doi: 10.13241/j.cnki.pmb.2019.21.025

单侧人工耳蜗植入对学龄前耳聋儿童听觉言语康复的效果影响因素分析 *

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摘要 目的：探讨单侧人工耳蜗植入(cochlear implantation，CI)对学龄前耳聋儿童听觉语言康复的治疗效果以及相关影响因素。**方法：**将我院自 2017 年 1 月至 2017 年 12 月行 CI 治疗的学龄前儿童 72 例行作为研究对象，通过问卷调查手术患儿的相关资料，对可能影响患儿听觉言语康复效果的因素和听觉行为分级 (Categories of auditory performance,CAP) 以及言语可懂程度分级(Speech intelligibility rating,SIR)结果进行二分类变量的单因素分析，再进行多分类变量的 Logistic 回归分析评估患儿的治疗效果和影响康复效果的因素。**结果：**耳聋患儿 CI 植入年龄、术前平均残余听力、术前佩戴助听器时间、使用人工耳蜗时间和术后语训时间等因素和 CAP 增长倍数之间有明显的相关性($P<0.05$)，除了上述因素之外还有术前语训时间等因素与治疗后患儿 SIR 增长倍数存在相关性($P<0.05$)；CI 植入年龄、术前平均残余听力和术前佩戴助听器时间对患儿术后 CAP 的恢复具有影响($P<0.05$)；CI 植入年龄、术前佩戴助听器时间、术前语训时间等因素对患儿 SIR 恢复产生影响($P<0.05$)。**结论：**患儿植入人工耳蜗的年龄、术前平均残余听力、术前佩戴助听器时间和术前言语训练时间是影响学龄前耳聋患儿术后听力言语功能恢复的主要因素。

关键词：学龄前儿童；听觉言语康复；人工耳蜗植入；影响因素

中图分类号：R764.43 **文献标识码：**A **文章编号：**1673-6273(2019)21-4112-04

Influencing Factors of the Effect of Unilateral Cochlear Implantation on the Hearing and Speech Rehabilitation in Preschool Deaf Children*

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ABSTRACT Objective: To investigate the therapeutic effect and related factors of unilateral cochlear implantation (CI) on auditory language rehabilitation in preschool children with deafness. **Methods:** A total of 72 preschool children who underwent CI treatment from January 2017 to December 2017 in our hospital were selected as subjects. The questionnaires were used to investigate the factors affecting the auditory speech rehabilitation of children. The category of auditory performance (CAP) and the speech intelligibility rating (SIR) results were used to perform univariate analysis of the two categorical variables, and then the logistic regression analysis of the multi-categorical variables was used to evaluate the therapeutic effects of the children. Factors affecting the rehabilitation effect. **Results:** There was a significant correlation between the age of CI implantation, the average residual hearing before surgery, the time of wearing hearing aid before surgery, the time of using cochlear implant and the time of postoperative speech training, and the increase of CAP ($P<0.05$). In addition to the above factors, there were factors such as preoperative language training time and the SIR growth factor of patients after treatment ($P<0.05$). The age of CI implantation, the average residual hearing before surgery and the time of wearing hearing aid before operation had an effect on the recovery of postoperative CAP ($P<0.05$). The age of CI implantation, the time of wearing hearing aid before surgery, and the time of preoperative training time had an effect on the recovery of SIR ($P<0.05$). **Conclusion:** The age of the implanted cochlear implant, the preoperative average residual hearing, the main factors affecting the recovery of postoperative hearing and speech function in children with preschool deafness.

Key words: Preschool children; Hearing and speech rehabilitation; Cochlear implantation; Influencing factors

Chinese Library Classification(CLC): R764.43 Document code: A

Article ID: 1673-6273(2019)21-4112-04

* 基金项目：河北省自然科学基金项目(H20162012389)

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(收稿日期：2019-04-03 接受日期：2019-04-27)

前言

目前,我国患有听力残疾的学龄前儿童约有 14 万人[1],而且每年新增 2.3 万人[2],及早的实施有效的听力补偿和重建可帮助 80%的患儿获得理想的听、说能力[3]。人工耳蜗植入是治疗重度聋患的有效方法,可恢复其听觉,临床上主要用于治疗先天性重度、极重度或者全聋的低龄语前儿童,而且有大量研究证实干预的越早,治疗效果越好[4,5]。但是对于患儿而言,植入单侧人工耳蜗植入(cochlear implantation,CI)后期听觉言语康复的效果受发育情况、听力障碍程度、佩戴助听器时间、言语能力等诸多因素的影响。为了进一步研究 CI 的学龄前耳聋患儿听觉言语康复的效果以及影响因素[6,7],本研究将我院 2017 年收治的 72 例接受 CI 植入的儿童作为研究对象,分析可能影响其术后康复效果的因素,旨在为行 CI 患儿进行术前评估和病例筛选提供参考依据。

1 资料与方法

1.1 一般资料

将我院自 2017 年 1 月至 2017 年 12 月收治的双耳极重度感音性耳聋行 CI 治疗的学龄前儿童 72 例行作为研究对象,包括男 38 例,女 34 例,植入 CI 时患儿年龄 1.2~6 岁,平均 3.52± 1.34 岁,63 例患儿在治疗前有佩戴助听器史,使用时间 3~54 个月,平均 35.21± 4.92 个月。

1.2 纳入和排除标准

纳入标准:年龄≤ 6 周岁,经听力学、医学、影像学、学习能力和智力评估方面检查均符合 2013 年人工耳蜗植入工作指南中界定的适应症[8,9]。

排除标准:先天性耳蜗畸形、颅脑 MRI 检查存在异常的患儿。

1.3 听觉言语评估

所有患儿在治疗前、行 CI 植入后康复训练的 3、6、9、12 个月由同一位研究者进行听觉行为分级 (Categories of auditory performance,CAP)以及言语可懂程度分级(Speech intelligibility rating,SIR)评估。其中 CAP 分为八个级别,0 级为不能感知环境声音,1 级为可感知环境声音,2 级为对语言声能做出反应,3 级为可辨识环境声音,4 级为能够辨别一些言语声,5 级为不借助唇读可理解常用的短句,6 级为不借助唇读可与人沟通,7 级为能使用电话和熟悉的人进行沟通[10,11];SIR 分为五级,其中 1 级主要沟通方式为手语或手势,2 级为主要通过个别词和借助唇读提示理解,3 级为集中注意力结合唇读可听懂,4 级为可被不具备聆听聋人言语经验的人听懂,5 级为连贯言语可被全部听懂[12,13]。

1.4 统计学方法

采用 SPSS19.0 对数据进行统计学分析,对可能影响患儿听觉言语康复效果的因素和 CAP 以及 SIR 分级结果进行二分类变量的单因素分析,再进行多分类变量的 Logistic 回归分析,$P<0.05$ 为表示差异具有统计学意义。

2 结果

2.1 行 CI 植入耳聋患儿 CAP 和 SIR 分级增长倍数的影响因素

耳聋患儿 CI 植入年龄、术前平均残余听力、术前佩戴助听器时间、使用人工耳蜗时间和术后语训时间等因素和 CAP 增长倍数呈明显相关性($P<0.05$)。除了上述因素之外,术前语训时间等因素与治疗后患者 SIR 增长倍数存在相关性($P<0.05$),详见表 1。

表 1 行 CI 植入耳聋患儿 CAP 和 SIR 分级增长倍数的影响因素

Table 1 Influencing factors of the growth of CAP and SIR grades in children with deafness after CI implantation

Influencing factor		Cases	CAP growth factor		SIR growth multiple	
			CAP growth factor	*P*	SIR growth multiple	*P*
Sex	Male	38	4.24	>0.05	2.97	>0.05
	Female	34	4.63		3.12	
Implant age	<3 year old	42	5.62	<0.05	4.59	<0.05
	3~6 year old	30	4.05		3.74	
Preoperative average residual hearing	≤ 95 dB HL	53	3.32	<0.05	5.11	<0.05
	>95 dB HL	19	6.35		2.15	
Preoperative language training time	10~24 months	33	4.73	>0.05	4.82	<0.05
	25~50 months	39	4.31		2.46	
Hearing aid time before surgery	3~24 months	18	3.25	<0.05	4.69	<0.05
	25~54 months	54	5.84		2.56	
Using cochlear time	6~24 months	30	3.95	<0.05	2.63	<0.05
	25~50 months	42	5.48		4.56	
Post-linguistic training time	1~6 months	20	3.11	<0.05	2.65	<0.05
	6~12 months	52	5.84		4.52	
Large vestibular aqueduct syndrome	Yes	9	4.34	>0.05	3.10	>0.05
	No	63	4.51		3.02	

2.2 CAP 分级多因素 Logistic 回归分析

将耳聋患儿植入 CI 年龄、术前平均残余听力、术前佩戴助听器时间、使用人工耳蜗时间和术后语训时间等因素作为自变量，患儿 CAP、SIR 术后 1 年的增长量作为因变量，进行多元回归分析。结果显示 CI 植入年龄、术前平均残余听力和术前佩戴助听器时间对患儿术后 CAP 的恢复有显著影响 ($P<0.05$)，详见表 2。

表 2 CAP 分级多因素 Logistic 回归分析

Table 2 Multivariate logistic regression analysis of the CAP classification

Influencing factor	β value	Wald value	*P* value
Implant age	3.638	5.139	0.008
Preoperative average residual hearing	4.116	9.630	0.000
Wearing hearing aids before surgery	3.622	6.206	0.010
Post-linguistic training time	0.025	0.591	0.196

2.3 SIR 分级多因素 Logistic 回归分析

将耳聋患儿植入 CI 年龄、术前平均残余听力、术前佩戴助听器时间、使用人工耳蜗时间、术前语训时间和术后语训时间等因素作为自变量，将患儿 CAP、SIR 术后 1 年的增长量作为因变量进行 Logistic 回归分析，结果显示 CI 植入年龄、术前佩戴助听器时间、术前语训时间等因素对患儿 SIR 恢复产生显著影响($P<0.05$)，详见表 3。

表 3 SIR 分级多因素 Logistic 回归分析

Table 3 Multivariate logistic regression analysis of the SIR classification

Influencing factor	β value	Wald value	*P* value
Implant age	2.854	4.292	0.026
Preoperative average residual hearing	0.120	0.487	0.139
Wearing hearing aids before surgery	0.426	0.210	0.084
Preoperative language training time	3.147	4.872	0.016
Post-linguistic training time	0.358	0.285	0.097

3 讨论

目前，人工耳蜗植入是治疗学龄前耳聋儿童的主要手段，其目的是使患儿获得听觉感知并进行语言交流[14]。对 CI 植入后的康复效果可通过患儿在其生活环境中的听觉言语发展情况来进行评估，主要包括听力水平和语言能力两个方面的指标[15,16]。本研究选择诺丁汉人工耳蜗中心开发的 CAP 和 SIR 分级标准对患儿行 CI 植入后的效果进行评估，并分析影响听觉言语康复的影响因素，结果显示患儿植入年龄、术前平均残余听力、术前佩戴助听器时间术前语训时间是影响听觉言语康复效果的影响因素[17,18]。

有资料显示 1~6 岁的耳聋儿童行 CI 植入，CAP 分级会随着年龄呈阶梯状上升，而且在术后 1 年内听觉普遍得到迅速的发展，并且年龄＜3 岁的儿童听觉能力提高速度快，3~6 岁的儿童听觉能力提高相对较慢；从言语能力康复情况来看，2~4 岁的儿童 SIR 增长倍数较高，5~6 岁的儿童相对较慢[19,20]。本次研究结果与文献报道一致，患儿 CI 植入年龄对术后听力水平和言语能力康复均产生明显的影响[21,22]。同时，患儿术前平均残余听力和佩戴助听器的时间是影响术后康复效果的因素，而且与 CAP 分级呈正相关，即术前患儿的平均残余听力越好，佩戴助听器时间越长，术后听觉行为反应就更好[23,24]。分析发生这种情况的主要原因可能是残存听力的程度能够反应耳蜗螺旋神经节细胞的存活情况[25,26]，而 CI 植入后言语识别效果是基于存活的耳蜗神经节细胞可接受电刺激，术前残余听力好的患儿耳蜗存活的耳蜗螺旋神经节细胞的数量更多，同时手术方法改进后患儿残余的听力被保留，因此患儿 CI 植入后的康复阶段听觉行为分级就更好[27,28]。对于患儿 SIR 分级来说，术前言语训练时间越长的患儿术后言语康复效果更好，可能是经过训练后患儿具备一定的发音水平和语言能力，而佩戴助听器的患儿术后建立声音概念和适应的言语测试得分均明显高于未使用或使用助听器时间短的患儿[29,30]。

CI 植入术后需要通过人工耳蜗信号编码语言信息对患儿进行听力重建，患儿对声音的感知和识别能力也随着 CI 的使用时间增加而逐渐提高，听觉言语康复的程度基于科学的康复训练。本次研究结果显示使用人工耳蜗时间长短、术后言语训练时间和 CAP、SIR 提高倍数之间具有明显的相关性，但是经多元 Logistic 回归分析发现并未有统计学意义，分析可能是与本次研究的病例较少，患儿未进行长期随访有关。相关研究还需要更加深层次研究，从不同的角度再次进行观察，并且随访管理远期效果等。

综上所述，患儿植入人工耳蜗的年龄、术前平均残余听力、术前佩戴助听器时间和术前言语训练时间是影响患儿术后听力言语功能恢复的主要因素。

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