

LVIS 支架辅助 Target 弹簧圈栓塞治疗颅内微小动脉瘤 47 例效果观察

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[摘要] 目的 评估 LVIS 支架辅助 Target 弹簧圈栓塞颅内微小动脉瘤的临床效果。方法 回顾性分析 2015 年 7 月—2023 年 5 月我中心采用 LVIS 支架辅助 Target 弹簧圈介入栓塞的 47 例微小动脉瘤患者的临床资料及随访结果。结果 47 例患者术后即刻造影显示致密栓塞 32 例(68.1%),瘤颈残留 11 例(23.4%),部分栓塞 4 例(8.5%)。围手术期并发症 4 例(8.5%),包括 2 例破裂动脉瘤发生术中出血(1 例死亡,1 例致密栓塞后无明显后遗症),1 例破裂动脉瘤术后合并颅内感染(抗感染治疗后无神经系统功能缺损),1 例术中血栓形成(术中应用替罗非班后无神经系统功能缺损)。33 例患者进行了影像学随访,其中动脉瘤完全闭塞 29 例(87.9%),动脉瘤稳定 4 例(12.1%)。随访过程中 1 例患者出院 14 d 后颞叶出血死亡,余患者无再出血发生。结论 LVIS 支架辅助 Target 弹簧圈栓塞颅内微小动脉瘤较为安全、有效,适合在临床推广使用。

[关键词] 颅内动脉瘤;栓塞,治疗性;血管内操作;支架;治疗结果

[中图分类号] R743.9;R651.122

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Efficacy of LVIS stent-assisted Target coil embolization in treatment of very small intracranial aneurysms: An analysis of 47 cases XU Hongzhang, ZHANG Zhaolong, XU Rui (Interventional Medicine Center, The Affiliated Hospital of Qingdao University, Qingdao 266003, China)

[ABSTRACT] **Objective** To investigate the efficacy of LVIS stent-assisted Target coil embolization in the treatment of very small intracranial aneurysms. **Methods** A retrospective analysis was performed for the clinical data and follow-up results of 47 patients with very small intracranial aneurysms who underwent LVIS stent-assisted Target coil embolization in our center from July 2015 to May 2023. **Results** For the 47 patients, angiography immediately after surgery showed dense embolization in 32 patients (68.1%), residual aneurysm neck in 11 patients (23.4%), and partial embolization in 4 patients (8.5%). Perioperative complication was observed in 4 patients (8.5%), among whom 2 had intraoperative bleeding due to ruptured aneurysms (1 died and 1 had no obvious sequela after dense embolization), 1 had intracranial infection after ruptured aneurysm surgery (with no neurological deficit after anti-infective therapy), and 1 had thrombosis during surgery (with no neurological deficit after the intraoperative application of tirofiban). Radiological follow-up examination was performed for 33 patients, among whom 29 (87.9%) achieved complete embolization of aneurysms and 4 (12.1%) had stable aneurysms. During follow-up, 1 patient died due to temporal lobe hemorrhage after 14 days of discharge, while the other patients did not experience rebleeding. **Conclusion** LVIS stent-assisted Target coil embolization is safe and effective in the treatment of very small intracranial aneurysms, and therefore, it holds promise for clinical application.

[KEY WORDS] Intracranial aneurysm; Embolization, therapeutic; Endovascular procedures; Stents; Treatment outcome

近年来,血管内介入栓塞在颅内动脉瘤治疗中的地位越来越突出,但介入栓塞较高的手术难度及潜在并发症风险一直是微小动脉瘤血管内介入治疗的难点。随着神经介入技术的发展及神经介入器械的改进,能够进行介入治疗的颅内微小动脉瘤越来越多^[1-2]。动脉瘤栓塞手术中常使用弹簧圈填塞瘤腔,其可为血管内皮提供附着点,有助于重塑载瘤血管形态。Target 弹簧圈因其质地柔软,顺应性好,应力释放佳,对动脉瘤壁压力小,在动脉瘤介入治疗中具有一定的优势。LVIS 支架是网孔直径大约为 0.8 mm 的小网孔编织支架,能够有效阻止微小弹

簧圈疝出,且其具有半释放及可回收的特性,能够精准定位并固定微导管位置,特别适合用于微小动脉瘤的栓塞操作^[3-6]。本研究对我中心 47 例 LVIS 支架辅助 Target 弹簧圈介入栓塞微小动脉瘤患者的临床资料进行回顾性分析,旨在评估该技术的安全性和有效性,为临床微小动脉瘤的血管内介入治疗提供更多选择。

1 资料与方法

回顾性分析 2015 年 7 月—2023 年 5 月我院介入医学中心采用 LVIS 支架辅助 Target 弹簧圈栓塞颅内宽颈微小动脉瘤的 47 例患者的临床资料,包括患者的一般资料、术后即刻栓塞效果(Raymond

分级^[7]评价)、术后 6~12 个月的并发症及随访情况[脑血管造影结果、改良 Rankin 量表(mRS)^[8]评分、弹簧圈有无移位、载瘤动脉是否存在狭窄]。患者纳入标准:①影像学检查显示颅内动脉瘤直径<3.0 mm,且于我院行血管内介入治疗者;②动脉瘤未破裂需口服双联抗血小板药物(100 mg 阿司匹林+75 mg 硫酸氢氯吡格雷,每天 1 次)超过 5 d 者,动脉瘤破裂术前 3 h 需口服负荷量抗血小板药物(300 mg 阿司匹林+300 mg 硫酸氢氯吡格雷)者;③术后口服双联抗血小板药物半年后,改为阿司匹林长期口服者;④临床资料完整者。患者排除标准:①颅内夹层动脉瘤、梭形动脉瘤者;②合并载瘤动脉粥样硬化、动静脉畸形、动静脉瘘者;③患有严重心、肝、肾疾病或恶性肿瘤者。

2 结 果

2.1 患者一般资料分析

47 例患者当中,男 14 例,女 33 例,年龄 37~



①3.5 mm×15 mm LVIS 支架半释放辅助 Target 弹簧圈微导管,且微导管均已输送至动脉瘤腔内,②Target 弹簧圈微导管超选至动脉瘤囊,③填入 1.5 mm×2 cm、1 mm×1 cm Target 弹簧圈两枚后即造影显示动脉瘤致密栓塞,④术后即刻透视显示支架打开良好

图 1 LVIS 支架辅助 Target 弹簧圈栓塞颈内动脉末端微小动脉瘤效果

2.2 患者并发症情况

所有患者中,2 例术中出现破裂再出血,均为蛛网膜下腔出血患者。其中 1 例患者弹簧圈穿出动脉瘤后继续填塞,最终实现动脉瘤致密栓塞,术后未遗留明显后遗症;另 1 例患者术中发生再出血,术后病情较重,最终死亡。其他患者中,1 例破裂动脉瘤术后合并颅内感染,经抗感染治疗后病情稳定出院,随访未遗留神经系统功能缺损;1 例未破裂动脉瘤术中血栓形成,术中应用替罗非班后,载瘤动脉通畅,随访未遗留神经系统功能缺损。

2.3 患者随访情况

患者随访时间 6~60 个月,其中 1 例脑实质出血后死亡,余无再出血、脑梗死及载瘤动脉狭窄等情况发生。排除围手术期死亡 1 例及随访死亡 1 例

79 岁。其中动脉瘤未破裂者 12 例,蛛网膜下腔出血者 35 例。蛛网膜下腔出血患者 Hunt-Hess 分级^[9] I 级者 7 例,II 级者 18 例,III 级者 9 例,IV 级者 1 例。12 例动脉瘤未破裂患者的动脉瘤破裂风险 PHASES 评分^[10]5~8 分,且 5 例患者焦虑自评量表^[11]评分>70 分。患者平均动脉瘤最大径(2.1±0.8)mm。47 枚动脉瘤部位包括颈内动脉眼段 6 枚,后交通段动脉 9 枚,脉络膜前动脉 5 枚,前交通动脉 11 枚,大脑前动脉 A2 段 3 枚,大脑中动脉分叉部 6 枚,椎动脉 V4 段 1 枚,小脑后下动脉 3 枚,基底动脉尖 2 枚,大脑后动脉 1 枚。47 例患者中,13 例手术采用了 6 F Envoy 导引导管,34 例采用了 6 F Envoy DA 导引导管。所有患者采用单 LVIS 支架辅助栓塞,填入 3、2、1 枚 Target 弹簧圈者分别为 12、19、16 例。术后即刻造影结果显示 Raymond I 级 32 例(68.1%),Raymond II 级 11 例(23.4%),Raymond III 级 4 例(8.5%)。LVIS 支架辅助 Target 弹簧圈栓塞微小动脉瘤过程见图 1。

后,临床 mRS 评分 0~1 分者 35 例,2 分者 6 例,3 分者 4 例。术后 33 例患者随访时行脑血管造影(随访时间 6~36 个月),其中 29 例(87.9%)患者动脉瘤完全闭塞,4 例(12.1%)患者动脉瘤瘤颈残留,均情况稳定无复发。

3 讨 论

介入治疗目前已成为绝大部分颅内动脉瘤的首选治疗方式^[12]。尽管颅内动脉瘤介入治疗的并发症发生率较低,但对于某些特殊类型动脉瘤,仍需进一步评估介入栓塞治疗的安全性及有效性。其中,颅内微小动脉瘤因对介入操作及器械要求较高,是介入治疗的难点之一。微小动脉瘤的支架辅助栓塞早期主要选用 Solitaire(美国 EV3 公司)或 Enter-

prise 支架(美国强生公司)^[13]。由于上述支架网眼较大,采用小直径弹簧圈填塞动脉瘤时,理论上存在弹簧圈脱出可能。LVIS 支架因具有网眼直径较小的特点,在微小动脉瘤辅助栓塞时被越来越多地采用并取得良好效果^[14]。另外,微小动脉瘤栓塞过程中微导管及弹簧圈活动范围小,Target 弹簧圈质地较软,十分有利于栓塞操作^[15]。稳定的介入通路支持也是微小动脉瘤介入栓塞操作成功的重要因素。本研究中 34 例(72.3%)患者选用了 Envoy DA 导引导管通路系统,其顺应性好,可平滑通过迂曲血管,使后续操作更加稳定^[16]。另外微小动脉瘤栓塞时微导管显影标记点的理想位置位于动脉瘤颈瘤囊较浅处,本研究中 2 例患者出现术中动脉瘤破裂,其所用导管均为 Echelon-10 微导管,且微导管显影标记点均已送至动脉瘤腔内,提示微导管位置可能与动脉瘤的破裂有关。

治疗效果方面,本研究中所有患者即刻致密栓塞率为 68.1%,瘤颈残留为 23.4%,部分栓塞率为 8.5%。获得影像学随访的患者中,动脉瘤完全闭塞者占 87.9%,动脉瘤稳定者 12.1%。在一项包含 1 105 例微小动脉瘤介入治疗患者的 meta 分析中,患者术后即刻致密栓塞率为 85%;在术后超过 6 个月的随访中,91%的动脉瘤达到了致密栓塞或接近致密栓塞水平,动脉瘤复发率为 6%,再治疗率为 7%^[17]。本研究结果与上述研究报道类似,说明 LVIS 支架辅助 Target 弹簧圈栓塞颅内微小动脉瘤的安全性及有效性较高。

由于微小动脉瘤瘤壁薄弱,同时微导管调整的囊腔空间较小,因此微小动脉瘤介入治疗术中术后可能存在动脉瘤破裂等并发症发生的风险。本研究中 2 例(4.3%)患者发生动脉瘤术中破裂,1 例患者最终因病情较重死亡;另有 1 例(2.1%)患者术中有血栓形成。既往一项样本量较大的单中心研究显示,颅内微小动脉瘤患者围手术期动脉瘤破裂率为 7.7%,手术相关致残率为 2.1%,病死率为 1.1%^[18]。另有研究表明,微小动脉瘤介入治疗患者的术中动脉瘤破裂率为 7%,血栓栓塞率为 4%^[17]。因此对于未破裂的颅内微小动脉瘤,介入治疗的选择应更加谨慎^[19]。本研究行介入治疗的患者中,除蛛网膜下腔出血者 35 例,还包含 12 例动脉瘤未破裂患者。目前对于未破裂微小动脉瘤的治疗方式仍存在争议。根据 PHASES 评分,瘤径<7 mm 的颅内动脉瘤 5 年破裂率≤7%^[20],但微小动脉瘤破裂后有可能导致比较大动脉瘤破裂更为严重的蛛网膜下腔

出血^[21]。因此本研究中医师结合临床经验及患者意愿,对部分 PHASES 评分较高患者实施介入栓塞治疗。

综上所述,LVIS 支架辅助 Target 弹簧圈栓塞颅内微小动脉瘤具有较高的安全性和有效性,根据患者病情选用合理的治疗方案可以进一步降低手术并发症发生风险。

伦理批准和知情同意:本研究涉及的所有试验均已通过青岛大学附属医院医学伦理委员会的批准(QYFYWZLL28734),所有试验过程均遵照《赫尔辛基宣言》的条例进行。受试对象或其亲属已经签署知情同意书。

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