

半髋关节置换术的研究进展

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收稿日期: 2025年7月14日; 录用日期: 2025年8月7日; 发布日期: 2025年8月15日

摘 要

目的: 介绍不同髋关节置换术手术入路发展及适应人群, 半髋关节置换术改良入路、微创入路及不同假体和有无使用骨水泥的研究进展。方法: 广泛查阅国内、外近年相关文献, 对半髋关节置换术改良如路、微创入路及假体进行总结分析。结论: 半髋关节置换术是治疗老年人股骨颈骨折最主要的手术方式之一。微创及改良入路对比传统入路各有优势, 但多是短中期随访结果, 需要长期随访数据来证明其优势及并发症发生情况。双极半髋关节置换与单极半髋关节置换的选择尚未达成一致, 基于不同情况做出个性化选择。双极半髋关节置换的骨溶解问题, 需进行更多改良解决该问题。半髋关节置换使用骨水泥假体有显著优势, 但临床实践多使用非骨水泥假体。

关键词

半髋关节置换, 人工股骨头置换, 微创入路, 骨水泥

Research Progress in Hemiarthroplasty

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Received: Jul. 14th, 2025; accepted: Aug. 7th, 2025; published: Aug. 15th, 2025

Abstract

Objective: To summarize the development of surgical approaches for hemiarthroplasty and their indications, as well as research progress on modified approaches, minimally invasive approaches, different prosthesis designs, and the use of cement. **Methods:** Based on an extensive review of recent domestic and international literature, the modified approaches, minimally invasive approaches,

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and prosthesis options for hemiarthroplasty were analyzed. Conclusion: Hemiarthroplasty is one of the primary surgical procedures for managing femoral neck fractures in elderly patients. Minimally invasive and modified approaches offer distinct advantages over the traditional approach; however, the evidence primarily stems from short-to mid-term follow-up studies. Long-term follow-up data is necessary to confirm their benefits and assess complication rates. No consensus exists regarding the choice between bipolar and unipolar hemiarthroplasty, necessitating individualized selection based on specific clinical circumstances. The issue of osteolysis associated with bipolar hemiarthroplasty requires further modifications and investigation. While cemented prostheses demonstrate significant advantages in hemiarthroplasty, uncemented prostheses are more commonly utilized in clinical practice.

Keywords

Hemiarthroplasty, Femoral Head Replacement, Minimally Invasive Approach, Cement

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1. 引言

随着人口老龄化加速,全球髋部骨折年发病率呈上升趋势,我国髋部骨折其中约 50%为股骨颈骨折[1]。半髋关节置换术(Hemiarthroplasty, HA)是治疗老年移位型股骨颈骨折(Femoral Neck Fracture, FNF)的主流术式,尤其适用于高龄、活动需求较低的患者[2]。近年来,半髋关节置换术的技术演进集中于微创化、假体设计优化及并发症防控三大方向,同时其与全髋关节置换术(Total Hip Arthroplasty, THA)的适应证争议持续引发学界关注。现就半髋关节置换术进行文献总结。

2. 髋关节置换术

髋关节置换术是临床上治疗股骨颈骨折、股骨头坏死及髋关节骨性关节炎等疾病的常用方法,主要采用人工髋臼、人工股骨头来置换损伤的髋关节,从而纠正畸形,缓解疼痛并提高关节功能。根据不同置换范围分为全髋关节置换术、半髋关节置换术和表面置换术。

全髋关节置换术问世于 20 世纪 50 年代[3],通过人工髋臼和股骨头置换损伤的髋关节。发展至今全髋关节置换术被认为是一种非常成功的手术,作为缓解疼痛、恢复髋关节功能、改善髋关节疼痛或畸形患者生活质量的最有效方法之一,在世界范围内得到了广泛的使用。全髋关节置换术主要有 4 种手术入路:后外侧、直接外侧、前外侧和直接前入路[4]。为了减少肌肉等软组织损伤,降低术后并发症发生率,研究者们报道了许多微创入路,如直接前方入路(Direct Anterior Approach, DAA)、微创前外侧入路又称慕尼黑骨科(Orthopädische Chirurgie München, OCM)入路、保留梨状肌后入路(Piriformis-Keeping Posterior Approach, PSPA)和 SuperPATH 入路等。此外,微创入路具有一定学习曲线,术者必须具备充分的解剖知识和手术经验,盲目推行微创可能会起到相反效果[5]。

髋关节表面置换术(Hip Resurfacing Arthroplasty, HRA),于 20 世纪 20 年代 Smith-Peterson 首先建立了原始模型,采用玻璃、钴铬合金行股骨头表面置换[6]。髋关节表面置换术在设计上不同于传统的全髋置换,其保留了股骨颈,没有承重的股骨柄,并且使用较大的球头,头颈比例和生理接近[7]。表面置换假体的第一代产品主要基于聚乙烯-金属关节面设计,但并未得到广泛应用。究其根本原因在于聚乙烯髋臼面的磨损速度相对较快。由此产生的聚乙烯颗粒会导致假体周围炎症反应,进而引发植入体松动。

直到新一代采用金属-金属关节面设计的表面置换假体问世(该设计具有极高的耐磨特性),这种术式才重新获得学界关注[8]。目前该术式主要适用于较年轻(通常 21~55 岁)、活动量较大的髋关节骨关节炎患者,且要求患者股骨具备足够的骨量[9]。

半髋关节置换又称人工股骨头置换,与全髋关节置换不同通过人工股骨头置换损伤的髋关节。半髋关节置换术是目前老年人股骨颈骨折最主要的手术方式之一,旨在恢复患者的髋关节功能,具有手术创伤小等优点[10]-[13]。半髋关节置换术的手术入路通常有前侧入路、外侧入路、前外侧入路、后侧入路等。

3. 手术技术与假体设计的革新与研究进展

3.1. 微创与改良手术入路

半髋关节置换术是治疗老年股骨颈骨折的常用手术,尤其适用于高龄、活动量低的患者。随着微创手术(Minimally Invasive Surgery, MIS)技术的发展,改良入路通过减小软组织损伤、优化康复预后,成为研究热点。微创入路的核心是缩小切口并减少肌肉剥离,以加速术后功能恢复。

前外侧微创入路(Anterolateral Minimally Invasive Approach, ALMIS)是对传统前外侧入路的改良术式,其通过阔筋膜张肌前侧与臀中肌后侧之间的肌间隙进行操作,并实施前侧关节囊切开术。该术式通常会在手术结束时切除关节囊且不予重建。Shigemura 等学者通过系统回顾分析证明,ALMIS 的功能性预后优于经典外侧入路,但术中失血量较多[14]。Tsailas 团队将 ALMIS 与常规后侧入路对比后发现,前者术后下肢长度差异更小,但手术耗时更长[15]。

直接上入路(Direct Superior Approach, DSA)是后外侧入路的一种微创变体,从臀中肌后方进入关节。因此,关节囊切开术在背侧进行,通常在手术结束时重建。Ulivi 等人通过一项随机对照试验证明,与经典的后外侧入路相比,DSA 术后功能更好,虽然在 THA 中手术时间有所增加[16]。Moussaouim 等人开展的回顾性分析显示,前外侧微创入路与直接上入路相比,在使用双极半髋关节置换术治疗股骨颈骨折患者时,直接上入路术中及术后并发症较少,且失血量有减少的趋势,尽管手术时间略长[17]。

术后脱位是髋关节置换的常见并发症。为降低脱位风险通常推荐采用外侧入路,但可能会导致术后功能和活动能力下降。为解决脱位问题,现已发明保留肌肉的入路,如 SPAIRE (保留梨状肌和闭孔内肌,修复闭孔外肌)以解决脱位问题。Apostolides 等人通过回顾性队列研究,与标准外侧入路、后侧入路对比后发现,SPAIRE 脱位率非常低还能让患者术后更早期地进行活动[18]。

直接前入路髋关节置换术是一种微创手术,通过大腿前方肌肉间隙进入,无需切断肌肉组织可减少髋关节组织损伤,患者术后早期体验更佳、疼痛感更轻。Krassnig 等人通过前瞻性试验证明,与前外侧入路相比,直接前入路术后疼痛感更轻[19]。Charles 等人开展的回顾性分析显示,与后外侧入路相比,直接前入路显著降低脱位相关并发症和死亡风险还具有经济学效益优势[20]。顾和平通过一项随机对照试验发现,与前外侧入路相比,直接前入路能有效减少术中出血量,缩短手术时间,抑制炎症反应,加快康复进程[21]。相比于其他手术入路,DAA 存在明显的学习曲线,手术操作难度较大[22][23]。因此许多学者研制了牵引床辅助该入路。李骏然等人通过一项回顾性分析研究发现,使用特制牵引床完成 DAA 半髋关节置换术治疗高龄股骨颈骨折疗效确切,可以缩短手术时间,提高股骨假体中心性固定率,但其术前准备时间较长[24]。直接前入路髋关节置换术在临床上的广泛应用,一些问题也逐渐显现。如股外侧皮神经损伤发生率较高、仰卧位直接前入路手术时股骨端暴露较困难并增加股骨端骨折的风险、直接前入路具有一定的学习曲线、手术瘢痕影响美观等。针对这些问题,许多学者持续对直接前入路髋关节置换术进行改良。改良措施包括侧卧位直接前入路手术、Bikini 微创入路、改良直接前入路切口和短柄髋关节假体[25]。随着这些改良措施的实施,直接前入路髋关节置换术的临床应用前景变得更加广阔。

SuperPATH 入路由标准后外侧入路改良而来,标准后外侧入路可微创改良为 SuperCap 入路和 PATH

入路, SuperPATH 入路结合了这两种入路的优势[26]。该入路利用臀小肌和梨状肌之间的间隙进入髋关节囊,从而避免了对重要肌肉和肌腱的广泛切开或切除,对软组织的“肌肉间隙进入”和“肌腱保留”的理念是 SuperPATH 入路的核心创新点[27]。Scaglione 团队将 SuperPATH 入路与传统后外侧入路相比发现,脱位率显著降低,潜在感染风险更小,并能促进更快功能康复, SuperPATH 是真正的微创术式[28]。Ramadanov 等开展的系统回顾分析显示,与传统手术入路相比, SuperPATH 髋关节置换早期功能评分、切口长度、失血量、下床活动时间、VAS 评分和住院时长等指标上均显著优于传统术式[29]。曹拥通过一项前瞻性研究证明,与后侧入路半髋关节置换比较, SuperPATH 入路髋关节评分、疼痛评分、术中出血量、术后引流量优于前者,但手术时间延长[30]。手术时间的延长可能与该入路的学习曲线较为陡峭有关,通过手术量的增加会拉近时间的差距。目前 SuperPATH 入路,多应用于全髋关节置换,半髋关节置换较少,期待更多的临床实践丰厚该研究结果。

目前大多数研究侧重于短期或中期结果,需要更多的长期随访数据来证实其持续的优势和潜在的长期并发症。现存的改良入路术后疗效是优于传统入路,但大多学者仍以改良或微创手术入路与传统入路进行疗效比较,缺乏改良及微创入路之间的比较。

3.2. 单极和双极假体

半髋关节置换假体选用有单极和双极两种,单极半髋关节置换(Unipolar Hemiarthroplasty, UHA)的特点是股骨头假体直接与患者自身的髋臼软骨接触。其理论优势在于手术操作相对简单,成本较低。然而,这种设计可能导致髋臼磨损的风险,特别是在高活动量或长期随访的患者中[31]。Saleem 等人进行的随机对照网络系统回顾分析表明,与双极半髋关节置换术、双动全髋关节置换术和单极全髋关节置换术比较,单极半髋关节置换术手术时间最短且其他差异大多无统计学显著性[32]。单极假体主要分为 Moore 型和 Thompson 型, Moore 型假体在柄部设有孔隙便于骨长入,从而增强假体与原生骨的锚定;而 Thompson 型假体不含此类孔隙,需依赖骨水泥实现固定。双极半髋关节置换(Bipolar Hemiarthroplasty, BHA)则在股骨头假体内部设计了一个额外的活动界面,形成“头中头”结构。这意味着股骨头假体可以在其自身内部的小头与外面的大头之间发生运动,从而减少了假体外层与髋臼软骨之间的摩擦,理论上可以降低髋臼磨损的风险。Filippo 等开展的系统回顾分析显示,双极半髋关节置换术较单极假体能减少髋臼磨损[33]。双极假体最初是为了缓解单极假体引起的关节间隙狭窄、疼痛和髋臼突出等问题而开发的。

双极半髋关节置换与单极半髋关节置换在选择上尚未达成共识。一些研究发现,接受双极半髋关节置换术的患者在疼痛缓解、生活质量、髋关节功能、髋臼磨损方面表现更佳[34]。然而其他研究未能证实双极半髋置换术的优势。Kanu Okike 等人发现与既往研究不同,未发现两种假体的假体周围骨折风险存在差异[35]。这些研究表明单极与双极半髋置换术的髋关节功能结果相当[36][37]。也有研究发现双极假体设计较单极设计具有更低的翻修风险,但对于预期寿命较短(≤ 2.5 年)的股骨颈骨折患者,单极半髋关节置换术仍是较好的选择[38]。

双极半髋关节置换的主要问题是聚乙烯碎屑导致的骨溶解,因此许多研究者对此进行改良。遂有新型双极假体产生具有抛光/光滑小直径(约 10 mm)股骨颈组件,轴向截面呈圆形或椭圆形且无锐角的设计,Seneki Kobayashi 等人开展的全国性多中心队列研究,显示使用新型双极假体有降低再手术风险的趋势[39]。随着现代股骨假体倾向于采用较大直径的颈部,小直径这一特征不再被强调,从而将双极假体分为光滑颈部双极假体和粗糙表面颈部双极假体,此外还开发了外头表面由氧化铝陶瓷制成和外头采用高交联聚乙烯的双极假体,目的在于超越金属双极假体和采用传统聚乙烯双极假体的耐用性, Kobayashi 等人通过多中心队列研究证明双极半髋关节置换的改良并未提高其耐用性,而且外头表面由氧化铝陶瓷制成的双极假体耐用性更差[40]。

3.3. 骨水泥

半髋关节置换术可分为骨水泥型与非骨水泥型假体,多用于老年髋部骨折患者,目前指南推荐使用骨水泥型假体,部分术者因担忧骨水泥植入综合征偏好非骨水泥柄,但现有证据仍支持骨水泥柄为首选[41]。Fernandez 等人开展的多中心随机对照实验证明,与非骨水泥型半髋置换术相比,骨水泥型可带来适度但显著更优的生活质量,并降低假体周围骨折风险[42]。Parker MJ 等人研究结果显示,接受骨水泥半髋关节置换术治疗的患者在术后初期活动能力恢复显著更好,骨水泥组患者的死亡率显著更低,支持使用骨水泥型半髋关节置换术作为老年髋部股骨颈移位骨折患者的常规治疗方案[43]。Yuenyongviwat 等人通过回顾性研究分析显示,有骨水泥植入综合征发生高危因素的患者行骨水泥型双极半髋置换术,未显著增加骨水泥植入综合征发生分险[44]。Migliorini 等人通过网络荟萃分析显示,骨水泥假体在死亡率、翻修率和脱位率方面呈现更低趋势[45]。但 Elmenshawy 等人通过回顾性研究分析显示,与骨水泥型相比,非骨水泥型双极半髋关节置换术具有手术时间短、失血量少、局部并发症少等优势,且全身并发症和再手术率与骨水泥型相当。老年髋部骨折患者多有骨质疏松且骨质增生能力较差,假体植入后与周围骨组织不能进行充分的骨接触,但骨水泥型假体可以充分填充骨髓腔内的空间有效进行负荷的传导。在临床实践中骨水泥型假体容易引发中毒反应,不易翻修,且有发生骨水泥植入综合征的致命风险。多数研究表明骨水泥在半髋关节置换中的应用较非骨水泥型假体有优势,然而在临床实际工作中大多术者采用非骨水泥型假体[46]。

4. 总结

半髋关节置换术是治疗老年人股骨颈骨折最主要的手术方式之一。微创及改良入路对比传统入路各有优势,但多是短中期随访结果,需要长期随访数据来证明其优势及并发症发生情况。双极半髋关节置换与单极半髋关节置换的选择尚未达成一致,基于不同情况做出个性化选择。双极半髋关节置换的骨溶解问题,需进行更多改良解决该问题。半髋关节置换使用骨水泥假体有显著优势,但临床实践多使用非骨水泥假体。

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