

Chronic Hemodialysis

Mohammad Abedisamakoush

Assistant Professor of Nephrology
Mazandaran Medical school

- Although uremic toxicity is due to both small and large molecular weight, solute, small toxins appear to be of a greater Importance.
- The amount of dialysis prescribed is based of urea, which has 60 Dalton.
- Only reflecting concentration of other, presumably more harmful, Uremic toxins

- Both removal and serum level should be monitored when checking dialysis adequate
- A low serum urea level doesn't reflect adequate dialysis
- Serum level depends not only on the rate of removal but also on the rate of urea generation
- A low serum urea level may be found in patient, whom removal is poor but in whom the generation rate is also low (due to poor protein intake)

The rate of treatment failure increased dramatically in Patient, dialyzed three times per week when was $kt/v < 0.8$

Compared with when values were >1

- Minimum kt/v for dialysis patients of **1.2** .
with a target value of at least **1.4** .
- Patients assigned to the higher dose of dialysis did not live longer, were not hospitalized less frequently, and were not found to manifest nutritional or other benefit

Effect of gender:

The women assigned to the higher dose of dialysis survival longer than the women assigned to the standard dose.

Survival in the men assigned to the higher dialysis dose was slightly worse.

- Minimum KT/V in women should be about 25%-30% higher than that in men
- Because the ratio of $V/\beta SA$ is about 12%-15% different in men than in women.
- If a man & a woman have the same level of $V/\beta SA$ in the woman will be 12%-15% higher, So theoretically that women need about 15% more dialysis than men.

Smaller Patients:

Should get relatively more dialysis when dose is measured as Kt/V .

- Small patient (Small value for v) would get a larger amount of dialysis if dose were scaled to βSA .
- Post dialysis urea rebound tends to be larger in smaller patients.

Malnourished Patient

- Increased amount of dialysis will help return the patient to his or her healthier premorbid Condition.
- When Patient urine volume was $>100\text{ml}$ per day. The amount of dialysis delivered had little impact on survival.

- Twice a week dialysis may result in longer Preservation of residual kidney function.
- In Patient who have large weight gains one will need a higher kT/v to get a given URR than in patients with minimal weight gain

Writing the initial Prescription

The dialysis dose: $K \times T$

Prescription involves two main Components:

K, the dialysis clearance

t, the dialysis Session length

k depends on the dialysis size. Used and the blood flow rate.

The dialysate flow rate also plays a small role.

Initial Prescription to Achieve a desired $spKt/V$

Step 1: Estimate the Patient v

Step 2: Multiply V by the desired Kt/V to get the required $K \times t$

Step 3: Compute required K for a given t or the required t for a given K .

Choice of Dialyzer

- Use of **high flux membranes** may also reduce incidence of beta-2 microglobulin amyloidosis in patients dialyzed for many years.
- Associated with about 8% increased survival
- Cardiovascular mortality appeared to be reduced

Fluid removal orders

Concept of dry weight: (optimum post dialysis weight)

- The postdialysis weight at which all or most excess body fluid has been removed.
- If the dry weight is set too high, the patient will remain in fluid-overloaded state at the end of dialysis session.
- Fluid ingestion during the interdialysis interval might then result in edema or pulmonary congestion.
- If dry weight is set too low, the patient may suffer frequent hypotensive episodes during the latter part of dialysis session.

- In practice, the optimum post dialysis weight of each patient must be determined on a trial-and-error basis.
- When setting of UF rate, allow for the 0.2 L of saline that the patient will receive at the end of dialysis during the blood return procedure.
- The optimum postdialysis weight should therefore be reevaluated at least every 2 weeks.
- Patient in whom the UF rate is < 12 mL/kg/hr have a higher survival rate.
- In patients with substantial urine volume , use of diuretics will reduce UF rate by virtue of increasing daily urine volume unless the patients reacts by taking in more fluid.

- The fluid removal rate is increased during the initial 1-2 hours of dialysis
- The dialysis solution sodium level also may be increases during the initial phase of dialysis to help maintain the blood volume osmotically

Patient Monitoring

Weight

Patient should strive to keep their inter dialysis weight gain below 1kg per day although the average weight gain tends to be higher.

- Need to be counseled about limiting sodium rather than fluid intake
- Excessive thirst may be due to a high dialysis solution sodium level
- Complaint of a washed-out feeling or of persistent muscle cramps after dialysis suggest that the target post dialysis weight is too low.
- Post dialysis recovery time can be shortened by use of cool dialysis solution.

Serum creatinine

The predialysis serum creatinine level is measured monthly. The usual mean value in hemodialysis patients is about 10mg/mL, with a common range of 5 - 15 mg/dL. Paradoxically, in dialysis patients, high serum creatinine levels are **associated with a low risk of mortality**, because the serum creatinine value is an indicator of muscle mass and nutritional status.

Serum albumin

- The predialysis serum albumin level should be measured every 3 months.
- The serum albumin concentration is an important indicator of nutritional state. A low serum albumin level is very strong predictor of subsequent illness or death in dialysis patients.
- The increased mortality risk begins at serum albumin levels < 4.0 g/dL.
- Patients with serum albumin levels < 3.0 g/dL are at high risk of morbid events.
- Every effort should be made to find the cause of the low albumin value and correct it.

Serum total cholesterol

- The serum total cholesterol level is an indicator of nutritional status.
- A predialysis value of 200-250 mg/dL is associated with the lowest mortality risk in dialysis patients.
- Low serum total cholesterol values especially <150 mg/dL, are associated with an elevated mortality risk in dialysis patients probably because they reflect poor nutritional status.

Serum potassium

- Dialysis patient with a predialysis serum potassium level of 5 -5.5 mmol/L have the lowest mortality risk.
- The mortality risk increases greatly for values over 6.5 and under 4.0 mmol/L.

Serum phosphorus

- Measure monthly
- The pre diagnosis value associated with the lowest mortality is below 5.5 mg/dL
- Mortality rates increase sharply for values over 9 mg/dL and under 3 mg/dL
- Current KDIGO targets are to “lower serum phosphorus toward the normal range”.
- Serum phosphorus values tend to be slightly higher on Monday/Tuesday that is after the 3 day interdialytic interval.

Serum calcium

- Measure monthly (more often when changing the dose of vitamin D)
- The lowest mortality is associated with the values of 9-12 mg/dL
- Mortality rates increases markedly at values over 12 mg/dL and under 7 mg/dL
- The target value should be a calcium within the normal range
- Targeting the upper range of normal serum calcium is no longer recommended, for fear of precipitating vascular classification.

Serum Magnesium

- **Not routinely monitored in HD**
- **Hypomagnesemia is Common in HD Patient receiving proton pump inhibitors**
- **Hypomagnesemia associated with AF a Poor Cardiovascular outcome**

Serum alkaline phosphatase

- **Measure every 3 months**
- **High values are a sign of hyperparathyroidism or liver disease**
- **High level are associated with elevated mortality risk**

Serum bicarbonate

- **Measure monthly**
- **Lowest mortality is for values between 20-22/5 mmol/l**
- **Mortality increases for both lower and higher values.**
- **Marked increase in mortality when the predialysis value is under 15 mmol/l**

Hemoglobin

- Checked at least monthly and in many cases every 2 weeks.
- Spontaneously high hemoglobin levels (without Eprex therapy) may be PCKD , Renal cystic disease, Hydronephrosis hypernephroma.
- Serum ferritin levels, iron LEVEL, TIBC , as well as erythrocyte indexes should be checked 3 months.

- **Serum aminotransferase values are usually checked monthly.**
- **High or high normal values may unmask silent disease (especially hepatitis or hemosiderosis)**
- **PTH should be checked every 3-6 months.**

با تشکر از توجه شما

