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LONG TERM RENAL & CARDIAC OUTCOMES AFTER RENAL ANGIOPLASTY IN PATIENTS WITH RESISTANT HYPERTENSION WITH RENAL ARTERY STENOSIS

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ABSTRACT **BACKGROUND**: RAS(RAS) is associated with uncontrolled hypertension and chronic renal failure. In the patients with severe renal artery stenosis, the evaluation of long-term clinical outcome after percutaneous transluminal renal angioplasty (PTRA) has yet been insufficient . **METHODS** the ambispective study was done on 146 cases to evaluate long-term renal and cardiac outcomes after renal angioplasty in patients with resistant hypertension and RAS by following them for upto 3 years and evaluating the various parameters **RESULTS** : Blood pressure decreased rapidly after renal stenting and was normalized in 47 patients during follow up and 40patients with reduction in the number of antihypertensive drugs.9patients showed improvement from stage 3 -stage 2 CKD, post renal angioplasty.3patients had associated stroke during follow up.5patients were on Hemodialysis and none needed renal transplantation. Out of 94patients , in threepatients the LV function improved from mild to good, one patient with severe to good, and in another it had improved from moderate to good 74.5% ofpatients . **CONCLUSION**: Inpatients with resistant hypertension with significant RAS , stenting of renal artery decreases blood pressure and need for antihypertensive medications and it preserves renal function., coronary revascularisation improves cardiovascular outcomes. This suggests the need of timely identification of RAS in these patients with significant benefits for both renal and cardiovascular outcomes.

KEYWORDS :

INTRODUCTION

Atherosclerosis is by far the most prevalent etiology of renal artery stenosis. Atherosclerotic renal artery stenosis (ARAS) contributes to the development and progression of systemic atherosclerotic disease. It stems from having a hemodynamically significant renal artery atherosclerotic lesion that causes upregulation of the renin-angiotensin-aldosterone system (RAAS) resulting in accelerated hypertension that then adversely impacts pre-existing cardiovascular disease. Additionally, ARAS can also cause three clinical problems: renovascular hypertension, ischemic nephropathy and cardiac destabilization syndrome that include, acute decompensated heart failure (ADHF), recurrent ADHF and acute coronary syndromes (ACS). The prevalence of ARAS identified by Doppler ultrasound (DUS) within a US Medicare population ranges from 0.5% to 7% of individuals. ARAS accounts for 10–20% of individuals with end stage renal disease who are on dialysis. [1] Furthermore, concurrent diagnosis of coronary artery disease (CAD) among individuals with ARAS ranges from 11.3% to 39%. [2]

Cristiana Catena et al [3]noted that 54 patients with RHTN with as ARAS > 70% and were followed for 4 years after renal stenting.. They concluded that inpatients with RHTN, stenting of hemodynamically significant RAS decrease blood pressure, preserves renal function and improves LV structure and function .

Thomas Zeller et al[4] on 456 hemodynamically significant RAS≥70% concluded that Stent-supported angioplasty of RAS preserves renal function and improves blood pressure control in a broader spectrum ofpatients than previously thought.

Brigit C et al[5] on 106patients with hypertension who had atherosclerotic renal-artery stenosis noted that in the treatment ofpatients with hypertension and renal-artery stenosis, angioplasty has little advantage over antihypertensive-drug therapy.

MATERIALS AND METHOD

146patients were enrolled between November 2006 to January 2016 in the department of Cardiology, AIMS. It is a ambispective study with 3 years follow up.patients were followed and collected information from the electronic medical records. 52patients who lost their follow up during the study period were excluded. 94patients had undergone regular follow up for 6 months, 1 and 3 years.patients with clinical findings such as uncontrolled hypertension, renal dysfunction, and heart failure were screened by Doppler ultrasound and magnetic resonance imaging of the renal artery to detect RAS. At the time of coronary angiography, renal angiography was concomitantly done inpatients who had been suspected to have RAS. Renal stenting was indicated for angiographic stenosis >60% on visual estimation. Clinical indications included HTN and or CKD in combination with significant RAS. HTN was defined as systolic blood pressure (SBP) > 140 mmHg and diastolic pressure (DBP) > 80 mmHg. CKD was defined as estimated glomerular filtration rate (eGFR) < 60 ml/min.patients with resistant renal hypertension with renal angiogram showing more than 60% stenosis, were included in the study, 52patients who lost their follow up during the study period were excluded in the study The primary efficacy endpoints were change in blood pressure and change in estimated glomerular filtration rate (eGFR) at 6 months, 1 year and 3 years follow up period. The primary safety endpoint was absence of major cardiovascular or renal events.

RESULTS:

A total of 146patients received PTRA between November 2006 to January 2016. 52patients who lost their follow up during the study period were excluded. Of the 94patients included, 42.6% ofpatients were elderly in the age group of 60-70 years, 66.6% males. The various comorbidities observed in this study were resistant hypertension (96%), diabetic nephropathy (58.5%), and dyslipidemia (75.5%). Takayasu's arteritis 5(5.3%) Fibromuscular in 1 (1.1%) dysplasia. Hospitalisation with pulmonary edema was noted in 12patients pre renal angioplasty and 4patients Post renal angioplasty. One among thepatients with severe LV, both prior and post procedure, developed CHF on 6 months follow up and eventually recovered. Another patient with TVD developed CHF on 3 years of follow up but succumbed to it. Two otherpatients developed pulmonary edema on 1 year follow up of which CAD was the cause in one and accelerated HTN in another. 79patients had associated CAD and 34% ofpatients had associated PVOD. Out of 94patients , in threepatients the LV function improved from mild to good, one patient with severe to good, and in another it had improved from moderate to good 74.5% ofpatients had unilateral RAS with predominant involvement of left renal artery. 98.9% stenosis in the Ostio- Proximal part of renal artery. Blood pressure decreased rapidly after renal stenting and was normalized in 47patients during follow up and 40patients with reduction in the number of antihypertensive drugs.9 showed improvement from stage 3 to stage 2 CKD, post renal angioplasty.3 had associated stroke during follow up.5patients were on Maintenance Hemodialysis and none of thepatients had undergone renal transplantation. The assessment of cardiovascular and renal survival at the end of follow up revealed 4 deaths.

Table 1 : The Lesion Type , Management And Outcome

Lesion Type	Frequency(N)	Percent (%)
Unilateral	70	74.5
Bilateral	24	25.5

Lesion Location	Frequency(N)	Percent (%)
Ostio - Proximal	93	98.9
Mid	1	1.1
Side Artery	Frequency(N)	Percent (%)
Right	37	39.4
Left	42	44.7
CAD Management	Frequency(N)	Percent (%)
Medical	23	29
PTCA	27	34
CABG	29	37
Mortality	Frequency(N)	Percent (%)
Absent	81	86.2
Cardiac/Renal cause	4	4.3
Other causes	9	9.6

TABLE 2 : THE STUDY VARIABLES

study variable		Number					percentage				
	Range	baseline	discharge	6 months	12 months	36 months	baseline	discharge	6 months	12 months	36 months
SBP (mmHg)	<100	2	2	2	3	1	2.13%	2.13%	2.13%	3.19%	1.06%
	101-140	35	56	57	59	65	37.23%	59.57%	60.64%	62.77%	69.15%
	141-170	35	31	28	27	24	37.23%	32.98%	29.79%	28.72%	25.53%
	>170	22	5	7	5	4	23.40%	5.32%	7.45%	5.32%	4.26%
DBP (mmHg)	<60	1	0	1	1	0	1.06%	0.00%	1.06%	1.06%	0.00%
	60-80	39	61	61	58	73	41.49%	64.89%	64.89%	61.70%	77.66%
	81-100	28	28	31	35	21	29.79%	29.79%	32.98%	37.23%	22.34%
	>100	26	5	1	0	0	27.66%	5.32%	1.06%	0.00%	0.00%
SerumCreatinine (mg/dl)	< 1	12	23	20	20	21	12.77%	24.47%	21.28%	21.28%	22.34%
	1.01 – 1.5	52	54	57	53	44	55.32%	57.45%	60.64%	56.38%	46.81%
	1.51 – 2	20	15	14	18	21	21.28%	15.96%	14.89%	19.15%	22.34%
	> 2	10	-	2	3	3	10.64%	-	2.13%	3.19%	3.19%
numberof Anti Hypertensives	Zero	0	-	1	3	4	0.00%	-	1.06%	3.19%	4.26%
	One	13	-	11	13	21	13.83%	-	11.70%	13.83%	22.34%
	Two	33	-	46	43	32	35.11%	-	48.94%	45.74%	34.04%
	Three	33	-	25	24	29	35.11%	-	26.60%	25.53%	30.85%
	Four	12	-	10	11	8	12.77%	-	10.64%	11.70%	8.51%
eGFR	>90	5	-	8	7	5	5.32%	-	8.51%	7.45%	5.32%
	60-90	22	-	34	27	31	23.40%	-	36.17%	28.72%	32.98%
	30-60	59	-	49	56	50	62.77%	-	52.13%	59.57%	53.19%
	15-30	6	-	2	2	6	6.38%	-	2.13%	2.13%	6.38%
	<15	2	-	1	2	2	2.13%	-	1.06%	2.13%	2.13%

DISCUSSION

In Japan multi-central Renal Artery Stent study[6] the renal outcome and blood pressure control were reported to be good in ARASpatients with severe stenosis who underwent PTRA. However, the observation period of this study was only 1 year.

Regarding the natural course of ARAS, it has been reported as progressive disease. In ARASpatients with >□ 60% stenosis, the major renal axis will decrease by >□ 1 cm after 1 year in 20% of totalpatients [7]. It has also been reported that 40% of renal arteries >□ 75% stenosis undergo occlusion within 12 months[8]

With the development of interventional therapy, renal artery stent implantation is now the key in management of RAS. PTRAS can restore the renal blood supply, block the damage of ischemia to the kidney and improve the renal function. Improvement in blood pressure control, promotion of cardiac function and renal function are favourable factors for the prognosis ofpatients . This results of this study showed that PTRAS could effectively control the blood pressure, and block the progressive deterioration of renal function ofpatients , but it did not significantly improve the renal function ofpatients .

Patients with myocardial infarction were screened by using Doppler-ultrasound and magnetic resonance imaging.Uncommon causesof hypertension that affect mainly the renal arteries FMD. Takayasu's arteritis were also screened.

146patients received PTRA between November 2006 to January 2016. 52patients who lost their follow up during the study period were excluded. Of the 94patients included, 42.6% ofpatients were elderly in the age group of 60-70 years, followed by 32% in the age group of 40-60 years.66.6% were males. 96% of our cohort had resistant hypertension. Diabetic Nephropathy was seen in 58.5% of our study population. 75.5% ofpatients had dyslipidemia.61% ofpatients were smokers.5patients had Takayasu's Arteritis. Fibro muscular dysplasia was noted in one patient. Hospitalisation with pulmonary edema was noted in 12patients before renal angioplasty. Post renal angioplasty 4patients were hospitalised with pulmonary edema. One among thepatients with severe LV, both prior and post procedure, developed CHF on 6 months follow up and eventually recovered. Another patient with TVD developed CHF on 3 years of follow up but succumbed to it. Two otherpatients developed pulmonary edema on 1 year follow up of which CAD was the cause in one and accelerated HTN in another .79patients had associated CAD, with 28patients (SVD), 13patients (DVD) and 38patients (TVD).29% ofpatients had mild CAD and were on medical management.34% ofpatients underwent coronary angioplasty.37% ofpatients underwent CABG. Overall 5patients had significant improvement in LV function from baseline. Out of 94patients , in threepatients the LV function improved from mild to good, one patient with severe to good, and in another it had improved from moderate to good.

Only 34% ofpatients had associated PVOD.Only 3patients had associated stroke.74.5% ofpatients had unilateral RASwith predominant involvement of left renal artery and 25.5% had bilateral involvement.98.9% ofpatients had stenosis in the Ostio- Proximal part of renal artery whereas only 1% of patient had lesion in the mid part of artery.35patients had renal hypertension with systolic blood pressure in the range of 141-170 mmHg at baseline, which showed improvement in 25patients . 22patients had very high blood pressure with systolic blood pressure>170 mmHg at baseline, which showed significant improvement in all 22patients .26patients had high diastolic blood pressure with blood pressure>100 mmHg at baseline, which showed significant improvement in all 26patients , post renal angioplasty.12patients had resistant hypertension with 4 antihypertensive medications at baseline, which showed significant reduction of medications in 10patients on follow up. 3patients were on 5 antihypertensive medications at baseline, which showed reduction in medications in all 3patients on follow up.

Number of antihypertensive medications were brought down in 40patients , whereas 35patients continued the same number of medications. Only 19patients had to start with added antihypertensives.9patients showed improvement from CKD stage 3 to stage 2, post renal angioplasty. Mortality due to Cardiac and Renal causes were seen in 4patients and 9patients had mortality due to other causes. 5patients were on Maintenance Hemodialysis and none of thepatients had undergone renal transplantation.

There was no procedural deaths or emergency renal surgical procedures. Blood pressure decreased rapidly after renal stenting and was normalized inpatients during follow up with reduction in the number of antihypertensive drugs. These effects were persistent throughout the follow up years.

CONCLUSION

Inpatients with resistant hypertension with significant renal artery stenosis, stenting of renal artery decreases blood pressure and need for antihypertensive medications and it preserves renal function. Inpatients with associated Coronary artery disease, coronary revascularisation improves cardiovascular outcomes. This suggests the need of timely identification of RAS in thesepatients with significant benefits for both renal and cardiovascular outcomes.

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