Location of Involvement in Pediatric Patients with Cerebral Palsy and the Relationship to Development of Scoliosis: A Retrospective Cross-Sectional Analysis

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INTRODUCTION

- Scoliosis is a spinal abnormality secondary to curvature of the spine
- The three main forms of scoliosis are idiopathic, congenital, and neuromuscular
- Cerebral palsy (CP) is a non-progressive injury to the premature brain and is the most common cause of spasticity in pediatric patients that can require medical intervention to assist in improving functional status and mobility.
- Cerebral palsy can be classified based on
  - Gross motor functional abilities from I (functional ambulator without any deficit) to V (dependent for any type of mobility)
  - Location affected from hemiplegic, diplegic, triplegic, and quadriplegia
  - Symptoms secondary to location of brain injury (spastic, dyskinetic, ataxic, mixed).
- Spasticity secondary to CP can lead to contractures without medical interventions and result in hip subluxation, hip dislocation, and a neuromuscular scoliosis

- **Objective:** To determine if pediatric patients with cerebral palsy (CP) with a quadriplegic type of CP have a stronger correlation of developing scoliosis compared to other types of CP

METHODS

- **Design:** Retrospective cross-sectional study
- **Setting:** Tertiary Pediatric Rehabilitation Outpatient Clinic
- **Participants:** 500 subjects were identified by an informatics search from a quality improvement project classifying patients with cerebral palsy. 494 subjects met inclusion criteria, and those were analyzed to determine factors associated with increased radiographic Cobb angle measurements
- **Main Outcome Measures:**
  - Cobb angle measurement analysis by radiographic imaging of spine and orthopedic surgery evaluation
  - Location of CP involvement
  - Age
  - Weight
  - Gross Motor Functional Classification System

RESULTS

- Using an analysis of variance, a statistically significant difference in Cobb angle ($p<0.0001$) was found between quadriplegic patients (mean 42.7*, standard deviation $\pm$32.9*) compared to hemiplegic (9.1*, $\pm$3.9*), diplegic (13.5*, $\pm$6.9*), and triplegic (17.7*, $\pm$16.2*) patients after controlling for both weight and age.
- Individually, there is a moderate correlation observed ($p< 0.001$, $r=0.40$) between increasing age and increased Cobb angle
- However, no statistically significant correlation related to weight.
- Patients with GMFCS level V had greater Cobb angles compared to all other GMFCS levels ($p<0.05$).
- Using a Spearman correlation between hip dysplasia and Cobb Angle showed no significant correlation ($p=0.1022$)

CONCLUSION

- In comparing patients with CP, those with quadriplegic involvement or GMFCS level V patients had an increased amount of scoliosis compared to those with different locations of involvement or improved functional mobility.

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