

· 综 述 ·

# 全髋置换术后内衬分离：1例报告和综述

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**摘要:** 髋关节置换术已经成为关节外科的一种常见的手术方式, 用于治疗累及髋关节的骨折、中重度骨关节炎、骨肿瘤和先天性关节发育不良等疾病。随着髋关节置换技术的不断成熟和假体材料的改进, 人工关节的稳定性极大改善, 假体磨损日渐减少, 但由于假体组件间的相对运动和材料的电解、退变, 以及假体安装位置不当等原因, 假体磨损和松动等术后并发症不可避免。内衬分离是一种极为罕见的术后并发症, 目前关于内衬分离的发生机制、诊断和治疗研究更为罕见, 其诊断主要依靠X线片表现。本文报道了1例内衬分离且不易明确诊断的患者, 并对相关文献进行综述。

**关键词:** 髋关节置换术, 内衬分离, 磨损, 翻修术

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**Acetabular liner dissociation following total hip arthroplasty: A case report with literature review // WEI Cong-cong, YANG Meng, YAO Meng-xuan, LI Hui-jie. Department of Orthopedics, Third Hospital, Hebei Medical University, Shijiazhuang 050051, China**

**Abstract:** Hip arthroplasty has become a common surgical procedure in joint surgery for the treatment of fractures involving the hip, moderate to severe osteoarthritis, bone tumors, congenital dysplasia and so on. With the continuous maturation of hip replacement technique and improvement of prosthetic materials, the stability of the artificial joint has improved greatly, whereas wear of the prosthesis is decreasing. However, postoperative complications such as wear and loosening of the prosthesis are inevitable due to the relative movement between prosthetic components and electrolysis and degeneration of the materials, as well as the improper placement of the prosthesis. Liner separation is an extremely rare postoperative complication, and research on the mechanism of occurrence, diagnosis and treatment of liner separation is even rarer, with its diagnosis mainly focused on X-ray. This article reports a case of a patient with a separated liner that is not easily diagnosed definitively, with a review of relevant literature about this catastrophic complication.

**Key words:** total hip arthroplasty, acetabular liner dissociation, wear, revision surgery

模块化髋臼假体提供了螺钉固定和各种内衬配置的设计, 极大的增加了全髋关节置换术和翻修的灵活性和适应性<sup>[6]</sup>。与此同时, 模块化髋臼假体的术后并发症也日益引起临床医师的关注。研究表明, 假体锁定机制和内衬与金属外杯之间的不协调是内衬分离的主要原因<sup>[7]</sup>。假体组件设计的不断改进已经显著减少了内衬分离的发生率, 目前, 内衬分离是一种极其罕见的术后并发症<sup>[8]</sup>。由于高交联聚乙烯材料较好的抗磨损特性, 其作为髋关节假体内衬广泛应用于临床<sup>[9, 10]</sup>。高交联聚乙烯内衬是完全不透光的, 内衬的完整性可以通过影像上股骨头相对于金属杯的位置间接推断出, 但往往和内衬严重磨损不易鉴别<sup>[11]</sup>。本文报道1例全髋置换术后内衬分离的患者, 并对相关文献进行综述。

## 1 病例报告

患者, 男, 40岁。于2020年行左髋关节置换术, 置入合适大小多孔涂层外杯, 高交联聚乙烯衬垫, 氧化锆合金股骨头和全涂层柄。术后4个月出现左髋部疼痛、活动时左髋异响。入院前10d, 左髋疼痛加重且难以忍受。减少活动和负重, 并口服药物治疗后, 仍觉疼痛剧烈, 遂入院治疗。专科查体: 有明显的跛行步态, 并且在负重行走时有明显的异响。左髋关节活动度降低, 主要表现为前屈70°、后伸5°、内收5°、外展40°、内旋5°、外旋5°。骨盆X线片显示假体上外侧存在偏心磨损, 假体周围见大量不规则骨化(图1a)。鉴别诊断包括髋关节置换术后假体

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磨损和内衬分离。

翻修手术前排除感染，因为白细胞计数、C 反应蛋白水平和红细胞沉降率均为阴性。仍选择高交联聚乙烯内衬，并且准备锆镍合金人工股骨头、钛合金股骨头柄和髋臼外杯来应对可能磨损严重或松动的髋关节假体。术中可见大量的黑色液体和黑色金属碎片分布于关节腔、外展肌和阔筋膜内（图 1b）。内衬外上侧部分发生磨损变形、脱出于髋臼外杯（图 1c）。股骨头表面也有一定程度的磨损（图 1d）。髋臼杯固定良

好，未见明显磨损。术中发现股骨柄假体稳定，可以保留。此外，对肉芽肿组织和金属碎片进行彻底清理后，更换陶瓷球头和高交联聚乙烯内衬。复位人工髋关节后检查其活动范围良好，无髋关节撞击和脱位。

术前 Harris 髋关节功能评分 50 分。术后 1 年，Harris 评分为 80 分。术后骨盆 X 线片显示假体的尺寸和位置理想（图 1e）。末次随访时，患者双下肢等长，无跛行及术后其他并发症，左髋关节主动和被动活动良好，无明显疼痛不适。



图 1 患者，男，40 岁，左髋关节置换术后内衬分离 1a: 翻修术前髋关节 X 线片示左侧股骨头假体位置偏心，假体周围见不规则骨化，密度不均匀的“云雾”状的高密度影考虑系磨损颗粒 1b: 翻修术中可见大量的黑色液体和黑色金属碎片分布于关节腔、外展肌和阔筋膜内 1c: 翻修术中可见高交联聚乙烯内衬部分发生严重磨损变形，内衬上的锁定齿和锁定卡槽发生严重变形和断裂 1d: 翻修术中可见氧化锆合金人工股骨头表面磨损 1e: 翻修术后骨盆 X 线片示假体的尺寸和位置可

## 2 讨论与文献综述

在全髋关节置换术中，聚乙烯内衬与髋臼外杯分离是一种极其少见且灾难性的术后并发症。目前关于内衬分离的发生机制、诊断和治疗研究极为罕见。

### 2.1 发生原因

内衬分离发生的主要原因是金属外杯和衬垫之间的锁定机制失效<sup>[12, 13]</sup>。相关研究显示，假体各组件位置不合适可能是导致内衬分离的因素<sup>[14, 15]</sup>。不合适的股骨和髋臼组件的联合前倾角、过大髋臼杯外展角以及股骨偏心距减少等问题，都可能引起髋臼组件过度变形，导致边缘负荷加重，从而导致更高的接触压力和磨损，最终锁定机制失效<sup>[16-18]</sup>。此外，假体安装位置不当可能会导致髋臼内衬边缘和颈部的撞击，从而引起内衬的磨损或脱位<sup>[19, 20]</sup>。Wang 等<sup>[21]</sup>的研究显示，理想的髋臼杯外展角为 $(40 \pm 10)^\circ$ 、前倾角为 $(15 \pm 10)^\circ$ 。另外，研究者发现较大直径的股骨头假体与小的髋臼杯结合会导致聚乙烯内衬变薄，

加速锁定机制的失效<sup>[22]</sup>。而且与传统聚乙烯相比，高交联聚乙烯内衬的摩擦力矩随着假体球头尺寸增大而增大，进而引起更大的磨损<sup>[23]</sup>。高交联聚乙烯的出现使得髋关节置换术的近、远期疗效都取得了极大改善，同时磨损引起的骨溶解的发生率也明显降低，但代价是机械强度明显减小，这些变化降低了内衬抗拔出强度，增加内衬分离的风险<sup>[24, 25]</sup>。尽管本研究中内衬锁定机制可能对硬轴承是足够的，但对于机械强度较小的高交联聚乙烯可能是远远不够的，因为它会随着时间的推移而变形，进而导致锁定机制失效<sup>[26]</sup>。大量研究显示，高交联聚乙烯的磨损率为 $0.04 \sim 0.20 \text{ mm/年}$ <sup>[27-30]</sup>。此外，氧化锆合金股骨头假体的使用也降低了磨损率<sup>[31]</sup>。但本研究中所回收的置入物显示髋臼内衬边缘有严重磨损，推断，在内衬边缘的应力集中导致聚乙烯内衬过度磨损，形成磨损碎片且增加了股骨头和内衬假体间的粗糙程度，进而加速内衬的磨损并引起其变形和活动，内衬上的锁定齿和锁定卡槽发生严重变形或断裂，导致锁定机制失效引起内衬分离，进而使股骨头与髋臼外杯之间进一

步磨损。这种严重的磨损形成了大量金属碎片，在X线片上表现为密度不均匀的“云雾”状的高密度影(图1)。另外，股骨头存在严重磨损，而髋臼杯未见明显异常。本研究认为原因是：病程短，股骨头与髋臼杯的接触较少；氧化锆合金人工股骨头相对于钛合金髋臼杯有更易磨损。

## 2.2 诊断

内衬分离诊断主要依靠在X线片表现，其影像学表现取决于脱位的衬垫是否仍与髋臼杯相连或脱离髋臼杯<sup>[11]</sup>。类似于聚乙烯内衬磨损，内衬分离在X线片上也表现为股骨头组件偏心放置在金属髋臼杯内<sup>[5]</sup>。有文献报道指出，“新月征”是聚乙烯衬垫分离在放射影像上的特异性征象，表明衬垫相对于髋臼杯发生了错位<sup>[11]</sup>。此外，还有研究提出，内衬分离后软组织在X线片上出现环形白斑，即“气泡征”<sup>[32]</sup>。但这些征象对内衬分离的诊断极其不敏感，而且在解释这些X线征象时，其可靠性也值得进一步研究<sup>[33]</sup>。本研究病例中，患者X线无特异性征象，放射影像难以明确诊断。然而，对于内衬分离患者的翻修手术来说，明确游离衬垫的具体位置是很重要的，尤其是在那些衬垫移位到骨盆或腹腔的罕见病例中<sup>[34]</sup>。通过对大量内衬分离患者进行全面的检查和评估，Chauhan等<sup>[35]</sup>认为：与X线透视相比，CT和MRI定位聚乙烯衬垫的位置更可靠。因此，本研究建议假体可疑失败的患者常规行CT及MRI检查。

## 2.3 处理方法

目前临床上对于内衬分离的处理包括简单的内衬更换和整个髋臼假体更换<sup>[36]</sup>。Perkins等<sup>[37]</sup>认为应该更换整个髋臼假体，因为术后并发症复发的原因是双重的，可能是由于组件不合适的方向和位置没有改变，导致同一组件再次严重磨损失效，或者是直接与之相接触的假体球头破坏了髋臼的锁定机制。Goyal等<sup>[38]</sup>认为如果术前存在撞击，应考虑对髋臼和股骨假体都进行翻修，以降低内衬再分离的风险。本研究中，术中探查发现股骨柄假体和髋臼外杯稳定，聚乙烯内衬和股骨头假体磨损严重。因此，本研究对髋关节进行彻底清创后行股骨头和髋臼内衬置换。

综上所述，本研究根据临床症状、影像学检查和术中探查综合考虑为髋关节置换术后内衬分离。髋关节置换术后内衬分离的病例是极为罕见的，关于髋关节翻修术治疗内衬分离的长期效果及相关并发症的大宗样本研究较少，因此，目前髋关节翻修术治疗内衬分离的最佳治疗策略尚不明确。此外，内衬分离的发生机制和诊断策略也需要大宗样本进一步研究。本病

例在彻底清创后行髋关节翻修术，置换股骨头假体和人工髋臼内衬。采用氧化锆合金人工股骨头和高交联聚乙烯内衬，随访显示，临床效果良好。本病例的诊治方法可能是这类罕见并发症的可行选择。本研究存在一定的局限性：仅纳入1例，随访时间仅1年。未来还需要其他治疗成功的病例报告及大样本量的研究，以帮助就此类患者的最佳诊断、治疗达成共识。

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