

# VI. Head MRI Measurements

MRI measurements were performed on a 3T SIEMENS instrument (MAGNETOM Trio, A Tim System).

## 1) Periventricular hyperintensity

Divided into 4 classes according to an appendix 1.

## 2) Ventricular dilatation

Divided into 4 classes according to an appendix 2.

## 3) Brain atrophy

Divided into 4 classes according to an appendix 3.

## 4) Cerebrovascular disease

Cerebral infarction

Decided as following,

Lacuna infarction : The lesions of white matter, basal ganglia, thalamus, internal capsule, midbrain, pons, medulla oblongata and whose size are larger than or equal to 3mm and smaller than or equal to 15mm.

Cerebral embolism : Include cerebral or cerebellar cortex, and which is not border zone infarction.

Cerebral thrombosis : Other than above.

Cerebral infarction was defined as all of lacuna infarction, cerebral embolism and thrombosis.

## Cerebral hemorrhage

On T2 weighted image(WI), hyperintensity inside the lesion and no signal around the lesion, or on T2WI no signal slit lesion.

## Cerebrovascular diseases

Cerebrovascular diseases were defined as all of cerebral infarction and cerebral hemorrhage.

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## References

Stroke 1994 vol25, p318-327

Naika 1997 vol79 (4)

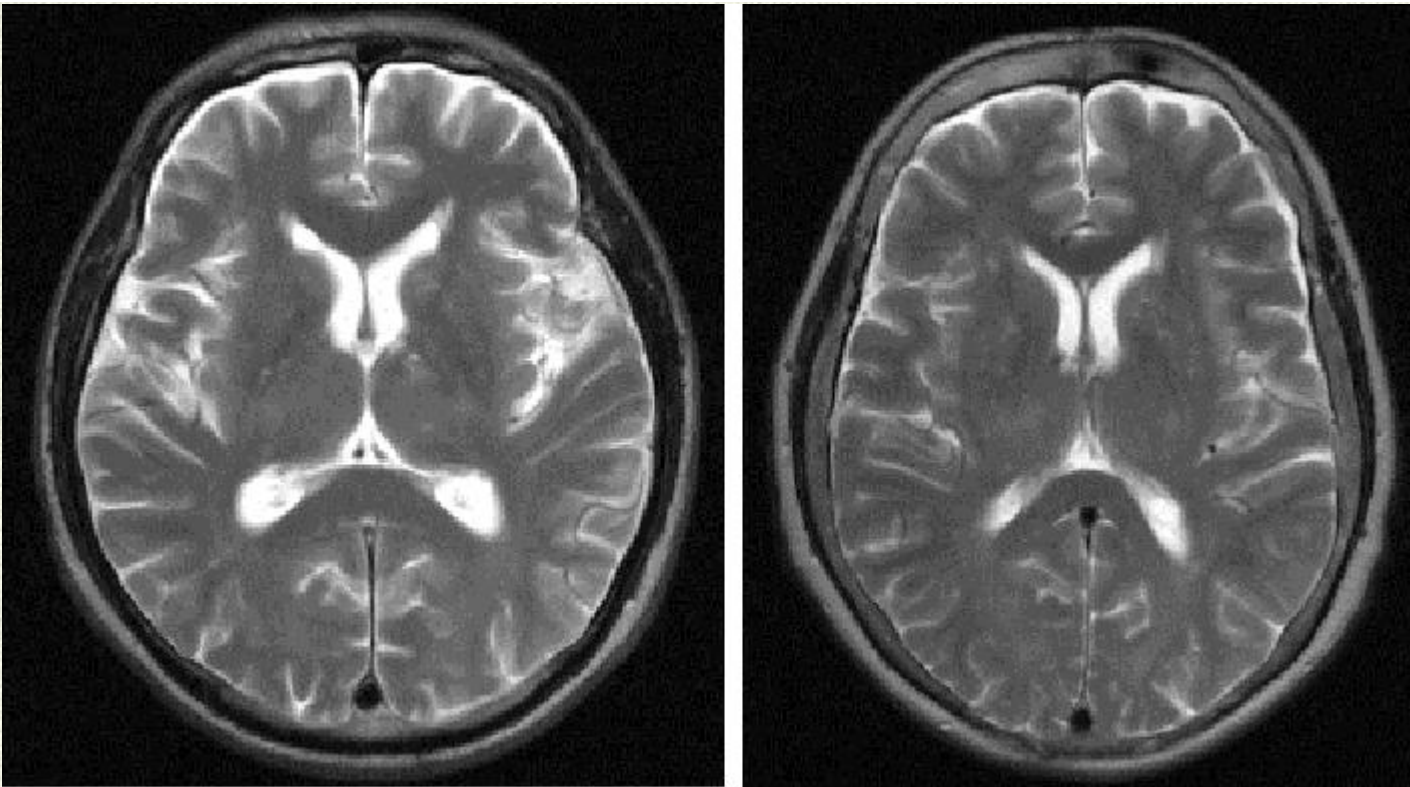
Nihon Naika Gakkai Zasshi 1997 vol. 86

Medicina 1994 vol31 (8)

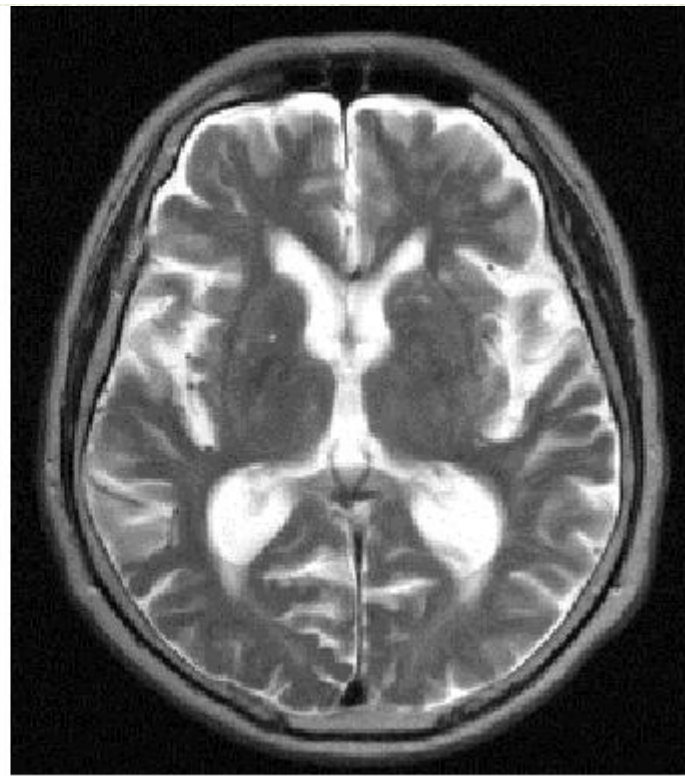
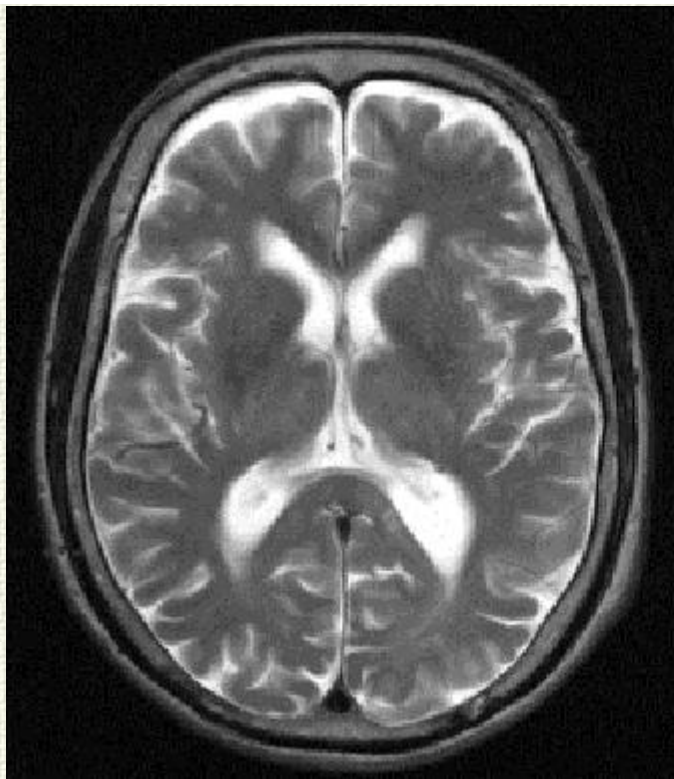
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## **Appendix 1: Periventricular hyperintensity**

- I. None : None or minimal periventricular signal hyperintensities in the form of caps only in the anterior horn of lateral ventricles.



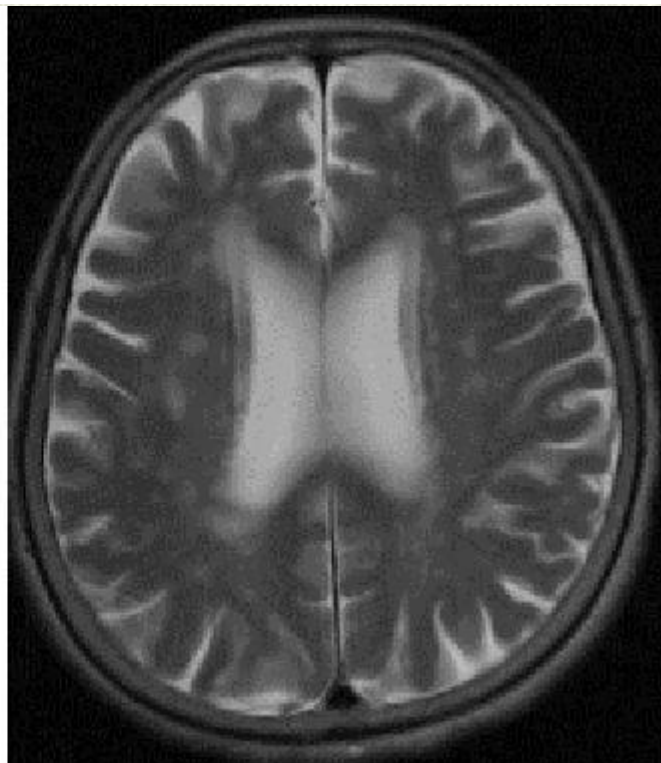
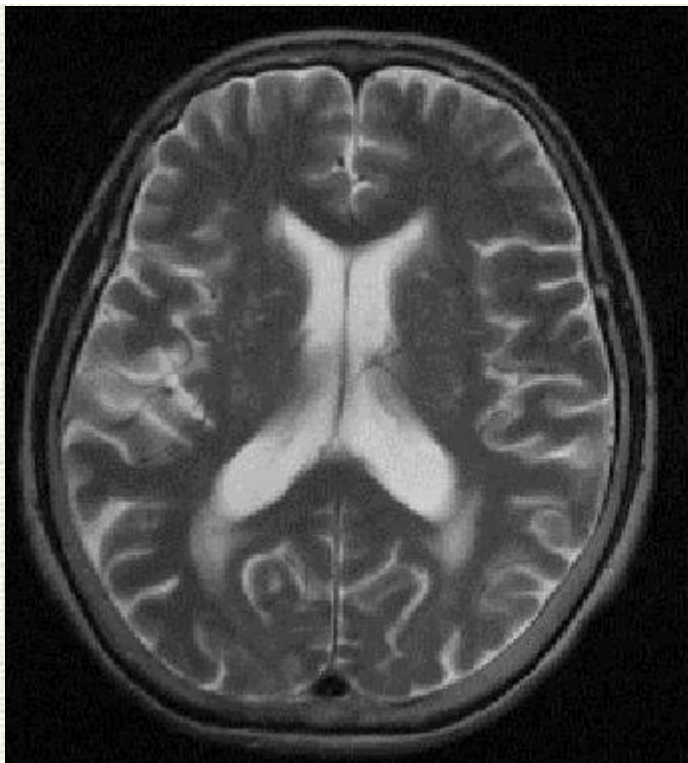
II. Mild : Caps in both anterior and posterior horns of lateral ventricles.

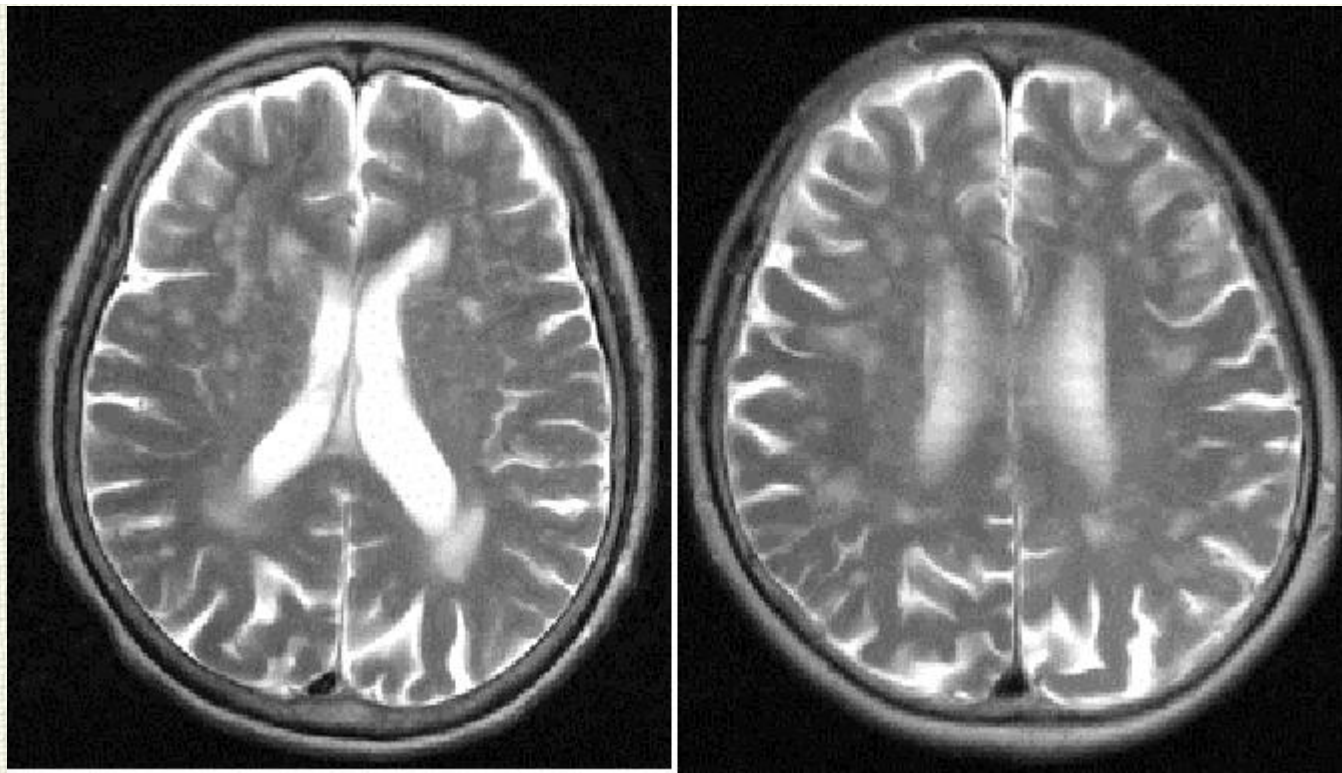






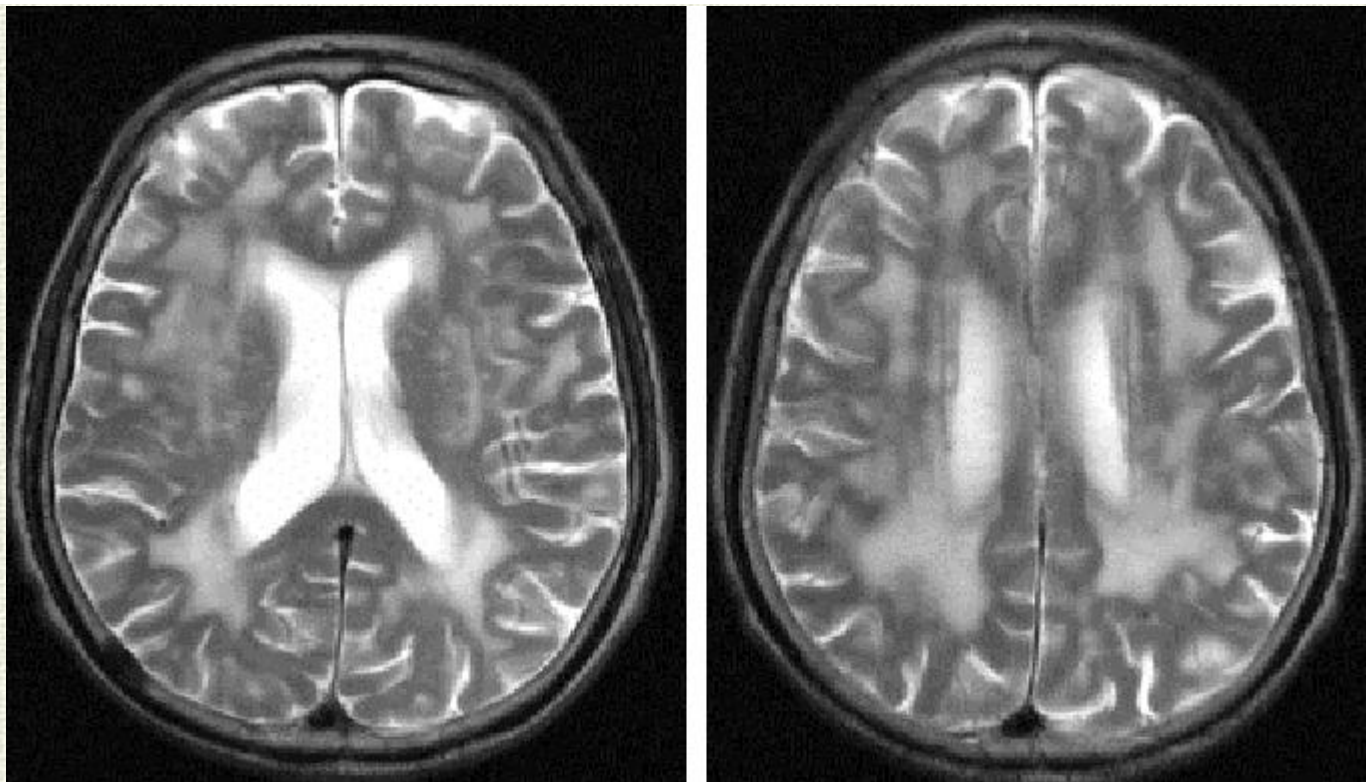
III. Moderate : Multifocal periventricular hyperintense punctuate lesions.





IV. Severe : Multiple high signal intensity area that reached confluency in the periventricular region and white matter.

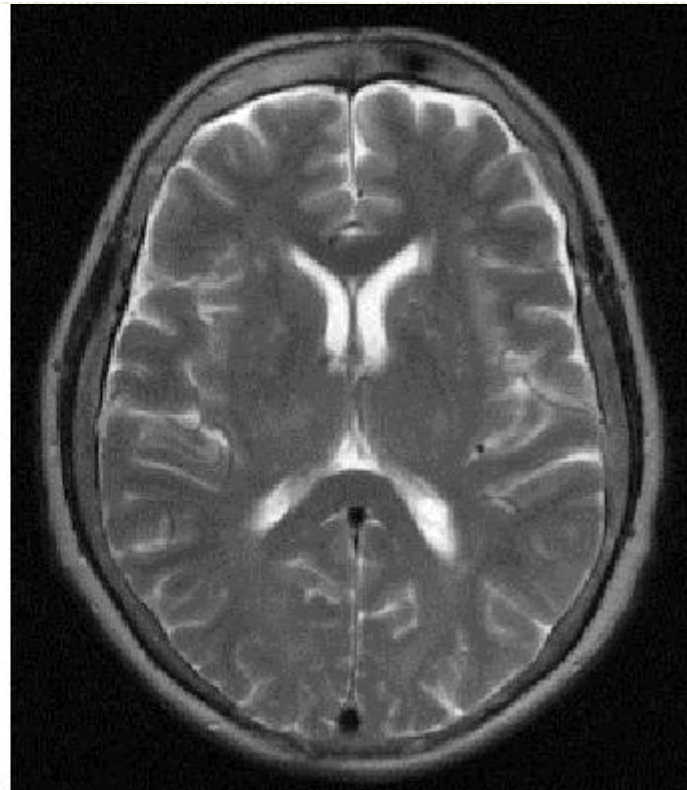
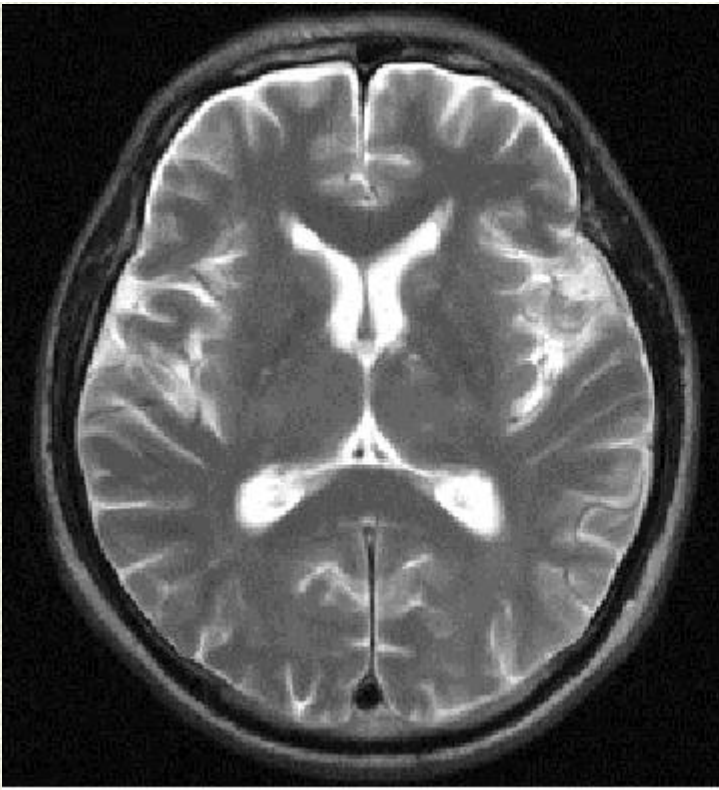




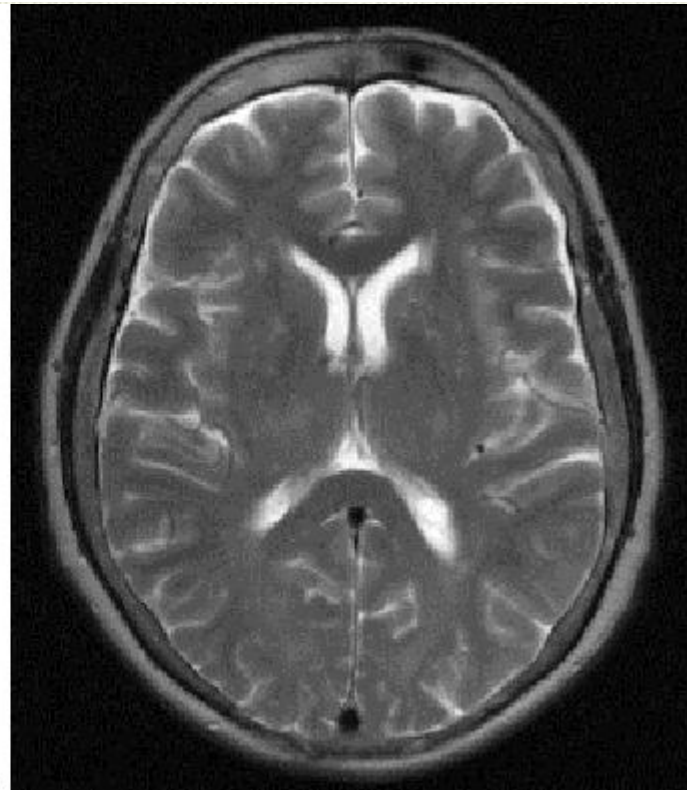
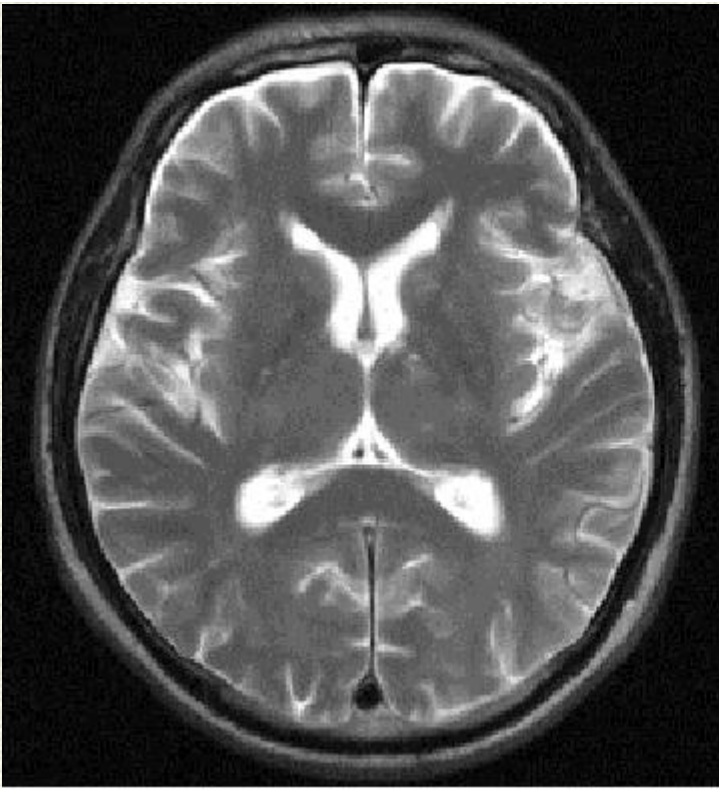
## **Appendix 2: Ventricular dilatation**

I. None

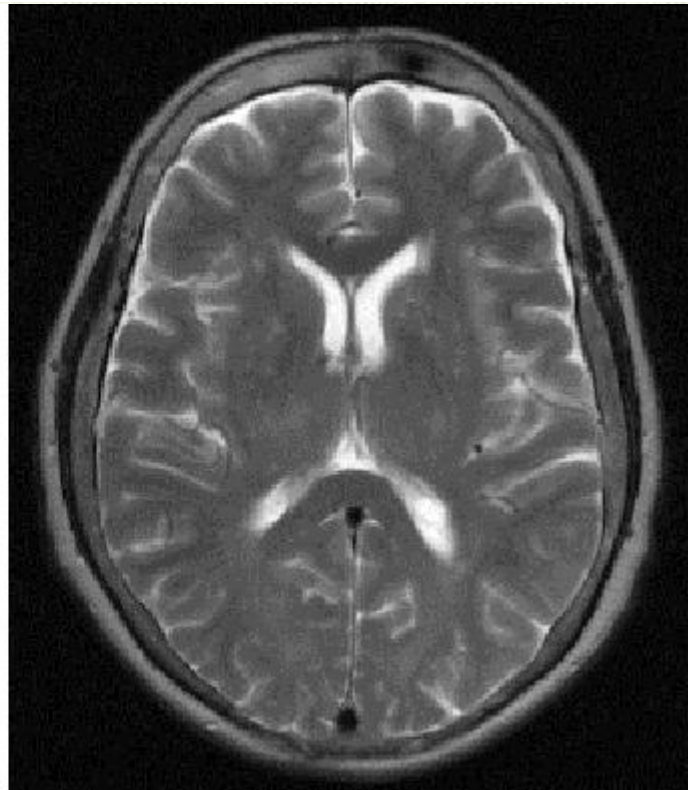
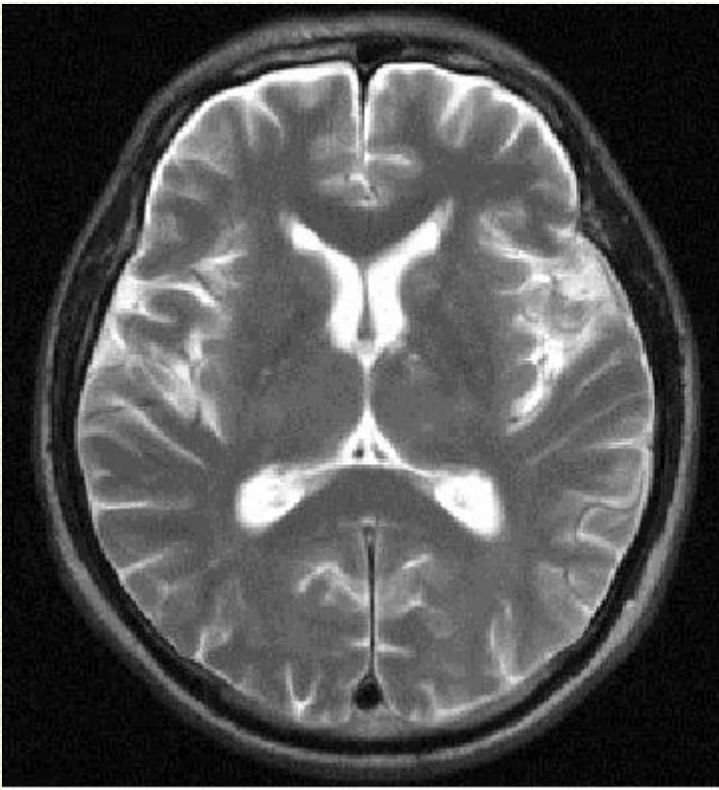




II. Mild

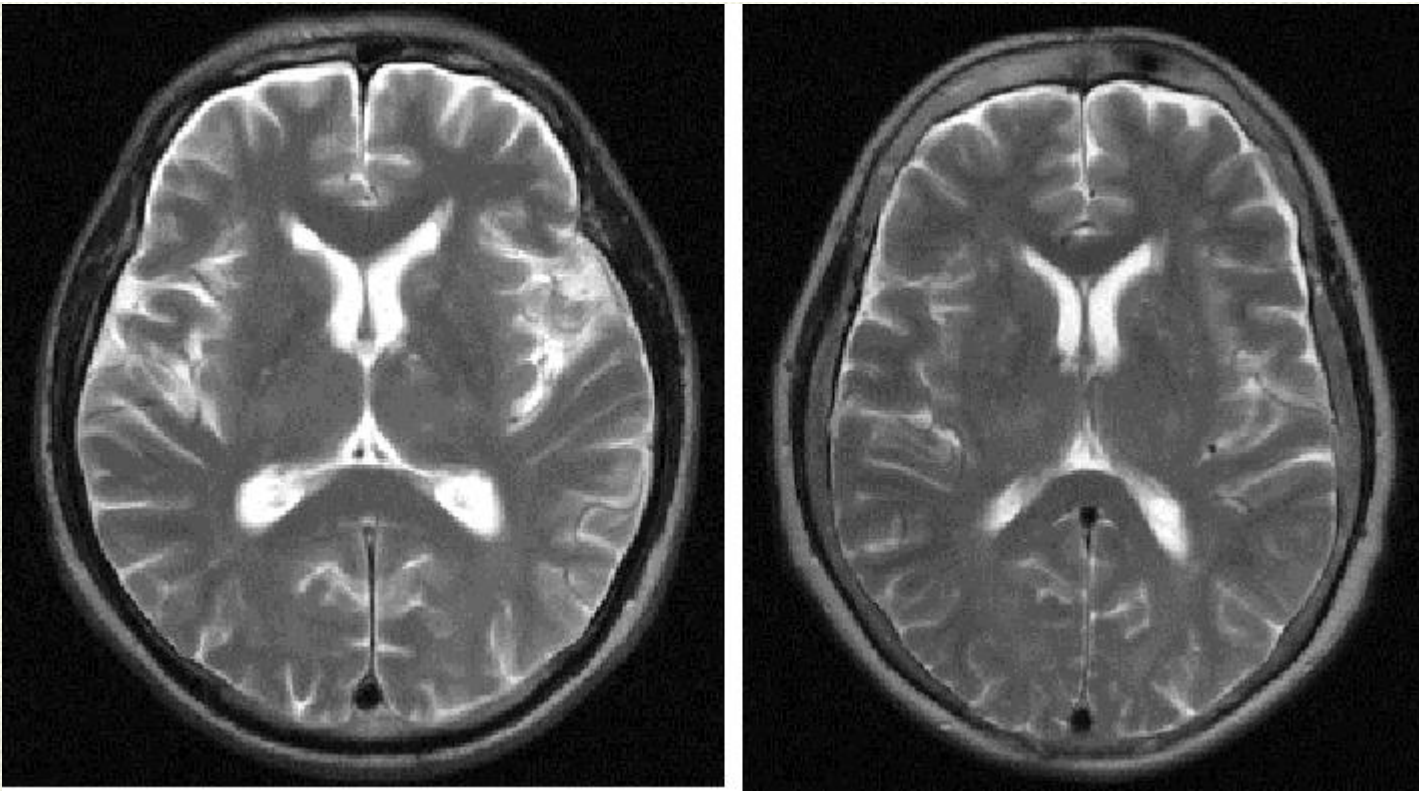


III. Moderate



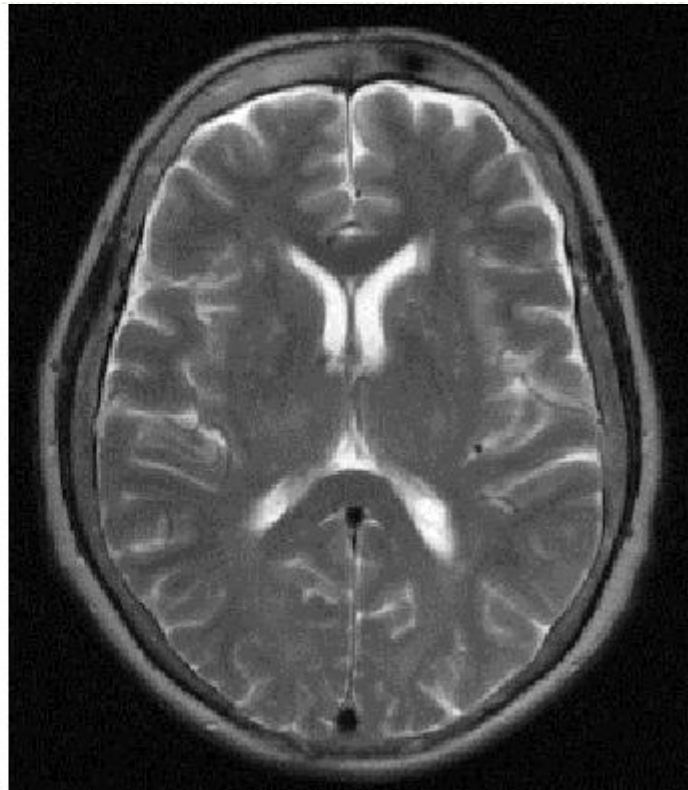
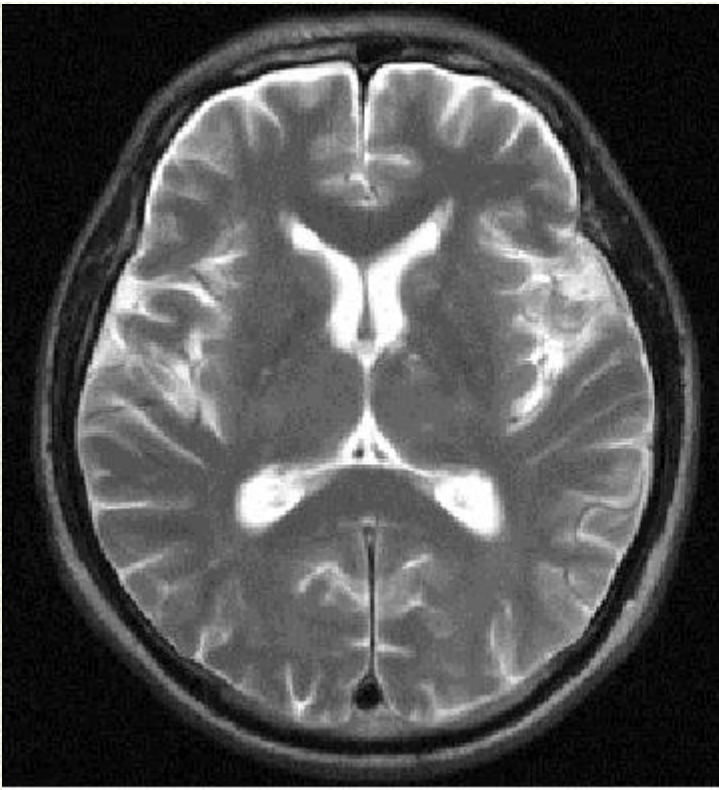
IV. Severe



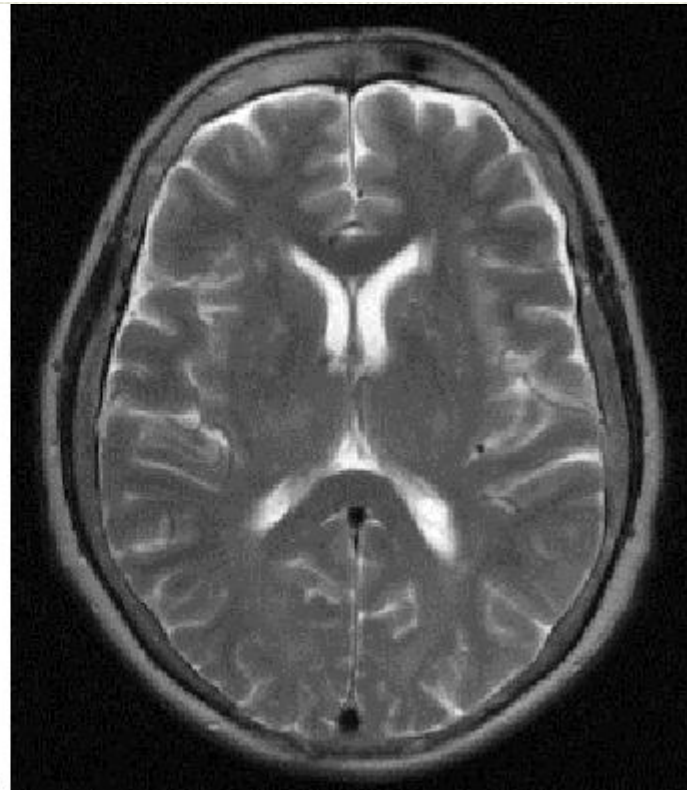
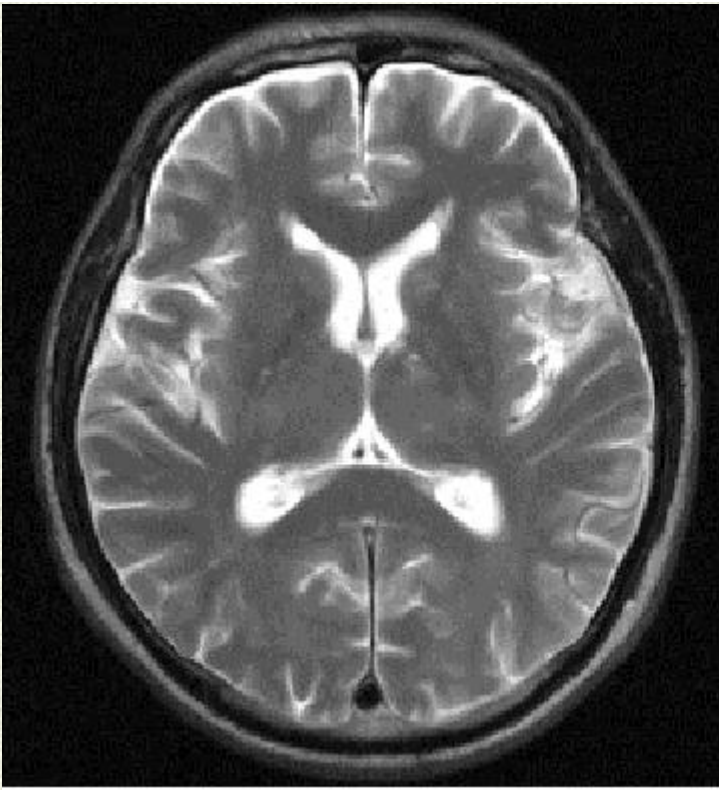


### **Appendix 3: Brain atrophy**

I. None

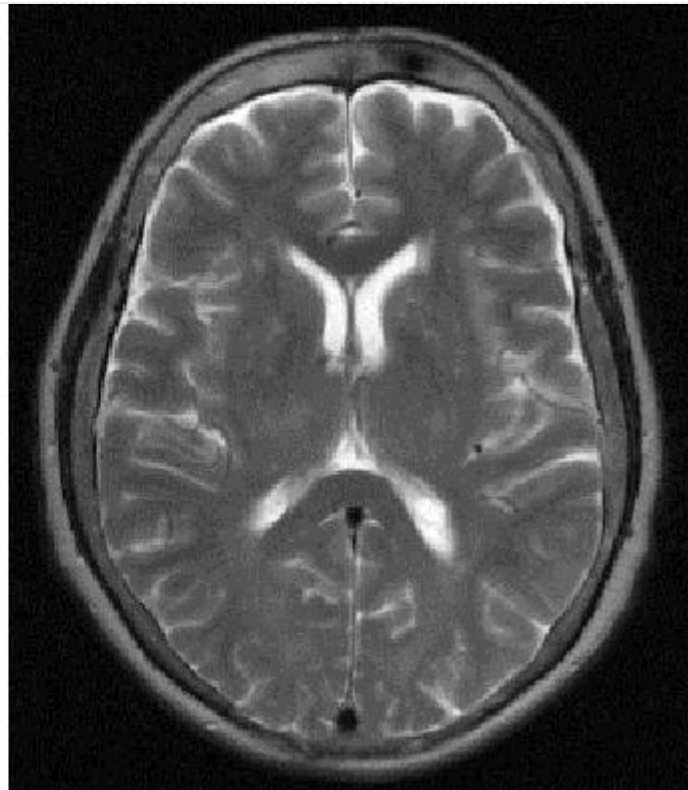
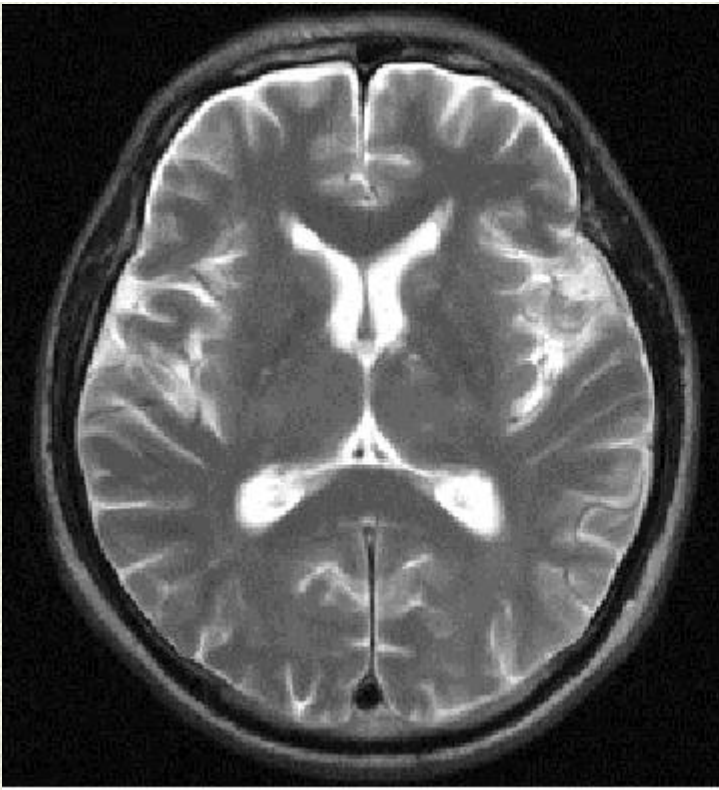


II. Mild

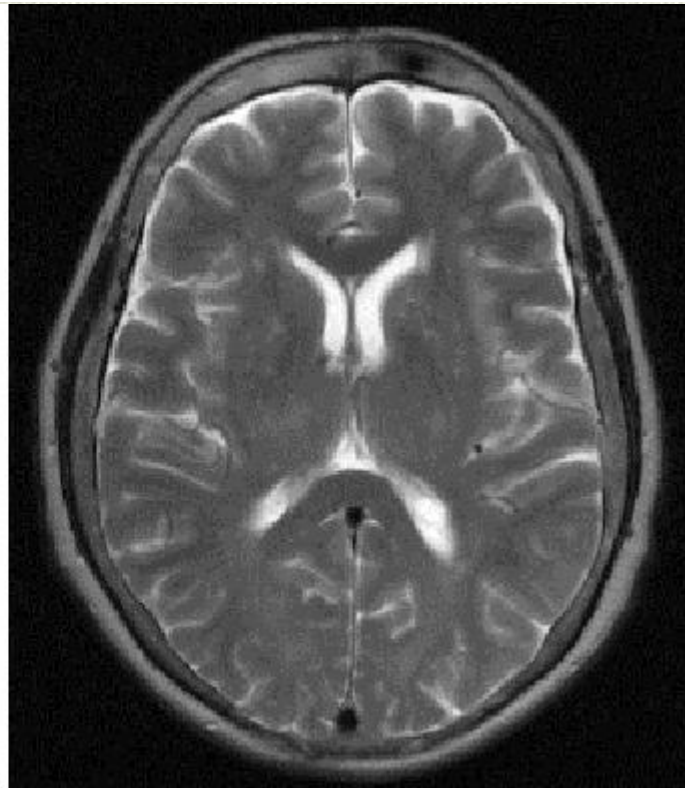
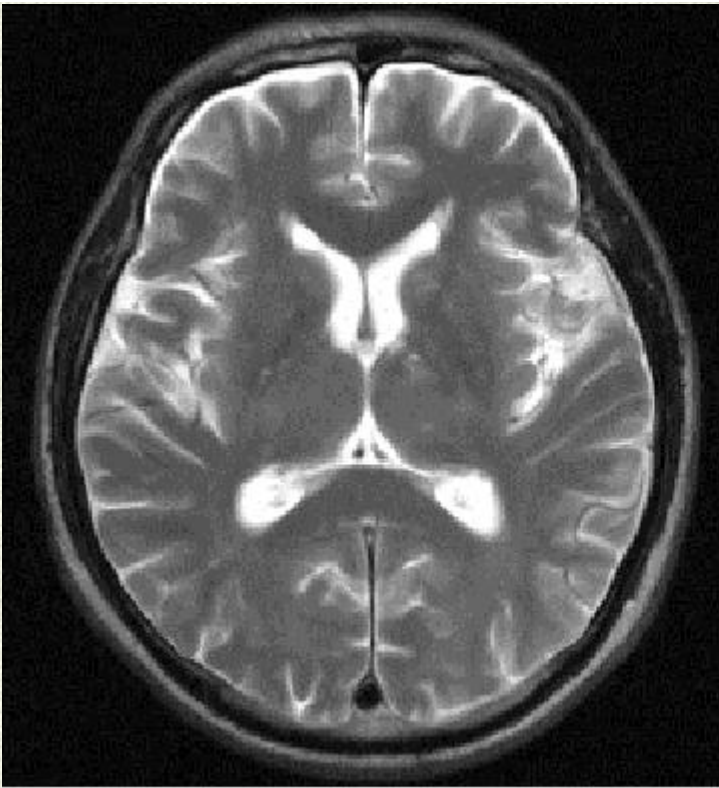


III. Moderate





IV. Severe



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1) Periventricular hyperintensity (PVH)

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40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
N	%	N	%	N	%	N	%	N	%	N	%

None	Male	133	99.3	218	87.9	181	62.6	65	27.2	12	10.3	609	59.4
	Female	145	98.0	255	93.8	179	68.8	77	33.2	17	13.5	673	64.8
	Total	278	98.6	473	91.0	360	65.6	142	30.1	29	12.0	1282	62.1
Mild	Male	1	0.7	29	11.7	97	33.6	118	49.4	42	36.2	287	28.0
	Female	3	2.0	16	5.9	70	26.9	105	45.3	42	33.3	236	22.7
	Total	4	1.4	45	8.7	167	30.4	223	47.3	84	34.7	523	25.3
Moderate	Male	0	0.0	1	0.4	11	3.8	52	21.8	57	49.1	121	11.8
	Female	0	0.0	1	0.4	11	4.2	49	21.1	61	48.4	122	11.8
	Total	0	0.0	2	0.4	22	4.0	101	21.4	118	48.8	243	11.8
Severe	Male	0	0.0	0	0.0	0	0.0	4	1.7	5	4.3	9	0.9
	Female	0	0.0	0	0.0	0	0.0	1	0.4	6	4.8	7	0.7
	Total	0	0.0	0	0.0	0	0.0	5	1.1	11	4.5	16	0.8
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

## 2) Ventricular dilatation

### Ventricular dilatation

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
None	Male	122	91.0	200	80.6	173	59.9	54	22.6	8	6.9	557	54.3
	Female	138	93.2	251	92.3	213	81.9	112	48.3	23	18.3	737	71.0



	Total	260	92.2	451	86.7	386	70.3	166	35.2	31	12.8	1294	62.7
Mild	Male	12	9.0	44	17.7	110	38.1	146	61.1	48	41.4	360	35.1
	Female	10	6.8	20	7.4	47	18.1	103	44.4	71	56.3	251	24.2
	Total	22	7.8	64	12.3	157	28.6	249	52.9	119	49.2	611	29.6
Moderate	Male	0	0.0	4	1.6	6	2.1	39	16.3	56	48.3	105	10.2
	Female	0	0.0	1	0.4	0	0.0	16	6.9	32	25.4	49	4.7
	Total	0	0.0	5	1.0	6	1.1	55	11.7	88	36.4	154	7.5
Severe	Male	0	0.0	0	0.0	0	0.0	0	0.0	4	3.4	4	0.4
	Female	0	0.0	0	0.0	0	0.0	1	0.4	0	0.0	1	0.1
	Total	0	0.0	0	0.0	0	0.0	1	0.2	4	1.7	5	0.2
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

#### Ventricular dilatation (anterior horn)

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
None	Male	133	99.3	240	96.8	251	86.9	124	51.9	24	20.7	772	75.2
	Female	148	100.0	271	99.6	251	96.5	180	77.6	53	42.1	903	87.0
	Total	281	99.6	511	98.3	502	91.4	304	64.5	77	31.8	1675	81.2
Mild	Male	1	0.7	8	3.2	36	12.5	105	43.9	58	50.0	208	20.3
	Female	0	0.0	1	0.4	9	3.5	49	21.1	60	47.6	119	11.5
	Total	1	0.4	9	1.7	45	8.2	154	32.7	118	48.8	327	15.8

Moderate	Male	0	0.0	0	0.0	2	0.7	10	4.2	33	28.4	45	4.4
	Female	0	0.0	0	0.0	0	0.0	3	1.3	13	10.3	16	1.5
	Total	0	0.0	0	0.0	2	0.4	13	2.8	46	19.0	61	3.0
Severe	Male	0	0.0	0	0.0	0	0.0	0	0.0	1	0.9	1	0.1
	Female	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Total	0	0.0	0	0.0	0	0.0	0	0.0	1	0.4	1	0.0
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

#### Ventricular dilatation (posterior horn)

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
None	Male	123	91.8	201	81.0	174	60.2	55	23.0	8	6.9	561	54.7
	Female	138	93.2	251	92.3	213	81.9	112	48.3	23	18.3	737	71.0
	Total	261	92.6	452	86.9	387	70.5	167	35.5	31	12.8	1298	62.9
Mild	Male	11	8.2	43	17.3	110	38.1	146	61.1	48	41.4	358	34.9
	Female	10	6.8	20	7.4	47	18.1	104	44.8	72	57.1	253	24.4
	Total	21	7.4	63	12.1	157	28.6	250	53.1	120	49.6	611	29.6
Moderate	Male	0	0.0	4	1.6	5	1.7	38	15.9	56	48.3	103	10.0
	Female	0	0.0	1	0.4	0	0.0	15	6.5	31	24.6	47	4.5
	Total	0	0.0	5	1.0	5	0.9	53	11.3	87	36.0	150	7.3

Severe	Male	0	0.0	0	0.0	0	0.0	0	0.0	4	3.4	4	0.4
	Female	0	0.0	0	0.0	0	0.0	1	0.4	0	0.0	1	0.1
	Total	0	0.0	0	0.0	0	0.0	1	0.2	4	1.7	5	0.2
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

### 3) Brain atrophy

#### Brain atrophy

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
None	Male	130	97.0	225	90.7	204	70.6	74	31.0	8	6.9	641	62.5
	Female	147	99.3	270	99.3	237	91.2	123	53.0	18	14.3	795	76.6
	Total	277	98.2	495	95.2	441	80.3	197	41.8	26	10.7	1436	69.6
Mild	Male	4	3.0	23	9.3	82	28.4	131	54.8	40	34.5	280	27.3
	Female	1	0.7	2	0.7	22	8.5	98	42.2	72	57.1	195	18.8
	Total	5	1.8	25	4.8	104	18.9	229	48.6	112	46.3	475	23.0
Moderate	Male	0	0.0	0	0.0	3	1.0	32	13.4	64	55.2	99	9.6
	Female	0	0.0	0	0.0	1	0.4	10	4.3	34	27.0	45	4.3
	Total	0	0.0	0	0.0	4	0.7	42	8.9	98	40.5	144	7.0
Severe	Male	0	0.0	0	0.0	0	0.0	2	0.8	4	3.4	6	0.6
	Female	0	0.0	0	0.0	0	0.0	1	0.4	2	1.6	3	0.3
	Total	0	0.0	0	0.0	0	0.0	3	0.6	6	2.5	9	0.4



Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

### Brain atrophy (frontal lobe)

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
None	Male	133	99.3	236	95.2	232	80.3	116	48.5	15	12.9	732	71.3
	Female	148	100.0	271	99.6	247	95.0	165	71.1	41	32.5	872	84.0
	Total	281	99.6	507	97.5	479	87.2	281	59.7	56	23.1	1604	77.7
Mild	Male	1	0.7	12	4.8	56	19.4	101	42.3	57	49.1	227	22.1
	Female	0	0.0	1	0.4	12	4.6	62	26.7	64	50.8	139	13.4
	Total	1	0.4	13	2.5	68	12.4	163	34.6	121	50.0	366	17.7
Moderate	Male	0	0.0	0	0.0	1	0.3	21	8.8	42	36.2	64	6.2
	Female	0	0.0	0	0.0	1	0.4	5	2.2	20	15.9	26	2.5
	Total	0	0.0	0	0.0	2	0.4	26	5.5	62	25.6	90	4.4
Severe	Male	0	0.0	0	0.0	0	0.0	1	0.4	2	1.7	3	0.3
	Female	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	1	0.1
	Total	0	0.0	0	0.0	0	0.0	1	0.2	3	1.2	4	0.2
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

Brain atrophy (temporal lobe)

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
None	Male	131	97.8	230	92.7	226	78.2	92	38.5	13	11.2	692	67.4
	Female	147	99.3	270	99.3	246	94.6	139	59.9	21	16.7	823	79.3
	Total	278	98.6	500	96.2	472	86.0	231	49.0	34	14.0	1515	73.4
Mild	Male	3	2.2	18	7.3	61	21.1	120	50.2	39	33.6	241	23.5
	Female	1	0.7	2	0.7	14	5.4	84	36.2	73	57.9	174	16.8
	Total	4	1.4	20	3.8	75	13.7	204	43.3	112	46.3	415	20.1
Moderate	Male	0	0.0	0	0.0	2	0.7	25	10.5	62	53.4	89	8.7
	Female	0	0.0	0	0.0	0	0.0	8	3.4	31	24.6	39	3.8
	Total	0	0.0	0	0.0	2	0.4	33	7.0	93	38.4	128	6.2
Severe	Male	0	0.0	0	0.0	0	0.0	2	0.8	2	1.7	4	0.4
	Female	0	0.0	0	0.0	0	0.0	1	0.4	1	0.8	2	0.2
	Total	0	0.0	0	0.0	0	0.0	3	0.6	3	1.2	6	0.3
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

4) Cerebrovascular disease (CVD)

Lacuna infarction

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
Lacuna (-)	Male	129	96.3	223	89.9	214	74.0	103	43.1	21	18.1	690	67.3
	Female	145	98.0	265	97.4	220	84.6	149	64.2	51	40.5	830	80.0
	Total	274	97.2	488	93.8	434	79.1	252	53.5	72	29.8	1520	73.6
Lacuna (+)	Male	5	3.7	25	10.1	75	26.0	136	56.9	95	81.9	336	32.7
	Female	3	2.0	7	2.6	40	15.4	83	35.8	75	59.5	208	20.0
	Total	8	2.8	32	6.2	115	20.9	219	46.5	170	70.2	544	26.4
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

### Cerebral embolism

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
Embolism (-)	Male	134	100.0	246	99.2	287	99.3	225	94.1	98	84.5	990	96.5
	Female	148	100.0	269	98.9	254	97.7	224	96.6	118	93.7	1013	97.6
	Total	282	100.0	515	99.0	541	98.5	449	95.3	216	89.3	2003	97.0
Embolism (+)	Male	0	0.0	2	0.8	2	0.7	14	5.9	18	15.5	36	3.5
	Female	0	0.0	3	1.1	6	2.3	8	3.4	8	6.3	25	2.4
	Total	0	0.0	5	1.0	8	1.5	22	4.7	26	10.7	61	3.0
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0



Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0
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### Cerebral thrombosis

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
Thrombosis (-)	Male	133	99.3	246	99.2	286	99.0	233	97.5	108	93.1	1006	98.1
	Female	148	100.0	271	99.6	259	99.6	230	99.1	122	96.8	1030	99.2
	Total	281	99.6	517	99.4	545	99.3	463	98.3	230	95.0	2036	98.6
Thrombosis (+)	Male	1	0.7	2	0.8	3	1.0	6	2.5	8	6.9	20	1.9
	Female	0	0.0	1	0.4	1	0.4	2	0.9	4	3.2	8	0.8
	Total	1	0.4	3	0.6	4	0.7	8	1.7	12	5.0	28	1.4
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

### Cerebral infarction

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
Infarction(-)	Male	128	95.5	221	89.1	214	74.0	99	41.4	18	15.5	680	66.3
	Female	145	98.0	261	96.0	217	83.5	146	62.9	49	38.9	818	78.8
	Total	273	96.8	482	92.7	431	78.5	245	52.0	67	27.7	1498	72.6

Infarction(+)	Male	6	4.5	27	10.9	75	26.0	140	58.6	98	84.5	346	33.7
	Female	3	2.0	11	4.0	43	16.5	86	37.1	77	61.1	220	21.2
	Total	9	3.2	38	7.3	118	21.5	226	48.0	175	72.3	566	27.4
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

### Cerebral hemorrhage

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
Hemorrhage (-)	Male	134	100.0	248	100.0	289	100.0	236	98.7	116	100.0	1023	99.7
	Female	148	100.0	272	100.0	258	99.2	230	99.1	126	100.0	1034	99.6
	Total	282	100.0	520	100.0	547	99.6	466	98.9	242	100.0	2057	99.7
Hemorrhage (+)	Male	0	0.0	0	0.0	0	0.0	3	1.3	0	0.0	3	0.3
	Female	0	0.0	0	0.0	2	0.8	2	0.9	0	0.0	4	0.4
	Total	0	0.0	0	0.0	2	0.4	5	1.1	0	0.0	7	0.3
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0

### Cerebrovascular diseases

		40-49yr		50-59yr		60-69yr		70-79yr		80yr -		Total	
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		N	%	N	%	N	%	N	%	N	%	N	%
CVD (-)	Male	128	95.5	221	89.1	214	74.0	98	41.0	18	15.5	679	66.2
	Female	145	98.0	261	96.0	216	83.1	145	62.5	49	38.9	816	78.6
	Total	273	96.8	482	92.7	430	78.3	243	51.6	67	27.7	1495	72.4
CVD (+)	Male	6	4.5	27	10.9	75	26.0	141	59.0	98	84.5	347	33.8
	Female	3	2.0	11	4.0	44	16.9	87	37.5	77	61.1	222	21.4
	Total	9	3.2	38	7.3	119	21.7	228	48.4	175	72.3	569	27.6
Total	Male	134	100.0	248	100.0	289	100.0	239	100.0	116	100.0	1026	100.0
	Female	148	100.0	272	100.0	260	100.0	232	100.0	126	100.0	1038	100.0
	Total	282	100.0	520	100.0	549	100.0	471	100.0	242	100.0	2064	100.0