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单侧聋人工耳蜗植入专题

浙江诺尔康神经电子科技股份有限公司
NUROTRON BIOTECHNOLOGY., Ltd.

诺尔康文摘

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浙江诺尔康神经电子科技股份有限公司

编辑委员会：
诺尔康科学委员会和技术委员会

名誉主编：曾凡刚 付前杰
主编：银力
编辑：
付鑫焱 高珊仙 屠文河 张地

地址：
浙江省杭州市拱墅区祥茂路99号
邮编：310011
电话：4006 222 571
传真：0571-88179905
邮箱：service@nurotron.com
网址：http://www.nurotron.com

词汇

综述

单侧聋患者植入人工耳蜗的进展

银力[1]，高珊仙[1]，屠文河[2]，曹永茂[3]，平利川[4]，龙墨[5]，付前杰[6]，高志强[7]

1 浙江诺尔康神经电子科技股份有限公司（杭州 310000）；
2 曼彻斯特大学（英国 曼彻斯特 M13 9PL）；
3 武汉大学 湖北省人民医院（武汉 430000 ）；
4 诺尔康生物技术有限公司（美国 加州 尔湾 CA 62618）；
5 中国聋儿康复研究中心（北京 100029）；
6 加州大学洛杉矶分校 （UCLA）（美国 洛杉矶 CA 90057）；
7 中国医学科学院中国协和医院医科大学（北京100000）.

【摘要】：既往未将双耳非对称性听力损失（Asymmetric Hearing Loss, AHL）的极端案例—单边听力损失（Unilateral Hearing Loss, UHL）或单侧聋（Single Side Deafness, SSD）纳入人工耳蜗适应症，直到近来开始有人尝试发现对单侧聋伴有严重耳鸣的病人，在患耳植入人工耳蜗后可以有效地减轻甚至消除耳鸣。除了缓解耳鸣症状以外，研究结果还发现单侧聋病人植入人工耳蜗后通过适应可以与健耳听力很好地整合，从而达到双耳听力的听声效果。现在一些国家的医疗机构和医生已将单侧聋作为人工耳蜗植入适应症的选择。本文回顾了近年来对单侧聋的干预、特别是单侧聋植入人工耳蜗的情况，总结了在多篇关于阐述单侧聋的病因、危害、干预及效果的文章，做出综述。虽然单侧聋植入效果满意，但在中国同类案例较少，而且尚未正式纳入人工耳蜗植入适应症，也未得到广大单侧聋患者的接受，因此应当谨慎推荐。

【关键词】： 非对称性听力损失；单边听力损失；单侧聋 耳鸣； 人工耳蜗

An overview of single sided deafness with cochlear implantation

YIN LI, GAO SHANXIAN, TU WENHE, CAO YONGMAO, PING LICHUANG, LONG MO, FU QIANJIE, GAO ZHIQIANG

Abstract: UHL (Unilateral Hearing Loss) or SSD (Single Sided Deafness) the extreme condition of AHL (Asymmetric Hearing Loss) was not included in traditional cochlear implant candidate selection criteria until recent years, people began to try cochlear implant for SSD patients to treat their incapacitating tinnitus and found not only the loudness of tinnitus diminished or disappeared but recipients could integrate the aided hearing with the opposite hearing and benefit from binaural hearing after a period of adaptation of the electric stimulation. Some overseas institute or surgeons began to routinely refer SSD patients to receive cochlear implant surgeries. The present study reviewed and summarized papers about SSD etiology, hazard, intervention and intervention outcomes, and focus on intervention with cochlear implant. Even though the SSD with cochlear implant outcomes were satisfactory, there are very few case of SSD with cochlear implant in China. Also SSD has not yet been included in cochlear implant candidate selection criteria and not widely accepted by SSD patients in China. Cautions must be given when referring SSD patients for cochlear implantation in China at this stage.

Key words: Asymmetric hearing loss, Unilateral hearing loss, Single Sided deafness, Tinnitus, Cochlear implant

对双耳听力有差距的情况统称非对称性听力损失（Asymmetric Hearing Loss, AHL），泛指双耳听敏度存在一定程度的不对称，极端例子是差耳为全聋，而对侧耳听力正常或仅有轻度听力损失。一般将这种极端例子称为单边听力损失（Unilateral Hearing Loss, UHL）或单侧聋（Single Sided Deafness, SSD），此时双耳间4频率(即0.5, 1, 2 and 4 kHz)的纯音阈值不对称差值达到30dBHL或更多，同时差耳听力达到传统的人工耳蜗植入标准。另一个得到公认的UHL额外条件是好耳平均阈值应好于60 dBHL，从而明确了不适合在好耳侧植入人工耳蜗[1]。表 1 是以上定义的总结。

根据全面新生儿听力筛查数据估算，单侧聋儿童的发病率为1-3%[1] 成人单侧聋发病率高，特别是老年人的发病率可以高达18%[2]。

单侧聋的发生原因：造成单侧聋的原因可以是遗传性、先天性和获得性，如单侧蜗神经发育异常（Cochlear Nerve Deficiency CND）、先天性小耳畸形、大前庭导水管综合征、听神经病、病毒/细菌感染性耳聋、单侧突发性耳聋、噪音性耳聋、梅尼埃病、头部外伤、单侧听神经瘤等[3,4]。

单侧聋的危害：非对称性听力损失和单侧聋患者言语识别率会降低[5]，但一般不会严重影响患者的言语和语言发育，部分患者学习成绩没有受到直接影响，因此许多单侧聋患者终生没有接受任何干预[6]。有研究表明[7,8]，如果耳聋发生在言语发育关键期，由于听觉未能建立，会发生中枢功能重塑，而这种重塑会降低预期植入人工耳蜗的效果。植入人工耳蜗前，缺乏刺激会导致大脑易于发生交叉知觉模式重组（补偿）（CROSS-MODAL recruitment）[9,10,11]，即大脑通过视觉和体感系统补充缺失的声刺激信号刺激[12,13,14]。由于发生单侧聋，大脑会牺牲双侧声源定位能力，而强化单侧听力。这种效应包括高级听觉处理过程，获取语言通路及单侧听觉定位问题。这种中枢适应性优化的变化会对以后恢复聋侧听力和双耳声源定位功能不利[15]。单侧聋患者常常会反映其聋侧耳难于听懂谈话声，无法辨别声音来源以及在有背景噪音时理解言语差[16]。有文献报道[17,18]，那些患有永久性单侧聋的孩子中有35%的比例无法跟上班级课程。单侧聋患者与他人交流或参加会议时往往要选择好耳朝向声源而造成尴尬和不便，单侧聋患者择业时会受到一定限制，很难选择那些对听力要求高的职业。单侧聋另一个危害是耳聋往往伴有严重的耳鸣。估算突发性单侧聋的发病率为1/10,000，其中40% 患者伴有严重耳鸣，且每年每百万人口会新发20-25例[1]。

单侧聋的干预：建议对非对称性听力损失和单侧聋进行干预，双耳聆听可以辨别声音来源，这可以帮助植入者在群组交流时快速辨别和定位谈话者。由于单侧聋或单侧人工耳蜗植入者对谈话者的语音线索，如音调等辨别能力弱, 故此双耳聆听尤为重要[19,20]。

目前发生/发现单侧聋时一般采用不治疗、验配环绕信号（Contralateral Routing Of Signal CROS）助听器方法即通过患侧耳放置的麦克风接收声音并无线传送到对侧耳助听设备和应用骨导助听系统（BCHS）设备，即在患侧通过佩戴软袋（Softband）固定骨导助听器或通过手术植入钛钉（BAHA）或磁力钛板（Sophono等）外佩体外机的方法，利用双耳骨导衰减小的原理获得“双耳”听力等手段。但收效不大[21,22,23]。这些干预方式并不能带来真正的双侧听力，因为大脑仅接收和处理了来自单边的声输入，因此植入人工耳蜗是唯一能帮助极重度耳聋患者恢复听力的选择[24]。另外有研究表明[25~29]在某些情形下，个体可以将一耳的声刺激与另一耳的电刺激相结合从而获得双侧听力的益处。 根据已知的人类言语发育关键期(3.5岁)，推算应该在3.5岁前对单侧聋进行干预。而且，聋耳的弱势也只能通过弱势耳（weaker ear）的刺激输入得以补偿，这是由于该耳与皮层间尚保持有残存的连接。确诊单侧聋后即便只是对弱势耳进行短期的训练，比如，使其聆听睡前故事，都有可能进一步帮助患耳克服已经存在的对侧优势耳的趋势[30]。

单侧聋患者选择人工耳蜗植入的原因：为了解决患者单侧聋的难治性耳鸣症状，比利时的Van de Heyning等人为患有单侧聋及耳鸣，而对侧耳听力正常或轻

度听力损失的患者植入了人工耳蜗，尝试是否可以用电刺激的方式来抑制耳鸣，初步的结果非常令人满意[31]。之后不断有医生尝试为伴有严重耳鸣的单侧聋患者植入人工耳蜗并逐渐将人工耳蜗植入适应症拓展到那些没有（严重）耳鸣的单侧聋病人，陆续的研究结果表明单侧聋人工耳蜗植入者在使用人工耳蜗一段时间后可以整合双耳不同的刺激源（声和电）并获得了双耳听力的益处，比如可以定位声音来源，听声“音量”变大、噪音环境下不必努力寻求健耳朝向发声源等优势。除了这些原因外，其它原因还包括健侧耳听力开始出现下降，即将或已经成为单侧聋，为了避免因双侧耳聋造成的听觉剥夺，而对原耳聋侧植入人工耳蜗和同期或之后在新发生耳聋侧植入人工耳蜗。原因还包括医患达成共识，给患耳植入人工耳蜗没有“失去”什么[32]。现在开始有更多的单侧聋患者开始意识到双耳听力在社会交往中所发挥的作用，因此开始考虑对患耳进行干预[33]。此外尚有由于工伤和外伤导致单侧聋要求赔偿而植入人工耳蜗的情形。

单侧聋的测试方法：1. 术前试用设备：除非有禁忌症，否则应将其它干预方式（如传统的CROS及BICROS和骨导设备）包含在评估方案中，对单侧聋患者试用软带时应注意不要故意堵塞健耳，这样虽然会得到较好的试戴效果，但与骨导助听系统设备植入术后实际情况相差较大，会造成植入者的失望。2. 术前和术后测试手段：对非对称性单侧聋的患者，日常生活中需要声源定位，无法声源定位是非对称性听力损失患者术前的最大缺陷，可以声源定位是植入人工耳蜗后比较显著的收益。由于年幼儿声源定位试验的实施很困难，特别是对于4-6岁以下的儿童实施起来非常花时间，因为这个试验需要高度的认知能力的发育，因此对头阴影效应（一种稳定的物理效应）的评价可能是一种相关的替代方法，可以展示双耳刺激的益处。由于尚无一种理想的疾病相关生活质量问卷表，因此推荐采用测试声源定位和疾病特定的生活质量问卷表，例如言语、空间和听觉质量量表（SSQ）[34,35,36]。该量表可以反映非对称性单侧聋病人日常听觉能力和遇到困难的情境。由于噪音下听声对于无双侧听力的病人是比较困难的，因此，也应将噪音下测听作为考虑选择治疗的评估内容[1]。目前常用的言语测听非对称性听力损失的方法包括：SRT即言语理解阈（Speech Reception Threshold），三维空间构型（Three spatial speech-in-noise configurations）等。除了声源定位效益外，另外一个比较显著的收益是对耳鸣的抑制。目前对耳鸣的测试量表包括：耳鸣残疾分类（Tinnitus Handicap Inventory THI），耳鸣问卷（Tinnitus Questionnaire TQ）和视觉比拟量表（Visual Analogue Scale VAS）等[37~42]。3. 测试方法细节：1）三维空间构型测试方法为：言语和噪音均自前方（0°方位）给出（S0N0）以测试双耳整合（binaural summation）效应，言语自前方（0°方位）给出而噪音从人工耳蜗植入侧（90° 方位）给出（S0NCI）以测试双耳抑噪（binaural squelch）效应以及言语在人工耳蜗植入侧（90°方位）给出而噪音自正常听力侧（270°方位）给出（SCINNH）以测试头阴影和噪音抑制的结合效应。测试时采用关闭人工耳蜗（CIoff）和开启人工耳蜗（CIon）两种测试条件。测试时那些平常佩戴助听器的患者应保持佩戴。2）SSQ（言语、空间和听觉质量量表）包含有50个问题分为三组题为言语、空间和声音质量评分。SSQ 得分的情况有助于判断听障者每日生活的表现。测试要求受试者完成术前及人工耳蜗术后12和36个月的问卷[43]。衡量单侧聋及植入人工耳蜗后收益还可以采用工作表现问卷表（表），实施时间可以选取植入后的一定阶段，如开机6个月，12个月，24个月等[44]。除了以上的主观测试方法外，尚有客观测试方法。单侧聋测试客观测试方法如测试双侧皮层反应[45]，以及磁共振弥散张量成像（Diffusion Tensor Imaging DTI）评估双侧听中枢功能及形态[46]。

表. 工作表现问卷表

1. 人工耳蜗对你的工作帮助有多大？How much has the CI helped you to do your work?

(a) 很大 (b)中等 (c) 不大a (d) 无变化(e) 变差

2. 人工耳蜗对你的职业生涯发展帮助有多大？How much has the CI positively influenced your career

development or planning?

(a)很大 (b)中等 (c) 不大 (d) 无变化(e) 变差

3. 植入人工耳蜗后你工作的主动性变化有多大？How much more active have you been in your working environment after the CI?

(a)很大 (b)中等 (c) 不大 (d) 无变化(e) 变差

4. 佩戴人工耳蜗工作后是否会降低你的疲劳感？Has the CI decreased your fatigue after the working day?

(a)很大 (b)中等 (c) 不大 (d) 无变化(e) 变差

5. 佩戴人工耳蜗是否有助于你与客户的交流？Is it easier to communicate with your co-workers after the CI?

(a)很大 (b)中等 (c) 不大 (d) 无变化(e) 变差

6. 人工耳蜗是否有助于你通过电话交流？Is it easier to speak on the phone after the CI?

(a)很大 (b)中等 (c) 不大 (d) 无变化(e) 变差

单侧聋的手术指征：设立手术指征的目的应当是使得由单侧耳聋所造成的听觉剥夺时间尽可能地缩短从而避免听中枢重组。非对称性听力损失达到单侧聋的程度，即单侧耳听力损失达到重度或极重度感音神经性聋且助听效果不佳时，就可以考虑在差侧植入人工耳蜗。儿童和成人单侧聋人工耳蜗植入指征不同，儿童需要更加迫切。单侧聋儿童的人工耳蜗植入应在发生耳聋后尽早实施。目前对于先天性或早发的单侧聋植入时机虽然尚无定论，但如果听觉剥夺时长超过4年则需要谨慎考虑。对于大龄儿童和成人单侧聋确诊后也应推荐尽早植入人工耳蜗，这点对于那些对侧好耳具有发展成显著性听力下降风险的患者尤为重要[1]。另外需要指出，进行病例选择时，无论患者年龄，术前均应进行头部MRI检查以排除听神经异常，因为有超过50%的单侧聋儿童患有耳蜗神经发育不良，而蜗神经异常往往是人工耳蜗植入的禁忌症[4]。对于那些植入的目的主要是为了减缓耳鸣的患者，术前耳鸣残疾分类（THI）得分至少要达到38 和/或耳鸣问卷（TQ）得分至少要达到42，视觉比拟量表（VAS）选择至少达到7.0[37~40]。

单侧聋患者植入人工耳蜗后的效果分析：多个研究表明人工耳蜗可以改善单侧聋植入者的生活质量，言语识别率[18]和声源定位[47~50]且较传统的单侧聋干预方法，如使用骨导助听系统设备和CROS效果好[49]。Härkönen等[51]人研究单侧聋植入人工耳蜗后对工作效率的影响发现，单侧聋植入人工耳蜗者较易应对工作，并且工作一天后较少产生疲劳感。而且，由于与同事或客户的沟通变得容易，使得植入者在工作时变得更加主动。双耳听力降低了植入者产生倦怠或从事对听力要求较高的职业时常请病假的风险。1976年第一次有文章发表提出人工耳蜗对耳鸣抑制有帮助[52]。其后不断有人工耳蜗对耳鸣抑制的综述研究文章发表[53,54]。近来的研究依然支持既往的观点[55,56]，发现单侧聋且伴有无法忍受的耳鸣患者通过在患耳植入人工耳蜗不但恢复了听力而且有90%的患者耳鸣的响度和严重程度均得以显著降低[43,57,58]。研究者[59]对耳鸣成因达成的共识是耳鸣是由于听觉剥夺导致中枢听觉通路的不良适应塑形（maladaptive plasticity）导致的。对耳鸣抑制是基于对假定的神经不良适应塑形反转或通过引入环境声转移对耳鸣的注意力从而减轻植入者对耳鸣的感知。可以通过圈内电刺激（looped electrical stimulation）甚至有时可以采用非听性刺激减轻耳鸣。因此推论可能不需要引入外界声音信号而仅通过蜗（圈）内电刺激而治疗耳鸣。这种不依赖于外部声信号的蜗内电刺激法是潜在的治疗耳鸣手段。研究未发现手术自身可以造成耳鸣，通过长期使用人工耳蜗可以进一步优化对耳鸣的抑制作用[57,60~64]。对耳鸣抑制理想的刺激参数是要特定设置的，中等到大的刺激较小刺激抑制耳鸣的效果明显，这与掩蔽效应有关[64,65]。选取与耳鸣音调匹配的电极刺激的耳鸣抑制效果与所有可用电极刺激产生的效果无显著差异[64]。刺激幅度调制对耳鸣的抑制没有显著效果[66,67]。不同的刺激率对耳鸣抑制作用没有显著差异[63,68]。虽然单侧聋患者使用人工耳蜗可以显著受益，然而与双侧人工耳蜗植入者相比他们的双耳整合效应发展是缓慢的。这与单侧聋植入人工耳蜗的植入者较难整合电和声刺激有关[69]。为此，术前应为他们调整好期望值，并鼓励他们坚持使用。

讨论：非对称性听力损失特别是单侧聋可以造成患侧听中枢发育迟滞，患者声源定位障碍，噪声环境下听声困难以及择业选择受限等危害。既往由于对非对称性听力损失特别是单侧聋的危害认识不够，从而有相当数量的患者终生未接受任何治疗或干预。对非对称性听力损失的短期或长期干预的手段包括传统助听器验配，应用CROS和骨导助听系统（BCHS）设备，但这些干预手段并不能使得佩戴者获得声源定位感，因为声源定位需要双侧耳蜗受到刺激。现在越来越多的单侧聋患者开始选择植入人工耳蜗。由于长期单侧聋会导致听中枢非良性重塑从而导致不可逆性损害，因此一旦确定传统干预手段无效或收效不大时，应尽早植入人工耳蜗。

通过观察一般单侧聋患者植入人工耳蜗后长期效果满意，但植入后短期内植入者往往会感到双侧声音的响度和音质的不平衡。可以通过调试和鼓励坚持佩戴而达到预期效果。当单侧聋植入人工耳蜗达到了双侧聆听效果时，可以改善言语理解力的特定线索，这包括头阴影效应，双侧抑制噪音和双侧整合效应。头阴影效应是由头颅对声波造成衍射的物理效应[70]。对于空间分割源而言，每一侧耳的信噪比由于头阴影效应而不同。如果信噪比较好侧耳部聆听，就可改善言语理解力。单侧聋患者如果具有功能的耳朝向较差信噪比侧时，言语理解力会降低[70,71]。双侧抑噪效应（binaural squelch effect）是通过在信噪比较差的对侧耳增加额外的声音输入改善噪音下的言语理解力。空间分割信号（spatially separated signals）在双耳间的时间和强度差有利于改善言语理解力[71,72]。双侧整合效应（binaural summation）是言语和噪音均来自同一方位以及同一信号同步抵达双耳。双侧整合可以改善正常听力者言语理解阈 (SRT) 0.5 – 2 dB[73]。需要双耳输入信号的中枢神经整合才能达到双耳整合与双耳抑制噪音效应同时发挥作用。

由于中国非对称性性听力损失和单侧聋人群数量大，且大部分伴有严重难治性耳鸣，随着人们对生活质量要求的逐步提高，再加上国际上近几年的有益尝试，相信会有越来越多的非对称性性听力损失和单侧聋的患者寻求改善听力和/或消除耳鸣，越来越多的中国医生也会向他们推荐人工耳蜗植入。最终植入人工耳蜗会成为一种常规的对非对听力损失和单侧聋干预手段之一。

结论：由于非对称性听力损失特别是当达到单侧聋程度时会造成患者声源定位能力缺失，噪音下言语理解能力下降和往往伴有严重耳鸣，从而对患者的学习和生活均造成困扰。且发生非对称性听力损失后如果不及时干预，大脑听中枢的非良性重塑会造成不可逆的损害。故此对非对称性听力损失特别是达到单侧聋程度时应积极干预，迄今为止，人工耳蜗是可以恢复单侧聋功能性听力并可能继之恢复双侧听力的唯一治疗方法。如果没有禁忌症则要积极考虑尽早在患耳植入人工耳蜗，双侧聋已经植入一侧人工耳蜗的经过评估符合植入标准的也要积极考虑尽早在对侧耳植入人工耳蜗。但必须说明，由于中国尚未正式将单侧聋纳入人工耳蜗适应症，故而应谨慎实施。

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文献摘要

Identification and Evaluation of Cochlear Implant Candidates with Asymmetrical Hearing Loss

Vincent C.[a] · Arndt S.[b] · Firszt J.B.[c] · Fraysse B.[d] · Kitterick P.T.[e] · Papsin B.C.[f] · Snik A.[g] · Van de Heyning P.[h] · Deguine O.[d] · Marx M.[d]

a Department of Otology and Neurotology, University Hospital of Lille, Lille, France;
b Department of Otorhinolaryngology, Head and Neck Surgery, University Medical Centre Freiburg, Freiburg, Germany;
c Department of Otolaryngology, Washington University School of Medicine, St. Louis, Mo., USA;
d Department of Otology-Neurotology and Skull Base Surgery, Purpan University Hospital, Toulouse, France;
e National Institute for Health Research Nottingham Hearing Biomedical Research Unit, Nottingham, UK;
f Archie's Cochlear Implant Laboratory, Department of Otolaryngology, The Hospital for Sick Children, Toronto, Ont., Canada;
g Department of Otorhinolaryngology, Radboud University Medical Centre, Nijmegen, The Netherlands;
h Department of Otorhinolaryngology, Head and Neck Surgery, Antwerp University Hospital, University of Antwerp, Antwerp, Belgium.

Abstract

Objective: Recommendation for cochlear implant (CI) treatment for individuals with severe to profound single-sided deafness (SSD) and asymmetrical hearing loss (AHL) is on the rise. This raises the need for greater consistency in the definition of CI candidacy for these cases and in the assessment methods of patient-related benefits to permit effective comparison and interpretation of the outcomes with both conventional and implantable options across studies. ***Method:*** During a dedicated seminar on implant treatment in AHL patients, the panellists of the closing round table reviewed the clinical experience presented with the aim to define clear audiometric characteristics for both AHL and SSD cases, as well as a common data set enabling consistent evaluation of hearing benefits in this population. ***Conclusions:*** The panellists agreed on a clear differentiation between AHL and SSD CI candidates, defining average pure-tone thresholds up to 4 kHz for better and poorer ears. Agreement was reached on a minimum set of assessment procedures, and included the necessity of trials with conventional CROS/BICROS hearing aids and bone conduction devices before considering CI treatment. Objective assessment of sound localisation abilities was identified as the most relevant criterion to quantify performance before and after treatment. In parallel, subjective assessment of overall hearing ability was recommended via the Speech, Spatial and Qualities of hearing questionnaire. Longitudinal follow-up of these parameters and the hours of daily use were considered essential to reflect the potential treatment benefits for this population. The consistency in the data collection and its report will further support health authorities in their decision on acceptable gains from available hearing loss treatment options.

Table 1. Definition of SSD and AHL based on pure-tone average hearing thresholds for each ear

SSD	Poorer ear	Severe to profound hearing loss
	Better ear	≤30 dB HL to 4,000 Hz inclusively
AHL	Poorer ear	Severe to profound hearing loss
	Better ear	>30 dB HL to 4,000 Hz inclusively ≤60 dB HL to 4,000 Hz inclusively
Interaural asymmetry		≥30 dB (poorer ear PTA_4 – better ear PTA_4)

PTA_4 = Four-frequency pure-tone average threshold.

Key Words: Asymmetrical hearing loss, Bimodal stimulation, Cochlear implant, Tinnitus.

Article source:
Vincent C, Arndt S, Firszt J B, et al. Identification and Evaluation of Cochlear Implant Candidates with Asymmetrical Hearing Loss[J]. Audiology & Neurotology, 2015, 20 Suppl 1:87-89.

参考译文：

非对称性听力损失人工耳蜗植入候选者的识别与评价

Vincent C.[a]·Arndt S.[b]· Firszt J.B.[c] · Fraysse B.[d] · Kitterick P.T.[e] · Papsin B.C.[f] · Snik A.[g] · Van de Heyning P.[h] · Deguine O.[d] · Marx M.[d]

a 里尔大学附属医院 耳科和神经耳科，法国 里尔；
b 弗莱堡大学医学中心 耳鼻喉头颈外科，德国 弗莱堡；
c 华盛顿大学医学院 耳鼻咽喉科，美国 密苏里州 圣路易斯；
d 波旁大学附属医院 耳科-神经耳科及颅底外科，法国 图卢兹；
e 诺丁汉听力医学研究单位国立卫生研究所，英国 诺丁汉；
f 儿童医院 耳鼻喉科阿尔奇人工耳蜗植入实验室，加拿大 安大略省多伦多；
g 内梅亨大学医学中心 耳鼻喉科，荷兰 内梅亨；
h 安特卫普大学附属医院 耳鼻喉头颈外科，比利时 安特卫普.

【摘要】

目的：推荐重度、极重度单侧聋（SSD）和非对称听力损失（AHL）的患者接受人工耳蜗植入治疗的案例越来越多。这就需要统一这些案例的人工耳蜗植入标准的定义、病人相关受益和预后进行比较的评估方法，以便有效地解释传统的干预方法和植入方法的结果。**方法**：在一次人工耳蜗治疗AHL患者的专门研讨会上，会议小组成员审查了意在定义AHL和SSD案例的明确的听力测定特点的临床经验，以及一种在这一人群中能对听力受益进行一致性评价的常用数据集。**结论**：会议小组同意AHL和SSD 人工耳蜗植入标准之间存在明确不同之处，定义好耳和差耳的平均纯音阈值可选用频率达到4 kHz 。会议小组最终达成一组最低评估程序协议，包括考虑人工耳蜗植入手术治疗之前必需尝试使用传统的CROS /BICROS助听器和骨传导设备进行干预，确定声音定位能力的客观评估为治疗前后最相关的量化表现标准，推荐使用《言语、空间、生活质量听力问卷》进行综合听力能力的主观评估。同时，会议小组认为反映这类人群的预后效果必需纵向随访这些参数和日常使用时间，这些数据收集和报告的一致性将进一步影响卫生部门官员关于从现有听力损失治疗方案选择中获得可接受的受益的决策。

【关键词】非对称性听力损失；双模式刺激；人工耳蜗植入；耳鸣.

图表：

表1. 基于纯音平均听阈的SSD和AHL定义

SSD	差耳	重度到极重度听力损失
	好耳	≤30dB HL 包括4000 Hz
AHL	差耳	重度到极重度听力损失
	好耳	≥30dB HL 包括4000 Hz
		≤60dB HL 包括4000 Hz
双耳听力不对称	≥30dB HL（差耳PTA_4-好耳PTA_4）	
PTA_4=四频率纯音平均阈值		

Strengthening of hearing ear representation reduces binaural sensitivity in early single-sided deafness

Kral A.[a, b], Hubka P.[a], Tillein J.[a, c]

a Institute of AudioNeuroTechnology and Department of Experimental Otology, ENT Clinics, School of Medicine, Hannover Medical University, Hannover, Germany;
b School of Behavioral and Brain Sciences, The University of Texas at Dallas, Dallas, Tex., USA; c MED-El Comp., Innsbruck, Austria.

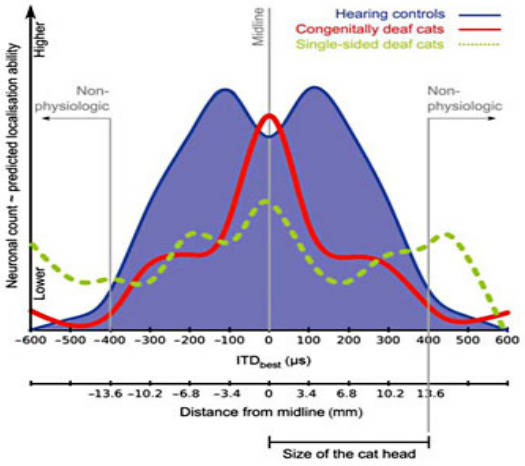
Abstract

Single-sided deafness initiates extensive adaptations in the central auditory system, with the consequence that a stronger and a weaker ear representation develops in the auditory brain. Animal studies demonstrated that the effects are substantially stronger if the condition starts early in development. Sequential binaural cochlear implantations with longer interimplant delays demonstrate that the speech comprehension at the weaker ear is substantially compromised. A pronounced loss of the ability to extract and represent binaural localisation cues accompanies this condition, as shown in animal models.

Key Words: Asymmetric hearing, Cochlear implants, Hearing loss, Unilateral deafness.

Tables and Figures:

Fig. 2. Distribution of ITD with highest firing rates (ITD best)



Article source:
Kral A, Hubka P, Tillein J. Strengthening of hearing ear representation reduces binaural sensitivity in early single-sided deafness.[J]. Audiology & Neurotology, 2015, 20 Suppl 1(1):7-12.

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早发单侧聋患者强化好耳会降低双耳听敏度

Kral A.[a, b], Hubka P.[a], Tillein J.[a, c]

a汉诺威医科大学 医学院听神经技术研究所和实验耳科学、耳鼻喉科门诊部 德国 汉诺威;
b德克萨斯大学达拉斯分校 行为与脑科学学院 美国 得克萨斯州达拉斯;
c MED-EL公司 奥地利 因斯布鲁克.

【摘要】

单侧聋引起中枢听觉系统宽泛的适应，其影响为患者的优势耳和弱势耳听中枢的分别发展。动物实验表明如果这种情况发生在发育的早期其影响更强。两耳相继植入人工耳蜗，植入时间的长期间隔使得弱势耳的言语理解能力显著降低，动物模型也表明极重度听力损失会造成信号提取和表达双耳定位能力的线索显著丢失。

【关键词】非对称性听力；人工耳蜗植入；听力损失；单侧耳聋.

Binaural Hearing after Cochlear Implantation in Subjects with Unilateral Sensorineural Deafness and Tinnitus

Katrien Vermeire[a, b] , Paul Van de Heyning[a]

a University Department of Otorhinolaryngology, Head and Neck Surgery, University Hospital Antwerp, University of Antwerp, Antwerp , Belgium;
b C. Doppler Laboratory for Active Implantable Systems, Institute of Ion Physics and Applied Physics, University of Innsbruck, Innsbruck , Austria.

Abstract

The aim of this clinical study was to assess speech recognition in noise after cochlear implantation in subjects with single- sided deafness and incapacitating tinnitus. 20 subjects complaining of severe intractable tinnitus unresponsive to treatment received a MED-EL cochlear implant (CI). 11 subjects had normal hearing (NH group) on the contralateral side, while 9 used a hearing aid (HA group). The subjects were tested in noise in two listening conditions, i.e. with their acoustic hearing only and with adding the CI to the acoustic hearing (binaural). Subjective improvement in daily life was evaluated using the Speech Spatial and Qualities Hearing Scale (SSQ). The summation effect (3.3 dB for the HA group and 0.6 dB for the NH group) is not significant in both groups. A significant squelch effect of adding the CI was seen for the HA users (3.8 dB), but not for the NH group (1.2 dB). Additionally, a significant effect of adding the CI was found for the spatial configuration where noise is presented in front and speech on the CI side for both the HA group (6.5 dB) and the NH group (1.7 dB). Results of the SSQ show a significant overall benefit of wearing the CI for both groups. The preliminary results of these 20 subjects suggest that cochlear implantation can improve hearing in people suffering from single-sided deafness combined with tinnitus.

Key Words: Unilateral sensorineural hearing loss, Cochlear implant, Speech recognition.

Tables and Figures:

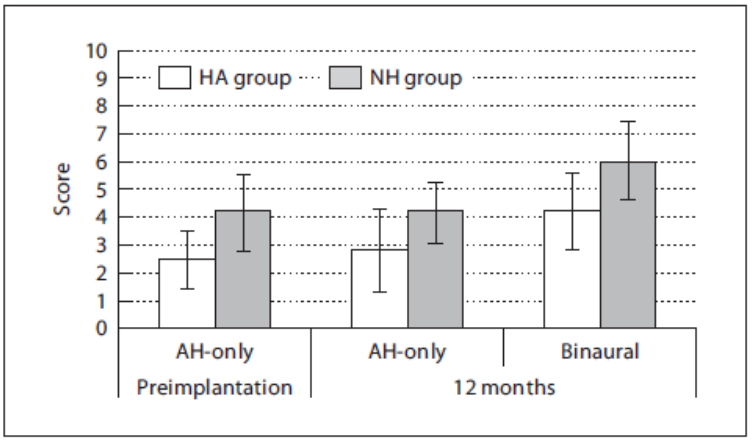

Fig. 2. Total score of the SSQ for the two groups (columns show mean values; error bars show standard deviation).

Article source:
Vermeire K, Van d H P. Binaural Hearing after Cochlear Implantation in Subjects with Unilateral Sensorineural Deafness and Tinnitus[J]. Audiology & Neurotology, 2008, 14(3):163-71.

参考译文：

单侧感音神经性耳聋和耳鸣患者人工耳蜗植入后的双耳听力情况

Katrien Vermeire[a, b] , Paul Van de Heyning[a]

a 安特卫普大学附属医院 耳鼻喉头颈外科 比利时 安特卫普；
b 因斯布鲁克大学 离子和应用物理研究所 主动植入式系统多普勒实验室 奥地利 因斯布鲁克

【摘要】

这项临床研究的目的是评估患有难以忍受的耳鸣的单侧聋患者在人工耳蜗植入术后的噪声背景的言语识别能力。20例患有严重顽固性耳鸣且治疗无效的患者接受了MED-EL人工耳蜗植入，其中11例 拥有对侧听力正常的受试者（NH组），9例 使用助听器的受试者（HA组）。所有人在噪声背景下进行裸耳和使用人工耳蜗（双耳）两种情况下的听力测试，使用《言语、空间、生活质量听力量表（SSQ）》评价其日常生活的主观改善。结果表明两组（HA组3.3dB、NH组0.6dB）的累加效应并不显著，同时测试观察到HA组（3.8dB）具有明显的人工耳蜗静噪效应，但是NH组（1.2dB）没有人工耳蜗静噪效应。此外，无论 HA组（6.5dB）和NH组（1.7dB），当在前方给出噪音和在人工耳蜗侧给出言语声这种空间构型，均能显示出佩戴人工耳蜗的显著效果。SSQ结果表明两组佩戴人工耳蜗的受试者均有显著的受益。主要研究结果表明人工耳蜗可以改善这20例伴有耳鸣的单侧聋受试者的听力状况。

【关键词】单侧感音神经性听力损失；人工耳蜗植入；言语识别.

Binaural Auditory Outcomes in Patients with Postlingual Profound Unilateral Hearing Loss: 3 Years after Cochlear Implantation

Mertens G., Kleine Punte A., De Bodt M., Van de Heyning P.
Department Otorhinolaryngology, Head and Neck Surgery, Antwerp University Hospital, and University of Antwerp, Antwerp, Belgium.

Abstract

The value of cochlear implants (CI) in patients with profound unilateral hearing loss (UHL) and tinnitus has recently been investigated. The authors previously demonstrated the feasibility of CI in a 12- month outcome study in a prospective UHL cohort. The aim of this study was to investigate the binaural auditory outcomes in this cohort 36 months after CI surgery. The 36-month outcome was evaluated in 22 CI users with postlingual UHL and severe tinnitus. Twelve subjects had contralateral normal hearing (single-sided deafness - SSD group) and 10 subjects had a contralateral, mild to moderate hearing loss and used a hearing aid (asymmetric hearing loss - AHL group). Speech perception in noise was assessed in two listening conditions: the CI_{off} and the CI_{on} condition. The binaural summation effect (S_0N_0), binaural squelch effect (S_0N_{CI}) and the combined head shadow effect ($S_{CI}N_0$) were investigated. Subjective benefit in daily life was assessed by means of the Speech, Spatial and Qualities of Hearing Scale (SSQ). At 36 months, a significant binaural summation effect was observed for the study cohort (2.00, SD 3.82 dB; $p < 0.01$) and for the AHL subgroup (3.34, SD 5.31 dB; $p < 0.05$). This binaural effect was not significant 12 months after CI surgery. A binaural squelch effect was significant for the AHL subgroup at 12 months (2.00, SD 4.38 dB; $p < 0.05$). A significant combined head shadow and squelch effect was also noted in the spatial configuration $S_{CI}N_0$ for the study cohort (4.00, SD 5.89 dB; $p < 0.01$) and for the AHL subgroup (5.67, SD 6.66 dB; $p < 0.05$). The SSQ data show that the perceived benefit in daily life after CI surgery remains stable up to 36 months at $CI_{on.}$ CI can significantly improve speech perception in noise in patients with UHL. The positive effects of CI_{on} speech perception in noise increase over time up to 36 months after CI surgery. Improved subjective benefit in daily life was also shown to be sustained in these patients.

Key Words: A Asymmetric hearing loss, Binaural hearing, Cochlear implants, Profound unilateral hearing loss, Single-sided deafness, Speech perception in noise.

Tables and Figures:

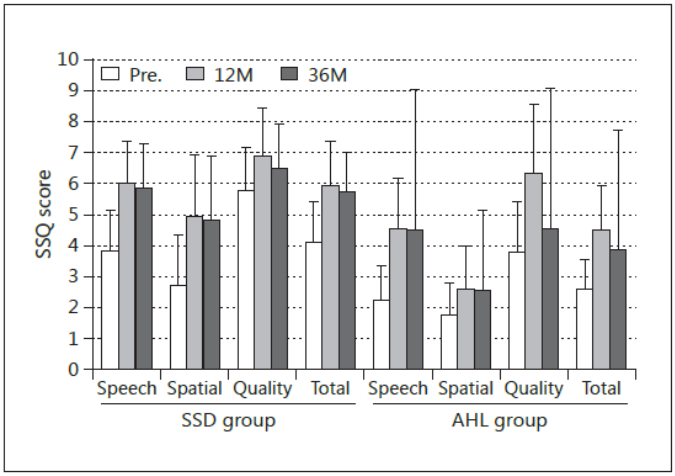

Fig. 2. SSQ total and subscale scores and standard deviations for the SSD subgroup and AHL subgroups before implantation (Pre.), and 12 months (12M) and 36 months (36M) after fitting the first CI.

Article source:
Mertens G, Kleine Punte A, De Bodt M, et al. Binaural Auditory Outcomes in Patients with Postlingual Profound Unilateral Hearing Loss: 3 Years after Cochlear Implantation[J]. Audiology & Neurotology, 2015, 20 Suppl 1(1):67-72.

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语后单侧极重度听力损失患者植入人工耳蜗术后三年的双耳听觉效果

Mertens G., Kleine Punte A., De Bodt M., Van de Heyning P.

安特卫普大学附属医院 耳鼻喉头颈外科，比利时 安特卫普.

【摘要】

最近研究了伴有耳鸣的极重度单侧听力损失（UHL）患者植入人工耳蜗的价值。作者之前阐述了在一个前瞻性单侧听力损失队列研究中观察人工耳蜗植入12个月后的结果的可行性，这项研究的目的是探讨这个队列研究中人工耳蜗植入者术后36个月的双耳听力效果。这项研究共有22例伴有重度耳鸣语后单侧听力损失患者参与，其中对侧听力正常（单侧聋-SSD组）12例，对侧轻中度听力损失并使用助听器（非对称听力损失-AHL组）10例。研究分别在两种听力条件（CI_{off}和CI_{on}）下评估噪声环境下的言语感知，同时研究双耳累加效应（binaural summation effect（S_0N_0））， 双耳静噪效应（binaural squelch effect (S_0N_{Cl})），联合头影效应（combined head shadow effect，$S_{Cl}N_0$），并通过《言语、空间、生活质量听力量表（SSQ）》评估其日常生活质量。结果表明术后12个月，发现受试者无显著的双耳效应，但是非对称听力损失亚组显示了显著的双耳静噪效应（2.00, SD 4.38 dB; $p < 0.05$），同时也注意到在空间构型 $S_{Cl}N_0$中研究组（4.00, SD 5.89 dB; $p < 0.01$）和非对称听力损失亚组（5.67, SD 6.66 dB; $p < 0.05$）有显著的头影和静噪的联合效应；术后36个月，研究组（2.00, SD 3.82 dB; $p < 0.01$）和非对称听力损失亚组（3.34, SD 5.31 dB; $p < 0.05$）均显示显著的双耳累加效应，SSQ数据表明术后36个月内植入者开机（CI_{on}）状态下的日常生活受益一直保持稳定，人工耳蜗能够显著改善 单侧听力损失患者在噪声背景下的言语感知，这种噪声背景下的言语感知（CI_{on}）效果在术后36个月一直随着时间延长而增加，并且这些患者的日常生活也得到持续改善。

【关键词】非对称听力损失；双耳听力；人工耳蜗植入；极重度单侧听力损失；单侧聋；噪声环境下言语感知.

Bilateral cochlear implantation in a patient with petrous bone cholesteatoma in the only hearing ear: case report

S T Husseini[1], M Guida[2], M Negri[3], M Falcioni[1]
1 Gruppo Otologico, Piacenza, 2 Department of ENT, University of Parma, and 3 Department of ENT, Carpi Hospital, Modena, Italy.

Abstract

Objective: We report a case of successful cochlear implantation in a patient with petrous bone cholesteatoma in the only hearing ear.

Case report: A 63-year-old man presented with a four-year history of right-sided, progressive hearing loss in his only hearing ear. Computed tomography and magnetic resonance imaging revealed a right supralabyrinthine petrous bone cholesteatoma, with erosion of the superior semicircular canal and the roof of the internal auditory canal. Due to the high risk of post-operative right-sided deafness, we decided first to perform left cochlear implantation. Five months later, the patient had a 40 per cent score for open-set two-syllable word recognition and an 85 per cent score for sentence recognition. Given these good performances, we decided to eradicate the cholesteatoma via a translabyrinthine approach, with insertion of a second cochlear implant, as a single-stage procedure. A successful outcome was achieved.

Conclusion: Cochlear implantation can be an effective method of hearing rehabilitation in patients with petrous bone cholesteatoma, following total eradication of disease, if the cochlea remains intact. To our best knowledge, this is the first English language report of cochlear implantation in a patient with petrous bone cholesteatoma.

Key Words: Humans, Petrous Bone, Cholesteatoma, Middle Ear, Hearing Loss, Unilateral, Vertigo, Treatment Outcome, Middle Aged, Cochlear Implantation, Ear, Inner, Male.

Article source:
Husseini S T, Guida M, Negri M, et al. Bilateral cochlear implantation in a patient with petrous bone cholesteatoma in the only hearing ear: case report.[J]. Journal of Laryngology & Otology, 2011, 125(12):1272-4.

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一例患有颞骨岩部胆脂瘤的患者植入双侧人工耳蜗: 病例报告

S T Husseini[1], M Guida[2], M Negri[3], M Falcioni[1].
1 Gruppo Otologico，皮亚琴察；2 帕尔马大学 耳鼻喉科；3 Carpi医院 耳鼻喉科 意大利 摩德纳.

【摘要】

目的：我们报告一例患有颞骨岩部胆脂瘤的患者植入人工耳蜗成功的案例。**病例报告**：一位63岁伴有右耳进行性听力损失的男性，其听力损失已经4年，计算机断层扫描（CT）和磁共振成像（MRI）显示右侧迷路上隐窝岩骨胆脂瘤侵蚀半规管上半部和内听道。由于右耳具有听力，且有发生术后全聋的高风险，我们决定首先进行左耳人工耳蜗植入。术后五个月，植入者开放式双音节识别测试得分40%，句子识别测试得分85%。由于左侧植入效果好，我们 决定在右耳也植入人工耳蜗 ，采用经迷路的方法根除胆脂瘤并在右侧植入人工耳蜗，结果非常成功。**结论**：完全根除疾病以后，如果耳蜗保持完好，进行人工耳蜗植入手术是颞骨岩部胆脂瘤患者恢复听力的一种有效方法。据我们所知，这是对颞骨岩部胆脂瘤患者进行人工耳蜗植入的第一例病例英语报告。

【关键词】非人类；岩骨；胆脂瘤；中耳；听力损失，单侧；眩晕；临床效果；中年；人工耳蜗植入术；耳；内；男性.

Single-Sided Deafness: The Effect of Cochlear Implantation on Quality of Life, Quality of Hearing, and Working Performance

Kati Härkönen [a], Ilkka Kivekäs [a], Markus Rautiainen [a], Voitto Kotti [a], Ville Sivonen [b], Juha-Pekka Vasama [a]

a Department of Otorhinolaryngology, Tampere University Hospital, University of Tampere, Tampere ;
b Department of Otorhinolaryngology, Helsinki University Central Hospital, Helsinki , Finland.

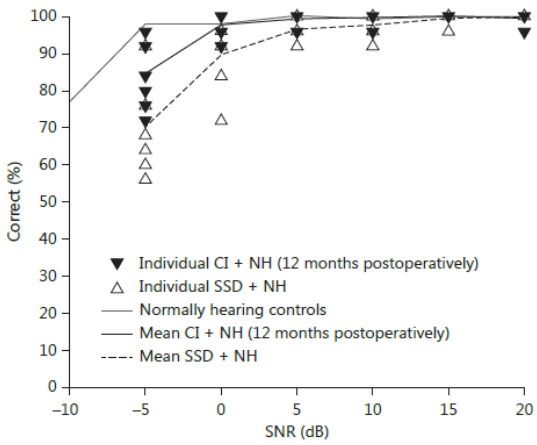
Abstract

Aims: To evaluate the effect of a cochlear implant (CI) on quality of life (QoL), quality of hearing (QoH), and working performance in patients with single-sided deafness (SSD). ***Methods:*** Using specific questionnaires, we measured QoL, QoH, and working performance in 7 SSD patients scheduled for CI surgery of the affected ear. Sound localization and speech perception in noise were also assessed. All questionnaires and tests were performed before the CI surgery and at 6 and 12 months after CI activation. ***Results:*** The QoL, QoH, sound localization, and speech perception in noise had improved statistically significantly after CI surgery. Communication with co-workers became easier, and the patients were less fatigued after the working day. Conclusions: CI clearly improves QoL, QoH, and working performance in patients with SSD.

Key Words: Working performance, Quality of life, Quality of hearing, Cochlear implant, Single-sided deafness.

Tables and Figures:

Fig. 1. Speech perception in noise



Article source:
Härkönen K, Kivekäs I, Rautiainen M, et al. Single-Sided Deafness: The Effect of Cochlear Implantation on Quality of Life, Quality of Hearing, and Working Performance.[J]. ORL, 2015, 77(6):339-345.

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单侧聋：人工耳蜗植入对生活质量、听力质量、工作表现的影响

Kati Härkönen [a], Ilkka Kivekäs [a], Markus Rautiainen [a], Voitto Kotti [a], Ville Sivonen [b], Juha-Pekka Vasama [a]

a 坦佩雷大学医学院耳鼻喉科 芬兰 坦佩雷；
b 赫尔辛基中心医院 耳鼻咽喉科 芬兰 赫尔辛基.

【摘要】

目的： 评估人工耳蜗植入对单侧耳聋患者的生活质量、听力质量、工作表现的影响。**方法：** 使用专业问卷测量7例单侧聋人工耳蜗植入者的生活质量、听力质量、工作表现，同时测量声源定位和噪声背景下言语感知。所有问卷和测试均在术前和术后开机6个月、开机12个月进行。结果: 人工耳蜗植入显著改善了患者的生活质量、听力质量、声源定位和噪声背景言语感知，患者更加容易与同事交流，同时也减轻了工作后的疲劳程度。**结论：** 人工耳蜗植入明显改善了单侧聋患者的生活质量、听力质量和工作表现。

【关键词】 工作表现；生活质量；听力质量；人工耳蜗植入；单侧聋.

Diffusion tensor imaging of the auditory nerve in patients with long-term single-sided deafness

Sjoerd B. Vos[a, b, c], Wieke Haakm[ad, e], Huib Versnel[a, c], Martijn Froeling[d], Lucienne Speleman[a], Pieter Dik[f], Max A. Viergever[b, c], Alexander Leemans[b, c], Wilko Grolman[a, c]

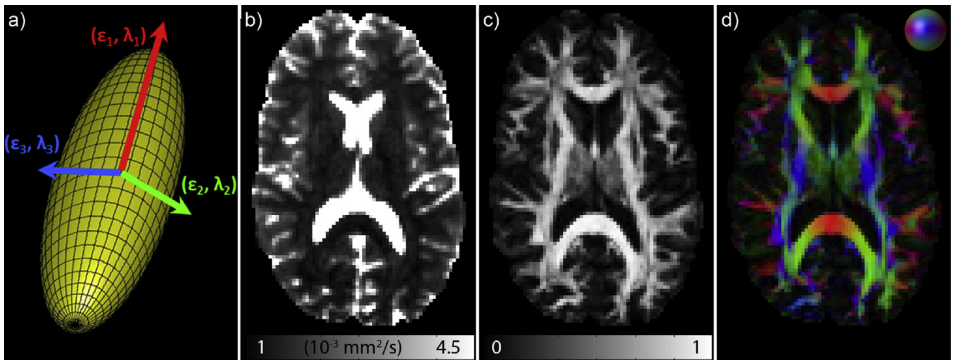
a Department of Otorhinolaryngology and Head & Neck Surgery, University Medical Center Utrecht, Utrecht, The Netherlands;
b Image Sciences Institute, University Medical Center Utrecht, Utrecht, The Netherlands;
c Brain Center Rudolf Magnus, University Medical Center Utrecht, Utrecht, The Netherlands;
d Department of Radiology, University Medical Center Utrecht, Utrecht, The Netherlands;
e Department of Forensic Medicine & Comparative Medicine Lab, Aarhus University, Aarhus, Denmark;
f Department of Pediatric Urology, University Children's Hospital UMC Utrecht, Utrecht, The Netherlands.

Abstract

A cochlear implant (CI) can restore hearing in patients with profound sensorineural hearing loss by direct electrical stimulation of the auditory nerve. Therefore, the viability of the auditory nerve is vitally important in successful hearing recovery. However, the nerve typically degenerates following cochlear hair cell loss, and the amount of degeneration may considerably differ between the two ears, also in patients with bilateral deafness. A measure that reflects the nerve's condition would help to assess the best of both nerves and decide accordingly which ear should be implanted for optimal benefit from a CI. Diffusion tensor MRI (DTI) may provide such a measure, by allowing noninvasive investigations of the nerve's microstructure. In this pilot study, we show the first use of DTI to image the auditory nerve in five normal-hearing subjects and five patients with long-term profound single-sided sensorineural hearing loss. A specialized acquisition protocol was designed for a 3 T MRI scanner to image the small nerve bundle. The nerve was reconstructed using fiber tractography and DTI metrics – which reflect the nerve's microstructural properties – were computed per tract. Comparing DTI metrics from the deaf-sided with the healthy-sided nerves in patients showed no significant differences. There was a small but significant reduction in fractional anisotropy in both auditory nerves in patients compared with normal-hearing controls. These results are the first evidence of possible changes in the microstructure of the bilateral auditory nerves as a result of single-sided deafness. Our results also indicate that it is too early to assess the degenerative status of the auditory nerve of a subject-specific basis.

Tables and Figures:

Fig. 1. The diffusion tensor can be visualized



Article source:

Vos S B, Haakma W, Versnel H, et al. Diffusion tensor imaging of the auditory nerve in patients with long-term single-sided deafness[J]. Hearing Research, 2015, 323:1-8.

参考译文：

长期单侧耳聋患者的听觉神经弥散张量成像

Sjoerd B. Vos[a, b, c], Wieke Haakm[ad, e], Huib Versnel[a, c], Martijn Froeling[d], Lucienne Speleman[a], Pieter Dik[f], Max A. Viergever[b, c], Alexander Leemans[b, c], Wilko Grolman[a, c]

a 乌得勒支大学医学中心 耳鼻咽喉头颈外科，荷兰 乌得勒支；
b 乌得勒支大学医学中心 影像科学研究所，荷兰 乌得勒支；
c 乌得勒支大学医学中心 鲁道夫马格努斯 脑研究中心，荷兰 乌得勒支；
d 乌得勒支大学医学中心 放射科，荷兰 乌得勒支；
e 奥胡斯大学 法医学与比较医学实验室，丹麦 奥胡斯；
f 乌得勒支大学儿童医院 小儿泌尿科，荷兰 乌得勒支.

【摘要】

人工耳蜗（CI）可以通过直接电刺激听神经使得极重度感音神经性聋患者恢复听力。因此，听神经的活性决定了是否可以恢复听力。然而，听神经通常随着耳蜗毛细胞的丧失而退化，并且两耳间退化的神经数量可能也存在很大的不同，这种现象也见于双侧聋患者。一个反映神经状态的评价指标将有助于评估双耳神经状态，并且有助于决定哪个耳植入人工耳蜗才能获得最佳效果；弥散张量成像（DTI）可能是这样的指标，它能够无创地观察神经的微观结构。在这个初步研究中，我们第一次使用DTI来显示5个正常听力受试者和5个长期单侧聋患者的听觉神经影像，并且为3台MRI扫描仪器专门设计了一种特殊的探测方法来记录小神经束，使用反映神经显微结构特征的纤维束成像和DTI度量来构建神经束结构。通过单侧聋和对侧正常神经DTI度量的比较发现二者之间没有显著差异，但是患者双侧听神经的各向异性分数（fractional anisotropy）均显著弱于正常人。这些结果第一次证明单侧聋可能导致双侧听神经微观结构的变化，同时也表明利用DTI来评估特殊受试者的听神经的退化状态还为时过早。

Tinnitus Suppression by Intracochlear Electrical Stimulation in Single Sided Deafness – A Prospective Clinical Trial: Follow-Up

Remo A.G.J. Arts[a], Erwin L.J. George[a], Miranda Janssen[a], Andreas Griessner[b], Clemens Zierhofer[b], Robert J. Stokroos[a]

a Department of ENT/Head and Neck Surgery, Maastricht University Medical Centre, Maastricht , The Netherlands;
b Institute of Mechatronics, University of Innsbruck, Innsbruck , Austria.

Abstract

Cochlear implantation is a viable treatment option for tinnitus, but the underlying mechanism is yet unclear. Is the tinnitus suppression due to the reversal of the assumed maladaptive neuroplasticity or is it the shift in attention from the tinnitus to environmental sounds and therefore a reduced awareness that reduces tinnitus perception? In this prospective trial, 10 patients with single-sided deafness were fitted with a cochlear implant to investigate the effect of looped intracochlear electrical stimulation (i.e. stimulation that does not encode environmental sounds) on tinnitus, in an effort to find optimal stimulation parameters. Variables under investigation were: amplitude (perceived stimulus loudness), anatomical location inside the cochlea (electrode/electrodes), amplitude modulation, polarity (cathodic/anodic first biphasic stimulation) and stimulation rate. The results suggest that tinnitus can be reduced with looped electrical stimulation, in some cases even with inaudible stimuli. The optimal stimuli for tinnitus suppression appear to be subject specific. However, medium-to-loud stimuli suppress tinnitus significantly better than soft stimuli, which partly can be ex- plained by the masking effect. Although the long-term effects on tinnitus would still have to be investigated and will be described in part II, intracochlear electrical stimulation seems a potential treatment option for tinnitus in this population.

Article source:
Arts R A G J, George E L J, Janssen M, et al. Tinnitus Suppression by Intracochlear Electrical Stimulation in Single Sided Deafness – A Prospective Clinical Trial: Follow-Up[J]. Plos One, 2016, 11(4).

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通过耳蜗内电刺激抑制单侧聋患者的耳鸣——前瞻性临床随访

Remo A.G.J. Arts[a], Erwin L.J. George[a], Miranda Janssen[a], Andreas Griessner[b], Clemens Zierhofer[b], Robert J. Stokroos[a]

a 马斯特里赫特大学医学中心 耳鼻喉头颈外科 荷兰 马斯特里赫特;
b 因斯布鲁克大学 机电学院 奥地利 因斯布鲁克.

【摘要】

人工耳蜗植入有助于抑制耳鸣，但是至今不清楚其潜在的机理。耳鸣抑制是对假定的神经可塑性不良适应的逆转？还是由于环境声音转移了对耳鸣的注意力，从而降低了对耳鸣认识的关注？在本前瞻性研究中，收集10例单侧聋人工耳蜗植入者，研究其内耳电刺激（例如无环境声音编码的电刺激）对耳鸣的影响，并寻找最佳刺激参数，研究变量为：振幅（感知刺激音量）、耳蜗内解剖位置（电极）、调幅、极性（阴极/阳极第一双相刺激加英语）和刺激率。结果表明回路（蜗内）电刺激可以减轻耳鸣，某些情况下即使听不见的刺激也依然有效；虽然不确定耳鸣抑制的最佳刺激量，但中等至强刺激对耳鸣的抑制显著优于轻度刺激，这可以解释为掩蔽效应。尽管电刺激对耳鸣的长期影响仍需要进一步的研究，这将在第二部分阐述，但是耳蜗内电刺激似乎是对耳鸣的一个潜在治疗方案。

Unilateral spectral and temporal compression reduces binaural fusion for normal hearing listeners with cochlear implant simulations

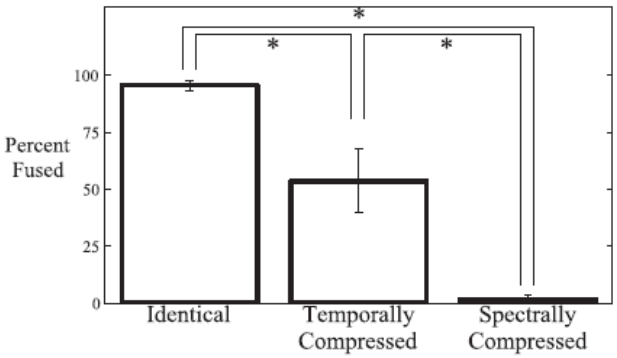
Justin M. Aronoff [a, *], Corey Shayman [a, b], Akila Prasad [a], Deepa Suneel [a], Julia Stelmach [a]
a Department of Speech and Hearing Science, University of Illinois at Urbana-Champaign, 901 S. 6th St., Champaign, IL 61820, USA;
b Department of Molecular and Cell Biology, University of Illinois at Urbana-Champaign, 393 Morrill Hall, 505 S. Goodwin Ave., Urbana, IL 61801, USA.

Abstract

Patients with single sided deafness have recently begun receiving cochlear implants in their deaf ear.These patients gain a significant benefit from having a cochlear implant. However, despite this benefit,they are considerably slower to develop binaural abilities such as summation compared to bilateral cochlear implant patients. This suggests that these patients have difficulty fusing electric and acoustic signals. Although this may reflect inherent differences between electric and acoustic stimulation, it may also reflect properties of the processor and fitting system, which result in spectral and temporal compression. To examine the possibility that unilateral spectral and temporal compression can adversely affect binaural fusion, this study tested normal hearing listeners' binaural fusion through the use of vocoded speech with unilateral spectral and temporal compression. The results indicate that unilateral spectral and temporal compression can each hinder binaural fusion and thus may adversely affect binaural abilities in patients with single sided deafness who use a cochlear implant in their deaf ear.

Key Words: Sound Localization, Single-Sided Deafness (SSD), Spatial Hearing, Binaural Hearing, Cochlear Implantation (CI).

Tables and Figures: Fig. 2. The effect of spectral and temporal compression on binaural fusion.



Article source:
Aronoff J M, Shayman C, Prasad A, et al. Unilateral spectral and temporal compression reduces binaural fusion for normal hearing listeners with cochlear implant simulations[J]. Hearing Research, 2015, 320:24-29.

参考译文：

单侧波谱和时间压缩减弱使用人工耳蜗模拟刺激的正常听力者的双耳融合

Justin M. Aronoff [a, *], Corey Shayman [a, b], Akila Prasad [a], Deepa Suneel [a], Julia Stelmach [a]
a 伊利诺伊大学厄巴纳-香槟分校 语言与听觉科学系，美国 香槟 IL61820；b 伊利诺伊大学厄巴纳-香槟分校 细胞和分子生物学系，美国 厄巴纳IL61801.

【摘要】现在单侧聋患者开始接受人工耳蜗手术，并且人工耳蜗植入后得到显著的受益。然而，和双侧人工耳蜗植入者相比，他们（单侧植入者）恢复双侧听能（例如整合能力）相当慢，这表明这些植入者难以整合电和声信号。虽然这可能反映了电刺激和声刺激之间的固有差异，但它也可能反映了压缩波谱和时间的处理器和拟合系统的属性。为了检查单侧波谱和时间压缩是否影响双耳融合，本研究通过使用单侧波谱和时间压缩的声码语音来测试正常听力者的双耳融合。结果表明单侧波谱和时间压缩能够阻碍双耳融合，因此可能影响使用人工耳蜗的单侧聋患者的双耳听能。

【关键词】声源定位；单侧耳聋（SSD）；空间听觉；双耳听觉；人工耳蜗植入（CI）.

Prospective case-controlled sound localisation study after cochlear implantation in adults with single-sided deafness and ipsilateral tinnitus

G. Mertens[1,2,*], J. Desmet[1,2,] M. De Bodt[1,2] and P. Van de Heyning[1,2]

1 University Department of Otorhinolaryngology, Head and Neck Surgery, Antwerp University Hospital, Edegem, Antwerp, Belgium;
2 Antwerp University, Antwerp, Belgium.

Abstract

Objectives: To analyse the sound localisation skills of subjects with profound single-sided deafness (SSD) and accompanied ipsilateral tinnitus who are using a cochlear implant (CI) for between 4 and 11 years. ***Design:*** Sound localisation skills were tested using nine loudspeakers in a frontal semicircle ranging from −90° to +90°. Subjects were tested in the CI_{ON} and the CI_{OFF} conditions via 3 localisation stimuli: broadband noise (BB), low-pass noise (LP) and high-pass noise (HP). ***Participants:*** The test group consisted of 10 adult subjects with profound sensorineural SSD, ipsilateral tinnitus and a CI. Normative data of a control group of 30 normal hearing subjects were used for comparison. ***Main outcome measures:*** Sound location accuracy was analysed via the root-mean-square error (RMSE), the mean absolute error (MAE), the localisation bias ('b') and the bias-adjusted deviation ('db'). Subjective dynamic aspects of hearing were assessed via a reduced version of the Speech, Spatial and Qualities of Hearing Scale (SSQ5). ***Results:*** For all 3 stimuli, the RMSE improved significantly in SSD subjects in the CI_{ON} condition compared to the CI_{OFF} condition. The localisation accuracy of subjects with SSD improved significantly for BB and HP stimuli. A significant bias-adjusted deviation 'db' was found for the BB and HP stimuli. Subjects' mean SSQ5 scores were significantly higher in the CI_{ON} condition at test date than in the CI_{OFF} condition preoperatively. ***Conclusions:*** Subjects can better locate sound in the CI_{ON} condition than in the CI_{OFF} condition.

Key Words: Humans, Brain, Gyrus Cinguli, Hippocampus, Auditory Pathways, Tinnitus, Electroencephalography, Treatment Outcome, Brain Mapping, Case-Control Studies.

Tables and Figures:

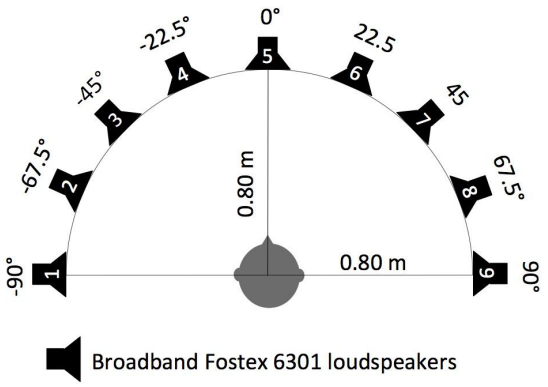


Figure 2. *Localization set-up: 9 Broadband Fostex 6301 loudspeakers at intervals of 22.5°, located in a frontal horizontal semicircle at the subject's head level.*

Article source:
Mertens G, Desmet J, Bodt M D, et al. Prospective case-controlled sound localization study after cochlear implantation in adults with single-sided deafness and ipsilateral tinnitus[J]. Clinical otolaryngology: official journal of ENT-UK; official journal of Netherlands Society for Oto-Rhino-Laryngology & Cervico-Facial Surgery, 2015.

参考译文：

成人单侧聋合并同侧耳鸣患者人工耳蜗植入后的前瞻性病例对照声源定位研究

G. Mertens[1,2,*], J. Desmet[1,2,] M. De Bodt[1,2] and P. Van de Heyning[1,2]

1 安特卫普大学附属医院 大学部耳鼻咽喉头颈外科，比利时 安特卫普；
2 安特卫普大学，比利时 安特卫普.

【摘要】

目标：分析植入人工耳蜗4至11年时长的重度单侧聋（SSD）且伴有同侧耳鸣的患者的的声源定位能力。**设计：**在人工耳蜗开机（CI_{ON}）和关机（CI_{OFF}）两种状态下，使用9个排列成正面半圆形（范围-90° 到+90° ）的扬声器对受试者进行声源定位能力测试，包括宽带（BB）噪声，低通（LP）噪声、高通（HP）噪声定位刺激。**参与者：**受试组由10例伴有同侧耳鸣的重度感音神经性单侧聋（SSD）的成人人工耳蜗植入者组成。对照组使用30例正常听力受试者的规范化数据作为比较。**主要观察指标：**通过使用均方根误差（RMSE）、平均绝对误差（MAE），定位偏离（B）和有偏调整离差（‘db’）分析声源定位的准确度，并通过使用简化版的《言语、空间、生活质量听力量表（SSQ5）》评估听力的主观动态方面。**结果：**与关机（CI_{OFF}）状态相比，单侧聋受试者在人工耳蜗开机（CI_{ON}）状态下对三种刺激的均方根误差均有显著改善（RMSE）；受试者对宽带（BB）和高通（HP）刺激存在显著的有偏调整离差（‘db’），受试者对宽带（BB）和高通（HP）刺激的声源定位的准确度显著改善；受试者的SSQ5的平均分数在人工耳蜗开机（CI_{ON}）状态下也显著高于术前关机（CI_{OFF}）状态。**结论：**受试者的声音定位能力在人工耳蜗开机（CI_{ON}）状态明显优于关机（CI_{OFF}）状态。

【关键词】人类；脑；扣带回；海马；听觉通路；耳鸣；脑电图；临床效果；脑图；病例对照研究.

Neural substrates predicting improvement of tinnitus after cochlear implantation in patients with single-sided deafness

Jae-Jin Song[a], Andrea Kleine Punte[b], Dirk De Ridder[c, d], Sven Vannested[d,e], Paul Van de Heyning[b, d]
a Department of Otorhinolaryngology-Head and Neck Surgery, Seoul National University Hospital, Seoul, South Korea;
b Brain, TRI & ENT, University Hospital Antwerp, Belgium;
c Department of Surgical Sciences, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand;
d Department of Translational Neuroscience, Faculty of Medicine, University of Antwerp, Belgium;
e School of Behavioral and Brain Sciences, The University of Texas at Dallas, USA.

Abstract

Notwithstanding successful reduction of tinnitus after cochlear implantation (CI) in patients with single-sided deafness (SSD) in recent studies, neither the exact mechanism of suppression nor the predictors of the amount of improvement are fully understood yet. We collected quantitative electroencephalography (qEEG) data from nine SSD patients who underwent CI for tinnitus management. By correlating the degree of improvement in tinnitus intensity and tinnitus-related distress with preoperative source-localized qEEG findings and comparing qEEG findings of patients with marked improvement after CI with those with relatively slight improvement with regard to source-localized activity complimented by connectivity analysis, we attempted to find preoperative predictors of tinnitus improvement. Our results showed increased activities of the auditory cortex (AC), posterior cingulate cortex (PCC) and increased functional connectivity between the AC and PCC as negative prognostic factors for the reduction of tinnitus intensity after CI in patients with SSD. Also, relatively increased activity of the right dorsolateral prefrontal cortex and decreased connectivity between distress-related areas such as the orbitofrontal cortex/parahippocampus and sensory-perception areas such as the AC/precuneus were found in patients with relatively slight improvement in tinnitus-related distress as compared with those with marked improvement. The current study suggests that preoperative cortical oscillations can be applied to predict post-CI tinnitus reduction in patients with SSD.

Key Words: Humans, Brain, Gyrus Cinguli, Hippocampus, Auditory Pathways, Tinnitus, Electroencephalography, Treatment Outcome, Brain Mapping, Case-Control Studies.

Tables and Figures:

Table 3
Summary of the brain areas found to be predictive of slight improvement of tinnitus with regard to the numeric rating scale intensity and the tinnitus questionnaire score.

Parameters	Brain areas	Significant differences compared to the marked improvement group
NRS intensity	Left A2	Increased activities for the delta and gamma frequency bands
	Left temporal pole	Increased activity for the beta 1 frequency band
	Left A1–right PCC	Increased functional connectivity for the delta frequency band
TQ score	Right DLPFC	Negative correlation with the percent improvement of TQ score for the alpha2 band
	Left A1–right A1, right A1–left PHC, left A1–right PCC, right OFC–left precuneus	Decreased functional connectivity for the gamma frequency band

NRS, numeric rating scale; TQ, tinnitus questionnaire; A2, secondary auditory cortex; PCC, posterior cingulate cortex; A1, primary auditory cortex; PHC, parahippocampus; OFC, orbitofrontal cortex.

Article source:
Song J J, Punte A K, Ridder D D, et al. Neural substrates predicting improvement of tinnitus after cochlear implantation in patients with single-sided deafness[J]. Hearing Research, 2013, 299(3):1-9.

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神经基板可以预测单侧聋人工耳蜗植入者的耳鸣改善程度

Jae-Jin Song[a], Andrea Kleine Punte[b], Dirk De Ridder[c, d], Sven Vannested[d,e], Paul Van de Heyning[b, d]

a 国立首尔大学附属医院 耳鼻咽喉头颈外科学系，韩国汉城；
b 安特卫普大学附属医院 脑TRI&ENT（耳鼻喉）科，比利时；
c 奥塔哥大学达尼丁医学院 外科科学系，新西兰达尼丁；
d 安特卫普大学医学部 转化神经科学系，比利时；
e 德克萨斯大学 达拉斯分校 行为与脑科学学院，美国.

【摘要】

尽管单侧耳聋（SSD）患者植入人工耳蜗（CI）后成功减轻了耳鸣，然而尚不清楚耳鸣抑制的确切机制和预估改善量。我们收集9名植入人工耳蜗的单侧耳患者耳鸣的定量脑电图数据（qEEG）。通过关联耳鸣强度及由耳鸣导致的负面情感（耳鸣忧伤）的改善程度与术前耳鸣源定位qEEG结果之间的关系，以及通过连通性分析比较患者植入耳蜗（CI）后显著改善与相对轻微改善的耳鸣源定位活动的qEEG，我们试图找到术前预测耳鸣改善效果的方法。研究结果显示单侧聋患者植入人工耳蜗后的耳鸣轻度降低的不良预后因素为：听觉皮层（AC）和后扣带回皮质（PCC）的活动增加，并且AC和PCC之间的功能性联系增强。同时，与耳鸣忧伤显著改善的患者相比，发现相对轻微改善的患者中右背外侧前额叶皮层活动增加，窘迫相关区域（如眶额叶皮质/海马旁回）和感官知觉区（听觉皮层/楔前叶）之间的联系减少。当前研究表明术前皮层共振活动可以用于预测单侧聋患者植入人工耳蜗后的耳鸣减轻效果。

【关键词】人类，脑；扣带回；海马；听觉通路；耳鸣；脑电图；临床效果；脑图；病例对照研究.

图表：

表3. 考虑数字评分量表和耳鸣问卷评分可以预测耳鸣轻微改善的脑区小结

参数	脑区	和明显改善组存在显著差异
NRS强度	左侧A2	δ和γ频带活动增强
	左侧颞极	β1频带活动增强
	左侧A1-右侧PCC	δ频带的功能连接增强
TQ分数	右侧DLPFC	α2频带与TQ评分改善的百分程度负相关
	左侧A1-右侧A1，右侧A-左侧PHC，左侧A-右侧PCC，右侧 OFC-左侧楔前叶	γ频带功能连接减弱

NRS，数字评定量表；TQ，耳鸣问卷；A2，次级听觉皮层；PCC，后扣带回皮质；A1，初级听皮层；PHC，海马旁回；OFC，眶额皮层。

Expanded selection criteria in adult cochlear implantation

Christoph Arnoldner[a] & Vincent Y. W. Lin*[a]

a Department of Otolaryngology/Head & Neck Surgery,Sunnybrook Health Sciences Centre, University of Toronto, Toronto, ON, Canada.

Abstract

Cochlear implantation has become the standard procedure for restoring substantial hearing in the profoundly deaf. The excellent performance of most of the CI recipients coupled with the rapid evolution of implant technology lead to a distinct expansion in selection criteria for CI. These changes in candidacy primarily include patients with (1) moderate preoperative speech recognition with hearing aids, (2) significant residual hearing, (3) single-sided deafness, and (4) geriatric patients. Many of these patients' conditions were regarded as a clear contraindication to CI only a few years ago. In this article an overview of the current and new aspects of candidacy for cochlear implantation is provided.

Key Words: Humans, Deafness, Hearing Loss, Unilateral, Cochlear Implantation, Cochlear Implants, Patient Selection, Adult, Aged.

Article source:
Arnoldner C, Lin V Y. Expanded selection criteria in adult cochlear implantation.[J]. Cochlear Implants International, 2013, 14 Suppl 4(S4):10-3.

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成人人工耳蜗植入选择标准的扩展

Christoph Arnoldner[a] & Vincent Y. W. Lin*[a]

a 多伦多大学 森尼布鲁克健康科学中心耳鼻咽喉头颈外科 加拿大 多伦多.

【摘要】

人工耳蜗植入已经成为极重度聋患者极大恢复固有听力的常规手术。绝大多数人工耳蜗植入者的良好表现和植入技术的快速进步促使人工耳蜗植入候选标准的范围明显扩大。这些候选标准变化主要包括：（1）术前中等的助听言语识别得分；（2）显著的残余听力；（3）单侧聋；（4）老年患者。而几年前，很多这样的患者情况还被认为是明显的人工耳蜗手术禁忌症。本文概述当前和最新的人工耳蜗植入入选标准方面的进展。

【关键词】 人类，耳聋，听力损失，单侧，人工耳蜗植入，人工耳蜗植入体，患者选择，成人，老年.

Early unilateral cochlear implantation promotes mature cortical asymmetries in adolescents who are deaf

Salima Jiwani[1], Blake C. Papsin[2,3] and Karen A. Gordon[1,2,3,*]

1 Institute of Medical Sciences, Faculty of Medicine, University of Toronto, Toronto, Canada, Ontario;
2 Archie's Cochlear Implant Laboratory, the Hospital for Sick Children, Toronto, Ontario, Canada;
3 Department of Otolaryngology-Head & Neck Surgery, University of Toronto, Toronto, Ontario, Canada.

Abstract

Unilateral cochlear implant (CI) stimulation establishes hearing to children who are deaf but compromises bilateral auditory development if a second implant is not provided within 1.5 years. In this study we asked: 1) What are the cortical consequences of missing this early sensitive period once children reach adolescence? 2) What are the effects of unilateral deprivation on the pathways from the opposite ear? Cortical responses were recorded from 64-cephalic electrodes within the first week of bilateral CI activation in 34 adolescents who had over 10 years of unilateral right CI experience and in 16 normal hearing peers. Cortical activation underlying the evoked peaks was localized to areas of the brain using beamformer imaging. The first CI evoked activity which was more strongly lateralized to the contralateral left hemisphere than normal, with abnormal recruitment of the left prefrontal cortex (involved in cognition/attention), left temporo-parietal-occipital junction (multi-modal integration), and right precuneus (visual processing) region. CI stimulation in the opposite deprived ear evoked atypical cortical responses with abnormally large and widespread dipole activity across the cortex. Thus, using a unilateral CI to hear beyond the period of cortical maturation causes lasting asymmetries in the auditory system, requires recruitment of additional cortical areas to support hearing, and does little to protect the unstimulated pathways from effects of auditory deprivation. The persistence of this reorganization into maturity could signal a closing of a sensitive period for promoting auditory development on the deprived side.

Key Words: Bilateral cochlear implant, Cortical maturation, Single sided deaf, Unilateral deaf, Development, Brain imaging, source localization, Auditory cortex, Hearing loss, Deafness, Adolescent, Evoked related potential, Evoked potential, Electrophysiology.

Tables and Figures:
Fig. 4.

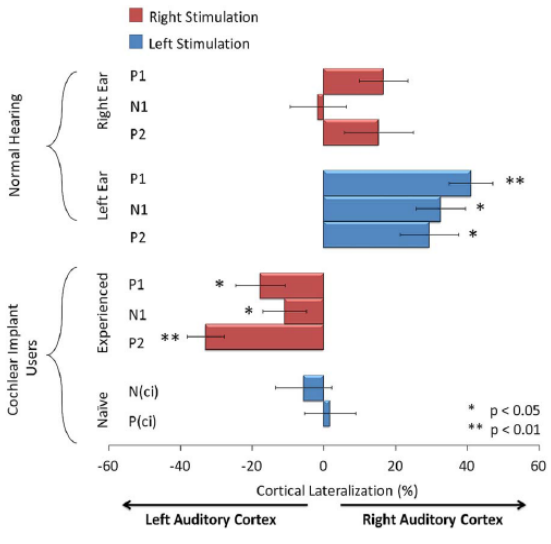

Figure 4.

Article source:
Jiwani S, Papsin B C, Gordon K A. Early unilateral cochlear implantation promotes mature cortical asymmetries in adolescents who are deaf[J]. Human Brain Mapping, 2016, 37(1):135–152.

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早期单侧人工耳蜗植入导致青少年聋患者成熟皮质的不对称性

Salima Jiwani[1], Blake C. Papsin[2,3] and Karen A. Gordon[1,2,3,*]

1 多伦多大学医学院医学科学研究所 加拿大 安大略 多伦多；
2 儿童医院 阿尔奇人工耳蜗植入实验室 加拿大 安大略 多伦多；
3 多伦多大学 耳鼻咽喉头颈外科 加拿大 安大略 多伦多.

【摘要】

单侧人工耳蜗刺激能够建立聋童的听力，但是如果1.5年内对侧未植入人工耳蜗则会损害双侧听觉的发育。本研究的目的为：1）一旦孩子进入青春期，缺失这一早期敏感期对皮质影响是什么？2）单侧剥夺对侧耳路径的影响是什么？用64电极记录34例双侧植入人工耳蜗的青少年开机第一周的皮质反应，这些植入者均有10年右耳人工耳蜗植入史，同样记录16例正常听力同龄人的皮质反应，同时使用波束成像定位诱发峰的皮层激活脑区。结果发现第一个人工耳蜗诱发的活动比正常组更强地定位于对侧左半球，并且异常募集于左前额叶皮层（认知/关注）、左颞顶枕交界区（融合）、右楔前叶（视觉）区；对侧剥夺耳的人工耳蜗刺激会诱发伴随遍布整个大脑皮质的异常大和广泛的偶极活动的非典型的皮层反应。因此，超出皮层成熟期使用单侧人工耳蜗植入会导致听觉系统的持久性不对称，需要募集额外的皮层区域支持听力，并且对保护受听觉剥夺影响的未经刺激的路径的作用不大，这种持续到成熟的重组可能标志着促进剥夺侧听觉发育的敏感期的结束。

【关键词】双侧人工耳蜗植入；皮质成熟；单侧聋；单侧聋；发育；脑成像；声源定位；听觉皮层；听力损失；耳聋；青少年；诱发电位；诱发电位；电生理学.

Bilateral cochlear implants in long-term and short-term deafness

Celene McNeill[1], William Noble[2], Suzanne C Purdy[3], Anna O'Brien[4], Mridula Sharma[5]

1 Healthy Hearing & Balance Care, Australia;
2 University of New England, Australia;
3 University of Auckland, New Zealand;
4 National Acoustic Laboratories, Australia;
5 Macquarie University, Australia.

Abstract

This case is of a 70-year-old man with single-sided deafness (SSD) in the right ear since childhood, who developed a sudden severe hearing loss in the left ear at the age of 63. Eventually, after he received cochlear implants in both ears, he started to present behavioural auditory processing skills associated with binaural hearing, such as improved ability to understand speech in the presence of background noise, and sound localization. Outcomes were measured using cortical auditory evoked potentials, speech perception in noise, sound localization tests, and a self-rating questionnaire. The results suggest that even after more than 50 years of unilateral deafness it was possible to develop binaural interaction and sound localization as a result of electric auditory stimulation.

Key Words: Bilateral cochlear implant, Cortical plasticity, Single-sided deafness (SSD), Auditory deprivation, Sound localization.

Article source:
Mcneill C, Noble W, Purdy S C, et al. Bilateral cochlear implants in long-term and short-term deafness.[J]. Cochlear Implants International, 2012, 13(1):50-3.

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长期和短期聋的双侧人工耳蜗植入

Celene McNeill[1], William Noble[2], Suzanne C Purdy[3], Anna O'Brien[4], Mridula Sharma[5]

1 健康听力和平衡护理 澳大利亚；
2 新英格兰大学，澳大利亚；
3 奥克兰大学，新西兰；
4 国家声学实验室，澳大利亚；
5 麦克里大学，澳大利亚.

【摘要】

这是一个70岁的老年男性单侧聋案例报告，老人右耳自幼失聪，63岁时左耳突然严重听力损失。在接受双侧人工耳蜗植入以后， 最终老人表现出了双耳听力相关的听觉行为处理技能，例如提高了在背景噪声背景下的言语理解能力和声源定位能力。使用皮层听觉诱发电位、噪声背景言语感知、声源定位测试和自评量表进行测试，结果表明尽管存在超过50年的耳聋史，老人在听觉电刺激下仍然可以发展双耳相互作用和声源定位。

【关键词】双侧人工耳蜗植入；皮质可塑性；单侧耳聋（SSD）；听觉剥夺；声源定位.

Causation of permanent unilateral and mild bilateral hearing loss in children

Tharpe AM, Sladen DP

Vanderbilt Bill Wilkerson Center, Vanderbilt University Medical Center, Nashville 37232-8242, Tennessee.

Abstract

Children with permanent unilateral or mild bilateral hearing loss have been a focus of concern by audiologists, educators, and physicians for at least 2 decades. These children are known to be at risk for psychoeducational difficulties. However, despite this concern, little has been learned about the causative factors of these hearing losses and how those factors might be contributing to child development. This review of known causes of permanent unilateral and mild bilateral hearing loss in children is meant to draw attention to the importance of the search for etiologic factors. That is, the identification of the hearing loss should not signal the end of the diagnostic process but, rather, the beginning of a search for causation. With the combined efforts of audiologists, otolaryngologists, pediatricians, geneticists, and other medical professionals, we may enhance our understanding of the primary causes of unilateral and mild bilateral hearing loss and, perhaps, create links between causative factors and psychosocial and psychoeducational outcomes.

Key Words: Humans, Vestibular Aqueduct, Virus Diseases, Bacterial Infections, Hearing Loss, Bilateral, Hearing Loss, Unilateral, Cochlear Diseases, Vestibular Diseases, Severity of Illness Index, Noise.

Article source:
Tharpe A M, Sladen D P. Causation of permanent unilateral and mild bilateral hearing loss in children.[J]. Trends in Amplification, 2008, 12(1):17-25.

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儿童永久性单侧和轻度双侧听力损失的病因

Tharpe AM, Sladen DP

范德比特大学医学中心，范德比尔特·比尔·威尔克森 中心，美国 田纳西州 纳什维尔37232-8242.

【摘要】

近20年来，儿童永久性单侧或轻度双侧听力损失一直是听力学家、教育学家和内科医生关注的焦点，这些儿童面临心理教育的困难，然而除此之外，人们很少关注造成这些听力损失的原因以及这些原因对儿童发育的影响。本文综述儿童永久性单侧和轻度双侧听力损失的病因以引起人们关注其病因的重要性，即确定听力损失时不代表诊断结束，而应作为探求病因的起点。在听力师、耳鼻喉科医师、儿科医师、遗传学家和其他医疗专业人员的协作下，我们可能能够加强对单侧和轻度双侧听力损失的主要病因的理解，或许能找出致病因素和社会心理以及心理教育结果之间的联系。

【关键词】人类；前庭水管；病毒性疾病；细菌感染；听力损失；双侧；听力损失，单侧；人工耳蜗疾病；前庭疾病；疾病严重程度指数；噪声.

Cochlear implantation for single-sided deafness: the outcomes An evidence-based approach

Petros V. Vlastarakos[1], Kostas Nazos[2], Evangelia-Filothei Tavoulari[3], Thomas P. Nikolopoulos[4]

1 ENT Department, MITERA Infirmary, 6 Erythrou Stavrou Str, Marousi-Athens 15123, Greece;
2 ENT Department, Asklepeion Voulas General Hospital, Athens,Greece;
3 2nd Pediatric Department, Penteli Children's Hospital, Athens,Greece;
4 ENT Department, Attikon University Hospital, Athens, Greece.

Abstract

The aim of the present paper is to critically review the current evidence on the efficacy of cochlear implantation as a treatment modality for single-sided deafness (SSD), and/or unilateral tinnitus. Systematic literature review in Medline and other database sources was conducted along with critical analysis of pooled data. The study selection includes prospective and retrospective comparative studies, case series and case reports. The total number of analyzed studies was 17. A total of 108 patients with SSD have been implanted; 66 patients due to problems associated with SSD, and 42 primarily because of debilitating tinnitus. Cochlear implantation in SSD leads to improved sound localization performance and speech perception in noise from the ipsilateral side with an angle of coverage up to (but not including) 90° to the front, when noise is present in the contralateral quartile (Strength of recommendation B). Speech and spatial hearing also subjectively improve following the insertion of a cochlear implant (Strength of recommendation B); this was not the case regarding the quality of hearing. Tinnitus improvement was also reported following implant placement (Strength of recommendation B); however, patients need to be advised that the suppression is mainly successful when the implant is activated. The overall quality of the available evidence supports a wider use of cochlear implantation in SSD following appropriate selection and counseling (overall strength of recommendation B). It remains to be seen if the long-term follow-up of large number of patients in well conducted high quality studies will confirm the above mentioned results.

Key Words: Cochlear implant, Deafness, Unilateral, Tinnitus, Single-sided hearing loss, Sound localization, Speech perception in noise, Quality of life.

Article source:

Vlastarakos P V, Nazos K, Tavoulari E F, et al. Cochlear implantation for single-sided deafness: the outcomes. An evidence-based approach[J]. European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery, 2014, 271(8):2119-26.

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单侧聋人工耳蜗植入：临床结果一种基于证据的方法

Petros V. Vlastarakos[1], Kostas Nazos[2], Evangelia-Filothei Tavoulari[3], Thomas P. Nikolopoulos[4]

1 马鲁西 Erythrou Stavrou大街6号 MITERA 医务室 耳鼻喉科, 希腊 雅典15123；
2 Asklepeion Voulas 总医院 耳鼻喉科, 希腊 雅典；
3 Penteli 儿童医院 第二儿科，希腊 雅典；
4 Attikon 大学附属医院 耳鼻喉科，希腊 雅典.

【摘要】

本文回顾了将人工耳蜗植入作为单侧聋（SSD）和单侧耳鸣的一种治疗方法及其疗效的证据，本文的目的是对有关其疗效的现有证据进行综述。对Medline数据库进行系统性文献回顾，并对其他数据库汇总的文献数据进行批判性分析，选择的研究文献包括前瞻性和回顾性比较研究、案例系列和案例报告，一共17项研究，包含已植入人工耳蜗的SSD患者108例，其中包括SSD患者66例，主要表现为衰减耳鸣的患者42例。单侧聋患者植入人工耳蜗后能够改善同侧（0-90°）声源定位表现和噪声环境下的言语感知（噪声声源在对侧四分之一处（默认参数B））。植入者的言语和空间听觉均主观改善（默认参数B），并且这不是有关听力质量的个案。植入者的耳鸣情况也有改善，然而需要告知患者耳鸣抑制成功主要发生在人工耳蜗使用时。综合考虑现有证据，结果表明经过适当的选择和辅导（默认参数B），人工耳蜗在单侧聋患者中已广泛使用，然而长期随访的高质量的大样本研究是否支持上述结果，还有待进一步观察。

【关键词】人工耳蜗植入；耳聋；单侧；耳鸣；单侧听力损失；声源定位；噪音环境下言语感知；生活质量.

Cochlear implantation improves localization ability in patients with unilateral deafness

Távora-Vieira D[1,2], De Ceulaer G[3], Govaerts PJ[3], Rajan GP[1].
1 Fiona Stanley Hospital, Perth, Australia; Otolaryngology, Head & Neck Surgery, School of Surgery, University of Western Australia, Perth, Australia; 2 Fremantle Hospital, Alma Street, Fremantle, Australia;3 The Eargroup, University of Antwerp, Antwerp-Deurne, Belgium.

Abstract

Objectives: One of the major complaints of people with a single-sided deafness is the inability to localize sound sources. Evidence suggests that subjects with a hearing loss can benefit from the use of a cochlear implant (CI) in sound localization. This study aimed to determine the effect of CI use on localization ability in unilaterally deafened subjects. ***Design:*** Sixteen adult subjects with postlingual unilateral deafness, fitted with a CI on the deaf side, were included in this study. The auditory speech sounds evaluation (A§E) localization test was used to determine localization with a CI on (binaural) and a CI off (monaural). The root mean square error was used as a measure of the subject's localization performance. Stratified analyses were performed to test the influence of gender, age of implantation (<55 years and >55 years), and the duration of deafness (<10 years and >10 years) on localization ability. ***Results:*** Subjects with a CI on localized significantly better than without a CI. Gender, age, and the duration of deafness had no effect on the localization ability of the subjects. ***Conclusions:*** Cochlear implantation is effective in improving localization abilities in subjects with unilateral deafness. The root mean square error dropped significantly with binaural hearing compared to monaural hearing.

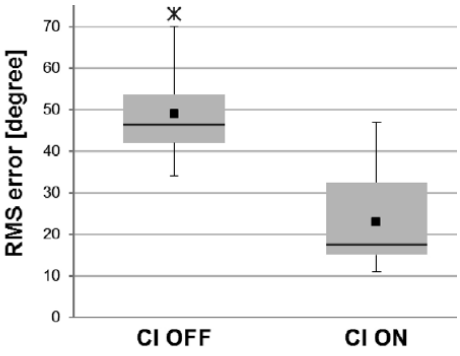

Fig. 2. Mean root mean square (RMS) error with CI on and CI off (
Lower RMS represents better localization skills. Median values
played as horizontal line, mean values as black squares. Length of th
kers corresponds to the range of the data. The black asterisk repres
outlier (1.5 to 3 × box height above the 75th percentile).

Key Words: Bilateral, Binaural, CI, Hearing loss, Localization, Monaural, Unilateral deafness.
Article source: Távora-Vieira D, De C G, Govaerts P J, et al. Cochlear implantation improves localization ability in patients with unilateral deafness.[J]. Ear & Hearing, 2014, 36(3).

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人工耳蜗植入能够改善单侧聋患者的声源定位能力

Távora-Vieira D[1,2], De Ceulaer G[3], Govaerts PJ[3], Rajan GP[1].
1 菲奥娜·斯坦利 医院，澳大利亚 珀斯；西澳大利亚大学 外科学院 耳鼻喉 头颈外科澳大利亚 珀斯；
2 弗里曼特尔医院，澳大利亚 弗里曼特尔 阿尔玛大街；3 安特卫普大学 听力小组，比利时 安特卫普 德尔讷.

【摘要】目的： 单侧聋患者的一个主要抱怨为无法进行声源定位，研究表明听力损失患者可以通过使用人工耳蜗(CI) 在声源定位中受益，本研究目的为确认单侧聋受试者使用人工耳蜗进行声源定位的效果。**实验设计：** 本研究入选16例成年语后单侧聋患者，均在耳聋侧植入人工耳蜗，分别在人工耳蜗开机 (双耳听力) 和关机 (单耳听力) 状态下，使用听音评价定位测试对植入者进行声源定位测试，并使用均方根误差来描述受试者的声源定位表现，同时统计分析植入者的性别、年龄 (<55岁和>55岁) 、耳聋时间 (<10年和>10年) 对声源定位能力的影响。**结果：** 受试者在人工耳蜗开机状态下的声源定位能力显著高于关机状态，受试者的性别、年龄和耳聋时间对声源定位能力无影响。**结论：** 人工耳蜗能够改善单侧聋患者的声源定位能力，使用双耳听力的均方根误差显著低于单耳听力。

【关键词】双侧；双耳；CI；听力损失；定位；单声道；单侧聋.

Cochlear implantation in a child with posttraumatic single-sided deafness

Arndt S., Prosse S., Laszig R., Wesarg T., Aschendorff A., Hassepass F.
Department of Otorhinolaryngology, Head and Neck Surgery, University Medical Centre Freiburg, Freiburg, Germany.

Abstract

For adult patients with single-sided deafness (SSD), treatment with a cochlear implant (CI) is well established as an acceptable and beneficial hearing rehabilitation method administered routinely in clinical practice. In contrast, for children with SSD, CI has been applied less often to date, with the rationale to decide either on a case-by-case basis or under the realm of clinical research. The aim of our clinical study was to evaluate the longitudinal benefits of CI for a group of children diagnosed with SSD and to compare their outcomes with respect to patient characteristics. Evaluating a pool of paediatric SSD patients presenting for possible CI surgery revealed that the primary aetiology of deafness was congenital cochlear nerve deficiency. A subgroup of children meeting the CI candidacy criteria for the affected ear (the majority with acquired hearing loss) were enrolled in the study. Preliminary group results suggest substantial improvements in speech comprehension in noise and in the ability to localise sound, which was demonstrated through objective and subjective assessments after CI treatment for the group, with results varying from patient to patient. Our study shows a trend towards superior outcomes for children with acquired hearing loss and a shorter duration of hearing loss compared to congenitally deafened children who had a longer duration of SSD. This indicates an interactive influence of the age at onset, aetiology and duration of deafness upon the restoration of binaural integration and the overall benefits of sound stimulation to two ears after CI treatment. Continued longitudinal investigation of these children and further studies in larger groups may provide more guidance on the optimal timing of treatment for paediatric patients with acquired and congenital SSD.

Key Words: Child, Cochlear implant, Hearing loss, Single-sided deafness (SSD), Temporal bone fracture, Unilateral hearing loss (UHL).

Article source:
Plontke S K, Heider C, Koesling S, et al. Cochlear implantation in a child with posttraumatic single-sided deafness[J]. European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery, 2013, 270(5):1757-1761.

Tables and Figures:

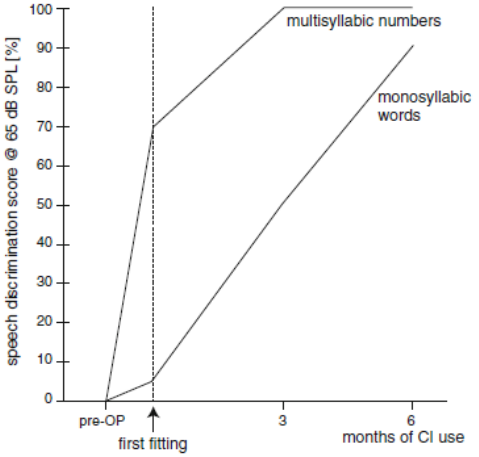

Fig. 3 Speech discrimination in quiet using the cochlear implant only improved significantly after activation of the cochlear implant. Discrimination of German multisyllabic numbers (Freiburger test) at a constant hearing level of 65 dB SPL improved from 0 to 100 % whereas the speech discrimination score for German monosyllabic words improved to 90 % within 6 months

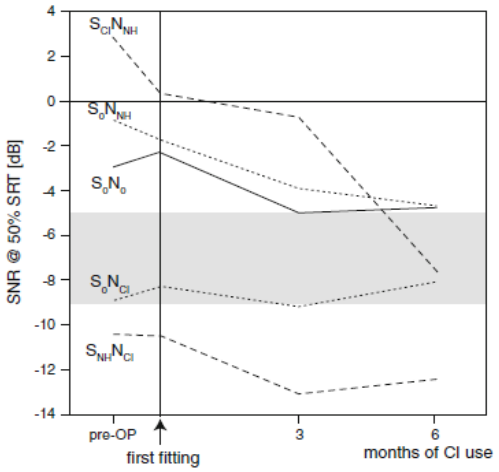

Fig. 4 Hearing in noise test showed a significant improvement of the signal-to-noise ratio (SNR), at which 50 % of the presented sentences (Oldenbourg sentence test, OLSA) were understood in a constant noise level of 65 dB SPL within 3 and 6 months after activation of the cochlear implant sound processor

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外伤性单侧聋儿童的人工耳蜗植入

Arndt S., Prosse S., Laszig R., Wesarg T., Aschendorff A., Hassepass F.

弗莱堡大学医学中心 耳鼻喉科，德国 弗莱堡.

【摘要】

在医学实践中, 成人单侧聋患者植入人工耳蜗是一种普遍接受的有益的常规听力重建方法, 然而无论以个案为基础还是从临床研究领域来看, 儿童单侧聋患者植入人工耳蜗的应用很少。我们的临床实验研究目的为评估一组单侧聋儿童患者的纵向收益, 并根据患者的个人特征比较他们的实验结果, 这些研究入选的单侧聋儿童耳聋的主要病因为先天性耳蜗神经缺如, 本研究包含一个受损耳 (大多为获得性听力损失) 符合植入人工耳蜗入组标准的儿童亚组。初步研究结果表明, 主观和客观评估均表明人工耳蜗实质性的改善了植入者在噪声环境下的言语感知和声源定位能力, 但是也存在个体间差异。我们的研究也显示和先天性长期单侧聋儿童相比, 获得性听力损失和短期听力损失儿童显示出具有良好预后的趋势, 这表明耳聋的发病年龄、病因和病程对双耳整合恢复与植入人工耳蜗后声音对双耳刺激的总体效应存在交互影响; 对这些孩子进行持续的纵向随访以及扩大样本的进一步研究可以为这些先天性和后天性单侧聋儿童患者的最佳治疗时机选择提供更多指导。

【关键词】儿童；人工耳蜗植入；听力损失；单侧聋（SSD）；颞骨骨折；单侧听力损失（UHL）.

Cochlear implantation in asymmetrical hearing loss for children: Our experience

Tzifa K, Hanvey K

The Midlands Hearing Implant Programme - Children's Service, Birmingham, UK.

Abstract

Cochlear implantation in children with an asymmetrical hearing loss is now becoming more recognized as an appropriate and beneficial treatment option. In our programme, we have been implanting children with asymmetrical hearing loss since 2008.Asymmetrical hearing loss is defined as hearing loss when one ear meets criteria for cochlear implantation and the other ear has better hearing and receives benefit from a hearing aid. There is a wide range of asymmetrical hearing loss: single-sided deafness is the end of the spectrum.Amplification in asymmetrical hearing loss is usually difficult, it is often not possible to adequately aid the poorer ear; therefore patients often experience compromised hearing with adequate aiding of their better ear only. The impact of hearing with one ear on speech development, education, and employment is significant.

Key Words: Humans, Deafness, Hearing Loss, Sensorineural, Hearing Loss, Unilateral, Hearing Tests, Cochlear Implantation, Cochlear Implants, Hearing Aids, Speech Perception, Child.

Article source:
Tzifa K, Hanvey K. Cochlear implantation in asymmetrical hearing loss for children: our experience.[J]. Cochlear Implants International, 2013, 14 Suppl 4(Suppl 4):56-61.

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非称听力损失儿童的人工耳蜗植入经验

Tzifa K, Hanvey K

米德兰兹听觉植入计划-儿童服务，英国 伯明翰.

【摘要】

当前非对称性听力损失儿童植入人工耳蜗已成为合适的和有益的治疗选择。在我们的计划中, 从2008年开始我们对非对称性听力损失儿童实行人工耳蜗植入术。非对称性听力损失定义为单耳符合人工耳蜗植入标准同时对侧耳具有较好的听力并能够借助助听器听声音的听力损失, 非对称性听力损失存在一个广泛的区间 (极端情况为单侧聋）。对非对称听力损失患者进行听力放大通常是困难的, 对听力差耳的声音助听也经常是难以实现的; 因此仅仅好耳侧的助听也会打折扣, 单耳听力会显著影响患者的言语发育、教育以及就业。

【关键词】人类；耳聋；听力损失；感音神经性；听力损失，单侧；听力测试；人工耳蜗植入术；人工耳蜗植入体；助听器；言语感知；儿童.

Comparison of the benefits of cochlear implantation versus contra-lateral routing of signal hearing aids in adult patients with single-sided deafness: study protocol for a prospective within-subject longitudinal trial

Pádraig T Kitterick[1,2*], GerardM O'Donoghue[1,3], Mark Edmondson-Jones[1,2], Andrew Marshall[3],Ellen Jeffs[3], Louise Craddock[4], Alison Riley[4], Kevin Green[5,6], Martin O'Driscoll[5,6], Dan Jiang[7],Terry Nunn[7], Shakeel Saeed[8], Wanda Aleksy[8] and Bernhard U Seeber[9,10]

1 National Institute for Health Research (NIHR) Nottingham Hearing Biomedical Research Unit, Ropewalk House, 113 The Ropewalk, NG1 5DU Nottingham, UK; 2 Otology and Hearing group, Division of Clinical Neuroscience, School of Medicine, University of Nottingham, NG7 2UH Nottingham, UK; 3 Nottingham University Hospitals NHS Trust, Queen's Medical Centre, NG7 2UH Nottingham,UK; 4 Midlands Hearing Implant Programme, Queen Elizabeth Hospital Audiology Centre, University Hospitals Birmingham, B15 2TH Birmingham, UK; 5 Central Manchester University Hospitals NHS Foundation Trust, Manchester Academic Health Science Centre, M13 9WL Manchester, UK; 6 University of Manchester, Oxford Rd, M13 9PL Manchester, UK; 7 Department of Audiology, St Thomas' Hospital, Lambeth Palace Road, SE1 7EH London, UK; 8 The Royal National Throat, Nose and Ear Hospital, 330 Gray's Inn Road, WC1X 8DA London, UK; 9 MRC Institute of Hearing Research, University Park, NG7 2RD Nottingham, UK; 10 Technische Universität München, Associated Institute Audio Information Processing, Arcisstrasse 21, 80333 Munich, Germany.

Abstract

Background: Individuals with a unilateral severe-to-profound hearing loss, or single-sided deafness, report difficulty with listening in many everyday situations despite having access to well-preserved acoustic hearing in one ear. The standard of care for single-sided deafness available on the UK National Health Service is a contra-lateral routing of signals hearing aid which transfers sounds from the impaired ear to the non-impaired ear. This hearing aid has been found to improve speech understanding in noise when the signal-to-noise ratio is more favourable at the impaired ear than the non-impaired ear. However, the indiscriminate routing of signals to a single ear can have detrimental effects when interfering sounds are located on the side of the impaired ear. Recent published evidence has suggested that cochlear implantation in individuals with a single-sided deafness can restore access to the binaural cues which underpin the ability to localise sounds and segregate speech from other interfering sounds. ***Methods/Design:*** SThe current trial was designed to assess the efficacy of cochlear implantation compared to a contra-lateral routing of signals hearing aid in restoring binaural hearing in adults with acquired single-sided deafness. Patients are assessed at baseline and after receiving a contra-lateral routing of signals hearing aid. A cochlear implant is then provided to those patients who do not receive sufficient benefit from the hearing aid. This within-subject longitudinal design reflects the expected care pathway should cochlear implantation be provided for single-sided deafness on the UK National Health Service. The primary endpoints are measures of binaural hearing at baseline, after provision of a contra-lateral routing of signals hearing aid, and after cochlear implantation. Binaural hearing is assessed in terms of the accuracy with which sounds are localised and speech is perceived in background noise. The trial is also designed to measure the impact of the interventions on hearing- and health-related quality of life. ***Discussion:*** This multi-centre trial was designed to provide evidence for the efficacy of cochlear implantation compared to the contra-lateral routing of signals. A purpose-built sound presentation system and established measurement techniques will provide reliable and precise measures of binaural hearing.. ***Trial registration:*** Current Controlled Trials http://www.controlled-trials.com/ISRCTN33301739 (05/JUL/2013).

Key Words: Cochlear implantation, Single-sided deafness, Unilateral hearing loss, Contra-lateral routing of signals, Hearing aid, Binaural hearing, Spatial listening.

Article source:
Kitterick P T, O'Donoghue G M, Edmondson-Jones M, et al. Comparison of the benefits of cochlear implantation versus contra-lateral routing of signal hearing aids in adult patients with single-sided deafness: study protocol for a prospective within-subject longitudinal trial[J]. Bmc Ear Nose & Throat Disorders, 2014, 14(1):1-11.

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成人单侧聋患者植入人工耳蜗与对侧信号传入助听器的疗效比较：一项前瞻性的受试者组内纵向研究方案

Pádraig T Kitterick[1,2*], GerardM O'Donoghue[1,3], Mark Edmondson-Jones[1,2], Andrew Marshall[3],Ellen Jeffs[3], Louise Craddock[4], Alison Riley[4], Kevin Green[5,6], Martin O'Driscoll[5,6], Dan Jiang[7],Terry Nunn[7], Shakeel Saeed[8], Wanda Aleksy[8] and Bernhard U Seeber[9,10]

1 国立卫生研究所（NIHR）诺丁汉听力生物医学研究单位，英国 诺丁汉 NG1 5DU；
2 诺丁汉大学医学部 临床神经科学学科 耳科和听力组，英国 诺丁汉 NG7 2UH；
3 诺丁汉大学附属医院NHS信托基金，皇家医学中心，英国 诺丁汉 NG7 2UH；
4 伯明翰大学 伊丽莎白女王医院听力中心 米德兰兹听觉植入计划,英国 伯明翰 B15 2TH；
5 中央曼彻斯特大学医院NHS信托基金会 曼彻斯特学术健康科学中心，英国 曼彻斯特M13 9WL；
6 曼彻斯特大学，英国 曼彻斯特M13 9WL；
7 圣·托马斯医院 听力学科, 英国 伦敦SE1； 7EH
8 皇家耳鼻喉医院， 英国 伦敦 WC1X 8DA；
9 MRC听力学研究所, 英国 诺丁汉NG7 2RD；
10 慕尼黑技术大学 音频信息处理联合研究所， 德国 慕尼黑 80333.

【摘要】

背景： 尽管留有一只声学意义上保存完整的好耳, 重度、极重度听力损失或单侧聋患者个体在很多日常情况下存在听力困难。英国国民医疗服务对单侧聋的标准治疗是使用对侧信号传入助听器, 这种助听器可以将声音从受损耳传递到非受损耳; 并且研究发现当信噪比更加有利于受损耳而不是非受损耳时, 这种助听器可以改善噪声背景下的言语理解; 然而当干扰声音出现在受损耳一侧时, 单耳听到的不加区分的信号干扰可能会产生有害影响。现有文献证据表明单侧聋患者植入人工耳蜗可以重建声源定位和区分干扰声音的双耳听力基础。**实验方法/设计：** 本实验设计的目的为评估成年获得性单侧聋患者使用人工耳蜗和对侧信号传入助听器重建双耳听力的疗效。患者分别在基线和使用对侧信号传入助听器情况下进行评估, 对于使用助听器没有效果的患者, 则提供植入人工耳蜗。这个受试者组内纵向研究反映了给单侧聋患者提供人工耳蜗的预期治疗方案是否应该写入英国国民医疗服务。双耳听力基线的两个测量时间节点为: 提供对侧信号传入助听器后和植入人工耳蜗后, 通过使用声源定位和噪声背景下的言语感知的精度来评估患者的双耳听力, 同时这个实验也用来测量干扰措施对听力和健康相关生活质量的影响。**讨论：** 这个多中心临床试验的目的是为比较植入人工耳蜗和对侧信号传入助听器的疗效提供证据, 同时专设的声音演示系统和建立的测量技术将为双耳听力的可靠精确测量提供技术支持。 **临床实验注册：** 当前对照实验 http://www.controlled-trials.com/ISRCTN33301739 (2013年7月05日)。

【关键词】人工耳蜗植入术；单侧聋；单侧听力损失；对侧的信号通路；助听器；双侧听力；空间听觉.

测试装置：

Interaural Level Difference Cues Determine Sound Source Localization by Single-Sided Deaf Patients Fit with a Cochlear Implant

Michael F. Dorman[a], Daniel Zeitler[b] , Sarah J. Cook[a] , Louise Loiselle[a], William A. Yost[a] , George B. Wanna[c] , Rene H. Gifford[c, d]

a Department of Speech and Hearing Science, Arizona State University, Tempe, Ariz.; b Denver Ear Associates,Englewood, Colo.; Departments of c Otolaryngology and d Hearing and Speech Sciences, Vanderbilt University,Nashville, Tenn., USA.

Abstract

In this report, we used filtered noise bands to constrain listeners'access to interaural level differences (ILDs) and interaural time differences (ITDs) in a sound source localization task. The samples of interest were listeners with single-sided deafness (SSD) who had been fit with a cochlear implant in the deafened ear (SSD-CI). The comparison samples included listeners with normal hearing and bimodal hearing, i.e. with a cochlear implant in 1 ear and low-frequency acoustic hearing in the other ear. The results indicated that (i) sound source localization was better in the SSD-CI condition than in the SSD condition, (ii) SSD-CI patients rely on ILD cues for sound source localization, (iii) SSD-CI patients show functional localization abilities within 1–3 months after device activation and (iv) SSD-CI patients show better sound source localization than bimodal CI patients but, on average, poorer localization than normal-hearing listeners. One SSD-CI patient showed a level of localization within normal limits. We provide an account for the relative localization abilities of the groups by reference to the differences in access to ILD cues.

Key Words: Cochlear implant, Interaural level differences, Single-sided deafness, Sound source localization.

Article source:
Dorman M F, Zeitler D, Cook S J, et al. Interaural level difference cues determine sound source localization by single-sided deaf patients fit with a cochlear implant.[J]. Audiology & Neurotology, 2015, 20(3):183-188.

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双耳级差线索可以帮助单侧聋人工耳蜗植入者进行声源定位

Michael F. Dorman[a], Daniel Zeitler[b] , Sarah J. Cook[a] , Louise Loiselle[a], William A. Yost[a] , George B. Wanna[c] , Rene H. Gifford[c, d]

a亚利桑那州州立大学 言语及听觉科学系，美国 亚利桑那州 坦佩;
b丹佛耳科学联盟，美国 科罗拉多州 恩格尔伍德;
c范德比尔特大学 耳鼻喉学系和d范德比尔特大学 听力和言语科学系，美国 田纳西州 纳什维尔.

【摘要】

在这篇报告中, 我们通过过滤噪声频带来限制受试者在进行声源定位测试时的双耳级差 (ILDs) 和时间差 (ITDs) , 实验组受试者为植入人工耳蜗的单侧聋患者, 对照组受试者为正常听力和双模式听力 (例如一只耳植入人工耳蜗, 另一只耳保留低频声 (信号刺激) 听力 (low-frequency acoustic hearing)) 。结果表明：(1) 植入人工耳蜗的单侧聋植入者的声源定位能力优于单侧聋患者；(2) 植入人工耳蜗的单侧聋患者依赖双耳级差进行声源定位；(3) 植入人工耳蜗的单侧聋植入者在开机1-3个月内表现出声源定位能力；(4) 植入人工耳蜗的单侧聋植入者的声源定位能力优于双模式听力的人工耳蜗植入患者, 但是平均而言, 其声源定位能力弱于正常听力受试者。然而只有一例植入人工耳蜗的单侧聋植入者的声源定位能力在正常范围内。通过参考双耳级差线索, 我们为这个植入人工耳蜗单侧聋群体的相对声源定位能力提供了一个解释。

【关键词】人工耳蜗植入；双耳级差；单侧聋；声源定位.

Preliminary comparison of bone-anchored hearing instruments and a dental device as treatments for unilateral hearing loss

Brian C. J. Moore* & Gerald R. Popelka†

* Department of Experimental Psychology, University of Cambridge, UK;
† Otolaryngology, Head and Neck Surgery, Stanford University, Palo Alto, California, USA.

Abstract

Objectives: To compare the effectiveness of two types of treatment for unilateral hearing loss (UHL), bone-anchored hearing instruments (BAHI) and a dental device (SoundBite). ***Design:*** Either BAHI or SoundBite were worn for 30 days, and then the devices were swapped and the second device was worn for 30 days. Measures included unaided and aided sound-fi eld thresholds, sound localization, and perception of speech in babble. The APHAB questionnaire was administered for each trial period. ***Study sample:*** Nine adult BAHI wearers with UHL. ***Results:*** Mid-frequency aided thresholds were lower for SoundBite than for BAHI. Both devices gave benefi ts for localization after 30 days, but there was no difference between devices. Speech perception was better for both devices than for unaided listening when the target speech came from the poorer hearing side or in front, and the interfering babble came from the better-hearing side. There was no consistent difference between devices. APHAB scores were better for SoundBite than for BAHI. ***Conclusions:*** Speech perception and sound localization were similar for the two types of device, but the SoundBite led to lower aided thresholds and better APHAB scores than the BAHI.

Key Words: Unilateral hearing loss, single-sided deafness, bone conduction, bone-anchored hearing device, speech perception, sound localization.

Article source:
Moore B C, Popelka G R. Preliminary comparison of bone-anchored hearing instruments and a dental device as treatments for unilateral hearing loss.[J]. International Journal of Audiology, 2013, 52(10):678-86.

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骨锚定助听器与齿音设备治疗单侧听力损失的初步比较

Brian C. J. Moore* & Gerald R. Popelka†

* 剑桥大学 实验心理学系，英国；† 斯坦福大学 耳鼻咽喉、头颈外科， 美国 加利福尼亚州 帕洛阿尔托.

【摘要】

目的： 比较不同治疗方法 (骨锚定助听器 (BAHI) 与齿音设备 (SoundBite)) 对单侧听力损失 (UHL) 的疗效。**实验设计：**患者均佩戴 BAHI 或SoundBite设备30天, 然后更换另一种设备也佩戴30天, 听力测试包括裸耳和助听声场阈值, 声源定位、噪声背景下的言语感知, 每个实验均采用APHAB问卷。 **研究对象：** 9例佩戴BAHI的成人单侧听力损失患者。 **结果：** SoundBite的中频助听阈值低于BAHI。佩戴30天后, 两种设备均有助于声源定位, 但是两种设备的效果无差异。当声音来自听力差耳或前方, 干扰音来自好耳时, 使用两种设备的言语感知能力均优于裸耳听力, 且设备之间无差异。SoundBite的APHAB得分优于BAHI。**结论：** 两种设备的言语感知和声源定位结果类似, 但是SoundBite和BAHI相比具有更低的助听听阈和更好的APHAB得分。

【关键词】单侧听力损失；单侧聋；骨导；骨锚式听力设备；言语识别；声源定位.

Single-sided deafness leads to unilateral aural preference within an early sensitive period

Andrej Kral[1], Peter Hubka[1], Silvia Heid[2], Jochen Tillein[1,2,3]

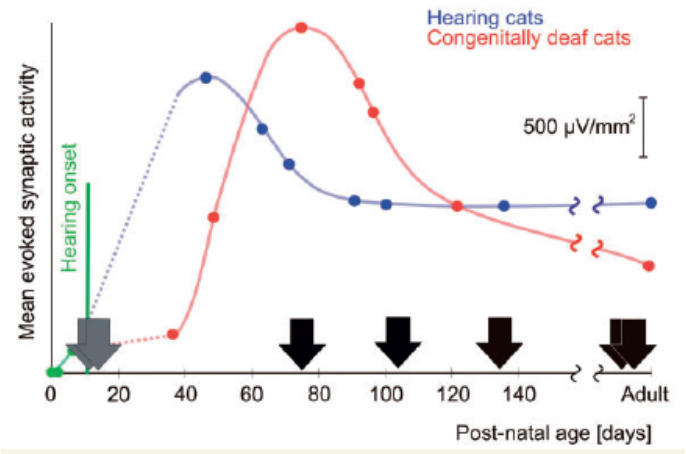
1 Institute of Audioneurotechnology, Department of Experimental Otology, ENT Clinics, Hannover Medical School, D-30625 Hanover, Germany;
2 Institute of Sensory Physiology and Neurophysiology, J. W. Goethe University, D-60590 Frankfurt am Main, Germany;
3 ENT Clinics, J. W. Goethe University, D-60590 Frankfurt am Main, Germany.

Abstract

Unilateral deafness has a high incidence in children. In addition to children who are born without hearing in one ear, children with bilateral deafness are frequently equipped only with one cochlear implant, leaving the other ear deaf. The present study investigates the effects of such single-sided deafness during development in the congenitally deaf cat. The investigated animals were either born with unilateral deafness or received a cochlear implant in one ear and were subjected to chronic monaural stimulation. In chronically stimulated animals, implantation ages were at the following three critical developmental points: 'early' during the peak of functional cortical synaptogenesis in deaf animals; 'intermediate' at the age when synaptic activity in the deaf cats dropped to the level of hearing control cats and finally, 'late' at the age when the evoked synaptic activity fell below the level of hearing control cats. After periods of unilateral hearing, local field potentials were recorded from the cortical surface using a microelectrode at ~100 recording positions. Stimulation was with cochlear implants at both ears. The measures evaluated were dependent only on the symmetry of aural input: paired differences of onset latencies and paired relations of peak amplitudes of local field potentials. A massive reorganization of aural preference in favour of the hearing ear was found in these measures if the onset of unilateral hearing was early (before or around the peak of functional synaptogenesis). The effect was reduced if onset of unilateral hearing was in the intermediate period, and it disappeared if the onset was late. In early onset of unilateral deafness, the used ear became functionally dominant with respect to local field potential onset latency and amplitude. This explains the inferior outcome of implantations at the second-implanted ear compared with first-implanted ear in children. However, despite a central disadvantage for the deaf ear, it still remained capable of activating the auditory cortex. Appropriate training may thus help to improve the performance at the second-implanted ear. In conclusion, periods of monaural stimulation should be kept as short as possible, and training focused on the deaf ear should be introduced after delayed second implantation in children.

Key Words: Deafness, Children, Animals, Assistive Technology, Auditory Stimuli, Stimulation, Age, Lateral Dominance.

Tables and Figures:



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参考译文：

单侧聋导致早期敏感期的单侧听觉偏好

Andrej Kral[1], Peter Hubka[1], Silvia Heid[2], Jochen Tillein[1,2,3]

1汉诺威医学院 耳鼻喉科诊所 实验儿科学系 听觉神经技术研究所， 德国 汉诺威D-30625；
2歌德大学 感觉生理学和神经生理学研究所，德国 法兰克福D-60590；
3 歌德大学 耳鼻喉科诊所，德国 法兰克福D-60590.

【摘要】

单侧聋 在儿童中具有很高的发病率。除了一侧耳先天性聋的儿童之外, 大多双侧聋的儿童一侧耳植入人工耳蜗, 另一侧耳依然耳聋。本实验用先天性聋猫来研究发育过程中单侧聋的影响。实验动物 (猫) 为先天性单侧聋或者一侧植入人工耳蜗的动物, 实验进行慢性单耳刺激。在慢性刺激的动物中, 植入人工耳蜗的年龄为以下三个发育关键时间点：“早期”为在耳聋动物功能皮质突触形成的高峰期间，“中期”为在当聋猫的突触活动下降到听力控制猫的水平的年龄，“晚期”为在当诱发的突触活动下降到听力控制猫的水平的年龄。在单侧听力时期之后, 使用微电极在~100记录位置记录皮质表面的局部场电位, 使用人工耳蜗对双耳进行刺激。结果发现评估的标准只依赖于听觉输入的对称性: 局部场电位的起始潜伏期配对差异和峰值振幅配对关系。如果单侧听力发生在早期 (功能性突触峰值时期或之前) , 在这些测量评估中发现听觉偏好倾向的大规模重组; 如果单侧听力起始发生在中间时期, 这种影响就会减弱; 如果单侧听力起始发生在晚期, 这种影响就会消失。在单侧聋起始早期, 好耳在局部场电位起始潜伏期和振幅方面占优势地位, 这也解释了儿童第二个植入的人工耳蜗的效果比第一个植入的人工耳蜗的效果较差的原因; 然而尽管它 (第二个植入的人工耳蜗) 对聋耳具有明显的不足, 但是它仍然能够激活听觉皮层, 因此合适的训练可能有助于改善第二个“迟到的”人工耳蜗植入耳的听觉表现。结论: 单耳刺激时期的时间控制要尽可能短, 要在儿童植入第二个人工耳蜗之后, 要进行针对性的康复训练。

【关键词】耳聋；儿童；动物；辅助技术；听觉刺激；刺激；年龄；单侧优势.

词汇

词汇	翻译
Aplasia of the cochlea (AC)	耳蜗发育不全
Auditory Brainstem Response (ABR)	听觉诱发电位
Abbreviated profile of hearing aid benefit (APHAB)	助听器效果简化问卷
Adolescent	青少年
Auditory cortex (AC)	听觉皮层
Auditory Neuropathy Spectrum Disorder (ANSD)	听神经病谱系障碍
Bone conduction devices (BCD)	骨导装置
Bone-anchored hearing aid (BAHA)	骨锚式助听器
Boundary element model (BEM)	边界元模型
Categories of auditory performance (CAP)	听觉行为分级标准
Completely in the canal (CIC)	完全内耳式
Contraindication	禁忌症
Contralateral routing of signal (CROS)	信号对传线路式
Contra-lateral Routing Of Signals (CROS)	对侧信号传入
Default mode network (DMN)	默认模式网络
Dorsolateral prefrontal cortex (DLPFC)	背侧前额叶皮层
Flap dehiscence	瓣状裂开
Infant-toddler meaningful auditory integration scale (IT-MAIS)	婴幼儿有意义听觉整合量表
Interaural level differences (ILDs)	双耳级差
Interaural time differences (ITDs)	双耳时间差
Kindergarten	幼儿园
Meaningful auditory integration scale (MAIS)	有意义听觉整合量表
Meaningful use of speech scale (MUSS)	有意义言语使用量表
Mismatch Negativity (MMN)	失匹配负波
Oldenbourg sentence test (OLSA)	奥登伯格句子测试
Orbitofrontal cortex (OFC)	眶额皮层
Otolaryngology	耳鼻喉科学
Otorhinolaryngology	耳鼻喉科学
Parahippocampus (PHC)	海马旁回
Posterior cingulate cortex (PPC)	后扣带回皮质
Primary auditory cortex (A1)	初级听觉皮层
Quantitative electroencephalography (qEEG)	定量脑电图
Real Ear Measurement (REM)	真耳测量
Real-Ear Aided Response (REAR)	真耳助听响应
Real-Ear Unaided Response (REUR)	真裸耳响应
Secondary auditory cortex (A2)	次级听觉皮层
Speech discrimination score (SDS)	语音识别评分
Speech Spatial and Qualities of Hearing Scale (SSQ)	言语、空间、生活质量听力量表
Speech-Reception Threshold (SRT)	言语听阈
Standardized low resolution brain electromagnetic tomography (sLORETA)	规范低分辨率脑电磁断层扫描
Tinnitus Functional Index (TFI)	耳鸣功能指数
Tinnitus handicap inventory (THI)	耳鸣残疾量表
Tinnitus questionnaire	耳鸣问卷
Visual Analogue Scale (VAS)	视觉模拟量表

杭州总部
地址：浙江省杭州市拱墅区祥茂路99号
邮编：310011
电话：4006 222 571
传真：0571-88179905
邮箱：service@nurotron.com
网址：http://www.nurotron.com