URINARY SYSTEM DISEASES

Lecture 6 for 2 year dentistry students.

DEPARTMENT OF INTERNAL MEDICINE # 3

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- Program of internal medicine for dental students is slightly different from the one for medical students
- with some diseases, the first symptoms are often revealed on the mucous membrane of the oral cavity, which leads the patient to the dentist.
- dental care - a type of specialized medical care, which is conducted, in most cases, against the background of concomitant somatic pathology.
- dentist often faces patients with numerous co-morbidities and special lists and protocols were developed to lead dentist through
- in the practice of a dentist, there may be emergencies arising from diseases of the internal organs that require an immediate medical care and the actions of the dentist may safe the life of the patient

- Dentists work as a primary care specialists and so face numerous patients and have an important influence of the prevention of the internal diseases
- It is necessary to pay attention to link between the pathology of internal organs and diseases of the oral cavity. The health of the whole body depends on the condition of the oral cavity. The mouth is a mirror of the body.
- Many diseases of the gastrointestinal tract, central nervous system, urinary and endocrine systems and blood are reflected in the oral cavity. Pathology that occurs in one of the organs (liver, pancreas, kidneys), or systems (nervous, endocrine, cardiovascular), can affect the mucous of the mouth, gums, periodontal and teeth.
- On the other hand, chronic pain in the oral cavity affect the development of autoimmune and inflammatory diseases (rheumatism, glomerulonephritis, pyelonephritis and others). Such a relationship not only unites dentistry with other clinical disciplines, but also makes it the most important preventive section among them.

- Throughout the world, there has been an increase in the number of patients with kidney disease. This is due not only to the incidence of kidney diseases (glomerulonephritis, pyelonephritis), but also with an increase in the number of patients with diabetes mellitus, hypertension, general aging of the population. According to the latest epidemiological data, among 1,122 countries with a population of 5.9 billion people, there are 1 million 783,000 patients with end-stage renal disease in the world, 1 million 371,000 (77%) receive dialysis treatment, 412 thousand (23%) received kidney transplantation . The number of patients with renal insufficiency doubles every 7-10 years.

- Patients with kidney disease are more likely to develop hypertension, diabetes, heart attacks and strokes. In people with kidney disease, the risk of sudden death from cardiovascular disease is 100 times higher than from the terminal stage of kidney failure.

- This once again confirms the need for early diagnosis and treatment of kidney disease, when it is possible not only to slow the progression of renal failure, but also to reduce the incidence of cardiovascular diseases, which remain the most common cause of premature death.

Symptoms of Kidney diseases

Kidney diseases can be accompanied by symptoms and can be asymptomatic.

Typically, renal symptoms include:

changes in urination (amount, color, frequency),

urinary output, or appearance;

Hematuria (blood in urine);

Lower back pain,

oedema,

and nonspecific symptoms and signs, related to renal insufficiency.

In symptomatic patients may be observed:

fever,

weight loss,

advanced renal failure, and

urinary tract infections.

Asymptomatic patients with renal disease may have:

hypertension,

oedema or

abnormal blood or urine findings.

They may have a family history of renal disorders (eg, polycystic disease, hereditary nephropathy).

Urine test

- **Urine color** normally is yellow.
- **Darker urine** may be seen in some diseases (e.g., porphyria) and with certain drugs (e.g., methyldopa).
- **Red-orange-brown urine** may be seen with hematuria, hemoglobinuria, and myoglobinuria and with certain drugs (e.g. , phenothiazines).
- **Urine chemistry.** Qualitative chemical analysis of urine is performed with commonly available dipsticks.
- **Blood** usually is not present in normal urine, so erythrocytes, hemoglobin, and myoglobin all produce positive test results.
- **Glucose** usually is not present in normal urine above 0.3 g/24 hr.
- **Ketone bodies are present in the urine of healthy individuals only during fasting.**
- Protein usually is not present in normal urine above 150 mg/24 hr. The tesyt detects only albumin, not immunoglobulins or light chain polypeptides, which must be assayed using acid precipitation.
- Bilirubin is not present in normal urine. If elevated in blood, bilirubin is filtered and present in urine.
- Urine pH is normaly between 5.0 and 7,5.
- Urine concentration and dilution are measured by either specific gravity (normal = 1.000-1.025) or osmolality (normal =. 50-1000 mOsm/kg urine).

Urine test

- Urinary sediment of formed elements is prepared by centrifugation of urine at 2000 RPM for 10 minutes. The sediment from 12 ml of urine is resuspended in 1 ml of supernatant and is examined microscopically.
- Crystals that are seen in acid urine include cystine and uric acid; those found in alkaline urine include calcium phosphate and calcium oxalate.
- **Cells** that are found in various disease states include erythrocytes, leukocytes, and epithelial cells (i.e., renal tubular, transitional, or squamous).
- Bacteria may be seen and are best confirmed with Gram staining of the sediment.
- Casts are cylindrical elements formed in disease states associated with low renal urine flow or heavy proteinuria. The cast is a protein coagulum, which is formed in the renal tubule and traps any tubular luminal contents within its matrix.

Terminology and semiotic

Polyuria (> 2500 mL/day)

- may be caused by increased water intake (eg, compulsive water drinking), osmotic diuresis (eg, glycosuria from uncontrolled diabetes mellitus), decreased vasopressin release due to hypothalamic or posterior pituitary disease.

Oliguria (< 500 mL/day in adults or < 24 mL/kg body weight/day in young children)

- tends to be **acute** and caused by decreased renal perfusion (prerenal factors), ureteral or bladder outlet obstruction (postrenal factors), or primary renal disease. Uremia may occur.

- **Anuria** (< 100 mL/day in adults), although rare, may be a sign of the acute renal failure, the end stage of chronic progressive renal insufficiency, or, rarely, renal infarction or cortical necrosis. It may also be due to reversible urinary obstruction. Prolonged anuria inevitably results in uremia.
- **Nocturia** (voiding during the night) is an abnormal but nonspecific symptom. Nocturia may reflect early renal disease and polyuria from a decrease in concentrating capacity or heart and liver failure without evidence of intrinsic urinary system disease.

Enuresis (bed-wetting) is normal during the first 2 or 3 yr of life but later becomes an increasing problem.

Dysuria (painful urination) suggests irritation or inflammation in the bladder neck or urethra, usually due to bacterial infection. Persistent symptoms without such infection require careful evaluation of the bladder and urethra.

Hematuria (blood in the urine) can produce red to brown discoloration depending on the amount of blood present and the acidity of the urine. Slight hematuria may cause no discoloration and may be detected only by microscopy or chemical analysis.

Hematuria without pain usually is due to renal, vesical, or prostatic disease. In the absence of RBC casts (which usually indicate glomerulonephritis), silent hematuria may be caused by bladder or kidney tumor. Hematuria with dysuria is also associated with bladder infections or lithiasis.

Urine test is the best guide to intrinsic GU disease and includes microscopic examination of sediment and qualitative evaluation of protein, glucose, ketones, blood, nitrites, erythrocytes and WBC.

- **Normal urine** contains a few cells and other formed elements shed from the entire urinary tract. With disease, these cells are increased and may help to indicate the site and type of the injury.

- WBCs/high-power field, ie, > 4000 cells/mL in centrifuged urine. Excessive WBCs may indicate infection or other inflammatory diseases.

Laboratory tests for kidney disease

Renal function testing:

- Glomerular filtration rate (GFR) is a measure of the amount of plasma ultrafiltrate derived from blood in a specified time period. (A normal GFR is 115-125 ml/min.)
  In most kidney diseases, the GFR is an accurate index of overall renal function.
- Urine concentrating ability is determined by measuring urine osmolality after 18-24 hours of water deprivation and again after the administration of 5 units of vasopressin. Under these conditions, urine reaches an osmolality of 900 mOsm/kg (or a specific gravity of 1.023) in 90% of normal individuals.

Serum tests

Persistent increase in **serum creatinine**, is highly specific for renal dysfunction (normal value are for creatinine <120 mrmol/l)

- Urine diluting ability is determined by measuring urine osmolality and volume 5 hours after a water load of 20 ml/kg body weight.
- Urine reaches an osmolality of 100 mOsm/kg {or a specific gravity of 1.003), and urine volume exceeds 80% of the water load in normal individuals.
- Fasting urine pH normally is below 5.5.

Visualization

Plain-film radiography, tomography, ultrasonography, and computer tomography (CT) are useful noninvasive techniques for determining renal size and the presence of obstruction, stones, or mass lesions.

Intravenous urography and arteriography may also help to define intararenal morphology.

Computer tomography (CT)

Intravenous urography

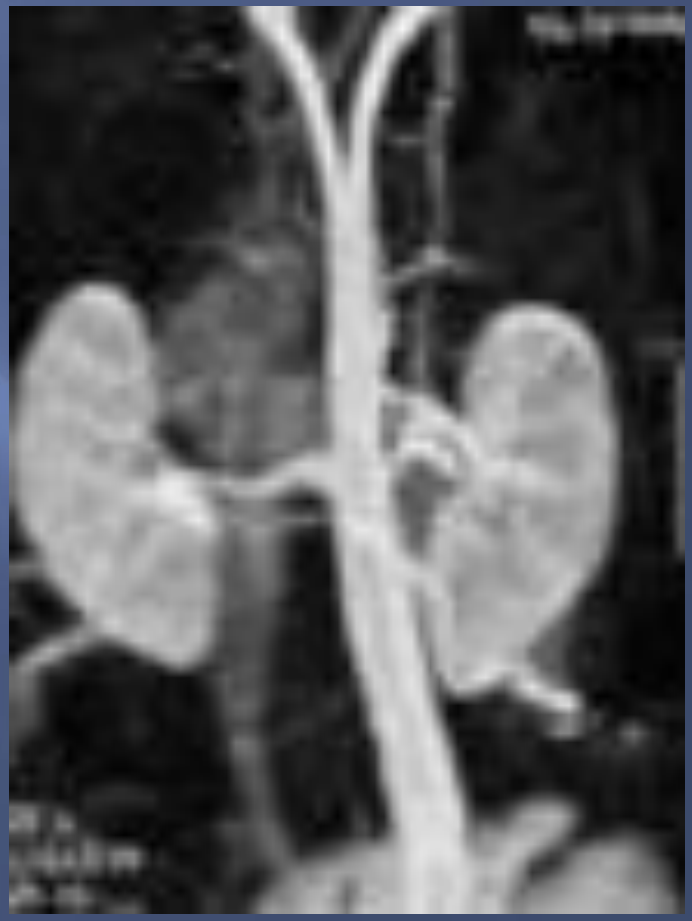
- IVU; excretory urography; is often used to visualize the kidney and lower urinary tract.

Ultrasonography

- **Ultrasonography** (US), a noninvasive, fast and affordable technique often use in primary care sets, used to determine the location, shape, size and to indicate abnormal formations and kidney stones.

MRI

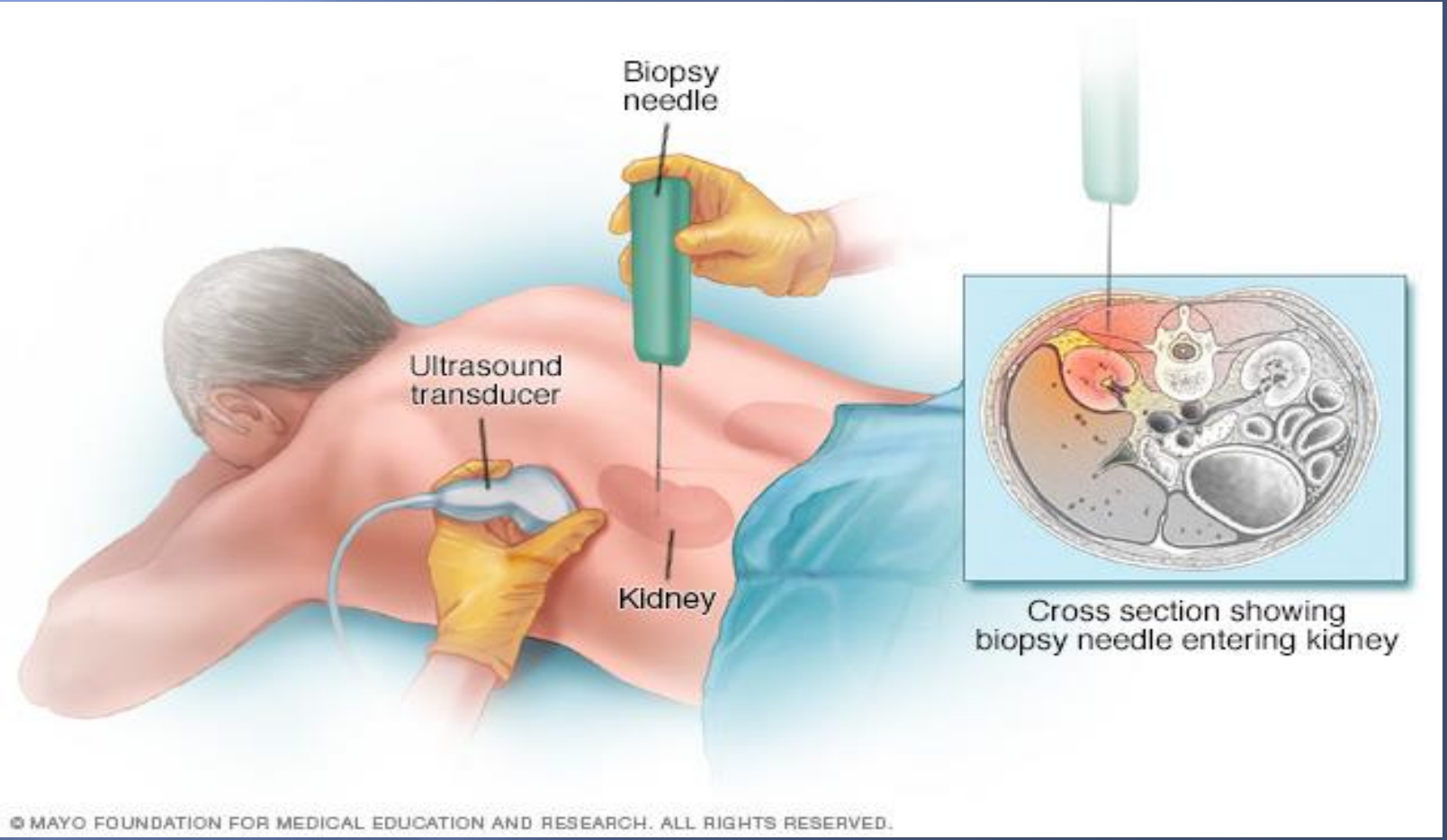
- **MRI** offers information about renal masses that cannot be determined by other techniques. It allows direct imaging in the transverse, coronal, and sagittal planes.



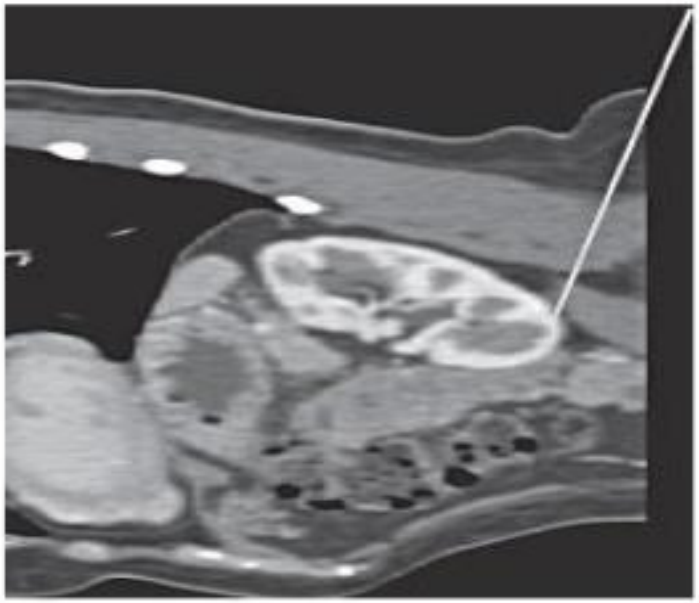
Renal biopsy

- Indications for renal biopsy include acute renal failure of unknown etiology or abnormal course, delayed recovery from acute renal failure. Also, renal biopsy occasionally may be indicated in the cases of nephrotic syndrome and diabetes.
- Contraindications for renal biopsy include diastolic blood pressure ower 100 mm Hg, infection at the biopsy site, and abnormal blood coagulation.

Renai biopsy



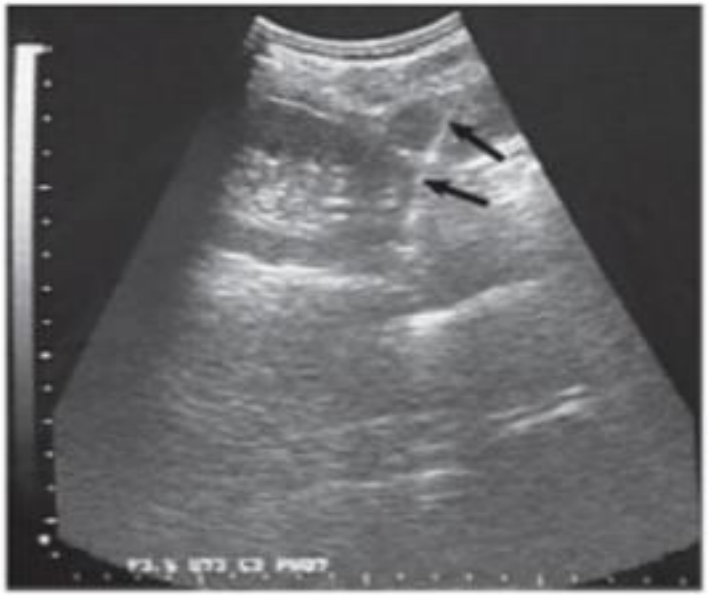
Renai biopsy



Renal biopsy imaging
CT left kidney

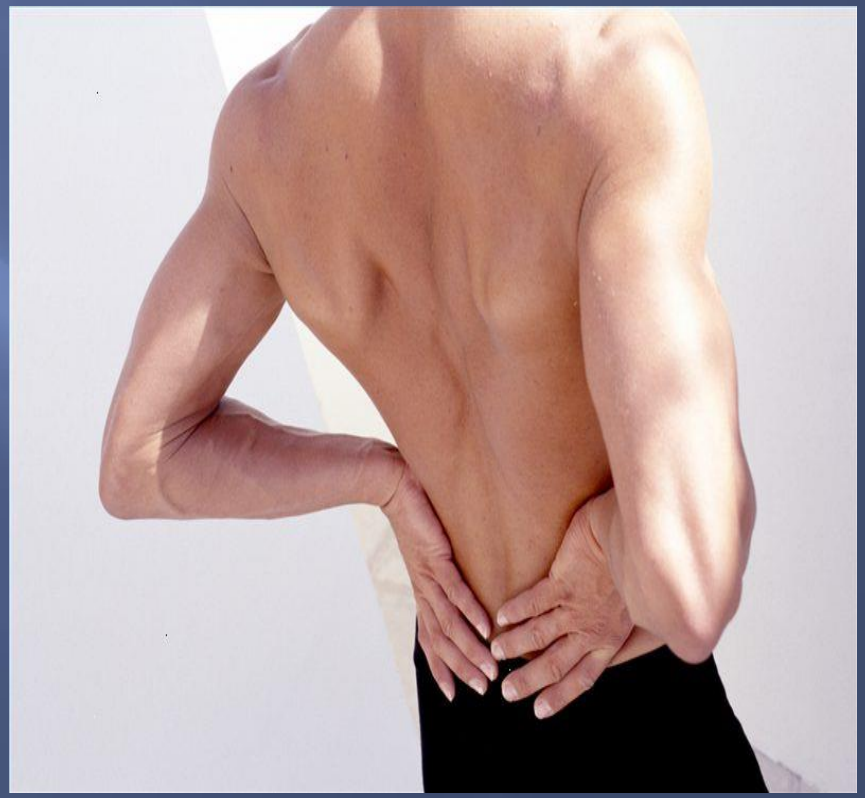
The angle of approach of needle is demonstrated.

Note adjacency to the lower pole of the kidney



Renal biopsy imaging. Ultrasound scan shows the needle entering the lower pole of the left kidney. *Arrows* indicate the needle track, which appears as a fuzzy white line.

- **Kidney pain** usually is felt in the lower back between the 12th rib and the iliac crest, with occasional radiation to the epigastrium. The pain is intermittent but does not completely remit between waves of colic.



Kidney Disease - Symptoms

* High blood pressure
* Shortness of breath
* Thirst
* Fatigue
* Weight loss
* Nausea & vomiting
* Bad taste in mouth/bad breath
* Loss of appetite
* Puffy eyes, hands & feet
* Itchy skin
* Tea-coloured/cloudy urine
* Muscle cramping

{ MediFee.com }

- **Uremia** - a toxic condition, associated with excessive accumulation of protein metabolism productsc in the blood - occurs when GFR declines to < 10% of normal, with resultant disturbances of multiple organ systems.
- Weight loss,
- weakness, fatigue,
- dyspnea, anorexia,
- nausea and vomiting,
- itching, tetany, peripheral neuropathy, pericarditis and convulsions are the usual symptoms and signs;
- Most can be treated or reversed by dialysis or renal transplantation and appropriate diet.

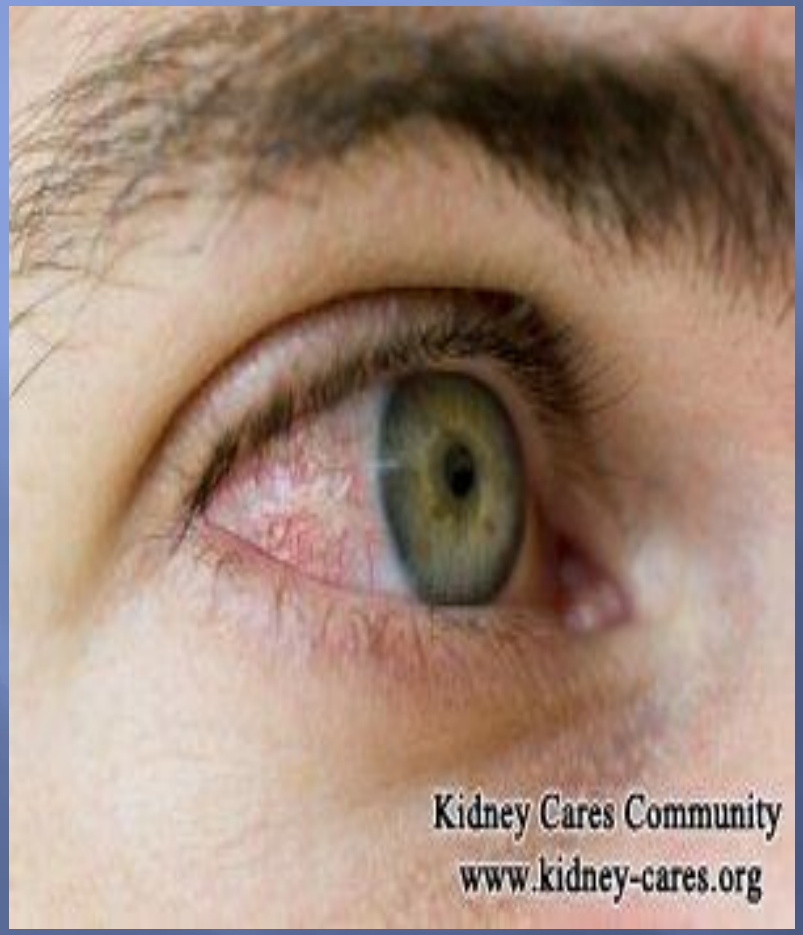
- **Retinal abnormalities** on ophthalmoscopy may include hemorrhages, exudates, and papilledema as signs of cerebral edema associated with malignant hypertension or metabolic abnormalities.
- **Other abnormalities** suggesting urinary system disease include **stomatitis;**

- **Anemia** (particularly normocytic normochromic from a lack of erythropoietin) may be a clue to renal failure
- **Polycythemia** may occur in renal cell carcinoma or polycystic disease.

EDEMA


Normal foot and ankle
Mild edema
Moderate to severe edema


Kidney Disease Symptoms
www.kidney-symptom.com



Gabitus nephritica


Kidney Disease Symptoms
www.kidney-symptom.com


KidneyFailure
www.kidneyfailureweb.com


Kidney Failure
www.kidneyfailureweb.com

Common Kidney Diseases

- Diabetes - thought to cause about half of all cases
- Hypertension (high blood pressure) - thought to cause about one quarter of all cases
- Inflammation of the kidney (glomerulonephritis)
- Malaria
- Long-term exposure to lead, solvents and fuels
- Systemic lupus erythematosus - body's own immune system attacks the kidneys
- Polycystic kidney disease - inherited
- Physical injury, such as a heavy blow to the kidney
- Kidney infection (pyelonephritis)
- Jaundice
- Over consumption of some medications
- Unborn baby does not normally developing kidneys
- Yellow fever
- Written by Christian Nordqvist

- KDOQI defines CKD according to the presence or absence of markers of kidney damage and the level of kidney function (GFR) – irrespective of the type of kidney disease (the specific diagnosis).
- Thus, there are two independent criteria for CKD:

Table 11. Definition of Chronic Kidney Disease

Criteria
1. Kidney damage for ≥3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased GFR, manifest by *either*: • Pathological abnormalities; or • Markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging tests
2. GFR <60 mL/min/1.73 m^2 for ≥3 months, with or without kidney damage

Methods to estimate GFR are discussed in Guideline 4. Markers of kidney damage are discussed in Guidelines 5–6.

Source: National Kidney Foundation. *K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification and Stratification.* Am J Kidney Dis 39:S1-S266, 2002 (suppl 1) http://www.kdoqi.org

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Causes of chronic renal failure

- Chronic glomerulonephritis
- Chronic infections
- Renal obstruction (prolonged)
- Exposure to toxic chemicals, toxins or drugs (aminoglycoside antibiotics and nephrotoxicity)
- Diabetes
- Hypertension
- Nephrosclerosis (atherosclerosis of the renal artery)
- Diabetic nephropathy
- Alport syndrome (inherited disorder causes deafness, progressive kidney damage and eye defects)
- Polycystic kidney disease
- Interstitial nephritis or pyelonephritis

Risk factors of renal disease

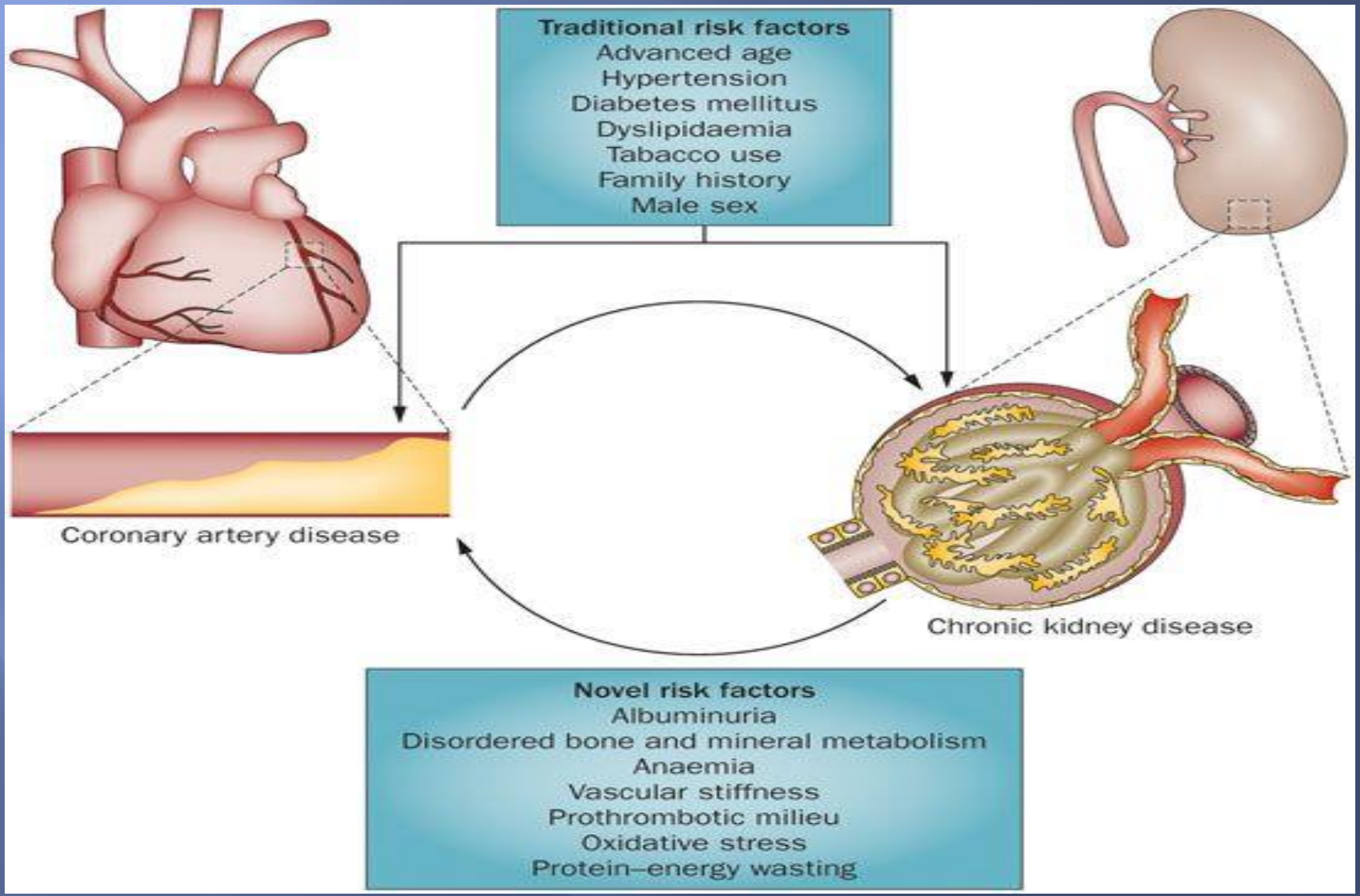


Table 1. Stages of Chronic Kidney Disease

Stage	Description	GFR (mL/min/ 1.73m2)
1	Kidney damage with normal/increased GFR	≥ 90
2	Kidney damage with mild decrease in GFR	60–89
3	Moderate decrease in GFR	30–59
4	Severe decrease in GFR	15–29
5	Kidney failure	< 15

GFR = glomerular filtration rate. (Adapted with permission from the National Kidney Foundation.)

Symptoms of chronic renal failure

- Until very kidney function remains, chronic renal failure may not developed
- Anemia, increased levels of phosphates (in blood) are complications of kidney failure
- Malaise
- Dry skin
- Poor appetite
- Vomiting
- Bone pain
- metallic taste in mouth
- detectable abdominal mass

Treatment

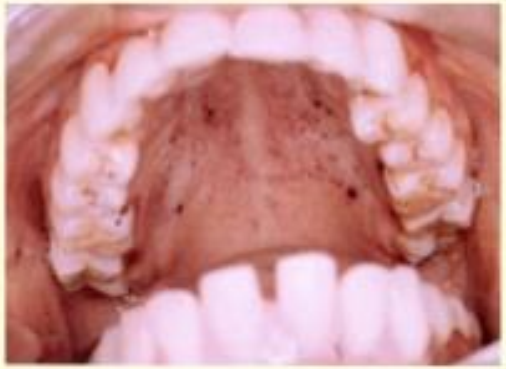
- Acidosis; IV fluids, sodium bicarbonate
- Infection; Antibiotics
- Bleeding; Adequate dialysis
- Renal osteodystrophy; Hypocalcaemia is corrected by giving 1α-hydroxylated synthetic analogues of vitamin D.

- Hyperphosphataemia is controlled by dietary restriction of foods with high phosphate content (milk, cheese, eggs) and the use of phosphate-binding drugs administered with food

c) **Renal replacement therapy**

Chronic Renal Failure & Dialysis

Signs & Symptoms



- Patient appears ill & anemic
- Hemorrhagic episodes: ecchymosis, petechiae, purpura and gingival or mucous membrane bleeding (epistaxis)
- Cardiovascular manifestations include:
  - Hypertension
  - Congestive heart failure (shortness of breath, dyspnea on exertion & peripheral edema)
  - Pericarditis

hemodialisis

Dental Management of Patient with End-Stage Renal Disease

- Consult with physician regarding physical status and level of control
- Avoid dental treatment if disease is unstable (poorly controlled or advanced)
- Screen for bleeding disorder before surgery (bleeding time, platelet count, hematocrit, hemoglobin)
- Monitor blood pressure closely
- Pay meticulous attention to good surgical techniques
- Avoid nephrotoxic drugs (acetaminophen in high doses, acyclovir, aspirin, non-steroidal anti-inflammatory drug)
- Adjust dosage of drugs metabolized by the kidney e.g. Lidocaine, Acyclovir


Kidney Disease Symptoms
www.kidney-symptom.com

Dental aspects of nephrology - chronic glomerulonephritis

- Subjective changes: dryness, bitterness, unpleasant taste in the mouth, bleeding gums. These signs are most often due to the disorder of water metabolism, liver function, vascular disorders characteristic of diffuse kidney diseases.

Dental aspects of nephrology

Fat tongue, chronic renal failure Chronic candidiasis, chronic renal failure