Typical Hemodialysis in India: A Case Report

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Keywords

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Abstract

We report here a typical case of a patient on hemodialysis (HD) for end-stage renal disease (ESRD) in India that highlights some of the management issues encountered in a country with an enormous burden of ESRD and major challenges of underdialysis and management of comorbidities. The patient, a 42-year-old multiparous woman with chronic kidney disease (CKD) stage V, type 2 diabetes mellitus, and hypertension is a homemaker from a middle-class family, living in a large city, with no family history of CKD. From May 2013 to December 2016, she has been receiving twice-weekly maintenance HD for 4 h (intermittent HD); access was via an internal jugular line initially and then via a left brachiocephalic arteriovenous fistula (AVF) from late June 2013. Medical problems in this patient included poor medication and dietary compliance, underdialysis, anemia, volume overload, congestive cardiac failure with recurrent pulmonary edema, and hypertensive crisis. In December 2016, she complained of pain in the fistula arm during dialysis, and in January 2017, she developed edema of the arm. Specific endovascular intervention with balloon angioplasty resulted in a resolution of the stenosis of the venous side of the AVF and the edema. Counselling for dietary compliance and drug ad-

herence resulted in good blood pressure control. Unlike in most other dialysis units, we have been able to increase her HD to thrice weekly and institute several ancillary services, including skilled dietary counselling, cardiac care, and regular bioimpedance analysis with favorable outcomes. Thus, a multidisciplinary team approach offering such ancillary services would allow for better management and improved outcomes in patients with ESRD in resource-poor settings.

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Introduction

Currently, the burden of end-stage renal disease (ESRD) in India is enormous [1], with a huge demand for hemodialysis (HD) and other forms of renal replacement therapy (RRT). This is because many patients with chronic kidney disease (CKD) present for specialist care by a nephrologist at stage 5 disease. However, even for those who are able to start HD, underdialysis remains a major challenge.

The beneficial effects of dietary intervention for patients with CKD such as improved overall health-related quality of life and reduced blood pressure have been demonstrated [2]. Also, hydration status and blood pressure

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Table 1. Clinical features and laboratory values of our patient while on maintenance hemodialysis

Parameters	May–June 2013	October 2016	December 2016
Urine output/day, mL	500	<100	<100
Dialyzer	F6	F6	F6
Kt/V	1.3	1.5	1.6
Edema	++	++	–
Blood pressure, mm Hg	150/88	190/110	160/70
Echocardiography	Concentric LVH No RWMA Good LV EF-65 Minimal pericardial effusion Severe PAH	Concentric LVH No RWMA Good LV EF-54 Minimal pericardial effusion Severe PAH	Not repeated
Ca, mg/dL	9	9	
P, mg/dL	2.4	2.2	
iPTH, pg/mL	116	224	
Erythropoietin stimulating agent	Epoetin alfa 4,000 U twice weekly IV iron	Darbepoetin alfa 40 µg, once every 2 weeks Blood transfusion	Darbepoetin alfa 40 µg, once every 2 weeks
Blood flow, mL/min	250–300	200–250	220–250
Arterial pressure, mm Hg	–20	–20	–20
Venous pressure, mm Hg	110–120	110–120	160–170
Antihypertensives, <i>n</i>	3	5	5
Hemoglobin, g/dL	11.6	8	10.4
Urea, mg/dL	177	86	160
Creatinine, mg/dL	12.3	7.9	10.3
Na, mmol/L	133	132	3.8
K, mmol/L	4.8	5.1	5.2
HCO ₃ , mmol/L	26	22	20
Total protein/Albumin, g/dL	6.6/3.2	6.2/3.2	6.2/3.8

Bold highlight indicates the important clinical feature of increased venous pressure in the fistula arm. EF, ejection fraction; HCO₃, serum bicarbonate; iPTH, intact parathyroid hormone; K, potassium; LV, left ventricle; LVH, left ventricular hypertrophy; Na, sodium; PAH, pulmonary arterial hypertension; RWMA, regional wall motion abnormalities.

have been shown to influence cardiovascular outcomes in HD patients [3], thus suggesting the importance of monitoring body fluids and other parameters in the management of ESRD. Here, we report a typical case of ESRD in India where the patient developed complications due to underdialysis and pre-existing diabetes mellitus and hypertension. Unlike in most dialysis units, we achieved favorable outcomes by multidisciplinary management that provided ancillary services alongside an increase in her HD prescription.

Case Report

A 42-year-old woman presented to us in December 2016 with a complaint of pain in her arm during dialysis. She was a known type 2 diabetic mellitus and hypertensive patient of 8 years' and 11 years' duration, respectively, who had been undergoing twice-

weekly 4-h maintenance HD since May 2013 using the F6 low-flux polysulfone dialyzer membrane (Fresenius, Bad Homburg, Germany). Access was originally via an internal jugular line and then via a left brachiocephalic arteriovenous fistula (AVF) from late June 2013. On examination, the patient was conscious, oriented, and afebrile, blood pressure was markedly elevated at 220/104 mm Hg, and heart rate was 108 bpm, regular. Bilateral basal crackles could be heard on auscultation. She had previously made several visits to the emergency room due to pulmonary edema and hypertensive emergencies.

From May 2013, there had been progressive impairment of renal function with reduced urinary output of about 500 mL/day. She had also been receiving an erythropoiesis-stimulating agent (ESA), epoetin alfa 4000 U, twice weekly with intravenous iron. Echocardiography done in May 2013 and repeated in October 2016 revealed concentric left ventricular hypertrophy, minimal pericardial effusion, and findings suggestive of severe pulmonary arterial hypertension. At the time of presentation in December 2016, urinary output had further decreased to <100 mL/day and Kt/V, an index of dialysis adequacy, was 1.6 (target Kt/V ≥1.2).

Fig. 1. Timeline of the patient's course.

Table 2. Bioimpedance analysis results while on maintenance hemodialysis

Parameters	May 2013	October 2016
Dry weight, kg	50	48
Interdialytic weight gain, kg	2–2.5	3–4
ICW	Normal	Normal
ECW	Normal	High
Protein	Normal	Low
Fat	Normal	Normal
BMI	21.4	21.2

ICW, intracellular water; ECW, extracellular water; BMI, body mass index.

Also, bioimpedance analysis with a body composition monitor (BCM; Fresenius) showed high extracellular water content, with a maximum interdialytic weight gain of 3–4 kg. The twice-weekly epoetin alfa 4,000 U was changed to darbepoetin alfa 40 µg once every 2 weeks to reduce the frequency of injections. She also received blood transfusions due to severe unexplained anemia. These findings and other clinical features and laboratory investigations are shown in Table 1. Later in December 2016, she complained of pain in her arm during dialysis and developed elevated venous pressure in the AVF arm of 160–170 mm Hg. Other problems identified in the management of this patient included underdialysis, anemia, volume overload, congestive cardiac failure with recurrent pulmonary edema, and hypertensive crisis. In early January 2017, she suddenly developed edema of the AVF arm and venous pressure was further increased to 180 mm Hg. Computed tomography angiography and venography showed stenosis of the venous side of the AVF. Specific endovascular intervention using balloon angioplasty was performed, which reduced the venous pressure and the arm edema.

Because the patient was underdialyzed and had excessive weight gain with poor compliance to antihypertensive medications, HD was intensified to 4-h sessions thrice weekly. She was identified as a high-risk patient and therefore better control of blood pressure, nutritional counselling, strict salt and fluid restriction, regular bioimpedance analysis, correction of anemia, and cardiovascular follow-up are being done regularly. The patient is currently being maintained on the same dialysis prescription at our unit. A timeline of the patient's course is shown in Figure 1.

Discussion

There is an enormous burden of ESRD in India [1] and an attendant shortage of nephrologists, with only one nephrologist per 700,000 population. In India, most CKD patients present to a nephrologist only at stage 5, and renal biopsy is not performed for many patients due to the late stage of presentation. RRT such as HD is available for

less than 10% of the population requiring it [4]. Patient survival rates in private tertiary care centers are better than those of other dialysis facilities [5]. This is due to continuous surveillance by a nephrologist in these tertiary care centers. This specialist care allows for monitoring of cardiovascular and infection-related causes, which are the most important reasons for morbidity and mortality in HD patients. Availability of cardiac care, nutritional counselling, and vascular services is limited in dialysis units in India, leading to suboptimal outcomes in HD patients. In our unit, the cardiac care, skilled dietary counselling, and regular bioimpedance analysis we provide enable us to highlight the importance of these ancillary services to HD patients. These initiatives have yielded marked improvement in the patients' attitude to lifestyle changes, salt and water intake, and compliance with medications.

In our patient, maintaining near-ideal body weight through dietary counselling, attending thrice-weekly HD, and ensuring drug compliance has achieved good blood pressure control (Table 2). This is a pointer to hypertension being a consequence of salt and water retention, but it may also be erythropoietin related. When residual renal function falls, twice-weekly HD will not provide adequate toxin clearance or salt and water removal. To maintain residual renal function and to enhance survival of HD patients in India, management should include regular nutritional counselling to assess intake of fluid, salt, potassium, and phosphorous, assessment of CKD-mineral and bone disorder, appropriate management of anemia, and regular examination of the vascular access. Bioimpedance measurements will help to monitor lean body mass and hydration status.

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Statement of Ethics

The patient provided written informed consent for her case to be published.

Disclosure Statement

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References

- 1 Rajapurkar MM, John GT, Kirpalani AL, Abraham G, Agarwal SK, Almeida AF, Gang S, Gupta A, Modi G, Pahari D, Pisharody R, Prakash J, Raman A, Rana DS, Sharma RK, Sahoo RN, Sakhuja V, Tatapudi RR, Jha V: What do we know about chronic kidney disease in India: first report of the Indian CKD registry. *BMC Nephrol* 2012;13:10.
- 2 Palmer SC, Maggo JK, Campbell KL, Craig JC, Johnson DW, Sutanto B, Ruospo M, Tong A, Strippoli GF: Dietary interventions for adults with chronic kidney disease. *Cochrane Database Syst Rev* 2017;23:10:CD011998.
- 3 Czyżewski Ł, Wyzgał J, Czyżewska E, Sierdziński J, Szarpak Ł: Contribution of volume overload to the arterial stiffness of hemodialysis patients. *Ren Fail* 2017;39:333–339.
- 4 Abraham G: The challenges of renal replacement therapy in Asia. *Nat Clin Pract Nephrol* 2008;42:643.
- 5 Abraham G, Jayaseelan T, Milly M, Padma P, Saravanan AK, Lesley N, Reddy YN, Saravanan S, Reddy YN: Resource settings have a major influence on the outcome of maintenance hemodialysis patients in South India. *Hemodial Int* 2010;14:211–217.