

· 综 述 ·

耳鸣的个性化声治疗

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【摘要】声治疗是基于神经生理模型,通过声音刺激实现耳鸣适应,从而减轻耳鸣相关恼人症状,临床取得不错的成绩。声治疗的应用不是统一的,涵盖了多维度组合,本文就耳鸣声治疗的个性化研究方向进行综述。

【关键词】耳鸣;声治疗;个性化

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Advances in Individualized Sound Therapy for Tinnitus

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【Abstract】Based on neurophysiological models, sound therapy helps achieve tinnitus adaptation and reduction of tinnitus annoyance through acoustic stimulation. It has been used in tinnitus treatment with good results. Sound therapy is not uniform in its application. Instead, it covers a complex combination of dimensions. This article reviews the relevant literature on sound therapy and its individualized applications in tinnitus therapy.

【Key words】Tinnitus; Sound therapy; Individuation

耳鸣是指在没有外界声源刺激时所感知的声音。研究发现,成人耳鸣发病率约10%–25%^[1–3],其中对生活产生严重影响的占1%–7%^[4–6],这类患者往往积极寻求干预。为提高耳鸣诊疗质量,2014年美国指南建议区分原发性耳鸣为恼人型和非恼人型^[7],本文针对的是恼人型,即6个月以上伴有生活质量消极影响的耳鸣患者。发病机制尚未完全明确,治疗方法也缺乏统一标准。有学者认为,从听力学角度治疗耳鸣具有广阔前景,指南也建议持续恼人型耳鸣患者接受声治疗,通过声音来减轻大脑皮层对耳鸣的感知或反应,忽略、适应耳鸣。耳鸣存在异质性,适用于所有患者的声治疗方法尚未被发现,个性化是未来研究方向。数字化发展为耳

鸣精细化匹配和治疗提供技术基础。Jastreboff^[8]依据神经生理模型提出耳鸣习服疗法(tinnitus re-training therapy, TRT),心理指导结合声治疗以达到耳鸣感知的习服,减轻其对生活、情感的负面影响。

目前为止,耳鸣声治疗的个性化研究主要有以下方向:

1 听力补偿

耳鸣的病因复杂,听力损失是最相关因素^[9–11]。Vanneste^[12]研究认为,依据听力损失的不同,至少应该存在两种截然不同形式的耳鸣,分别与听觉皮层活动和海马旁机制有关,与此同时,听力损失似乎又驱动着听觉皮层和海马旁的沟通,在耳鸣的听觉及听觉外系统中扮演重要角色,听力补偿成为耳鸣治疗的切入点。指南推荐听力损失处于助听器临界值的耳鸣患者首选助听器治疗,其可能作用包括补偿听力、放大背景音、逆转耳鸣有关皮层重组

等^[13]。Jalilvand 等^[14]研究发现,相对噪声掩蔽,助听器在爆震相关性耳鸣的治疗上更具优势,可能与其促进听觉功能恢复和神经重塑有关。Mcneill 等^[15]研究认为,当参与者的低频听力良好且耳鸣音调在助听器的频率范围内时,实现掩蔽的几率较高,可能与助听器的高频放大功能对高频音调性耳鸣的作用有关。融合声发射器和助听器的新型组合也被应用到耳鸣的治疗中,Santos 等^[16]研究发现,组合治疗和单纯助听器治疗后,两组耳鸣残疾量表(tinnitus handicap inventory, THI)评分都明显减少,但组间差异不具有统计学意义。这一结果与 Henry 的研究一致^[17,18],组合器械能否为耳鸣患者带来更大的益处值得探讨。听力补偿是耳鸣声治疗的重要内容,但严重的听力下降(纯音测听 0.25–8kHz 的听力值大于 70dB)是临床试验的排除条件^[19]。由于费用和舒适性问题,助听器的使用也受到诸多限制,建议向更多伴有听力损失的耳鸣患者推荐助听器。

2 音调匹配

音调匹配是临床应用广泛的耳鸣评估方法。研究认为,耳鸣的产生可能与相邻频率差异有关^[20],频率决定音调,音调匹配是声音刺激的基础,也是心理声学的重要内容。Melcher 等^[21]研究认为,耳鸣可能与 8kHz 以上的超临床频率听力损失有关。黄娟等^[22]发现,10kHz 及 11.2kHz 的平均听阈值下降与中高频耳鸣有关,提示耳鸣频率与听力损失频率存在相关性,考虑到高频耳鸣主要发生在耳蜗基底部,建议扩展高频听阈检查以早期评估耳蜗功能。罗彬等^[23]研究发现,若耳鸣频率分布在听力损失频率范围内,个性化多元复合声的效果更好,可能与减弱耳鸣相关听觉神经元活动的侧抑制作用有关。与 Schaette 观点一致,其认为当耳鸣音调在声刺激的频率范围内,声治疗最有效^[24]。考虑到耳鸣声音可能存在多个主调频率,单一频率的掩蔽很难实现全覆盖,多频率匹配也是个体化声治疗的重要内容。残余抑制(residual inhibition, RI)是耳鸣患者是否接受声治疗的参考指标,愈接近耳鸣频率的掩蔽声,RI 阳性率愈高;RI 时间越长,掩蔽效果越好^[25]。谭君颖^[26]等研究发现,一般环境声对耳鸣的掩蔽效果有无与听力下降程度、耳鸣主调频率和响度、掩蔽曲线以及 RI 均无关,与主调频率听阈有关,主调频率听阈提高者掩蔽效果更明显,其结果与之前对心理声学指标的认识不一致,值得进一步探讨。

3 定制声信号

蒋涛^[27]认为,目前耳鸣临床硬件装置的声学信号主要沿两个方向发展:一种是依据个体耳鸣特征定制的多元复合声。通过将 3 种属性的声音有机混合,包括标准刺激声(纯音或窄带噪声)、TRT 声(自然声或环境声)和音乐声,结合精细化纯音听阈测试和耳鸣匹配,形成个性化的声治疗方案^[28,29]。研究认为,叠加自然背景音可以促进听觉神经通路的背景活动,减轻耳鸣感知^[30];而融合的音乐是以患者喜好选取的放松音乐片段或依据个人耳鸣特征定制,具有悦耳和舒适的特点,可以改善耳鸣诱发的负面情绪。李昌武等^[31]研究发现,复合声可以减轻听力正常耳鸣患者的 THI 及视觉模拟评分法(visual analogue scale, VAS),提示复合声对听力正常耳鸣患者有效,尤其对 RI 阳性的患者治疗效果更好。另一种是音乐疗法,也称为声治疗的代替疗法。目前临床常见的音乐疗法包括海德堡神经音乐疗法(heidelberg neuro-music therapy, HNMT)、定制缺口音乐训练(tailor-made notched music training, TMNMT)、五行音乐疗法等^[32]。其中 HNMT 是运用与耳鸣频率相似的谐波谱声音反复刺激,产生脱敏,结合心理干预技术,形成固定的耳鸣治疗方法^[33];TMNMT 则是通过移除耳鸣频率附近一个八度音的能量带,抑制缺口内的频率,产生侧抑制作用;五行音乐疗法是结合音乐和五行理论,以五音应五脏,采用中医相生相克原理进行个体化治疗。长期的音乐训练有助于耳鸣听觉皮层相关神经元超微结构形态或功能的重塑^[34],轻松舒缓的音乐可以让患者忽略、适应耳鸣,达到与耳鸣的“和平相处”。考虑到重复的音乐有可能引起患者的记忆与适应^[35],基于分形算法的耳鸣康复音应运而生^[36,37]。其将分形图片处理技术运用到声音合成中,使用算法创建旋律的音调链,声音信号相似而不重复,可明显提高耳鸣患者 THI 功能性的领域(集中、阅读、睡眠等),被认为是有希望的声音治疗策略^[38]。

4 关注心理和社会反应

耳鸣是一种身心疾病,其症状包括从轻微的烦恼到对日常生活的灾难性影响。个体对耳鸣的感受存在差异,前期评估尤其重要,耳鸣量表通过问题清单细致观察患者的耳鸣、情感 and 睡眠状态,临床医师应根据个体情况选择合适的问卷,准确把握患者的心理和社会反应。通过文献搜索总结发现,影响耳鸣临床管理的因素包括听力水平、耳鸣严重

程度、焦虑情绪、睡眠、患者的接受度等^[39]。耳鸣的诊治要符合生物-心理-社会医学模式,既要考虑听力学因素,又要关注心理及社会因素。实际临床工作中,相对于掩蔽疗法,结合心理干预的TRT更有助于减轻患者心理负担,转移注意力。指南认为,临床医生应向持续恼人型耳鸣患者推荐认知行为疗法(cognitive behavior therapy,CBT),长期来看,CBT改善患者生活质量疗效显著^[40],可作为声治疗的辅助疗法。冯天赐等^[41]研究发现,音乐疗法联合CBT治疗耳鸣后,患者的睡眠好转、EEG明显改善、耳鸣逐渐适应甚至消失。杨海弟等^[42]研究发现,二者联合治疗后患者的THI、VAS及焦虑自评量表均明显下降,耳鸣主观感受及伴随的焦虑抑郁等不适情感得到改善,值得推广。

5 小结与展望

耳鸣治疗不以消除耳鸣为目的,而是减轻耳鸣感知及不适躯体症状。声治疗是实现耳鸣适应的主要方法,正确的声治疗不会对听力产生额外损伤,国内外专家推荐运用声治疗联合心理干预治疗耳鸣。耳鸣的听力学特点及心理社会反应不一,多维度的评估是个性化治疗的前期基础,本文主要从听力补偿、心理声学匹配、定制声信号以及关注心理社会反应四个方向出发,优化耳鸣的听力学及心理社会学管理,做到声治疗的“量声定制”和“以人为本”。

声治疗技术尚未完全成熟,耳鸣定制声治疗仪器原理各有特点,使用方法及时间也存在较大差异,规范化的声治疗方法还需要进一步探讨。耳鸣缺乏客观评估标准,建议对声治疗反应较好的患者采用听力学方法评估疗效,以期获得更优的证据支持,增强患者治疗信心。总之,个性化声治疗的发展为从听力学角度管理耳鸣提供了新的方向,值得进一步研究。

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