·阿尔茨海默病神经影像学研究·

阿尔茨海默病颞干纤维束扩散张量成像研究

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【摘要】 **目的** 应用扩散张量成像(DTI)研究阿尔茨海默病和遗忘型轻度认知损害患者白质和颞干纤维束部分各向异性(FA)值变化特点,探讨颞干纤维束损伤机制及其对阿尔茨海默病和遗忘型轻度认知损害的诊断与鉴别诊断价值。**方法** 应用常规MRI和DTI测量阿尔茨海默病(10例)、遗忘型轻度认知损害(10例)和正常对照者(10例)颞干纤维束(包括前连合、钩束、额枕下束)及前额叶、颞叶、顶叶、枕叶白质FA值,比较各组受试者左右侧对称部位白质和颞干纤维束FA值变化。**结果** 各组受试者左右侧对称部位白质和颞干纤维束FA值差异无统计学意义(均$P>0.05$),但其前连合、钩束、额枕下束及前额叶白质FA值差异具有统计学意义(均$P<0.05$)。其中,阿尔茨海默病组前连合、钩束、额枕下束FA值低于遗忘型轻度认知损害组(均$P<0.05$),前连合、钩束、额枕下束及前额叶、顶叶白质FA值低于正常对照组(均$P<0.05$);而遗忘型轻度认知损害组与正常对照组前连合、钩束、额枕下束及前额叶白质FA值差异无统计学意义(均$P>0.05$)。**结论** 阿尔茨海默病和遗忘型轻度认知损害患者与正常老年人颞干纤维束FA值存在显著差异,提示颞干纤维束在阿尔茨海默病患者白质损伤中具有重要意义,DTI检查有助于阿尔茨海默病与遗忘型轻度认知损害和正常老龄化的鉴别诊断。阿尔茨海默病前连合、钩束、额枕下束及前额叶、顶叶白质FA值异常具有良好的临床诊断价值。

【关键词】 阿尔茨海默病; 认知障碍; 记忆障碍; 颞叶; 磁共振成像

Diffusion tensor imaging study of the temporal stem in Alzheimer´s disease

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【**Abstract**】 **Objective** To study the changes of fractional anisotropy (FA) value of white matter of brain and temporal stem in Alzheimer´s disease (AD) and amnestic mild cognitive impairment (aMCI) patients as well as normal cognitive (NC) aged people with diffusion tensor imaging (DTI), and explore the damage mechanism of temporal stem and its diagnostic value on AD and aMCI. **Methods** Ten patients with AD, 10 patients with aMCI and 10 NC volunteers as control group were scanned by routine MRI and DTI. FA values were calculated by post-processing software (DTIstudio) in temporal stem (including anterior commissure, uncinate fasciculus and inferior occipitofrontal fasciculus), and white matter in anterior frontal, temperal, parietal and occipital lobes. The data were analyzed by SPSS 13.0. If bilateral differences of FA values were not statistically significant ($P>0.05$), the average values of bilateral FA were selected and compared among 3 groups. If bilateral differences of FA values were statistically significant ($P<0.05$), the measurement values were directly compared. **Results** 1) There was no significant difference of FA values in bilateral symmetric white matter and temporal stem among AD, aMCI and NC groups ($P>0.05$, for all). 2) There was significant difference of FA values in anterior commissure, uncinate fasciculus and inferior occipitofrontal fasciculus between AD and aMCI groups ($P<0.05$, for all). 3) There was significant difference of FA values in anterior commissure, uncinate fasciculus, inferior occipitofrontal

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fasciculus, anterior frontal and parietal lobes between AD and NC groups ($P < 0.05$, for all). 4) There was no significant difference of FA values in anterior commissure, uncinate fasciculus, inferior occipitofrontal fasciculus, anterior frontal lobe between aMCI and NC groups ($P > 0.05$, for all). **Conclusions** The significant difference of FA values in temporal stem among AD, aMCI and NC groups suggests that temporal stem fiber bundles are of great significance in the white matter damage of AD, and DTI is helpful for the differential diagnosis of AD, aMCI and NC. The abnormal changes of FA values in anterior commissure, uncinate fasciculus, inferior occipitofrontal fasciculus, anterior frontal and parietal lobes are of great diagnostic value in AD.

【Key words】 Alzheimer disease; Cognition disorders; Memory disorders; Temporal lobe; Magnetic resonance imaging

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阿尔茨海默病是一种以认知功能进行性减退为主要特征的神经变性疾病。阿尔茨海默病在老年人群中的患病率仅次于心血管病和肿瘤，位居第三位，全球数据一致性评价显示，阿尔茨海默病发病率约为0.75%，且随年龄增长呈指数增加之趋势，从60～64岁的0.50%增至90岁以上的7%[1]。但是目前尚无针对阿尔茨海默病的有效治疗方法，一旦发生便无法逆转，于是人们寄希望于早期诊断、早期干预，进而延缓病情进展，以达到降低医疗费用、提高生活质量之目的，尤其是轻度认知损害（MCI）作为正常老龄化到阿尔茨海默病的过渡状态而成为临床研究之热点。遗忘型轻度认知损害（aMCI）为轻度认知损害的常见亚型，其结局是进展为阿尔茨海默病，被认为是阿尔茨海默病之临床前期[2]。随着神经影像学技术的不断进步，MRI除应用于脑结构成像，其功能像也越来越多地应用于阿尔茨海默病等中枢神经系统疾病的早期诊断和发病机制研究。有研究显示，阿尔茨海默病不仅累及灰质亦可累及白质，疾病早期即出现白质损害[3-4]。扩散张量成像（DTI）作为一种通过测量组织内水分子扩散程度和方向进而显示白质纤维束并定量检测其损害程度的技术，可在疾病早期即观察到白质损害状态[5]。颞干（TS）是联系颞叶前部与其他脑区的重要白质纤维束，通常认为在下限沟与颞角顶部之间，由前连合、钩束、额枕下束、视辐射和下丘脑脚组成[6-8]。本研究主要通过DTI技术观察阿尔茨海默病和遗忘型轻度认知损害患者前连合、钩束、额枕下束及前额叶、颞叶、顶叶、枕叶白质FA值变化特点，探讨颞干纤维束在阿尔茨海默病患者白质损害过程中的作用及DTI技术对阿尔茨海默病与遗忘型轻度认知损害的鉴别诊断意义。

对象与方法

一、研究对象

选择2011年12月–2012年12月经首都医科大学宣武医院神经内科门诊诊断为阿尔茨海默病或遗忘型轻度认知损害的患者各10例，根据美国阿尔茨海默病学会2011年公布的诊断标准，排除脑卒中、精神疾病、中至重度高血压、糖尿病、系统性疾病及药物滥用患者。

1. 阿尔茨海默病组　10例患者，男性4例，女性6例；年龄68～76岁，平均（71.40±1.71）岁；受教育程度9～16年，平均（12.50±3.23）年。所有患者均符合以下条件。（1）有记忆力障碍主诉，且经知情者、陪同者或临床医师证实。（2）校正韦氏记忆量表（WMS）中逻辑记忆Ⅱ测验（仅行延迟故事回忆A）提示记忆功能异常（最高评分25分）：受教育程度≥16年，评分≤8分；受教育程度8～15年，评分≤4分；受教育程度0～7年，评分≤2分。（3）简易智能状态检查量表（MMSE）评分≤23分。（4）临床痴呆评价量表（CDR）评分0.50或1分。（5）诊断符合美国国立神经病学、语言障碍和卒中研究所-阿尔茨海默病及相关疾病协会（NINCDS-ADRDA）标准中的很可能阿尔茨海默病。（6）服用非禁止药物稳定后至少4周。

2. 遗忘型轻度认知损害组　共计10例患者，男性4例，女性6例；年龄68～73岁，平均为（70.20±2.30）岁；受教育程度9～16年，平均为（12.30±2.40）年。所有患者均符合以下条件。（1）有记忆力障碍主诉，且经知情者、陪同者或临床医师所证实。（2）校正韦氏记忆量表中逻辑记忆Ⅱ测验（仅进行延迟故事回忆A）提示记忆功能异常（最高评分为

25分)：受教育程度≥16年，评分≤8分；受教育程度8～15年，评分≤4分；受教育程度0～7年，评分≤2分。(3)MMSE评分24～27分；CDR评分为0.50分，其中记忆项评分至少为0.50分。(4)整体认知功能充分保留，未被诊断为痴呆。(5)服用非禁止药物稳定后至少4周。

3. 正常对照组　选择同期在我院进行体格检查的健康老年志愿者共10例，男性5例，女性5例；年龄67～74岁，平均(71.50±2.41)岁；受教育程度9～14年，平均(12.00±2.82)年。所有受试者均符合以下条件。(1)无记忆力障碍主诉，并经知情者证实。(2)排除阿尔茨海默病以外其他原因所致记忆力损害。(3)校正韦氏记忆量表中逻辑记忆Ⅱ测验(仅进行延迟故事回忆A)提示记忆功能异常(最高评分为25分)：受教育程度≥16年，评分≥9分；受教育程度8～15年，评分≥5分；受教育程度0～7年，评分≥3分。(4)MMSE评分≥28分，CDR评分为零，其中记忆项评分为零，认知功能正常，日常生活活动能力无损害。(5)可服用不影响本研究结果的药物，但必须规律服药至少4周。

二、研究方法

1. MRI检查　采用德国Siemens公司生产的Trio 3.0T超导型MRI扫描仪进行常规MRI和DTI检查。通过梯度回波序列(GRE)-回波平面成像(EPI)获得DTI数据，重复时间(TR)6000 ms、回波时间(TE)85 ms，翻转角度(FA)90°、扫描视野(FOV)为256 mm×256 mm，矩阵128×128，扫描层厚5 mm、无间隔，扫描30层，b值为0和1000 s/mm^2，从12个方向采集DTI图像。

2. 数据处理　采用DTIstudio后处理软件进行白质纤维束追踪，于不同层面b0图和彩色编码图中测定前连合、钩束、额枕下束，以及前额叶、颞叶、顶叶、枕叶白质FA值，兴趣区(ROI)由同一位医师在未获知诊断结果的情况下统一放置(表1，图1～7)，其中彩色编码图中红、绿、蓝色分别代表左右、前后和上下方向。

3. 统计分析方法　采用SPSS 13.0统计软件进行数据处理与分析。采用t检验比较3组受试者左右侧对称部位白质和颞干纤维束FA值若差异无统计学意义，则取左右侧前连合、钩束、额枕下束及前额叶、颞叶、顶叶、枕叶白质平均FA值，行单因素方差分析，两两比较行LSD-t检验。以$P\leq0.05$为差异具有统计学意义。

结　果

各组受试者社会人口学特征比较，性别($P=0.680$)、年龄($P=0.365$)、受教育程度($P=0.922$)差异无统计学意义(均$P>0.05$，表2)，均衡可比。

各组受试者白质和颞干纤维束FA值比较，左右侧对称部位白质和颞干纤维束FA值差异均无统计学意义($P>0.05$，表3～5)。

进一步行单因素方差分析和LSD-t检验显示，各组受试者前连合、钩束、额枕下束及前额叶白质FA值差异有统计学意义(均$P<0.05$)；而颞叶、顶叶、枕叶白质FA值差异无统计学意义(均$P>0.05$，表6)。其中，阿尔茨海默病组患者前连合、钩束、额枕下束FA值低于遗忘型轻度认知损害组(均$P<0.01$)，而前连合、钩束、额枕下束及前额叶、顶叶白质FA值低于正常对照组(均$P=0.000$)；而遗忘型轻度认知损害组与正常对照组前连合、钩束、额枕下束及前额叶白质FA值比较，差异无统计学意义(均$P>0.05$，表7)。

讨　论

在2011年公布的阿尔茨海默病新诊断标准中，除保留1984年NINCDS-ADRDA诊断标准[9]的基本框架，还将阿尔茨海默病视为包括轻度认知损害在内的连续疾病过程，并增补了生物学标志物[10-13]。轻度认知损害系指记忆或认知功能下降但尚未达痴呆标准的过渡阶段，根据Petersen等[13]提出的诊断标准：(1)患者及其家属或知情人提供记忆力减退主诉。(2)患者记忆测验成绩低于同年龄段和受教育程度的正常对照者1.50个标准差(SD)。(3)认知功能测验呈现轻度异常即总体衰退量表(GDS)为2～3级，或CDR评分为0.50分。(4)一般认知功能正常。(5)日常生活活动能力正常。(6)排除痴呆或任何可导致神经功能紊乱的躯体和精神疾病。轻度认知损害病因、临床表现、影像学表现和转归均具有多样性，可以分为3种亚型：遗忘型、单认知域型和多认知域型。虽然已知阿尔茨海默病的病理改变表现为神经元大量缺失，细胞外不可分解的β-淀粉样蛋白(Aβ)斑块沉积，以及细胞内神经原纤维缠结(NFTs)形成[14]，而遗忘型轻度认知损害也存在类似病理改变，只是Aβ密度和分布范围略有不同[15]；但是二者发病机制至今仍未阐明。根据“失连接综

表1 FA值测量部位及兴趣区放置方法

Table 1. Measurement position of FA value and placement method of ROI

Position	Placement method of ROI
Anterior commissure	Placed ROI (Figure 1) on both sides of the center line and temporal stem by the transverse position of color-coded diagrams, measured once more close to the upper and lower levels, and then averaged
Uncinate fasciculus	Placed ROI (Figure 2) on frontal site, temporal stem and temporal site of uncinate fasciculus by the transverse position of color-coded diagrams, measured once more close to the upper and lower levels, and then averaged
Inferior occipitofrontal fasciculus	Placed ROI (Figure 3) on frontal site, temporal stem and occipital site of inferior occipitofrontal fasciculus by the transverse position of color-coded diagrams, measured once more close to the upper and lower levels, and then averaged
Anterior frontal lobe	Placed ROI (Figure 4) on three consecutive levels of anterior frontal lobe by the transverse position of b0 diagrams, and then averaged
Temperal lobe	Placed ROI (Figure 5) on three consecutive levels of temperal lobe by the transverse position of b0 diagrams, and then averaged
Parietal lobe	Placed ROI (Figure 6) on three consecutive levels of parietal lobe by the transverse position of b0 diagrams, and then averaged
Occipital lobe	Placed ROI (Figure 7) on three consecutive levels of occipital lobe by the transverse position of b0 diagrams, and then averaged

ROI, region of interest, 兴趣区

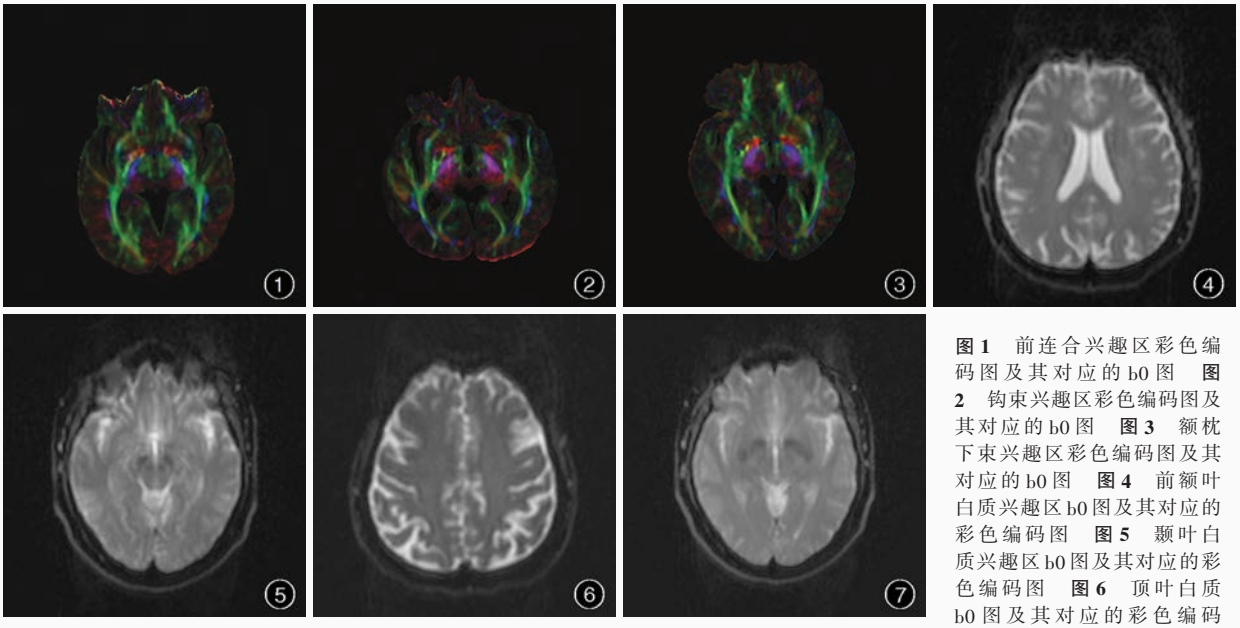

图1 前连合兴趣区彩色编码图及其对应的b0图 **图2** 钩束兴趣区彩色编码图及其对应的b0图 **图3** 额枕下束兴趣区彩色编码图及其对应的b0图 **图4** 前额叶白质兴趣区b0图及其对应的彩色编码图 **图5** 颞叶白质兴趣区b0图及其对应的彩色编码图 **图6** 顶叶白质b0图及其对应的彩色编码图 **图7** 枕叶白质兴趣区b0图及其对应的彩色编码图

Figure 1 Color-coded graph of ROI in anterior commissure, and its corresponding b0 graph. **Figure 2** Color-coded graph of ROI in uncinate fasciculus, and its corresponding b0 graph. **Figure 3** Color-coded graph of ROI in inferior occipitofrontal fasciculus, and its corresponding b0 graph. **Figure 4** b0 graph of ROI in white matter of anterior frontal lobe, and its corresponding color-coded graph. **Figure 5** b0 graph of ROI in white matter of temporal lobe, and its corresponding color-coded graph. **Figure 6** b0 graph of ROI in white matter of parietal lobe, and its corresponding color-coded graph. **Figure 7** b0 graph of ROI in white matter of occipital lobe, and its corresponding color-coded graph.

合征假说”,阿尔茨海默病和遗忘型轻度认知损害均由于不同神经元系统(或脑区)失连接所致[16]。阿尔茨海默病早期即可累及脑白质,究其原因可能是脑白质稀疏、神经轴索缺失、少突胶质细胞减少,以及Aβ斑块沉积所致。DTI根据水分子扩散程度和方向可以清晰地显示白质纤维束,并定量评价其损害程度,FA值下降能够反映白质纤维束完整性的破坏程度[17]。

颞叶是人脑最为复杂的脑区之一,包含外侧和底面外侧部的新皮质、海马和齿状核的古皮质、海马旁回的旧皮质三种成分。颞叶在认知、情感、记忆、定时、定向和言语等项功能中发挥重要作用,而且颞叶白质与大脑其他脑区联系广泛。颞叶前部通过颞干纤维束与其他脑区相连,其概念最早由Horel[18]于1978年提出,系指位于岛叶下限沟与颞角外上缘之间,由前连合、钩束、额枕下束和视辐射组成的白质纤维束,其前界为杏仁核、后界为膝状体外侧[19]。钩束构成颞干前部的核心,前连合位于

表2 各组受试者社会人口学特征的比较

Table 2. Characteristics of subjects in 3 groups

Group	N	Sex case (%)		Age ($\bar{x}\pm s$, year)	Education ($\bar{x}\pm s$, year)
		Male	Female		
Control	10	5 (5/10)	5 (5/10)	71.50±2.41	12.00±2.82
AD	10	4 (4/10)	6 (6/10)	71.40±1.71	12.50±3.23
aMCI	10	4 (4/10)	6 (6/10)	70.20±2.30	12.30±2.40
χ^2 or F value		-0.444		1.046	0.081
P value		0.680		0.365	0.922

AD, Alzheimer's disease, 阿尔茨海默病; aMCI, amnesic mild cognitive impairment, 遗忘型轻度认知损害

表3 阿尔茨海默病组患者左右侧颞干纤维束和不同部位白质FA值的比较($\bar{x}\pm s$)

Table 3. Comparison of FA values in bilateral temporal stem and white matter of different regions in AD group ($\bar{x}\pm s$)

Position	Right	Left	t value	P value
Anterior commissure	0.40±0.02	0.41±0.02	0.463	0.654
Uncinate fasciculus	0.40±0.02	0.39±0.01	-1.072	0.311
Inferior occipito-frontal fasciculus	0.42±0.02	0.42±0.02	-0.220	0.831
Anterior frontal lobe	0.36±0.03	0.38±0.03	-0.260	0.801
Temporal lobe	0.39±0.04	0.37±0.03	1.121	0.292
Parietal lobe	0.41±0.02	0.39±0.03	2.243	0.052
Occipital lobe	0.42±0.01	0.42±0.01	0.585	0.573

表4 遗忘型轻度认知损害组患者左右侧颞干纤维束和不同部位白质FA值的比较($\bar{x}\pm s$)

Table 4. Comparison of FA values in bilateral temporal stem and white matter in aMCI group ($\bar{x}\pm s$)

Position	Right	Left	t value	P value
Anterior commissure	0.42±0.02	0.44±0.02	2.236	0.052
Uncinate fasciculus	0.41±0.01	0.41±0.01	0.470	0.650
Inferior occipito-frontal fasciculus	0.44±0.02	0.45±0.02	1.609	0.142
Anterior frontal lobe	0.37±0.02	0.37±0.03	-0.569	0.583
Temporal lobe	0.39±0.03	0.39±0.02	-0.060	0.953
Parietal lobe	0.42±0.03	0.42±0.02	0.085	0.934
Occipital lobe	0.43±0.03	0.44±0.03	-0.222	0.829

表5 正常对照组受试者左右侧颞干纤维束和不同部位白质FA值的比较($\bar{x}\pm s$)

Table 5. Comparison of FA values in bilateral temporal stem and white matter of different regions in normal control group ($\bar{x}\pm s$)

Position	Right	Left	t value	P value
Anterior commissure	0.45±0.03	0.44±0.03	-1.802	0.105
Uncinate fasciculus	0.42±0.01	0.42±0.01	-0.984	0.351
Inferior occipito-frontal fasciculus	0.45±0.01	0.45±0.03	0.343	0.739
Anterior frontal lobe	0.38±0.02	0.38±0.01	-0.185	0.857
Temporal lobe	0.40±0.02	0.40±0.02	-1.412	0.192
Parietal lobe	0.42±0.02	0.43±0.03	-0.342	0.740
Occipital lobe	0.43±0.02	0.43±0.03	-0.350	0.735

表6 各组受试者颞干纤维束和不同部位白质FA值的比较($\bar{x}\pm s$)

Table 6. Comparison of FA values in temporal stem and white matter of different regions in every group ($\bar{x}\pm s$)

Position	Control	AD	aMCI	F value	P value
Anterior commissure	0.44±0.02	0.40±0.02	0.43±0.02	11.761	0.000
Uncinate fasciculus	0.42±0.01	0.39±0.01	0.41±0.01	34.080	0.000
Inferior occipito-frontal fasciculus	0.45±0.02	0.42±0.01	0.44±0.02	11.429	0.000
Anterior frontal lobe	0.38±0.01	0.36±0.02	0.37±0.02	3.850	0.034
Temporal lobe	0.40±0.02	0.38±0.03	0.39±0.02	1.741	0.194
Parietal lobe	0.42±0.02	0.40±0.02	0.42±0.02	3.086	0.062
Occipital lobe	0.43±0.02	0.42±0.01	0.43±0.03	1.805	0.184

AD, Alzheimer's disease, 阿尔茨海默病; aMCI, amnesic mild cognitive impairment, 遗忘型轻度认知损害。The same as Table 7

表7 各组受试者颞干纤维束和不同部位白质FA值的两两比较

Table 7. Comparison of FA values in temporal stem and white matter of different regions in every group

Paired comparison	P value			
	Anterior commissure	Uncinate fasciculus	Inferior occipito-frontal fasciculus	Anterior frontal lobe
Control∶AD	0.000	0.000	0.000	0.000
Control∶aMCI	0.179	0.065	0.232	0.111
AD∶aMCI	0.002	0.000	0.002	0.276

钩束后部,二者共占据颞干前1/3;额枕下束穿过整个颞干,而大部分视辐射位于颞干中后2/3[20]。有研究显示,阿尔茨海默病患者视辐射不受累[21],FA值无异常改变,而且结构相对复杂,因此本研究未测量视辐射FA值。

应用DTI研究阿尔茨海默病和轻度认知损害,发现阿尔茨海默病早期即可累及海马旁回、胼胝体压部、颞叶、顶叶和后扣带回白质[22-23],且大脑后部重于前部[24]。Xie等[25]和Bai等[26]发现,阿尔茨海默病患者上纵束Ⅱ之FA值显著减低,但Fellgiebel等[27]的研究结果却与之相反,未见上纵束异常改变,笔者认为可能与不同研究组所选用的设备、选择的兴趣区和患者病情严重程度有关。与此同时,Fellgiebel等[28]的研究还发现,半卵圆中心(由连接

内囊和胼胝体的联合纤维组成)平均扩散率(MD)显著升高。有研究显示,遗忘型轻度认知损害患者顶叶[23,29]和后扣带FA值低于对照组[24,30],认为该项指标可以作为遗忘型轻度认知损害的诊断依据。有文献报道,遗忘型轻度认知损害患者顶叶白质FA值显著下降,可能与其顶叶相关网络破坏有关[31],而后扣带为胆碱能纤维的一部分,其FA值下降提示胆碱能系统损害[32]。

认知活动涉及复杂的神经网络,而颞顶叶联合皮质在认知功能中发挥重要作用。本研究结果显示,阿尔茨海默病组患者顶叶白质和额枕下束FA值降低,支持阿尔茨海默病"失连接综合征假说"。前额叶主要与工作记忆有关,本研究阿尔茨海默病组与正常对照组受试者前额叶白质FA值存在显著差异,支持阿尔茨海默病病理发展的"反向起源假说"[33]。该理论认为,阿尔茨海默病之病情进展与髓鞘发育进程相反,即最晚髓鞘化的额叶在阿尔茨海默病早期即受到损害。

前连合在大脑中线形成紧密绳样结构,联系双侧嗅结构和颞叶前部,向外侧走行至颞干,在钩束后方散开进入颞叶,在侧脑室颞角前上方进入颞回。本研究结果显示,阿尔茨海默病、遗忘型轻度认知损害与正常老年受试者前连合白质FA值存在明显差异,此与文献报道相一致[27]。钩束自颞叶走行,弯曲围绕侧裂干,向上经前部颞干到达岛叶内侧的外囊和最外囊,散开进入额叶,联系前颞叶和额叶,是颞叶与额叶之间的通路。钩束内有从Meynert基底核发出的胆碱能纤维,在情绪、决策、情景记忆和阿尔茨海默病发病过程中起重要作用[22],其损伤可致严重记忆损害[34]。有文献报道,轻度阿尔茨海默病即存在钩束损害[21],与后扣带同属胆碱能纤维,在阿尔茨海默病早期即受累[32],本研究进一步证实,阿尔茨海默病患者钩束FA值显著降低。额枕下束是前后走行的纤维束,在岛叶下方经颞叶联系枕叶和额叶,并在钩束上方进入外囊和最外囊;额枕下束在视空间能力、物体辨认和记忆力方面发挥重要作用[35],本研究显示的阿尔茨海默病患者额枕下束FA值降低与文献报道一致[27,36]。常城等[30]发现,遗忘型轻度认知损害患者额枕下束FA值较正常老年人降低且差异有统计学意义,与本研究结果不尽一致,推测可能与所用设备、选择的兴趣区和患者病情严重程度等因素有关。

阿尔茨海默病、遗忘型轻度认知损害与正常老年受试者颞干纤维束FA值存在显著差异。提示颞干纤维束在阿尔茨海默病患者白质损害中具有重要意义,DTI检查有助于阿尔茨海默病、遗忘型轻度认知损害与正常老龄化的鉴别诊断。

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下期内容预告 本刊2014年第4期报道专题为痴呆相关疾病神经影像学研究，重点内容包括：脑脊液生物学标志物在阿尔茨海默病早期诊断中的作用；阿尔茨海默病免疫治疗：对攻克神经变性疾病的几点启示；为更早识别阿尔茨海默病：阿尔茨海默病神经影像学计划简介；2013年痴呆临床研究进展；基于多模态神经影像的人脑海马毕生变化曲线；语义性痴呆结构性磁共振成像研究；不同类型痴呆脑代谢改变图型：^{18}F-FDG PET显像；皮质下缺血性血管性认知损害扩散张量成像研究；扩散加权成像诊断散发性Creutzfeldt-Jakob病价值