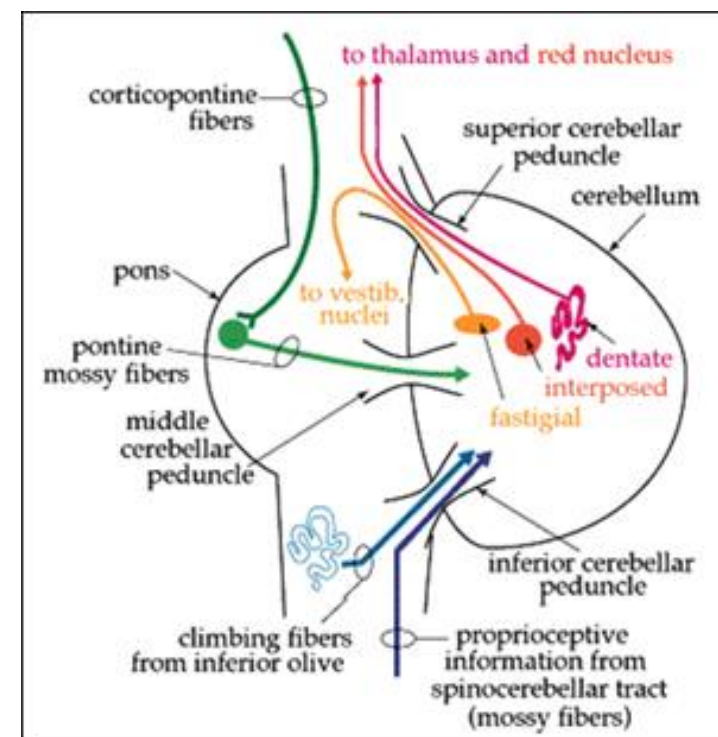


The Relationship between Multiple Sclerosis and Middle Cerebellar Peduncle Lesions: An Exploratory Study

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Introduction

- Cerebellar involvement has been implicated in many MS symptoms.¹
- The middle cerebellar peduncle (MCP) contains afferent fibers relaying messages from the cortex through the pons to the cerebellum along the cortico-pontine-cerebellar tract.²



- Lesioned MCPs may impair information transfer to the cerebellum in MS patients:
- Decreased cerebellar functional connectivity⁴
- Working memory impairment⁵
- More falls⁶
- Cerebellar ataxia⁷
- Clinical impairment based on Kurtzke EDSS functional system scores⁸

- To our knowledge, only one study has investigated the prevalence of MCP lesions in MS patients.⁸
- Differential diagnosis of MCP lesions is broad², but prevalence of MS in patients with MCP lesions, regardless of diagnosis, has not been investigated.

Methods

Study 1: Prevalence of MCP lesions in MS patients

- Retrospective chart review of patients at Loyola University Medical Center (LUMC) with any MS diagnosis between 2010 and 2014.
- Radiological reports and attending neurology interpretation used to determine if MCP lesion was present at any given encounter.
- If no MCP lesion was reported, T2-weighted MRI was first reviewed by the medical student for focal hyperintensities, followed by secondary review by the attending neurologist.

Study 2: Prevalence of MS in patients with MCP lesions

- Retrospective chart review of LUMC patients with any intrinsic MCP lesion in radiological reports of MRI or CT imaging between 2007 and 2015. Patients were excluded if etiology was attributed to mass effect from adjacent tumor.

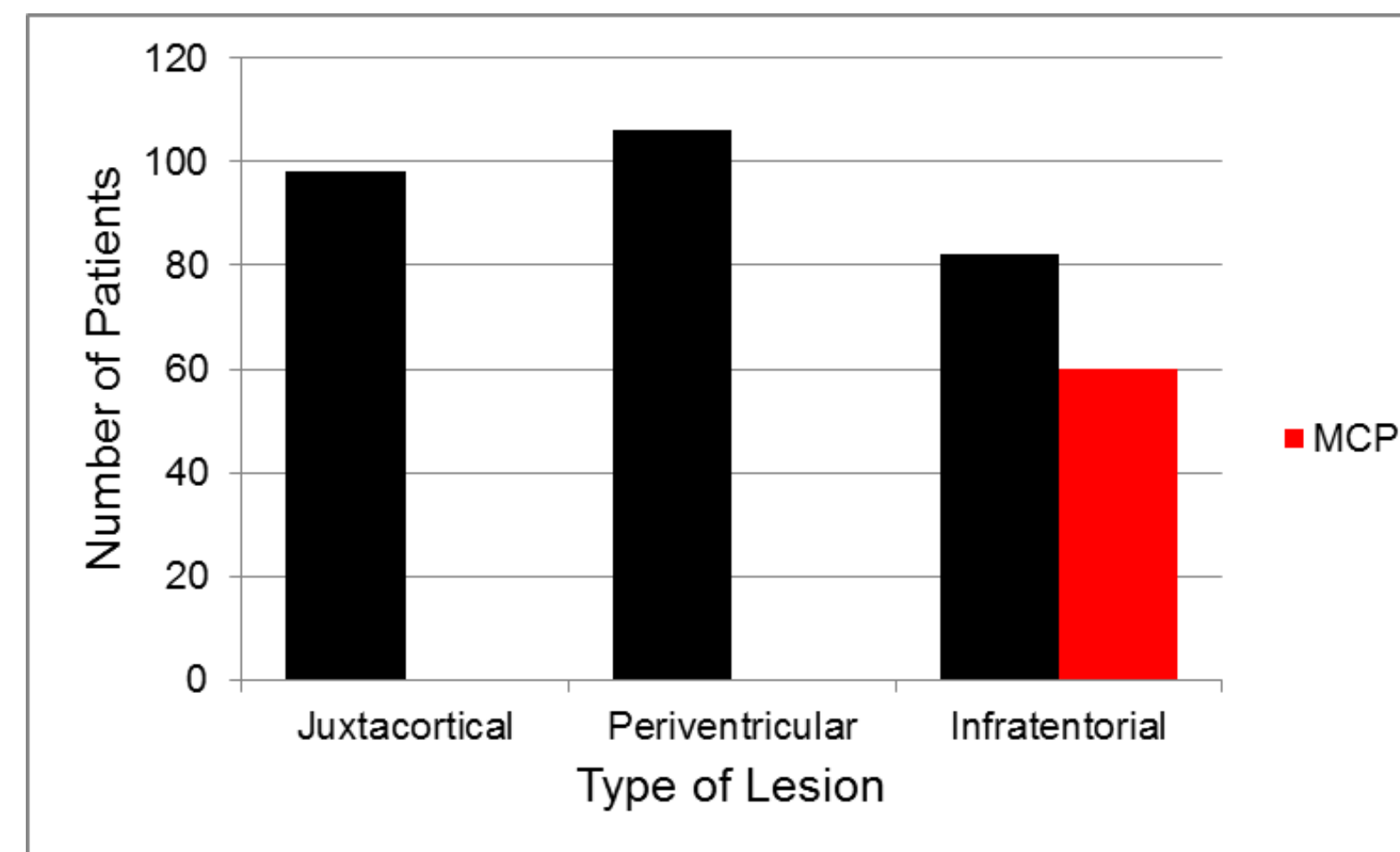
Results

Characteristics	N, %
Mean age at time of diagnosis (years)	34.8 (17-62)
Sex	
Male	29 (26.6%)
Female	80 (73.4%)
Race	
Caucasian	74 (67.9%)
African American	23 (21.1%)
Other	12 (11.0%)

Results

Study 1:

- 109 MS patients met study criteria.
- Over half (55%) of patients possessed an MCP lesion.
- 18.3% (n=11) of patients with MCP lesions were not identified specifically as such in radiological reports.



Study 2:

Characteristics	N, %
Mean age at time of lesion (years)	54.6 (9-97)
Sex	
Male	59 (41.5%)
Female	83 (58.5%)
Race	
Caucasian	93 (65.5%)
African American	39 (27.5%)
Other	10 (7.0%)

- 142 patients met study criteria.
- MS accounted for 37.3% of MCP lesions.
- Vascular etiologies accounted for 26.8% of lesions, over half of which were related to chronic ischemic changes.
- Other: metastatic disease, cavernous malformation most common

MRI

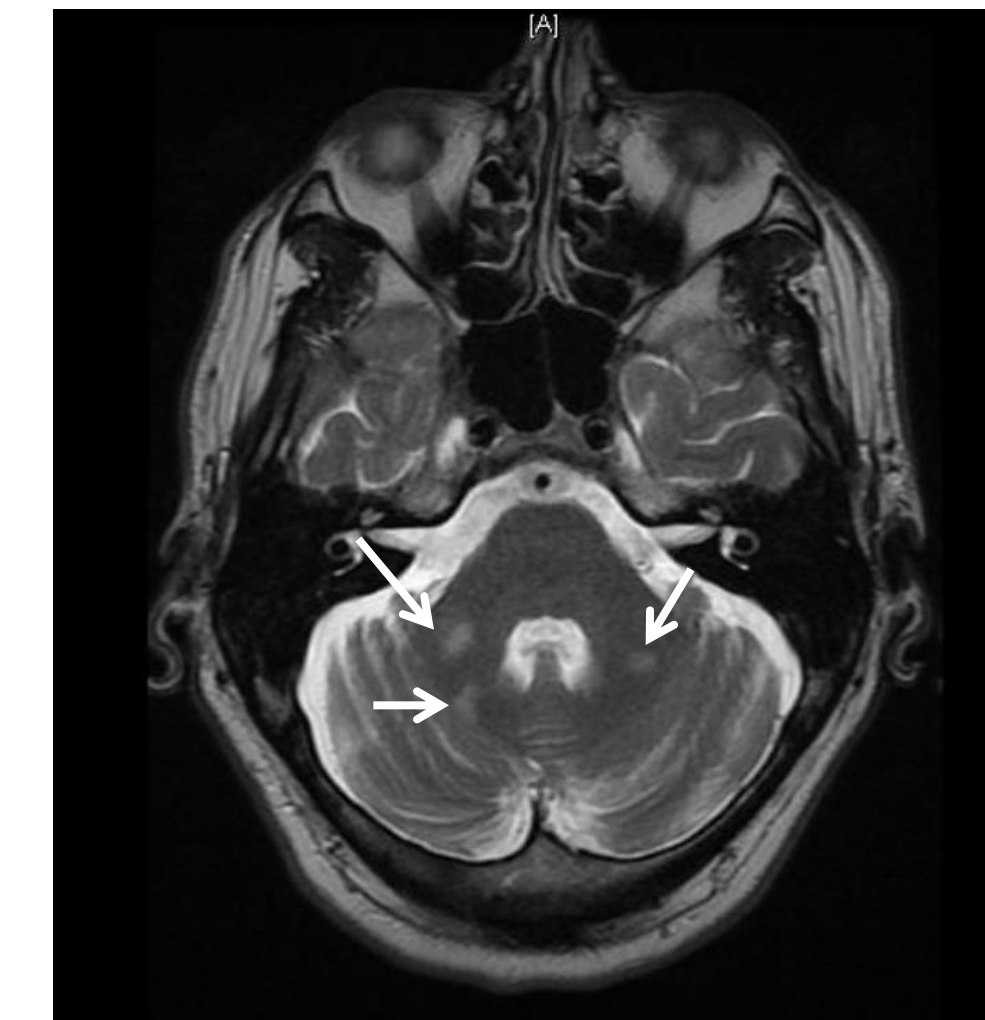


Image 1. Brainstem of 50 y/o MS patient.

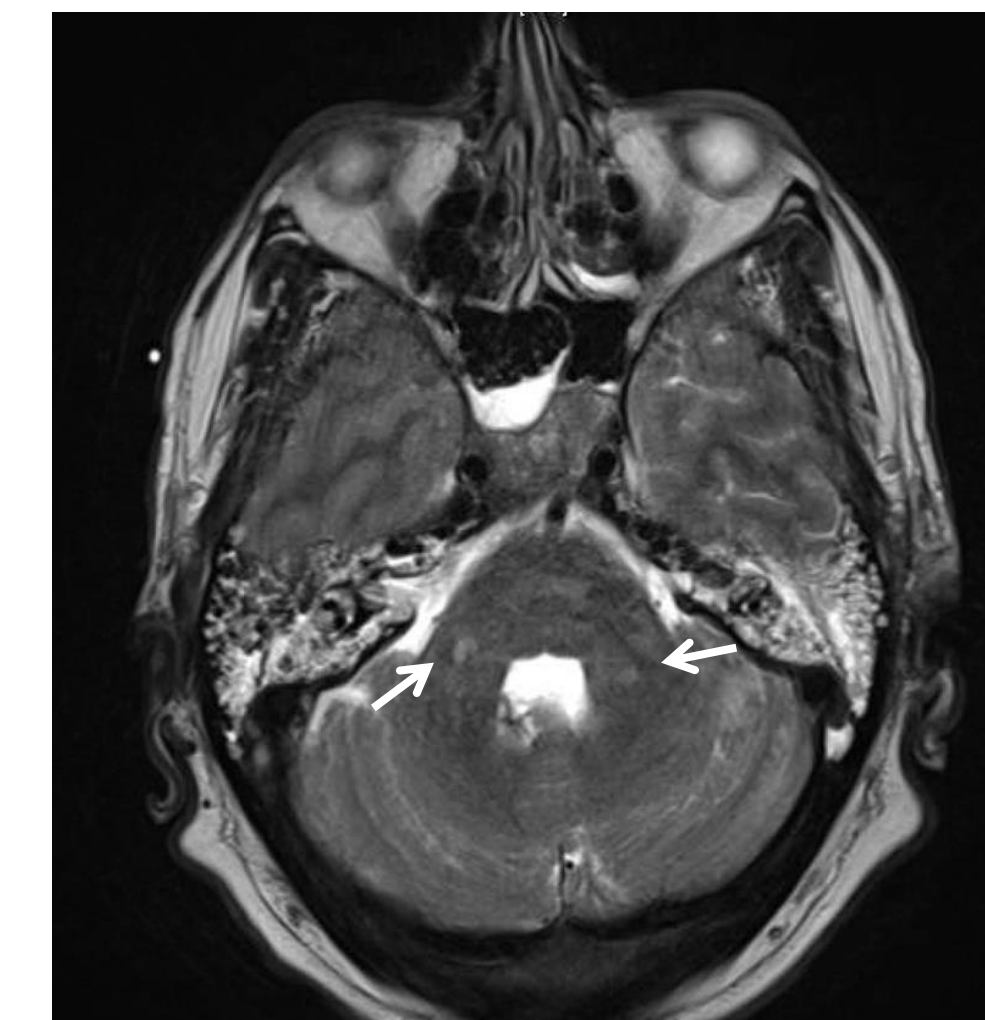
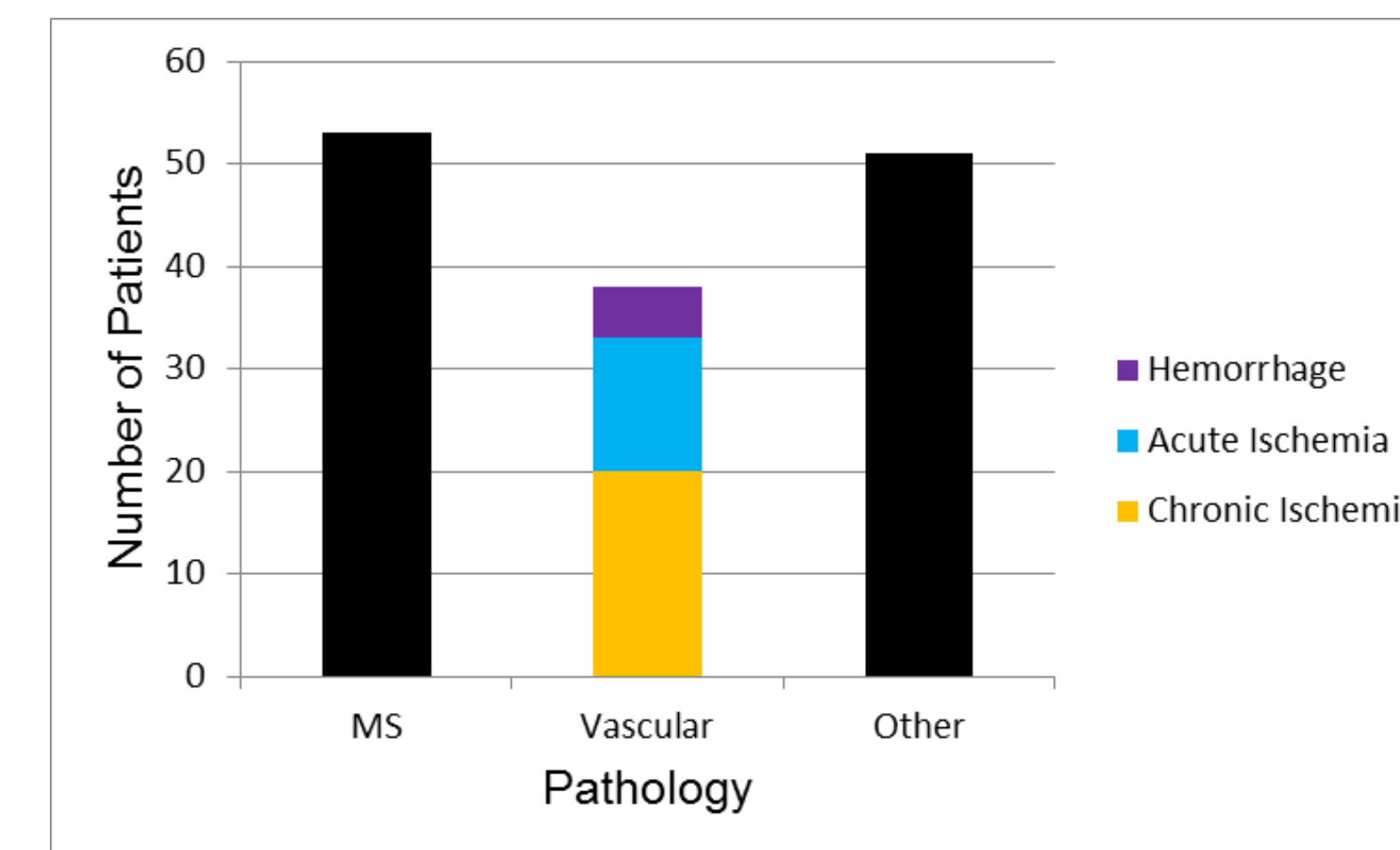


Image 2. Brainstem of 44 y/o patient with chronic small vessel disease.

Results



Conclusion

- **Study 1:** The prevalence of MCP lesions in this MS patient sample was 55%. Previosa et al.⁸ found that of 172 MS patients, 65% had T2-weighted MCP lesions.
- **Study 2:** Of singular causes of MCP lesions, MS was the most common etiology (37.3%.)
- Among vascular causes of MCP lesions (26.8%), chronic ischemic changes accounted for slightly over half.
- Comparing our two studies, the mean age at the initial appearance of an MCP lesion was 20 years above the mean age at MS diagnosis. Age may be informative in determining the underlying etiology of an MCP lesion.
- Given these prevalence percentages and the disability that may be associated with MCP lesions, more investigation into their significance in this population is warranted.

References

1. Tornes L, Conway B, Sheremata W. Multiple sclerosis and the cerebellum. *Neural Clin* 2014 Nov; 32 (4): 957-77.
2. Moritani T et al. Anatomy and pathology of the middle cerebellar peduncle. *ASNR* 2003; 2 (1).
3. Image: <http://thalamus.wustl.edu/course/cerebell.html>
4. Dogonawski A et al. Multiple sclerosis impairs regional connectivity in the cerebellum. *NeuroImage: Clinical* 2014; 4: 130-138.
5. Li Y et al. Differential cerebellar activation on functional magnetic resonance imaging during working memory performance in persons with multiple sclerosis. *Arch Phys Med Rehabil* 2004; 76: 635-639.
6. Prosperini L et al. The relationship between infratentorial lesions, balance deficit, and accidental falls in multiple sclerosis. *J Neural Sciences* 2011; 304: 55-60.
7. Nakashima I et al. Clinical and MRI study of brainstem and cerebellar involvement in Japanese patients with multiple sclerosis. *J Neural Neurosurg Psychiatry* 1999; 67: 153-157.
8. Previosa P et al. Relationship between damage to the middle cerebellar peduncles and clinical disability in multiple sclerosis. *Radiology* 2014; 271 (3): 822-830.