TRIPLE LEADS WITH LONGITUDINAL GUARDED CATHODES IN SPINAL CORD STIMULATION-EFFECT OF TRANSVERSAL LEAD SEPARATION

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1 Introduction

In spinal cord stimulation (SCS) clinical practice, longitudinal guarded cathode (±++) stimulation by a single lead, placed on the spinal cord midline provides the broadest paresthesia coverage [1, 3]. Suboptimal lead placements and lead migrations result in changes in paresthesia locations with the inability to be corrected postoperatively. Dual-lead longitudinal tripoles and triple lead transverse tripoles (TTS) provide the necessary mediolateral control over the dorsal column (DC) activated area by steering the cathodal and lateral anodal currents respectively. Dual lead longitudinal tripoles placed symmetrical to the spinal cord midline however recruit a smaller width of DC area [2] and with the transverse tripoles the area of activation remains limited [4]. This study uses a triple lead longitudinal tripole with the center lead placed on the midline. The transversal spacing between the leads is varied to study its effect on the usage range (UR) and the recruited area (both depth and width) of dorsal column activation.

2 Methods

Triple aligned leads were modeled with longitudinal guarded cathode configurations (center lead placed on the SC midline) for various transversal lead separations (1.0, 1.5, 2.0 and 2.5 mm). Medio-lateral field steering was performed with the left and the midline lead for various variable anodal current ratios (VAS). Usage range (UR) and the maximum recruited DC area ($S_{RA}$) were determined for all cathodal current ratios (CCR).

3 Results

A smaller transversal lead separation recruited a larger depth (D) and width (W) of DC area. The triple lead configuration with 1mm transversal separation had the maximum and least varying $S_{RA}$ and UR for the whole range of CCRs.

4 Conclusions

Triple leads with longitudinal guarded cathodes provide more post-operative flexibility in covering a larger W of the DCs. The transversal separation between the leads is a major determinant in the area and distribution of paresthesia. Leads with a smaller transversal separation activate a larger DC area.

References


