

Incremental Dialysis in New Haemodialysis Patients

Renal Unit

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Introduction

Most patients starting haemodialysis will have significant residual kidney function when compared with patients who have been undergoing haemodialysis for a longer period of time. Historically, patients have been started on a standard thrice weekly dialysis schedule based on a concept that was developed in the early 1980s. This approach is based on studies that mainly involved established haemodialysis patients with little or no residual kidney function[1].

There has been a growing trend over recent years to take into account a patient's residual renal function when starting dialysis and to individualise dialysis prescriptions as a result. This generally involves increasing the duration and frequency of the patient's dialysis treatment as their residual kidney function reduces. This approach is evidenced by a few observational studies and no randomised control trial has yet been completed comparing patients starting incremental haemodialysis with traditional thrice weekly haemodialysis[2]. The updated 2015 KDOQI Clinical Practice Guideline for Haemodialysis Adequacy, however, advise that the dose/frequency of dialysis may be reduced in patients with significant residual kidney function[3]. This is also reflected within the Renal Association Haemodialysis Guidelines which states, "twice weekly HD without an increase in treatment time may be acceptable if patients have a significant level of residual renal function, such as either a combined urinary urea and creatinine clearance or eGFR above 5ml/min/1.73m², provided that residual renal function is monitored at least every 3 months and the frequency of dialysis is increased when renal function decreases." [4]

While the concept of a one size fits all approach ensures that all patients are adequately dialysed and does not require dialysis prescriptions to be individualised, it does not take into account the negative impact that dialysis will have on a patient's residual kidney function and on their quality life. Strategies that potentially preserve the residual renal function of haemodialysis patients should confer survival benefit on the patients concerned [2]. Logically a patient with some residual renal function should require less dialysis than a patient with no residual renal function.

Importance of preserving residual renal function

Preservation of residual renal function is associated with improved outcomes in long term haemodialysis patients as a result of stable fluid and electrolyte balance and a greater removal of middle molecules leading to reduced pre HD beta-2-microglobulin levels.[Renal association]. Factors that will influence the loss of residual renal function in HD patients include primary renal diagnosis, comorbid disease, vascular access related infection, the use of nephrotoxins and certain characteristics of a patient's HD prescription including water quality and membrane type[1].

In addition, intradialytic hypotension is recognised as a major cause of residual kidney function loss and is also associated with an increased incidence of myocardial stunning[1]. Efforts must be made to ensure that episodes of intradialytic hypotension are kept to a minimum with immediate correction of any episodes of hypotension and hypovolaemia on HD[Renal Association]. Incremental dialysis is associated with preservation of residual

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renal function likely due to a reduced incidence of intradialytic hypotension and hypovolaemia.[1][2]

Benefits of Incremental Dialysis

The main benefit of incremental HD is an increased preservation of the patient's residual renal function, mainly as a result of the patient being exposed to fewer HD treatments with less opportunity for intradialytic hypotension and hypovolaemia. Fewer cannulations of the patients AVF/graft will lead to an increased longevity of the patient's vascular access. Incidence of anaemia is likely to be reduced in HD patients on incremental HD, due to the preservation of their residual renal function, with potentially lower Aranesp doses to maintain their Hb[1]. Fewer dialysis treatments each week should also improve the quality of life of new HD patients. Starting hospital HD may have a major impact on a patient's home and work life and reducing the number of HD treatments patients receive each week can only improve this[1].

In addition to the patient related benefits listed above there are also some benefits not directly linked to the patient concerned including reduced costs and a reduction in the non recyclable waste generated by a typical HD treatment. Starting dialysis at a reduced frequency will also leave space available within the Renal Unit for other HD patients.

Risks associated with Incremental Dialysis

While there are benefits associated with incremental dialysis, there are also some potential risks that must be considered when selecting patients. There is the potential for fluid and electrolyte imbalance in patients undergoing incremental HD given the increased interdialytic period. Patients with ongoing fluid overload or hyperkalaemia should be started on a thrice weekly regimen. Consideration must also be given to the patient's ability cope with an eventual increase in dialysis time and/or frequency due to future reduction in their residual renal function[1].

Incremental haemodialysis requires monthly monitoring of a patient's residual kidney function.

Suitable Patients

Low Clearance / Failing Transplant Patients.

All low clearance and failing transplant patients with a stable decline in kidney function and who have been relatively symptom free with regard to their chronic kidney disease up to the point of starting dialysis should be considered for incremental dialysis providing they meet the inclusion criteria below. Suitability should be determined once the patient has provided a 24 hour urine collection to allow residual kidney function to be measured.

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Unplanned Starts

Patients with undiagnosed chronic kidney disease who are referred to a Nephrologist at the point of starting dialysis may be suitable for incremental dialysis providing they meet the inclusion criteria below and are still passing in excess of 600ml of urine per day.

Acute Kidney Injury Patients

Patients who start dialysis as a result of an acute kidney injury and fail to recover their native kidney function are unlikely to be suitable for incremental haemodialysis, although they may become eligible if they recover some function but insufficient to stop dialysis completely. For them to be suitable they will need to be passing in excess of 600ml of urine per day and meet the inclusion criteria below.

Peritoneal Dialysis Patients

The reason for transfer to haemodialysis will influence a PD patient's suitability for incremental haemodialysis. Patients transferring from PD to HD with significant residual kidney function after a fairly short period of PD may be suitable while patients transferring to HD because they are under-dialysed on PD and have lost most of their residual kidney function will likely not be suitable for incremental haemodialysis.

Inclusion Criteria

- Residual renal function(KrU) >3ml/min.
- 24 hour urine volume >0.6 Litres.
- eGFR >5 ml/min/1.73m² at point of starting HD.
- Infrequent hospitalisation.
- Infrequent history of hyperkalaemia with K⁺ generally <5.5mmol/L.
- Infrequent history of hyperphosphataemia with P₀₄ generally <1.8 mmo/L*.
- Lack of profound anaemia with Hb>80g/L.
- Fluid status stable with fluid overload not being the primary reason for commencing HD.
- Stable nutritional status with no evidence of catabolism.
- Patient with good understanding, and who will be accepting, of the reasons for potentially increasing their dialysis time/frequency in the future.

A previously isolated incidence of hyperkalaemia, hyperphosphataemia, anaemia or fluid overload should not be a barrier to commencing a patient on incremental HD providing a clear cause has been identified that has responded to medical management. For example, hyperkalaemia that has resolved following discontinuation of Spironolactone.

*Higher phosphate levels may be considered acceptable in patients with raised phosphate at the point of commencing HD who have not yet started phosphate binders.

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Dialysis Time/Frequency

All patients on incremental HD should start dialysis on a twice weekly schedule with no more than three days between HD treatments. Dialysis time should start at 3 hours twice weekly for patients <75kg and 4 hours twice weekly for patients ≥75kg.

Ongoing Monitoring of Residual Kidney Function

All patients undergoing incremental haemodialysis must have their residual kidney function and haemodialysis adequacy measured on a six weekly basis and the results made available to the relevant Consultant Nephrologist in time for the HD ward round. Total 24 hour urine volume, KrU urea clearance ml/min and Weekly Kt/V measurement will be recorded.

A calculator is available on Peel Shared for the calculation of weekly Kt/V.

Adequacy for twice weekly dialysis men target 2.0												
Patient name	Kt/V total	Kt/V renal	Kt/V dialysis	KrU urea clearance ml/min	Urinary urea concentration mmol/ml	Volume of urine collection ml	Post dialysis urea	pre-dialysis urea	V (Watson)	Post-dialysis weight kg	Height cm	Age
Test	0.099383	0.09938306		0.434027778	5	1000	4	12	41488.6	70	178	60

Considerations for improving weekly Kt/V in Incremental HD Patients

Dialysis adequacy must be improved where patients retain significant residual kidney function (KrU >3ml/min) and are passing more than 600ml of urine in 24 hours yet have a weekly Kt/V <2. This should involve examination of dialysis access for possible recirculation, assessment of dialyser membrane size, assessment of blood flow rate and assessment of dialysis time. Dialysis time can be increased to up to five hours on a twice weekly HD schedule.

A 2mmol K⁺ dialysate should be considered in Patients with pre HD K⁺ > 5mmol/L.

Intercurrent Illness/Hospital Admissions

Any patient undergoing incremental haemodialysis who develops an intercurrent illness and/or hospital admission that requires a period of daily haemodialysis must have their residual kidney function measured before switching back to a twice weekly HD schedule.

KrU <3ml/min and/or less than 600ml urine volume in 24 hours will necessitate a switch to thrice weekly haemodialysis.

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Reasons for switching to thrice weekly HD

- Pre HD K^+ > 5.7mmol in patient dialysing on 2mmol dialysate.
- Excessive fluid gains with UF rate regularly >10ml/kg/hour to achieve target weight.
- Excessive fluid shifts leading to ongoing episodes of Hypotension and Hypovolaemia. **Episodes of intradialytic hypotension as a result of large fluid shifts must be avoided due to the risk of myocardial stunning and cardiac events.**
- Six weekly KrU urea clearance <3ml/min on two consecutive occasions.
- Six weekly 24 hour urine volume <600ml.
- Weekly Kt/V <2, or symptoms suggesting inadequate dialysis, on 5 hour HD sessions with maximum blood flow rate and dialysis membrane size.

Scheduling of HD patients

Twice weekly HD as a result of incremental dialysis may lead to gaps within the HD patient diary when compared with traditional thrice weekly HD. This can be avoided by if patients are allocated dialysis shifts as follows:

Patient 1: Dialysis on Monday and Thursday
Patient 2: Dialysis on Tuesday and Friday
Patient 3: Dialysis on Wednesday and Saturday.

Management of Patients Fluid Status

Retention of residual kidney function is important in all HD patients regardless of their dialysis frequency, but is of particular importance in patients dialysing less than three times per week. Efforts should therefore be made to minimise episodes of intradialytic hypotension and hypovolaemia [2]. Target weights may need to be more flexible in this patient group and only reduced if there is evidence of peripheral or pulmonary oedema. Hypertension should also ideally be managed with medication rather than with reduction of target weight especially in hypertensive patients with no other signs of fluid overload.

The Consultant Nephrologist on the monthly HD ward round may consider the introduction of Furosemide in patients on incremental HD who are showing evidence of fluid overload. There are some risks associated with long term use of high doses of Furosemide but there are also risks associated with fluid removal on HD leading to potential hypotension, hypovolaemia, reduced residual kidney function and myocardial stunning[1].

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Planned or unplanned surgery in Incremental HD Patients

There should be no difference between patients who are undergoing incremental haemodialysis and patients who are undergoing standard thrice weekly haemodialysis with regard to their management before and after surgery. Patients undergoing incremental HD must be dialysed before (usually the day before) and after (usually the day after) any surgery. A post operative u&e check is also required when the patient returns to the ward as is the case with all other dialysis patients.

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