Eur J Vasc Endovasc Surg (2011) **42**, 803–808

Hybrid Laparoscopic Technique for Renal Artery Takayasu Arteritis

P. Shao [a], C. Qin [a], X. Meng, J. Li, X. Ju, P. Li, C. Yin*

Department of Urology, The First Affiliated Hospital of Nanjing Medical University, 300 Guangzhou Road, Nanjing 210029, China

Submitted 24 May 2011; accepted 8 September 2011
Available online 5 October 2011

KEYWORDS
Laparoscopy;
Renal artery stenosis;
Takayasu's arteritis;
Bypass;
Autotransplantation

Abstract *Objective:* To evaluate the feasibility of combined laparoscopic technique for different types of vascular reconstruction in the treatment of Takayasu renal artery stenosis.
Design: Retrospective study of seven cases of renal artery stenosis caused by Takayasu arteritis (TA).
Materials: Institutional practice and hospitalised patients. All these patients manifested renal arterial hypertension and failed to percutaneous transluminal angioplasty (PTA) treatment. Different types of revascularisation using hybrid laparoscopic technique were applied.
Methods: Laparoscopic renal artery isolation and kidney mobilisation were first performed. Several types of vascular reconstruction were performed as two patients underwent autotransplantation, four patients aortorenal bypass and one splenorenal bypass. For bypass patients, hypogastric artery was harvested by laparoscopic approach while saphenous vein and spleen artery were dissected by conventional opening. Autotransplantation and arterial anastomosis were then performed through an open incision.
Results: All procedures were performed successfully without major intraoperative complications. The total operative time was 191 (130–280) min while laparoscopic part was 62 (40–105) min. The mean blood loss was 261 (150–400) ml. Postoperative blood pressure returned to normal in five patients but two others required single-agent antihypertensive medication. Minor complications included lumbar artery injury and flank pain each in one case. The anastomosis was patent in all patients and no re-stenosis occurred during 6–40 months of follow-up.
Conclusions: Hybrid laparoscopic techniques involving renal artery dissection and hypogastric artery harvesting are feasible in surgical treatment of Takayasu renal arteritis. This hybrid surgical technique provides an alternative approach to revascularise the renal circulation, especially for the patients of PTA treatment failure.

* Corresponding author. Tel.: +86 13770738899; fax: +86 25 8370079.
E-mail address: Changjunyin@hotmail.com (C. Yin).
[a] P. Shao and C. Qin made equal contributions to this article.

1078-5884/$36
doi:10.1016/j.ejvs.2011.09.005

Significant renal artery stenosis may lead to refractory hypertension, increased risk of vascular events and impaired renal function.[1] In Asian countries the most common cause of renal artery stenosis in young patients is Takayasu arteritis (TA).[2] TA is a chronic vasculitis involving the aorta and the root of its major branches. The diagnosis of TA depends on the following criteria such as age no more than 40 years, decreased brachial artery pulse, Claudication of extremities and arteriographic abnormality.[3] Surgical intervention of renal artery stenosis is necessary when renal arterial hypertension (RAH) could not be controlled by medications.[4,5] Percutaneous transluminal angioplasty (PTA) with stenting provides a simple procedure with minimal invasion while it may fail in the case of severe arterial narrowing and the long-term patency of stenting is not satisfactory.[6–8] Surgical revascularisation is still the gold standard treatment of renal artery stenosis as a salvage method for failed endovascular procedures as well.[9–11] Conventional renal revascularisation, either autotransplantation or bypass operation, is performed through an open approach. As it was first introduced in live donor nephrectomy involving renal pedicle and parenchyma dissection in 1995,[12] laparoscopic technique has widely been accepted by transplant surgeons.[13–15] In this study, we used hybrid laparoscopic technique including different types of renal revascularisation in treating TA with refractory RAH. The technical feasibility and efficiency of these hybrid laparoscopic techniques in reconstitution of renal circulation were evaluated.

Patients and Methods

Between March 2007 and August 2010, seven patients with renal artery stenosis were admitted to our department. Information on patients and preoperative data are summarised in Table 1. All patients had sustained hypertension that could not be well controlled by oral antihypertensive drugs. Computer tomography angiography (CTA) and digital subtraction angiography (DSA) in each patient confirmed that the stenosis was caused by TA disease. TA in every case was assessed as in a stable stage due to the normal erythrocyte sedimentation rate (ESR) and no requirement of steroids. Radiological studies revealed that three patients (cases 2, 3, 5) had bilateral stenosis with different severity. No immediate intervention was given for the mild side. The other four patients presented unilateral affected renal artery. Attempts of PTA as initial treatment failed in seven patients due to the severe lumen narrowing.

Renal artery reconstructive methods of seven patients included two autotransplantations, one aortorenal anastomosis, two aortorenal bypass with autogenous hypogastric artery, one aortorenal bypass with autogenous saphenous vein, and one splenorenal arterial bypass. In this study we combined laparoscopic dissection of renal pedicle, renal parenchyma and harvesting hypogastric artery with open procedure to complete renal revascularisation.

1. Laparoscopic dissection of renal pedicle (Fig. 1): All patients were placed in a lateral decubitus position with four ports in lumbar region. By mobilising posterior wall of kidney, renal artery was isolated and dissected to its stenotic part. Accessory renal artery and peripheral compensating artery were also dissected if existed. Renal parenchyma was then defatted for completed mobilisation.
2. Laparoscopic harvesting of hypogastric artery (Fig. 2): Two patients were placed in a supine position. Four ports were placed, with subsequent open incision passing three of them. Bifurcation of right common iliac artery was exposed after pelvic peritoneum incised. Hypogastric artery was isolated to its major branch. Hypogastric artery was clipped at proximal and distal sites of the stem for harvesting.
3. Autotransplantation: A Gibson incision ipsilateral to the affected side was made through which the mobilised kidney was taken out. The renal artery was end-to-end anastomosed to hypogastric artery while the renal vein was end-to-side anastomosed to external iliac vein. The accessory renal artery was preserved and conjoined with the main renal artery before anastomosis with the hypogastric artery. The ureter was transected and reimplanted to the bladder.
4. Aortorenal bypass (Fig. 2): A right subcostal, curved incision was made to expose the renal pedicle and aorta from the level of renal artery to inferior mesenteric artery. A suitable segment of infrarenal aorta was transversely clamped at both ends following systemic heparinisation. An aortic hole was made with aortic punches for end-to-side anastomosis. Subsequently,

Table 1 Preoperative demographic data and information of patients.

Patient	Age/sex	BMI	Estimated length of RAS in DSA (cm)	Pre-op BP (mmHg)	Pre-op rennin (decubitus) (μg/L/h)	Pre-op GFR in operative side (ml/min)	Preoperative sCr (μmol/L)	ESR (mm/H)	Number of BP medications
1	24/M	22.0	0.5/ostial	180/110	10.9	33.7	79.1	7	2
2	26/F	23.1	2.1/main RA	195/105	9.5	36.3	88.1	6	2
3	29/M	24.4	1.5/main RA	210/110	6.2	29.8	115	10	3
4	22/F	19.6	1.0/main RA	205/110	7.2	34.5	69.1	9	2
5	23/F	19.1	0.5/ostial	180/105	17.1	61.7	60.4	10	3
6	8/F	18.3	1.2/main RA	145/100	4.9	41.7	48.5	7	1
7	26/F	19.4	2.8/main RA	165/95	7.7	35.3	72.5	6	1

BMI: body mass index, RAS: renal artery stenosis, GFR: glomerular filtration rate, Cr: creatinine, ESR: erythrocyte sedimentation rate, BP: blood pressure.