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The physical and functional outcomes after ultrasound guided intramuscular botulinum toxin injections in ambulatory children with cerebral palsy attending to a multidisciplinary tertiary care center

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Hypertonia is one of the major manifestations and affects the movement and posture of children with cerebral palsy (CP). Evidence-based interventions for hypertonia include the administration of botulinum toxin (BoNT-A) with adjunctive therapy. Administration of BoNT-A, an adjunctive to physiotherapy interventions has demonstrated a significant improvement in gait pattern, range of motion of muscles as well as functional abilities. This study aimed to investigate the physical and functional outcomes of ultrasound-guided BoNT-A injections for lower limb hypertonia in ambulatory children with CP, Gross Motor and Functional Classification System (GMFCS) level I, II, and III. This retrospective study was conducted using the medical records at Ayati center, of the children with CP who received lower limb BoNT-A injections. Besides, these children have received evidence-based interdisciplinary interventions such as physiotherapy, and occupational therapy and have been referred to devices such as Ankle Foot Orthoses along with serial casting, and tone-managing medications. The Modified Tardieu Scale (MTS) and the Edinburg Visual Gait analysis (EVG) were done to assess the physical outcome and the Gross Motor Function Measure (GMFM-66) and the GMFCS level were assessed for the functional outcome before and after BoNT-A treatment. Seven children (4 males and 3 females) with CP were included. The age range was 23 to 118 months (mean 62 ± 31.37 months). Most of the children had bilateral involvement (85.7%) and had diplegic topographical distribution (42.9%). Twenty-eight percent had quadriplegic CP. Distal injections for foot deformity were given on 3 occasions (42.9%), while multilevel injections targeting the muscles of the three joints, hip, ankle, and/or knee were given on 4 occasions (57.1%). Participants with good functioning according to their GMFCS level were more likely to receive a distal, rather than proximal injection. The most common injected site was the plantar flexor muscles for dynamic foot deformity (28.6%). The second most commonly injected site was the hip adductor muscles and the knee flexor muscles. The Modified Tardieu Scale of hip adductors, hamstrings, and plantar flexors has improved after BoNT-A treatment, but these changes were not statistically significant. The mean EVG scores on the right leg were 12.86 (± 5.367) before treatment and 10.43 ± 4.894 after treatment. The mean ± SD of EVG scores on the left leg was 14.57 ± 6.37 before treatment, and 12.0 ± 4.08 after treatment. There was a statistically significant mean reduction in the EVG score on both sides ($p<0.05$). There was a significant improvement in mean GMFM-66 scores from 54.72 (± 10.44) before the BoNT-A treatment, to 61.61 (± 13.27) after treatment ($p<0.01$). GMFCS level following treatment improved in 28.6% of the participants and has not changed in five participants. There is a significant improvement in the functional outcomes of children with ambulatory CP who received BoNT-A adjunctive to physiotherapy interventions.

Keywords: Cerebral palsy, Hypertonia, Botulinum toxin, Functional outcomes, EVG, GMFM

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