5-Year Retrospective Study: Relationship Between Cervical Spine Whiplash Injuries and Demyelinating Diseases in the Pediatric Population

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Introduction

Case-controlled studies have suggested a link between cervical spine trauma and demyelinating diseases, such as multiple sclerosis (MS), whereas cohort studies have not supported these findings.[1]A case report has described rapid-onset MS following whiplash in an adult with a family history of demyelinating disease.[2]

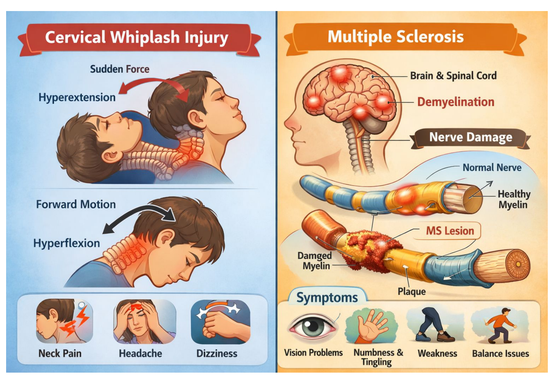
The relationship remains unclear and there is a paucity of data examining it in the pediatric population, which has whiplash as the most common cervical spine injuries.[3-5] We conducted this study to investigate whether such a relationship exists to better identify risk factors for MS and potentially guide earlier treatments.

We hypothesized an association of demyelinating disease in pediatric patients with history of cervical spine whiplash.

Aims and Objectives

1. Evaluate the relationship exists between whiplash and the subsequent development of demyelinating disease in pediatric patients.

2. Determine whether affected patients had a predisposition for a demyelinating disease based on family history.



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Methods

Eelectronic medical record at Corewell Health William Beaumont University Hospital, was queried for patient encounters from 01/2019-01/2024. Inclusion criteria were age 10–16 years, suspected cervical spine whiplash, and cervical spine MRI performed post-injury. Patients <10 or >16 years old, without cervical spine MRI, or with a prior history of demyelinating disease were excluded. International Classification of Diseases, 10th Revision (ICD-10) codes for cervical spine sprain, subluxation, dislocation, and related sequelae were used to identify a whiplash diagnosis.

63 patients met inclusion criteria. Their charts were reviewed using the keywords hyperintensities, demyelination, numbness, and tingling to identify clinical or radiographic features of demyelinating disease.

1° variables: age, sex, MRI and Computed Tomography (CT) findings, time from accident to symptom onset, demyelinating symptoms, family history of demyelinating disease, other trauma, neurological history, and treatment. 2° variables: additional past medical and family history.

Descriptive statistics were used to summarize demographics, clinical characteristics, and outcomes as counts and percentages. Given the retrospective design and small sample size, no inferential analyses were performed. All analyses were conducted using Microsoft Excel 2024 (Microsoft, Redmond, WA)

Results

Median and mean patient ages were 13.0 years and 13.1 years, respectively. 52% of patients were female.

Total patients	63
Median age (Years)	13.0
Mean age (Years)	13.1
Gender	
Female	52.3% (n = 33)
Male	47.6% (n = 30)

Table 1: Patient demographic data including age and gender reported with mean and median values for continuous data, and raw values and percentages provided for categorical data.

The cohort had 87 documented past medical diagnoses, including but not limited to allergies, heart abnormalities, scoliosis, and nausea. 4 patients had a history of depression, 4 had a headaches, and 3 had concussion. No patients demonstrated clinical or radiographic evidence of demyelinating disease. One patient had a hyperintensity on cervical spine MRI consistent with ligament sprain, and another had a hyperintensity on cervical spine CT consistent with subarachnoid hemorhage. 58.7% of patients did not have a documented family history of disease. Those with documented family history had a range of unrelated 66 diagnoses; diabetes, heart failure, anxiety, headaches, and hyperlipidemia. Most frequent diagnoses; diabetes (n = 13), asthma (n = 12), cancer (n = 11), hypertension (n = 10), and stroke (n = 6). None of these patients demonstrated a family history of demyelinating disease.

Finding	Number of Patients (n)	Notes
Evidence of demyelinating disease	0	
Hyperintensity on cervical spine imaging	2	One on CT (subarachnoid hemorrhage); one on MRI (acute interspinous ligament sprain)

Table 2: Clinical and radiographic findings regarding possible demyelinating disease.

Past Medical History	Result	Notes
Total diagnoses	87	This included a very wide range of diagnoses, with no more than four patients having the same diagnosis.
Family History		
No documented family history	58.7% (n = 37)	
Total diagnoses	66	No evidence of family history of demyelinating disease for any patient.

Table 3: Medical and family histories documented within patient charts, used to evaluate for possible predisposing factors related to demyelinating disease.

Conclusions

We found no cases of demyelinating disease in pediatric patients experiencing cervical spine whiplash injuries within a five-year period in study.

Although consistent with several large cohort studies, the complexity of demyelinating disease requires further research to clearly delineate these relationships in the pediatric population. Investigation with larger, prospective cohort studies with enhanced longitudinal follow-up will help to account for the interplay of trauma, genetic predisposition, and environmental risk factors that impact the development of demyelinating disease.

References

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