

STATIC NIGHT SPLINTS MAY INFLUENCE FUNCTIONAL OUTCOME IN THE HEMIPLEGIC UPPER EXTREMITY OF CHILDREN FOLLOWING BOTULINUM TOXIN A INJECTIONS

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INTRODUCTION

Botulinum Toxin A (BtA) injections have been widely used to manage upper extremity spasticity in hemiplegic children and therefore to improve functional motor abilities. However these beneficial effects are relatively short lived, despite intensive, post-injection occupational therapy. Splints may be used in addition to therapy in order to passively stretch contracted agonist or in dynamic functional situations. The purpose of this study was to investigate the necessity and effectiveness of a night static hand splint following BtA treatment of the upper extremity in hemiplegic cerebral palsy (CP) children.

METHODS AND MATERIAL

Population of the study

- 20 children with spastic hemiplegia
- Age: 3 – 12 years old (mean 6,8 yrs)
- Selection criteria

All the children received BtA injections at the upper extremity
All children received occupational therapy at least 3 times per week in the post – injection period.

Methods

- Botulinum toxin A was injected into at least two muscles of the upper extremity including a forearm group ie: pronator teres, brachioradialis, adductor pollicis.
- Quality of Upper Extremity Skills Test (QUEST) was assessed at baseline, 2 and 6 months post botox.
- Comparisons
Group A (10 children) wearing night splint
Group B (10 children) without splinting

Splint Description

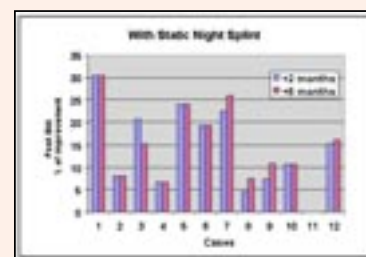
- Material: thermoplastic
- Advantages: lightweight, durable, easy to modify, has "memory"
- Position: - wrist in 20-30 degrees flexion
- thumb in abduction
- fingers slightly extended
- splint covers 2/3 of forearm
- is stabilized with velcros



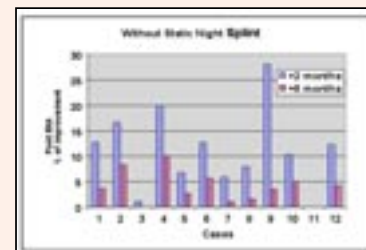
Results

Both groups showed an improvement in the function of the injected extremity at two months post BtA. Group A (splint group) showed a 15, 4 % difference from baseline, whereas group B (non-splint group) had an average 12, 2 % improvement. These were not statistically significant. At 6 months, group A still maintained a 15, 9 % improvement in function, compared to group B which differed only by 4, 2 % from pre- BtA baseline. These differences were significant by student's t test. The improvements that were noted as measured by the QUEST were increased range of motion of isolated movements in the shoulder, elbow, wrist and fingers, improved grasping and releasing of an object with thumb opposition, improved coordination of the body during ambulation, increased weight-bearing through the hemiplegic hand and improved protective reactions (in particular anterior and lateral) with extension of the elbow.

| Diagnosis | AGE | Quest Pre-Botox | SPLINT | Quest 2mos-POST | Quest 6mos-POST | % of improvement | |
|----------------|-----|-----------------|--------|-----------------|-----------------|------------------|-------------|
| | | | | | | +2 mos | +6 mos |
| 1 Hemiplegia | 9 | 56 | ✓ | 73 | 73 | 30,4 | 30,4 |
| 2 " | 5 | 87 | ✓ | 94 | 94 | 8,0 | 8,0 |
| 3 " | 2,5 | 39 | ✓ | 47 | 45 | 20,5 | 15,4 |
| 4 " | 8 | 74 | ✓ | 79 | 79 | 6,8 | 6,8 |
| 5 " | 11 | 71 | ✓ | 88 | 88 | 23,9 | 23,9 |
| 6 " | 5 | 73 | ✓ | 87 | 87 | 19,2 | 19,2 |
| 7 " | 5 | 58 | ✓ | 71 | 73 | 22,4 | 25,9 |
| 8 " | 9 | 66 | ✓ | 69 | 71 | 4,5 | 7,6 |
| 9 " | 2,5 | 82 | ✓ | 88 | 91 | 7,3 | 11,0 |
| 10 " | 12 | 84 | ✓ | 93 | 93 | 10,7 | 10,7 |
| Average | | | | | | 15,4 | 15,9 |



| Diagnosis | AGE | Quest Pre-Botox | SPLINT | Quest 2mos-POST | Quest 6mos-POST | % of improvement | |
|----------------|-----|-----------------|--------|-----------------|-----------------|------------------|------------|
| | | | | | | +2 mos | +6 mos |
| 1 Hemiplegia | 5 | 55 | ☐ | 62 | 57 | 12,7 | 3,6 |
| 2 " | 7 | 60 | ☐ | 70 | 65 | 16,7 | 8,3 |
| 3 " | 7 | 85 | ☐ | 86 | 85 | 1,2 | 0,0 |
| 4 " | 8 | 60 | ☐ | 72 | 66 | 20,0 | 10,0 |
| 5 " | 5 | 74 | ☐ | 79 | 76 | 6,8 | 2,7 |
| 6 " | 11 | 71 | ☐ | 80 | 75 | 12,7 | 5,6 |
| 7 " | 4 | 85 | ☐ | 90 | 86 | 5,9 | 1,2 |
| 8 " | 8 | 63 | ☐ | 68 | 64 | 7,9 | 1,6 |
| 9 " | 5 | 57 | ☐ | 73 | 59 | 28,1 | 3,5 |
| 10 " | 9 | 78 | ☐ | 86 | 82 | 10,3 | 5,1 |
| Average | | | | | | 12,2 | 4,2 |



CONCLUSIONS

Static night upper extremity splints are well tolerated by hemiplegic children who were treated with BtA injections to reduce spasticity. Night splints, together with appropriate OT therapy may help to initially enhance and then maintain functional gains from BtA treatment of the hemiplegic upper extremity for at least 6 months thereafter.

REFERENCES

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2. Fess E.E, Kiel J.H. Treatment of Occupational Performance Areas (Neuromuscular treatment: upper Extremity Splinting) In *Occupational Therapy*, 9th Edition, 1998, pg.406-21.