Section: Anaesthesiology

Original Research Article

ANALYSIS OF LEFT VENTRICULAR FUNCTIONS IN END STAGE RENAL DISEASE PRESENTING FOR RENAL TRANSPLANTATION

S. Kathirselvan[1], S. Kulandayan[2], Geetha Ravi[3]

[1]Post Graduate, Department of Anaesthesiology, Dhanalakshmi Srinivasan Medical College and Hospital, Tamil Nadu, India
[2,3]Associate Professor, Department of Anaesthesiology, Dhanalakshmi Srinivasan Medical College and Hospital, Tamil Nadu, India.

Received : 07/02/2024
Received in revised form : 22/03/2024
Accepted : 08/04/2024

Keywords:
End-stage kidney disease, hypertension, mean arterial pressure, Left ventricle diastolic dysfunction.

Corresponding Author:
Dr. Geetha Ravi
Email: geetha.adiart@gmail.com

DOI: 10.47009/jamp.2024.6.2.242

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (2); 1213-1216

Abstract

Background: Over half of deaths in end-stage kidney disease (ESKD) are due to cardiovascular disease; the age-corrected relative risks are extreme, reaching over 100-fold in younger patients. The majority of these deaths are not due to myocardial infarction as a result of coronary atheroma but due to heart failure and sudden cardiac death. Consistent with this observation, treatments for traditional cardiovascular risk factors such as hypertension and elevated cholesterol are relatively ineffective in this population. These observations can be explained by the near-universal syndrome of uraemic cardiomyopathy in patients with ESKD. **Materials and Methods:** A Reterospective study was conducted 50 patients of Renal transplant recipients who presented for PAC from April 2023- November 2023. Pulse rate, Systolic blood pressure, Diastolic blood pressure, Mean arterial pressure, Ejection fraction, Regional wall motion abnormalities, Left ventricle diastolic dysfunction, Left ventricular hypertrophy. All renal transplant recipients who presented for PAC in the above said period were taken up for study. Patient demographics and the said parameters were noted and fabulated. **Result:** The data showed age distribution most between 30 and 55 years. Gender distribution was 74% males and 26% females. Statistical analysis with correlation co-efficient R value and p value which indicated statistical significance were evaluated. Pulse rate and Ejection fraction had a negative correlation with R of -0.0365 and p of 0.8014. Systolic blood pressure and Ejection fraction had R of -0.1383 and p of 0.3381. Diastolic blood pressure and Ejection fraction had R of -0.1697 and p of 0.2388. Mean arterial pressure and Ejection fraction had R of -0.1614 and p of 0.2692. **Conclusion:** In general population, a good ejection fraction indicated adequate mean arterial pressure and a low ejection fraction indicated poor mean arterial pressure, peripheral vasodilation and poor tissue perfusion. In our study of end stage renal disease patients, ejection fraction had rather a negative correlation with systolic blood pressure, diastolic blood pressure and mean arterial pressure with a statisfically significant p value of an average of 0.2.

INTRODUCTION

Over half of deaths in end-stage kidney disease (ESKD) are due to cardiovascular disease; the age-corrected relative risks are extreme, reaching over 100-fold in younger patients. The majority of these deaths are not due to myocardial infarction as a result of coronary atheroma but due to heart failure and sudden cardiac death.[1] Consistent with this observation, treatments for traditional cardiovascular risk factors such as hypertension and elevated cholesterol are relatively ineffective in this population. These observations can be explained by the near-universal syndrome of uraemic cardiomyopathy in patients with ESKD.[2]

Left ventricular hypertrophy is the cardinal feature of uraemic cardiomyopathy, in addition to ventricular dilatation and both systolic and diastolic dysfunction. Histologically, myocytes are severely hypertrophied with myocardial disarray and diffuse interstitial fibrosis. As renal function declines, these features become more prevalent and are present in up to 90% of those requiring renal replacement. Such changes are strongly linked to cardiovascular outcomes with the presence of left ventricular hypertrophy associated with increased mortality in both transplant recipients and those requiring haemodialysis.[3] The gold standard for the treatment of ESKD is renal transplantation. The associated improvement in glomerular filtration rate reduces cardiovascular risk

below that of those on waiting lists. However, cardiovascular risk still remains higher than healthy individuals of the same age and sex with transplant recipients displaying a three-fold increased risk.[4]

Cardiovascular system-adapts to various stages of renal failure. Endothelial dysfunction which is the basis of all vascular problems is triggered by the uremic toxins leading to vascular damage with respect to every organ system especially respiratory and cardiovascular systems.[5]

Increasing vascular resistance, hypertension, left ventricular hypertrophy occurs early in renal failure.[6]

Myocardial fibrosis, microvascular disease and accelerated atherosclerosis and arteriosclerosis increase incidence of coronary artery disease in renal failure.[7] Inadequate fluid handling affects right heart and the above vascular changes affect both systolic and diastolic functions of left ventricle.[8]

Right ventricle is assessed mainly by pulmonary hypertension. In this study we intend to analyse left ventricle functions through simple clinical and echocardiac findings.

Aims and Objectives

- To evaluate left ventricular functions in end stage renal disease by ejection fraction, pulse rate and blood pressure.
- To establish independence of ejection fraction and blood pressure.

MATERIALS AND METHODS

Study type: Reterospective study.
Study population: Renal transplant recipients who presented for PAC.
Study period: April 2023- Nov 2023.
Sample size: 50
Parameters: Pulse rate, Systolic blood pressure, Diastolic blood pressure, Mean arterial pressure, Ejection fraction, Regional wall motion abnormalities, Left ventricle diastolic dysfunction, Left ventricular hypertrophy.

All renal transplant recipients who presented for PAC in the above said period were taken up for study. Patient demographics and the said parameters were noted and fabulated.

All the patients have already undergone renal transplantation at this point of time with successful outcome. All were on T.Arkamin 0.1 mg BD with T.Nifedepine 10 mg sos and on hemodialysis twice a week.

RESULTS

The data showed age distribution most between 30 and 55 years.

Gender distribution was 74% males and 26% females.

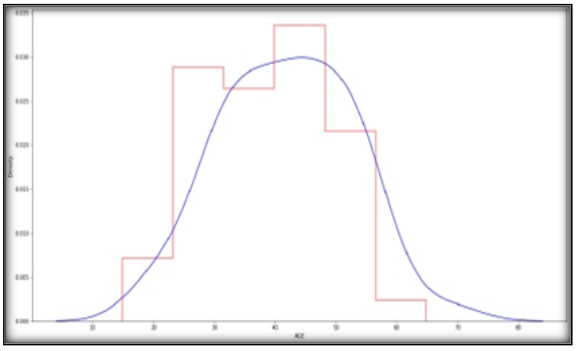
Statistical analysis with correlation co-efficient R value and p value which indicated statistical significance were evaluated.

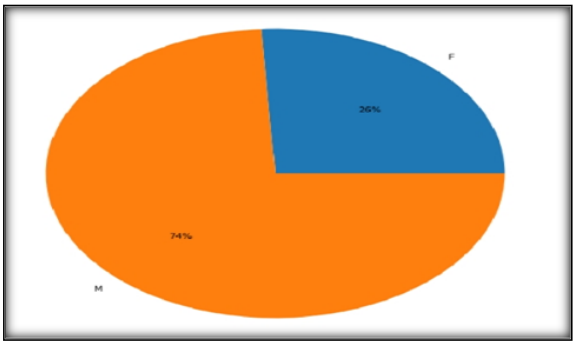
Pulse rate and Ejection fraction had a negative correlation with R of -0.0365 and p of 0.8014.

Systolic blood pressure and Ejection fraction had R of -0.1383 and p of 0.3381.

Diastolic blood pressure and Ejection fraction had R of -0.1697 and p of 0.2388.

Mean arterial pressure and Ejection fraction had R of -0.1614 and p of 0.2692.





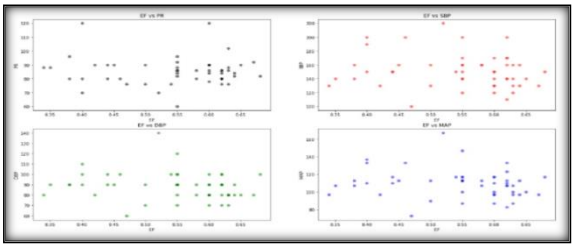


Table 1

S.No	AGE/SEX	PR	SBP	DBP	MAP	EF	RWMA	LVDD	LVH
1	37/M	86	150	100	117	60%	-	-	-
2	44/M	90	130	80	97	60%	-	-	-
3	56/M	84	170	100	123	62%	-	-	-
4	43/M	80	190	110	137	40%	-	GRADE 2	+
5	41/F	86	110	70	83	62%	-	-	-
6	55/M	88	140	80	100	55%	-	GRADE 1	-
7	52/F	102	140	80	100	63%	-	-	-
8	59/M	86	160	80	107	63%	-	-	-
9	44/M	96	170	90	117	55%	-	-	-

ISSN (O): 2687-5365; ISSN (P): 2753-6556

10	43/M	76	150	100	117	54%	-	GRADE 1	-
s.no	AGE/SEX	PR	SBP	DBP	MAP	EF	RWMA	LVDD	LVH
11	48/F	80	140	90	107	62%	-	-	-
12	46/M	86	160	80	107	58%	-	-	-
13	37/M	120	150	90	110	40%	+	GRADE 2	+
14	40/M	76	100	60	73	47%	+	GRADE 1	+
15	32/F	76	120	70	87	63%	-	-	-
16	39/M	90	170	90	117	60%	-	-	-
17	31/M	90	130	80	97	42%	+	GRADE 1	+
18	53/F	60	200	120	147	55%	-	-	-
19	28/M	80	200	100	133	46%	+	GRADE 1	+
20	22/M	90	140	80	100	65%	_	_	_
S.NO	AGE/SEX	PR	SBP	DBP	MAP	EF	RWMA	LVDD	LVH
21	37/M	92	150	100	117	55%	_	_	_
22	38/M	80	160	90	113	58%	_	_	_
23	53/M	90	150	100	117	44%	+	GRADE 1	+
24	50/M	86	120	70	87	55%	_	_	_
25	35/M	120	150	90	110	60%	_	_	_
26	33/F	82	150	100	117	68%	_	_	_
27	52/M	82	160	90	113	55%	_	GRADE 1	_
28	31/F	80	200	100	133	62%	_	_	_
29	46/M	76	130	70	90	50%	_	GRADE 1	_
30	34/M	70	200	100	133	40%	+	GRADE 2	+
S.NO	AGE/SEX	PR	SBP	DBP	MAP	EF	RWMA	LVDD	LVH
31	39/F	90	120	70	87	60%	_	_	_
32	21/M	96	160	90	113	38%	+	GRADE 2	+
33	59/M	90	160	90	113	50%	+	GRADE 1	+
34	29/M	86	140	100	113	55%	_	_	_
35	53/M	80	140	90	107	38%	+	GRADE 2	+
36	46/M	76	160	90	113	62%	_	_	_
37	46/M	80	170	80	110	62%	_	_	_
38	28/F	88	130	80	97	34%	_	GRADE 2	+
39	19/M	84	130	80	97	60%	_	_	_
40	45/M	70	220	140	167	52%	+	GRADE 1	_
S.NO	AGE/SEX	PR	SBP	DBP	MAP	EF	RWMA	LVDD	LVH
41	44/F	88	130	80	97	63%	_	GRADE 1	_
42	49/M	84	160	90	113	55%	_	GRADE 1	+
43	30/M	90	160	90	113	45%	+	GRADE 2	+
44	54/M	78	140	80	100	60%	_	GRADE 1	+
45	32/M	88	140	90	107	35%	+	GRADE 2	+
46	52/F	92	130	80	97	67%	_	_	_
47	31/F	82	160	90	113	64%	_	_	_
48	69/M	86	140	90	107	62%	_	GRADE 1	_
49	53/M	80	150	90	110	44%	+	GRADE 2	+
50	36/F	84	130	80	97	64%	_	_	_

DISCUSSION

Reversing uraemic cardiomyopathy is potentially the key to reducing cardiovascular morbidity and mortality in ESKD. Although no targeted therapy has been shown to achieve this, it is generally assumed that restoration of kidney function by kidney transplantation reverses the changes observed. At present, however, the evidence does not support this.[9]

Patients with chronic kidney disease (CKD) manifest an increased prevalence of cardiovascular morbidity and mortality compared with age-matched persons, and this relationship is directly proportional to the severity of CKD. After age, left ventricular hypertrophy (LVH) is considered to be the strongest independent predictor of cardiovascular disease and events, cardiovascular death and total mortality. In CKD patients, LVH contributes to diastolic dysfunction, congestive heart failure, arrhythmia and sudden death.[10]

CONCLUSION

In general population, a good ejection fraction indicated adequate mean arterial pressure and a low ejection fraction indicated poor mean arterial pressure, peripheral vasodilation and poor tissue perfusion.

In our study of end stage renal disease patients, ejection fraction had rather a negative correlation with systolic blood pressure, diastolic blood pressure and mean arterial pressure with a statisfically significant p value of an average of 0.2.

A poor ejection fraction in end stage renal disease thus may not present with hypotension as the poor left ventricle systolic function is often due to uremic toxins induced cardiomyopathy, pericarditis and pericardial effusion.

Though left ventricular hypertrophy was said to set in early in renal failure, it was not detected in Echocardiogram significantly and left ventricle diastolic dysfunction and hypokinesia were noted in 12 out of 50 patients.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Recommendations

Meticulous evaluation and clinical correlation with echocardiographic findings to choose anaesthetic drugs and timing of ionotropic support along with fluid handling before developing an idea on left ventricular function depending solely on ejection fraction.

REFERENCES

1. Manual of nephrology Robert w. Schrier
2. brenner textbook of nephrology
3. Burhan Dost, Muzeyyen Beldagli, Cengiz Kaya, Yasemin Burcu Ustun, Sezgin Bilgin, Ersin Koksal, Yakup Bostancı. Anesthetic Management of Patients Undergoing Renal Transplantation: A Review of A Two-year Experience. Signa Vitae. 2021. 17(1);95-100
4. Carmine Zoccali, Francesca Mallamaci, Marcin Adamczak, Rodrigo Bueno de Oliveira, Ziad A Massy, Pantelis Sarafidis, Rajiv Agarwal, Patrick B Mark, Peter Kotanko, Charles J Ferro, Christoph Wanner, Michel Burnier, Raymond Vanholder, Andrzej Wiecek, Cardiovascular complications in chronic kidney disease: a review from the European Renal and Cardiovascular Medicine Working Group of the European Renal Association, Cardiovascular Research, Volume 119, Issue 11, August 2023, Pages 2017–2032, https://doi.org/10.1093/cvr/cvad083
5. Pugh D, Gallacher PJ, Dhaun N. Management of Hypertension in Chronic Kidney Disease. Drugs. 2019 Mar;79(4):365-379. doi: 10.1007/s40265-019-1064-1. Erratum in: Drugs. 2020 Sep;80(13):1381. PMID: 30758803; PMCID: PMC6422950.
6. Roumeliotis S, Mallamaci F, Zoccali C. Endothelial Dysfunction in Chronic Kidney Disease, from Biology to Clinical Outcomes: A 2020 Update. J Clin Med. 2020 Jul 23;9(8):2359. doi: 10.3390/jcm9082359. PMID: 32718053; PMCID: PMC7465707.
7. Devine PA, Courtney AE, Maxwell AP. Cardiovascular risk in renal transplant recipients. J Nephrol 2019; 3232: 389–399.
8. Kaesler N, Babler A, Floege J, Kramann R. Cardiac remodeling in chronic kidney disease. Toxins (Basel) 2020; 12: 161.
9. Deng Y, Pandit A, Heilman RL, Chakkera HA, Mazur MJ, Mookadam F. Left ventricular torsion changes post kidney transplantation. J Cardiovasc Ultrasound 2013; 21: 171–176.
10. Ferreira SR, Moises VA, Tavares A, Pacheco-Silva A. Cardiovascular effects of successful renal transplantation: a 1-year sequential study of left ventricular morphology and function, and 24-hour blood pressure profile. Transplantation 2002; 74: 1580–1587.

ISSN (O): 2687-5365; ISSN (P): 2753-6556