**Table 1: Use of BTA for Management of Spastic Equinus (Toe-walking)**

| Title of Study (Authors) | Description of Study | Outcome | Level of Evidence |
|---|---|---|---|
| BTA neuromuscular blockade in the treatment of lower extremity spasticity.<br>(Koman et al., 2000) | • Randomized* double-blind** trial in 114 children with CP and spastic equinus<br>• Treatment = **BTA or saline into calf** | • BTA group improved gait up to 12 weeks post injection<br>• No serious side effects were noted | I |
| Double blind study of BTA into the gastrocnemius muscle in patients with cerebral palsy.<br>(Sutherland et al., 1999) | • Randomized double blind trial of 20 children with cerebral palsy and equinus<br>• Treatment = **BTA or saline into the calf muscle**(gastrocnemius) | • Improvement in ankle movement on gait analysis<br>• No adverse events | I |
| Randomized double blind placebo controlled trial of the effect of BTA on walking in CP.<br>(Ubhi et al., 2000) | • Randomized double-blind trial in 40 children with CP, spastic diplegia or hemiplegia<br>• Treatment = **BTA or saline into calf muscle** | • Improvement in walking found on Gross Motor Function Measure and on gait analysis in the BTA group | I |
| BTA versus fixed cast stretching for dynamic calf tightness in cerebral palsy.<br>(Flett et al., 1999) | • Randomized single blind study of 20 children with CP and equinus<br>• Treatment = **BTA into calf or serial casting** | • Both groups had similar improvements<br>• Parents favoured BTA over casting | II |
| BTA compared with stretching casts in the treatment of spastic equines.<br>(Corry et al., 1998) | • Randomized trial of 20 children with CP and equinus<br>• Treatment = **BTA into calf or serial casting** | • Both groups improved ankle motion during gait<br>• BTA group had longer lasting effects (12 weeks) and fewer side effects | II |
| BTA neuromuscular blockade in the treatment of equinus foot deformity in cerebral palsy: a multi-center, open-label clinical trial.<br>(Koman et al., 2001) | • Prospective study evaluating long term safety and efficacy of repeated BTA injections<br>• 155 of 207 children with spastic equinus completed at least one year | • Improvements in gait were maintained in 41 to 58% of children at 2 years<br>• Adverse effects related to the treatment included stumbling, leg cramps, and calf atrophy<br>• One child had a serious adverse event with self-limited generalized weakness | IV |

* Randomized = The participants in the study are assigned randomly to either the intervention group or the control group.

** Double-blind = A research design in which the participant and the person doing the assessment do not know if the participant is in the control group or the intervention group.

### Table 2: Use of BTA in Other Leg Muscles

| Title of Study (Authors) | Desrcription of Study | Outcome | Level of Evidence |
|---|---|---|---|
| Evaluation of botulinum toxin A therapy in children with adductor spasm by Gross Motor Function Measure. (Mall et al., 2000) | • Prospective study of 18 children with CP with adductor (hip muscle) spasm<br>• Treatment = **BTA into adductor muscle (hip) and/or hamstring injection** | • Improvements in tone, range of motion, and GMFM scores | IV |
| Botulinum toxin A in hamstring spasticity. (Corry et al., 1999) | • Prospective study of 10 children with CP who had dynamic hamstring spasticity likely requiring orthopaedic surgery in the future<br>• Treatment = **BTA in hamstrings muscles** | • Improvement in hamstring flexibility, knee extension during gait, and speed of walking | IV |
| Botulinum toxin in the management of the lower limb in cerebral palsy. (Cosgrove et al., 1994) | • Propsective study of 26 children with spastic CP with involvement in the lower extremity<br>• Treatment = **BTA into calf and/or hamstrings muscles** | • Decrease in muscle tone<br>• Inreased range of motion and flexibility at the ankle and/or knee<br>• Improved walking<br>• Increased knee extension during gait | IV |
| Treatment of cerebral palsy with botulinum toxin: evaluation with Gross Motor Function Measure. (Yang et al., 1999) | • Prospective study on 38 children with spastic CP in lower extremities<br>• Treatment = **BTA into calf and/or hamstrings muscles** | • Improvements in tone and walking distance<br>• Improvements in gross motor function<br>• No difference in quality of gait | IV |
| BTA in the management of spastic gait disorders in children and young adults with CP: a randomized, double-blind study of "high-dose" vs. "low-dose" treatment. (Wissel et al., 1999) | • Randomized*, double blind**, controlled study on 33 children with spastic diplegia or hemiplegia<br>• Treatment = **Multilevel = BTA into calf and a second level**(hamstrings, hip adductor or hip flexor) using a high or low dose | • Dose-development improvements in tone, active and passive range of motion at ankle, improved stride length and speed of walking<br>• Improvements in active and passive range of motion at knee found in both the high and low dose groups | I |

* Randomized = The participants in the study are assigned randomly to either the

intervention group or the control group.
** Double-blind = A research design in which the participant and the person doing the assessment do not know if the participant is in the control group or the intervention group.

**Table 3: Use of BTA in the Upper Extremity**

| Title of Study (Authors) | Description of Study | Outcome | Level of Evidence |
|---|---|---|---|
| • Botulinum toxin A in the hemiplegic upper limb: a double-blind** trial. (Corry et al., 1997) | • Randomized*, double blind, controlled study of 14 children with hemiplegia • BTA into multiple spastic arm muscles | • Improvement seen in range, tone, grasp, and cosmetic appearance • Decreased ability to pick up coins | I (evidence for improvement in tone, range and cosmetic appearance but not function) |
| • An evaluation of BTA to improve upper extremity function in children with hemiplegia. • (Fehlings et al., 2000) | • Randomized trial of 30 children with hemiplegia • BTA into multiple spastic arm muscles | • Improvement found in function in the BTA group | I (evidence for improvement in upper extremity function) |
| • Botulinum A chemodenervation: a new modality in cerebral palsied hands. • (Wall et al., 1993) | • Prospective study of 5 children with hemiplegia • BTA into adductor pollicis muscle plus splinting | • Improvement in the cosmetic appearance and function of the hand was seen in all 5 children (rated by a blinded panel) | IV |
| • Botulinum toxin in the treatment of cerebral palsy. • (Denisilc & Meh, 1995) | • Prospective study of 10 children with CP • BTA into multiple muscles in the arm | • 9 out of 10 children improved function/tone | IV |
| • Effects of BTA on upper limb spasticity in children with cerebral palsy. • (Friedman et al., 2000) | • Prospective study of 32 children with CP • BTA into multiple spastic arm muscles | • Improvement seen in tone | IV (evidence for reduction in tone) |
| • BTA as an adjunct when planning hand surgery in children with spastic hemiplegia. • (Autti-Ramo et al., 2000) | • Prospective study of 8 children with hemiplegia • BTA into multiple spastic arm muscle | • 5 of the 8 children met treatment goals, with improvement in grasp and bimanual function | IV |

* Randomized = The participants in the study are assigned randomly to either the intervention group or the control group.

** Double-blind = A research design in which the participant and the person doing the assessment do not know if the participant is in the control group or the intervention group.

**Table 4: Use of BTA with Individuals with Traumatic Brain Injury**

| Title of Study (Authors) | Description of Study | Outcome | Level of Evidence |
|---|---|---|---|
| Botulinum toxin in severe upper extremity spasticity among patients with traumatic brain injury: An open labeled trial. (Yablon et al., 1996 | • Prospective (before-after) study of 21 individuals with a traumatic brain injury and related upper extremity spasticity, aged 16-54 years (9 individuals were treated less than one year after the injury)<br>• Treatment = BTA into multiple muscles in the upper extremity and therapy including casting | • Both groups (acute and chronic) had increased range at the wrist and decreased spasticity<br>• Decreased pain during range of motion, and improved positioning and hygiene | IV |
| Botulinum toxin type A in the treatment of upper limb spasticity among patients with traumatic brain injury. (Pavesi et al., 1998) | • Prospective (before-after) study of 6 individuals with traumatic brain injury and related upper extremity spasticity, aged 18-42 years<br>• Spasticity had been present for 4-6 months.<br>• Treatment = **BTA into multiple muscles in the upper extremity** plus casting | • Increased range of motion and decreased spasticity were found<br>• Improvements in functional arm use were reported based on clinical evaluation<br>• Decreased pain | IV |
| Botulinum toxin treatment of lumbrical spasticity: A brief report. (Palmer et al., 1998) | • Prospective study of a 19-year-old male who had a traumatic brain injury and related wrist and hand spasticity. He was two years post injury.<br>• Treatment = BTA into the lumbrical muscles of the left hand (from the index to the little finger) | • Decreased spasticity in the hand (lumbrical muscles)<br>• No change in hand function<br>• Hygiene more easily preformed on the left hand | IV |
| Kinematic changes following botulinum toxin injection after traumatic brain injury. (Wilson et al., 1997) | • Prospective (single-subject) study of a 19-year-old male who had a traumatic brain injury and related lower extremity spasticity.<br>• The individual was two years post-injury.<br>• Treatment = BTA into calf muscle | • Improvements seen in walking pattern - walking speed increased, and movement at the ankle and knee improved<br>• No difference in range of motion | IV |