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Hemodialysis in Ibadan: a preliminary report on the first 100 dialysis

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Summary

The experience with the first 100 hemodialysis sessions at the Owena Dialysis Centre of the University College Hospital, Ibadan (UCH) is hereby presented. A total of 9 patients were dialysed during a 7-month period. The femoral vein was the most often utilised vascular access route (53 episodes in 5 patients) while a forearm fistula was functional in only one patient. The dialyzer and blood lines were reused for each patient for a maximum of 5 times. Technical problems encountered were: power failure (12 episodes), ruptured dialyzer (3), water-pipe leakage (4) machine breakdown (2) and heparin pump failure (2). Clinical problems were: failure of fistula access (2), thrombosed femoral veins (2), clotted cannula (3), low arterial pressure (20); nausea and vomiting (2), pruritus (46), muscle cramps (5), Sepsis (8) and hypotension (2). Six patients discontinued treatment after less than 10 dialyses due to financial constraints. The high cost of hemodialysis remains the major setback to its use in the treatment of end-stage renal disease in developing countries; there is the need for acceptable improvisation to reduce the overhead cost so as to make it available to most patients requiring dialysis.

Résumé

L'experimentation avec les 100 premieres sessions d'hemodialyses au centre de dialyse d'Owena du centre hospitalier Universitaire d'Ibadan a donne les resultants suivants. Un total de 9 patients ont subi la dialyse pour une periode de 7 mois. Le plus souvent is veine femorale est utilisee comme moyen d'acces au milieu vasculaire. (53 episodes dans 5 patients). Le dialyseur et les lignes sanguines sont reutilises pour chaque patient au maximum 5 fois. Les problems techniques recontres sont: Panne electrique (12 fois), rupture de dialyse (3 fois), fuito de la pompe a enu (4 fois), panne de machine (2 fois) et panne de la pompe a heparin (2 fois). Les problemes cliniques recontres sont: derrangement de l'acces pistulaire (2 fois), thrombose de la veine femorale (2 fois), congulation cannulaire (3 fois), faible pression arterielle (20 fois), nause et vomissement (2 fois), "Pruritus" (46 fois), cramps musculaire (5 fois), "sepsis" (8 fois), et hypotension (2 fois). Onze faut noter que le traitement de 6 patients a ete irregulier, a pres une periode de suivi d'au moins 10 dialyses, ceci pour des raison financieres. Le cout eleve de l'hemodialyse reste l'obstacle majeur a son utilisation dans le traitement du stade finale des maladis renales dans le les pays developes, il fauit donc trouver un moyen de reduire ce cout pour que la dialyse soit a la portee des patients qui en ont besoin.

Introduction

Hemodialysis is a complex, demanding, and expensive treatment for end-stage renal failure, which though palliative for chronic renal failure, is invaluable as an integral part of a transplant programme and in sustaining life in acute renal failure. The high cost of hardware and the dearth of skilled personnel required for running the dialysis programme have made this treatment modality virtually non-existent in most health facilities in tropical Africa[1].

Recently however, there has been a spate of hemodialysis units in Nigeria. In spite of this new wave of activity, the high cost of treatment still makes this procedure unaffordable by majority of patients since they are poor and have little or no social support.

Apart from cost-constraints to patients, many other problems exist which are peculiar to a developing

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country like Nigeria. These include erratic power supply and lack of suitable spare parts for the dialysis machine. The dialysis programme at the University College Hospital (U.C.H.), Ibadan has from its very beginning been geared towards cost-cutting by utilising adaptive techniques with the hope that this life-saving facility would eventually be brought within the reach of virtually all patients requiring it.

This review of the first 100 dialyses at the Owena Dialysis Centre, U.C.H., Ibadan, is aimed at highlighting the problems encountered at this early phase and the various attempts at circumventing them, including cost cutting.

Patients and methods

The dialysis episodes of patients who were treated by hemodialysis from the first to the hundredth dialyses were reviewed. All patients were in established end-stage renal failure with clinical and biochemical evidence of severe uremia (Table 1). Dialysis was routinely performed using the Centry-2 Cobe Machine and the Cobe HF hollow fibre dialyser. Vascular access routes variously used were the jugular and the subclavian veins, and a forearm fistula. A subclavian or femoral vascular catheter was routinely used for cannulating the veins. On three episodes the 16 gauge medicut intravenous cannula was used as a substitute for the femoral or subclavian catheters in cannulating the veins. Patients were dialysed routinely twice per week. After each dialyses, the dialyser was cleansed and sterilised for reuse. All the complications and problems — both clinical and technical — observed while the patients were on dialyses were noted.

Results

A total of 9 patients were dialysed during the 7 month period of the first hundred dialyses. The ages of the patients ranged from 17-56 years, and all were males. Table 1 shows the clinical and biochemical profile of the patients pre-dialyses. The frequency of dialyses per patient ranged from 2 to 37 dialyses. The frequency of utilisation of each access route was: jugular vein 2 times, subclavian vein 14 times, forearm fistula 31 times, and the femoral vein 53 times (Table 2). The complications observed during the period were: failed fistula, nausea and vomiting, pruritus, muscle cramps, hypotension, and sepsis in form of infection around the catheter site with occasional spreading cellulities and septicemia (Table 3). Technical problems included machine breakdown, power failure, water pipe leakage, heparin pump failure, and ruptured dialyzer (Table 4).

Table 1: Clinical and biochemical parameters of the patients before dialysis

Patient No.	Age (yrs)	Sex	BP (mmHg)	Blood Urea (mg/dl)	Creatinine (mg/dl)	Potassium mEq/L	Na mEq/L	HCO_3 mEq/L	Cl mEq/L	PCV (%)
1	45	M	120/80	206	14.2	5.9	125	18	97	18
2	17	M	180/120	395	22.7	5.0	125	14	98	21
3	47	M	210/130	232	8.4	4.0	124	16	93	27
4	38	M	180/100	216	24.6	4.9	128	18	102	20
5	32	M	190/110	324	30.5	5.2	132	20	107	23
6	33	M	200/140	240	20.3	4.1	137	23	102	15
7	46	M	220/130	285	14.6	3.9	140	22	100	21
8	28	M	210/120	224	26.4	5.6	128	17	96	16
9	56	M	180/110	319	29.8	4.5	133	18	103	18

Table 2: Frequency of utilisation of the various access routes

Access Routes	Jugular	Subclavian	Forearm Fistula	Femoral	
				Right	Left
Frequency of use	2	14	31	39	14

Table 3: Frequency of complications

Complication	Frequency of occurrence
Failed fistula	2
Thrombosed veins	2
Clotted canula	3
Low arterial pressure	20
Nausea and vomitting	2
Pruritus	46
Cramps	5
Sepsis	8
Hypotension	2
Formaldehyde reaction	nil

Table 4: Technical problems

Machine Breakdown	Power failure	Water failure	Heparin Pump failure	Ruptured Dialyser
2	12	4	2	3

Discussion

Our review highlights the major problems in a fledging dialysis centre in a developing country. The hemodialysis programme was commenced in Ibadan in June 1990 with five Centry-2 Cobe machines and a few trained staff. An average of 5 new patients with end-stage renal failure are seen per month at the Renal Unit of the U.C.H. The small number of patients treated by hemodialysis over this 7-month period reflects the small percentage of patients who could afford this modality of treatment. Nevertheless the role of this facility as an integral part of a transplant programme cannot be over emphasised.

We have had to utilise various access routes because most of our patients go on hemodialysis initially as emergency cases due to late presentation. This leaves no time for the creation of a fistula which needs time to mature for routine use. The 31 dialysis episodes in which a forearm fistula access was utilised were actually carried out on the same patient who had his fistula created many months before commencing dialysis with us. The failure of fistula access on two occasions was because these were created and put to use within a period of time too short for adequate maturation. The femoral access route was the most often used in our series. The reasons for this are: its relative ease of cannulation,

but relatively cheaper cost of the femoral catheter compared to the subclavian catheter, and the elimination of such major complications of subclavian cannulation as pneumothorax. The intravenous medicut cannula was effectively used in place of the femoral vascular catheter to reduce costs on three occasions, but it is still too early to comment on the long-term advantage of this improvisation. The subclavian catheters are usually left in-situ for 1-2 weks for reuse, but the risk of infection and thrombus generation becomes more real. By routinely leaving heparin in the catheter we have minimised the incidence of venous thrombosis. Sepsis has been attributed to infection around the catheter site and this we have treated by catheter removal and the use of antibiotics. On two occasions the catheter infection resulted in generalised septicemia warranting the use of potent parenteral antibiotics. Serious hemodialysis related infections have been reported especially in diabetic and older patients[2]. The conspicuous absence of the use of shunts as a temporary access device is due in part to inavailability of the proper shunts material in our centre, and also to the fact that shunts have the disadvantage of distorting the vascular anatomy making future attempts at fistular creation problematic.

As part of our cost-cutting strategy, we have embarked on a dialyser reuse system, employing the same dialyser 4-5 times per patient. Much of the earlier literature regarding dialyser reuse described the dangers and risks associated with this practice, mainly an increase in morbidity[3], septicemia and febrile reactions[4], risk of cross-use between patients with an increased risk of hepatitis[5], and allergic reaction due to formaldehyde contamination from the cleansing solutions[6]. There is also the possible deleterious effect on the mechanical integrity of the dialyser with risk of dialyser rupture. However, most of these hazards and complications have so far been rarely encountered in our dialysis centre. This may be due in part to meticulous handling of the dialyser and blood lines following each procedure:- rinsing, cleansing and sterilization. In our centre, we have experienced dialyser rupture on three occasions during reuse, manifested by blood leaking into the dialysing fluid. The risk of cross-use of dialyser between patients is very low as we still have few patients on dialysis at any given time, and each patient's dialyser is well labelled and preserved. Our cleansing, rising and sterilization process is done by a trained technician.

Formaldehyde reaction is a potentially serious though rare complication of hemodialysis with reuse of dialysers as this is the agent used in the sterilization process. Fortunately, we have not recorded any complication that can be linked to formaldehyde toxicity. One patient developed pruritus each time he was dialysed, with the onset usually towards the end of each dialysis. Although the causes of pruritus in dialysis patients are not yet well understood, allergic reaction to an allergen in the dialysis system has been postulated[7], and this may be responsible for our patient's recurrent pruritus. The technical problems encountered were mainly those common to a developing country. Power failure during dialysis is the most frustating experience, both to the dialysis staff and patients. Blood is rapidly returned to the patient manually, although occasionally clotting within the lines occurs and results in blood loss. The need for a standby generator for prompt switch-over of power thus seems compelling. Breakdown of dialysis machine on two occasions was due to dust and heat damage — a problem peculiar to our tropical environment.

Effectiveness of dialysis

The survival rate of our patients has so far been 'argely limited by the lack of funds to continue on maintenance hemodialysis, and in fact six patients had to discontinue after less than 10 dialyses. As the whole cost of the hemodialysis treatment is borne solely by the patient in Nigeria at present, the need for more acceptable improvisations that would help cut the overhead cost and eventually make chronic hemodialysis available and affordable to the majority of our patients is further emphasised. Although intermittent peritoneal dialysis has been utilised in our centre for the management of chronic renal failure, the procedure is not without its own disadvantages. Frequent peritonitis with the attendant increased morbidity and the high cost of antibiotics required for its treatment apparently nullifies the advantage gained in terms of cost of material and the simpler technical demand of the procedure.

The rehabilitation level has also not been very encouraging. Only one patient has been able to return to routine work. Another patient comes for dialysis on an out-patient basis, although he has not been able to undertake gainful employment. The rest of the patients remained as in-patients throughout the

period they were being dialysed. Our patients are also usually in an advanced stage of uremia, with severe uremic symptoms before presenting for dialysis. This, in addition to the probable inadequacy of the twice weekly dialysis schedule, would possibly account for the unencouraging rehabilitation level in our patients.

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