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Long Term Gait, Mobility, and Daily Living Outcomes after Orthopedic Surgery for Youth with Cerebral Palsy: Influence of Rehabilitation Dose and Setting

Christina Bourantas
DePauw University

Nancy Lennon

Tim Niller

Jason Beaman

M Wade Shrader

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Christina Bourantas[1], Nancy Lennon[2], MS, PT, Tim Niiler[2], PhD, Jason Beaman[3], MPT, M Wade Shrader[2], MD

Departments of [1]Biomedical Research, [2]Orthopedics, and [3]Rehabilitation, Nemours/A.I. duPont Hospital for Children, Wilmington, DE, USA

INTRODUCTION

- Cerebral palsy (CP) is a broad diagnostic description of early brain insult causing motor impairment with an incidence of 2.5-3 per thousand
- 60-70% of youth with CP are ambulatory and many undergo orthopedic surgery to help correct gait abnormalities. The standard of care is to correct multiple malalignments in a single event multi-level surgery (SEMLS).
- SEMLS is most commonly used in youth to avoid multiple invasive surgeries at young ages. Additionally, when youth are young or already been through a SEMLS, they may have another "low burden" surgery.
- After surgery and most importantly SEMLS, rehabilitation is very important to recovery. A good rehabilitation plan should be part of the treatment plan when recommending SEMLS to a patient.
- **The purpose of this study** was to examine the effects of post-op rehab therapy on functional mobility outcomes for children with CP.

METHODS

- IRB-approved retrospective study
- Inclusion criteria:
  - CP diagnosis
  - Surgery at A.I. duPont Hospital for Children (AIDHC) (1/1/15 to 1/1/19)
  - Baseline gait analysis and post-op gait analysis
  - Rehab therapy from either Nemours or outside center
- Orthopedic surgery with one or less osteotomies was classified as low burden, while surgeries with two or more osteotomies were classified as high burden.
- Outcome measures were collected from the two gait analyses and include:
  - Gait deviation index (GDI)
  - Walking speed
  - Pediatrics Outcomes Data Collection Instrument (PODCI)
  - Functional mobility scale (FMS)
  - GMFM-D
- Post-op rehab therapy data were collected in EPIC by searching PT documentation, shared notes from outside therapy centers, and CP Clinic notes.
- Post-op rehab therapy defined by number of sessions 0-12 months after surgery and by the therapy setting
- There were four different therapy settings:
  1. Inpatient rehab at AIDHC
  2. Comprehensive Outpatient Rehab Program (CORP) at AIDHC
  3. Outpatient therapy at Nemours
  4. Outpatient therapy at an outside therapy center
- Statistical analysis:
  - 2-way ANOVA was used to test for differences in results based on therapy
  - Welch t-test to compare # of days for those who improved vs. those who did not

PATIENT SAMPLE

- 74 cases met the inclusion criteria
- Average age (years):
  - Baseline gait analysis= 11.54
  - Surgery= 12.00
  - Post-op gait analysis= 13.30
- Average time (months):
  - Between baseline gait analysis and surgery= 5.00
  - Between surgery and post-op gait analysis= 15.09

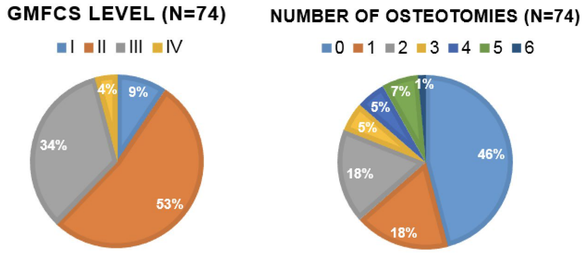

Figure 1: Sample Characteristics

RESULTS

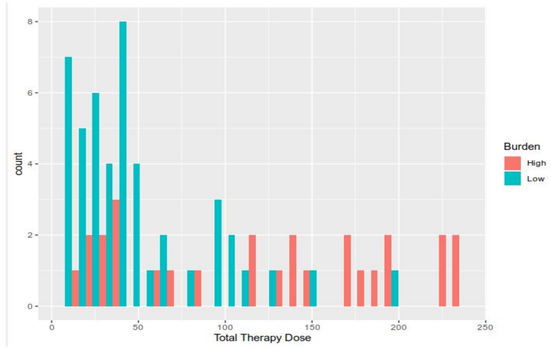

Figure 2: Total number of therapy sessions

Post-Op Rehab Therapy Setting	Number of Cases (n=74)
Inpatient Rehab Only	2
CORP Only	1
Outpatient Therapy Only	43
Inpatient Rehab & CORP	2
Inpatient Rehab & Outpatient Therapy	5
CORP & Outpatient Therapy	1
Inpatient Rehab, CORP, & Outpatient Therapy	20
TOTAL	**74**

Table 1: Therapy setting

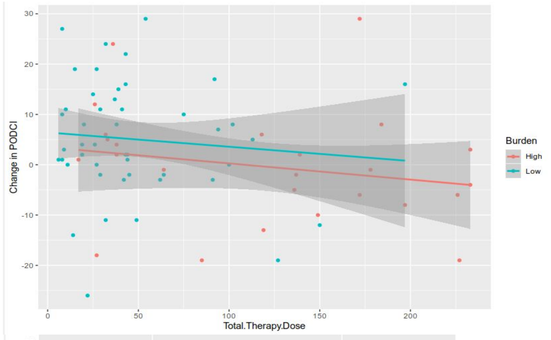

Figure 3: Change in PODCI vs. total therapy

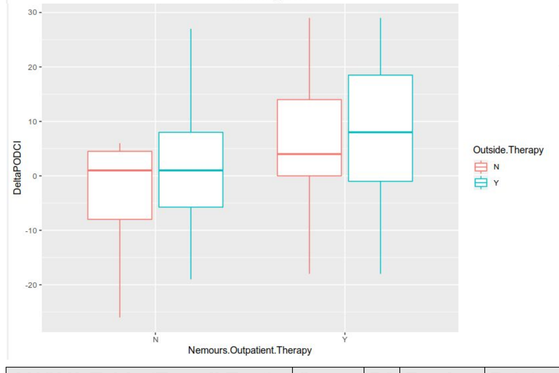

Figure 4: ANOVA for therapy setting and PODCI

ANOVA Table (Type II Test)	Sum Sq	Df	F value	Pr(>)
Nemours.Outpatient.Therapy	1111.4	1	8.3304	0.004508**
Outside.Therapy	148.5	1	1.1133	0.293159
Nemours.Outpatient.Therapy: Outside.Therapy	69.6	1	0.5215	0.471400

Table 2: ANOVA for therapy setting and PODCI

RESULTS (continued)

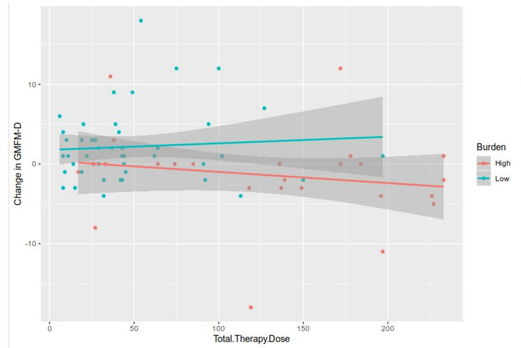

Figure 5: Change in GMFM-D vs. total therapy

(# of sessions)	Improvement	No Improvement	P-value
No osteotomies			
Velocity	39.5	50	0.4195
GMFM-D	46.0	25	0.0167*
Mean GDI	48.0	31.75	0.1226
PODCI	37.9	54.4	0.2408
≥2 osteotomies			
Velocity	98.25	131.57	0.311
GMFM-D	104.9	139.8	0.2341
Mean GDI	111.6	138.9	0.3864
PODCI	88.3	150.0	0.0422

Table 3: Threshold Analysis

DISCUSSION

- Surgical outcomes are well documented in literature, but Rehab outcomes are not.
- Clinical practice recommends rehab therapy after SEMLS, but is inconsistent.
- Post-op PT varied widely by setting and number of sessions.
- Youth who had low burden surgery had less post-op PT, compared with youth with high burden surgery.
- The lack of knowledge about post-op rehab therapy makes it difficult to counsel families and develop a treatment plan when discussing surgical options.

LIMITATIONS

- Incomplete access to rehab therapy data from outside centers
- Missing information from therapy reports
- Our analysis did not include content of therapy sessions
- Youth who undergo high burden surgery may not fully recover by one year post-op

CONCLUSION

There is high variability in post-op rehab therapy which contributes to inconsistent outcomes after SEMLS in youth with CP. Post-op rehab therapy is important to achieve functional outcomes after surgery. We found a positive influence of therapy setting on PODCI gains and number of therapy sessions on GMFM-D improvements.

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