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RESEARCH ARTICLE

DIALYZER REUSE-PRACTICE IN MADAGASCAR: A NEW CHALLENGE TO IMPROVE THE ACCESSIBILITY TO END STAGE RENAL DISEASE CARE

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ABSTRACT

Hemodialysis is the most useful renal replacement therapy in the world. However, it remains inaccessible to the majority of patients in developing countries because of its costs. In Madagascar, 95% of patients requiring dialysis don't have an access to do it. That prompted us to search some solutions while prioritizing the effectiveness of the treatment. We initiated the reuse of dialyzers with lines in Hemodialysis since June 2016. Our objectives are to determine its efficiency, to report its side effects, and to compare its cost to single-use dialysis. This is a prospective, observational study in single center. All patients dialyzed incorrectly (less than three times a week) in the Center and who accepted to practice reuse were included. We excluded all infected patients with Hepatitis, HIV, severe infections or under corticotherapy for a long period. In our cohort, 44.76% of the patient accepted to practice reuse. 537 reuses were carried out with 47 dialyzers. Each dialyzer were reused on average 11 times. The average urea before and after reuse were 15.42 and 4.53 mmol / l. The mean Urea Reduction Ratio was 70,6% and the mean Kt/V was 1.4. Any side effects and any death were reported. Concerning the costs, the reuse technique allowed to reduce monthly 57.07% on the total costs of treatment comparing to single-use dialysis. To conclude, reuse of dialyzer seems to offer both cost-effective and efficient results. We conclude that it may be a safe alternative of end-stage renal disease care in Madagascar.

INTRODUCTION

Hemodialysis is the most useful renal replacement therapy in the world (US Renal Data Systeml, 2007). It remains inaccessible to the majority of patients in developing countries because of its costs (Diallo, 1997 and Diouf, 2003). In Madagascar, this is the only treatment available, the costs are in charge of the patients and their families due to the lack of the social security coverage. Among the chronic kidney disease-patients who are coming for hospitalisation, 95% are classified as End Stage Renal Disease (ESRD) and require a periodic hemodialysis, but less than 3% have an access to practice it (Ramilitiana, 2016). In addition, the majority of these patients dialyze irregularly less than three times a week and many others can not continue to practice it just after few sessions. These real facts lead generally a serious accidents requiring several hospitalizations and sometimes induce life threatening-injuries. This situation motivated us to find solution to improve the accessibility to ESRD care while prioritizing the effectiveness of the treatment. Based on Vietnamese experience on hemodialyzer reuse, we have initiated this technique in our Center since June 2016. At the sixth month of application, we want to evaluate its impact on the management of the patients. The main objectives are to evaluate the effectiveness of reuse, to report its side effects and to compare its cost to single-use dialysis.

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MATERIALS AND METHODS

It is a prospective, descriptive, observational study during a period of six months. We included in this study all patients who dialyzed irregularly and who wanted to practice reuse. Before starting, patients were well informed of advantages and eventual side effects of this technique. An oral and written consent were done. We excluded all patients who didn't respect

the rhythm with 3 times sessions a week, all patients infected by hepatitis, HIV / AIDS or TB and all patients immunodepressed or under corticosteroid therapy for a long-term. As parameters, we retained age, sex, weight before and after reuse, urea before and after reuse, Urea Reduction Ratio (URR), Kt/V, the costs of treatment.

Reuse in madagascar

Reuse was initiated by the Nephrology Team of Befelatanana, Madagascar since 13/01/2016 after some training in Hemodialyse Center of HUE Hospital in Vietnam. It is supported by CARE La Baule France Association. This technique was applied because of two reasons. Firstly, the high costs of dialysis don't allow the accessibility of the patients to ESRD care and secondly, there are several incorrect dialysis less than three times a week. The goal is to alleviate the costs of dialysis treatment in order to allow the accessibility to a correct treatment. It is a technique that has been accepted to be applied in Madagascar after the validation of the Ministry of Health. The doctors, the nurses and the technicians were trained in the center and evaluated before practicing. As a definition, reuse involves using dialyzer with lines in several times. In this study, we set the maximum number of reuse up to 12 times. We used Polyflux F10HPS as dialyzer. Each dialyzer is identified and specific to each patient. The name of the patient and the date of the first reuse should be written in dialyzer with an indelible marker.

Rinsing time: after each session, the dialyzer with lines must be rinsed immediately by retrofiltration with an osmosed water circuit.

Disinfection time: after rinsing, they are disinfected with an acetic acid solvent (Puristeril), they must be filled with this solvent and pH must be tested before storage in a refrigerator.
Second rinsing time: before starting the dialysis in each next session, they are rinsed once again and the pH should be also tested to prouve the presence of the desinfecting solvent or not.
During this period of observation, viral serology and infectious tests were performed systematically at the end of the months.
A record book summarized the condition of each dialyzers and remarks during dialysis. A report was written monthly for observation and traceability.

RESULTS

Among the patients in the Center, 46.7% accepted to practice reuse (7/15) including 6 men and 1 woman. The mean age was 55 years with extremes of 35 and 62 years. Since the application of this technique, each patient dialysed correctly three times a week. This has not been the case before. At the end of the sixth month, 537reuse was carried out on 47 dialyzers. The dialysate flow ranged from 300 - 500 ml / min. The blood flow was between 250-400ml / min. The dose of heparin were between 4500-6000 IU. The average urea before and after reuse were 15.42 and 4.53 mmol / l. The average URR was 70,6%. The mean Kt/V was 1.4. Except missing session, the average number of reuse was 11 times per dialyzer. One patient was able to do up to 13 times. The factors which required to change another dialyzer were mainly related to blood transfusion (7 cases) and breaks during rinsing time (2 cases). Any thrombotic nor haemorrhagic events were noted. All viral serology performed monthly and at the end of the observation were negative. Any side effects such as skin irritations, pyrogenic reactions or sepsis have been reported by patients or by the personnel responsible. The monthly microbiological analysis of osmosed water did not found any particular germs. One patient must stop to practice reuse definitely because of his vascular access problem. The dialyser, the lines and consumables for single-use costs 2,167,680 Ariary per month per patient. Reuse reduced this costs up to 1,280,640 Ar, which is equal to 59.07% of reduction.

Table 1. Patients's characteristics

Patients's characteristics	
Number of patients	7 Patients
	6 Men (85,7%)
1 Women	(14,3%)
Average weight before reuse	60 Kg (50-77,4)
Average weight after reuse	56 Kg (48,5-74,4)
Average urea before reuse	15,4mmol/l (8-19,1)
Average urea after reuse	4,5mmol/l (3-5)
Mean Kt/V	1,4 (1,1-1,6)
Mean URR	70,6 (62-74)
Causal nephropathies	
Diabetic nephropathy	4 (57,1%)
Vascular nephropathy	2 (28,6%)
Chronic tubulo-interstitial nephropathy	1 (14,3%)
Vascular Access	
Brachio-cephalic Fistula	4 (57,1%)
Radio-cephalic Fistula	2 (28,6%)
Femoral catheter	1 (14,3%)

DISCUSSION

Reuse technique has begun several centuries ago (Shaldon, 1964). This is the only way to reduce the costs of a periodic dialysis treatment. Several studies have reported its beneficial effects (Chuang, 2008). Manandhar and al. have reported that practicing reuse can always maintained a good quality of extra-renal purification. They found an average Kt/V equal or greater than 1.2 (Manandhar, 2009).Another Indian study written by Lobo and al. reported 187 reuse sessions in 21 patients with Kt/V between 1.26-1.59 (Lobo, 2002). In this study, we found an average Kt/V at 1.4 with an URR at 70 % by using a polyflux dialyzer. According to the literature, using dialyzers with high permeability membranes allow easily to eliminate molecular with high weight and improves their clearance (Port, 2001). The same study of Manandhar and al. reported an average urea 160mg / dl and 71mg / dl respectively before and after reuse and an average URR 54.82% (Manandhar, 2009). The Sridhar's study confirms this hypothesis of unchanged urea clearance using three different types of membranes (Sridhar, 1999). The numbers of reuse per dialyzer remains variable. Some studies have highlighted the optimal number of reuse to retain its effectiveness. According to Miach and Bourke, the dialyzer was reused only up to 6 times (12) (13). In Nepal, it was used up to 9 times (Manandhar, 2009). In Arabia, each dialyzer has been used on average 13 times with a maximum of 21 times (Mitwalli, 2001). In our study, each dialyzer was reused on average 11 times. These differences are related firstly to the experience of each center and secondarily due to each applied protocol. The apprehended side effects in reuse technique are mainly related to disinfectants agents like peracetic acid, glutaraldhehyde, citric acid. According to the literature, few cases were reported before 1980 (Hakim, 1980). However, most recent studies have shown a reduction of these

adverse effects (Husni, 1989 and Archibald, 2006). No side effects of reuse were reported in this study. The mortality rate in reuse remains controversial. Most studies reported that there was no difference in mortality between reuse and single-use dialysis (Collins, 2004 and Collins, 1993). In theirs observations, compared to single use dialysis, Feng-Rong Chuang and al. reported a lower mortality rate (Chuang, 2008). While Lowrie and al. were able to find a higher mortality rate (Lowrie, 2004).

In fact, the causes of mortality were mainly related to other morbid factors than disinfectants used during reuse (National Kidney Foundation report on dialyzer reuse, 1997). There were no reported death in this study during the observational period. The main reason for practicing reuse technique whether in developed or in developing countries, is primarily due to economic reason (National Kidney Foundation report on dialyzer reuse, 1997). By practicing reuse, Lobo and al. were able to find a cost reduction up to 42.46% using the dialyzer FB 130T, and 36.39% using the dialyzer F6 (Lobo, 2002). Mitwalli and al. were able to find monthly a cost reduction up to 53% per patient (Mitwalli, 2001). According to
E Wittich, practicing reuse up to 20 times allowed a significant reduction up to 95% (Wittich, 1995). In Madagascar, the monthly cost of dialysis is 2,167,680 Ariary (723 USD) per patient while the average monthly income of a family is approximately 65 USD. Reuse allowed to reduce this cost up to 1,280,640 Ariary (426 USD) which is equal to 59,07% of reduction. Our study has some limitations in particular the numbers of studied patients, the absence of another molecular clearance evaluation. Anyway, it is one step to improve the accessibility to ESRD care with a correct periodic hemodialysis.

Conclusion

To conclude, reuse technique is newly applied and initiated in Madagascar because of the high cost of treatment and the presence of many irregular periodic dialysis. Reuse allowed our patients to dialyze properly and regularly with three sessions per week. In this study, our results showed that the reuse of dialyzers does not affect the quality of dialysis and the clearance of urea. We found a Kt/V 1.4% and a 70% of URR. The average number of reuse was 11 times per dialyzer. No side effects and no death during the observation period, reuse saves monthly 59% on the total cost of dialysis. Our next step would be to nationalize this technique with creation of dialysis antennas in the provinces. Simple, safe, easy, affordable, and cheaper, reuse could be an alternative of ESRD care in Madagascar.

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Conflict of Interest: We declare to have any conflict of interest.

REFERENCES

Archibald LK, Khoi NN, Jarvis WR, Reller LB, Cam PD, Thu TA, et al. Pyrogenic reaction in hemodialysis patients, Hanoi, Vietnam. *Infect Control Hosp Epidemiol*. 2006;27(4):424–6.

Bourke MA, Mathew TH, Fazzalari RA, Thirlwell G, Disney AP. Multiple use of dialysers. Six uses is the optimum. *Med J Aust.* 1984;140(1):10–2.

Chuang F-R, Lee C-H, Chang H-W, Lee C-N, Chen T-C, Chuang C-H, et al. A quality and cost-benefit analysis of dialyzer reuse in hemodialysis patients. *Ren Fail.* 2008;30(5):521–6.

Collins AJ, Liu J, Ebben JP. Dialyser reuse-associated mortality and hospitalization risk in incident Medicare haemodialysis patients, 1998-1999. *Nephrol Dial Transplant*. 2004;19(5):1245–51.

Collins AJ, Ma JZ, Constantini EG, Everson SE. Dialysis unit and patient characteristics associated with reuse practices and mortality: 1989-1993. *J Am Soc Nephrol.* 1998;9(11):2108–17.

Denny GB, Golper TA. Does hemodialyzer reuse have a place in current ESRD care : "To be or not to be"? Semin Dial. 2014;27(3):256–8.

Diallo A, Niamkey E, Beda YB. Chronic renal insufficiency in Cote d'Ivoire: study of 800 hospital cases. Bull Soc Pathol Exot. 1997; 90 (5):346–348

Diouf B, Niang a, Ka EHF, Badiane M, Moreira Diop T. Chronical renal failure in the Dakar Hospital Department. *Dakar Med.* 2003; 48 (3): 185-8.

Hakim RM, Lowrie EG. Effect of dialyzer reuse on leukopenia, hypoxemia and total hemolytic complement system. Trans *Am Soc Artif Intern Organs.* 1980. p. 159–64.

Husni L, Kale E, Climer C, Bostwick B, Parker TF. Evaluation of a new disinfectant for dialyzer reuse. *Am J Kidney Dis.* 1989;14(2):110–8.

Lobo V, Gang S, Ganju A, Acharya V. Effect of reuse of hollow fiber dialyzers upon Kt / V (Urea): a prospective study. *Indian J Nephrol.* 2002. p. 40–6.

Lowrie EG, Li Z, Ofsthun N, Lazarus JM. Reprocessing dialysers for multiple uses: Recent analysis of death risks for patients. *Nephrol Dial Transpl.* 2004;19(11):2823–30.

Manandhar DN, Chhetri PK, Tiwari R, Lamichhane S. Evaluation of dialysis adequacy in patients under hemodialysis and effectiveness of dialysers reuses. *Nepal Med Coll J.* 2009;11(2):107–10.

Miach PJ, Evans SM, Wilcox AA, Dawborn JK. Reuse of a disposable dialyser for home dialysis. *Med J Aust.* 1976;1(6):146–7.

Mitwalli AH, Abed J, Tarif N, Alam A, Abu-aisha H, Memon N. Dialyzer reuse impact on dialyzer efficiency , patient morbidity and mortality and cost effectiveness. *Saudi J kidney Dis Transpl.* 2001;12(3):305–11.

National Kidney Foundation report on dialyzer reuse. Task Force on Reuse of Dialyzers, Council on Dialysis, National Kidney Foundation. *Am J Kidney Dis*. 1997;30(6):859–71.

Port F, Wolfe R, Hulbert-Shearon T. Mortality risk by hemodialyzer reuse practice and dialyzer membrane characteristics : results from the USRDS Dialysis Morbidity and Mortality Study. *Am J Kidney Dis*. 2001. p. 276–86.

Ramilitiana B, Ranivoharisoa EM, Dodo M, Razafimandimby E, Randriamarotia WF. A retrospective study on the incidence of chronic kidney failure in the department of

internal medicine and nephrology of the university hospital center of Antananarivo. *Pan Afr Med J.* 2016. p. 141. *Med J.* 2016. p. 141.

Shaldon S, Silva H, Rosen S. Technique of refrigerated coil preservation haemodialysis with femoral venous catheterization. BMJ. 1964;2:411–3.

Sridhar NR, Ferrand K, Reger D, Hayes P, Pinnavaia L, Butts D, et al. Urea kinetics with dialyzer reuse – A prospective study. *Am J Kidney Dis.* 1999;19(6):668–73.

US Renal Data System (USRDS) 2007. 2007 Annual Data Report: Atlas of End-Stage Renal Disease in the United States. Bethesda, MD: US- RDS, National Institutes of Health, and National Institute of Diabetes and Digestive and Kidney Diseases, 2007. 2007;2007.

Wittich E. Reusing dialyzers in the Care of renal patients. *Prof Nurse.* 1995;10:663-5

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