Evidenced Based Therapeutic Intervention for Children and Youth with Neonatal Brachial Plexus Palsy

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Introduction

Neonatal Brachial Plexus Palsy (NBPP) results in transient or permanent weakness of the affected arm. The incidence of NBPP is 1-4 per 1,000 live births -- whereas the persistence of disablements related to affected arm function can be as high as 40%.

Some children do well with conservative management while others can profit from surgical reconstruction. Regardless, occupational therapy services are instrumental for maximizing the recovery of function in NBPP children with NBPP.

Therefore, knowledge of evidence-based therapy interventions throughout child development is critical for optimal treatment of these children.

Objective

To educate occupational therapists regarding appropriate treatment strategies for NBPP from birth to the transition to adulthood.

Methods and Materials

Various patient related research derived from the interdisciplinary clinic at Michigan Medicine are included. A continuum of care for therapists to consider during their treatment of children with NBPP.

Discussion

Intervention methods to maximize the recovery of patients with NBPP include therapy and surgical interventions. Primary nerve surgery needs to occur within the first year of life with optimal timing around 6 months of age. Therapy services begin as early as first day of life with initiation of range of motion exercises when medically safe. Additional therapy interventions include initiation of NMES at 3 months of age. Referrals to other providers are imperative at various time points. Treatment interventions not included in the research by Michigan Medicine which is utilized by treating therapists includes the following: constraint therapy, serial casting, splinting, and Kinesiotaping. Additional interventions that are imperative which have not been studied include: splinting in intrinsic plus position, suspension, proprioceptive input, and weight bearing.

Conclusions

Interdisciplinary clinics are important for the treatment of NBPP (16). Therapists are charged with providing evidenced-based intervention for children with NBPP. In addition to standard patient assessment, utilization of appropriate outcome measures designed for NBPP should be included by therapists to measure progress over time (5). Timely referrals to additional providers such as speech therapy, physical therapy, orthotics, psychology, neurosurgery, orthopedic surgery, and hand surgery should be considered and initiated.

Acknowledgements

All studies were IRB approved.

Results: Chart 1 (Interventions for First Year of Life)

Months	Intervention	Evidence
0-12+	Begin PROM	Begin when medically cleared Parents prefer digital format over paper for home programs (15) Performing range of motion improves active shoulder rotation/abduction (15)
>1	Refer for EMG	EDX is reliable for determining nerve root function except C5 (18) Prediction of NBPP is best at 1 month (14)
1-2	Evaluate for Phrenic Nerve Palsy	Phrenic nerve palsy ipsilateral in 2.4% of which 75% require plication not related to severity (2) Can impact oral feeding skills and weight gain
1-9	Initiate NMES	A review of the literature indicates beginning use of NMES at 3 weeks to 4.5 months of age (13) A RCT study indicates home use of NMES to biceps on >1 muscle grade has greatest effect on elbow flexion in first month (Justice, in progress)
2-9	Address Torticollis	Torticollis incidence is 43% (55/128) and ipsilateral in 98% (54/55) not related to severity (11)
3-6	Primary Nerve Surgery	3-6 months of age is typical for nerve graft surgery (23, 26) 3.3% patients require primary nerve surgery (21)
3-12	Monitor for Plagiocephaly	Positional plagiocephaly was present in 64% (18/28) patients (22)
3-168	Litigation	47% of patients mean age 53 months are in active litigation with pursuit related to lack of physician communication (10) 46% of the patients who had primary nerve surgery were in litigation cases (9)
12+	Persistence of NBPP	NBPP is weakness continues beyond 12 months of age and is more likely to persist in patients who were delivered vaginally (8)

Results (Chart 2) Interventions Beyond First Year of Life

Years	Intervention	Evidence
1-18	Continue Range of Motion	Repeat instruction for shoulder exercises (17) Use of DVD for self and active range of motion
2-3	Speech and Language Delay Referral	Speech and language delay occurs in 30% of patients with NBPP whereas typically developing is 14% (7)
2-4	Screen for Posterior Shoulder Subluxation	Prevalence of posterior shoulder subluxation is 20% among NBP and is confirmed with ultrasound and OT assessment with presence of 5/8 criteria of shoulder dysfunction (12)
5-9	Hand Dominance Development	Limb preference: 93% with left BPP preferred right and 17% with right BPP preferred right which is not related to severity (25)
9-11	Address Impaired Hand Sensation	Tactile and spatial perception and stereognosis deficits of the NBPP hand is prevalent (3)
10-17	Evaluate Quality of Life	Quality of life is an important consideration for those with NBPP in terms of function and aesthetics. NBPP adapt and accept their condition better than those with acquired conditions (20)
10-17	Consider Body Image Deficits	Standard outcome measures fail to capture NBPP specific topics of functionality, sensory, physical appearance, compensation or preference of arm, explaining of deficits to others, self-esteem and body image as determined from semi-structured interviews (6)
10-17	Self-Determination Skills	NBPP ability to transition to adulthood is similar to age matched peers however at school there are less opportunities when compared to home (1)
10-17	Involve in Medical Decision Making	Adolescents should be involved in decision making regarding the long-term sequelae of their NBPP (19)
11-17	Address Proprioception of Elbow	Elbow proprioception of 9-17 year old is 40% impaired in patients with NBPP (4)

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References

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- Other references available upon request.