

腰椎间盘突出症诊疗指南

中华医学会骨科学分会脊柱外科学组; 中华医学会骨科学分会骨科康复学组

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【摘要】 腰椎间盘突出症是骨科常见疾病, 人群发病率高。随着社会发展和生活方式的改变, 腰椎间盘突出症的发病率呈现逐渐增高的趋势。鉴于腰椎间盘突出症诊疗理念和技术手段的不断进步, 有必要对腰椎间盘突出症的诊断和治疗方法进行总结和规范其诊疗流程。本指南遵循循证医学的原则, 参照 2013 年我国卫生行业科研专项项目制订的《腰椎间盘突出症诊疗指南专家共识及临床路径》和 2013 年北美脊柱外科学会制订的《腰椎间盘突出症伴神经根病诊疗指南》, 经过指南注册及指南计划书撰写、组建指南制订专家工作组及确定临床问题; 参照证据推荐分级的评估、制订与评价工作组相关方法进行检索文献的证据等级和推荐等级评定, 形成推荐意见; 经专家工作组三轮讨论, 最终确定终稿。指南从腰椎间盘突出症的定义、自然病程、症状和体征、辅助检查、诊断标准、保守治疗、手术治疗、手术疗效评估、手术效果的影响因素等方面阐述了腰椎间盘突出症的诊疗措施, 以期为腰椎间盘突出症的诊断和治疗提供可靠的临床理论依据。

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Clinical practice guideline for diagnosis and treatment of lumbar disc herniation

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【Abstract】 Lumbar disc herniation is one of the most common orthopaedic diseases. With the increasingly improvement of the diagnosis and treatment strategies of lumbar disc herniation, it is necessary to standardize the diagnosis and treatment procedures in lumbar disc herniation. Based on the principle of evidence-based medicine, the guideline was developed according to the Expert Consensus and Clinical Pathway of Diagnosis and Treatment Guidelines for Lumbar Disc Herniation developed by Special Scientific Research Project of Medical Industry in 2013 and clinical guidelines of diagnosis and treatment of lumbar disc herniation with radiculopathy developed by North America Spine Society in 2013. After guideline registration, plan publication, expert working group development, clinical problem screening and determination, the authors systematically reviewed literatures from the data base of China National Knowledge Infrastructure, Wanfang Data Knowledge Service Platform, China Biology Medicine and PubMed. According to inclusion and exclusion criteria, the guideline included 119 literatures with 109 in English and 10 in Chinese. Grading of Recommendations Assessment Development and Evaluation System was used to rate the quality of evidence and determined the strength of recommendations. Recommendations were derived from quality of evidence body. After three rounds of discussions in expert work group, clinical guidelines for diagnosis and treatment of lumbar disc herniation were finally developed. The guidelines defined the screening for definition, natural history, symptoms and signs, auxiliary examination, diagnostic criteria, conservative treatment, surgical treatment, evaluation of surgical effect and influencing factors of surgical effect. It can provide a reliable clinical basis for the diagnosis and treatment in lumbar disc herniation and can improve the prognosis of patients with lumbar disc herniation.

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2013 年, 北美脊柱外科学会(North American Spine Society, NASS)制订了《腰椎间盘突出症伴神经根病诊疗指南》, 提出了腰椎间盘突出症神经根压迫的诊疗流程和方法。同年, 我国卫生行业科研专项项目制订的《腰椎间盘突出症诊疗指南专家共识及临床路径》又对我国腰椎间盘突出症的诊治进行了一系列总结和概括。为了进一步规范腰椎间盘突出症的诊断及治疗技术, 改善腰椎间盘突出症的治疗效果及预后, 本课题组在借鉴已有指南和共识的基础上, 对腰椎间盘突出症诊治相关的中英文

文献进行系统回顾, 提出问题并展开讨论, 从而制订《腰椎间盘突出症诊疗指南》, 供临床医生参考。

参照 2013 年 NASS 指南的文献检索原则, 于中国知网(China National Knowledge Infrastructure, CNKI)、万方数据知识服务平台数据库、中国生物医学文献数据库(China Biology Medicine, CBM)、PubMed 数据库中对中英文文献进行检索。以“腰椎间盘突出症(lumbar disc herniation, LDH)” and “定义(definition)”, “腰椎间盘突出症(LDH)” and “自然病程(natural history)[重吸收(resorption) or 预后

(prognosis)]”,“腰椎间盘突出症(LDH)”and“诊断(diagnosis)[症状(symptom) or 体征(sign) or 影像学(imaging) or X线(X ray) or CT(Computer Tomography) or MRI(Magnetic Resonance Imaging) or 脊髓造影(myelography) or 椎间盘造影(discography) or 神经根造影(radiculography) or 神经电生理检查(electrodiagnostic testing)]”,“腰椎间盘突出症(LDH)”and“保守治疗(conservative therapy)[卧床(bed rest) or 药物治疗(drug/medical therapy) or 运动疗法(exercise therapy) or 硬膜外注射(epidural steroid injection) or 牵引(traction) or 手法治疗(manipulation)]”,“腰椎间盘突出症(LDH)”and“手术治疗(surgical treatment)[开放手术(open surgery) or 微创手术(minimally invasive surgery) or 融合手术(fusion) or 人工椎间盘置换(total disc replacement)]”为检索式,检索2019年9月以前的文献。

共检索到英文文献13 339篇、中文文献17 592篇。文献排除标准为动物研究、会议摘要、社评、信件、会议论文及学位论文。文献纳入顺序优先选择系统性综述、荟萃分析、高质量随机对照研究,其次为前瞻性非随机对照研究、回顾性队列研究和病例对照研究,最后为系列病例报告、临床经验、专家委员会意见等。专家组通过阅读文献标题、摘要和原文的方式进行筛选,最终纳入文献119篇,其中中文文献10篇、英文文献109篇。

文献的等级评定采用改良北美脊柱外科学会2013年指南的标准,参照证据推荐分级的评估、制订与评价(Grading of Recommendations Assessment Development and Evaluation, GRADE)工作组相关方法,评估研究证据的质量,结合研究设计和其他证据特征综合判定研究的证据级别。采用3级分类标准,推荐等级与文献等级评定标准对应,推荐强度自1级向3级递减。

1级:①差异有统计学意义的高质量随机对照研究,或虽然差异无统计学意义但可信区间很窄的高质量随机对照研究;②高质量随机对照研究的系统综述(前提是纳入的研究结果具有同质性)。

2级:①质量稍差的随机对照研究(如随访率<80%、非盲法对照、随机化分组不合适);②前瞻性非随机对照研究;③研究结果不同质的1级研究或2级研究的系统综述;④回顾性队列研究;⑤病例对照研究;⑥2级研究的系统综述。

3级:①系列病例报告;②临床经验、描述性研究或专家委员会报告的权威意见。

一、腰椎间盘突出症的定义

腰椎间盘突出症是在椎间盘突出病理基础上,由突出的椎间盘组织刺激和(或)压迫神经根、马尾神经所导致的临床综合征,表现为腰痛、下肢放射痛、下肢麻木、下肢无力、大小便功能障碍等^[1-4]。

二、腰椎间盘突出症的自然病程

关于腰椎间盘突出症自然病程的研究目前多限于影像学及临床随访。大部分证据表明突出的椎间盘随时间推移通常会出现不同程度的萎缩,患者临床功能得到改善,但多见于非包容性椎间盘突出^[5-6];也有相关证据表明腰椎间盘突出症状的改善与突出椎间盘的体积、椎间盘退变的变化无关^[7-8],其具体机制尚不明确(2级推荐)。

三、腰椎间盘突出症的诊断

(一)症状

基于患者年龄和病程、突出椎间盘的位置和大小、对神经的压迫及神经的炎症反应程度不同,腰椎间盘突出症常见的症状有:

- 1.放射性神经根性痛^[9-11](1级推荐);
- 2.受累神经根支配的肌肉无力和(或)神经支配区感觉异常^[9-16](1级推荐);
- 3.可伴有急性或慢性腰背部疼痛,腰部活动受限或代偿性侧凸^[10,16-18](1级推荐);
- 4.儿童及青少年腰椎间盘突出症患者常表现为腘绳肌紧张^[19-20](3级推荐);
- 5.马尾综合征^[21-22](1级推荐)。

(二)体征

- 1.受累神经根支配的运动和(或)感觉障碍,腱反射减弱^[9-16](1级推荐);
- 2.神经牵拉试验阳性^[9,10,12-14,16,23-24],主要包括股神经牵拉试验、直腿抬高试验、对侧直腿抬高试验、Lasègue征和对侧Lasègue征(1级推荐);
- 3.腰椎局部压痛,腰部活动受限,椎旁肌紧张或痉挛^[16,17,24-26](1级推荐);
- 4.马尾综合征可出现会阴部感觉障碍,肛门括约肌无力及松弛^[21-22,27](1级推荐)。

四、辅助检查

(一)X线

X线片在判断脊柱骨结构及序列变化上较其他影像学方法有诸多优势,提示椎间盘突出方面的间接征象有局部不稳、椎间隙变窄、代偿性侧凸、牵张性骨赘等^[28],但不能直接显示腰椎间盘突出,因此无直接诊断意义,不能作为诊断腰椎间盘突出症的

方法^[29](3级推荐)。

(二)CT

CT及三维重建方法可提高腰椎间盘突出症的检出率^[30-32]。CT较X线片可以更好地观察骨性结构,但对神经、椎间盘等软组织的分辨率较差,较难分辨椎间盘与神经根的关系^[33](1级推荐)。

(三)MRI

MRI为腰椎间盘突出症首选的影像学检查手段。与CT相比具有以下优势:无放射性损害、可评估椎间盘退变情况、更好地观察突出椎间盘与神经根的关系^[34-36],但对骨性结构压迫的分辨能力较低^[37-38](1级推荐)。

(四)腰椎间盘突出症的区域定位

根据椎间盘突出的病理和程度(CT或MRI),突出椎间盘组织在矢状面、水平面和冠状面均有相应的位置^[1,39]。

1.矢状面:Ⅰ层面,椎间盘层面;Ⅱ层面,椎间盘上层即上一椎体椎弓根下切迹椎体平面至椎间盘上界;Ⅲ层面,椎间盘下层即椎间盘下界至下一椎体的椎弓根下切迹椎体平面(图1)。

2.水平面:以椎体后缘为界分1~4区,两侧椎弓根内界为1、2区,中1/3为1区(中央区),左右1/3为左右侧2区(旁中央区),椎弓根内外侧之间为3区(外侧区),椎弓根外侧以外为4区(极外侧区,图2)。

3.冠状面:将骨性椎管矢状径分为四等份,从前至后一至四份分别命名为a域、b域、c域、d域(图3)。

其中Ⅲ层面3区被椎弓根所占,为无实际区域的空间区。

对腰椎矢状面结构,MRI区域定位较CT区域定位更具优势。普通CT扫描多局限于椎间盘层面,可遗漏在椎间盘层面以外椎管内椎间盘组织的图像(如Ⅱ层面或Ⅲ层面),此时应行腰椎MR或CT三维重建检查。区域定位可反映不同病理类型、不同严重程度的椎间盘突出的精确定位诊断^[39-41],为治疗方法的选择和手术的实施提供参考(2级推荐)。

(五)脊髓造影、椎间盘造影

对体内有特殊金属内植物(如心脏起搏器)无法行MR检查的患者,可行脊髓造影、CT脊髓造影(computer tomography myelography, CTM)间接观察神经受压。脊髓造影、CTM对有腰椎手术史的患者更有优势^[37,42-43]。在诊断腰椎椎间盘源性腰痛、症状体征与影像学不符合的病例以及腰椎间盘突出症再手术的术前计划制定时,可行椎间盘造影、CT椎间盘造影(computer tomography discography, CTD)辅助诊断和手术策略制订^[44-47](2级推荐)。

(六)选择性神经根造影、神经根阻滞

选择性神经根造影、神经根阻滞可用于诊断及治疗的目的。在诊断方面常用于以下情况:不典型的坐骨神经痛、影像学与症状体征不相符、多节段椎间盘突出明确责任间隙、腰椎手术失败后治疗计划的制定等^[48-49](2级推荐)。

(七)神经电生理检查

神经电生理检查时腰椎间盘突出症的诊断具有实用价值,可以在影像学证据的基础上进一步证实神经根损害的存在^[50]。H反射可以辅助诊断S₁神经根受压的腰椎间盘突出症;肌电图的神经传导和F波检查在腰椎间盘突出症的诊断中价值有

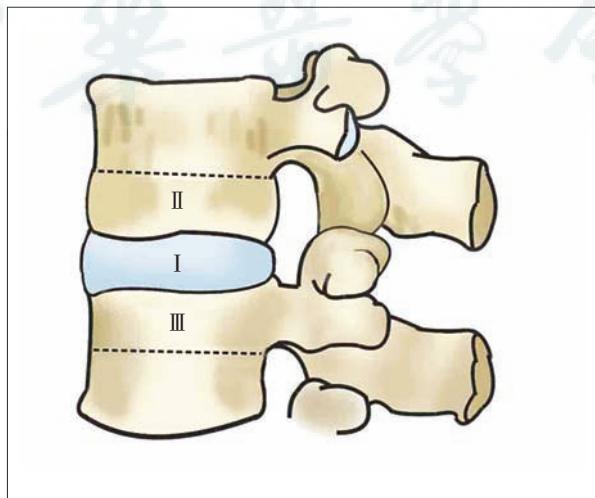


图1 矢状面分层。Ⅰ层面,椎间盘层面;Ⅱ层面,椎间盘上层即上一椎体椎弓根下切迹椎体平面至椎间盘上界;Ⅲ层面,椎间盘下层即椎间盘下界至下一椎体的椎弓根下切迹椎体平面

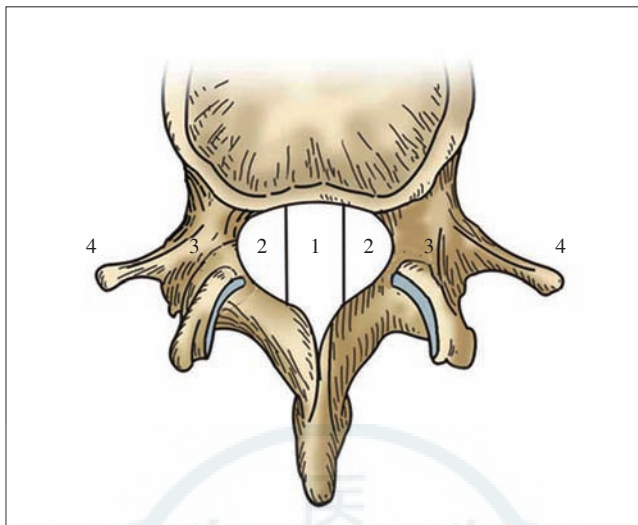


图2 水平面分区。以椎体后缘为界分区,两侧椎弓根内界为1、2区,中1/3为1区,左右1/3为左右侧2区,椎弓根内外侧之间为3区,椎弓根外侧以外为4区

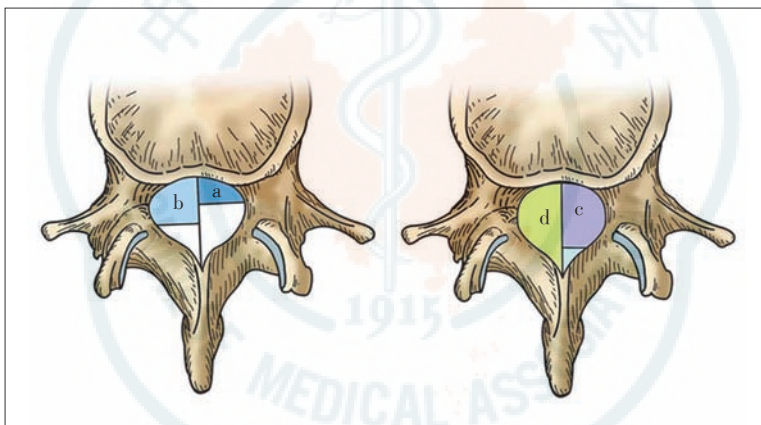


图3 冠状位分域。将骨性椎管矢状径分为四等分,分别命名为a域、b域、c域、d域

限^[51-54]。体感诱发电位可作为辅助手段诊断神经根受压,但是不能独立诊断腰椎间盘突出症及神经根受压的节段^[54-55]。目前运动诱发电位在腰椎间盘突出症诊断中的价值尚不明确^[56](2级推荐)。

五、腰椎间盘突出症的诊断标准

在诊断中必须明确腰椎间盘突出与腰椎间盘突出的区别。腰椎间盘突出为形态学或影像学定义,指髓核、纤维环或终板组织超越了相邻椎体边缘造成的椎间盘局部外形异常^[1,41]。仅凭MRI或CT即可诊断,不作为临床疾病诊断。而腰椎间盘突出症为临床诊断名词,是在腰椎间盘退变、损伤的病理基础上发生椎间盘局限性突出,刺激和(或)压迫神经根、马尾而表现出腰痛、神经根性疼痛、下肢麻木无力、大小便功能障碍等;患者具有腰椎间盘突出症相应的病史、症状、体征及影像学表现,且影像学与神经定位相符,可诊断为腰椎间盘突出症^[2,57](1级推荐)。

六、腰椎间盘突出症的保守治疗

腰椎间盘突出症有良好的自然病程,大部分腰椎间盘突出症患者经保守治疗症状均能得到改善^[57-59]。因此,非手术治疗应作为不伴有显著神经损害的腰椎间盘突出症患者的首选治疗方法。突出的椎间盘随时间推移通常会出现不同程度的萎缩,临床功能得到改善。非手术治疗的成功率约为80~90%^[60-61],但临床症状复发率达25%^[57](1级推荐)。

(一)保守治疗的时间

文献报道多数腰椎间盘突出症患者的症状经保守治疗6~12周得到改善。因此,对无显著神经损害的病例,一般推荐保守治疗的时间为6~12周^[57,62](1级推荐)。

(二)保守治疗方法

1. 卧床休息

卧床休息一直被认为是腰椎间盘突出症保守

治疗最重要的方式之一。但越来越多的循证医学证据表明,与正常的日常活动相比卧床休息并不能降低患者的疼痛程度及促进患者功能恢复^[63]。对疼痛严重需卧床休息的患者,应尽量缩短卧床时间,且在症状缓解后鼓励其尽早恢复适度的正常活动,同时需注意日常活动姿势,避免扭转、屈曲及过量负重^[64](1级推荐)。

2. 药物治疗

非甾体类抗炎药(nonsteroidal anti-inflammatory drugs, NSAIDs):是治疗腰背痛的一线药物。NSAIDs可缓解慢性腰痛并改善功能状态,但对坐骨神经痛的改善效果并不明确,不同种类NSAIDs之间效果也未发现明显差异^[65](2级推荐)。

阿片类止痛药:在减轻腰痛方面短期有益^[66]。在坐骨神经痛患者的症状改善和功能恢复方面,阿片类药物的效果仍不明确^[67],同时应关注药物长期使用的副反应及药物依赖(2级推荐)。

糖皮质激素:全身应用可短期缓解疼痛,但缺乏长期随访的数据;考虑到激素全身使用带来的副反应,不推荐长期使用^[68](2级推荐)。

肌肉松弛剂:可用于急性期和亚急性期腰痛患者的药物治疗^[69]。但在治疗坐骨神经痛方面,是否选用肌肉松弛剂缺乏相关研究(2级推荐)。

抗抑郁药:抗抑郁药对慢性腰背痛和坐骨神经痛有一定疗效^[70],但目前相关的高证据级别研究较少(2级推荐)。

其他药物:目前尚没有足够的证据支持麻醉镇静药、抗癫痫药等对腰椎间盘突出症患者的疗效^[71-72](2级推荐)。

3. 运动疗法

运动疗法包括核心肌群肌力训练、方向特异性训练、腰痛学校等。应在康复医学专业人员的指导下进行针对性、个体化的运动治疗^[2,73]。运动疗法可在短期内缓解坐骨神经痛,但疼痛减轻幅度较小,长期随访患者在减轻疼痛或残疾方面没有明显获益^[74](2级推荐)。

4. 硬膜外注射

硬膜外类固醇激素注射(epidural steroid injection, ESI)可用于腰椎间盘突出症的诊断和治疗。对根性症状明显的腰椎间盘突出症患者,ESI短期内可改善症状,但长期作用并不显著^[75](2级推荐)。

5. 腰椎牵引

腰椎牵引是治疗腰椎间盘突出症的传统手段,但目前牵引治疗对缓解腰背痛和坐骨神经痛的价

值缺乏高质量的循证医学证据支持^[76]。牵引治疗应在康复科专业医生的指导下进行,避免大重量、长时间牵引(2级推荐)。

6. 手法治疗

手法治疗可改善腰背部疼痛和功能状态。对没有手术指征的轻中度腰骶神经痛患者可改善腰椎间盘突出所致的根性症状^[77],但应注意手法治疗有加重腰椎间盘突出风险(2级推荐)。

7. 其他

热敷、针灸、按摩、中药等对缓解腰椎间盘突出症的症状均有一定的效果^[78],但相关文献随访时间较短,且实验设计有局限(2级推荐)。

七、手术治疗

与非手术治疗相比,手术治疗通常能更快及更大程度地改善症状。手术治疗方式是安全的,并发症的发生率也较低,但手术不能改善患者恢复工作的比例^[79-80](1级推荐)。

(一) 手术适应证

手术适应证包括:①腰椎间盘突出症病史超过6~12周,经系统保守治疗无效;或保守治疗过程中症状加重或反复发作;②腰椎间盘突出症疼痛剧烈,或患者处于强迫体位,影响工作或生活;③腰椎间盘突出症出现单根神经麻痹或马尾神经麻痹,表现为肌肉瘫痪或出现直肠、膀胱症状^[80-82](1级推荐)。

(二) 手术方式

腰椎间盘突出症的术式可分为四类:开放性手术、微创手术、腰椎融合术、腰椎人工椎间盘置换术。

1. 开放性手术

后路腰椎突出椎间盘组织摘除术:后路腰椎突出椎间盘组织摘除术应遵循椎板有限切除的原则,尽量减少对脊柱稳定性的破坏。手术中短期疗效优良率90%左右,长期随访(>10年)的优良率为60%~80%^[83-85](1级推荐)。

腹膜后入路椎间盘切除术:腹膜后入路椎间盘切除术能够保留脊柱后方结构的完整性,但间接减压的理念使其不利于处理非包容型椎间盘突出^[86],同时需联合融合技术。单独针对腹膜后入路处理腰椎间盘突出症的相关研究较少,但对椎间盘突出复发的患者腹膜后入路椎间盘切除术也是一种选择^[87](3级推荐)。

2. 微创手术

经皮穿刺介入手术:经皮穿刺介入手术主要包

括经皮椎间盘切吸术、经皮椎间盘激光消融术、经皮椎间盘臭氧消融术及射频消融髓核成形术等。其工作原理是减少椎间盘内压,间接减轻神经根压迫。对椎间盘内压增高型的椎间盘突出有一定的疗效,不适用于游离或明显移位的椎间盘突出,需严格掌握手术适应证^[80,88](2级推荐)。

显微腰椎间盘切除术:相对于开放手术,显微腰椎间盘切除术(包括通道辅助下的显微腰椎间盘切除术)同样安全、有效,可作为腰椎间盘突出症手术治疗的有效方式^[89-90](1级推荐)。

显微内窥镜腰椎间盘切除术(micro-endoscopic discectomy, MED):显微内窥镜腰椎间盘切除术是开放手术向微创手术的过渡。尽管其手术操作技术有较陡峭的学习曲线,但安全性和有效性与开放手术相当,在住院天数、出血量、早期恢复工作等方面优于开放手术,可作为开放手术的替代方案^[91-92](1级推荐)。

经皮内镜腰椎间盘切除术:经皮内镜腰椎间盘切除术是治疗腰椎间盘突出症的安全、有效的微创术式,与开放手术、显微或显微内窥镜腰椎间盘切除术的效果相同,而经皮内镜腰椎间盘切除术更加微创化,创伤更小、恢复更快^[4,93](1级推荐)。

3. 腰椎融合术

腰椎融合术不作为腰椎间盘突出症首选的手术方案,但以下情况可选择腰椎融合术^[94-96]:腰椎间盘突出症伴明显的慢性轴性腰背痛;巨大椎间盘突出、腰椎不稳;复发性腰椎间盘突出,尤其是合并畸形、腰椎不稳或慢性腰背痛的情况(2级推荐)。

4. 腰椎人工椎间盘置换术

腰椎人工椎间盘置换术主要用于腰椎椎间盘源性腰痛,包括包容型腰椎间盘突出患者。是否适用于非包容型椎间盘突出和有严重神经压迫症状的腰椎间盘突出患者仍无定论。大量超过10年的长期随访研究证实该技术具有不低于腰椎融合术的手术有效性和安全性^[97]。目前针对腰椎人工椎间盘置换术治疗腰椎间盘突出症的高证据等级研究较少。同时应注意腰椎人工椎间盘置换术技术难度及技术要求较高,具有一定的学习曲线(3级推荐)。

八、手术疗效评估

腰椎间盘突出症手术疗效评估指标分为两类,即较简单的评定标准和量化评定标准。较简单的评定标准包括中华医学会骨科学分会脊柱学组腰痛手术评定标准^[84]、Macnab标准^[98]、视觉模拟评

分(visual analogue scale, VAS)^[99-100]等。量化评定标准多以问卷形式评定,包括日本骨科学会(Japanese Orthopaedic Association, JOA)腰痛手术评分标准^[101-102]、Oswestry功能障碍指数(Oswestry disability index, ODI)^[103-104]、健康调查评分表SF-12(the short form-12 health survey)^[105]、健康状况评分表SF-36(the short form-36 health survey)^[106-107]、EuroQol健康指数量表EQ5D^[108]、Roland-Morris功能障碍问卷调查^[109]等。常用的手术疗效评价指标包括VAS评分、ODI指数及SF-36等^[110-112](2级推荐)。

九、手术疗效的影响因素

吸烟、高龄、肥胖、糖尿病、抑郁症、术前肌力减退甚至完全性神经功能损伤、术前病程大于3~6个月、合并下肢骨关节病等是腰椎间盘突出症手术预后不良的影响因素^[113-120](2级推荐)。

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参 考 文 献

- [1] 陈伯华, 胡有谷. 腰椎间盘突出症[M]. 第4版. 北京: 人民卫生出版社, 2012: 167-181, 275-279, 305-308.
Chen BH, Hu YG. Lumbar disc herniation[M]. 4th ed. Beijing: People's Medical Publishing House, 2012: 167-181, 275-279, 305-308.
- [2] Kreiner DS, Hwang SW, Easa JE, et al. An evidence-based clinical guideline for the diagnosis and treatment of lumbar disc herniation with radiculopathy[J]. Spine J, 2014, 14(1): 180-191. DOI: 10.1016/j.spinee.2013.08.003.
- [3] Latka D, Miekisiak G, Jarmuzek P, et al. Treatment of lumbar disc herniation with radiculopathy. Clinical practice guidelines endorsed by The Polish Society of Spinal Surgery[J]. Neurol Neurochir Pol, 2016, 50(2): 101-108. DOI: 10.1016/j.pjnns.2015.12.001.
- [4] Joaquim AF, Botelho RV, Mudo ML, et al. Lumbar herniated disc-endoscopic discectomy treatment[J]. Rev Assoc Med Bras (1992), 2018, 64(5): 397-407. DOI: 10.1590/1806-9282.64.05.397.
- [5] Chiu C, Chuang T, Chang K, et al. The probability of spontaneous regression of lumbar herniated disc: a systematic review[J]. Clin Rehabil, 2015, 29(2): 184-195. DOI: 10.1177/0269215514540919.

- [6] Zhong M, Liu JT, Jiang H, et al. Incidence of spontaneous resorption of lumbar disc herniation: a meta-analysis[J]. *Pain Physician*, 2017, 20(1): E45-E52.
- [7] Seo J, Roh Y, Kim Y, et al. Three-dimensional analysis of volumetric changes in herniated discs of the lumbar spine: does spontaneous resorption of herniated discs always occur?[J]. *Eur Spine J*, 2016, 25(5): 1393-1402. DOI: 10.1007/s00586-014-3587-1.
- [8] Masui T, Yukawa Y, Nakamura S, et al. Natural history of patients with lumbar disc herniation observed by magnetic resonance imaging for minimum 7 years[J]. *J Spinal Disord Tech*, 2005, 18(2): 121-126. DOI: 10.1097/01.bsd.0000154452.13579.b2.
- [9] Kortelainen P, Puranen J, Koivisto E, et al. Symptoms and signs of sciatica and their relation to the localization of the lumbar disc herniation[J]. *Spine (Phila Pa 1976)*, 1985, 10(1): 88-92. DOI: 10.1097/00007632-198501000-00014.
- [10] Suri P, Rainville J, Katz JN, et al. The accuracy of the physical examination for the diagnosis of midlumbar and low lumbar nerve root impingement[J]. *Spine (Phila Pa 1976)*, 2011, 36(1): 63-73. DOI: 10.1097/BRS.0b013e3181c953cc.
- [11] Vroomen PC, de Krom MC, Knottnerus JA. Diagnostic value of history and physical examination in patients suspected of sciatica due to disc herniation: a systematic review[J]. *J Neurol*, 1999, 246(10): 899-906. DOI: 10.1007/s004150050480.
- [12] Tawa N, Rhoda A, Diener I. Accuracy of clinical neurological examination in diagnosing lumbo-sacral radiculopathy: a systematic literature review[J]. *BMC Musculoskelet Disord*, 2017, 18(1): 93. DOI: 10.1186/s12891-016-1383-2.
- [13] Tawa N, Diener I, Louw Q, et al. Correlation of the self-reported Leeds assessment of neuropathic symptoms and signs score, clinical neurological examination and MR imaging in patients with lumbo-sacral radiculopathy[J]. *BMC Neurol*, 2019, 19(1): 107. DOI: 10.1186/s12883-019-1333-3.
- [14] Al Nezari NH, Schneiders AG, Hendrick PA. Neurological examination of the peripheral nervous system to diagnose lumbar spinal disc herniation with suspected radiculopathy: a systematic review and meta-analysis[J]. *Spine J*, 2013, 13(6): 657-674. DOI: 10.1016/j.spinee.2013.02.007.
- [15] Jensen OH. The level-diagnosis of a lower lumbar disc herniation: the value of sensibility and motor testing[J]. *Clin Rheumatol*, 1987, 6(4): 564-569. DOI: 10.1007/bf02330594.
- [16] Vucetic N, Svensson O. Physical signs in lumbar disc hernia[J]. *Clin Orthop Relat Res*, 1996(333): 192-201.
- [17] Stankovic R, Johnell O, Maly P, et al. Use of lumbar extension, slump test, physical and neurological examination in the evaluation of patients with suspected herniated nucleus pulposus. A prospective clinical study[J]. *Man Ther*, 1999, 4(1): 25-32. DOI: 10.1016/s1356-689x(99)80006-x.
- [18] Pearson AM, Blood EA, Frymoyer JW, et al. SPORT lumbar intervertebral disk herniation and back pain: does treatment, location, or morphology matter?[J]. *Spine (Phila Pa 1976)*, 2008, 33(4): 428-435. DOI: 10.1097/BRS.0b013e31816469de.
- [19] Kim HJ, Green DW. Adolescent back pain[J]. *Curr Opin Pediatr*, 2008, 20(1): 37-45. DOI: 10.1097/MOP.0b013e3282f357fe.
- [20] Lavelle WF, Bianco A, Mason R, et al. Pediatric disk herniation[J]. *J Am Acad Orthop Surg*, 2011, 19(11): 649-656. DOI: 10.5435/00124635-201111000-00001.
- [21] Ahn UM, Ahn NU, Buchowski JM, et al. Cauda equina syndrome secondary to lumbar disc herniation: a meta-analysis of surgical outcomes[J]. *Spine (Phila Pa 1976)*, 2000, 25(12): 1515-1522. DOI: 10.1097/00007632-200006150-00010.
- [22] Kapetanakis S, Chaniotakis C, Kazakos C, et al. Cauda equina syndrome due to lumbar disc herniation: a review of literature[J]. *Folia Medica*, 2017, 59(4): 377-386. DOI: 10.1515/folmed-2017-0038.
- [23] Poiraudou S, Foltz V, Drape JL, et al. Value of the bell test and the hyperextension test for diagnosis in sciatica associated with disc herniation: comparison with Lasegue's sign and the crossed Lasegue's sign[J]. *Rheumatology (Oxford)*, 2001, 40(4): 460-466. DOI: 10.1093/rheumatology/40.4.460.
- [24] van der Windt DA, Simons E, Riphagen II, et al. Physical examination for lumbar radiculopathy due to disc herniation in patients with low-back pain[J]. *Cochrane Database Syst Rev*, 2010(2): CD007431. DOI: 10.1002/14651858.CD007431.pub2.
- [25] 许德荣, 宋友东, 王海, 等. 我国青少年腰椎间盘突出症的荟萃分析[J]. *中华医学杂志*, 2013, 93(45): 3606-3609. DOI: 10.3760/cma.j.issn.0376-2491.2013.45.011.
- Xu DR, Song YD, Wang H, et al. Meta-analysis of lumbar disc herniation in Chinese adolescents[J]. *Zhonghua Yi Xue Za Zhi*, 2013, 93(45): 3606-3609. DOI: 10.3760/cma.j.issn.0376-2491.2013.45.011.
- [26] Hirayama J, Yamagata M, Ogata S, et al. Relationship between low-back pain, muscle spasm and pressure pain thresholds in patients with lumbar disc herniation[J]. *Eur Spine J*, 2006, 15(1): 41-47. DOI: 10.1007/s00586-004-0813-2.
- [27] Gitelman A, Hishmeh S, Morelli BN, et al. Cauda equina syndrome: a comprehensive review[J]. *Am J Orthop (Belle Mead NJ)*, 2008, 37(11): 556-562.
- [28] Amin RM, Andrade NS, Neuman BJ. Lumbar disc herniation[J]. *Curr Rev Musculoskelet Med*, 2017, 10(4): 507-516. DOI: 10.1007/s12178-017-9441-4.
- [29] Hakelius A, Hindmarsh J. The comparative reliability of preoperative diagnostic methods in lumbar disc surgery[J]. *Acta Orthop Scand*, 1972, 43(4): 234-238. DOI: 10.3109/17453677208991261.
- [30] Bosacco SJ, Berman AT, Garbarino JL, et al. A comparison of CT scanning and myelography in the diagnosis of lumbar disc herniation[J]. *Clin Orthop Relat Res*, 1984(190): 124-128. DOI: 10.1097/00003086-198411000-00017.
- [31] Modic MT, Masaryk T, Boumpfrey F, et al. Lumbar herniated disk disease and canal stenosis: prospective evaluation by surface coil MR, CT, and myelography[J]. *AJR Am J Roentgenol*, 1986, 147(4): 757-765. DOI: 10.2214/ajr.147.4.757.
- [32] Houghton VM, Eldevik OP, Magnaes B, et al. A prospective com-

- parison of computed tomography and myelography in the diagnosis of herniated lumbar disks[J]. *Radiology*, 1982, 142(1): 103-110. DOI: 10.1148/radiology.142.1.7053518.
- [33] van Rijn JC, Klemetso N, Reitsma JB, et al. Observer variation in the evaluation of lumbar herniated discs and root compression: spiral CT compared with MRI[J]. *Br J Radiol*, 2006, 79(941): 372-377. DOI: 10.1259/bjr/26216335.
- [34] Wassenaar M, van Rijn RM, van Tulder MW, et al. Magnetic resonance imaging for diagnosing lumbar spinal pathology in adult patients with low back pain or sciatica: a diagnostic systematic review[J]. *Eur Spine J*, 2012, 21(2): 220-227. DOI: 10.1007/s00586-011-2019-8.
- [35] Albeck MJ, Hilden J, Kjaer L, et al. A controlled comparison of myelography, computed tomography, and magnetic resonance imaging in clinically suspected lumbar disc herniation[J]. *Spine (Phila Pa 1976)*, 1995, 20(4): 443-448. DOI: 10.1097/00007632-199502001-00006.
- [36] Jackson RP, Cain JJ, Jacobs RR, et al. The neuroradiographic diagnosis of lumbar herniated nucleus pulposus: II. A comparison of computed tomography (CT), myelography, CT - myelography, and magnetic resonance imaging[J]. *Spine (Phila Pa 1976)*, 1989, 14(12): 1362-1367. DOI: 10.1097/00007632-198912000-00013.
- [37] Epstein NE. Lumbar surgery for 56 limb fractures emphasizing noncalcified type III lesions[J]. *Spine (Phila Pa 1976)*, 1992, 17(12): 1489-1496. DOI: 10.1097/00007632-199212000-00008.
- [38] Peh WC, Griffith JF, Yip DK, et al. Magnetic resonance imaging of lumbar vertebral apophyseal ring fractures[J]. *Australas Radiol*, 1998, 42(1): 34-37. DOI: 10.1111/j.1440-1673.1998.tb00561.x.
- [39] 胡有谷, 吕成昱, 陈伯华. 腰椎间盘突出症的区域定位[J]. *中华骨科杂志*, 1998, 18(1): 14-16.
Hu YG, Lyu CY, Chen BH. The three-dimensional localization of the herniation of lumbar disc[J]. *Chin J Orthop*, 1998, 18(1): 14-16.
- [40] Wiltse L, Berger P, Mcculloch J. A system for reporting the size and location of lesions in the spine[J]. *Spine (Phila Pa 1976)*, 1997, 22(13): 1534-1537. DOI: 10.1097/00007632-199707010-00023.
- [41] Fardon DF, Williams AL, Dohring EJ, et al. Lumbar disc nomenclature: version 2.0[J]. *Spine J*, 2014, 14(11): 2525-2545. DOI: 10.1016/j.spinee.2014.04.022.
- [42] Epstein NE, Epstein JA, Carras R, et al. Far lateral lumbar disc herniations and associated structural abnormalities. An evaluation in 60 patients of the comparative value of CT, MRI, and myelo-CT in diagnosis and management[J]. *Spine (Phila Pa 1976)*, 1990, 15(6): 534-539. DOI: 10.1097/00007632-199006000-00019.
- [43] Raskin SP, Keating JW. Recognition of lumbar disk disease: comparison of myelography and computed tomography[J]. *AJR Am J Roentgenol*, 1982, 139(2): 349-355. DOI: 10.2214/ajr.139.2.349.
- [44] Sachs BL, Vanharanta H, Spivey MA, et al. Dallas discogram description. A new classification of CT/discography in low-back disorders[J]. *Spine (Phila Pa 1976)*, 1987, 12(3): 287-294. DOI: 10.1097/00007632-198704000-00018.
- [45] Saboeiro GR. Lumbar Discography[J]. *Radiol Clin North Am*, 2009, 47(3): 421-433. DOI: 10.1016/j.rcl.2009.02.002.
- [46] Greenspan A, Amparo EG, Gorczyca DP, et al. Is there a role for diskography in the era of magnetic resonance imaging? Prospective correlation and quantitative analysis of computed tomography-diskography, magnetic resonance imaging, and surgical findings [J]. *J Spinal Disord*, 1992, 5(1): 26-31. DOI: 10.1097/00002517-199203000-00004.
- [47] Kluner C, Kivelitz D, Rogalla P, et al. Percutaneous discography: comparison of low-dose CT, fluoroscopy and MRI in the diagnosis of lumbar disc disruption[J]. *Eur Spine J*, 2006, 15(5): 620-626. DOI: 10.1007/s00586-005-1030-3.
- [48] Datta S, Everett CR, Trescot AM, et al. An updated systematic review of the diagnostic utility of selective nerve root blocks[J]. *Pain Physician*, 2007, 10(1): 113-128.
- [49] Dooley JF, Mcbroom RJ, Taguchi T, et al. Nerve root infiltration in the diagnosis of radicular pain[J]. *Spine (Phila Pa 1976)*, 1988, 13(1): 79-83. DOI: 10.1097/00007632-198801000-00019.
- [50] 齐宗华, 西永明, 胡有谷. 腰椎间盘突出症神经根损害的肌电图检查分析[J]. *中国骨与关节外科*, 2009, 2(1): 9-11. DOI: 10.3969/j.issn.1674-1439.2009.01.005.
Qi ZH, Xi YM, Hu YG. Value of electrophysiologic study to evaluate nerve root impairment in lumbar disc herniation[J]. *Chin J Bone Joint Surg*, 2009, 2(1): 9-11. DOI: 10.3969/j.issn.1674-1439.2009.01.005.
- [51] Tullberg T, Svanborg E, Isaccsson J, et al. A preoperative and postoperative study of the accuracy and value of electrodiagnosis in patients with lumbosacral disc herniation[J]. *Spine (Phila Pa 1976)*, 1993, 18(7): 837 - 842. DOI: 10.1097/00007632 - 199306000-00005.
- [52] Albeck MJ, Taher G, Lauritzen M, et al. Diagnostic value of electrophysiological tests in patients with sciatica[J]. *Acta Neurol Scand*, 2000, 101(4): 249-254. DOI: 10.1034/j.1600-0404.2000.101004249.x.
- [53] Dillingham TR, Dasher KJ. The lumbosacral electromyographic screen: revisiting a classic paper[J]. *Clin Neurophysiol*, 2000, 111(12): 2219-2222. DOI: 10.1016/S1388-2457(00)00461-2.
- [54] Beyaz EA, Akyuz G, Us O. The role of somatosensory evoked potentials in the diagnosis of lumbosacral radiculopathies[J]. *Electromyogr Clin Neurophysiol*, 2009, 49(4): 131-142.
- [55] Pape E, Eldevik O, Vandvik B. Diagnostic validity of somatosensory evoked potentials in subgroups of patients with sciatica[J]. *Eur Spine J*, 2002, 11(1): 38-46. DOI: 10.1007/s005860100322.
- [56] Tabaraud F, Hugon J, Chazot F, et al. Motor evoked responses after lumbar spinal stimulation in patients with L5 or S1 radicular involvement[J]. *Electroencephalogr Clin Neurophysiol*, 1989, 72(4): 334-339. DOI: 10.1016/0013-4694(89)90069-2.
- [57] Deyo RA, Mirza SK. Clinical practice. Herniated lumbar intervertebral disk[J]. *N Engl J Med*, 2016, 374(18): 1763 - 1772. DOI: 10.1056/NEJMc1512658.
- [58] Benoist M. The natural history of lumbar disc herniation and radiculopathy[J]. *Joint Bone Spine*, 2002, 69(2): 155 - 160. DOI:

- DOI: 10.1016/s1297-319x(02)00385-8.
- [59] Weber H. Lumbar disc herniation. A controlled, prospective study with ten years of observation[J]. Spine (Phila Pa 1976), 1983, 8(2): 131-140. DOI: 10.1097/00007632-199701150-00015.
- [60] Pinto RZ, Maher CG, Ferreira ML, et al. Drugs for relief of pain in patients with sciatica: systematic review and meta-analysis[J]. BMJ, 2012, 344: e497. DOI: 10.1136/bmj.e497.
- [61] Deyo RA, Diehl AK, Rosenthal M. How many days of bed rest for acute low back pain? A randomized clinical trial[J]. N Engl J Med, 1986, 315(17): 1064-1070. DOI: 10.1056/NEJM198610233151705.
- [62] Vroomen PC, de Krom MC, Knottnerus JA. Predicting the outcome of sciatica at short-term follow-up[J]. Br J Gen Pract, 2002, 52(475): 119-123. DOI: 10.1097/00000441-200202000-00012.
- [63] Dahm KT, Brurberg KG, Jamtvedt G, et al. Advice to rest in bed versus advice to stay active for acute low-back pain and sciatica [J]. Cochrane Database Syst Rev, 2010, 6: CD007612. DOI: 10.1002/14651858.CD007612.pub2.
- [64] Di Mattia F, Tejani S, Hall T. Bed rest for sciatica: a closer look at the evidence[J]. J Orthop Sports Phys Ther, 2018, 48(6): 436-438. DOI: 10.2519/jospt.2018.0609.
- [65] Enthoven WT, Roelofs PD, Deyo RA, et al. Non-steroidal anti-inflammatory drugs for chronic low back pain[J]. Cochrane Database Syst Rev, 2016, 2: CD012087. DOI: 10.1002/14651858.CD012087.
- [66] Chaparro LE, Furlan AD, Deshpande A, et al. Opioids compared with placebo or other treatments for chronic low back pain[J]. Spine (Phila Pa 1976), 2014, 39(7): 556-563. DOI: 10.1097/BRS.0000000000000249.
- [67] Khoromi S, Cui L, Nackers L, et al. Morphine, nortriptyline and their combination vs. placebo in patients with chronic lumbar root pain[J]. Pain, 2007, 130(1): 66-75. DOI: 10.1016/j.pain.2006.10.029.
- [68] Balakrishnamoorthy R, Horgan I, Perez S, et al. Does a single dose of intravenous dexamethasone reduce Symptoms in Emergency department patients with low Back pain and RAiculopathy (SEBRA)? A double-blind randomised controlled trial[J]. Emerg Med J, 2015, 32(7): 525-530. DOI: 10.1136/emered-2013-203490.
- [69] Qaseem A, Wilt TJ, Mclean RM, et al. Noninvasive treatments for acute, subacute, and chronic low back pain: a clinical practice guideline from the American college of physicians[J]. Ann Intern Med, 2017, 166(7): 514-530. DOI: 10.7326/M16-2367.
- [70] Williamson OD, Sagman D, Bruins RH, et al. Antidepressants in the treatment for chronic low back pain: questioning the validity of meta-analyses[J]. Pain Pract, 2014, 14(2): E33-E41. DOI: 10.1111/papr.12119.
- [71] Mathieson S, Maher CG, McLachlan AJ, et al. Trial of pregabalin for acute and chronic sciatica[J]. N Engl J Med, 2017, 376(12): 1111-1120. DOI: 10.1056/NEJMoa1614292.
- [72] Brötz D, Maschke E, Burkard S, et al. Is there a role for benzodiazepines in the management of lumbar disc prolapse with acute sciatica? [J]. Pain, 2010, 149(3): 470-475. DOI: 10.1016/j.pain.2010.02.015.
- [73] 周谋望, 岳寿伟, 何成奇, 等. “腰椎间盘突出症的康复治疗”中国专家共识[J]. 中国康复医学杂志, 2017, 32(2): 129-135. DOI: 10.3969/j.issn.1001-1242.2017.02.001.
- Zhou MW, Yue SW, He CQ, et al. Chinese experts' consensus on rehabilitation treatment of lumbar disc herniation[J]. Chinese Journal of Rehabilitation Medicine, 2017, 32(2): 129-135. DOI: 10.3969/j.issn.1001-1242.2017.02.001.
- [74] Fernandez M, Hartvigsen J, Ferreira ML, et al. Advice to stay active or structured exercise in the management of sciatica[J]. Spine (Phila Pa 1976), 2015, 40(18): 1457-1466. DOI: 10.1097/BRS.0000000000001036.
- [75] Chou R, Hashimoto R, Friedly J. Epidural corticosteroid injections for radiculopathy and spinal stenosis[J]. Ann Intern Med, 2016, 164(9): 635-636. DOI: 10.7326/L15-0563.
- [76] Wegner I, Widyahening IS, van Tulder MW, et al. Traction for low-back pain with or without sciatica[J]. Cochrane Database Syst Rev, 2013(8): D3010. DOI: 10.1002/14651858.CD003010.pub5.
- [77] Santilli V, Beghi E, Finucci S. Chiropractic manipulation in the treatment of acute back pain and sciatica with disc protrusion: a randomized double-blind clinical trial of active and simulated spinal manipulations[J]. Spine J, 2006, 6(2): 131-137. DOI: 10.1016/j.spinee.2005.08.001.
- [78] Mo Z, Li D, Zhang R, et al. Comparisons of the effectiveness and safety of Tuina, acupuncture, traction, and Chinese herbs for lumbar disc herniation: asystematic review and network meta-analysis [J]. Evid Based Complement Alternat Med, 2019, 2019: 6821310. DOI: 10.1155/2019/6821310.
- [79] Chen BL, Guo JB, Zhang HW, et al. Surgical versus non-operative treatment for lumbar disc herniation: a systematic review and meta-analysis[J]. Clin Rehabil, 2017, 32(2): 146-160. DOI: 10.1177/0269215517719952.
- [80] Gibson JN, Waddell G. Surgical interventions for lumbar disc prolapse[J]. Cochrane Database Syst Rev, 2007(1): CD001350. DOI: 10.1002/14651858.CD001350.pub4.
- [81] Larequi-Lauber T, Vader JP, Burnand B, et al. Appropriateness of indications for surgery of lumbar disc hernia and spinal stenosis [J]. Spine (Phila Pa 1976), 1997, 22(2): 203-209. DOI: 10.1097/00007632-199701150-00015.
- [82] 马庆军, 刘忠军, 陈仲强, 等. 第六届国际腰椎病研究学会高级讲习班演讲综述[J]. 中国脊柱脊髓杂志, 1996, 6(1): 37-40.
- Ma QJ, Liu ZJ, Chen ZQ, et al. A summary of the speech of the sixth international society for lumbar spine research[J]. Chin J Spine Spinal Cord, 1996, 6(1): 37-40.
- [83] Loupasis GA, Stamos K, Katonis PG, et al. Seven- to 20-year outcome of lumbar discectomy[J]. Spine(Phila Pa 1976), 1999, 24(22): 2313-2317. DOI: 10.1097/00007632-199911150-00005.
- [84] 陈伯华, 陈福令, 胡有谷. 腰椎间盘突出症术后的中远期疗效分析[J]. 中华骨科杂志, 2009, 29(7): 630-633. DOI: 10.3760/cma.j.issn.0253-2352.2009.07.005.
- Chen BH, Chen FL, Hu YG. Long term results of discectomy for

- lumbar intervertebral disc herniation[J]. Chin J Orthop, 2009, 29(7): 630-633. DOI: 10.3760/cma.j.issn.0253-2352.2009.07.005.
- [85] 周秉文, 胡有谷, 孙进修. 腰椎间盘突出症的分型和手术商榷[J]. 中华骨科杂志, 1988, 8(5): 366-369.
- Zhou BW, Hu YG, Sun JX. The pathological patterns of lumbar disc herniation and prolapsed lumbar disc tissue excision[J]. Chin J Orthop, 1988, 8(5): 366-369.
- [86] 郑召民, 王建儒. 开展侧方入路腰椎间融合术应思考的几个问题[J]. 中国脊柱脊髓杂志, 2018, 28(5): 385-388. DOI: 0.3969/j.issn.1004-406X.2018.05.01.
- Zheng ZM, Wang JR. Several considerations about performing lateral lumbar interbody fusion[J]. Chin J Spine Spinal Cord, 2018, 28(5): 385-388. DOI: 0.3969/j.issn.1004-406X.2018.05.01.
- [87] Mamuti M, Fan S, Liu J, et al. Mini-open anterior lumbar interbody fusion for recurrent lumbar disc herniation following posterior instrumentation[J]. Spine (Phila Pa 1976), 2016, 41(18): E1104-E1114. DOI: 10.1097/BRS.0000000000001569.
- [88] 中华医学会放射学分会介入学组. 腰椎间盘突出症的介入和微创治疗操作规范的专家共识[J]. 中华放射学杂志, 2014, 48(1): 10-12. DOI: 10.3760/cma.j.issn.1005-1201.2014.01.004.
- Interventional Radiology Sub-society of Chinese Medical Association. Expert consensus on intervention and minimally invasive treatment of lumbar disc herniation[J]. Chin J Radiol, 2014, 48(1): 10-12. DOI: 10.3760/cma.j.issn.1005-1201.2014.01.004.
- [89] Zhang Q, Qian J, Zhu Y. Meta-analysis on microdiscectomy and sequestrectomy for lumbar disc herniation[J]. J Invest Surg, 2015, 28(4): 225-229. DOI: 10.3109/08941939.2015.1006378.
- [90] Azarhomayoun A, Chou R, Shirdel S, et al. Sequestrectomy versus conventional microdiscectomy for the treatment of a lumbar disc herniation: asystematic review[J]. Spine (Phila Pa 1976), 2015, 40(24): E1330-E1339. DOI: 10.1097/BRS.0000000000001174.
- [91] Smith N, Masters J, Jensen C, et al. Systematic review of microendoscopic discectomy for lumbar disc herniation[J]. Eur Spine J, 2013, 22(11): 2458-2465. DOI: 10.1007/s00586-013-2848-8.
- [92] He J, Xiao S, Wu Z, et al. Microendoscopic discectomy versus open discectomy for lumbar disc herniation: a meta-analysis[J]. Eur Spine J, 2016, 25(5): 1373-1381. DOI: 10.1007/s00586-016-4523-3.
- [93] Ruetten S, Komp M, Merk H, et al. Full-endoscopic interlaminar and transforaminal lumbar discectomy versus conventional microsurgical technique: a prospective, randomized, controlled study[J]. Spine (Phila Pa 1976), 2008, 33(9): 931-939. DOI: 10.1097/BRS.0b013e31816c8af7.
- [94] Tanavalee C, Limthongkul W, Yingsakmongkol W, et al. A comparison between repeat discectomy versus fusion for the treatment of recurrent lumbar disc herniation: systematic review and meta-analysis[J]. J Clin Neurosci, 2019, 66: 202-208. DOI: 10.1016/j.jocn.2019.05.004.
- [95] Satoh I, Yonenobu K, Hosono N, et al. Indication of posterior lumbar interbody fusion for lumbar disc herniation[J]. J Spinal Disord Tech, 2006, 19(2): 104-108. DOI: 10.1097/01.bsd.0000180991.98751.95.
- [96] Wang JC, Dailey AT, Mummaneni PV, et al. Guideline update for the performance of fusion procedures for degenerative disease of the lumbar spine. Part 8: lumbar fusion for disc herniation and radiculopathy[J]. J Neurosurg Spine, 2014, 21(1): 48-53. DOI: 10.3171/2014.4.SPINE14271.
- [97] 吴佳源, 田伟. 腰椎人工椎间盘置换术的研究进展[J]. 中国脊柱脊髓杂志, 2019, 29(3): 268-274. DOI: 10.3969/j.issn.1004-406X.2019.03.11.
- Wu JY, Tian W. Progress in research of lumbar total disc replacement[J]. Chin J Spine Spinal Cord, 2019, 29(3): 268-274. DOI: 10.3969/j.issn.1004-406X.2019.03.11.
- [98] Macnab I. Negative disc exploration. An analysis of the causes of nerve - root involvement in sixty - eight patients[J]. J Bone Joint Surg Am, 1971, 53(5): 891-903.
- [99] Vishwanathan K, Braithwaite I. Comparative responsiveness of four visual analogue scales in microdiscectomy for lumbar disc herniation[J]. Eur J Orthop Surg Traumatol, 2019, 29(6): 1199-1204. DOI: 10.1007/s00590-019-02429-z.
- [100] Haefeli M, Elfering A. Pain assessment[J]. Eur Spine J, 2006, 15(S1): S17-S24. DOI: 10.1007/s00586-005-1044-x.
- [101] Fujiwara A, Kobayashi N, Saiki K, et al. Association of the Japanese Orthopaedic Association score with the Oswestry Disability Index, Roland-Morris Disability Questionnaire, and short-form 36 [J]. Spine (Phila Pa 1976), 2003, 28(14): 1601 - 1607. DOI: 10.1097/01.brs.0000077510.95462.39.
- [102] Azimi P, Mohammadi HR, Montazeri A. An outcome measure of functionality and pain in patients with lumbar disc herniation: a validation study of the Japanese Orthopedic Association (JOA) score[J]. J Orthop Sci, 2012, 17(4): 341 - 345. DOI: 10.1007/s00776-012-0232-x.
- [103] Fairbank JC, Couper J, Davies JB, et al. The Oswestry low back pain disability questionnaire[J]. Physiotherapy, 1980, 66(8): 271-273.
- [104] Jeremy CT, Fairbank PB. The Oswestry Disability Index[J]. Spine (Phila Pa 1976), 2000, 25(22): 2940-2953. DOI: 10.1097/00007632-200011150-00017.
- [105] Ware JJ, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity[J]. Med Care, 1996, 34(3): 220-233. DOI: 10.1097/00005650-199603000-00003.
- [106] Ware JJ. SF-36 health survey update[J]. Spine (Phila Pa 1976), 2000, 25(24): 3130-3139. DOI: 10.1097/00007632-200012150-00008.
- [107] Laucis NC, Hays RD, Bhattacharyya T. Scoring the SF-36 in orthopaedics: a brief guide[J]. J Bone Joint Surg Am, 2015, 97(19): 1628-1634. DOI: 10.2106/JBJS.O.00030.
- [108] Johnsen LG, Hellum C, Nygaard OP, et al. Comparison of the SF6D, the EQ5D, and the Oswestry Disability Index in patients with chronic low back pain and degenerative disc disease[J]. BMC Musculoskelet Disord, 2013, 14: 148. DOI: 10.1186/1471-2474-14-148.
- [109] Roland M, Morris R. A study of the natural history of back pain.

- Part I: development of a reliable and sensitive measure of disability in low-back pain[J]. *Spine (Phila Pa 1976)*, 1983, 8(2): 141-144. DOI: 10.1097/00007632-198303000-00004.
- [110] Weinstein JN, Tosteson TD, Lurie JD, et al. Surgical vs nonoperative treatment for lumbar disc herniation[J]. *JAMA*, 2006, 296(20): 2441-2450. DOI: 10.1001/jama.296.20.2441.
- [111] Nikoobakht M, Yekaninejad MS, Pakpour AH, et al. Plasma disc decompression compared to physiotherapy for symptomatic contained lumbar disc herniation: a prospective randomized controlled trial[J]. *Neurol Neurochir Pol*, 2016, 50(1): 24-30. DOI: 10.1016/j.pjnns.2015.11.001.
- [112] Gerszten PC, Smuck M, Rathmell JP, et al. Plasma disc decompression compared with fluoroscopy-guided transforaminal epidural steroid injections for symptomatic contained lumbar disc herniation: a prospective, randomized, controlled trial[J]. *J Neurosurg Spine*, 2010, 12(4): 357-371. DOI: 10.3171/2009.10.SPINE09208.
- [113] Wilson CA, Roffey DM, Chow D, et al. A systematic review of preoperative predictors for postoperative clinical outcomes following lumbar discectomy[J]. *Spine J*, 2016, 16(11): 1413-1422. DOI: 10.1016/j.spinee.2016.08.003.
- [114] Rihn JA, Hilibrand AS, Radcliff K, et al. Duration of symptoms resulting from lumbar disc herniation: effect on treatment outcomes: analysis of the Spine Patient Outcomes Research Trial (SPORT) [J]. *J Bone Joint Surg Am*, 2011, 93(20): 1906-1914. DOI: 10.2106/JBJS.J.00878.
- [115] Wang H, Zhang D, Ma L, et al. Factors predicting patient dissatisfaction 2 years after discectomy for lumbar disc herniation in a Chinese older cohort: a prospective study of 843 cases at a single institution[J]. *Medicine (Baltimore)*, 2015, 94(40): e1584. DOI: 10.1097/MD.0000000000001584.
- [116] Nv A, Rajasekaran S, Ks S, et al. Factors that influence neurological deficit and recovery in lumbar disc prolapse-a narrative review [J]. *Int Orthop*, 2019, 43(4): 947-955. DOI: 10.1007/s00264-018-4242-y.
- [117] Stottrup CC, Andresen AK, Carreon L, et al. Increasing reoperation rates and inferior outcome with prolonged symptom duration in lumbar disc herniation surgery - a prospective cohort study[J]. *Spine J*, 2019, 19(9): 1463-1469. DOI: 10.1016/j.spinee.2019.04.001.
- [118] Balaara A, Xu XF, Huang YH, et al. Predictors of the outcome of lumbar disc herniation following classical surgery: laminotomy with discectomy[J]. *Orthopade*, 2017, 46(6): 530-537. DOI: 10.1007/s00132-017-3398-2.
- [119] Madsbu MA, Salvesen Ø, Werner DAT, et al. Surgery for herniated lumbar disc in daily tobacco smokers: a multicenter observational study[J]. *World Neurosurg*, 2018, 109: e581-e587. DOI: 10.1016/j.wneu.2017.10.024.
- [120] Koerner JD, Glaser J, Radcliff K. Which variables are associated with patient - reported outcomes after discectomy? Review of SPORT disc herniation studies[J]. *Clin Orthop Relat Res*, 2015, 473(6): 2000-2006. DOI: 10.1007/s11999-014-3671-1.

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