·综述·

全膝关节置换术后康复治疗的研究进展

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【摘要】 全膝关节置换术被认为是当前最有效的手术之一,对晚期膝骨性关节炎患者关节活动度、疼痛及关节僵硬的改善作用显著,但仍有 19%的患者术后效果较差。现有大量文献报道康复治疗在提高全膝关节置换术后关节活动度、平衡功能及改善日常生活能力等方面均具有显著疗效。本文就近年来全膝关节置换术后康复方面的研究进展情况进行回顾性总结,为全膝关节置换术后康复干预及相关研究提供参考资料。

【关键词】 全膝关节置换术;　骨性关节炎;　康复
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全膝关节置换术(total knee arthroplasty,TKA)被认为是治疗严重或终末期膝关节病变最有效的方法之一。近年来由于假体设计、手术方法及围手术期管理不断优化,大多数患者术后膝关节畸形、疼痛情况得到缓解,其关节活动功能及日常生活能力均明显提高[1],但仍有高达 19%的患者术后效果较差,主要功能障碍包括术后残留持续性疼痛、关节僵硬以及日常生活活动受限等[2-3]。随着接受 TKA 手术治疗患者数量不断增多(每年递增 5%到 17%不等)[4],康复训练对于 TKA 患者术后功能恢复及生活质量改善具有十分重要的临床意义。本研究通过查阅近年来国内、外相关文献报道,拟对 TKA 患者术后康复治疗相关进展情况作一简要阐述。

TKA 康复治疗理念

一、术前功能锻炼

在过去很长一段时间人们对于 TKA 手术的关注点都集中在手术成功与否及术后康复锻炼,而对于术前康复锻炼则很少提及,实际上术前康复锻炼与术后康复锻炼同样重要。通过术前肌力训练可增强膝关节稳定性,术前膝关节主、被动锻炼可改善局部血液循环,预防术后并发症发生,并能减轻患者心理应激,缩短患者住院时间,有利于患肢功能尽早恢复[5]。石明国等[6]研究发现在其他因素相同情况下,术前膝关节活动度对 TKA 术后关节功能恢复有很大影响,术前膝关节活动度大的患者较活动度小的患者术后能获得更好的功能改善。

二、术后加速康复治疗

加速康复理念最早在 2001 年由丹麦外科医生 Kehlet 等[7]提出,目前该理念被广泛应用于临床治疗中,近些年在骨科(尤其是关节外科)领域取得了令人振奋的疗效,加速康复强调详细充分的术前教育、术后早期下床活动、早期功能锻炼以及关节置换后强化功能锻炼,让患者积极、主动进行功能训练,尽早达到术前制订目标,但这些都需建立在良好镇痛措施及多学科合作基础上。Tucker 等[8]研究评估多学科、多模式骨科加速康复方案对髋关节及膝关节置换术患者术后疼痛的影响,其治疗方案由麻醉师、外科医生及理疗师共同制订,包括优化术前营养、麻醉前药物使用、标准化麻醉及手术技术、局部浸润镇痛的使用以及术后镇痛方案等,结果表明由多学科小组针对患者个性化设计的快速康复方案在择期髋关节和膝关节置换术后可降低疼痛评分,促进患者功能恢复,缩短住院时间,节省住院成本。随着关节置换术手术价值及术后功能障碍日益受到重视,加速康复治疗作为一种安全有效的干预方案,对需要接受关节置换术的患者具有重要意义。

三、出院后远程康复治疗

远程康复是由经验丰富的理疗师通过互联网以视频会议或微信等方式指导患者在家中进行康复治疗。Shukla 等[9]系统回顾分析了多个关于远程康复治疗 TKA 术后患者的临床报道,其评估指标包括膝关节伸展和屈曲范围、股四头肌肌力、起立-行走计时测试等,并采用西安大略和麦克马斯特大学骨关节炎指数(Western Ontario and McMaster Universities Osteoarthritis Index,WOMAC)和视觉模拟评分法(visual analogue scale,VAS)评估患者关节疼痛、僵硬及功能情况,发现家庭远程康复组患者运动功能状态与常规治疗组间差异无统计学意义(P>0.05),该证据提示远程康复治疗是有效替代传统面对面康复的实用手段。另一项纳入 442 例 TKA 术后患者的 Meta 分析结果显示,与传统面对面康复组患者比较,远程康复治疗不仅能获得类似的疼痛缓解效果,同时接受远程康复治疗的患者其膝关节伸展范围及股四头肌肌力改善情况均较面对面康复组更佳[10]。

TKA 患者康复治疗方法

一、把握好康复训练时间及强度

已有多项研究报道 TKA 术前或术后康复干预可有效改善患者功能障碍及生活质量,但起效时间报道结果不一。Umehara 等[11]对 27 项随机对照试验进行分析发现,在接受 TKA 手术的膝关节骨性关节炎患者中,出院后至少需 8 周康复训练方可显著改善身体功能及活动能力。Oktas 等[12]研究发现在 TKA 术后积极控制膝关节疼痛及水肿(如术后立即冷敷),并实施针对

髋关节、膝关节周围肌肉功能的强化康复训练,可提高手术成功率,加速患者功能恢复。此外 Husby 等[13]研究表明 TKA 术后介入最大力量训练(maximal strength training,MST)较标准康复干预(standard rehabilitation,SR)能更有效增强肌肉力量,在术后 7 d 到 10 周随访期间,发现接受 MST 的患者其腿部下压及伸膝肌力均显著优于接受 SR 的对照组,且肌肉力量组间差异在术后 1 年随访时仍持续存在,故建议 TKA 后应针对患肢进行高强度力量训练。虽然相关文献报道 TKA 术后介入高强度渐进式康复训练安全有效,但笔者认为该方案的选择与否应参考患者年龄、身体功能状态以及耐受能力等具体条件而定。

二、选择合适的康复训练技术

1.核心稳定性训练:机体核心稳定性有利于维持下背部功能,防止膝关节韧带损伤,躯干肌群的肌肉活动与下肢运动功能密切相关,躯干功能对于步行过程中的平衡控制非常重要。此外 TKA 术后患者在行走时,躯干功能可在一定程度上弥补受损的膝关节功能[14]。Sano 等[15]研究坐位侧向敲击(即坐位下躯干尽可能快速进行左右侧向运动)训练(seated side tapping,SST)对 TKA 后短期内躯干功能及移动能力的影响,结果显示 SST 组患者表现出更好的运动能力及灵活性。尽管 SST 组、对照组患者肌肉力量、膝关节运动范围及疼痛程度类似,但 2 组患者步行速度组间差异在术后 1~3 周期间均大于 0.1 m/s,具有一定临床意义,因此 SST 训练可被作为 TKA 后早期康复计划的一部分,但其长期有效性仍需进一步研究评估。

2.平衡及本体感觉训练:TKA 术后介入平衡及本体感觉训练的疗效曾受到质疑。近年来研究指出 TKA 手术对膝关节本体感觉系统的破坏作用不容忽视,即使在保留后交叉韧带的情况下,长期骨关节炎引起的退行性变及手术损伤均会对患者平衡功能产生不良影响,这可能是 TKA 患者术后功能受限的直接原因之一[16]。相关系统回顾性研究及 Meta 分析发现平衡及本体感觉训练对 TKA 术后患者本体感觉和平衡功能具有显著改善作用[17],提示 TKA 术后平衡及本体感觉训练有利于患者受损功能恢复。

3.循环模式训练:Hsu 等[18]通过观察 24 周循环模式训练对 TKA 术后患者膝关节功能的影响,其训练模式为牵伸训练-有氧训练-阻力训练-有氧训练-阻力训练-牵伸训练(其中有氧训练为骑功率自行车,阻力训练采用下肢阻力训练仪),发现上述循环模式训练能减轻 TKA 术后患者膝关节疼痛,改善日常生活能力及生活质量,步态分析结果显示循环训练组步长及膝关节活动度均较对照组明显增加;但在下肢最大肌力方面组间无明显差异。虽然循环模式训练未能进一步增强患者最大等速肌力,但对下肢肌肉协调功能具有改善作用,有利于患者步行及日常活动能力恢复[18-20]。

4.下肢机器人训练:HAL(hybrid assistive limb)是一种可穿戴下肢机器人系统,它可检测由穿戴者肌肉活动产生的生物电信号和(或)重心移动时引起地板反作用力信号,为穿戴者提供行走、站立辅助,并根据穿戴者的预期运动意图提供交互式下肢运动辅助[21]。Yoshikawa 等[22]评估了 HAL 训练对 TKA 术后患者步行能力、活动范围及肌力的影响,并与术后常规训练干预进行疗效对比,发现 HAL 训练能显著改善 TKA 术后患者步行能力、关节活动度及肌力,疗效持续时间长达 8 周;且治疗过程中未观察到明显不良反应,因此 HAL 训练可作为 TKA 术后一种安全、有效的康复干预手段。

三、优化镇痛技术

1.多模式镇痛:多模式镇痛是将不同作用机制(如外周、中枢)、不同使用途径(如口服、肌注、静脉滴注、外用等)的镇痛药物联合应用,包括外周神经阻滞、关节周围注射、患者自控镇痛、口服或静脉应用药物等,从而减少单一药物使用剂量及副作用,延长镇痛时间,增强镇痛效果[23]。牛舜等[24]给予观察组多模式镇痛及超前镇痛,发现术后 6 h、24 h、48 h、72 h 及出院时患者疼痛评分均明显低于对照组水平($P<0.05$);另外观察组患者在术后 1 周时膝关节活动度即达到 110°以上,大部分患者其美国特种外科医院膝关节评分(hospital for special surgery knee score,HSS)均超过 80 分,对照组则需更长时间才能获得类似疗效。

2.冷疗:冷疗是应用低于体温的物体(如冰、水等)作用人体皮肤,降低局部或全身温度,起到镇痛、消肿、止血等目的。Morsi 等[25]研究发现术后 6 d 时冷疗组疼痛 VAS 评分为 4.2 分,较对照组评分(6.3 分)明显降低($P<0.05$);另外术后次日对照组镇痛药物使用量较冷疗组多 150%,术后第 6 天仍多 27%,冷疗组镇痛药平均每天使用 950 mg,较对照组每天使用量(1400 mg)明显减少($P<0.05$)。而 Adie 等[26]通过 Meta 分析指出,冷疗仅在术后 1~2 d 期间具有明显优势,在术后次日及 2 d 后冷疗组镇痛药物使用量与对照组间无明显差异($P>0.05$)。

3.射频消融治疗:射频治疗时通过电流产生的热量使目标组织产生热损伤,当前射频消融术已被广泛用于治疗多种类型慢性疼痛,其原理是用热能消融感觉神经纤维(尤其是神经纤维远端)[27]。Protzman 等[28]研究 TKA 术后射频治疗慢性膝关节疼痛的可行性,发现 TKA 术后持续性疼痛(长达 1 年)患者经膝神经射频消融 3 个月后,其疼痛完全缓解,膝关节活动度得到明显改善。

四、合适的评估方法及量表

目前研究中常用的 TKA 后膝关节功能评估方法及量表包括 WOMAC、牛津膝关节评分(Oxford knee score,OKS)、膝关节协会评分系统(knee society scoring system,KSS)、膝关节损伤、骨关节炎结果量表(knee injury and osteoarthritis outcome scale,KOOS)、VAS、起立-行走计时测试(timed up and go,TUG)、6 分钟步行试验及简化生活质量评价量表-36(short form 36 questionnaire,SF-36)等[29-31]。在 TKA 术后早期康复评估方面,Poitras等[32]指出于术后 6 周内采用 TUG 和出院准备量表(readiness for hospital discharge scale,RHDS)进行评估,能更好地反映患者早期临床特征及康复疗效情况;此外独立行走天数和 5 m 最大步行速度也可作为早期康复效果评价的观察指标[33]。Unnanuntana 等[31]将 2 分钟步行试验与改良版 WOMAC、OKS、KSS、VAS 量表、TUG 等进行比较,并评估其反映 TKA术后患者功能恢复情况的敏感性,结果显示 2 分钟步行试验在术后 1 年中能及时有效地反映 TKA 术后患者功能恢复情况,且评估过程简单易行、患者依从性较好,可用于临床常规评估,因此建议在 TKA 后采用 2 分钟步行试验进行功能评估,而不是耗时较长的 6 分钟步行试验。虽然 6 分钟步行试验在既往文献中报道较多,但在 TKA 术前和术后早期评估过程中可能会加重患者膝关节负担,不利于患膝功能恢复,在临床实践中较难常规使用。

结语

近年来 TKA 术后康复不仅在传统循序渐进肌力训练、关节活动度及平衡训练基础上更加深入细化，同时也逐渐兴起了诸如快速康复方案、远程康复、多学科小组康复工作模式以及术前制订个体化康复方案等新理念，不仅提高了手术疗效，减少了术后并发症发生，同时对患者术后尽早恢复功能、提高独立生活能力、加速重返社会也具有重要意义。随着 TKA 手术及相关康复方案不断完善，我们有理由相信 TKA 术后患者康复疗效将获得更显著提升。

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Modified rehabilitation exercises for mild cases of COVID-19

BACKGROUND Coronavirus disease 2019 (COVID-19) caused by a new Betacoronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is currently a global pandemic. Gathered clinicopathological evidence in COVID-19 patients shows that alveoli injuries and interstitial changes are the major mechanisms of impaired O_2/CO_2 exchange. Few rehabilitation exercises concerning COVID-19 patients were reported. Here, we present a modified version of rehabilitation exercises based on the underlying mechanism of the disease to mild cases of COVID-19. These exercises aimed to improve the pulmonary function of patients and ease the expectoration process. Additionally, an essential branch of Traditional Chinese Medicine (TCM) named acupressure was integrated into the exercises to facilitate the recovery and maintenance of pulmonary function.

METHODS From March 4, 2020 to May 5, 2020, a total of 60 COVID-19 patients who completed the full course of MRE were enrolled in this observational study. The diagnostic and classification criteria were based on the 7th edition of Diagnosis and Treatment Guideline of COVID-19 published by the National Health Commission of the People's Republic of China. We prospectively gathered patients' reported outcomes concerning respiration-related symptoms at four different time points, including: (I) at admission; (II) at the time of hospital discharge; (III) two weeks after discharge; (IV) four weeks after discharge. The reported respiratory symptoms included dry cough, productive cough, difficulty in expectoration, and dyspnea.

RESULTS In total, 60 confirmed mild COVID-19 cases were enrolled with a median age of 54 years old. The baseline prevalence for dry cough, productive cough, difficulty in expectoration, and dyspnea were 41.7%, 43.3%, 35.0%, and 50.0%, respectively. The pronounced decline in symptom prevalence was recorded over time. Interestingly, four weeks after discharge, we noticed a lower remission rate in productive cough and difficulty in expectoration.

CONCLUSION The modified rehabilitation exercises were retrieved from the Eight-Section Brocade, and are specifically designed for rehabilitation of COVID-19 patients at home or health facilities. Based on current findings on pronouncedly improved remission rate in respiratory symptoms, we recommend the MRE as suitable rehabilitation exercise to smooth respiration and ease the expectoration process in mild COVID-19 cases.

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