Age and Dialysis Adequacy in Maintenance Hemodialysis Patients

Hemodiliz Hastaları Yönetiminde Yaş ve Dializ Yeterliliği

Yaş ve Diyaliz Yeterliliği / Age and Dialysis Adequacy

Hamid Nasri, Fatemeh Ghaed-Amini
Department of Internal Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran

Özet

Amaç: Dializin optimal dozu ve sıklığı sorunu, dializ tedavisi alımında en önemli sorun başlığı olmuştur. Biz yaşın, bazı hemodiyaliz parametrelerin, özellikle üre reduksiyon hızı ile (URR) hemodializ yeterliliği üzerindeki etkisini değerlendirmeyi ve bu parametreleri diabetli ve diabetli olmayan hastalar arasında karşılaştırmaya çalıştık. Gereç ve Yöntem: İdame hemodiyaliz tedavisi alan End-stage (SON EVRE) hastalar dikkate alındı. Üre redüksiyon hızı ve boy kilo endeksleri hesaplandı. Bulgular: Tümü 60 kişi olan hastalar (K=21, E=39) 44 non-diyabetik hemodiyaliz(F=15, M=29) ve 16 (F=6, M=10) diyabetik hemodiyaliz hastasından oluşmakta idi. Non-diyabetikler ve diyabetikler arasında diyaliz yeterliliği açısından, diyabetik grupta düşük değerlerle, dikkate değer bir fark gözlendi ve 50 yaşındakilerle ve 50 yaş üstü hastalarda daha düşük değerlerle, kreatinin ve diyaliz yeterliliği açısından önemli bir fark gözlendi. Tüm hemodiyaliz hastalarında yaş ve hemodiyaliz yeterliliği arasında önemli bir negatif korelasyon gözlendi, ve aynı zamanda yaş ile serum kreatinin arasından dikkate değer bir negatif korelasyon belirlendi. Tartışma: Yaşın hemodiyaliz üzerine negatif etkisi daha fazla dikkate alınmalıdır, bu bakış açısıyla yaşlı hastalarda sıklıkla gözlenen diyaliz komplikasyonları azaltılabilir.

Anahtar Kelimeler

Hemodializ; Yaş; Üre Azalma Oranı; Diabetus Mellitus

Abstract

Aim: The issue of optimal dialysis dose and frequency has been a central topic in the delivery of dialysis treatment. We aimed to consider the effects of age on some hemodialysis parameters specially dialysis adequacy by urea reduction rate (URR) and to compare these parameters between diabetics and non diabetic HD(hemodialysis) patients. Material and Method: Patients with end-stage renal disease (ESRD), undergoing maintenance hemodialysis treatment were considered. The urea reduction rate and body mass index were calculated. Results: The total patients were 60 (F=21 M=39), consisting of 44 non diabetic hemodialysis patients (F=15 M=29), and 16 diabetic hemodialysis patients (F=6 M=10). A significant difference of dialysis adequacy between non-diabetics and diabetics was observed with lower values in diabetic group and a significant difference of dialysis adequacy and creatinine was observed in patients, with ages below and more than 50 years old with lower values in older patients. A significant negative correlation of age with dialysis adequacy in total hemodialysis patients and a significant negative correlation of age with serum creatinine were observed. Discussion: The negative effect of age on dialysis adequacy needs more attention to this aspect to reduce the dialysis complications which is frequently observed in older patients.

Keywords

Hemodialysis; Age; Urea Reduction Rate; Diabetes Mellitus

DOI: 10.4328/JCAM.1151 Received: 13.06.2012 Accepted: 08.07.2012 Printed: 01.11.2013 J Clin Anal Med 2013;4(6): 472-475
Corresponding Author: Professor Hamid Nasri, Department of Internal Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran.
E-Mail:hamidnasri@yahoo.com

Introduction

Until recently, elderly patients were offered renal replacement therapy, either in the acute or chronic stages of their illness [1-3]. Trends have changed and now over 35% of chronic dialysis patients are 65 or older, when starting dialysis therapy [1-6]. Currently, there are around one million chronic dialysis patients worldwide [3-7]. More than half of these patients are older than 65 years. For various reasons this is a fast growing population [1; 2; 8; 9]. Growing acceptance rates of elderly patients for dialysis requires a careful consideration because of their specific problems during hemodialysis(HD) [10-14]. From the beginning of the dialysis era, the issue of optimal dialysis dose and frequency has been a central topic in the delivery of dialysis treatment. Because among patients with end-stage renal disease who are treated with HD, solute clearance during dialysis is determinant of mortality and low urea reduction ratios during dialysis are associated with increased odds ratios for death [13-18]. Many patients enter for regular HD, are older and they are prone to some complications of hemodialysis. Patient's age by itself affects the HD procedure and may be complicated by the resultant problems, one of which is dialysis efficiency [12-20]. Low dialysis efficiency may influence nutrition and facilitate insidious malnutrition [21-25]. The urea reduction rate is a function of the clearance of urea from the blood by the dialyzer, the length of the individual dialysis treatment, and the volume of distribution of urea in a particular patient [15-20]. Therefore, the urea reduction rate (URR) is a quantitative measurement of an individual patient's urea clearance during a single HD treatment and can be used as a proxy for the adequacy of solute clearance during a treatment [20-26]. Studies showed that patients with diabetes had lower concentrations and urea reduction rates than non-diabetic patients. Possible factors contributing to the lower urea reduction ratios in these patients include; compromised blood flow during a dialysis treatment as a result of hemodynamic instability, poor flow through the vascular access for HD [8-10;27-29], and also women treated with HD may have higher urea reduction ratios and a reduced odds ratio of death [27-31]. Based on the above mentioned data we conducted a study on maintenance hemodialysis patients (MHPs) to consider the effects of age and also gender on hemodialysis adequacy by URR and secondly to compare these parameters between diabetics and non diabetic HD patients, to recognize the adverse effects of age better on HD.

Material and Method

This cross - sectional study was conducted on patients with end-stage renal disease (ESRD), who was undergoing maintenance hemodialysis treatment with acetate based dialysate and polysulfone membranes. The etiologies of renal failure were diabetic nephropathy, hypertension, various glomerular diseases, autosomal dominant poly cystic kidney disease(ADPKD) and also urinary tract infections [32-38].According to the severity of secondary hyperparathyroidism, each patient was treated with oral active vitamin D3 (Rocaltrol), calcium carbonate, and Rena-Gel capsules at various doses. According to the severity of anemia, patients were treated with IV iron therapy Iron Source (venofer) at various doses after each dialysis session .All patients were under treatments of 6 mg folic acid daily, oral vitamin B-complex tablet daily and also 2000 U IV Eprex (recombinant human erythropoietin (rHuEPO) were given to each patient after each dialysis session routinely[39-41]. Exclusion criteria were active or chronic infection. For patients predialysis BUN and creatinine and post dialysis BUN were measured. The urea reduction ratio is calculated with the formula 100 × (1 - [Ct/Co]), in which Ct is the blood urea nitrogen measured five minutes after the end of dialysis and Co is the blood urea nitrogen measured five minutes after the end of dialysis and Co is the predialysis blood urea nitrogen [42]. Body mass index (BMI) is calculated using the standard formula [postdialyzed weight in kilograms/height in square meters, kg/m2 . Duration and the amount of sessions of HD treatment were calculated from the patient's records. The duration of each HD session was 4 hours. Results are expressed as the mean ± SD. Comparison between the groups was done using Student's t-test. Statistical correlations were found by using partial correlation test. Statistic analysis was performed on total hemodialysis (HD), females, males, diabetics and non diabetic's populations separately. All statistical analysis were performed using SPSS (version 11.5.00). Statistical significance was determined at a p-value < 0.05.

Results

The total patients were 60 (F=21, M=39), consisting of 44 non diabetics HD patients (F=15, M=29), and 16 diabetic HD patients (F=6, M=10). Table 1 shows patients demographic data. Mean±SD of age of total patients were 46±18 years. The length of the time patients had been on HD were 46±18 months. The URR of total patients were 57.4±9%. Mean ± SD of URR of diabetic group and non-diabetic group were 52.3±9.5 and 59.3±8% respectively. Predialysis serum creatinine of total patients was 9±3.6 mg/dL. In this study no significant differences of age, BMI, duration and sessions of HD , and URR between males and

Table 1. Mean ±SD , Minimum and maximum of age, duration, dose and also URR of total, nondiabetic and diabetic hemodialysis patients

Total patients n = 60		Minimum	Maximum	Mean±SD
Age	years	11	80	46 ±18
DH*	months	2	156	25±30
Dialysis dose	sessions	18	1584	219±321
URR	%	39	76	57.4±9
BMI	kg/m2	16	38	22±4.5
Creatinine	mg/dL	1.5	18.	9±3.6
Nondiabetics n = 44		Minimum	Maximum	Mean±SD
Age	years	11	80	42.9±18
DH*	months	2	156	29.8±35
Dialysis dose	sessions	18	1584	258±367
URR	%	47	76	59.3±8
BMI	kg/m2	16	33	20.6±3.8
Creat	mg/dL	1.5	16	9.5±3.3
Diabetics n = 16		Minimum	Maximum	Mean±SD
Age	years	27	79	54±16.7
DH*	months	6	24	13±6
Dialysis dose	sessions	54	216	114±52
BMI	kg/m2	39	75	52.3±9.5
BMI	index	20	38	24.7±5
Creat	mg/dL	3	18	8. ±4.3

*Duration of HD treatment

females were found (p = N.S.). A significant difference of URR between diabetics and non diabetic HD patients was seen (p = 0.006). Significant differences of URR (p = 0.007) and creatinine (p = 0.024) between patients with age less than and more than 50 years were seen. Also a significant negative correlation of age with URR in total HD patients was found (r = -0.32, p = 0.014). A significant negative correlation of age with serum creatinine was seen (r=-0.36, p=0.005) (adjusted for duration of HD treatment for two correlations).

Discussion

In this study we found a significant difference of dialysis adequacy between non-diabetics and diabetics with lower values in diabetic group and a significant difference of dialysis adequacy and creatinine was observed in patients with age below and more than 50 years old, with lower values in older patients. A significant negative correlation of age with dialysis adequacy in total HD patients and a significant negative correlation of age with serum creatinine were seen. In a study conducted by Letourneau et al. [43] on ESRD patients with a total of 429 new chronic dialysis patients - 67 ESRD patients were over 75 years old and 66 patients were between 50 and 60 years old. It was found that life expectancy of the patients who began dialysis above 75 years old was significantly shorter than the patients who started dialysis between 50 and 60 years of age, especially if they had low weight, lost weight loss and/or required hospitalization [43]. Negative association of age with dialysis efficiency seriously influences the life expectancy of older patients [1-6]. We showed the negative association of age and predialysis serum creatinine. We also showed a significant lower predialysis serum creatinine in patients older than 50 years old which suggests insidious malnutrition in these patients might become more aggravated with their lower dialysis efficacy. Previous studies was also attested our findings (4, 6). In contrast to our findings no significant difference of dialysis adequacy between males and females were found, in a study with 18, 144 black and white patients receiving hemodialysis 3 times weekly. Owen et al. (44) showed that men had lower URRs' than women, which needs more work in this aspect of hemodialysis treatment (44). In conclusion we showed the important negative effect of age on dialysis adequacy. More attention on this aspect is needed for older hemodialysis patients to reduce this complications.

Competing interests

The authors declare that they have no competing interests.

References

1. Vanita Jassel S. Roscoe JM: Dialysis in old age – are we really doing all we should? Age and Ageing. 1999; 28: 503-504.
2. Gheissari A, Mehrasa P, Merrikhi A, Madihi Y. Acute kidney injury: A pediatric experience over 10 years at a tertiary care center. J Nephropathology. 2012; 2(1): 101-108.
3. Celik G, Kara I, Yilmaz M, Apiliogullari S.The relationship between bioimpedance analysis, haemodynamic parameters of haemodialysis, biochemical parameters and dry weight.J Int Med Res. 2011; 39(6):2421-8.
4. Bernaert P. Care of the geriatric patient in chronic renal failure. EDTNA ERCA J. 2001; 7(3):147-9.
5. Tayebi Khosroshahi H. Short history about renal transplantation program in Iran and the world: Special focus on world kidney day 2012. J Nephropathology. 2012; 1(1) 5-10.
6. Vachharajani TJ, Atray NK.Aging veterans and the end-stage renal disease management dilemma in the millennium. Hemodial Int. 2007; 11(4):456-60.
7. Tolou-Ghamari Z. Nephro and neurotoxicity, mechanisms of rejection: A review on Tacrolimus and Cyclosporin in organ transplantation. J Nephropathology. 2012; 1(1): 23-30.
8. Nasri H, Mortazavi M, Ghorbani A, Shahbazian H, Kheiri S, Baradaran A, et al.Oxford-MEST classification in IgA nephropathy patients: A report from Iran. J Nephropathology. 2012; 1(1): 31-42.
9. Khajehdehi P. Turmeric: Reemerging of a neglected Asian traditional remedy. J Nephropathology. 2012; 1(1):17-22.
10. Ghorbani A, Ehsanpour A, Roshanzamir N, Omidvar B. Alterations in antibiotic susceptibility of urinary tract infection pathogens. J Nephropathology. 2012; 1(1): 43-48.
11. Green JA, Mor MK, Shields AM, Sevick MA, Palevsky PM, Fine MJ, et al.Prevalence and demographic and clinical associations of health literacy in patients on maintenance hemodialysis. Clin J Am Soc Nephrol. 2011; 6(6):1354-60.
12. Catizone L, Malacarne F, Bortot A, Annaloro M, Russo G, Barillà A, et al. Renal replacement therapy in elderly patients: peritoneal dialysis.J Nephrol. 2010 Sep-Oct;23 Suppl 15:S90-7.
13. Grun RP, Constantinovici N, Normand C, Lamping DL; North Thames Dialysis Study Group.Costs of dialysis for elderly people in the UK. Nephrol Dial Transplant. 2003; 18(10):2122-7.
14. Gheshlaghi F. Malignant drug-induced rhabdomyolysis. J Nephropathology. 2012; 1(1): 59-60.
15. Abdel-Kader K, Myaskovsky L, Karpov I, Shah J, Hess R, Dew MA, et al.Individual quality of life in chronic kidney disease: influence of age and dialysis modality.Clin J Am Soc Nephrol. 2009; 4(4):711-8.
16. Owen WF. Lew NL. Liu Y. Lowrie EG. Lazarus JM. The Urea Reduction Ratio and Serum Albumin Concentration as Predictors of Mortality in Patients Undergoing Hemodialysis. N.Engl J. Med. 1993; 30, 329(14) pp. 1001-6.
17. Lamping DL, Constantinovici N, Roderick P, Normand C, Henderson L, Harris S, et al. Clinical outcomes, quality of life, and costs in the North Thames Dialysis Study of elderly people on dialysis: a prospective cohort study. Lancet. 2000 Nov 4; 356(9241):1543-50.
18. Kalantar E. Minimizing potential resistance among bacteria causing urinary tract infection. J Nephropathology. 2012; 1(1): 11-12.
19. Baradaran A, Nasri H.Correlation of serum parathormone with hypertension in chronic renal failure patients treated with hemodialysis.Saudi J Kidney Dis Transpl. 2005; 16(3):288-92.
20. Nasri H, Baradaran A.The influence of serum 25-hydroxy vitamin D levels on Helicobacter Pylori Infections in patients with end-stage renal failure on regular hemodialysis.Saudi J Kidney Dis Transpl. 2007; 18(2):215-9.
21. Baradaran A. Kheiri S, Kianmehr MR, Mortazavi M, Nasri H. Association of Secondary Hyperparathyroidism with Coronary Artery Disease in Patients on Regular Hemodialysis. Appl Med Inform.2011; 29(4):11-18.
22. Assadi F. The epidemic of pediatric chronic kidney diseasethe danger of skepticism. J Nephropathology. 2012; 2(1): 61-64.
23. Einollahi B. Are acquired cystic kidney disease and autosomal dominant polycystic kidney disease risk factors for renal cell carcinoma in kidney transplant patients? J Nephropathology. 2012; 2(1): 65-68.
24. Mubarak M, Collapsing focal segmental glomerulosclerosis: increasing the awareness . J Nephropathology. 2012; 2(1):77-80.
25. Nasri H.Linkage of elevated CaxPO4 product with inflammation in maintenance hemodialysis patients.Minerva Urol Nefrol. 2006; 58(4):339-45.
26. Nasri H.Association of white blood cell count with left ventricular hypertrophy and ejection fraction in stable hemodialysis patients.Saudi J Kidney Dis Transpl. 2007; 18(1):31-6.
27. Baradaran A, Nasri H.Correlation of serum magnesium with serum parathormone levels in patients on regular hemodialysis.Saudi J Kidney Dis Transpl. 2006; 17(3):344-50.
22-Bradran A, Nasri H.Association between white blood cell count and levels of serum homocysteine in end-stage renal failure patients treating with hemodialysis. J Ayub Med Coll Abbottabad. 2006; 18(1):22-6.
28. Nasri H, Baradaran A, Naderi AS.Close association between parathyroid hormone and left ventricular function and structure in end-stage renal failure patients under maintenance hemodialysis.Acta Med Austriaca. 2004;31(3):67-72.
29. Nasri H.Serum leptin concentration and left ventricular hypertrophy and function in maintenance hemodialysis patients.Minerva Urol Nefrol. 2006; 58(2):189-93.
30. Nasri H.Serum C-reactive protein (CRP) in association with various nutritional parameters in maintenance hemodialysis patients.Bratisl Lek Listy. 2005; 106(12):390-5.
31. Nasri H, Baradaran A.Correlation of serum magnesium with dyslipidemia in maintenance hemodialysis patients. Acta Medica (Hradec Kralove). 2004; 47(4):263-5.
32. Mubarak M. Oxford classification of IgA nephropathy: Broadening the scope of the classification. J Nephropathology. 2012; 1(1): 13-16.
33. Mortazavi M. Nasri H. Granulomatosis with polyangiitis (Wegener's) presenting as the right ventricular masses: A case report and review of the literature. J Nephropathology.2012; 1(1): 49-56.
34. Ghorbani A, Ehsanpour A, Roshanzamir N, Omidvar B. Alterations in antibiotic susceptibility of urinary tract infection pathogens. J Nephropathology. 2012; 1(1): 43-48.
35. Karimifar M. Deep vein thrombosis in combination with granulomatosis with

polyangiitis (Wegener's). J Nephropathology.2012; 1(1): 57-58.
36. Mubarak M, Collapsing focal segmental glomerulosclerosis: increasing the awareness. J Nephropathology. 2012; 1(2):77-80.
37. Mohammadi Torbati P. Focal segmental glomerulosclerosis; collapsing variant. J Nephropathology. 2012;1(2): 87-90.
38. Ardalan MR, Samadifar Z, Vahedi A. Creatine monohydrate supplement induced interstitial nephritis. J Nephropathology. 2012; 1(2): 117-120.
39. Rafieian-Kopaei M, Nasri H, Nematbakhsh M, Baradaran A, Gheissari A, Rouhi H, et al. Erythropoietin ameliorates genetamycin-induced renal toxicity: A biochemical and histopathological study. J Nephropathology. 2012; 2(1):109-116.
40. Kadkhodaee M. Erythropoietin; bright future and new hopes for an old drug. J Nephropathology. 2012; 2(1): 81-82.
41. Tavafi M. Inhibition of gentamicin – induced renal tubular cell necrosis. J Nephropathology. 2012; 2(1): 83-86.
42. Boag JT. (1994) : Basic Truths in Optimal Hemodialysis, Dialysis and Transplantation, Volume 23, Number 11, November 1994 Page 636.
43. Letourneau I, Ouimet D, Dumont M, Pichette V, Leblanc M. Renal replacement in end-stage renal disease patients over 75 years old. Am J Nephrol.2003; 23(2):71-7.
44. Owen WF. Chertow GM. Lazarus M. Lowrie E. Dose of Hemodialysis and Survival, Differences by Race and Sex. JAMA. 1998; 280:1764-1768.