磁共振薄层及特殊成像技术在突发性聋病因诊断中的价值

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摘 要：【目的】探讨磁共振(MRI)薄层及特殊成像技术在突发性聋病因诊断价值。【方法】分析 60 例突发性聋患者内耳 MRI 检查结果与听力检查及临床特征关系，探讨 MRI 明确病因的诊断价值以及何种情况下行 MRI 检查更合理。【结果】60 例患者 MRI 检查结果，23 例异常，阳性率为 38.3%。异常结果分为 3 类，明确病因 10 例(16.6%)，可能致病因素 6 例(10%)和无因果关系 7 例(11.7%)，10 例明确病因患者中，80%伴眩晕，均为重度以上感音神经性聋。重度以下聋组与重度以上聋组比较，眩晕发生率和 MRI 明确病因率差异有统计学意义($P < 0.05$)。行内耳 MRI 检查原因，22 例患者为重度聋以上合并眩晕，住院后建议立即行内耳 MRI 检查，6 例明确病因，检出率 27.3%；25 例患者治疗 1 周后效果差行 MRI 检查，4 例明确病因，检出率 16%。【结论】对于重度及以上聋突发性聋患者，MRI 薄层及特殊成像技术能显著提高明确病因的诊断率。

关键词：突发性聋；磁共振成像；内耳出血
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Etiological Evaluation of Folium MRI and Special Imaging Technology in Patients with Sudden Sensorineural Hearing Loss

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Abstract: 【Objective】 To evaluate etiological efficacy of MRI folium and special imaging technology in patients with sudden sensorineural hearing loss.【Methods】The clinical data of the MRI findings and relevant clinical results was analyzed in 60 patients with sudden sensorineural hearing loss.【Results】Abnormal findings MRI were identified in 23 patients (38.3%), including defined etiology in ten patients, possible etiology in six patients and uncertain etiology in seven patients. Those ten patients were characterized by severe sensorineural deafness and vertigo (80%). When subdivided into two groups: >=severe deafness group and <severe deafness group, there were higher vertigo occurrences and relevance ratio of obvious etiology in profound and severe groups. Besides, six individuals among 22 patients with profound deafness and vertigo who were arranged for MRI immediately were found to suffer from auditory pathway pathology (27.3%). Another four patients from 25 patients who received MRI one week later were also identifier (16%). 【Conclusions】 The results indicated the importance of MRI folium and special imaging technology in patients of sudden sensorineural hearing loss. It could significantly enhanced diagnosing rate of etiology in patients with severe to profound deafness.

Key words: sudden sensorineural hearing loss; magnetic resonance imaging; inner ear hemorrhage
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突发性聋(sudden sensorineural hearing loss，SSHL)是耳鼻咽喉科常见的一种急症，发病后如不及时治疗，其治疗效果可能受影响。引起 SSHL 常见病因有特异性病毒感染、内耳微循环障碍、免

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疫因素等，常见治疗方案是糖皮质激素及高压氧治疗[1-2],亦有应用溶栓及改善微循环等治疗的报道[3-5],无论采用何种治疗方法,总体有效率并不理想,一般为 50%左右[6-7]。由于大部分 SSHL 患者病因不明，治疗方案选择会存在偏差。内听道肿瘤、多发性硬化及脑梗死可以导致突发性聋,约 10%前庭神经鞘瘤患者以突发性聋为首发症状。近年有报道[8-10]显示,内耳出血也可以导致 SSHL。我们前期研究显示,利用 MRI 薄层及特殊成像系列和 MRI 随访可以确定 SSHL 其中内耳出血病因[10]。从临床角度分析,如果内听道肿瘤及脑梗死、内耳出血等因素未排除,可能会影响 SSHL 的治疗方案选择及治疗效果。因此,SSHL 治疗关键在于尽可能找出或者排除它们的内在病因。常规 MRI 检查时内耳 SE 序列由于层厚关系、部分容积效应的影响,阳性率低,主要用于排查体积较大内听道肿瘤。近年来,MRI 薄层及 3D-FLAIR(3-dimensional fluid-attenuated inversion-recovery),3D-CISS(3D-constructive interference of steady state)等特殊成像序列开始应用于内耳扫描,可以敏感显示内耳病变,提高内耳病变诊断阳性率[11-12],已经成为 SSHL 患者查找病因重要手段。但是,MRI 价格相对昂贵,SSHL 患者是否都需要进行内耳 MRI 检查，存在较大争议。本研究目的是探讨应用 MRI 对 SSHL 病因诊断价值,何种情况下建议进行 MRI 检查,以取得经济、实用的效果,为 SSHL 病因诊断提供帮助。目前国内报道有关 SSHL 患者 MRI 诊治价值的文献数量较少[13-14]。本研究分析 2014 年 4 月至 2014 年 10 月在中山大学附属第一医院收治的 60 例 SSHL 患者临床资料，包括纯音测听等听力学检查以及内耳 MRI 检查，了解 SSHL 患者行 MRI 检查明确病因率，期待为 SSHL 病因评估提供一定的参考意义。

1　材料与方法

1.1　研究对象

2014 年 4 月至 2014 年 10 月中山大学附属第一医院收治的 SSHL 患者共 108 例,其中筛选行内耳 MRI 检查 60 例,进入本研究。60 例 SSHL 患者的完整临床资料,包括临床表现,听力学检测,内耳 MRI 检查结果(包含随访的 MRI)。根据平均听阈(0.25,0.5,1,2,4 kHz)分轻度聋、中度聋、中重度聋、重度聋、极重度聋五个等级。

1.2　SSHL 纳入标准

无明显诱因的,突然发生的,可在数分钟、数小时或 3 天内发生的非波动性感音神经性听力损失,耳聋发生可为单耳,也可为双耳,可同时发生也可先后发生;②在相连的 2 个频率上,其听力下降 20 dB 以上;③在发病过程中,可有眩晕、耳鸣,恶心、呕吐等伴发症状；④只有第 8 对颅神经受损,并无其他颅神经的损害。同时行风湿、免疫等相关检查排除其他系统疾病引起的听力下降。

1.3　内耳 MRI 薄层及特殊成像系列检查方法

采用 Siemens Magnetom Trio 或 Verio 3.0T 超导磁共振成像系统，头线圈，内耳平扫及增强扫描。扫描范围乳突尖到岩骨上缘。平扫序列：常规 T1WI/T2WI(TR/TE：550 ms/14 ms，4000 ms/80 ~ 100 ms,层厚 3 mm),矩阵均为 512 × 512,轴位层厚 3 mm。内耳水成像 3D-SPACE(TR/TE：1000 ms/120 ~ 130 ms,体素大小 0.5 mm × 0.5 mm × 0.5 mm),扫描完毕行轴位、斜矢状位 1 mm 重组,最大信号强度重组;3D-FLAIR(TR/TE/TI：7000 ms/386 ms/2100 ms,体素大小 0.9 mm × 0.9 mm × 2.0 mm),1.5 ~ 2 mm 轴位重组。增强扫描:按 0.1 mL/kg 体质量经肘静脉注射对比剂 Gd-DTPA（磁影葡胺,北京北陆药业公司）后,行 3D-T1WI-VIBE 扫描(TR/TE：30 ms/3.69 ms,层厚 0.6 mm),2 mm 轴位、冠状位及矢状位重组。检查过程中如发现脑血管梗死,即同时进行头颅动脉成像 MRA,所用序列及参数为 3D-TOF 序列,TR/TE:22 ms/4.0 ms,FOV:210 mm,层厚 0.5 mm,矩阵 448 × 448。

1.4　研究方法及统计学方法

收集 60 例 SSHL 患者的病例资料，分析临床特征,纯音测听,听觉脑干反应测听(auditory brain response，ABR)等听力学结果及内耳 MRI 结果,对比突发性聋 MRI 检查明确病因阳性率及其与临床听力学关系。采用 SPSS 15.0 统计软件对数据进行分析处理,采用 χ^2 检验,$P < 0.05$ 为差异有统计学意义。

2　结　果

2.1　一般临床资料及 MRI 结果分类

60 例 SSHL 病例中,男 37 例,女 23 例,6 ~ 73 岁,平均(38 ± 3.5)岁。发病时间 3 ~ 18 d,平均

(8.5 ± 2.3) d,均为单耳发病。60 例患者行 MRI 检查,23 例提示异常,阳性率为 38.3%。异常结果分为三类及占总数百分比:明确病因 10 例(16.6%),可能病因 6 例(10%),和无因果 7 例(11.7%;表1)。

表 1 23 例 SSHL 患者内耳 MRI 异常结果分类及所占比例

Table 1 Magnetic resonance imaging abnormal findings of 23 cases of sudden deafness

Abnormality	*n*	Percentage/%
Obvious etiology	10	16.6
acoustic neuroma	2	
inner ear hemorrhage[1)]	4	
epencephala infarction	2	
cochlear malformation	2	
Possible etiology	6	10.0
multiple alba ischemia	2	
lacunar infarction	3	
facial neuritis	1	
Uncertain etiology	7	11.7
chronic mastoiditis	1	
tentorium cerebelli meningeoma	1	
encephalanalosis	2	
leukodystrophy	1	
ventricle hydatoncus	2	
Total	23	38.3

1) Diagnosis criteria for inner ear hemorrhage[10,15]: ①High signal in T1WI and 3D-FLAIR, without enhancement in MRI; ② Excluding accompanying otitis media or acute respiratory tract infection; ③The high signal in MRI decreased gradually during follow-up.

2.2 突发性聋患者临床特征、听力学特点及 MRI 检查原因结果

60 例患者听力学检查提示,重度以上聋(含重度聋和极重度聋)45 例,该 45 例患者患侧 ABR Ⅰ、Ⅲ、Ⅴ波均未引出;重度以下聋(含轻中度聋6例和中重度聋 9 例)患者共 15 例,其中 7 例患者 ABR 阳性:双耳波 V 潜伏期耳间差> 0.4 ms,I-V 波间期> 0.4 ms,重复性差,可能存在蜗后病变。8 例 ABR 阴性:双耳波 V 潜伏期耳间差< 0.4 ms,I-V 波间期< 0.4 ms,重复性好。60 例 SSHL 患者分组临床特征、听力学特点及 MRI 结果比较见表 2,重度以下聋组与重度以上聋组比较,眩晕发生率和 MRI 明确病因率差异有统计学意义(P 值为 0.011,0.046,均< 0.05)MRI 异常发生率差异无统计学意义(P 值为 0.878,> 0.05)。10 例明确病因 SSHL 患者临床特征、听力学及 MRI 结果见表 3。60 例 SSHL 患者何种原因行 MRI 检查见表 4。

2.3 明确病因 SSHL 患者内耳 MRI 影像学表现

明确病因 SSHL 患者 MRI 影像学表现,其中内听道肿瘤 2 例、内耳出血 4 例、小脑梗死 2 例、耳蜗畸形 2 例。其中 1 例显示内听道占位病变,直径约 5 mm,增强扫描肿瘤实质明显强化(图 1)。2 例小脑梗死,患耳与脑梗死病灶在同一侧,其中 1 例显示患侧椎动脉狭窄闭塞(图 2)。4例内耳出血,显示内耳 T1WI 不均匀信号,3D-FLAIR 高信号(图 3)。2 例耳蜗畸形为内耳 Mondini 畸形。

表 2 60 例 SSHL 患者临床特征、听力学特点及 MRI 结果

Table 2 Clinical features, audiology and abnormal MRI findings of 60 cases of sudden deafness (cases)

Deafness degree	*n*	Vertigo	MRI Abnormal	Obvious etiology	ABR result
Mild deafness	1	0	0	0	1 cases ABR negative
Moderate deafness	5	1	2	0	3 cases ABR positive
Moderately severe deafness	9	2	4	0	4 cases ABR positive
Severe deafness	21	12	8	3	Affected side no response
Profound deafness	24	14	9	7	Affected side no response

When divided into two subgroups according to hearing level (>=severe and < severe), the rate of vertigo and obvious etiology in MRI were compared, with χ^2 = 6.42 and 4.00, P Value = 0.011 and 0.046 respectively. The χ^2 value and P value were 0.02 and 0.878 correspondingly in comparison of abnormal MRI rate between two subgroups.

表 3　10 例明确病因 SSHL 患者临床特征、听力学及 MRI 结果

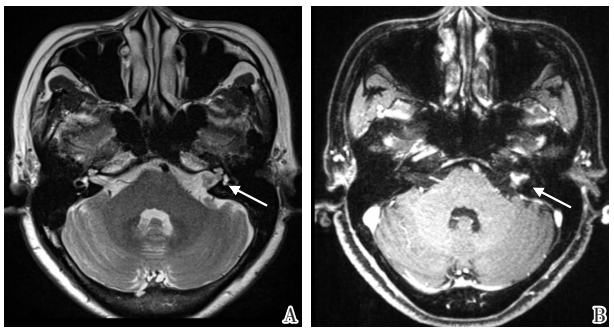
Table 3　Clinical features, audiology, and MRI findings of 10 cases with defined etiology　(cases)

Pathogens	*n*	Vertigo	MRI result	Audiology	ABR result
Acoustic neuroma	2	2	1 case diameter>2 cm	profound deafness	2 case affected side
			1 case diameter<1 cm	severe deafness	no response
Epencephala infarction	2	2	affected side epencephalon schistose infarct, affected side vertebral artery stenosis severe, far-end branch vanish	2 case profound deafness	2 case affected side no response
Cochlear Malformation	2	0	affected side cochlear malformation	2 case severe deafness	affected side no response
Inner ear hemorrhage	4	4	affected side cochlea vestibule signal abnormal T1WI show high signal 3D-FLAIR high signal	4 case profound deafness	affected side no response

表 4　60 例 SSHL 患者何种原因行 MRI 检查

Table 4　The reason for MRI examination of 60 cases of sudden deafness　(cases)

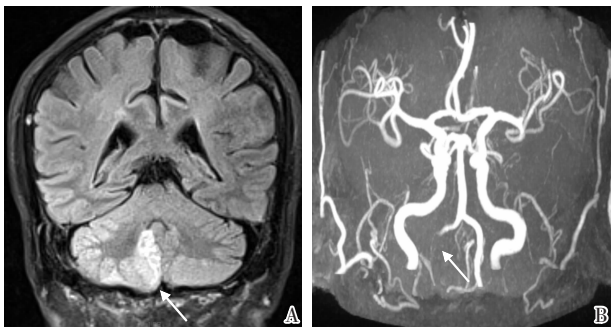
Reason	*n*	MRI obvious etiology	Detection ratio/%
ABR positive	7	0	0
Profound deafness and vertigo who were arranged for MRI immediately in hospital	22	4 cases inner ear hemorrhage 2 cases epencephala infarction	27.3
Received MRI one week after treatment because of poor curative effect	25	2 cases acoustic neuroma 2 case cochlear malformation	16.0
The patients asked for MRI even though with good curative effect	6	0	0



A 46-year-old male complained of severe deafness in left ear and vertigo, MRI revealed left internal auditory canal tumor, non-uniform equal signal on T2WI (A, white arrows), obviously intensify when enhancement (B, white arrows).

图 1　左耳听神经瘤 MRI 表现

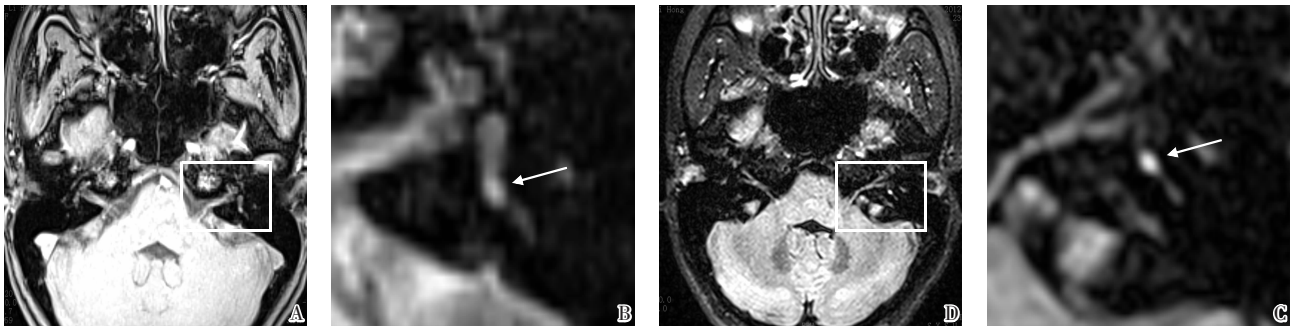
Fig.1　MRI features of internal auditory canal tumor in the left ear



A 58-year-old male complained of right ear with profound deafness and vertigo, MRI revealed right cerebellar hemispheres wedge-shaped infarction on T2WI FLALR (A, white arrows), MRA showed right vertebra arteriostenosis blocking (B, white arrows).

图 2　右小脑梗死 MRI 表现

Fig.2　MRI features of infarction in the right cerebellar hemispheres



A 33-year old female complained of left ear Profound deafness and vertigo, MRI revealed left semicircular canal abnormal signal, non-uniform high signal on T1WI (B, white arrows). high signal even more obvious on 3D -FLAIR (D, white arrows). A: Unenhanced T1-weighted images; B: partial enlarged detail; C: 3D-FLAIR axial view; D: partial enlarged detail

图 3 左耳内耳出血 MRI 表现

Fig.3 MRI features of inner ear hemorrhage in the left ear

3 讨 论

突发性聋是一种突然发生的、原因不明的感音神经性聋,发病率为每年 5 ~ 20/10 万,近年来发病率有增长趋势, 严重影响患者的听觉功能和生活质量。根据 2012 年美国医学会耳鼻咽喉科学会制订诊疗指南[16],SSHL 患者需要行 ABR、言语测听、声导抗、耳蜗电图等听力学检查及内耳 MRI 检查。MRI 在 SSHL 的诊治中具有重要的作用。Schick 等[17]分析了 354 例突发性聋内耳桥小脑角 MRI 结果。122 例(34.5%)异常。Aarnisalo 等[18]评估89例突发性聋 MRI 诊断价值,29 例 (35%)异常,其中明确病因 6 例(7%),可能致病因素 6 例(7%),和 17 例(21%)无因果关系。早期,SSHL 患者行 MRI 主要作用是排除蜗后占位病变,但对于体积较小内听道肿瘤容易漏诊。随着 MRI 在临床应用,先进的磁共振成像技术,薄层扫描和特殊序列(如 3D-FLAIR,3D-CISS 等)的应用,MRI 目的不仅可排除体积较小内听道占位病变,更能详细分析内耳病变如迷路炎,出血,血管瘤,畸形等[11-12,19]。MRI 还能显示外周和中枢异常,如多发性硬化或脑梗死[20]。

本研究 60 位 SSHL 患者,明确致病因素 10 例(16.6%),既往文献[20] 报道仅 7%,本研究 MRI 检查阳性率较以往文献报道偏高,原因在于:首先是本研究全部采用 MRI 薄层扫描及特殊成像技术,更高分辨率,更容易发现内耳病变,特殊成像技术中如 3D-FLAIR 可清晰显示内耳出血,3D-SPACE 及 3D-VIBE 亦较好显示内耳结构变化及内耳是否炎症,提高内耳病变阳性率,而既往文献研究中所采用常规 MRI 扫描,由于层厚关系、部分容积效应的影响,阳性率低。其次可能与本研究属回顾性研究有关,选择性进行 MRI 检查。10 例患者明确病因包括肿瘤、内耳出血、小脑梗死、耳蜗畸形等。2 例内听道肿瘤,其中 1 例位于内听道,直径小于 1 cm,1 例肿瘤位于桥小脑角,直径达 2 cm。4 例内耳出血,MRI 特征表现为 T1WI 高信号影,增强时高信号影未见强化,3D-FLAIR 序列为高信号,出血部位分别位于耳蜗或半规管、前庭。2 例小脑梗死,耳聋是与血管梗死在同一侧,其中 1 例患者患侧椎动脉狭窄闭塞。2 例耳蜗畸形,MRI 示患侧内耳 Mondini 畸形。此外,6 例患者 MRI 提示为突发性耳聋可能病因,包括 2 例脑白质多发缺血灶、3例陈旧腔隙性脑梗死、1 例面神经炎等,这些可能病因可以为突发性聋临床治疗方案选择提供帮助。

本研究中 SSHL 患者行 MRI 检查, 阳性率 38.3%,与既往文献[17-18]报道相近,尽管 MRI 检查阳性率对临床贡献有限, 但 MRI 检查能够明确病因。本研究为 16.6%,既往文献[18] 报道仅 7%,由此分析,大部分 SSHL 患者病因仍无法查明,因此,MRI 的使用并没有受到学者一致推荐。Loughran 等[21]对 100 名英国耳鼻咽喉科医生关于突发性聋处置方法调查,38%医生会采取 MRI 检查。MRI 价格相对昂贵,针对 SSHL 患者,何种情况下需要行内耳 MRI 检查存在争议。分析本研究 60 例患者行内耳 MRI 检查原因,7 例 ABR 检查阳性和 6 例患者自主要求排除颅内病变行 MRI 检查,均未查出

明确病因。22 例患者为重度聋以上合并眩晕,住院后建议立即行内耳 MRI 检查,6 例查出明确病因,分别是 4 例内耳出血和 2 例小脑梗死,检出率高达 27.3%；另外 25 例患者治疗 1 周后效果差建议行 MRI 检查,4 例查出明确病因,包括 2 例听神经瘤,2 例耳蜗畸形（2 例均为儿童患者),检出率 16%。尽管导致突发性聋治疗效果差的原因是复杂且多方面的,但内耳出血、蜗后占位及耳蜗畸形等因素在临床实践过程中仍然需要重点排除。

明确病因 10 例患者，听阈均为重度及以上感音神经性聋,8 例合并眩晕,眩晕发生率 80%(8/10)。本研究 60 例患者,分为重度及以上聋组与轻中重度聋组,两组 MRI 检查阳性率差别无统计学意义,而眩晕发生率及 MRI 检查明确病因两因素,两组差别有统计学意义,提示重度及重度以上聋 SSHL 患者中,行 MRI 检查更利于查出病因。因此,SSHL 患者若患侧重度及以上聋,合并眩晕,建议行内耳 MRI 薄层扫描及 3D-FLAIR 等特殊成像排除蜗后占位、内耳出血及小脑梗死等病因,以免漏诊。

ABR 以前一直作为内听道肿瘤的功能筛选试验,但当患侧为重度及重度以上感音神经性聋,ABR 患侧均无法引出反应,无法对蜗后是否存在病变进行评估。本研究中,2 例内听道肿瘤患者,由于纯音测试为重度以上感音神经性聋,ABR 患侧引不出反应,此时只有通过 MRI 检查才能明确诊断。此外,本研究 7 例 ABR 阳性,提示可能存在蜗后病变,行 MRI 检查却未发现蜗后占位,提示 ABR 对蜗后占位筛选并不是十分可靠选择。

综上所述,突发性聋的患者,当其纯音测听结果为重度及以上聋,合并眩晕或者治疗效果差部分患者,建议行内耳 MRI 薄层扫描及特殊成像技术排除相关内耳疾病。

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(编辑 王晓鹰)

(上接第897页 from page 897)

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