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Bulletin de la Dialyse à Domicile

Early results and medico-economic evaluation of a short daily home hemodialysis program in a Private hemodialysis center

(Résultats préliminaires et étude médico-économique d'un programme d'hémodialyse quotidienne à domicile dans un centre d'hémodialyse privé.)

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Résumé

Introduction : En France, entre 2015 et 2017 on note une progression de 40% de l'hémodialyse quotidienne (HDQ), selon le registre REIN. Celle-ci concerne moins de 1% de la population dialysée et le secteur privé restant sous-représenté.
Matériels et méthodes : Notre étude rétrospective a pour objectifs de décrire les résultats cliniques, les spécificités organisationnelles et medico-économiques de cette technique dans un centre d'hémodialyse privé.
Résultats :Entre le 01/02/2020 et 30/04/2021, 12 patients ont été formés. La moyenne d'âge est de 45 ans (28-71) avec une sex-ratio 4/8 (H/F) et un score de Charlson médian à 3. 58% des patients étaient en auto-dialyse. La résiduelle moyenne est de 700 ml/24h, 50% des patients sont anuriques. 100% étaient dialysés sur fistule artérioveineuse. La technique de la boutonnière est utilisée chez 100% des patients. Le temps médian de formation était de 35 jours (28-35). 83% des patients étaient dialysés 6 jours/semaine avec une durée moyenne de 210 minutes (130-150) par séance, avec un volume moyen de dialysat de 24.58 litres. 10 patients n'avaient pas d'anticoagulant. Une patiente a développé une allergie à la membrane PUREMA® motivant son switch vers une autre membrane. L'hémoglobinémie, la créatininémie, l'urémie, la phosphorémie et la bêta-2microglobulinémie pré-dialytiques sont stables à 9 mois, avec une amélioration significative de l'acidose métabolique. La survie de la technique est de 83% à 12 mois. La principale cause de sortie de technique étant la transplantation rénale. 3 patients ont repris une activité professionnelle.
Conclusion :Nos résultats préliminaires suggèrent que l'HDQ offre une bonne qualité de dialyse et une meilleure insertion socio-professionnelle.

Mots clés : Nx Stage, Buttonhole, Kt/v hebdomadaire, hémodialyse quotidienne, hémodialyse à domicile.

Summary

Introduction: Between 2015 and 2017 there was a 40% increase in daily hemodialysis, according to the REIN database. This increase concerns 1% of patients and the private sector remains under-represented. Our retrospective study aims to describe the clinical features, the organizational and medico-economic specificities of this technique in a private hemodialysis center.
Methods: We included 12 dialyzed patients trained on Nx Stage® machine from February 2020 to April 2021. Data were retrospectively obtained through review of our electronic medical records (EUCLID®).
Results: Of the 12 patients trained, 11 dialyzed from home, with an average follow-up of 9 months (1-14). The average age was 45 with a sex ratio of 4/8 (M/W), and a median Charlson score of 3. The average residual urinary output was 700 mL/24h, and 50% of patients were anuric. 100% of patients had an arteriovenous fistula and were cannulated using the buttonhole technique. 9 patients are on a transplant list. One patient needed anticoagulants. The mean training time was 35 days (28-35). 83% of patients were dialyzed 6 days a week with an average duration of 210 minutes (130-150) per session. The average volume of dialysate was 24.85 liters. One patient developed an allergy to the PUREMA® membrane. Pre-dialytic hemoglobin, serum creatinine, urea, phosphoremia and B2-microglobuline are stable at 9 months with improvement in metabolic acidosis.
Conclusion: DHHD allowed a better socio-professional integration. One patient received a transplant and 3 patients resumed professional activity

Key words : NxStage,Buttonhole,
weekly Kt/v, daily hemodialysis, home hemodialysis

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INTRODUCTION

In the 1970s, 40% of patients with end-stage renal disease (ESRD) in the United States were dialyzed at home 3 times a week [1]. Over the following decades, daily home dialysis declined as it gradually was replaced by conventional center hemodialysis.

In France, between 2015 and 2017 there was a 40% increase in daily hemodialysis (DHD), according to the REIN registry. This concerns a small number of patients (less than 1% of the dialysis patient population) and the private sector remains under-represented. The high mortality associated with end-stage chronic renal disease [2], the results of the HEMO study [3], and a growing body of literature on the benefits of more frequent and intensive hemodialysis, have sparked increasing interest in home dialysis [4-8]. However, daily hemodialysis (DHHD) remains a poorly developed modality in Europe and is not routinely offered to all eligible chronic renal failure patients.

The registry of the European Renal Association-European Dialysis and Transplant Association (ERA-EDTA) reports low prevalence of DHHD: Finland (7.1%), Denmark (5.8%), Netherlands (4, 4%), United Kingdom (4.3%) and Sweden (3.6%). The percentages are below 3% in all other countries [9]. The obstacles to the development of DHD are organizational and medico-economic [10]. Long night-time hemodialysis, and short daily home hemodialysis (DHHD) are associated with better quality of life and better survival compared to conventional center hemodialysis [11-15]. In recent years, DHHD has been able to develop in France and Europe thanks to the availability of new low-flow dialysate machines more suitable for homes [52].

Many hemodialysis centers have gone to great lengths to offer DHHD programs. These developed mainly in public hospitals and dialysis associations. The initiative of private centers remains rare due to cultural, medical and economic reasons. Here we report our experience of home DHHD in a private NephroCare hemodialysis center in private .

PATIENTS AND METHODS

Patients

We analyzed a cohort of hemodialysis patients trained on the System One® (Nx Stage® Fresenius Medical Care), from February 2020 to April 2021. The clinical and biological data were obtained retrospectively from the review of computerized patient records (EUCLID ®). We collected the dialysis prescriptions as well as the laboratory results. The Charlson comorbidity score was calculated for each patient. The following biological parameters were collected: one month before the start of DHHD training (M-1), during training (M0), at 3 months (M +3), 6 months (M + 6) and 12 months (M12) after installing the set-up in the patients' homes: urea, creatinine, calcemia, phosphatemia, parathyroid hormone (PTH), bicarbonatemia (HCO3), hemoglobinemia (Hb), ferritinemia (F), albuminemia (Alb) and the martial status. Standard Kt / V (sKt / V), and weekly Kt / V (calculated from single-pool Kt/ V (spKt / V) and beta2-microglobulin (b2m) were also collected.

We analyzed medical prescriptions at the patient's home installation: the type and volume of dialysate, the blood flow, the anticoagulation modality, the vascular access and its cannulation technique, the number and duration of weekly sessions. The causes of dropout from the

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technique were classified into three categories: renal transplantation, transfer to another dialysis modality and patient death.

Organization of the hemodialysis center to develop DHHD

The development of this technique in our center has been possible thanks to the motivation and conviction of the medical team and the clinical advantages of this technique.
The management of the establishment has invested in new locations to dedicate a room for DHHD patient training. A team of 6 nurses has been trained. This team provides training for patients and their fallback management (assembly of the machine, self-puncture of arteriovenous fistula, etc.)

Statistics

Descriptive statistics were used to summarize the data. Results are presented as the median with interquartile range [IQR] for continuous variables and counts, and as a percentage for categorical variables. Quantitative variables were described by their mean and standard deviation in normal distribution, and by the value of the median of the first and third quartiles in the case of skewed distribution. Qualitative variables were described by their proportion and percentage. The comparison between M1 and M9 data was performed using a correspondence test for biological values and doses of erythropoietin (EPO), and a chi-squared test for the proportion of patients receiving iron and EPO prescriptions. The 9-month laboratory data were completed when the patients were already on dialysis. The duration of the procedure was calculated between the date of the home installation and the announcement date of the technique. The statistical analyzes were completed using software R 3.1.3 (Foundation for Statistical Computing).

RESULTS

Patient chracteristics

Our dialysis center provides care for around a hundred dialysis patients, mainly using assisted self-dialysis (80%) and center hemodialysis (20%). Twelve patients usually dialyzed in our hemodialysis center in self-dialysis or referred by partner structures, were trained in our center. (Fig. 1). The average age was 45 years (28-71). The sex ratio was 8 women and 4 men. The average age was 45 years (28-71). The median Charlson comorbidity score is 3 , the mean BMI was 24 Kg / m2 (21-30).
Two patients have diabetic nephropathy, one patient has renal failure in addition to hemolytic uremic syndrome (HUS), three other patients have a vascular nephropathy. Four patients have a history of past kidney transplantation. The mean follow-up was 9 months (2-14). Eight patients were followed in self hemodialysis, three in hemodialysis center and one patient in peritoneal dialysis (PD).

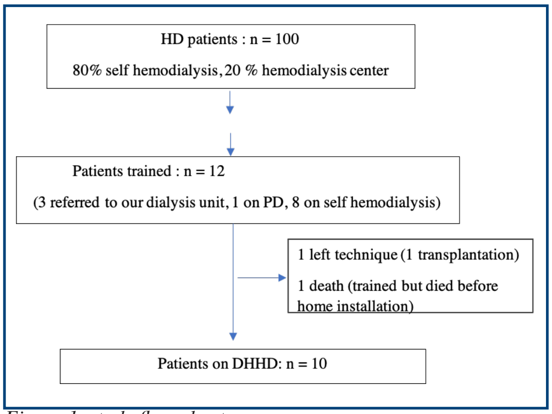

Figure 1. study flow chart

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The dialysis vintage was 5 years (1-6). Five patients had residual urinary ouput > 500 mL / 24h, Ten patients (83%) were on transplant list. The loss of residual kidney function was the reason for a patient's transfer from PD to hemodialysis. 100% of our patients are active. Four patients (30%) chose this therapy in order to resume professional activity. Three patients live in a house and 9 in an apartment. (*Table. I*).

Table I. Demographic and clinical caracteristics of the study population

	Mean	Standard deviation (SD)
Age (years)	45,6	28-71
BMI (Kg/m²)	23,5%	21-30
Charlson Score (points)	3	3-4
Vintage (years)	5	1-6

Training program for patients

A home pre-installation visit is systematically carried out in order to verify access to the home, organize the delivery of the equipment, and verify the conformity of the electrical installation, hygiene and where the equipment will be stored.

The average duration of training was 35 days (35-42). Ten patients (83%) were installed at home. Our training program aims to allow self-cannulation of the arteriovenous fistula (AVF) and dialysis machine assembly, according to a pre-established schedule. The evaluation of the training was carried out at the end of each stage. The so-called "buttonhole" cannulation technique was used in 100% of patients with application of the Mupirocin protocol (Bactroban®). A medical and nursing assessment is systematically carried out before the patient is installed at home. A caregiver training program is also carried out during the last week of the patient's training (training the caregiver in emergency procedures, and if necessary, for the cannulation of the AVF).

Medication circuit and delivery of medical devices

Ordering medical devices is ensured by our pharmaceutical service, and delivery is made directly to the patient's home after an effective pharmaceutical lock to verify the order and packaging. Orders are made on a monthly or bi-monthly basis depending on the storage capacity of the home, and the inventory is carried out monthly by the patient.

The other drugs are ordered by the pharmaceutical team and delivered by pharmacies (via signed agreements between NephroCare and the pharmacies). Other small-volume health products are delivered to the patient upon withdrawal, in a sealed, nominative case. An interview is conducted with the patient and the pharmaceutical team about the importance of inventories, the ordering process and the storage of sterile drugs and medical devices.

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Initial dialysis prescription

Eight patients were dialyzed 6 days a week for an average duration of 130 minutes (130-150). Two patients needed anticoagulants (Nadroparin 1900 IU / session) due to poor quality of blood restitution from the dialysis circuit leading to a drop in hemoglobin levels.

The blood flow was between 350 and 400 mL / min. The filtration fraction (FF, defined as the ratio of the sum of the ultrafiltration (UF) flow rate and the hourly dialysate flow rate over the blood flow rate) was less than or equal to 40% in 80% of patients. 80% of the patients used a dialysate with a concentration of 2 mmol /L of potassium and 45 mmol /L of lactates. The volume of dialysate prescribed was 20 L/session for 1 patient and 25 L/session for all other patients (*Table II)*.

Table II : treatment modality

Treatment modality	N=11
Dialysate composition RFP-204 (Na 140, Ca=3, K=1, lactate=40) RFP-207 (Na 140, Ca=3, K=1, lactate=45) RFP-209 (Na 140, Ca=2, K=2, lactate=45)	 1 4 6
Dialysate volume (Litres) Kt/V Ultrafiltration (UF) Blood flow	25 L (10 patients), 20 L (1 patient) 2,4 7mL/Kg/h 350-400mL/min
Session duration	130-150 min (11 patients)
Vascular access	100% AVF
Cannulation technique	100% Buttonhole
Anticoagulation	Nadroparin® 1900IU/j
Session/week	6d/w 10 patients 7d/w 1 one patient

Clinical-biological and socio-professional evolution of patients

The blood parameters remained stable for 100% of the patients during follow-up. The weekly sKt /V was greater than 2.1. There was no significant difference between the mean phosphatemia between initial switch to the home and at the end of the follow-up (1.5 mmol /L versus 1.6 mmol /L, p = 0.08). There was a significant improvement in serum albumin, from 36 g /L to 40 g /L (p= 0.007). Bicarbonatemia increased from 24 to 28 mmol /L (p= 0.005).

Hemoglobin (Hb) was maintained in the therapeutic target between 10 and 12 g / dl, with a reduction in EPO doses of 20%. A non-significant decrease in serum ferritin was observed, going from 380 to 470 mg / L (p = 0.06). These results are associated with a change in the EPO molecule and the injectable iron salt (change from RhuEPO beta to RhuEPO alfa, and from weekly Iron PAN ® to monthly Ferinject®).

Blood pressure improved from the first days of DHHD treatment, with a 50% reduction in antihypertensive therapy in 5 patients. (*Table III*). In our study, 2 patients underwent AVF angioplasty

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Table III: type of treatment

	M0	M3	M6	M9
Patients treated with anti HTA (%)	50 %	40 %	30 %	30 %
Numbers of treatments	3	2	2	1
Type of treatment Calcium inhibitors Inhibit converting enzyme Bêta-bloquers	1 1 1	0 1 1	0 1 1	0 0,5 0,5

3 months after beginning home treatment, a 3rd had an aneurysm reduction requiring them to switch for one week in the center. We have not reported any buttonhole infection warranting treatment. DHHD reduced symptoms of fatigue and cramps, resulting in better post-dialysis recovery. There was a marked improvement in the disabling restless legs syndrome in one patient. Three patients resumed their professional activity as soon as the program had begun.

Adverse events

One patient developed symptoms suggesting an allergy to the PUREMA® dialysis membrane (polyethersulfone dialyzer). She experienced nausea and a feeling of discomfort, giving in completely by switching her on with a membrane (BK-F®) (PMMA dialyzer). This allowed her symptoms to improve. She then received a week's training in machine assembly with a new cassette incorporating the new PMMA membrane. The healthcare team was trained with her on installing the cycler with a third-party membrane.

Another patient had regular check-ups for an active 10-week pregnancy as part of a medically assisted procreation project. The confirmation of this pregnancy prompted us to increase to 7 sessions per week with adaptation of the dialysis parameters. The patient had a recurrence of her initial kidney disease (HUS) complicated by a miscarriage at 10 weeks.

Evolution of patients who have left the technique:

Two patients were no longer on home dialysis at the end of the observation period. A patient had a transplant 1 month after being put in DHHD and recovered good kidney function. The other was trained but not installed at home due to digestive surgery complicated by severe and lethal sepsis. The mean duration of the technique at 1 year is around 75%. A third patient has moved and is still being followed in DHHD by another team.

DISCUSSION

We present here a single-center retrospective study of the outcome and evolution of patients with DHHD with low dialysate flow. Our preliminary results suggest that DHHD improves the control of the patient's blood pressure, anemia, mineral status and quality of life. Better socio-professional integration gives the DHHD medico-economic benefits for the health system.

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Our results are consistent with those of a European study evaluating the biological and clinical criteria in DHHD with low dialysate flow (n = 129) [16]. As in our study, the mean age of the patients was 50 years (i.e. - 10 years younger than Australian, Canadian or North American patients prevalent in conventional in-center HD) [17, 18, 19].

In our cohort, patients treated with DHHD are young, mainly women with low comorbidities. In a North American study published in 2012 (n =1873 patients matched between DHHD and central hemodialysis), the mean age was 52 years and the patients had been on dialysis for an average of 5 years [8]. In Canada, an DHHD program included 105 patients (mean age 52 years), mostly on long-term nocturnal hemodialysis, 71% of whom were male [20]. In the Australian and New Zealand registry, 706 patients are included with (median age of 50 years), a 75% proportion of men and predominantly anuric [19].

DHHD versus other dialysis modalities: independence? Competition? Synergy?

Some studies suggest competition between DHHD and peritoneal dialysis (PD). The Canadian study by Copland et al. In 2009 [21] demonstrated that the development of an DHHD program had no impact on the development of the pre-existing PD program. Over a 4-year longitudinal study, it seemed to affect the annual growth rate of self-hemodialysis. Even if it was a long-term nighttime home hemodialysis, it is conceivable that a DHHD program would have similar effects in France. PD patients treated secondarily with home hemodialysis are mainly young, non-diabetic and independent patients. Early information in patients who are at risk of PD failure, and the provision of materials allowing both techniques would reduce or abolish a transient transition to in-center hemodialysis and would ensure home care for patients who so wish. [50]

In the prospective FREEDOM study, the clinical benefits of low-flow DHHD of dialysate boiled down to improved physical and psychological quality of life [22]. It has also shown a decrease in treatment-related depression, restless legs syndrome, as well as an improvement in recovery time after dialysis [8].

Biologically, the parameters collected were stable over 12 months. There is therefore no argument for sub-dialysis (Table. 2) despite the use of a small volume of dialysate. These results confirm those of a North American study [23]. The improvement in albuminemia described in previous publications is also confirmed in our patients, who, moreover, already had a satisfactory nutritional status [24, 25]. Our study showed that increasing the frequency of dialysis sessions was associated with a sustained improvement in body composition in 3 patients. Our hypothesis is that DHHD leads to improved appetite, thereby improving nutritional status. These results could be explained by an improvement in general condition and post-dialytic fatigue, and by the daily nature of dialysis. The increased frequency of dialysis has resulted in improved nutritional status and weight gain in several studies [26]. These data are explained by an improvement in the purification of certain anorectic uremic toxins of medium size, and the fluid overload leading to a decrease in the inflammatory syndrome [24].

Our anemia data are consistent with published data. DHHD is associated with significantly higher hemoglobinemia and lower EPO requirements (*Table IV*). Regarding the treatment of anemia, we found an increase in EPO doses during the first weeks of treatment, with a drop in Hb in 3 patients. A patient had undergone significant deglobalization justifying a blood transfusion. In the

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Table IV. Biological parameters during the 9 first months of follow up

	M0	M3	M6	M9	p*
Mean Hb (g/dL)	10,6	11,0	11,5	11,8	0,01
ASE (EPO IU/Kg/week)	1,5	1,7	1,2	1,2	0,04
IRE (ASE/Hb) (UI/Kg/sem/g Hb)	14,2	13,3	10,4	10	0,03
Ferritin (μg/L)	380	420	450	470	0,06
CST (%)	29	28	28	28	0,09
HBPM (Nadroparin 1900IU)	0	1/12	2 /12	2/12	0,1
Béta-2 microglobulin (μg/L)	22	21	22	22	-

frequent hemodialysis network FHN cohort, there was an improvement in hemoglobin levels at 18 months in patients with frequent HD, but this is only significant for patients on daily nighttime hemodialysis [28]. Both ferritin levels and prescribed iron doses remained stable [28]. (*Table IV*).

The second parameter that improved in our study was the mean bicarbonatemia, despite the use of a lactate buffer, which therefore appeared to be well metabolized in our population with low co-morbidities. These results are consistent with those of two larger studies [16, 23]. (*Figure 2*).

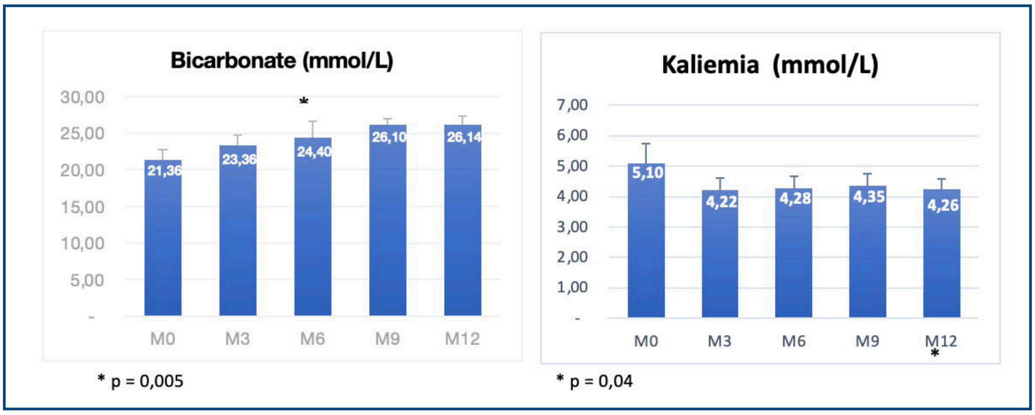

Figure 2. Evolution of biacrbonate and kalemia

In DHHD, the determinants of the purification of phosphates are the base phosphatemia, the volume of dialysate and the treatment time. Studies show an improvement in phosphatemia after a patient's transition from in-center HD to DHHD [28,29]. In their study, Kohn et al demonstrated better phosphorus extraction with low flow DHHD of dialysate (4.1 g / week) compared to a conventional diet (2 to 3 g / week) [30]. A recent study found a decrease in FGF23 levels in DHHD patients [31]. The lack of improvement in phosphatemia in our cohort could be explained in part by satisfactory control of phosphatemia and improvement in appetite, as well as increased protein intake in these patients.

Economic and organizational aspects of the DHHD modality

The medico-economic evaluation of the DHHD technique shows that the costs borne by our private establishment are lower than those related to the assisted auto-dialysis technique as illustrated in (*Table V*): Comparative study between the DHHD cost and assisted auto-dialysis. The weekly cost (6 sessions / week) of DHD is 181.55 € compared to the weekly cost of 3 sessions

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Table.V: Comparative study of the costs supported by the establishment and those of the health insurance

1- Costs billed to health insurance (€)				
	Cost Refund / session		Cost weekly /session	
	DHHD / 1 session	Self HD / 1 session	DHHD 6 s/week	Self HD 3 s/week
Cost (€ session/Private center (Cost 2021)	238,32	268,85	1 429,92	806,55
Coûts Taxi : 40 kms	0,00	120,16	0,00	360,48
Cost of medical consultation	0,00	30,00	0,00	90,00
TOTAL health insurance	238,32	419,01	1 429,92	1 257,03
COST SUPPORTED BY THE ESTABLISHMENT (€)				
	Cost CNAM/ session		Cost weekly /session	
	DHHD / 1 session	Self-hemodialysis / 1 session	DHHD 6 s/week	Self-hemodialysis 3 s/week
Medical Staff:				
- Cost of nursing staff	0,00	49,38	0,00	148,14
- Cost of nursing coordination	15,20	0,00	91,21	0,00
- Cost of secrétariat	10,76	21,51	64,54	64,54
Related activities:				
- Cost of the snack	0,00	2,51	0,00	7,53
- Cost of health care waste	4,30	0,80	25,80	2,40
- Cost of water, building	0,00	3,70	0,00	11,10
- Cost of bio-cleaning	0,00	20,52	0,00	61,55
TOTAL PRIVATE ESTABLISHMENT	30,26	98,42	181,55	295,26

The cost comparison does not include the costs of initial and fallback training, consumables and drugs, biomedical equipment (machines) and administrative costs.

/ week 295.26 €. The costs detailed in this table do not consider the cost of the machine and medical devices. In addition to the impact on quality of life, the elimination of costs associated with the medical transport of patients in DHHD constitutes an important economic advantage for health insurance, as suggested by the health high authority (HAS) report published in 2014 [53].

Low dialysate flow rate DHHD prescriptions

In our population, the average time for dialysis is greater than 2 hours per session with an average blood flow of 380ml / min (350-400). The filtration fraction recommended by the manufacturer ensuring 90% saturation of the dialysate is between 30 and 35% for dialysate volumes between 20 and 25 liters (*Table II*).

Dialysis without anticoagulant is justified by short session times and a dialysate circuit without venous bubble trap. This could help reduce the risk of bleeding, since there may be an increase in anti-Xa activity for up to 24 hours after a hemodialysis session [33]. In the long term, some studies suggest an increased risk of osteopenia, a deleterious effect on the lipid profile and an increased risk of hyperkalemia associated with the use of heparin in dialysis, which also creates the risk of induced thrombocytopenia through heparin use [34].

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Hydro-electrolyte et acide-base balance

Our results confirm the effect of dialysate potassium and lactate concentrations on potassium levels and alkaline reserves after transfer from conventional hemodialysis to DHHD. Regarding potassium, previous clinical experience [16,24] and theoretical models [34] have reported minimal changes in serum potassium after transfer from conventional HD to DHHD. King and Glickman reported anecdotally that patients treated with 1 mEq / L dialysate potassium achieved a kalaemia of 4.5 ± 0.5 mEq / L, with 83% of values measured between 3.5 and 5, 2 mEq / L [35]. Recently, Cherukuri et al, reported that serum potassium decreased significantly from 4.80 ± 0.63 mEq / L to 4.59 ± 0.78 mEq / L after 6 months of DHHD (104 patients treated with prescriptions like those of the FREEDOM study) [16]. Our current results are consistent with those observed previously. (Figure.2).

Low flow rate DHHD of dialysate does not alter bicarbonate concentrations, either before or after dialysis [36]. King and Glickman reported that the bicarbonatemia of patients treated with DHHD was 23.9 ± 1.6 mEq / L [35]. Although pre-dialysis serum bicarbonate concentrations are expected to be higher in DHHD than in conventional HD due to the shorter inter-dialytic interval [37], most patients achieved pre-dialysis serum bicarbonatemia recommended by KDOQI (≥ 22 mmol / L). (Figure.2).

Vascular access

The reference vascular access remains the arteriovenous fistula (AVF) [38]. There is controversy in some literature regarding the increased rate of complications from repeated DHHD punctures [39]. Several studies did not find a difference in terms of the number of interventions on AVF between DHH and conventional HD [40,41], while two North American studies found the opposite result [42,43]. The only randomized study carried out on the FHN cohort found a significant increase in the rate of AVF interventions in the DHHD group [44]. That study does not specify the reasons for intervention, but it is possible that they form part of a protocol for increased surveillance of the vascular accesses.

The risk of infectious complications linked to the use of the buttonhole technique remains very controversial, but the number of interventions on AVF seems like a classic puncture technique [42,43,49]. In a Franco-Belgian study, only 30% of patients with AVF use the buttonhole technique at home [45,51].

Role of the healthcare team

Our results suggest that the support of the healthcare team favors the choice of this technique. In addition, the role of the nursing team is very important during the period of training and transition to DHHD; especially for some patients who are less confident with this treatment [46]. Patients prefer longer training periods [47]. Patients considering DHHD have been shown to be primarily concerned about safety, isolation, and the psychological and logistical support they may have [48]. Despite increasing flexibility in dialysis schedules, the proportion of patients treated at home remains lower than expected. 10% of our patients are eligible but only 7% are DHHD. Our active patients, independent and supported in assisted auto-dialysis choose this modality, but some are hampered by the lack of suitable accommodation for this technique. Better information

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on treatment flexibility during pre-dialysis informative sessions may encourage eligible patients to choose this therapy. More models are needed to explore nursing support solutions for patients transitioning to DHHD. One of the innovative solutions is the remote monitoring of patients.

Our study showed that the machine has a relatively simple user interface, is small enough and easy to transport, and does not require any electrical or plumbing installation at home. The limitations of our study are linked to a limited duration of follow-up and a limited number of patients. Its strengths lie in the fact that despite having a limited number of patients, each patient was their own control, resulting in acceptable baseline values for evaluating the effects of DHHD.

CONCLUSION

The establishment of an DHHD program in a private dialysis center has made possible to diversify the offer of hemodialysis care and to facilitate access to this technique for our independent and eligible patients. This therapy has improved the control of blood pressure, mineral status, anemia. This program also helped motivate our healthcare teams. Thanks to the reduction in the costs of medical transport and the improvement of socio-professional integration, DHHD could reduce the expenses of the health system.

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DISCLOSURES

Nothing to disclose for Hadia Hebibi and Magali Ciroldi
David Attaf, Laure Cornillac, Charles Chazot are working in Fresenius Medical Care.
Samah SAIBI And Fatia EL BOUNDRI are working in NephroCare Ile de France.

AUTHORS' CONTRIBUTION

Conception, design, analysis and interpretation, Hadia Hebibi
Data collection: Hadia Hebibi, Magali Ciroldi, David Attaf, Laure Cornillac
Writing the article: Hadia Hebibi and David Attaf
Critical revision of the article: HH, MC, DA, LC, SS, FE, CC
Overall responsibility: Dr Hebibi

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