DIALYSIS

ESSY
SUBMITTED IN PARTIAL FULFILMENT
OF THE MASTER DEGREE IN
UROLOGY

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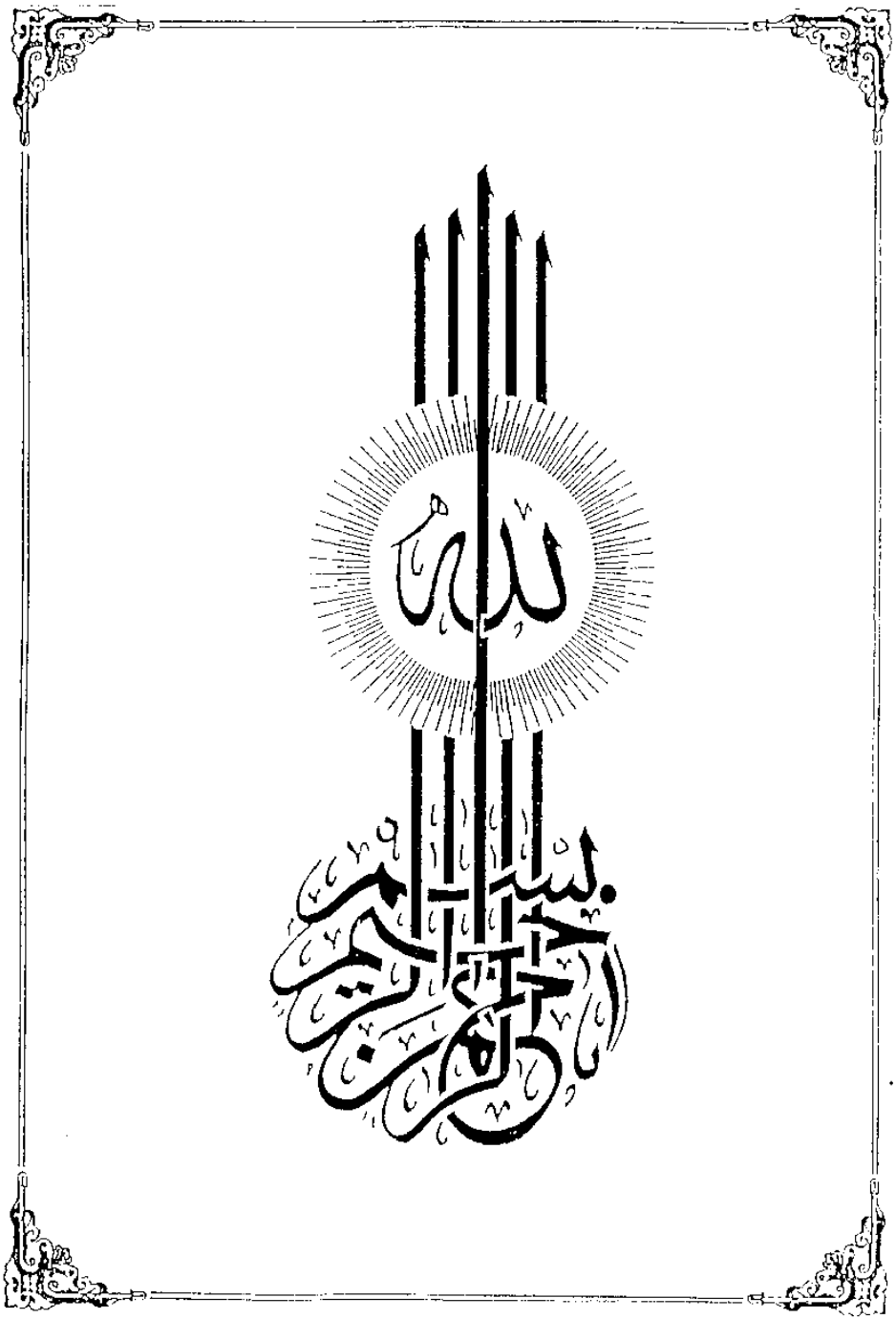
To the memory of my father

To my mother, my wife and

my daughter Jirmin.



A C K N O W L E D G E M E N T S

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C O N T E N T S

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INTRODUCTION

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Sedimentation, adsorption, electrophoresis and dialysis are different methods to separate a substance or substances from a mixture.

By dialysis we mean movement of crystalloid substances from a solution of a high concentration through a semipermeable membrane into a solution with a lower crystalloid concentration.

Dialysis can be done intracorporeal e.g. peritoneal dialysis pleural dialysis, ... etc., or outside the body in the extracorporeal dialyzers.

Graham, in 1861 was the first to separate colloids from crystalloids and called this process dialysis (Lewis W. Bluemle, 1971[1]).

Frank and his co-workers, in 1946 used the peritoneal irrigation in treatment of acute renal failure.

During the second world war in Holland, in 1943 Wilhelm Kolff made his rotating drum artificial kidney and performed the first hemodialysis in a female patient.(Lewis W. Bluemle, 1971[1] - Wing and Marry, 1975[2].

The second dialyzer was made by Alwall in Sweden in 1947. It was also able to ultrafilter the blood. The third dialyzer was made by Murray and it had been modified by Kolff and Watschinger, in 1956 to the Travenol Disposable Twin Coil Artificial Kidney. (John P. Merrill, 1963[3]).

Skeggs and Leonards, in 1949 designed the parallel flow dialyzer. Disposable multiple - layer plate dialyzers are now available manufactured by Gambro of Sweden and Rhone Poulence of France. (Wing and Marry, 1975[2]).

Many other dialyzers have been developed e.g. Rosenak and Saltzman, Mac Neill Collin, the Kiil, Malinow and Korzan and Muirhead and Reid.

Repeated hemodialysis demands repeated access to the circulation. This became possible following the development of Teflon cannulae in 1960 by Quinton, Dillard and Scribner and the development of arterio-venous fistula.

Other methods of dialysis have been explored, of these methods gastric lavage and suction is the only method which can be used in some cases.

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INDICATIONS & CONTRAINDICATION
OF
DIALYSIS

INDICATIONS & CONTRAINDICATION OF DIALYSIS

Dialysis is curable in some cases and symptomatic treatment in others.

HEMODIALYSIS

Indications:

1) Acute renal failure: (Farouk Fahmy, 1979[4]).
   Dialysis is indicated:-
   1) If conservative treatment is obviously failing by the 7th or 8th day.
   2) In the presence of acute pulmonary oedema or heart failure.
   3) Blood urea is 300 - 400 mg%.
   4) Serum potassium is 7 mEq/litre or above
   5) Carbon dioxide combining power is less than 12 mEq/litre.

   In the rare cases where serious oedema with over-hydration has occured, peritoneal dialysis with 7.5% dextrose solution may be life saving.

2) Chronic renal failure: (Roger Gabriel, 1979[5] - Farouk Fahmy[4], 1979).

The aim of dialysis in chronic renal failure is to ameliorate the symptoms of uremia if the conservative therapy fails to achieve this result.

Uremic peripheral neuropathy, C.N.S. uremic toxicity, G.I.T. symptoms and pruritis may respond to intermittent dialysis.

Dialysis may be indicated to correct the erythro-kinetics of anaemia in uremia.

Irreversible renal failure with a creatinine clearance below 5 ml/min. is an indication for long term hemodialysis.

Intercurrent infection in patients on chronic hemodialysis leads to rapid weight loss and increased frequency of dialysis might be indicated.

3) SOME RENAL DISEASES: (de Wardner, H.E., 1975[6] - Baker & Hendry, 1976[7]).

Uncertain acute uremic illness may need dialysis until the diagnosis is clear. Many such cases turn to prove acute urinary obstruction, infections or drug intoxications and complete recovery is anticipated.

Polycystic kidneys and severe renal failure may need a single long dialysis to control many of the symptoms.

Maintenance dialysis is indicated until a suitable matched kidney becomes available or if transplantation is contra-indicated for medical or immunological reasons.

The criteria for repeated hemodialysis are: the patient should have a stable personality, no marked bleeding tendencies particularly into the G.I.T., no infection else where in the body, not be toxic, cachectic or emaciated, with no peripheral vascular disease, severe hypertension or cardiac decompensation and his urine output is less than 400 ml/day. The age of the patient should be between 15-55 years and he or she must be hepatitis antigen free. The glomerular filtration rate is less than 5 ml/minute, blood urea is rising by 60-100 mg or more %/day, disturbed fluid, electrolytes or acid base balance despite of energetic dietary and therapeutic regimen or plasma creatinine rising to around 13-15 mg %.

4) PRE AND POST OPERATIVE CONDITIONS: (Rogers N. Riechers & Herbert Brendler, 1972[8] - Sturdy, D.E., 1974[9] - John Blandy, 1982[10].

Pre operative dialysis enables the patient to tolerate a major operative procedure which might other wise carry considerable risk. Correction of the uremia by dialysis though temporary, may allow the urologist an opportunity to operate on the patient with chronic renal failure due to lower urinary obstruction and relieve the obstruction. Pre operative dialysis has replaced nephrostomy in such

patients.

A patient in need for pre operative dialysis, often cells for re-dialysis shortly after surgery, so pre operative dialysis should be planned for the day prior to operation. The next hemodialysis with its attendant anti-coagulation and fluid shifts, can then be delayed until the second or third post operative day.

Pre operative dialysis is used in children in preparation for renal transplantation. Pre operative dialysis is indicated in stag horn renal stone if the renal function on the other side is pre carious.

Post operative dialysis may be needed for patients developing acute renal failure after elective or emergency surgery, because of the stresses of anaesthesia and surgical trauma.

Other causes which cause renal failure post operatively and need dialysis are ligation of a ureter or ureters, incompatible blood transfusions, acute tubular necrosis,...etc.

5) SINGLE DIALYSIS: (Wing & Marry, 1975[2] - Roger Gabriel, 1979[5]).

Single dialysis may be indicated in acute poisoning with salicylates, bar biturates bromides, aspirin, ethyl alcohol, methyl alcohol, ethylene glycol, nephrotoxic antibiotics, thiocyanates, aniline, carbon tetra chloride, chromic acid, atropine, digoxin and aromatic hydrocarbons. Dialysis may be indicated in severe ketosis in a diabetic crisis. Another indication of single dialysis is severe heart failure with intractable edema. Ultra filtration, and high bath glaucose are used during dialysis.

6) OTHERS INDICATIONS: (John P. Merrill, 1963[3] - Sado Kamidono, 1981[11] - Hamburger et al., 1979[12]).

Hemodialysis should be preferred in patients with oxalosis and acute and chronic gout.

Dialysis has been successfully applied in the treatment of hepatic failure following G.I.T. bleeding, acute

electrolyte disturbances, acute infections or with the artificial establishment of portocaval shunts where there is sudden elevation of the ammonia level.

Dialysis is used in treatment of acute porphyria and carcinoid syndrome.

Ultrafiltration may be used in treatment of pulmonary edema in the oliguric patient. Nephrotic syndrome resistant to other lines of treatment can be treated by dialysis. Resistant ascites can be treated by dialysis and the ascitic fluid can be re-injected to the patient after reduction of its volume & sodium content.

Myasthenia gravis, amyloidosis of familial mediterranean fever, diabetic nephro pathy, Good Pasture's syndrome, lupus erythrematosus, schizophrenia and psoriasis can be benefit from dialysis.

It is possible to remove stronium 90 by dialysis from mass radiation accidents.

Hemodialysis and direct hemoperfusion can be used in the intra arterial infusion of anticancer drugs via internal iliac artery in the treatment of cancer of the urinary bladder to reduce the systemic side effects of anticancer drugs in large doses.

Hemodialysis needle is an excellent instrument for irrigating thick blood from the corpora cavernosum in patients with priapism with heparinized normal saline. Severe hypertension difficult to control by drugs, serum creatinine greater than 15 mg/100 ml, irreversible renal damage and creatinine clearance less than 5 ml/minute are indications for regular hemodialysis.

Contraindications:

There is no absolute contraindication to the use of hemodialysis but relative contra indications include:- - Sturdy, 1974[9] - Baker & Hendry, 1976[7] - Kennedy, 1979[13] - Hamburger et al., 1979[12]).

- Bleeding in G.I.T., C.N.S. and the pericardium.
- Hemolytic anaemias with increased red cells mechanical fragility.
- Severe heart failure and myocardial insufficiency.
- Major psychiatric distrubances, mental instability and substantial neurological deficit.
- Extreme biological old age. Below 14 and above 60 years considered a relative contraindication to hemodialysis.
- Generalized neoplasia and multiple myeloma.
- Patients with high fever and in shock.
- Some patients with acute glomerulonephritis as fresh blood transfusion which is used in initiating hemodialysis may provide complement allowing the immune reaction in the kidney to proceed further to complete destruction of glomeruli.
- Patients with serum hepatitis or positive hepatitis B antigen. It is an ethical problem.
- Patients with systemic diseases as diabetic nephropathy amyloidosis, systemic lupus erythrematosus, poly arteritis nodosa and heroin addiction.
- The limiting factor to increased application of chronic dialysis is excessive cost.

PERITONEAL DIALYSIS

Indications:

Peritoneal dialysis is indicated for patients in uremia secondary to obstructive disease when hemodialysis is contraindicated or when hemodialysis is not found in the hospital.

Peritoneal dialysis is indicated also in the following conditions:-

- As a temporary solution in hemodialysis patients with vascular acces problems or transient contra indications to anticoagulants, such as cerebro vascular accidents.

- Acute renal failure without abdominal complications, if B U N is more than 125 mg %, severe hypo or hyper natremia, uncontrollable hyperkalaemia, intractable severe metabolic acidosis or with fluid overload.

- Children & elderly patients over 60 years of age.

- Children with intractable lactic acidosis, hyperuricemia, in born errors of metabolism with organic acidemia or hyper ammonemia, intoxications with dialyzable toxins and in over hydration with refractory edema.

- Peritoneal dialysis stylo cath can be used in treatment of an emergency urinary drainage when it can not be done per urethra or oper suprapubic cystotomy because of its several wide holes and large lumen.

(Rogers N. and Herbert, 1972[8] - Wing and Marry, 1975[2] - Hamburger et al., 1979[12]- Jose Florante, 1980[14]).