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·专题研究·

经腹小切口超声引导系膜穿刺逆向开通治疗肠系膜上动脉开口全堵病变

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摘　要

背景与目的：对于肠系膜上动脉（SMA）闭塞患者，尤其是存在开口处动脉粥样硬化性无残端病变，开腹逆行肠系膜动脉支架置入术（ROMS）是一种有效的治疗方法，但该手术创伤较大，一些身体条件差的患者并不适合。笔者通过报告 1 例 SMA 全堵病变病例的治疗过程介绍一种改良的微创 ROMS 技术，以期为临床治疗方法的选择提供参考。

方法：回顾复旦大学附属中山医院厦门医院血管外科 2019 年 10 月收治的 1 例 SMA 全堵病变患者的临床资料。患者为 64 岁女性，诊断为 SMA 闭塞引起的慢性肠系膜缺血，行杂交手术再通 SMA。

结果：患者 SMA 开口处为无残端完全闭塞病变且无侧支血管与腹腔干动脉及脾动脉沟通，顺行或逆行血管腔内开通均无法进行。因患者全身条件较差，难以耐受开放血运重建手术和传统的 ROMS。遂做腹部做小切口，超声引导下经系膜穿刺 SMA 远端建立通路，导丝顺利逆向通过 SMA 闭塞处进入降主动脉；右侧肱动脉入路导管和逆向导丝对接后顺利正向通过病变，完成球囊扩张和支架置入术。术后患者恢复良好，症状消失，3 个月后随访 CTA 示，支架形态、位置良好，血流通畅。

结论：对于血管腔内治疗失败且全身条件较差的 SMA 闭塞患者，通过经腹小切口超声引导系膜穿刺逆向开通 SMA 是可行的。

关键词　肠系膜血管闭塞；肠系膜上动脉；最小侵入性外科手术；血管内操作

中图分类号：R654.3

Mini-laparotomy retrograde recanalization by transmesenteric puncture under ultrasound guidance for total ostial occlusion of the superior mesenteric artery

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Abstract　**Background and Aims:** For patients with superior mesenteric artery (SMA) occlusion, especially those with

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no obvious stump due to atherosclerotic occlusion of the orifice, retrograde open mesenteric stenting (ROMS) is an effective treatment method. However, the surgical trauma of this procedure is relatively large, so it may not be feasible in some patients with poor physical status. Here, the authors present a surgical technique of modified minimally invasive ROMS through reporting the treatment process for a case with total SMA occlusion, so as to provide a treatment option for some clinical situations.

Methods: The clinical data of a patient with total SMA occlusion treated in October 2019 in the Department of Vascular Surgery of Xiamen Branch, Zhongshan Hospital, Fudan University were reviewed. The patient was a 64-year-old woman, was diagnosed as chronic mesenteric ischemia caused by SMA occlusion, and then underwent hybrid procedures for SMA recanalization.

Results: The patient had a flush ostial SMA occlusion without stump, and also no collateral vessels connecting the celiac artery and splenic artery were observed, so either antegrade or retrograde total endovascular revascularization attempt failed. In addition, the patient was unlikely to tolerate an open revascularization procedure or the traditional ROMS due to poor general condition. Then, a mini-laparotomy was made and a pathway to the distal portion of the SMA was created by transmesenteric puncture under ultrasound guidance. A retrograde guidewire successfully passed the occlusion of the SMA and was advanced into the descending aorta. An antegrade catheter from the right brachial artery access was successfully passed the occlusion of the SMA after engaging with the retrograde guidewire. After that, balloon predilation and stenting were performed. The patient recovered uneventfully after operation, with total alleviation of symptoms. The follow-up CTA on 3 months after operation demonstrated undeformed shape and accurate position of the stent as well as excellent patency of the vessel.

Conclusion: For patients with the SMA total occlusion and poor general condition following failed endovascular intervention, mini-laparotomy retrograde recanalization by transmesenteric puncture under ultrasound guidance is a feasible strategy.

Key words Mesenteric Vascular Occlusion; Mesenteric Artery, Superior; Minimally Invasive Surgical Procedures; Endovascular Procedures

CLC number: R654.3

慢性肠系膜缺血（chronic mesenteric ischemia，CMI）又称为小肠缺血，是由内脏动脉慢性狭窄闭塞而引起，肠系膜上动脉（superior mesenteric artery，SMA）狭窄后闭塞是最严重的一种。开放手术血运重建是治疗肠系膜缺血的经典方法。然而，血管腔内治疗在肠系膜缺血的治疗中已获得广泛的适用性，与开放手术相比，它显著降低了并发症发生率和围手术期病死率[1-3]。虽然血管腔内治疗有明显的优势，但SMA的一些病变，特别是开口处动脉粥样硬化性无残端病变，无法用传统的血管腔内介入治疗（从肱动脉或者股动脉入路）。一种名为开腹逆行肠系膜动脉支架置入术（retrograde open mesenteric stenting，ROMS）的杂交技术应运而生，它通常需要开腹并暴露和重建近段SMA，手术创伤较大[4-6]。为了尽量减少腹部大范围手术的风险，笔者在不切开肠系膜的基础上改良了这个技术，且成功治疗了1例CMI的老年患者，现报告如下。

1 资料与方法

1.1 临床资料

患者 女，64岁。因“反复餐后上腹痛半年”入院。患者半年以来餐后反复出现上腹痛，休息后可缓解，同时伴有肠道持续隐性出血，血色素不断下降，需要间断住院输血维持。既往患有多种自体免疫性疾病（血管炎、系统性红斑狼疮、干燥综合征、重叠综合征），长期口服激素等药物控制，同时有冠心病、甲状腺肿瘤、肺结核、主动脉瘤（TEVER术后）、甲减和高血压等疾病。体检：消瘦、贫血貌，腹软，无压痛、反跳痛和肌紧张，全身皮肤及巩膜无黄染，浅表

淋巴结无肿大。入院后实验室检查示：白细胞：3.25 × 10^9/L；血小板：67 × 10^9/L；血红蛋白：95 g/L；D–二聚体：4.57 mg/L，肝肾功能未见明显异常。术前CTA示：SMA近段完全闭塞，无残端；肠系膜下动脉（IMA）全段闭塞，未见显影（图1）。

1.2 治疗方法

局部麻醉后，穿刺右侧肱动脉，置入5 F鞘，泥鳅导丝配合猪尾巴导管进入腹主动脉，造影见肠系膜上动脉未见显影，且无残端（图2A）。多次尝试寻找SMA开口未能成功后，4 F C2导管替换猪尾巴导管，将C2导管选入腹腔干（CA）并进入肝总动脉造影：CA和SMA间未见明显侧支血管（图2B）。再将C2导管选入脾动脉（SA）造影：SA和SMA之间未见明显侧支血管（图2C）。因此无法顺向血管腔内或者通过侧支血管逆向开通SMA。

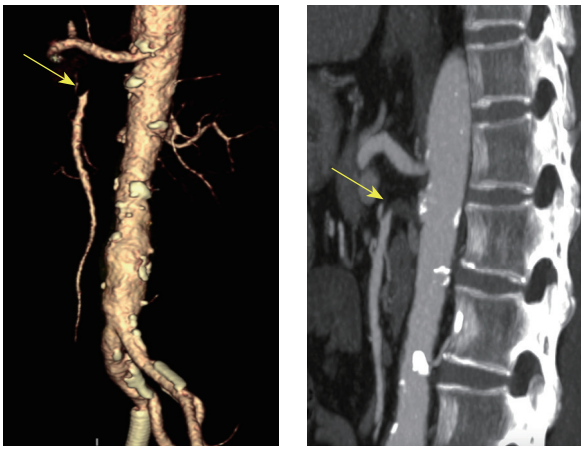

图 1　术前 CTA 示 SMA 近段完全闭塞，无残端；IMA 全段闭塞（箭头所示为 SMA 病变）

Figure 1　Preoperative CTA showing flush ostial occlusion of the proximal SMA with on stump, and complete occlusion of the IMA (arrow indicating the lesion of the SMA)

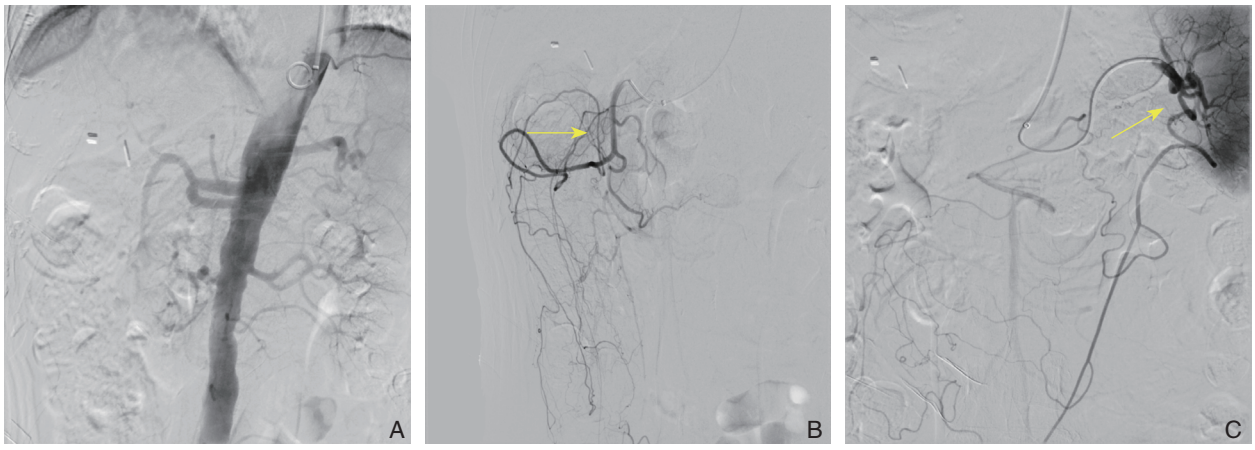

图 2　腹主动脉造影未见 SMA 显影，导管选入 CA 和 SA 造影均未见明显侧支　A：腹主动脉造影见 SMA 开口全闭塞，无残端；B：腹腔干造影未见 SMA 和 CA 之间有明显的侧支血管沟通（箭头所示为肝总动脉）；C：脾动脉造影未见 SMA 和 SA 之间有明显的侧支血管沟通（箭头所示为 SA）

Figure 2　Abdominal angiogram showing no stump of the SMA, and both selective angiography of the CA and SA showing no prominent lateral branches　A: Abdominal aortogram revealing flush ostial occlusion of the SMA with no visible stump; B: Selective angiography of the CA revealing no prominent lateral branches between the CA and SMA (arrow indicationg the common hepatic artery); C: Selective angiography of the SA revealing no prominent lateral branches between the SA and SMA (arrow indicating the SA)

鉴于患者目前较差的身体条件及开放手术承受能力，开放手术血运重建和传统的ROMS不推荐。为此笔者对ROMS进行改良，以减少创伤及手术应激。全麻后，中下腹正中作一小切口，显露肠系膜，用曲棍球超声探头定位SMA远端（图3A）。在超声引导下用21 G微穿针穿刺SMA远端（图3B），置入V18导丝及弯头的CXI支撑导管。退出V18导丝，手推造影证实导管位于真腔中。然后V18导丝配合CXI导管顺利通过闭塞病变（图3C）。接着，从右侧肱动脉入路更换6 F长鞘，进入降主动脉，再置入125 cm 4 F MPA。V18导丝与长鞘和MPA对接，并从MPA的尾端拉出一段（图3D）。在V18导丝的引导和支撑下顺行置入MPA通过闭塞病变进入SMA真腔，并手推造影证实。交换supracore导丝，使用4 mm × 40 mm球囊（EVERCROSS，EV3公司）进行预扩张后（图3E），手推造影闭塞段开通但仍有残余狭窄，病变处置入6 mm × 60 mm自膨式支架（smart-control，Cordis公司），

再次造影见支架形态良好，血流通畅（图3F）。退出导管导鞘，SMA远端穿刺点用手压迫15 min止血，最后造影见支架完全打开，小肠血流灌注良好且穿刺点无出血（图4）。

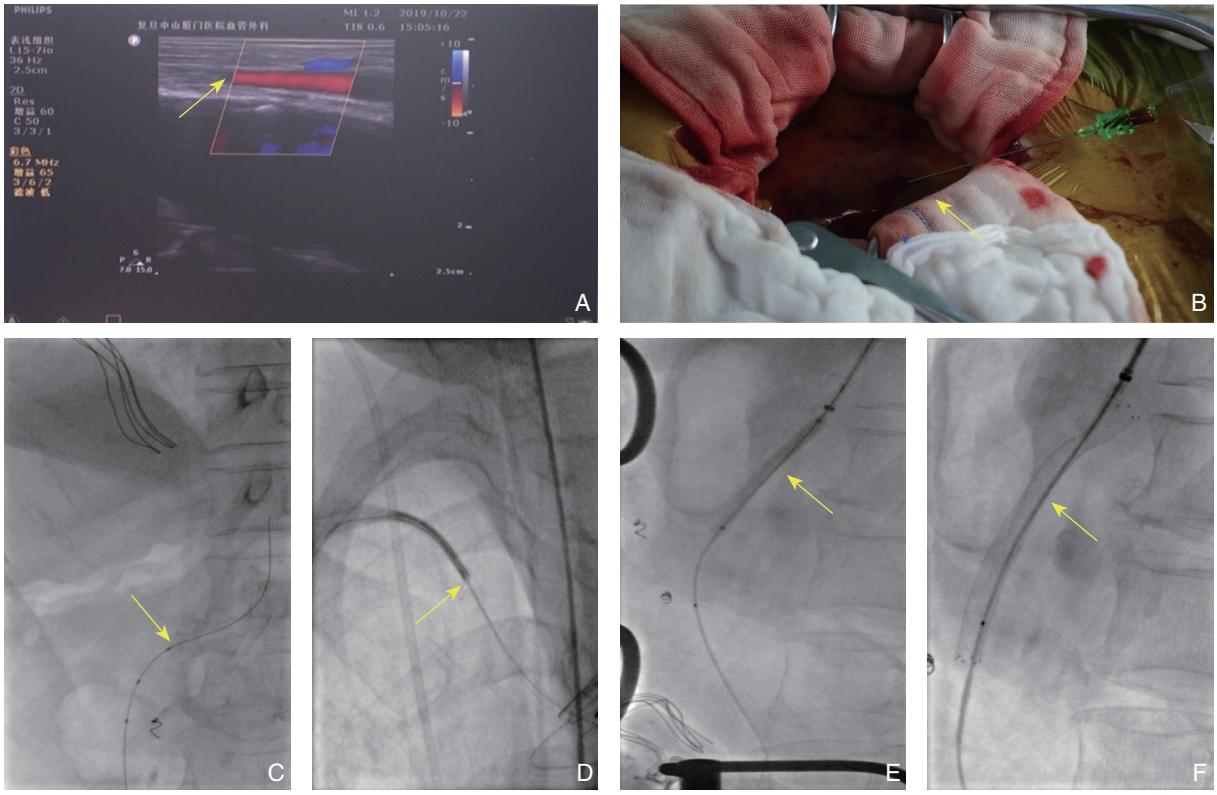

图 3　改良 ROMS 的手术过程　A：超声定位 SMA（箭头示）；B：超声引导下用 21 G 微穿针穿刺 SMA 远端；C：V18 导丝配合 CXI 导管顺利通过闭塞病变；D：利用 Through & Through 技术将 V18 导丝与 MPA 对接；E：用 4 mm × 40 mm 球囊预扩；F：选用 smart-control 自膨式裸支架置入闭塞段

Figure 3　The procedure of modified ROMS　A: Ultrasound localization of the SMA (shown by the arrow); B: Puncturing the distal part of the SMA with a 21-gauge micropuncture needle under the ultrasound guidance; C: Successful passage of the lesion by the V-18 guidewire and CXI catheter; D: Cannulating the V-18 guidewire into the MPA catheter with a through and through technique; E: Predilation of the occluded SMA using a 4 mm×40 mm balloon; F: Deployment of a 6 mm×60 mm smart-control self-expanding bare-metal stent over the lesion

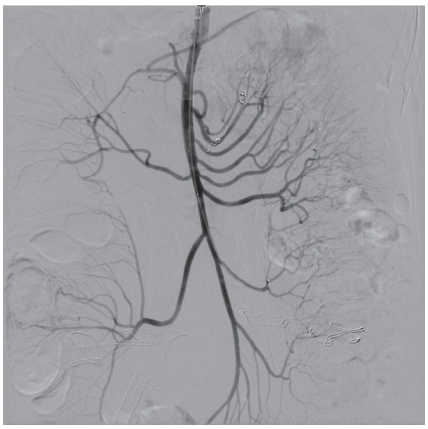

图 4　术后造影（支架通畅，远端血管显影良好且穿刺点无出血）

Figure 4　Postoperative angiography (showing patency of the SMA with excellent visualization of the distal vessels and no exudation of the puncture site)

2　结　果

2.1　手术结果

患者术后恢复良好，术后第2天即开始进食流质，第5天正常进食，进食后未出现腹痛。同时给予药物治疗，包括抗血小板，他汀类，激素等。患者症状完全缓解，于术后第9天出院。出院后随访，患者精神、体质良好，日常活动可，体质量增加约5 kg。

2.2　随访结果

术后3个月我院随访CTA示：支架形态、位置良好，血流通畅（图5）。

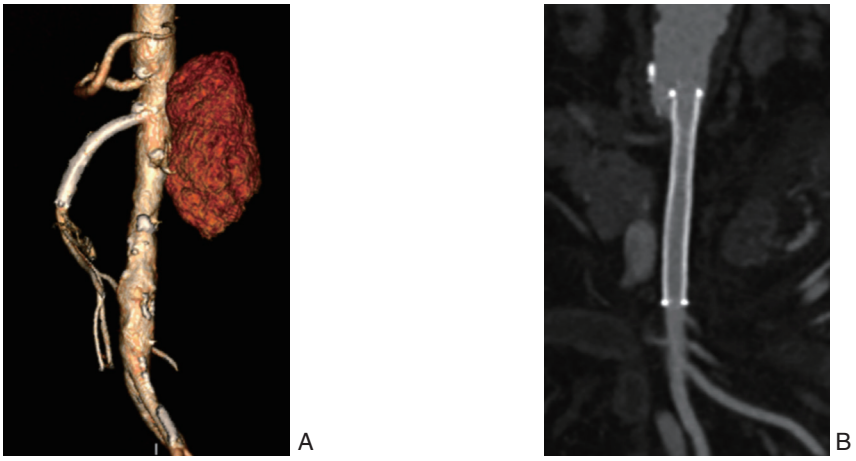

图 5　术后 3 个月随访 CTA　A：3D 重建图片显示支架定位良好，SMA 通畅；B：MPR 支架内纵切面重建显示支架形态良好，血管通畅

Figure 5　Follow-up CTA on postoperative 3 months　A: 3D reconstruction showing appropriate position of the stent and patency of the SMA; B: Reconstruction of the longitudinal section of the MPR stent showing the stent in good shape and excellent patency of the lumen

3　讨　论

腹腔内脏有3支供血动脉，即CA、SMA及IMA，其中1支或多支狭窄或闭塞造成血流不足即可引起肠系膜缺血。肠系膜上动脉闭塞（SMAO）是肠系膜缺血最常见的原因[7]，可急性发病也可慢性发病，急性较为多见，一旦发生肠坏死，病死率高达60%~90%[8]。急性肠系膜缺血（acute mesenteric ischemia，AMI）通常是由于血栓形成或栓塞所致，主要表现症状与体征不相符的剧烈腹痛[9-12]。尽管在影像诊断、外科手术和血管腔内治疗以及药物治疗方面取得了重大进展，但AMI仍极具挑战性，因其发病率和致死率都很高[1]。由于房颤等心脏疾病的广泛治疗，心脏来源栓塞减少，慢性肠系膜病变的原位血栓急性形成已成为AMI最常见的原因[13]。

与AMI不同，CMI较为少见，主要是由于动脉粥样硬化引起[14]，约占动脉粥样硬化患者中需血运重建的2%[15]。大多数患者大于60岁，女性患者约占70%以上。CMI症状主要表现为进食后腹痛、厌食、及体质量下降，这又称之为缺血的三联征[16]。早期诊断、早期开通血管是改善预后的关键[17-18]。治疗CMI的目标是改善或消除症状，从而达到改善营养状况和预防内脏梗死。目前主要采取基础治疗、血管腔内治疗、开放手术及杂交手术治疗[19]。自从1958年Shaw等[20]第1次对SMA进行内膜切除术以来，开放手术血运重建一直是备受推崇的治疗方法，其长期的通畅率尚可，文献[21-23]报道5年血管通畅率为57%~89%。开放手术血运重建方式包括动脉切开取栓术、动脉内膜切除术及SMA血管旁路术（常用术式有肠系膜上动脉–右髂动脉侧侧吻合、肠系膜上动脉–腹主动脉侧侧吻合和肠系膜上动脉–腹主动脉架桥术）[24]。然而，血管腔内治疗方法已经超越了开放手术血运重建，成为大多数肠系膜动脉闭塞的主要治疗方法[1]。目前，最常用的血管腔内治疗方法有置管溶栓术、血管腔内取栓术、血管成形术和支架置入术[25]。

尽管血管腔内治疗高效且广泛地应用于肠系膜动脉病变的治疗中，但某些SMA病变，如开口处动脉粥样硬化性无残端病变、长段病变和钙化病变，无法用传统的血管腔内治疗。针对这种情况，Milner等[26]在2004年创造了一种新颖且创伤更小的杂交手术，即ROMS。随后，几个单一的中心也使用了该技术，取得了相当满意的效果[5-6, 27-29]。有一最大宗报道表示，在15例患者中应用ROMS的成功率为93%，病死率为20%[6]。Wyers等[28]报道了6例患者应用ROMS全部成功，病死率为17%。大多数文献报道ROMS需要常规的剖腹手术并显露和重建近段SMA。也有学者对该技术进行了改良，Gilmore等[29]通过显露空肠动脉逆向开通SMA。ROMS不仅保留了对肠道活力的评估，而且避免了复杂和危险的血管旁路手术，从而避免假体材料植入污染区域的可能。本病例无法找到SMA开口且CA和SMA、SA和SMA无明显侧支血管，所以无法通过顺向血管腔内和侧支血管腔内逆向开通SMA。考虑到患者体质、营养状况

差，且有多种严重合并症，ROMS创伤还是太大，为此我们对该技术进行了改良。新的手术方式与传统ROMS相比有以下几种优势：(1) 可以大大减小腹部切口。新的手术方式只需要显露部分肠系膜即可，通过超声定位即能穿刺SMA远端建立通路。(2) 避免切开肠系膜。不破坏任何肠系膜组织及其内在的侧支血管，同时减少内脏翻动，降一步降低了创伤。(3) 操作完成后无需缝合SMA和肠系膜。采用微穿刺针穿刺SMA远端，微导管和导丝过病变，逆向通路仅仅是作为通过病变的辅助通道，支架仍由通过肱动脉建立的长鞘释放，因此远端的SMA穿刺点仅仅压迫15 min即可，无需缝合止血，进一步降低了创伤且减少了手术时间。正是有着这些诸多的优势，该患者即使极其脆弱，也能顺利耐受手术并快速康复。

总之，对于一些SMA开口处动脉粥样硬化性无残端病变、长段病变及钙化病变且没有侧支血管无法通过血管腔内治疗，这种新手术方式可作为一种可行的治疗选择。虽然本病例取得很好的治疗效果，但是最终的有效性和可行性需要更多的病例资料来验证。

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