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Work Up Renal Failure Patients

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Kidney is involved by many diseases, some are primarily renal diseases while in other cases kidney is involved secondarily in different systemic diseases. Whatever the case may be the final situation usually crystallizes into one of the following syndromes:–

Nephrological Syndromes:

Acute nephritis.
Nephrotic syndrome
Chronic renal failure.
Asymptomatic urinary abnormalities.
U.T.I.
Tubular dysfunction.
Obstructive uropathies.
Hypertension.
Urolithiasis.

Of these, obstructive uropathies and urolithiasis need surgical treatment while others are usually treated medically.

Work up of a renal patient would include history taking, physical examination and laboratory studies.

I. HISTORY

History of a renal patient is no different from other patients and a proper history and physical exaimination is the key to diagnosis.

A. Present History:
Specially ask about history of dysuria, haematuria, cloudy urine, puffines of face, loin pain, nausea, vomiting, loss of appetite, rash, joint pains, haemoptysis, fever, sore throat.

B. Past History:
Ask about hypertension, diabetes, stones, tuberculosis, trauma, surgery, SLE, haematuria, infection, drugs.

C. Family History:
of polycystic kidney disease, SLE, hypertension, diabetes, deafness, sickle cell disease.

II. PHYSICAL EXAMINATION

Look for raised BP, oedema, pallor JVP, palpable kidneys, tenderness, pericardial effusion or pericarditis, enlarged bladder.

III. MENTAL STATE:

Should be assessed as many patients distressed by prolonged illness are suffering from depression/anxiety.

IV. LABORATORY STUDIES:

Urine analysis.
Haematological studies.
Serum chemical analysis.
Serological and immunlogic studies.
Radiologic/sonographic studies.
Radio nucleide evaluation.
Tubular function test.
Renal biopsy.

URINE ANALYSIS:

Volume:	24 hours urine volume is about 1500 cc. Pale yellow is normal urine colour.
Turbidity:	Is not present in normal urine.
SP. Gravity:	1.002 – 1.035 is the range.
Protein:	Normally 75-150 mg of protein is excreted in urine daily, estimation is important. Proteinuria should always be investigated. Heavy proteinuria is always pathological. Urine should be checked for the presence of Bence-Jones protein in cases of gammopathies.
Blood:	Blood may be present in many renal diseases.
Dextrose:	For diabetes mellitis.
Ketones, Bilirubin, Urobilin,	For liver disease/haemolysis.
P.H.	Normal 4.5 – 8.0

Nitrate:	For evidence of infection with gram negative organisms.
Microscopy	
Red Cells:	90% of population has less than one RBC/PHF 97% less than 5/HPF
White Blood Cells	More than 10 PHF is always abnormal, normally 2-3 PHF in unspun urine.
Casts:	
Hyaline:	Occasionally excreted by normal individuals, also in febrile illness, loop diuretics.
Granular:	In glomerulonephritis e.g. ch. proliferative or membranous may also be seen in diabetic nephropathy and amyloidosis.
Fatty:	In nephrotic syndrome.
Red Cells:	Acute glomerulonephritis, vasculitis, SBE, ATN. Focal segmental glomerulosclerosis.
White Cells:	In acute nephritis, acute and chronic pyelonephritis, interstitial nephritis, acute glomerulonephritis
Epithelial:	Typically in ATN, acute glomerulonephritis.
Transitional Cells	Urinary infection.
Crystals:	Concentrated urine, stones.

BLOOD CHEMISTRIES:

Urea:	Normal blood urea is 20-40 mg/dl. It is not as usueful as creatinine and is affected by many fac tors, done alone is not reliable.
Creatinine:	Normal serum creatinine 0.6 – 1.6 mg/dl. It is more dependable as it is released at a steady rate and depends on muscle mass of individual.

Normal urea/plasma creatinine ration is 20-1 and is maintained in uremia. This ratio is disturbed by a variety of causes.

Plasma Urea Raised out of Propotion to Plasma Creatinine.

Sodium and water depletion.
Heart failure.
Gastrointestinal haemorrhage.
High protein intake in presence of renal disease.
Protein catabolism.
Corticosteroid therapy.
Tetracycline over dose or in presence of renal disease, pure water depletion.

Plasma Urea Depressed Out of Proportion to Creatinine.

Rhabdomyolysis.
Drugs that block creatinine secretion (Aspirin, Cotrimoxazole Cimetidine).

Plasma Urea Depressed Out of Proportion to Creatinine.

Pregnancy.
Liver failure.
Hight fluid in-take.
Low protein diet.

Plasma Urea and Creatinine Raised in Paralell

Chronic renal failure.
Established acute renal failure.
Others.

Glucose:	Patients with diabetes get renal failure and patients with chronic renal failure can have glycosuria.
Electrolytes:	Estimation is vital. Specially potassium and Sodium.
Calcium:	Is usually low in CRF but may be raised.
Phosphorus:	Is usually raised in CRF.
Alkaline Phosphatase:	Is elevated due to secondary hyperparathyroidism.
Proteins:	In nephrotic syndrome. Patients have ypo proteinemia.
Plasma Beta-2: Microglobulin:	Is better indicator than urea and creatinine and its level reflects G.F.R.
Uric Acid:	Hyperuricemia is often present in renal failure.

Creatinine Clearance:

Creatinine clearance in infants in Ist week is 28-57 ml/minute. It increases upto age 3 when it reaches adult level.

Normal Value:

male:	130 ± 18 ml per minute.
female:	120 ± 14 ml per minute.

It declines after third decade at the rate of 6.5 ml/decade. To avoid urine collection and estimation of urine creatinine certain formulas are devised to estimate creati-

nine clearance from a single blood sample.

Male; : $\frac{(145\text{-age})\ \text{body wt. in Kg.}}{\text{Serum creatinine in mg/dl} \times 72.}$

Female: $\frac{(145\text{-age})\ \text{body wt. in Kg.}}{\text{Serum creatinine in mg/dl} \times 72} \times 0.9$

Creatinine clearance is measured by using formula U.V/P where U is urine concentration of creatinine, V is volume of urine per minute and P is plasma creatinine. Creatinine clearance can also be measured with radioisotopes. These procedures are easy to perform and can be done in out patient department. These methods includes:—

Plasma clearance.
Bladder cumulative method.

HAEMATOLOSICAL STUDIES:

These are important as they give clue to certain systemic diseases in which kidney is also involved.

E.S.R.	raised in SLE, multiple myeloma, T.B.
H.B.%	usually arounad 6 gm% in CRF. may be raised in polycystic disease of kidney.
Leucocyte Count:	For evidence of infection.

R.B.C. Morphology:

Finding of abnormal cells may point to haemolytic disorder or haemoglobinopathy.

Burr Cells.
Fragmented Cells.
Sickle Cells
Malarial Parasite, in malaria.

SEROLOGICAL

Serologic and Immunologic.

Serum protein electrophoresis:	for monoclonal gammopathies.
Urine Protein electrophresis:	
ASOT	for post streptococcal glomerulonephritis.
Complement level:	C3 % C4 levels are changed in certain disease.
IgA Level:	
Anti DNA:	for the diagnosis of immunene diseases
Anti GBM antibodies:	good pasture syndrome

HORMONE ASSAYS:

Renin	For renovascular hypertension Bartter's syndrome, renin producing tumour of kidney.
Aldosterone.	Primary hyperoldesteronism secondary hyperoldosteronism in above, hyper-reninemic conditions.
Parathyroid Hormone: (PTH):	Is raised in renal failure and cause wide spread skeletal changes.

TUBULAR FUNCTION TESTS:

To assess the tubular function for concentrating ability and acidification following tests are done:—

1. Phosphate clearance.
2. Urate clearance.
3. Aminoacid clearance.
4. Urine pH after acid load.
5. Urine and blood pCO_2 after alkali load.
6. **Dehydration test**

Radiologic Procedures:

X-Ray Chest:	To see lung changes in uremia and heart size.
Plain KUB	To see size of kidney and also to see calcification or stones.
C.T.	For correct localization of renal mass/tumours.
Urography Antegrade Retrograde:	To out-line entire urinary tract when not outlined by I.V.U. or it is not possible.
Arteriography:	To detect renal artery stenosis and other vascular malformations.
Micturating Cystourethrography:	For reflux uropathy & urethral or bladder neck obstruction.
Sonography:	It is very useful, non invasive, reliable procedure for rapid assessment of kidney size and anatomical abnormalities. Finding of contracted kdineys with loss of corticomedullary contrast suggest chronic renal failure.
RENAL BIOPSY:	For correct histologic diagnosis.

NUCLEAR MEDICINE PROCEDURES:

Renography:	For renal artery obstruction ATN. Transplant rejection to compare the function of one side with the other.

Renal Scan: Renal scasns are useful in the evaluation of renal function and structure in renovascular disease, hypertension, mass lesion, lower urinary tract disease, determinations of regional glomerular and tubular function and for GRF. They are useful in serial evaluation of transplant function.

Following different kinds of renal scans can be done- –

DPTA (Diethyletriaminepenta acetic Acid).
DMSA (Dimercaptosuccinic Acid).
Glucoheptonate.
Gallium.
Thallium.
Sulphur, Colloid
Labelled Fibrinogen up take.

Bone Scan: To detect matastatic calcification in renal osteodystrophy

Densitometry: For assessment of mineral mass of bone in osteodystrophy.

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