

INM in Spastic Cerebral Palsy & Tethered Cord Syndrome



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Selective dorsal rhizotomy (SDR) and tethered cord surgery (TCS) are commonly performed pediatric surgeries. SDR is a procedure used to reduce spasticity in patients with spastic cerebral palsy. TCS, on the other hand, can be associated with several types of spinal dysraphism. Since it is important to preserve sacral function in those surgeries, intraoperative neurophysiologic monitoring (INM) has been widely used for identifying nerve roots and preventing development or progression of symptoms.

SDR is based on the assumption that sensory rootlets that mainly contribute to the spasticity elicit abnormal motor response upon electrical stimulation. It was first performed by Fasano et al. and modified by Warwick J. Peacock. Before the procedure, needle electrodes are placed in both lower extremities including thigh adductors (L2-4), quadriceps femoris (L2-4), tibialis anterior (L4-5), short head of biceps femoris (L5-S1), Gastrocnemius (S1-2), and external anal sphincter (S2-4). Free-running EMG, somatosensory evoked potential, motor evoked potential, bulbocavernosus reflex and triggered EMG are usual monitoring modalities. Stimulation of the dorsal rootlets is performed with square wave pulse of 0.1 ms and is applied as a 30- to 50-Hz stimulus for 0.5 to 1 second. Decremental and squared responses are considered normal, while other responses including the activation of muscles outside of the nerve root territory are considered abnormal. It is important to note that rootlets associated with anal sphincter be spared.

In TCS, the purposes of INM are 1) monitoring and preserving sacral function and 2) mapping of the filum terminale. Muscles to be sampled are quadriceps femoris (L2-4), tibialis anterior (L4-5), extensor hallucis longus (L5-S1), hamstrings (L5-S2), gluteus maximus (L5-S2), and medial gastrocnemius (S1-2). Common monitoring modalities are same as those of SDR.