

# Outcome of renal revascularization in mid aortic syndrome due to takayasu arteritis

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## Abstract

**Aim:** To study the outcome of Renal Revascularization in Mid Aortic syndrome due to Takayasu arteritis. **Methods and Materials:** Prospective study of 5 cases (Women – 4, Men -1) of Renal Revascularization over 12 months period from 2013 – 2014 at Vascular surgery Dept., Kilpauk Medical College Hospital. All 5 cases underwent preliminary investigations, 64 slice CT Angiogram and DTPA scan. All cases were due to Aortoarteritis. **Results:** The mean Blood pressure and Number of antihypertensive drugs required to control blood pressure are 140/90 mmHg and 2 respectively. 1 patient had Aortic aneurysm with Renal artery stenosis where as others had Aorto Iliac occlusion with Renal artery stenosis. 2 patients had Aorto biiliac bypass, 1 pt had Aorto uniiliac bypass and 1 pt had aneurysmal repair with carotid patch. 1 patient underwent left Nephrectomy with Aorto renal and Aorto bifemoral bypass. 2 patients underwent PTFE graft bypass and 3 pts underwent Reversed Long Saphenous Vein (RLSV) bypass for renal artery stenosis. All patients withstood the procedure without any mortality. **Conclusion:** Renal Revascularization has shown good outcome in patients of Mid Aortic syndrome due to Takayasu arteritis in terms of improvement in renal function and reduction of antihypertensive drugs.

**Keywords:** Takayasu Arteritis, Mid aortic syndrome, Renal artery stenosis, Renal revascularization, Poly Tetra Fluoro Ethylene (PTFE), Reversed Long Saphenous Vein (RLSV), Anti Hypertensive Drugs (AHD).

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## INTRODUCTION

Takayasu's arteritis (TA) is a nonspecific granulomatous inflammatory arteriopathy of unknown cause that result in occlusion or less commonly aneurysmal degeneration of large and medium-sized elastic arteries. Takayasu Arteritis is named after Japanese ophthalmologist Mikito Takayasu, who presented his findings of arteriovenous anastomosis of ocular papilla in a 21 year old woman with sudden vision loss in 1908. Subsequent description of the disease have emphasized the "Pulseless" syndrome,

with involvement of the brachiocephalic arteries. However, less attention has been paid to involvement of other segment of aorta, renal arteries and visceral arteries. Unrecognized involvement of Mid Aorta and/or renal artery can result in malignant hypertension, severe renal dysfunction, cardiac decomposition, and premature death. The morbidity associated with delayed diagnosis requires greater awareness, and more aggressive diagnostic evaluation and treatment in patients with Takayasu arteritis. This study is undertaken to assess the surgical outcome of renal revascularization with Aortic reconstruction in Takayasu arteritis.

## METHODS

One year prospective study of 5 patients who underwent surgical revascularization at the Dept. of vascular surgery, Kilpauk Medical College, Chennai, during the year 2013 to 2014. The diagnosis of Takayasu arteritis is established by the presence of at least 3 of 6 criteria, as adopted by the American college of Rheumatology: Age at onset of disease less than 40, Lower/upper Extremity claudication during exercise, Diminished brachial artery pulse, Blood

pressure difference >10mm Hg difference in measured systolic BP between extremities, Bruit over one or both subclavian and/ or Aorta and Focal angiographic abnormalities of Aorta and or Branch vessels. Patient demographic data, pre operative Blood pressure, number of Anti Hypertensive Drugs (AHD), blood urea and serum creatinine concentration, Erythrocyte sedimentation rate (ESR), C Reactive protein (CRP), use of oral prednisolone, methotrexate, cardiac function by ECG and Transthoracic Echocardiogram, computerized tomographic angiogram, intra operative and post operative morbidity and mortality, 6months morbidity and mortality, post operative blood pressure, urea, creatinine and number of antihypertensive needed are collected. Primary study endpoints are comparison of preoperative blood pressure, antihypertensive requirements, estimated blood urea and serum creatinine concentration with those documented at last follow up

visit and the patency of anastomosis and patient survival. Anti hypertensive drugs used are Amlodipine, Atenolol, Methyldopa, prazosin and Diuretics.

## RESULTS

Patient's data are shown in the Table 1 and 3. Of these, 4 out of 5 patients are female and the age group ranges from 28 – 40 yrs. All patients suffering from hypertension and the mean pre operative BP is 186/106 mmHg and mean requirement of Anti Hypertensive Drugs 3.2. Duration of Treatment varies from 1 year to 8 years. Pre operative mean ESR is 18.6mm (ranges from 10 – 42) and CRP is 17.6mg/L (Range from 5 – 30). All patients received oral prednisolone and 3 patients received methotrexate as per rheumatologist advice before surgery to prevent graft thrombosis. CT angiogram demonstrated juxta renal aortoiliac occlusion

**Table 1: Pre procedure parameters**

Age (Yrs)	38	26	40	28	32
BP	170/120	180/110	200/110	180/110	200/100
No. of AHD	4	3	4	3	3
Urea	30	39	36	29	36
Creatinine	1.0	1.6	0.9	1.1	1.4
ESR	42	10	29	10	16
CRP	28	7	18	5	30
EF	67%	69%	41%	68%	70%
USG ABDOMEN					
Rt Kidney	11.7 X 3.4	6.8X2.7	9X7.9	8X6.9	10.9X5.9
Lt Kidney	9.7X3.4	9.4X4.8	4X2.2	9X7.8	10.7x6.2

**Table 2: Graft types and sizes**

Graft	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Aortic Graft PTFE Size	14X40mm	14X7X7mm	16X8X8mm	16X40mm	14X7X7mm
Renal Graft	RLSV	6mm PTFE	6mm PTFE	RSV	RSV

**Table 3: Post procedure primary end point parameters**

BP	130/80	130/90	140/90	140/96	136//86
No. of AHD	1	Nil	1	2	2
UREA	31	34	38	27	32
CRATININE	0.9	1.1	1.0	0.9	1.1

with left renal artery occlusion in 1 case, Aortic occlusion with right renal artery stenosis in 1 case, Renal artery on right side with Aortic stenosis in 2 cases and suprarenal aortic aneurysm with celiac and superior mesenteric artery arising from aneurysmal sac with bilateral renal artery involvement in 1 case consistent with Takayasu arteritis in all cases. DTPA scan showed non functioning kidney in 1 case with reduced function in all involved kidneys. All cases were taken up for surgery under general anesthesia with epidural catheter for post operative pain relief. Transabdominal incision with medial visceral rotation was done in 4 cases and Left

thoracoabdominal incision, used for suprarenal aortic aneurysm. Renal revascularization accompanied by reconstruction of Aorta in all cases (Table 2). 6mm PTFE Synthetic graft used for renal revascularization in 2 cases and reversed autologous thigh segment saphenous vein were used in 3 cases. 2 cases underwent Aorto biiliac bypass and 1 case Aorto bifemoral bypass. 1 case underwent endo aneurysmorrhaphy of thoracoabdominal aorta with celiac and SMA implantation as single carrol's patch and 1 case underwent Aorto aortic bypass. 3 synthetic PTFE Bifurcation grafts (14x7x7mm – 2 and 16x8x8mm – 1) and 2 Dacron tube grafts (16X40mm) are

used for Aortic reconstruction. Post operative morbidity includes retroperitoneal hematoma requiring exploration in 1 case and wound infection in 1 case. There is no postoperative mortality. Mean follow up is 8 months (range from 3 to 12 months). All cases received steroid therapy and 2 cases were given immunosuppressant therapy. Anti hypertensive medication titrated according to blood pressure. There are no graft failures noted during the follow-up. During the last follow-up, the mean BP has decreased to  $135 \pm 6/88 \pm 4$  mm Hg (Table 3) and the requirement for antihypertensive medications is

reduced to 1.2. 1 (Table 3) patient has normal BP without any anti hypertensive medication. Steroid is tapered and all the patients are placed on maintenance dosage of steroid. Serum creatinine value improved from borderline renal failure in 2 patients where as other patients had normal creatinine pre operatively. In all cases graft is functioning well without occlusion/ stenosis. Paired "T" test is used to study the P value. T value obtained for systolic, diastolic BP reduction and requirement of anti hypertensive drugs are 10.2, 10.9 and 11.2 respectively and the P value is  $<0.05$  which is statically significant.



Figure 1: Left renal short segment occlusion



Figure 2: Right renal diffuse and left renal short segment occlusion



Figure 3: Reversed long saphenous graft to renal artery



Figure 4: PTFE graft to renal artery

## DISCUSSION

Reported results of surgical revascularization to treat renal artery stenosis have, for the most part, focused on the use of bypass grafts, in as much as the transmural injury of TA does not lend itself to endarterectomy or open angioplasty Keiffer *et al*<sup>6</sup> reported surgical revascularization of 37 renal arteries in 24 patients. Ancillary procedures such as aortic reconstruction (87%) and visceral revascularization (71%) were common. There was one postoperative death. At a mean follow-up

of 61.3 months, hypertension was cured in 12 patients (63%) and improved in 31%. Remedial renal revascularization was required in four patients during follow-up. Two other series, one by Langneau *et al*<sup>6</sup> and the other by Pokrovsky *et al*<sup>8</sup>, report similar surgical success, with hypertension cured in 55% to 63% of patients and improved in 17% to 45%, at follow-up of 5 to 14 years. Longstanding, chronic TA, the most common clinical scenario seen at our institution, produces full-thickness vessel injury, an inelastic fibrotic arterial wall,

and a significant incidence of occlusion. The natural history most consistent with the foregoing observations is that segmental injury to the aorta and its branches from TA is a one-time insult of unknown cause. This ultimately results in fibrous obliteration and stenosis, and at times superimposed atherosclerosis of the affected arterial segments. In this context the primary and greatest benefit of medical therapy is to limit the arterial inflammation in involved segments, particularly early in the disease. How much benefit this provides over time and whether it justifies the long-term use of immunosuppressant and corticosteroid therapy is unknown. Furthermore, the absence of reliable biochemical markers, such as ESR, C-reactive protein, and von Willebrand factor, to determine the acuity of the inflammatory process<sup>9</sup> means that the indications for medical therapy are inexact and empirically based on patient symptoms and elevated inflammatory markers. However, medical therapy does not eliminate, should not delay, and cannot be used in place of renal revascularization in the patient with renal artery stenosis complicated by malignant hypertension, renal dysfunction, or cardiac decompensation. After revascularization a significant improvement in BP control and reduction in anti hypertensive medication requirements was achieved. It is well-recognized that renovascular hypertension is responsible for a greater degree of target organ damage than is essential hypertension.<sup>10</sup> Consequently, when successful renal revascularization provides substantial benefit in BP control, it should be expected to limit target organ damage as well.<sup>11</sup> The magnitude and duration of this benefit is unknown, because previous reports of either endovascular or open surgical techniques to treat renal artery stenosis have restricted outcome analyses to hypertension control only.<sup>3,5,8</sup> Unlike the experience of Miyata *et al*,<sup>13</sup> who reported an 8.5% incidence of anastomotic aneurysm in 103 patients with surgically treated TA, anastomotic aneurysms did not occur in our patients. However, those authors reported that 25% of TA lesions they treated were aneurysms. They also documented that aneurysmal Takayasu is an independent predictor for the development of an anastomotic aneurysm. In our series one case had thoracoabdominal aneurysm repaired successfully without any anastomotic problem during 12 months follow-up. In our series, revascularization to treat renal artery stenosis resulted in successful retrieval of renal function, consistent with what has been demonstrated by Dean *et al*<sup>12</sup> in atherosclerotic renal artery disease. A documented increase in lowering of mean SCr occurred after renal revascularization. Data regarding endovascular renal procedures to treat renal artery stenosis are limited, with

only three studies of any size, all from India.<sup>3-5</sup> In one study of 20 patients who underwent 33 angioplasty procedures to treat renal artery stenosis, Sharma *et al*<sup>10</sup> reported a technical success rate of 85%, with clinical BP improvement in 82%. Selective angiographic follow-up at a mean of 8 months demonstrated recurrent stenosis in 21%. A follow-up experience from Sharma *et al*<sup>4</sup> described the results in 62 patients with renal artery stenosis. Immediate technical success and positive BP response was 95% and 89%, respectively. Cure of hypertension was demonstrated in 23% of patients. Mean follow-up was 22 months, and a recurrent stenosis rate of 16% was angiographically documented in patients with recurrent hypertension. The degree of BP response is not provided, and discussion of renal function and cardiac function is not included. Tyagi *et al*<sup>5</sup> studied 54 patients with 75 renal lesions from renal artery stenosis. and 89% technical success rate was reported, and a 14% recurrent stenosis rate was documented at 14 months of follow-up. In our series all the cases had associated aortic involvement and we have not contemplated angioplasty on any of the case.

## CONCLUSION

Takayasu arteritis with mid aortic syndrome is an often unrecognized clinical entity that can result in life-threatening hypertensive and cardiovascular events. Surgical revascularization with use of bypass grafts provides demonstrable improvements in BP, renal and cardiac function. The documented salutary clinical response is on BP, renal and cardiac function after successful intervention. This positive global response establishes renal revascularization as a successful and durable intervention for renal artery stenosis.

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