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 athetoid 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 underdiagnosed 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).
- CSS patients presented with a variety of clinical symptoms (Figure 1).
- The most common levels of stenosis were: C5-C6 (59%), C4-C5 (56%), and C6-C7 (53%) (Table 2).
- 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.

References

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Table 1

CP Type	No. of Patients
Spastic	28 (88%)
Athetoid	1 (3%)
Spastic/Dystonic	1 (3%)
Spastic/Athetoid	2 (6%)

Table 2

Stenosis Level	No. of Patients
C2/C3	2 (6%)
C3/C4	14 (44%)
C4/C5	18 (56%)
C5/C6	19 (59%)
C6/C7	17 (53%)

Figure 1

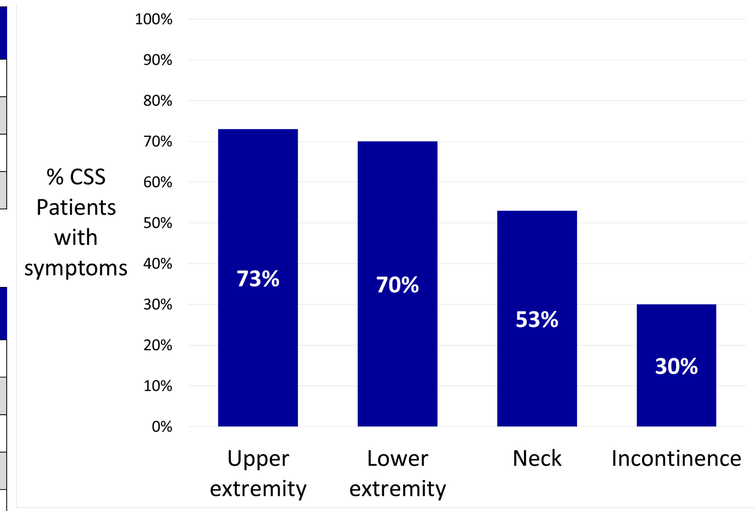

Table 3

Risk Factors	Patients with CSS	Patients without CSS	*p* -value
Age	**54.5**	31.6	< 0.05
BMI	**26.1**	23.4	
Depression	**40.6%**	20.4%	
Neurologic Comorbidity	9.4%	**32.4%**	
Non-spine Orthopedic Surgery	31.3%	**57.9%**	
Benzodiazepine Use	**37.5%**	16.6%	
Antispastic Use	**40.6%**	18.9%	
Analgesic Use	**46.9%**	17.6%	
Anticonvulsant Use	9.4%	**27.3%**	

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.