the commonly used contrast medium, Omnipaque (iohexol). It is well documented that delayed hypersensitivity reactions can occur following contrast administration, which can manifest as late as 48 hours post procedure.¹²⁾ Although mild and non-life-threatening, this can be distressing for the patients, since caudal injections are a day case procedure in the majority of patients and can lead to further hospital attendance.

More serious reactions have been reported including immunoglobulin E (IgE)-mediated anaphylactoid reactions.¹³⁾ Lee et al.¹⁴⁾ reported a severe anaphylactic reaction with its use. Brown et al.¹⁵⁾ reported on-table cardiac arrest following Omnipaque administration.

Other serious complications have been noted, which include lower-extremity myoclonic spasms, tonic seizure leading to status epilepticus, rhabdomyolysis and disseminated intravascular coagulation.¹⁶⁾

In addition to the serious complications of contrast, one needs to consider the financial cost of administration. The tertiary hospital in which this study was performed purchases the Omnipaque contrast at £20.80 per 50 mL vile. With one vile required for each patient, this has added an additional, potentially unnecessary cost of over £5,200. Costs are indeed magnified depending on the number of procedures per centre. When one considers that the procedure is performed by neurosurgeons and radiologists in addition to orthopaedic surgeons in some centres, the potential savings of not using contrast could be considerable.

We acknowledge that this study is limited chiefly by the trail design of an observational case series. The nature of this unblinded study introduces potential bias into the results. Furthermore, we acknowledge the impact of the experience of the performing surgeon on the results. This may not be the case for all practitioners, and therefore the results of this study may not be universally applicable. However, the purpose of this study is to introduce the idea that the use of contrast may not be necessary in every case, depending on the level of surgical experience.

In conclusion, the results of this study have shown the use of contrast to confirm the accuracy of needle position in a caudal epidural injection is unnecessary and adds no additional value in experienced hands. Of the 252 patients included in this study, the needle was accurately inserted under image intensification without the aid of

contrast on every occasion.

With equivalent accuracy between contrast and noncontrast guided injections, one needs to consider the necessity of contrast, given its high cost, both physiological and financial.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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