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HEMODIALYSIS ADEQUACY AND RECIRCULATION RATIO ACCORDING THE PERMANENT VASCULAR ACCESS TYPE IN PATIENTS WITH CHRONIC HEMODIALYSIS

KRONİK HEMODİYALİZ HASTALARINDA KALICI DAMAR YOLU TİPLERİNE GÖRE DİYALİZ YETERLİLİĞİ VE RESİRKÜLASYON ORANLARI

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ABSTRACT

Background: *Dialysis adequacy is an important parameter with regards to morbidity and mortality in chronic hemodialysis patients. Besides many other factors affecting this parameter, the effect of different permanent vascular access types (PVA), essential for the hemodialysis treatment, on this parameter should be further investigated. As PVA 's, native arteriovenous fistulas (NAVF), graft (polytetrafluoroethylene) arteriovenous fistulas (GAVF) and permanent hemodialysis catheters (PHC) are used. One of the factors during the performing a PVA is to find an answer to whether or not the type of PVA has an effect on Kt/V ratio and recirculation (R%). Our purpose was to find whether there was any difference depending on the type of PVA in terms of Kt/V and R%.*

Method: *Sixty-one patients who have been on hemodialysis with the same vascular access for the past 6 months were grouped according to their types of PVA. Of them, 37 were NAVF, 12 were GAVF and the remaining 12 were with PHC and they all received bicarbonate dialysis with low-flux dialysers 4 hours 3 times a week. Mean average Kt/V and R% ratios for six months were calculated. Kruskal-Wallis H test was used for statistically analysis.*

Results: *Mean average of Kt/V for six months was found as 1.29 +0.28 in 37 patients with NAVF, as 1.31 ±0.27 in 12 patients with GAVF and as 1.34 ±0.22 in 12 patients with PHC. R% was found 9.1 ±4.6% in NAVF, 8.1 ±4.1 % in GAVF and 6 ± 3.1 % in PHC. There was no significant difference among the three groups in terms of Kt/V and R% (p=0.68, p=0.3).*

Discussion: *Dialysis adequacy and R% were found similar in three types of PVA. The type of PVA was not observed as an important factor in means of R% and dialysis adequacy. When creating a PVA, other characteristics of the patient and the cost of the procedure should be taken into consideration.*

Key Words: Permanent vascular access, dialysis adequacy, recirculation and chronic renal failure

ÖZET

Amaç: *Kronik hemodiyaliz hastalarında diyaliz yeterliliği morbidite ve mortalite açısından önemli bir parametredir. Bu parametre üzerine etkili bir çok faktörün yanısıra hemodiyaliz işlemi için gerekli olan kalıcı damar yolu (KDY) tiplerinin etkilerinin bulunup bulunmadığı araştırılması gereken bir konudur. KDY olarak, nativ arteriovenöz fistüller (NAVF), Greft (politetrafluoraetilen) arteriovenöz fistüller (GAVF) ve kalıcı hemodiyaliz kateterleri (KHK) kullanılmaktadır. KDY oluşturulurken dikkat edilmesi gereken konulardan birisi de KDY tipinin diyaliz yeterliliğine olan etkisi olabilir mi sorusuna cevap aramak için Kt/V ve resirkülasyon (R) açısından KDY tipleri arasında fark olup olmadığını araştırmayı amaçladık.*

Yöntem: Son 6 aydır aynı damar yolu ile hemodiyalize giren 61 hasta KDY tiplerine göre gruplandırıldı. Hastalardan 37 si NAVF, 12'si GAVF ve 12Si KHK ile haftada 3 kez 4'er saat, bikarbonattı hemodiyalize giriyordu. Altı aylık KT/V ortalamaları ve R oranları hesaplandı. Gruplar arasında farklılık olup olmadığı araştırıldı. İstatistiksel yorumda Kruskal-Wallis H testi kullanıldı.

Bulgular: *NAVF'lü 37 hastanın son 6 aylık KT/V ortalamaları 1.29±0.28, GAVF'li 12 hastanın 1.31±0.27, KHK'li 12 hastanın 1.34±0.22 olarak bulundu. R oranları NAVF'de % 9.1 ±4.6, GAVF'de % 8.1 ±4.1 ve KHK'de % 6.6±3.1 bulundu. Her üç grup arasında da KT/V ve R oranları açısından farklılık yoktu (p=0.68, p=0.3).*

Tartışma: *Diyaliz yeterliliği ve R oranları üç tip KDY'nda benzer bulunmuştur. KDY tipi R ve diyaliz yeterliliği için belirleyici faktör olarak izlenmemektedir. KDY oluşturulurken hastanın diğer özellikleri ve maliyet göz önüne alınmalıdır.*

Anahtar kelimeler: Kalıcı damar yolu, diyaliz yeterliliği, resirkülasyon, kronik böbrek yetmezliği

INTRODUCTION

For hemodialysis treatment in patients with end stage chronic renal failure, there is a need for access to provide a repetetive and easy intervention. For this access that is named as permanent vascular access (PVA), native arteriovenous fistulas (NAVF), graft arteriovenous fistulas (GAVF) and permanent hemodialysis catheters (PHC) are used(l).

Many factors are taken into consideration when choosing the type of PVA in chronic hemodialysis patients. The age of the patient and concomitant diseases such as primary kidney disease, heart failure or peripheral vascular disease are among the important factors that are taking a part in this selection (1,2). In some countries like United States, GAVF is used more often, while NAVF is used more often in Europe, hi recent years, the use of PHC has started to increase especially in the United States (3).

Whether or not the type of the PVA has an effect on dialysis adequacy, that has been known especially to have a major impact on morbidity and mortality, is an important subject. When giving a decision on the type of PVA, it has to be clarified whether this factor, among other factors, should be taken into consideration or not.

We have planned to undertake this study in order to find out whether the type of PVA has an effect dialysis adequacy.

MATERIAL AND METHOD

Sixty-one patients who have been on hemodialysis with the same vascular access for the past 6 months were grouped according to their types of PVA (32 males; 29 females). Mean average of age was 46±9.5 years. Thirty-seven of them were NAVF, 12 of them were GAVF (4-7 mm PTFE standard, Goro-tex) and 12 of them were with jugular and subclavian PHC (Medcomp Ash Split Cath, 14 FR x 28 cm (11) with Dacron cuff) and they all received bicarbonate dialysis with low-flux dialysers (1.2-1.4 m^2, hemophane) 4 hours 3 times a week. Blood flow rate was 300 ml/ minute and dialysate flow rate was 500 ml/minute. The causes of primary renal disease were as follows glomerulonephritis in 15 patients, diabetic nephropathy 10 patients, chronic pyelonephritis 15, amyloidosis 5, polcystic kidney disease 3, hypertension 4 and unknown etiology 9.

Single-pool Kt/V was estimated accordind to Daugirdas' second-generation formula (4): Kt/V= -In (R - 0.008 x t) + (4 - 3.5 x R) x UF / W (4) in which 'In' is the natural logarithm; 'R' is the post-dialysis BUN / pre-dialysis BUN; 't' is the dialysis session length in hours; 'UF' is the ultrafiltration volume in liters; and 'W' is the patient's post-dialysis weight in kg. Pre-dialysis BUN samples were drawn immediately prior to dialysis, using a technique that avoided dilution of the blood sample with saline or heparin. Post-dialysis BUN samples were drawn using the Slow Flow/Stop Pump Technique that prevents sample dilution with recirculated blood and minimizes the confounding effects of urea rebound.

R% was calculated every month with the following formula: R% = (S-A / S-V) X 100 (5) in which 'A' is arterial, 'V is venous line samples and 'S' is systemic arterial sample from arterial line port. Procedure was practiced after approximately 30 minutes of treatment and after turning off ultrafiltration. Then blood flow rate was reduced to 120 mL/minute and turned blood pump off exactly 10 seconds after reducing blood flow rate. Arterial line was clamped immediately above sampling port. BUN was measured in A, V, and S samples and R% was calculated. Kruskal-Wallis H test was used for statisticaly analysis.

RESULTS

Mean Kt/V for six months was found in all patients as 1.29±0.28, with NAVF as 1.29±0.28, with GAVF as 1.31±0.27 and with PHC as 1.34±0.22. R% found in NAVF was 9.1±4.6 %, in GAVF was 8.1±4.1 % and in PHC was 6.6±3.1 %. There was no significant difference among the three groups in terms of Kt/V and R% (p=0.68, p=0.3, respectively).

DISCUSSION

To provide hemodialysis treatment in patients with end stage chronic renal failure, it is of great importance to provide a PVA for a repetitive intervention in every dialysis session with efficient blood flow. Many factors are taken into consideration when choosing the type of PVA in chronic hemodialysis patients. The age of the patient as well as primary kidney disease, heart failure or other concomitant diseases are among the important factors to decide on the selection of the type of PVA (6,8).

With the help of the efficiency of hemodialysis treatment as well as other advances in treatment options, the life expectancy and survey of the hemodialysis patients have been increasing. It is under study whether the type of PVA has a predictor value on hemodialysis adequacy among many other factors. If the type of PVA is an effective parameter on hemodialysis adequacy, then it should be taken into consideration when performing a PVA. In a study that have investigated hemodialysis adequacy among NAVF, GAVF and PHC used as PVA, similar hemodialysis adequacy was found in all of the three PVA types (9).

An important problem that results in the failure of hemodialysis adequacy in chronic hemodialysis patients is the R% development. One of the two components of R% is a functional loss due to PVA and the needles while the other one is functional disorder of cardiopulmonary system. Depending upon whether or not R% rates are changing, it is important to provide adequate dialysis. In various studies, it was found that R% was high in temporary hemodialysis catheters while in NAVF and GAVF there was no significant R%. But there is insufficient data with PHC in literature. R% of PHC was found with similar to the other permanent vascular accesses (10,11).

We did not find any significant difference among the three types with respect to the dialysis adequacy. Results were very much alike. Also, there was no significant difference in regard to R%.

In conclusion, for dialysis adequacy and R% that are important factors for mortality and morbidity, the type of the vascular access may not be a predictor. Therefore, it is important to make the selection by taking primarily to consideration factors like cost and other factors and prepare the PVA accordingly.

REFERENCES

1. NFK- DOQI clinical practise guidelines for vascular access. Am JKidneyDis 1997;30: Suppl. 152-191.
2. Stehman-Breen CO, Sherrard DJ, Gillen D, Caps M Determinants of type and timing of initial permanent hemodiyalysis vascular access. Kidney Int 2000; 57: 639-645.
3. Woods JD, Turenne MN, Strawderman RL, et al. Vasculer access survival among incident hemodialysis patients in the United States. Am J Kidney Dis 1997; 30: 50- 57.
4. Daugirdas JT. Second generation logarithmic estimates of single-pool variable volume Kt/V: an analysis of error. J Am Soc Nephrol 1993; 4:1205-1213.
5. Hester RL, Curry E, Bower J. The determination of hemodialysis blood recirculation using blood urea nitrogen measurements. Am J Kidney Dis 1992; 20:598-602.
6. Hirth RA, Turenne MN, Woods JD, et al. Predictors of type of vascular access in hemodialysis patients. JAMA 1996 ; 276: 1303-1307.
7. Rodriguez JA, Armadans L, Ferrer E, et al. The function of permanent vasculer access. Nephrol Dial Transplant 2000; 15:402-408.
8. Ifudu O, Mayers JD, Matthew JJ, Antoinette F, Friedman EA. Haemodialysis dose is independent of type of surgically-created vascular access. Nephrol Dial Transplant 1998;13:2311-2316.
9. Tonelli M, Muirhead N. Access type as a predictor of dialysis adequacy in chronic hemodialysis patients. ASAIO J 2000; 46:279-282.
10. Schneditz D. Theoretical and practical issues in resirculation; assessment of vascular access. EDTNA ERCA J 1998;24:3-6.
11. Bouchoureb D, Saveanu A, Bartoli JM, Olmer M. A new approach to evaluate vascular access in hemodialysis patients. Artif Organs 1998; 22:591-595.