Transplant Renal Artery Stenosis in Thailand

SOPON JIRASIRITHAM, MD*,
WIWAT TIRAPANITCH, MD*,
SIRIWAN JIRASIRITHAM, MD***,
JIEMJITRE TAPANEEYAKORN, MD**,
SURASAK LEELAUDOMLIPI, MD*,
SUTHUS SRIPHOJANART, MD*.

Abstract

Transplant renal artery stenosis (TRAS) is one of the common vascular complications post kidney transplantation. A retrospective study of TRAS among transplant recipients at a single transplant center in Thailand was performed from February 1986 to December 2002. Among 750 cases, 16 cases (2.1%) of TRAS were identified. Twelve cases (3.3%) were from cadaveric donors and four cases (1%) were from living-related donors (p-value = 0.034). Most cases presented with progressive deterioration of kidney graft with or without refractory hypertension. Doppler ultrasonography was used for initial screening followed by renal angiography. Fifteen cases were treated by Percutaneous Transluminal Angioplasty (PTA) with a 73 per cent success rate. Five cases underwent surgical revascularization with an 80 per cent success rate. Two cases (13%) of successful PTA showed recurrent stenosis with 46 months follow-up which were successfully treated by repeated PTA with stents.

Key word : Transplant Renal Artery Stenosis, Kidney Transplantation, Vascular Complication

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Transplant renal artery stenosis (TRAS) is one of the most common vascular complications after kidney transplantation. The reported incidence varies from 1 per cent to 23 per cent[1,2]. The actual incidence is probably unknown since there is no routine screening among all transplant recipients. TRAS is

* Department of Surgery,
** Department of Radiology,
*** Department of Anesthesiology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand.

classified according to its stenotic location: at the anastomosis, post-anastomosis, and at the native iliac artery[3]. The etiologies cited are surgical technique-related, atherosclerotic disease in both donor and recipient arteries, intimal hyperplasia, and immune-related from acute or chronic rejection. TRAS will result in graft deterioration and can cause refractory clinical hypertension. Its mechanism is renin-angiotensin system activation secondary to kidney hypoperfusion. TRAS must be distinguished from other causes such as acute rejection or calcineurin inhibitor nephrotoxicity which can also lead to graft dysfunction. Doppler ultrasonography is used as a simple and non-invasive technique to screen for TRAS with a reported sensitivity and specificity of 90-100 per cent and 87-100 per cent, respectively[4]. The objective of this study was to review the clinical experience including diagnosis, treatment, and outcome of TRAS among the Thai kidney transplant recipients at one single transplant center.

PATIENTS AND METHOD

A retrospective study of Thai kidney transplant recipients at Ramathibodi Hospital, Bangkok, Thailand from February 1986 to December 2002 was performed. There were 750 kidney transplantations with a kidney from 384 living donors and 366 cadaveric donors. The basic immunosuppression composed of microemulsion form cyclosporine, the calcineurin inhibitors, and low dose steroid with or without azathioprine or mycophenolate mofetil. The technique of graft implantation was using the renal vessels anastomosed to the external iliac vessels by end to side technique. Out of 750 cases of kidney transplants performed, sixteen cases (2.1%) of TRAS were identified and this forms the basis of the present study. TRAS was initially diagnosed by using a Doppler ultrasonography and defined as an increase in peak systolic velocity (PSV) at the stenotic site of the main vessel with a decrease in a resistive index (RI) in the post-stenotic intrarenal interlobar arteries. All diagnosis was subsequently confirmed by a conventional angiography. Presentation, investigation, treatment, and outcome were studied. A statistical analysis was performed using student *t*-test with a significance defined at $p = 0.05$.

RESULTS

Sixteen cases of TRAS were identified. The mean age was 54.8 ± 8.6 years old with a 9 : 7 male-to-female ratio. The mean time from transplant to diagnosis was 8.7 ± 3.4months. Twelve cases (3.3%) were from cadaveric donors and four cases (1.0%) were from living-related donors. There was no significant association between acute or chronic rejection with the incidence of TRAS. The typical clinical presentation, 14 cases (87.5%), was a progressive kidney graft function deterioration with a gradual rising of serum creatinine. Of these, eight also had uncontrolled hypertension requiring more than two antihypertensive regimens. Two cases presented with only recent refractory hypertension without graft dysfunction.

Fig. 1. Renal angiography demonstrates transplant renal artery stenosis in the middle site of the renal artery.

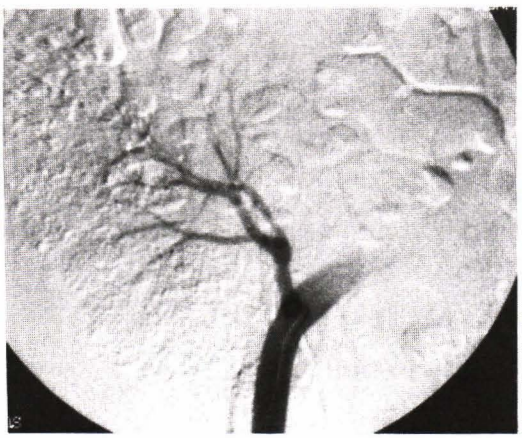

Fig. 2. Successful PTA in dilating TRAS.

Physical examination was not helpful as only four cases showed abnormally high-pitched bruit over the graft area. Eight cases had prior biopsy to exclude other causes of kidney graft dysfunction. From the angiogram, 11 cases (69%) had stenosis at the middle part of the donor renal artery, 3 cases (19%) at the anastomosis, and 2 cases (12.5%) at the native iliac artery. Fifteen cases were treated by percutaneous transluminal angioplasty (PTA) with the technical success rate of 73 per cent (11/15) (Fig. 1, 2, 3). Ten patients had improved kidney graft function by one month after the successful PTA with also improved control of hypertension demonstrated by a decrease in anti-hypertensive regimens. The mean serum creatinine before and after PTA were 2.7 ± 1.4 and 1.5 ± 0.8 mg/dl successively There were two cases (13%) of recurrent arterial stenosis after the averaged follow-up of 46 ± 11 months which were successfully treated with repeated PTA and an additional stent placement (Fig. 4, 5, 6, 7, 8). There were two cases of procedure-related hematoma complication at the femoral puncture sites that had no significant clinical sequel. Four cases that failed PTA and one case with long segment stenosis underwent surgical revascularization using vein grafts. Technical success in four with one failure requiring nephrectomy is noted.

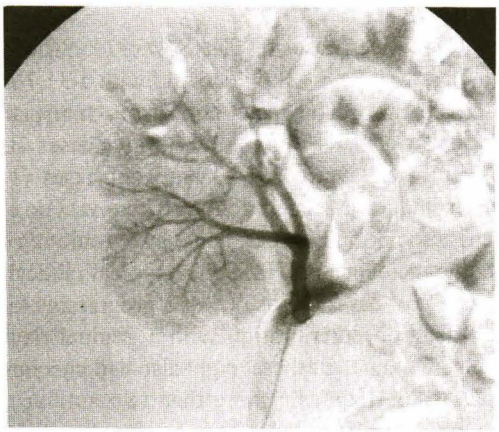

Fig. 3. Five year follow-up after PTA, no evidence of recurrent TRAS.

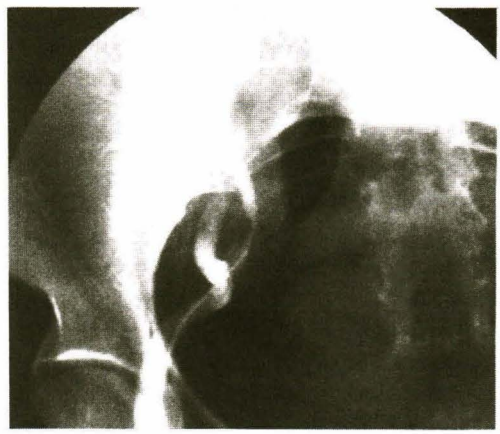

Fig. 4. A long segment of TRAS.

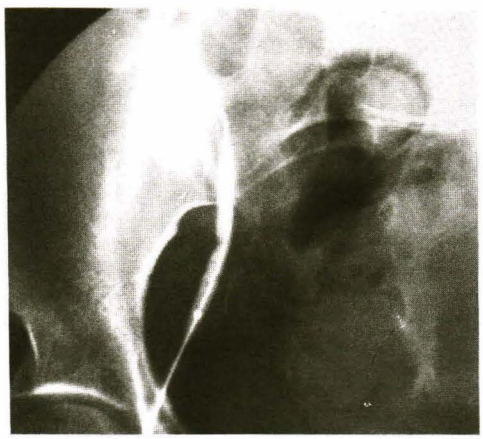

Fig. 5. During PTA inflating balloon.

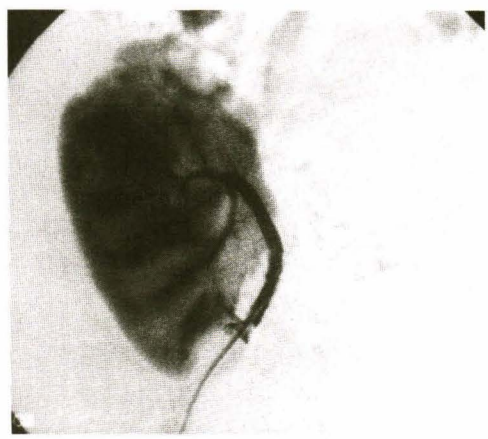

Fig. 6. Post PTA.

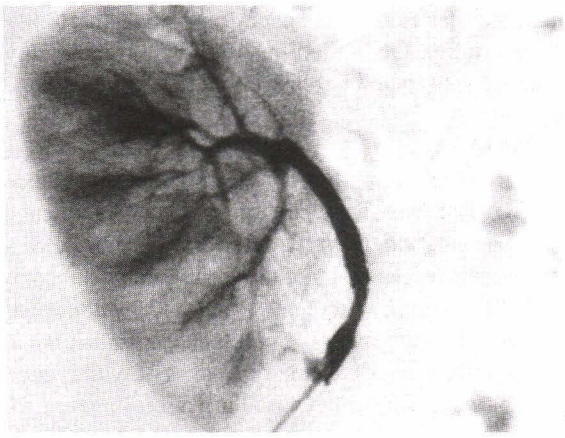

Fig. 7. Restenosis of renal artery.

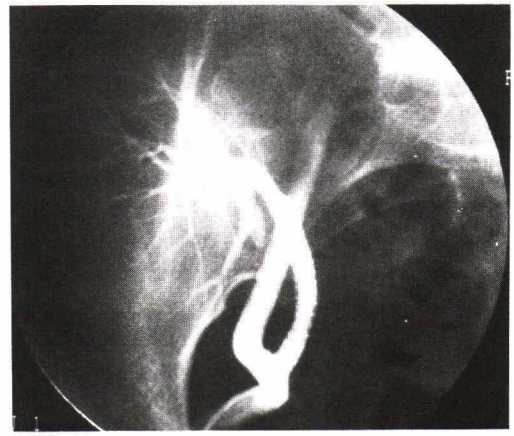

Fig. 8. Repeated PTA with stent.

DISCUSSION

In the present study, the authors identify a 2.1 per cent incidence of TRAS among Thai kidney transplant recipients with a higher incidence noted among the cadaveric than living-related donors (3.3% *vs* 1.0%, p = 0.034). This difference may be explained by the fact that kidneys from the living-related donors were thoroughly evaluated to exclude an vascular abnormality like atherosclerosis or fibromuscular dysplasia of the renal artery. Furthermore, the immunological damage at the anastomotic site from acute and chronic rejection is also less in living-related donor kidney. Another study reports the incidence of TRAS in kidney transplantation from a living donor as low as 0.4 per cent[5].

The clinical diagnosis of TRAS can be difficult since its manifestation of rising serum creatinine overlaps with other causes such as acute and chronic rejection or calcineurin inhibitor nephrotoxicity. Physical examination is not helpful as only four cases (25%) showed abdominal bruits. The abnormal high pitch bruit can also be positive in post biopsy intrarenal arteriovenous fistula. Therefore, during the early program, most grafts will be biopsied first followed by Doppler ultrasonography. Now, with the increased recognition of TRAS and ease of Doppler ultrasound screening, most TRAS are diagnosed sooner. One drawback is that the Doppler study is rather operator dependent. Hence, once TRAS is suspected, confirmatory angiography must be performed, but angiography itself can, however, cause contrast-induced renal failure[6]. Ten cases of TRAS developed recent uncontrolled hypertension. Eight cases were associated with the graft deterioration while two other cases had remaining good graft function. So refractory hypertension is not the main presenting problem in this study. This may be attributed to the efficacy of the antihypertensive medication. Unless the acute graft dysfunction after the use of angiotensin-converting inhibitors that TRAS can be diagnosed correctly. The authors did not use the plasma rennin level as a diagnostic tool since the results of this measurement before and after captopril have been variable and had low specificity[7].

Significant hemodynamic changes are noted with stenosis > 70 per cent and/or pressure gradient > 15 mmHg which will subsequently lead to kidney hypoperperfusion, and graft deterioration. This can also produce clinical refractory hypertension. Hence the aim of the treatment is to correct the flow and PTA is considered a preferably primary option. The stenotic lesions being more suitable to PTA are short, linear, and distal to the anastomosis, while long segment and kinking arteries are less of an option. PTA reported a technical success rate of > 90 per cent[8], followed by an improvement in graft function in 67 per cent and better control of hypertension in another 63-76 per cent with the median observation time of 24-30 months[2,9]. The authors observed a technical success rate of 73 per cent with 10/11 cases (91%) showing improved graft function and clinical refractory hypertension by one month follow-up. The literature reports the PTA-associated complication rate of 10-21 per cent which includes hematoma at the puncture site, intimal flaps, arterial rupture, and arterial dissection [2,10,11] the authors observed only two cases of

punctured site hematoma with no significant clinical sequel. An 18 per cent recurrence rate with 46 months follow-up was reported, while the literature reports range of 10-33 per cent[10,12,13]. Those that failed PTA or cases with an unfavorable lesion should undergo surgical revascularization as noted in five cases in the present report. Surgical revascularization can be technically challenging as reoperation is confronted with distorted anatomy and extensive perivascular fibrosis. Most surgeons prefer approaching the stenotic lesion through the peritoneal cavity. A success rate of more than 80 per cent with associated morbidity and mortality of 13-20 per cent and 5 per cent, respectively has been reported[10,12,14]. The authors reported four of five cases (80%) with a technical success rate with no peri-operative morbidity and mortality. One failed the attempt and inevitably required subsequent nephrectomy.

SUMMARY

The authors report a 2.1 per cent incidence of TRAS among Thai kidney transplant recipients. The presentation is graft deterioration and refractory hypertension. Doppler ultrasonography is recommended for primary screening followed by confirmatory renal angiography. Percutaneous transluminal angioplasty is the first line of treatment with a good success rate. Surgical revascularization is saved for those that fail PTA or have the unfavorable stenotic lesion.

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ภาวะหลอดเลือดแดงไตตีบหลังการปลูกถ่ายไตในประเทศไทย

โสภณ จิรสิริธรรม, พบ, เจียมจิตร ตปนียากร, พบ**, วิวัฒน์ ถิรพานิช, พบ*, สุรศักดิ์ ลีลาอุดมลิปิ, พบ*, ศิริวรรณ จิรสิริธรรม, พบ***, สุทัศน์ ศรีพจนารถ, พบ**

ภาวะหลอดเลือดแดงไตตีบหลังการปลูกถ่ายไต เป็นภาวะแทรกซ้อนหนึ่งที่พบบ่อยของภาวะแทรกซ้อนของหลอดเลือดหลังการปลูกถ่ายไต ผู้รายงานได้ศึกษาย้อนหลังคนไข้ปลูกถ่ายไตตั้งแต่เดือนกุมภาพันธ์ พ.ศ. 2529 จนถึงเดือนธันวาคม พ.ศ. 2545 ในจำนวนคนไข้ปลูกถ่ายไตทั้งหมด 750 ราย พบมีภาวะแทรกซ้อนดังกล่าว 16 ราย คิดเป็นอัตราร้อยละ 2.1 ในจำนวนนี้ 12 รายเป็นคนไข้ที่ได้รับไตจากผู้บริจาคที่เสียชีวิตแล้วและ 4 รายเป็นคนไข้ที่ได้รับไตจากผู้บริจาคที่มีชีวิต คนไข้กลุ่มนี้จะมีอาการไตที่ปลูกถ่ายจะเสื่อมลง ร่วมหรือไม่ร่วมกับการที่มีความดันโลหิตสูงผิดปกติ การวินิจฉัยเบื้องต้นใช้ดอปเลอร์-อัลตราซาวด์ แล้วยืนยันการวินิจฉัยอีกครั้งด้วยการฉีดสารทึบแสงดูหลอดเลือดแดงไต สำหรับการรักษาแก้ไขนั้นวิธีแรกใช้วิธีการถ่างขยายหลอดเลือดแดงโดยผ่านทางผิวหนัง โดยสามารถรักษาได้สำเร็จ 11 รายใน 15 ราย คิดเป็นผลสำเร็จอัตราร้อยละ 73 มีคนไข้ 5 รายที่มีความจำเป็นต้องรักษาโดยการผ่าตัดต่อหลอดเลือดใหม่ โดยประสบผลสำเร็จ 4 รายใน 5 รายคิดเป็นผลสำเร็จอัตราร้อยละ 80 หลังการแก้ไขรักษาสำเร็จ พบว่าไตทำงานดีขึ้น ความดันโลหิตสูงควบคุมได้ง่ายขึ้น จากการติดตามการรักษา 46 เดือน พบว่ามีคนไข้ 2 ราย ปรากฏอาการหลอดเลือดแดงไตตีบอีกครั้ง ซึ่งแก้ไขสำเร็จได้ด้วยการถ่างขยายหลอดเลือดโดยผ่านทางผิวหนัง และใส่ขดลวดดามด้านในรูหลอดเลือดแดงด้วย

คำสำคัญ : หลอดเลือดแดงไตตีบหลังการปลูกถ่ายไต, การปลูกถ่ายไต, ภาวะแทรกซ้อนของหลอดเลือด

โสภณ จิรสิริธรรม, เจียมจิตร ตปนียากร, วิวัฒน์ ถิรพานิช,
สุรศักดิ์ ลีลาอุดมลิปิ, ศิริวรรณ จิรสิริธรรม, สุทัศน์ ศรีพจนารถ
จดหมายเหตุทางแพทย์ ฯ 2547; 87: 304–309

* ภาควิชาศัลยศาสตร์,
** ภาควิชารังสีวิทยา,
*** ภาควิชาวิสัญญีวิทยา, คณะแพทย์ศาสตร์ โรงพยาบาลรามาธิบดี, มหาวิทยาลัยมหิดล, กรุงเทพ ฯ 10400