IFSSH Scientific Committee on Cerebral Palsy

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IFSSH Cerebral Palsy Scientific Committee Report

Treatment of the upper extremity manifestations of cerebral palsy continues to be a focus of ongoing research with over 150 articles published on this topic during 2014. Several recent advancements are highlighted for this committee's report.

Therapy Protocols

Whether insults to the CNS occur due to malformations, ischemia, or parenchymal lesions, therapy interventions continue to be developed and refined based on the adaptive plasticity of the central nervous system (CNS). Constraint induced movement therapy (CIMT) and bimanual hand therapy are two examples.[1]

Motion lab and biomechanics

Use of the motion lab to describe and further define the kinematics of the movement disorder continue to develop. The dynamic pattern of cerebral palsy upper limb motion is highly variable, mainly in relation to the location and the extent of the central nervous system injury. Current clinical methods of upper limb evaluation are made in terms of function, motor control, sensory impairments, dexterity, tone, degree of fixed versus dynamic deformity, and passive and active range of motion. In the higher functioning child, the quality of upper limb movement during several functional tasks is quantified using available clinical scales. Classification using the Manual Ability Classification System (MACS) evaluates the child's ability to handle objects in daily activities, and parallels the Gross Motor Function Classification System used for lower extremity assessment in cerebral palsy.

In order to better understand upper limb kinematic anomalies, several upper limb kinematic protocols have been developed. The linking of specific associated movements to a single joint deformity implies that treatment aiming at the correction of that single impairment will have an effect on all degrees of freedom involved in these associated movements.[2] The differentiations between a true impairment and a compensatory movement are, therefore, essential for the planning of treatment for multiple dynamic deformities. Associated compensatory movements should not be mistaken for separate impairments, as they do not need treatment. Dynamic trunk, shoulder or elbow kinematics anomalies in children with mild hemiplegia involvement could be related to a compensatory movement strategy. Indeed, in patients with lack of available ROM of the distal joints (the forearm and the wrist), additional degrees of freedom are integrated in the movement strategy in the proximal joints to perform the daily living tasks as described in adults hemiplegic. Proximal kinematic anomalies around the trunk, shoulder or elbow should therefore not be treated first but should be reconsidered after treatment of forearm and wrist limitations.[3]

Biomechanical studies about in vivo wrist torque in hemiplegic patients showed that despite distal tenotomy, the wrist flexors muscles still contribute to the flexion torque at the wrist through myofascial force transmission.[4] The therapeutic consequences are that when a surgeon performs a distal tenotomy, a release from the surrounding fascia of the involved muscle should always be associated for an optimal result.

Dynamic EMG analysis coupled with video is still a useful tool in order to characterize patterns of muscle spasticity for tendon transfer planning. A good voluntary phasic control makes a muscle candidate for a tendon transfer.

Timing of treatments

Recent publications claim for early interventions. Hand function assessment in the first years of life, and its evolution over time, combined with neuroimaging and cortico-spinal projection patterns in children with unilateral cerebral palsy showed an improved prediction of prognosis in young children.[5] Early treatments could shape future rehabilitative strategies based on the neurobiology and the therapy-induced changes seen in the brain.[6] These studies suggest that the first 2 years of life are a critical period during which non-surgical interventions could be more effective than in later life. [7] New evaluation tools of hand function in small children with CP, 8-18 months, have recently been introduced and may facilitate implementation of early interventions.[8, 9]

Surgical Treatment

Surgical treatment has been compared to botulinum toxin and regular ongoing therapy for children with spastic hemiplegic CP who are candidates for surgical intervention using a randomized surgical trial; surgery had greater improvements in functional use related to better joint positioning (better wrist extension and forearm supination).[10] Some authors have cautioned against doing tendon transfers in CP before adolescence because of the risk of overcorrection, especially at the wrist.[11] Spastic muscles, such as the Flexor Carpi Ulnaris, have been shown to have a reduced growth potential and may hence become tight when the child grows.[12] A wrist fixed in extension will limit the ability of releasing objects which may be very disabling. Lastly, the indications for surgical intervention have been evaluated, questioning whether bodily impairment measures such as active range of motion, or whether functional evaluations, are more appropriate.[13]

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