Selective dorsal rhizotomy for spastic diplegia

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Selective dorsal rhizotomy (SDR) is often recommended for children with spastic paraparesis and cerebral palsy. SDR reduces spasticity in the lower extremities for these children with spastic paraplegia. However, SDR is infrequently recommended for adults with spasticity. Spastic diplegia in adult patients can be due to stroke, brain or spinal cord injury from trauma, infection, toxic-metabolic disorders, and other causes. Although rarely considered, SDR is an option for adult patients with spastic diplegia as well.

Long-term outcomes of selective dorsal rhizotomy have been promising among the Archer et al., institutional series of patients.

They demonstrated the use of L1-S1 osteoplastic laminoplasty and L1-S1 selective dorsal rhizotomy in a 5-year-old male patient with cerebral palsy and spastic lower extremity diplegia. Favorable selection criteria for this case included disabling lower extremity diplegia, young age, good core strength, no cognitive delay, and strong rehabilitation potential. The patient's preoperative functional status was noncommunity ambulator (Gross Motor Function Classification System Level III) with walker use and good dynamic balance. Prior to the procedure, he demonstrated an overall decreased muscle strength in bilateral lower extremities with bilateral hamstring spasticity (Modified Ashworth Scale 3) and bilateral heel cord spasticity (Ashworth 4). Rhizotomy was performed with identification and selective sectioning of dorsal nerve roots with abnormal stimulation patterns. Fibers with unsustained discharge of appropriate muscles were identified and spared. No intraoperative or postoperative complications were encountered. The patient had minimal back pain and surgical morbidity postoperatively. Following the procedure and highly structured inpatient and outpatient rehabilitation therapies, the patient exhibited significant improvement in gait velocity (84%) and gait cadence (66%) at 5 months. Additionally, the patient demonstrated greater independence of activities of daily living and improvements in mobility by Pediatric Evaluation Disability Index.Patient consent was obtained from the parent [1)].

In a longitudinal study 19 ambulant patients with spastic diplegia due to cerebral palsy (CP) or other causes (mean age at Selective dorsal rhizotomy: 6.6 ± 1.6 years)were assessed four times: pre-Selective dorsal rhizotomy (SDR), 2 years post- SDR, 5 years post-SDR and at least 10 years post-SDR. From 2D video recordings, Edinburgh Visual Gait Score and lower limb joint kinematic parameters were calculated.

Data show that the improvement in the gait pattern obtained short-term after SDR continues during into adolescence and adulthood. Ten years after SDR all patients improved compared to baseline. Considering the lower limb joint kinematics, most notable improvements were found at knee and ankle joints. Compared to the evaluation before SDR, the range of motion of the knee increased: the knee was more extended at initial contact and knee flexion in midswing improved. Excessive ankle plantar flexion was reduced during the entire gait cycle. Only minor changes were found at hip and pelvis. Eight patients underwent additional orthopaedic surgery in the years after SDR, and the

present findings should be considered as a combination of SDR, development and additional treatment.

Romei et al., demonstrate lasting improvement of gait quality in ambulant patients with spastic diplegia who underwent SDR during childhood when they become adolescents and young adults [2].

Eppinger et al., describe a patient who underwent a SDR with a successful postoperative outcome. This man suffered a hypertensive and hemorrhagic stroke secondary to intravenous drug abuse at age 46. A SDR was performed after two failed intrathecal baclofen pump placements due to recurrent infections, likely resulting from his immunocompromised status. The patient underwent lumbar laminectomies and dorsal rhizotomies at levels L1-S1 bilaterally. Postoperatively, the patient's spasticity was significantly reduced. His Ashworth spasticity score decreased from 4/5 to 1/5, and the reduction in tone has been durable over 3 years [3].

References

1)
Archer J, Yaacoub AP, Angulo-Parker F, Fritsch G, Riner S, Coon A, Johnson SK, Delima S, Jea A, Raskin JS. Pre- and Postoperative Gait Analysis and Video for Selective Dorsal Rhizotomy in Spastic Diplegia: 2-Dimensional Operative Video. Oper Neurosurg (Hagerstown). 2018 Dec 27. doi: 10.1093/ons/opy392. [Epub ahead of print] PubMed PMID: 30590806.
2)
Romei M, Oudenhoven LM, van Schie PEM, van Ouwerkerk WJR, van der Krogt MM, Buizer AI. Evolution of gait in adolescents and young adults with spastic diplegia after selective dorsal rhizotomy in childhood: A 10 year follow-up study. Gait Posture. 2018 Jun 4;64:108-113. doi: 10.1016/j.gaitpost.2018.06.002. [Epub ahead of print] PubMed PMID: 29894977.
3)
Eppinger MA, Berman CM, Mazzola CA. Selective dorsal rhizotomy for spastic diplegia secondary to stroke in an adult patient. Surg Neurol Int. 2015 Jun 25;6:111. doi: 10.4103/2152-7806.159382. eCollection 2015. PubMed PMID: 26167363; PubMed Central PMCID: PMC4496840.