

旋磨术的临床应用现状

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【摘要】 旋磨术在冠状动脉复杂病变的介入治疗中占有很重要的地位,主要应用于钙化病变、开口病变、完全闭塞病变等。旋磨术修饰斑块后置入药物洗脱支架能取得良好的远期效果。该文主要简介旋磨术的原理、适应证、临床研究进展和并发症等方面的现状。

【关键词】 旋磨术;药物洗脱支架;钙化病变

doi:10.3969/j.issn.1673-6583.2015.02.006

在冠心病介入治疗发展初期,为了扩大管腔,增加球囊血管成形术治疗效果,许多用于切割动脉粥样斑块的血管内器械被研发。随着技术理念的革新以及支架尤其是药物洗脱支架的应用,大部分斑块切除器械已被淘汰,旋磨术是少数沿用至今的技术之一^[1]。20 世纪 90 年代旋磨术的应用达到高峰,约占 20%,随后旋磨术的使用逐渐减少。目前,旋磨术主要用于治疗一些特殊病变,如严重钙化病变及开口病变^[2]。本文主要从原理、并发症、适应证、临床研究进展等方面介绍旋磨术。

1 原理

目前旋磨术主要采用 Boston 公司生产的旋磨仪。通过嵌有钻石的磨头的高速旋转,将斑块磨成直径 $<10\ \mu\text{m}$ 的颗粒。颗粒进入外周循环系统,被肝、肺、脾的网状内皮系统吞噬。旋磨术有两个基本原理——差异切割和垂直移动摩擦。差异切割即选择性地对较坚硬的、弹性较差的组织病变(如钙化病变)进行切割,对于正常管壁、较软的病变则无切割作用。垂直移动摩擦即磨头在高速旋转期间始终保持纵向移位,从而能在迂曲和严重钙化病变中安全有效地运作。旋磨术的基本操作要素包括:(1)磨头血管直径比 0.5~0.6;(2)旋磨速度 140 000~150 000 转/分;(3)用部件缓慢推进磨头;(4)单次旋磨时间 15~20 s;(5)避免突然降速超过 5 000 转/分^[3]。

2 适应证

旋磨术的主要适应证为在不修饰斑块的情况下,球囊或支架无法通过,无法达到理想的置入效果,易导致再狭窄等其他并发症的钙化病变^[4]。临床试验证明,旋磨术能显著提高上述病变的手术成

功率和即刻效果^[5]。在 2%~15% 的慢性闭塞病变中,导丝能够通过病变达远端,但球囊无法通过。研究发现,对于球囊无法通过的病变,旋磨术的成功率为 95.5%^[6]。使用血管内超声(intravenous ultrasound, IVUS)及光学相干断层成像(optical coherence tomography, OCT)能有效观察钙化的位置和范围,接近 360° 的浅层钙化是旋磨术的最佳适应证。

3 临床研究进展

理论上,旋磨造成血管损伤,可能增加再狭窄风险,但是旋磨术通过修饰斑块,使斑块表面更平整,减少支架置入过程中支架表面涂层的损伤,从而防止再狭窄。另外,旋磨术能够防止不理想的支架贴壁,降低支架内血栓的风险。

在裸支架时代,有 2 项针对旋磨术的随机对照临床研究。ROSTER 研究显示,与单纯球囊扩张组相比,旋磨术后支架内斑块负荷明显减少,靶病变血运重建率明显减少^[7]。但 ARTIST 研究得出了相反的结论,研究显示,与球囊扩张组相比,旋磨术组患者没有明显获益,且急性并发症和远期不良事件发生率更高^[8]。这两项研究的主要区别在于 ARTIST 研究没有排除支架膨胀不良患者,并且是多中心研究;而 ROSTER 研究排除了因支架膨胀不良引起的再狭窄患者,并且是单中心研究。

旋磨术后置入药物洗脱支架的疗效明显优于裸支架^[9-12]。研究显示,旋磨术后置入药物洗脱支架的 1 年内主要心血管不良事件(MACE)发生率、靶血管再血管化率明显低于金属裸支架^[9-10]。对旋磨术联合药物洗脱支架的长期随访结果也比较理想,MACE 发生率为 6%~12%,靶病变再血管化率为 6%~12.3%^[13-16]。然而,在 ROTAXUS 研究中,对钙化病变患者随访 9 个月的结果显示,支架置入术前行旋磨术并不能减少管腔丢失,不支持常规

行旋磨术^[17]。对 2 152 例旋磨术后支架置入患者的随访显示,与对照组相比,旋磨术组患者手术成功率较低,并发症发生率更高,但旋磨术组患者的临床危险因素诸如高龄、多支病变、糖尿病、外周血管疾病、肾功能不全等的比例更大,研究结果可能与旋磨术组患者病情危重相关^[18]。

开口病变的介入治疗风险较高。有专家提出,通过旋磨术修饰这类病变斑块可获得更理想的支架置入效果及远期疗效。研究显示,对开口病变行旋磨术能显著减少术后即刻局部狭窄,降低边支受累风险及边支置入支架的概率^[19]。旋磨术结合药物洗脱支架能够显著改善开口病变的介入治疗效果。

对于支架内再狭窄,球囊成形术、切割球囊等都展示了很好的效果,一些专家认为应用旋磨术处理再狭窄病变再发风险较大,无临床意义^[20]。此外,对于因病变钙化严重而膨胀不良的支架或其他原因导致置入情况不理想的支架,有些术者尝试应用旋磨术磨除原支架^[21]。虽然旋磨金属与旋磨斑块产生的微颗粒大小相近,但此处理方法有磨头嵌顿等风险。

4 并发症

旋磨术主要的并发症为 Q 波急性心肌梗死(0.7%~4.8%)、夹层(1.7%~5.9%)、穿孔(0%~2.0%)、急性血管闭塞(0.3%~2.0%)、边支丢失(4.0%)、慢血流/无复流(0%~2.6%)、死亡(1.0%~5.0%)^[22]。相关临床研究的并发症发生率相差较大,与患者选择、术者经验等多方面相关。

磨头尺寸和旋磨时间与旋磨术并发症的发生相关。CART 研究及 STRATAS 研究显示,使用小磨头(磨头/动脉直径比 ≤ 0.7)在即刻管腔扩大和晚期靶病变再狭窄发生率等方面均不劣于大磨头(磨头/动脉直径比 > 0.7),且并发症更少^[23-24]。使用小磨头低速旋转,既可以达到修饰斑块移除钙化病变的目的,又可减少对冠状动脉及外周血管的损伤。小磨头允许采用桡动脉途径,可进一步减少并发症的发生^[25-26]。PROTECT II 研究发现,旋磨术后围术期发生心肌梗死的患者所用旋磨时间长于未发心肌梗死的患者^[27]。旋磨时间过长可能造成局部温度过高,导致内膜损伤,引起急性血小板聚集,导致心肌梗死。

旋磨过程中产生的微颗粒及局部产生的热量可引起血小板聚集、血管痉挛,进而导致无复流现象,可能引起心肌梗死、心源性休克,甚至死亡^[28]。旋磨术中使用 GP II b/III a 受体拮抗剂^[29]、腺苷^[30]能有效减少慢血流/无复流的发生。尼可地尔为钾

离子通道激动剂,可增加侧支循环^[31]。在旋磨术中冠状动脉内注入尼克地尔能显著减少慢血流/无复流等事件的发生。围手术期应用他汀类药物也能显著减少微颗粒引起的心肌坏死^[32]。

需要使用旋磨术的复杂病变(如冠状动脉弥漫钙化)患者多为高龄,其冠状动脉血管条件差,外周血管迂曲,易发生并发症^[33]。这可能是临床研究中旋磨术并发症发生率较高的原因之一。

5 小结

目前新型旋磨器械正被研发,新器械能进一步降低微颗粒大小,从而避免不良事件的发生^[34]。轨道旋磨系统采用表面嵌有微小钻石的椭圆形旋磨冠,借助离心力沿着轨道对坚硬斑块进行高速选择性切割,旋磨冠运行半径可根据斑块性质进行调节,该系统现在还处于临床试验中^[35]。

对于复杂病变,尤其是球囊无法通过的严重钙化病变,可以使用旋磨术以增加手术成功率。

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(收稿:2014-09-26 修回:2015-01-27)

(本文编辑:梁英超)