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LETTER

Creating Realistic Definitions of Clinically Significant Radiographic Lead Migration – A Response to "Migration of Epidural Leads During Spinal Cord Stimulator Trials" [Letter]

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Dear editor

I read with interest the retrospective study entitled "Migration of Epidural Leads During Spinal Cord Stimulator Trials" published in Journal of Pain Research.[1]

I would like to commend the authors for drawing attention to the underrecognised problem of lead migration during SCS trials. While lead migration has been reported as the most common complication of SCS and can result in failure to stimulate the intended area of the spinal cord with resultant loss of efficacy, lead migration during SCS trials presents a different set of challenges.[2] Firstly, response to stimulation may not yet have been established during an SCS trial and therefore lead migration may result in a false-negative SCS trial. Secondly, with the advent of paraesthesia-independent waveforms, loss of paraesthesia is now a poor marker of lead migration. Thirdly, many clinicians do not perform radiography at the end of the trial in order to confirm that lead migration has not taken place.[3] This is an important measure to facilitate subsequent surgical planning but also to out rule the presence of lead migration that can contribute to false negative and false-positive trials. If significant lead migration has taken place in the context of a negative trial, then consideration should be given to repeating the trial. Similarly, if there has been significant lead migration in the context of a positive trial, the clinician should consider the implications of this. It may be the case that the lead migrated immediately prior to the radiograph. If only one of two leads has migrated significantly, stimulation can still be delivered effectively on a single unmigrated lead. However, if the stimulation has been delivered on a lead that has migrated significantly, the contribution of a placebo effect resulting in a false-positive trial cannot be out ruled.

Defining what constitutes clinically significant lead migration is important in order to approach the problem correctly. The definition of clinically significant lead migration proposed by the authors of "greater than or equal to 50% of a full vertebral level" in at least one lead is problematic for a number of reasons.[1] First of all, 94% of participants in the study met this criterion, suggesting that this is a clinically expected degree of lead migration. All of these leads had migrated caudally. In practice, most physicians expect that there will be some caudal migration of percutaneous leads during a SCS trial and site their slightly higher leads to anticipate this. Secondly, the authors outline that "50% of a vertebral level would typically correlate with roughly 1 centimetre of migration assuming an average vertebral body and disc height of 24 mm in the mid- and lower thoracic spine". The distance covered by electrodes on SCS leads vary depending on the manufacturer; Nevro Octrode leads are 59 mm in length while Boston Scientific Linear 3–4 leads are 52 mm, Medtronic Vectris 3–4 leads are 52 mm and Abbott Quatrode 3–4 leads are 52 mm. If the midpoint of a 3–4 SCS lead (52 mm electrode coverage) was placed over the target area of stimulation (at 26 mm), lead migration of 10 mm would keep the target area easily inside the area of deliverable stimulation. Therefore, depending on the SCS lead employed, migration of at least 20 mm (or a full vertebral level) would be required in order to constitute clinically significant lead migration.

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Thirdly, as stated above, while one lead may migrate significantly during a trial, if two leads have been sited, stimulation can often be delivered on the remaining unmigrated lead, depending on the waveform and the configuration of leads.

I would suggest an alternative definition for clinically significant radiographic SCS lead migration of "lead migration of all leads outside the intended area of stimulation". For ease of rapid clinical decision-making, this would typically correspond to migration of approximately half the distance covered by the electrodes of a standard length octopolar SCS lead (52–59 mm) which is at least a full vertebral level in the thoracic spine or two vertebral levels in the cervical spine.[4,5] Investigating the incidence of clinically significant radiographic lead migration at the end SCS trials is an important scientific endeavour, especially as it may affect trial success, however, creating realistic definitions of lead migration is an essential step in this process.

Disclosure

The author reports no conflicts of interest in this communication.

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