



Comparison between multiple system atrophy-cerebellar type and idiopathic late onset cerebellar ataxia using quantitative Magnetic resonance imaging volumetry- A Pilot Study



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Introduction

- ✓ The pathogenesis and clinical course differ between multiple system atrophy with predominant cerebellar ataxia(MSA-C) and Idiopathic Late-Onset Cerebellar Ataxia (ILOCA).
- ✓ However, the neurological symptoms and signs are similar especially at early stages, making differentiation between the two difficult.
- ✓ Therefore, we investigated whether quantitative magnetic resonance imaging volumetry can detect difference in MSA-C and ILOCA.

Methods

- **Design:** a single-center, retrospective study
- **Participants:** 9 patients with MSA-C or ILOCA in outpatient rehabilitation clinic in Jeonbuk National University hospital, who underwent comprehensive clinical assessment as well as brain MRI.
- **Statistical analysis:** Mann-whitney U test
- **Outcome measures**
 - ✓ **Volume percentage of intracranial volume (ICV)** : Each brain region volume divided by the ICV expressed as volume percentage
 - ✓ **Normative percentile value for each volume percentage of ICV** : based on the data of healthy control subjects provided by the software, a normative percentile was calculated for each volume percentage of ICV
 - ✓ **Asymmetry index** : Right and left asymmetry of each brain region was calculated
 - ✓ **Regional total volume** : Each brain region was calculated as regional total volume

Table. 1. Demographic data of the participants

Participant No.	Sex	Age(Yr)	Type	Diagnosis to brain imaging duration(Yr)
1	F	55	ILOCA	1
2	F	64	ILOCA	1
3	F	41	ILOCA	1
4	M	64	MSA-C	5
5	M	69	MSA-C	1
6	M	52	MSA-C	3
7	F	54	MSA-C	4
8	M	61	MSA-C	5
9	M	55	MSA-C	1

Results

Table 2	MSA-C	ILOCA	P-value
Percentage of ICV (%)			
Whole brain parenchyma	72.55 ± 4.49	71.64 ± 6.63	1.000
Cortical GM	30.72 ± 2.93	29.48 ± 6.60	1.000
Cerebral WM	31.92 ± 2.15	30.03 ± 1.62	0.167
Basal ganglia	1.08 ± 0.10	1.10 ± 0.19	0.905
Brain stem	0.93 ± 0.08	1.21 ± 0.28	0.039*
Thalamus	0.92 ± 0.07	0.90 ± 0.10	0.905
Hippocampus	0.49 ± 0.05	0.45 ± 0.13	0.548
Ventricle	3.10 ± 1.35	3.83 ± 2.18	0.905
Cerebellum	5.61 ± 1.21	7.81 ± 3.13	0.262
Cingulate	0.89 ± 0.07	0.81 ± 0.11	0.381
Left cingulate	0.42 ± 0.03	0.38 ± 0.03	0.039*
Normative percentile			
Whole brain parenchyma	31.33 ± 28.37	27.67 ± 40.28	0.714
Cortical GM	31.33 ± 31.71	32.00 ± 28.82	0.905
Cerebral WM	83.83 ± 18.33	71.67 ± 19.40	0.381
Basal ganglia	29.50 ± 21.90	23.33 ± 26.76	0.714
Brain stem	1.00 ± 0.00	24.33 ± 40.41	0.333
Thalamus	67.83 ± 29.28	63.33 ± 47.27	0.905
Hippocampus	70.83 ± 35.68	42.00 ± 48.82	0.548
Ventricle	76.17 ± 16.06	84.00 ± 25.98	0.714
Cerebellum	1.17 ± 0.41	47.67 ± 49.17	0.092
Cingulate	55.67 ± 32.89	35.00 ± 53.78	0.381
Asymmetry index			
Whole brain parenchyma	-0.74 ± 1.33	-3.16 ± 5.01	0.548
Cortical GM	-1.18 ± 2.73	-4.06 ± 7.38	0.905
Cerebral WM	-1.31 ± 1.23	-3.97 ± 4.68	0.548
Basal ganglia	0.02 ± 3.16	-1.94 ± 5.58	0.714
Brain stem	14.44 ± 1.18	17.44 ± 2.71	0.548
Thalamus	1.97 ± 4.87	-6.15 ± 6.95	0.262
Hippocampus	-3.89 ± 4.93	-7.09 ± 8.75	0.905
Ventricle	-4.90 ± 7.22	-5.02 ± 7.92	0.905
Cerebellum	5.12 ± 8.00	2.30 ± 1.95	0.381
Cingulate	-10.69 ± 9.73	-12.92 ± 12.58	0.905
Corpus callosum	-77.57 ± 18.33	-43.43 ± 21.04	0.039*
Amygdala	5.23 ± 5.89	20.79 ± 9.79	0.039*

Table 3	MSA-C	ILOCA	P-value
Total volume			
Whole brain parenchyma	1126.10 ± 115.78	1062.34 ± 245.40	1.000
Cortical GM	475.53 ± 4.03	445.75 ± 116.33	1.000
Cerebral WM	496.85 ± 69.32	443.59 ± 87.39	0.714
Basal ganglia	16.71 ± 1.60	16.42 ± 4.99	0.548
Brain stem	14.44 ± 1.18	17.44 ± 2.71	0.262
Thalamus	14.27 ± 1.53	13.43 ± 3.70	0.905
Hippocampus	7.60 ± 0.60	6.75 ± 2.48	0.548
Ventricle	47.61 ± 19.27	56.57 ± 33.85	0.714
Cerebellum	87.17 ± 20.57	109.13 ± 25.96	0.262
Cingulate	13.94 ± 2.17	12.02 ± 3.11	0.714

Table 2 & 3. Relative regional volumes as a percentage of ICV, asymmetry index, normative percentile, total volume in MSA-C and ILOCA subjects

- The brain stem volume percentage of intracranial volume were significantly higher in ILOCA than MSA-C.
- Corpus callosum asymmetry index was significantly different in MSA-C and ILOCA.
- Left cingulate volume percentage of intracranial volume was significantly lower in ILOCA than MSA-C, and amygdala asymmetry index was significantly higher in ILOCA than MSA-C.

Conclusion

- Relative volume measures provided by automated brain segmentation software can be useful for screening MSA-C and ILOCA in clinical practice, help clinicians to predict outcomes and determine early intervention for delaying the progression to MSA-C.