# Vascular prosthesis graft bypass in the treatment of 78 patients with Leriche syndrome☆

Wang Chun-xi[1], Chen Gang[2], Liang Fa-qi[1], Peng Zheng[1]

## Abstract

**BACKGROUND:** Effective drugs for improving vascular elasticity and revascularization are few for treating Leriche syndrome (chronic lower extremities ischemia) induced by abdominal aortic occlusion. Vascular outflow tract reconstruction in vascular prosthesis transplantation can rapidly improve blood supply in the distal extremities.

**OBJECTIVE:** To evaluate the biocompatibility and outcome of vascular prosthesis transplantation for the treatment of Leriche syndrome.

**DESIGN:** Controlled study before and after surgery.

**SETTING:** Department of General Surgery of General Hospital of Chinese PLA and Department of Thoracic and Cardiovascular Surgery of Shijingshan Hospital.

**PARTICIPANTS:** Sixty-two patients and sixteen patients with Leriche syndrome were enrolled in this study, who were respectively from Department of General Surgery of General Hospital of Chinese PLA between January 1995 and January 2007 and from Department of Thoracic and Cardiovascular Surgery of Shijingshan Hospital between January 2001 and January 2007. The subjects were 66 males and 12 females, whose age ranged from 46-75 years (averagely 58 years) and onset time from 6 months-8 years (averagely 2 years and 6 months). Informed consents were obtained from all patients.

**METHODS:** After general anaesthesia or epidural anesthesia, vascular bypass was performed, including aortofemoral bypass in 63 cases and aortoiliac bypass in 15 cases. Vascular prostheses included polytetrafiuoroethylene (PTFE) vascular prosthesis in 18 cases and polyester vascular prosthesis in 60 cases. PTFE vascular prosthesis (Gore, USA) is a kind of inert material with low biological response. Its fibers with micropores arrange irregularly. Polyester vascular prosthesis (Intervascular, France) is a kind of knitting polyester products, which is made from high-purity cattle collagen I with high biocompatibility. To inlay heparin molecules that can retain 4 weeks into the surface of vessels coated with collagen can prevent thrombogenesis and inhibit hyperplasy of smooth muscle cells (SMC). The type is IGK1608; internal diameter of the bole is 16 mm; internal diameter of the branch is 8 mm. Therapeutic prescriptions were approved by Hospital's Ethics Committee. Follow-up was performed for 3 months-5 years by vascular Color Doppler Sonography, spiral CT angiography (SCTA) three-dimensional reconstruction or digital subtraction angiography (DSA) in hospital.

**MAIN OUTCOME MEASURES:** Biocompatibility of vascular prosthesis and outcome of vascular prosthesis transplantation.

**RESULTS:** Three months after vascular prosthesis transplantation, thrombus was not detected on vascular anastomosis and in vascular prosthesis by Color Doppler Sonography and SCTA. Seventy-seven patients were followed up for over one year, and their stomas were unobstructed. Seventy-six patients were followed up for over five years, and the patency rate of stomas was 89% (68/76). No changes in blood plaque, lencocyte count, haematoglobin or liver and kidney function were found after transplantation. Seven days after surgery, affected extremities with ischemic symptom were improved. Three months later, ischemic symptom disappeared.

**CONCLUSION:** With good biocompatibility of vascular prosthesis, vascular prosthesis transplantation in the treatment of Leriche syndrome has a good outcome following aortofemoral bypass and aortoiliac bypass.

[1]Department of General Surgery, General Hospital of Chinese PLA, Beijing 100853, China; [2]Department of Thoracic and Cardiovascular Surgery, Shijingshan Hospital, Beijing 100043, China

Wang Chun-xi, ☆ Doctor, Professor, Chief physician, Department of General Surgery, General Hospital of Chinese PLA, Beijing 100853, China
wangchunxi301pw@sina.com

Received: 2007-12-25
Accepted: 2008-01-30
(07-50-9-5189/H)

Wang CX, Chen G, Liang FQ, Peng Z. Vascular prosthesis graft bypass in the treatment of 78 patients with Leriche syndrome. Zhongguo Zuzhi Gongcheng Yanjiu yu Linchuang Kangfu 2008;12(18):3579-3582(China)

[www.zglckf.com/zglckf/ejournal/upfiles/12-18/18k-3579(ps).pdf]

## INTRODUCTION

Leriche syndrome refers to chronic lower extremities ischemia combined with sexual disturbance induced by occlusion of distal abdominal aorta. Leriche syndrome is one of common arterial occlusive diseases in vascular surgery. Drug treatment is mainly used for treating Leriche syndrome in clinic, but the outcome is not good. Recently, operation treatment has been employed and seems obtained good outcome, but the clinical data are few, especially there are few reports on improving extremity ischemia and sexual disturbance after vascular prosthesis transplantation. In this study, we obtained good outcome in the treatment of Leriche syndrome by vascular prosthesis bypass in 78 patients.

## SUBJECTS AND METHODS

### Subjects

Sixty-two patients and sixteen patients with Leriche syndrome, who were respectively from Department of General Surgery of General Hospital of Chinese PLA between January 1995 and January 2007 and from Department of Thoracic and Cardiovascular Surgery of Shijingshan Hospital between January 2001 and January 2007, were enrolled in this study. The patients contained 66 males and 12 females, who ranged from 46 to 75 years in age (averagely 58 years) and from 6 months to 8 years in onset time (averagely 2 years and 6 months). Informed consents were obtained from all patients.

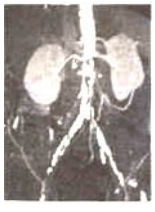
Diagnostic criteria: patients with intermittent lameness, cold exposure, numbness, humble skin, a decrease in hairs number or thickening of toenail, pain of the lower extremity; black and necrotic toes; disappeared impulse of bilateral femoral artery; a reduction in skin temperature of lower extremity; positive result of the toe-end compression test; occlusion or severe stenosis of the distal abdominal aorta and arteria iliaca by Color Doppler Sonography; patients combined ith decreased libido, erectile disfuction and apareunia; wwith the exception of sexual

disturbance due to spinal cord injury and spiritual disturbance.

Signs and symptoms: Seventy-eight patients developed intermittent lameness, cold exposure and numbness of lower extremity in combination with significant sexual disturbance. Fifty-six patients developed pain in the rump, the medial part of the thigh or perineum. Forty patients developed muscular atrophy of lower extremity. Forty-one patients developed skin cyanosis. Three patients developed edema of lower extremity. Six patients had humble and glazing pretibial skin. Thirty-five patients had purpura. Six patients had foot ulcer. Three patients had gangrene. In all patients, bilateral femoral artery was impalpable; Impulses of popliteal artery, dorsal pedal artery and posterior tibial artery were impalpable; The temperature of peripheral skin was low and the peripheral circulation was bad. Positive results were obtained in toe-end (finger-end) compression test.

Imageology examination: DSA was performed after admission, which showed that seventeen patients developed general stenosis of the lower segment of abdominal aorta; sixty-one patients developed local occlusion; aortic wall was rough and diffuse (Figure 1). Sixty-seven patients, who had enough money and time before vascular prosthesis bypass, received SCTA. The SCTA examination showed occlusion or severe stenosis of the end-piece of aorta, rough vessel wall, thrombosis or calcified plaque (Figure 2). Color Doppler Sonography manifested similar phenomenon and the distal outflow tract was smooth. Accompanied diseases: Of the seventy-eight patients, fifty-three patients (68%) simultaneously developed various accompanied diseases. Forty-eight patients (62%) were combined with coronary artery disease, twenty-eight patients (36%) with diabetes mellitus, fourteen patients (18%) with rheumatic heart disease and sixteen patients (20%) with hypertension.

Figure 1 Complete occlusion of lower segment of abdominal aorta and iliac artery (Digital subtraction angiography)



a: Calcification and severe stenosis of lower segment of abdominal aorta and iliofemoral artery

b: Complete occlusion of lower segment of abdominal aorta and iliac artery

Figure 2 Results of spiral CT angiography

## Methods

Vascular prosthesis used in vascular transplantation: After general anaesthesia or epidural anesthesia, vessel bypass was conducted, including aortofemoral bypass in 63 patients and aortoiliac bypass in 15 patients. Vascular prostheses were used as grafts, including polytetrafiuoroethylene (PTFE) vascular prosthesis in 18 patients and polyester vascular prosthesis in 60 patients. PTFE vascular prosthesis (Gore, USA) called e-PTFE is a kind of expanded inert material with low biological response and easy operation as well as a teflon expanded type. Its fibers arrange irregularly with micropores. Long-term patency rate is high. Bifurcate vascular prosthesis (Y type) was used with internal diameter of the bole of 16 mm and internal diameter of the bifurcation of 8 mm. Polyester vascular prosthesis (Intervascular, France) is a kind of knitting polyester products, which is made from high-purity cattle collagen Ⅰ with high biocompatibility. To inlay heparin molecules that could retain 4 weeks into the surface of vessels coated with collagen could prevent thrombogenesis and inhibit hyperplasy of smooth muscle cells. The type is IGK1608; internal diameter of the bole is 16 mm; internal diameter of the bifurcation is 8 mm.

Highlight of performing vascular transplantation: An incision was made on the median abdomen from 10 cm below xiphoid to 5-10 cm bellow the umbilicus (the umbilicus was maintained). After opening posterior peritoneum, exploration of the lower segment of abdominal aorta demonstrated that occlusion of distal abdominal aorta and bilateral iliac artery, stiff inelastic vessels, adherence round aorta to different degrees. Aorta below renal artery was dissociated and a block band for encircling aorta were prepared for aorta blockage and blood control. 50 mg of heparin sodium was injected into the occluded aorta by puncturation to prevent thrombus in distal vessels following aortic blockage. Aorta was obstructed. A 3 cm longitudinal incision was made in the anterior wall of aorta to remove local thrombus or plaque and to trim the incision oval. At the same time, the bole of Y type vascular prosthesis was trimmed to anastomose with the incision of the aorta. No. 3-0 vascular suture thread was used to continuously suture of vascular prosthesis and aorta for end-to-side anastomosis. Aortic cross-clamping was loosed for filling the vascular prosthesis and checking whether the leakage of blood was present at stoma. If obvious leakage of blood was present, a stitch was done for interrupted suture. After confirming no leakage of blood, vascular prosthesis was blocked at stoma to reconstruct a distal outflow tract. Aortoiliac bypass was performed in the same incision if bilateral iliac artery was relatively complete. Aortofemoral bypass was conducted in patients with wide stenosis or large local plaque of iliac artery and severe calcification of vascular wall. Bilateral iliac artery was exposed 4.0-5.0 cm. Tunnels were made along iliac vessel towards bilateral femoral artery in the pelvic cavity. The proximal and distal femoral arteries were blocked with an auricular clamp at stoma and a 2 cm incision was made, which were continuously sutured with the Y type vascular prosthesis after trimming with No. 5-0 vascular suture thread. After gas was evacuated in the vascular prosthesis, the clamp was loosed to recover distal vascular pulsation. Aortofemoral


P.O. Box 1200, Shenyang 110004 kf23385083@sina.com

bypass was done in 63 patients and aortoiliac bypass in 15 patients. Simultaneously, 21 patients combined with iliac vascular occlusion received iliac vascular reconstruction. Compound Danshen injection for expanding vessels and improving microcirculation was used one week before bypass and two weeks after bypass to improve the compensatory circulation of the lower extremity before vascular transplantation and to control combined diseases. Therapeutic procedures were approved by Hospital's Ethics Committee.

Follow-up: Follow-up was performed for 3 months-5 years by vascular Color Doppler Sonography, spiral CT angiography (SCTA) three-dimensional reconstruction or digital subtraction angiography (DSA) in hospital. SCAT was only performed in patients with enough money.

## RESULTS

### Biocompatibility of vascular prosthesis

Three months after vascular prosthesis transplantation, thrombus was not found on vascular stoma and in vascular prosthesis by Color Doppler Sonography and SCTA. Seventy-seven patients were followed up for over one year, and their stomas were unobstructed. Seventy-six patients were followed up for over five years, and the patency rate of stomas was 89% (68/76). No changes in blood plaque, lencocyte count, haematoglobin or liver and kidney function were found after transplantation.

### Outcome

Pulsations of the femoral artery and popliteal artery were observed after vascular transplantation in all patients. Seven days after transplantation, ischemia of affected extremities was improved. Pulsations of dorsal artery of foot and posterior tibial artery were present in 62 cases. However, blood flow of dorsal artery of foot and posterior tibial artery could be detected in the remaining patients by Doppler examination at bedside. Three months later, ischemic symptom disappeared in affected extremities. One died of myocardial infarction three years after transplantation. One developed local stoma thrombus due to abdominal injuries four years after transplantation, and healed after thrombolysis therapy. SCTA results in patients five years after aortofemoral bypass were shown in Figure 3.

Figure 3 Spiral CT angiography of improved blood supply of iliac artery, stoma potency and impotence five years after aortofemoral bypass

## DISCUSSION

At present, medical treatment for Leriche syndrome only can delay the development of diseases, improve compensatory circulation, release pain and accelerate ulcer healing. In patients with distal smooth vessels, who fit for vascular bypass, vascular prosthesis transplantation and vascular outflow tract reconstruction can effectively improve the blood supply of the distal extremity [1-2].

Requirements were strict to choose a vascular prosthesis for transplantation. The vascular prosthesis should have a suitable diameter, thickness of vascular wall and mesh. Severe errhysis should not occur when implanting. Surrounding tissues should grow from external to internal mesh after implantation to form a smooth new endomembrane in internal wall of vascular prosthesis. External wall was coated with fibrous tissues. Thus, external and internal walls were covered with autologous tissues, which keeps the vessel smooth and robust [2-3]. Ideal vascular prosthesis materials are inert, unstrain, non-carcinogenic, thermotropic, allergenic, easily sterilizing, operating and with low price. Nylon, orlon and Ivalon have been eliminated. Presently, terylene and polytetrafluoroethylene materials have been used. Vascular prostheses are weaved by woven, braided and knitted. Woven fibers are distributed in length and breadth; Braided fibers are distributed in braid shape; Knitted fibers are distributed in loop form, which has large mesh and needs to be precloted. Extruded e-PTFE is a kind of expanded inert material with low biological response and good elasticity; Ectonexine e-PTFE with tiny micropore is smooth and easy for repairing tissues and operating. Polyester vascular prosthesis (Intervascular, France) is a kind of knitting polyester products, which is made from high-purity cattle collagen I with high biocompatibility. To inlay heparin molecules that can retain 4 weeks into the surface of vessels coated with collagen can prevent thrombogenesis and inhibit hyperplasy of smooth muscle cells.

Aortofemoral bypass and aortoiliac bypass were mainly used in vascular transplantation [2,4]. Infrarenal abdominal aorta was dissociated during vascular bypass. Lesions on infrarenal abdominal aorta were light, where were better as a stoma. Whether end-to-end anastomosis or end-to-side anastomosis depends on the concrete condition. Many scholars thought that end-to-end anastomosis coinciding with hemodynamics was highly praised. However, authors believed that patients with occlusion or long stenosis of aorta, iliac artery lesions, without collateral circulation should receive end-to-end anastomosis; patients with local stenosis and collateral circulation in the pelvic cavity by visualization before vascular transplantation should receive end-to-side anastomosis. This could better improve blood supply in iliac artery and in pelvic cavity organs. Lower extremity ischemia and sexual function are rapidly improved following aortofemoral bypass or aortoiliac bypass. Authors confirmed that the patency of iliac vessels was checked when doing exploration of abdominal aorta and iliac vessels during vascular transplantation. Patients combined with occlusion of iliac vessels received reconstruction of iliac vessels. Therefore, impotence was significantly improved following vascular transplantation. This is accorded with the studies made by Cormio *et al* [1]. Leriche syndrome is often combined with many complications. Treatment before and

after transplantation is a crucial process for elevating success rate. Vascular transplantation is safe only when fully evaluating the risk of vascular transplantation and well disposing main organ complications such as cardio-cerebrovascular disease. Application of dilatation drugs and microcirculation improving drugs, including Chinese medicine for Huoxue Huayu (promoting blood flow and dissolving stagnant blood) before vascular transplantation can construct compensatory circulation, elevate tolerance of the body, improve blood supply in pelvic cavity, resulting in improving sexual function.

Long-term patency following vascular prosthesis transplantation is a hot topic in vascular surgery research. One-year patency rate was over 95%, but 5-years patency rate was 85%~90% [5-8]. In this study the patency rate was 87.18%. Main reasons for long-term occlusion or impatency of vascular prosthesis were hyperblastosis and local thrombus around stoma. How to prevent local hyperplasy of endomembrane and local thrombus was a hot problem in vascular surgery research [9-10]. However, there are no effective preventive measures. Anticoagulant followed vascular prosthesis transplantation can enhance the patency of vessels, but long-term application of anticoagulant can severely affect clotting mechanism and liver and kidney function of the body. Chinese medicine is distinctive in Huoxue Huayu research. Danshen root preparation can decrease blood viscosity, inhibit platelet aggregation, increase negative charge in the surface of erythrocyte, prevent hyperplasy of vascular endomembrane and avoid arteriosclerosis [10-11]. It is of great importance to improve microcirculation, enhance compensatory circulation and elevate long-term vascular patency rate by administrating heparin drug in one week after transplantation, and then using platelet aggregation inhibitor and Danshen root drugs, as well as orally taking small-dose of aspirin and compound Danshen root for a long term.

## REFERENCES


1 Cormio L, Edgren J, Lepntalo M, et al. Aortofemoral surgery and sexual. Eur J Vasc Endovasc Surg 1996;11:453-456
2 De Vries SO, Hunink MGM. Results of aortic bifurcation grafts for aortoiliac occlusive disease: a meta-analysis. J Vasc Surg 1997;25:365
3 Battaglia G, Tringale R, Monaca V. Retrospective comparison of a heparin bonded ePTFE graft and saphenous vein for infragenicular bypass: implications for standard treatment protocol. J Cardiovasc Surg (Torino) 2006;47(1):41-47
4 Shor NA, Pronin IV. Diagnosis and surgical treatment of false aneurism of proximal anastomosis after performance of aorto-femoral reconstruction for Leriche syndrome. Klin Khir 2006;9(9):45-48
5 Brewster DC. Current controversies in the management of aortoiliac occlusive disease. J Vasc Surg 1997;25:365-369
6 Wu QH. The choice of open operation and intervention in patients with leg arteriosclerosis obliterate.Zhongguo Zhongxiyi Jiehe Waike Zazhi 2005;12(2):97
7 Szpinda M.Angiographic study of the tibioperoneal trunks in patients with aorto-iliac occlusive disease.Ann Anat 2005;187(4):405-410
8 Chan HH, Tai KS, Yip LK. Patient with Leriche's syndrome and concomitant superior mesenteric aneurysm: evaluation with contrast-enhanced three-dimensional magnetic resonance angiography, computed tomography angiography and digital subtraction angiography. Australas Radiol 2005;49(3):233-237
9 Gou?ffic Y, Piffeteau T, Patra P. Acute leriche syndrome due to paradoxical embolism[J]. Eur J Vasc Endovasc Surg 2007;33(2): 220-222
10 Chen BN, Shang DJ. The progress of arteriosclerosis obliterate treating with Chinese and western medicine intergration. Zhongguo Zhongxiyi Jiehe Waike Zazhi 2005;12(2):100-103
11 Wu HN, Sun H.The effect of the integrated Chinese Salvia miltiorrhiza and west medicine in patients with diabetes foot. Zhongguo Zhongxiyi Jiehe Zazhi 2003;23(10):727-729


# 应用人工血管移植物转流治疗 Leriche 综合征 78 例☆


王春喜[1]，陈 刚[2]，梁发启[1]，彭 正[1]

[1]解放军总医院普通外科，北京市 100853；[2]北京市石景山医院心胸血管外科，北京市 100043

王春喜☆，男，1963 年生，山东省加祥县人，汉族，1995 年天津医科大学毕业，博士，教授，主任医师，主要从事普通外科和周围血管疾病基础和临床研究。



**摘要**

**背景**：针对腹主动脉闭塞引起下肢慢性缺血的 Leriche 综合征的治疗，尚缺乏有效恢复血管弹性和闭塞血管再通的药物。应用人工血管移植血管流出道重建可迅速改善远端肢体的血运。

**目的**：评估人工血管移植干预 Leriche 综合征的生物相容性，并观察治疗效果。

**设计**：前后对照观察。

**单位**：解放军总医院普通外科，北京市石景山医院心胸血管外科。

**对象**：选择 Leriche 综合征患者 78 例，包括于 1995-01/2007-01 解放军总医院普通外科收治的 62 例及 2001-01/2007-01 北京市石景山医院心胸血管外科收治的 16 例。男 66 例，女 12 例；年龄 46~75 岁，平均 58 岁。发病时间 6 个月~8 年，平均 2 年 6 个月。患者对治疗方案均知情同意。

**方法**：均在全身麻醉或硬膜外麻醉下行血管转流，其中主-股转流 63 例，主髂转流 15 例，采用人工血管作为移植物，其中 PTFE 人工血管 18 例，聚酯（polyester）人工血管 60 例。PTFE 人工血管由美国 Gore 公司提供，为膨体聚四氟乙烯人工血管，是一种惰性材料，生物反应较轻，其纤维呈非规则的随意排列，并具有微孔。聚酯人工血管为法国 Intervascular 公司生产的针织聚脂产品，这种针织聚脂人工血管采用高纯度 I 型牛胶原制成，具有高度生物相容性，同时在胶原涂层的血管表面镶嵌能保留 4 周的肝素分子，具有预防血栓形成和抑制平滑肌细胞过度增生的作用；所用型号 IGK1608，主干内径为 16 mm，分支内径为 8 mm。治疗方案经医院伦理委员会批准。采用回院复查的方法通过彩色血管多普勒、SCTA 三维重建或 DSA 血管造影，SCTA 检查对患者进行 3 个月~5 年随访。

**主要观察指标**：人工血管生物相容性；人工血管移植治疗效果。

**结果**：①人工血管生物相容性：人工血管移植后 3 个月复查，彩色超声以及 SCTA 检查血管吻合口及人工血管内均未见血栓。77 例获得 1 年以上的随访，吻合口均通畅。76 例获得 5 年以上随访，吻合口通畅率为 89%（68/76）。血管移植后血小板、白细胞计数、血红蛋白、肝肾功能无与血管移植相关的变化。②疗效：血管移植后 7 d，患肢缺血症状均得到改善。人工血管移植后 3 个月，患肢缺血症状消失，64 例阳痿现象得到明显改善。

**结论**：利用人工血管移植行血管重建，人工血管生物相容性良好，主动脉股动脉转流或主动脉髂动脉转流后治疗 Leriche 综合征疗效佳。



**关键词**：人工血管；Leriche 综合征；转流术；外周血管植入物；生物相容性

中图分类号：R617 文献标识码：A 文章编号：1673-8225(2008)18-03579-04

王春喜，陈刚，梁发启，彭正.应用人工血管移植物转流治疗 Leriche 综合征 78 例[J].中国组织工程研究与临床康复，2008，12(18):3579-3582

[www.zglckf.com/zglckf/ejournal/upfiles/12-18/18k-3579(ps).pdf]

(Edited by Ouyang CX/Qiu Y/Wang L)