

不同根管治疗对老年患者慢性根尖周炎的影响因素的探讨

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摘要

临床治疗根尖周炎的方法常采用根管治疗术, 也分为单次或多次根管治疗法, 但两者间疗效存在较大争议。尽管目前以多次根管治疗方式居多, 但由于单次根管治疗对于老年患者而言, 具有较短的治疗周期和较高的患者依从性的特点, 或许能够提高根管治疗的质量和舒适度。基于此目的, 本综述通过评估单次根管治疗在慢性根尖周炎中的临床效果, 分析单次根管治疗的治疗过程、成功率、复发率以及术后疼痛等关键指标, 探讨影响治疗效果的多种因素。研究表明, 单次根管治疗复杂病例或感染较重的慢性根尖周炎, 其疗效与多次治疗并无明显差异, 且降低了经济和出行负担。此外, 根管系统的解剖结构、感染的严重程度、治疗过程中的消毒及最后的充填材料等因素也对最终的治疗疗效产生重要影响。综合来看, 临床医师可根据病情程度、患者需求及治疗技术的情况, 提高单次根管治疗的应用率。未来的研究应进一步探讨新的治疗材料、技术以及治疗方案的优化, 以提高单次治疗老年患者慢性根尖周炎的治疗效果, 优化根管治疗的方式。

关键词

单次根管治疗, 多次根管治疗, 慢性根尖周炎, 治疗效果, 影响因素

Influencing Factors of Different Root Canal Treatments on Chronic Periapical Periodontitis in Elderly Patients

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Abstract

Root canal therapy is a commonly used clinical method for the treatment of periapical periodontitis, which can be performed as either single-visit or multiple-visit root canal treatment. However, the efficacy of these two approaches remains controversial. Although multiple-visit root canal therapy is currently more prevalent, single-visit treatment may offer advantages for elderly patients, such as a shorter treatment duration and higher patient compliance, potentially improving the quality and comfort of root canal therapy. Based on this perspective, this review evaluates the clinical outcomes of single-visit root canal therapy in chronic periapical periodontitis by analyzing key indicators such as the treatment process, success rate, recurrence rate, and postoperative pain, while exploring various factors influencing therapeutic efficacy. Studies indicate that for complex cases or severe chronic periapical periodontitis, the efficacy of single-visit root canal therapy does not significantly differ from that of multiple-visit treatment, while reducing economic burden and travel frequency. Additionally, factors such as the anatomical structure of the root canal system, severity of infection, disinfection during treatment, and the type of filling material used significantly impact the final therapeutic outcome. In summary, clinicians can increase the application rate of single-visit root canal therapy based on disease severity, patient needs, and available treatment techniques. Future research should further investigate new materials, technologies, and optimized treatment protocols to enhance the efficacy of single-visit root canal therapy in elderly patients with chronic periapical periodontitis and refine root canal treatment approaches.

Keywords

Single-Visit Root Canal Therapy, Multiple-Visit Root Canal Therapy, Chronic Periapical Periodontitis, Treatment Outcome, Influencing Factors

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1. 引言

临床上, 对于不可逆性牙髓炎和牙髓坏死等疾病, 如果不及时治疗可能会演变为根尖周炎, 通常表现为根尖周骨吸收[1], 可伴有或不伴有临床症状。许多流行病学研究调查了普通人群根尖周炎的患病率, 如 Tibúrcio [2]等人进行的全球范围的研究, 发现该疾病全球患病率高达 52%。根管治疗作为该疾病所推荐的常见的治疗方式, 其核心在于通过机械预备结合化学消毒清除根管系统内的有机残留、感染物质及微生物[3]。全球范围内接受治疗的比例超过 8% [4], 但目前对于单次或多次根管的治疗方式并未统一。其中较为传统也是最常见的多次根管治疗(Multiple-Visit Root Canal Treatment, MVRCT), 通常使用氢氧化钙作为诊间根管内消毒药物, 可在首次根管治疗后 24~48 小时内减轻疼痛[5], 杀灭细菌, 促进根尖周病变的愈合[6]。而单次根管治疗(Single-Visit Root Canal Treatment, SVRCT)是指将根管内的细菌及坏死物质一次性彻底清除后严密的填充。学者们指出, 一次性完成治疗能避免封药期间根管内微生物再度滋生[7], 且具有节省患者及医生的时间、节省患者花费的优点[8]。本文将从 SVRCT/MVRCT 临床疗效对比的角度, 对 SVRCT 针对慢性根尖周炎的治疗进行临床评估与影响因素的探讨。

2. 单次根管治疗概述

单次根管治疗(Single-Visit root canal treatment, SVRCT)即仅通过一次诊疗为患者完成开髓根备、充填

等操作, 缩短治疗周期, 提升疗效[9]。SVRCT 最初被认为是一种不符合标准的手术, 但随着技术的进步, 引入了新兴的和改进的技术和材料, 包括根管显微镜、NiTi 旋转仪器系统、根尖定位仪、超声技术和更优质的充填材料(如生物陶瓷类充填材料), 现已逐渐被部分学者认为是多次根管治疗的替代方案。

尽管对于患者而言, 什么是成功的根管治疗这一问题未得到普遍认同。但许多就诊时患者曾表达出减轻疼痛、恢复咀嚼功能的请求, 因此治疗的成功与缓解疼痛紧密相连[10]。这与 Su 等人的观点一致[11]。Su 曾指出, “在牙髓治疗中采用治疗方法不仅取决于其疗效或生物学结果, 还取决于将患者不适感的最小化”。SVRCT 因减少麻醉使用及就诊次数, 降低了患者多次治疗的不适感与恐惧心理, 缩短治疗时间。对于部分焦虑症患者或不能多次频繁就诊的老年患者来说, 提高了老年患者的方便程度和就诊满意度。同时由于治疗过程被简化, 能更早恢复正常的咀嚼功能[12] [13]。此外, 从治疗疗效的角度, SVRCT 由于在机械根管预备和药物治疗后立即充填根管, 理论上可限制氧气流向根管系统中的残留微生物, 并降低因多次就诊使用的暂封物微渗漏而导致再次感染的风险[14]。研究指出, SVRCT 疏通填充治疗后, 患者龈沟液中的基质金属蛋白酶-2 和基质金属蛋白酶-8 水平显著下降, 表明病灶炎症得到有效控制[15]。

然而关于 SVRCT 术后疼痛的报道存在矛盾。有研究显示, 与多次根管治疗患者组相比, SVRCT 组在一周内报告存在疼痛的患者比例更高。这可能与所用消毒药物和冲洗药物引起患者免疫反应有关[16]。但也有 Zaneva 等[17]发现, 由于接触冲洗剂和消毒药物的时间较短, 接受 SVRCT 的患者报告的术后疼痛较轻且持续时间较短。这种矛盾可能源于研究设计的差异(如病例纳入标准、疼痛评估时间点、使用的冲洗消毒方案等)。因此, 如果治疗中能有效化学预备和控制感染, 并以牙齿没有出现临床症状则认为治疗成功, 那么 SVRCT 的成功率高达 95%。从微生物学角度来看, 有学者认为充分隔离手术区域、正确的机械和化学治疗, 仅包括 EDTA、5.25%次氯酸钠和盐水或蒸馏水, 足以控制感染并减少根管系统中的微生物, 如粪肠球菌、白色念珠菌、大肠杆菌、铜绿假单胞菌[18], 为根尖周恢复创造了有利的环境条件[19]。

3. 多次根管治疗概述

多次根管治疗(Multiple-Visit Root Canal Treatment, MVRCT)是传统的治疗方法, 目前临床上仍最为常见。通常采用分阶段治疗, 每次治疗后都进行根管消毒和药物(如氢氧化钙)封闭。尽管 MVRCT 为清除感染提供了更长的药物作用时间, 但仍然存在固有局限。Sjogren 等学者通过分析发现, 约 68%的牙在根管填充时可检出微生物[20]。这可能是由于诊间封药期间, 由于暂封物微渗漏或细菌生物膜的复杂结构, 难以彻底杀灭所有细菌[21] [22]。此外, MVRCT 增加了患者的治疗费用和时间成本[23]-[25], 影响就诊体验, 尤其是对于腿脚不便、体力不支、全身状况较差的中老年患者, 影响更为显著, 还可能增加治疗间隔期间牙体折裂等并发症的风险。

4. 根管治疗在慢性根尖周炎中的疗效评估

慢性根尖周炎, 尤其是瘻管型慢性根尖周炎, 主要来源于根管系统中的细菌和微生物脓肿, 长期未得到治疗而引起[26]。当炎症持续和反复时, 在根尖形成肉芽组织, 导致牙槽骨逐渐吸收并形成牙龈瘻, 从而导致复发性牙周肿胀和脓液的流出[27]。由于病变持续时间长、窦道迂曲和患者病情反复恶化, 该疾病很可能演变为慢性且难以治疗的根尖周炎[28] [29]。对于此类病变, SVRCT 与 MVRCT 的疗效比较是临床关注的焦点。部分研究主张, 患者应无疼痛、肿胀和瘻管等临床症状, 才可被选择进行 SVRCT [30]。然而, 越来越多的证据表明 SVRCT 在治疗瘻管型慢性根尖周感染患者方面同样有效[31]。例如, Xiong 等人[32]对前牙慢性根尖周炎的对比研究发现, 两组之间的术后结局, 包括疼痛减轻、瘻管愈合、根尖愈合和整体临床疗效具有可比性, 且两组牙龈沟液中的炎症标志物均显著降低, 亦无显著差异, 这与多数研究结果一致[33] [34]。Karaoglan [35]等对伴有根尖周病变的无症状牙齿进行为期 24 个月的随访, 同样

未观察到两组愈合率的统计学差异, 并指出根尖周病变的大小和根管充填质量可能是更关键的预后因素。Jazib [36]等学者的研究也支持 SVRCT 与 MVRCT 的长期疗效无显著差异。

尽管多数研究结论趋于一致, 即两种疗法总体疗效相当, 但仍须批判性地看待这些证据。现有研究的异质性(如不同牙位、病变大小、随访周期、成功标准定义)可能掩盖了特定亚组中的差异。例如, 对于某些特定病原菌(如难治性粪肠球菌生物膜)感染或解剖结构极度复杂的病例, MVRCT 的诊间用药是否更具优势, 目前尚缺乏高质量、大样本、长随访期的随机对照试验来明确。因此, “无统计学差异”不等于“临床等效”, 临床决策仍需个体化。

5. 根管治疗影响慢性根尖周炎疗效的因素

5.1. 患者及患牙因素

5.1.1. 患者因素

现有研究普遍认为, 年龄和性别对根尖周愈合无显著影响。治疗结局的差异可能更多归因于个体间宿主免疫反应和遗传背景的差异[37]。Petean 等人[38]研究提示, 与根尖周组织愈合相关的基因(如 RANK/RANKL)多态性可能影响治疗结果, 这为未来实现个性化治疗提供了潜在方向。

5.1.2. 牙体结构

传统观点认为单根牙可能比多根牙表现出更高的根尖周愈合率, 但这可能是一种误解。这种观念可能是因为人们通常认为单根牙有更简单的解剖结构、更易进入的根管通道。而后牙因根管数量和位置更不方便探查, 以及由于严重的多根管弯曲而导致的复杂的根管难以治疗[39]。实际上, 预后差异主要取决于“根尖区解剖复杂性”(如根尖分歧、副根管、峡部等)而非“根管系统复杂性”本身。根尖区的复杂结构可能成为细菌生物膜的“避难所”, 增加清创难度, 从而影响愈合[40]。

5.1.3. 术前牙髓状态

研究发现术前牙髓状态(是否坏死)对根尖周的愈合无显著影响。即使根管内被感染, 坏死的牙髓组织既不会引起根尖病变, 也不影响其愈合[41]。决定预后的关键因素是术前根尖周病变的存在与否及其大小。较大的根尖周病变愈合时间更长, 失败风险更高。这可能是因为根尖周组织长期慢性感染, 细菌在牙本质小管中渗透的更深, 并且可能发生了囊性转化, 或造成了更严重的宿主反应, 因此可能在残留细菌存在下无法缩小或愈合而导致治疗失败[42]。

5.2. 治疗因素

5.2.1. 根管冲洗

根管冲洗是减少根管内细菌数量的关键步骤, 对减少根管内细菌数量有显著影响[43]。然而, 与直觉相反的是, 不同冲洗剂, 无论是否具有活性抗菌效果, 以及不同浓度的次氯酸钠, 对根尖愈合效果并无实质性差异。有研究评估了使用 1%、2.5%和 5.25%次氯酸钠或盐水溶液对接种粪肠球菌的根管进行溶液冲洗。所有测试溶液均显著减少根管中细菌细胞的数量($p < 0.05$)。测试的三种 NaOCl 溶液之间没有显著差异($p > 0.05$)。但尽管如此, 所有 NaOCl 溶液在减少根管内细菌细胞数量方面都明显比生理盐水更有效($p < 0.05$) [44]。这表明, 冲洗剂的抗菌活性固然重要, 但其机械冲刷作用和溶解有机物的能力同样不可忽视。

5.2.2. 根尖预备

直觉上, 更大的根尖预备直径(如 ISO 30 以上)有利于清除感染, 但许多研究都报告了相同的相反结果, 即随着根尖预备大小的增加, 根尖周愈合率降低。对此的解释可能是: 过度预备易引发医源性失误

(如根尖孔破坏、台阶形成), 产生大量牙本质碎屑堵塞根管, 若配合不当的冲洗方案, 反而影响根尖区的清洁和封闭, 从而可能危及根尖周愈合[45]。

5.2.3. 根管系统消毒

根管系统消毒的范围通常应延伸到其根尖末端。研究显示, 在根管末端的消毒使根尖周愈合的几率显著增加了 2 倍, 而对于距离末端每缺少 1 mm 的根管消毒, 成功愈合的几率降低 12%~14% [46]。

5.2.4. 根管系统充填

根管充填的核心目标是实现根管系统的三维严密封闭, 隔绝任何潜在的再污染途径。充填的密合性(减少空隙)和封闭能力是防止残留微生物重新定植、保障远期疗效的关键[47] [48]。

5.2.5. 操作能力和临床经验

根管治疗通常由经验丰富的口腔医生进行, 因为他们可以更好地评估彻底清洁、塑形和填充根管所需的时间[49], 术者的临床经验和技术水平直接影响上述所有治疗步骤的质量, 包括对复杂解剖的应对、感染控制的判断和操作精度。

5.3. 术后修复因素

术后冠部修复的质量是影响根管治疗远期成功率的决定性因素之一。包括剩余牙体组织的结构、分布和质量及其完整性、修复材料的类型、全部或部分覆盖、永久修复的时间、边缘密合性和咬合设计共同决定了牙齿抵抗微渗漏和折裂的能力, 对长期疗效至关重要。

6. 单次与多次根管治疗的临床选择与决策

SVRCT 与 MVRCT 的选择之争, 本质上是成本效益、患者舒适度、术后反应与生物学原则之间的权衡。这种差异主要来自于医生技术、牙齿类型、疾病急慢性、是否为再治疗病例、患者依从性、牙根解剖结构复杂性以及是否存在创伤性牙齿损伤等因素的差异[50]。Koçer 等[49]认为在不确定的情况下, 仍然推荐多 MVRCT。但迄今为止, 尚无高级别证据表明一种方案绝对优于另一种。Rather [51]提出的 SVRCT 选择标准至今仍有参考价值, 包括: 患者接受度高、有充足的操作时间、无急性症状(疼痛、肿胀)、无明显的解剖障碍(如钙化、极度弯曲)。临床决策应基于对上述影响因素的全面评估, 权衡利弊, 实现个体化治疗。

7. 讨论

综合来看, SVRCT 的优势在于减少老年患者预约次数, 提升依从性及就诊舒适度, 降低二次微生物感染风险, 无需临床医生重复熟悉牙齿解剖结构, 缩短治疗时间, 具有成本效益, 可以更快恢复咀嚼功能, 可能降低治疗费用, 最大限度减轻患者对疼痛的恐惧与焦虑。其潜在劣势包括: 单次操作时间长, 可能使患者感到疲惫, 尤其是患有颞下颌功能障碍者; 若根管系统存在出血或渗出, 可能难以控制并完成治疗; 治疗疑难病例时, 如遇钙化、多根管等情况, 会给患者和临床医生带来较大压力; 此外, 临床医生需具备扎实专业知识, 才能有效开展单次根管治疗。

本文在梳理现有证据时发现, 关于 SVRCT 与 MVRCT 的疗效比较, 尽管多数研究结论指向“无显著差异”, 但对其背后生物学机制的解释仍显不足。SVRCT 一次性彻底清创, 可能通过急剧改变根管内微生物生态, 触发宿主强烈的免疫反应, 这或许可以解释部分研究观察到的早期疼痛增加现象[16]。而 MVRCT 中氢氧化钙的诊间封药, 不仅能持续抗菌, 还可能通过其高 pH 值影响细菌生物膜的结构和毒性, 并调节根尖周组织的炎症微环境, 促进更平稳的愈合过程[5] [6]。未来研究需要将临床结局与微生物组学、免疫

组学分析相结合, 深入探究两种治疗模式下根尖周组织愈合的动态生物学过程, 从而为临床选择提供更坚实的理论基础。

8. 小结与展望

通过大量研究对比分析可见, SVRCT 与 MVRCT 在治疗慢性根尖周炎方面, 整体疗效并无显著差异。无论从术后疼痛减轻、瘘管愈合、根尖愈合以及整体临床疗效等多维度评估, 两种治疗方式均能取得较为理想的治疗效果。然而, SVRCT 在缩短治疗周期、减轻患者经济负担以及出行压力等方面具有一定优势, 尤其对于那些无法频繁往返医院就诊、时间紧张的老年患者而言是一种更为高效便捷的选择; 而 MVRCT 则在处理复杂病例、感染较重的情况时, 凭借分阶段进行、便于观察病情变化及调整治疗方案等特点也受到临床医师青睐。

根管治疗中除次数外, 影响根管治疗效果的因素众多, 包括根管解剖、感染状态、清创、消毒、充填质量及冠方修复等, 其中术者的技术水平和判断是串联所有环节的核心。因此, 对于符合条件的病例, 由经验丰富的医师实施 SVRCT, 能够高效地达到治疗预期。未来研究应聚焦于开发新型抗菌材料和消毒技术, 探索更精准的感染控制策略, 并结合分子生物学手段阐明根尖周愈合的机制, 以进一步优化根管治疗方案, 提升老年患者慢性根尖周炎的治疗效果和远期预后。

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本文所有作者均声明不存在利益冲突。

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