# Proton Magnetic Resonance Spectroscopy of Bilateral Putamen in Primary Unilateral symptoms of Parkinson's Disease

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**Abstract: Objective** To investigate the NMR (Nuclear Magnetic Resonance) spectroscopic methods to diagnose the feasibility of early Parkinson's disease. **Methods** In our hospital from February 2010 to February 2012, 26 patients were treated with unilateral idiopathic PD application of proton magnetic resonance spectroscopy (proton magnetic resonance spectroscopy, 1H-MRS) spectroscopy to check record acetyl aspartate acid (NAA), creatine (Cr), choline (Cho), and the peaks, and calculate the NAA / (Cho + Cr) ratio. The same period at the same time as the control group in our hospital examination 26 health personnel. According to the patient's actual medication situation they were divided into the medication group (15 cases) and non-medication group (11 cases). Observation of dopamine on the NMR results. Results: PD group ipsilateral putamen NAA crest, Cho crest and the crest of the control group statistically significant difference ($p < 0.05$), the NAA / (Cho + Cr) ratio ($0.8 \pm 0.3$) was significantly lower than the control group ($1.1 \pm 0.2$). Taking dopamine NAA peak, crest Cho and Cr peak is not significant, but taking dopamine will significantly change the ratio of NAA / (Cho + Cr). Which medication group NAA / (Cho + Cr) ratio ($0.9 \pm 0.3$) was significantly higher than the non-treated group ($0.6 \pm 0.1$). **Conclusion** nuclear magnetic resonance spectroscopy in patients with unilateral symptoms of PD with normal there are differences, so the use of nuclear magnetic resonance spectroscopy can provide a useful reference for the early diagnosis of PD.
[Jin Shang, Jing Du. **Proton Magnetic Resonance Spectroscopy of Bilateral Putamen in Primary Unilateral symptoms of Parkinson's Disease.** *Life Sci J* 2013;10(2):1557-1559]. (ISSN:1097-8135).http://www.lifesciencesite.com. 211

**Keywords:** Parkinson's, unilateral symptoms, Nuclear Magnetic Resonance, spectral analysis

Parkinson's disease (PD) is a disease common in the elderly, which affects the trend of increasing [1]. Proton magnetic resonance spectroscopy (proton magnetic resonance spectroscopy, 1H-MRS) in the detection of human chemicals will not produce damage to the human body, and therefore wider use in the detection of various diseases. Acetyl-aspartate in the presence of a large number of neurons and precursor cells, is considered to be important neurons flag. Elevated choline and creatine peak reflect gliosis [2]. The early detection of Parkinson's disease by measuring acetyl aspartate, creatine and choline. Proton magnetic resonance spectroscopy with high sensitivity acetyl aspartate, creatine and choline. Our hospital the spectrum of the metabolites measured by MRS, to explore the early diagnosis of PD. Are reported below

## 1 Materials and Methods

1.1 Data 26 cases in our hospital from February 2010 to February 2012 unilateral symptoms in patients with idiopathic PD (PD group), diagnostics are in line with 2006 Chinese Medical Association credits of Neurology Movement Disorders and Parkinson Study Group diagnosticstandard [3], in which the left side in 14 cases, 12 cases of right. Female ratio was 15:11. Aged 47 to 77 years, mean ($56.4 \pm 9.3$) years. Duration of 10 to 33 months, with an average of ($17.9 \pm 7.3$) months. Long-term use (> 1 year) dopaminergic drugs in patients 15 cases (medication group), not taking dopamine drugs (medication group) in 11 patients taking only a short period of time. Randomly selected as a control group of 26 healthy subjects were no significant difference ($p > 0.05$) between the two groups in terms of age, gender.

1.2 Methods: Siemens Avanto 1.5T magnetic resonance (Gearmany) was used. Groups were divided into PD group and control group, respectively, to be bilateral putamen MRS examination, the three-dimensional volumetric standard 20 mm × 20 mm × 20 mm, check the stimulated echo sampling spectral sequence, the pixel sizes of 20 mm × 20 mm × 20 mm, TR / TE = 1800/288 ms, NEX = 4, the total number of scans = 128. All data entry workstation. MRS determination of NAA, Cho, and Cr metabolites by measuring the NAA and NAA, Cho and Cr ratio for the diagnosis of PD.

During the MRS at the same time, the brain MRI conventional scanning surface and putamen MRI wave layer sweep surface inspection, including the axial T1W1 SE, T2WI FSE, DW / FLAIR EPI. The sequence measurement parameters are as follows:

T1W1 SE sequence, TR / TE = 380/10 ms, FOV = 24, NEX = 2, matrix = 256 × 192, slice thickness / spacing = 8/2mm.

T2WI FSE sequence, TR / TE = 000/105 ms,

FOV = 24, NEX = 2, matrix = 320 × 224, slice thickness / spacing = 8/2 mm, EC = 1:1, BW = 20.8.

DW / FLAIR EPI sequence, TI / TR / TE = 200/10 000/90 ms, FOV = 38, NEX = 1, matrix = 128 × 128, slice thickness / spacing = 8/2 mm, B = 1000, dispersion direction = ALL.

By the settings on the above parameters to exclude substantive lesions, such as lacunar state or multi-system atrophy.

1.3 Image processing the ADW WIN 3.1 graphics workstations and supporting software to calculate the metabolite peaks and concentration. To ensure the stability of the spectrum, invited two physicians with extensive experience in the Nuclear Magnetic Resonance detection of image and data processing, as much as possible the exclusion of bias, to ensure the accuracy of the data.

1.4 Statistical Methods All data taken mean ± standard deviation. Statistical treatment of the use of SPSS 18.0 for processing, test methods using the t-test, $p < 0.05$ was considered statistically significant.

**2. Results**

1.5 NAA, Cho, Cr spectrum case contralateral putamen of the PD group and the control group compared to the NAA peak, crest Cho and NAA / (Cho + Cr) ratio there are significant differences ($p < 0.05$). The crest of NAA and NAA / (Cho + Cr) ratio was significantly lower than the control group, crest Cho was significantly higher. Illustrated in table 1.

Table 1 NAA, Cho, Cr spectrum

| Groups | Site | NAA peak | Cho Peak | Cr Peak | NAA/(Cho+Cr) Ratio |
|---|---|---|---|---|---|
| PD Group | Contralateral putamen | 24.1±6.7* | 18.5±5.8* | 13.8±4.8 | 0.8±0.3* |
| | ipsilateral putamen | 27.2±8.5 | 15.2±6.2 | 13.5±4.4 | 0.9±0.4 |
| Control group | The left putamen | 30.1±9.9 | 14.1±5.3 | 13.2±4.0 | 1.1±0.2 |
| | Right putamen | 31.2±9.5 | 14.2±4.7 | 13.2±4.3 | 1.1±0.3 |

Note: * indicates statistical difference PD group and the control group, $p < 0.05$

1.6 Effect of dopamine use on the spectrum Medication group and not the medication group in NAA crest crest Cho, Cr crest no significant difference, but in NAA / (Cho + Cr) ratio, the medication group and not the medication group contralateral shell nuclear have significant difference, $P < 0.05$. , The difference was not significant in the ipsilateral putamen. This suggests that taking dopamine will have an impact on the patient's contralateral putamen NAA / (Cho + Cr) ratio. From the data, the medication group NAA peak is higher than the non-medication group, but the crest Cho and Cr peak was no significant difference, which may be the reason for the NAA / (Cho + Cr) ratios significant difference. As in table 2.

Table 2 dopamine on NAA, CHO, Cr spectrum

| Groups | Site | NAA peak | Cho Peak | Cr Peak | NAA/(Cho + Cr) Radio |
|---|---|---|---|---|---|
| Medication Group | Contralateral putamen | 25.8±8.2 | 18.4±5.6 | 13.2±4.8 | 0.9±0.3* |
| | Ipsilateral putamen | 28.2±8.7 | 15.6±6.3 | 13.7±4.7 | 0.9±0.3 |
| No Medication Group | Contralateral putamen | 22.6±6.9 | 20.1±6.3 | 13.9±4.5 | 0.6±0.1 |
| | Ipsilateral putamen | 26.6±7.5 | 14.8±4.9 | 13.4±3.7 | 0.8±0.2 |

Note: * indicates medication and non-medication group statistical difference, $P < 0.05$.

**3. Discussion:**

In recent years, studies have shown that Lewy bodies, and of DA neuron loss is the main pathological lead to Parkinson's disease [4]. The pathogenesis of Parkinson's disease is still under study. Polymeropoulos et al study found that Parkinson's

disease genes of the human body 4q21 ~ q23 of chromosome 4 is closely related to [5].

Parkinson's disease will lead to the mobility of the elderly, there will be severe damage to the nervous system. Therefore, timely diagnosis and treatment for the maintenance of the health of the elderly has a strong clinical practice. MRS in brain science in recent years as an important technology in the field of modern medical instruments, is very wide. However, due to the use of MRS detection more difficult, the substantia nigra substantia nigra and the structure is closely related to Parkinson's disease. Therefore, the MRS in the early diagnosis of Parkinson's use less. With the development of electronic technology and detection methods, and found that patients with Parkinson putamen at the dopamine transporter significantly reduced NMR early diagnosis of Parkinson possible. O Neill by statistics indicating the putamen of patients with early PD approximate volume of about 10% out, confirms the PD patients in the early deletion of neurons. 1H-MRS Determination of metabolites, NAA exists within neurons, the content thereof is reduced if the damage or loss of neuronal function; Cho is a precursor of acetylcholine and membrane phosphatidyl choline, participate in the composition of the cell membrane, its content is increased Tip membrane disintegrant; the Cr content is relatively stable in a variety of pathological conditions, often as the other metabolites changes in reference [6]. However, simply by CT scan or MRI examination difficult early detection of this deletion. However, MRS techniques can detect changes to NAA, Cr and Cho, by analyzing the variation of these metabolites can indirectly provide a reference for the diagnosis of early PD.

Judging from the results of this study, PD patients with nuclear magnetic resonance spectroscopy analysis and control group differences in NAA crest, Cr crest and NAA / (Cho + Cr) ratio is a statistical difference with the control group. This, undoubtedly, MRS technology in the early diagnosis of Parkinson's disease provides a possible and ideas. Furthermore, taking dopamine will also affect the test results, but from the view of the present study, this effect is mainly reflected in the ratio of NAA / (Cho + Cr), while the other NAA crest, CR crest and Cho crest no significant differences. This result seems to indicate that the dopamine neurons of the putamen has no negative effect. Of course, just a guess. This speculation is correct, due to the small sample size of this study, more experiments are needed corroboration.

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**References**

[1] Chen Dong. Parkinson's disease-related protein Parkin autophagy regulation [D], University of Science and Technology of China 2010.
[2] Zhao Qing. MPTP sub-acute Parkinson's disease mouse model neurobehavioral Observation and Echinacoside nerve-saving function of [D] Fudan University, 2010.
[3] Renhai Gang. Parkinson's disease and cancer-related protein DJ-1 in autophagy and mitochondrial function [D]., University of Science and Technology of China 2010.
[4] Polymeropoulos NH, Higgins JJ, Globe LI, et al. Mapping of agene for Parkinson's disease to chromosome 4q21 ~ 23.Science ,1996,274:1197-1199.
[5] Xiongkang Ping, Li Jie, Maocheng Jie, motor complications in Parkinson's disease pathophysiological mechanism [A] Fourth Chinese Academy of Sleep Medicine Forum papers assembly [C] 2011.
[6] O'Neill J, Schuff N, Marks WJ Jr, et al. Quantitative 1H magnetic resonance spectroscopy and MRI of Parkinson's disease. Mov Disord, 2002,17: 917-927.

14/5/2013