Cervical Spinal Stenosis in Adults with Cerebral Palsy – A Hidden Epidemic?

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Introduction
- Cerebral Palsy (CP) is the most common disability of childhood (2-4 per 1000 live births) [1].
- The prevalence of adults with CP is rapidly increasing due to advances in medical care (> 500,000 in U.S.) [2].
- CSS has been described primarily in ataxic and dystonic variants of CP [3][4].
- CSS can lead to loss of ambulation, upper extremity dysfunction, and incontinence.
- There is minimal information on CSS in spastic CP patients [5].
- CSS is likely undiagnosed in CP patients – accurate diagnosis of CSS is hindered by the underlying spasticity and upper motor neuron lesion signs that are often present in cases of CP.
- The prevalence of symptomatic CSS among CP patients is currently unknown, and there is a dearth of literature on the possible patient characteristics associated with CSS for CP.

Study Objective
- Describe the incidence of CSS in a cohort of adult patients with CP, and to report on the patient factors associated with symptomatic CSS.

Materials and Methods
- Study Design: Retrospective cohort study conducted at a single institution with a dedicated CP clinic.
- Participants: Consecutive adult patients with CP treated between 1/1/2006 and 12/31/2016.
- Data source: Chart review.
- Inclusion Criteria: Diagnosis of cerebral palsy and age > 18 years old.
- Exclusion Criteria: None.
- Statistical Analysis: Continuous and categorical variables were compared using independent sample t-test and Chi-squared test, respectively. Analyses were two-tailed and statistical significance was assumed at p < 0.05.

Results
- N= 424 (mean age 33.3±13.5 years; 53% female; >50% with spastic CP).
- 32 patients (7.5%) developed CSS.
- 28 patients (88%) with CSS had spastic CP (Table 1).
- Patients with CSS had significantly higher mean age and BMI and were significantly more likely to be diagnosed with depression and to use benzodiazepines, antispastics, and analgesics (Table 3).
- Patients with CSS were significantly less likely to be diagnosed with a neurological comorbidity, to undergo non-spine orthopedic surgery, and to use anticonvulsants (Table 3).
- No associations found between CSS and sex, height, weight or Gross Motor Function Classification System (GMFCS) level.

Conclusions
- This is the largest series to report the incidence of symptomatic CSS in a cohort of adult patients with CP.
- Adults with CP are at risk for developing CSS.
- CSS can lead to deterioration in function, incontinence, and pain if left untreated.
- The incidence of CSS described herein is likely underestimated due to the difficulty of diagnosis, communication impairment in CP patients, and attribution of CSS symptoms to CP itself.
- Several factors are identified as being associated with CSS in CP patients – these findings indicate that depression evaluation is important in CSS patients and that benzodiazepine, antispastic, and analgesic use should be examined further in these patients.
- Given the mean age of CSS patients (54.5 years) and the high incidence of CSS in this cohort (7.5%), we propose implementing active cervical X-ray screening for CSS in all CP patients over 50 years of age.
- Further research is necessary to identify the pathophysiology of CSS development and to identify causal relationships for risk factors that lead to the development of CSS in patients with CP.

References