

thrombotic occlusion is manifested by intensive pain, haematuria, oliguria and renal failure. If the renal functions recover a massive proteinuria appears.

4.13 Prae-eclampsia and eclampsia

In the last trimester of pregnancy sometimes abnormalities occur characterised by trias of symptoms: systemic arterial hypertension, oedemas and proteinuria. This condition is termed praе-eclampsia. In some cases unconsciousness and convulsions with impaired hypertension may occur. This condition is termed eclampsia.

In kidneys a generalized oedema is present. The thickened glomerular capillary basement membrane and narrowed capillary lumen due to enlargement of endothelial cells occur. This finding is sometimes termed glomerular endotheliosis. In addition, between and under the endothelial cells fibrinoid deposits are observed. In patients deceased in this stage of disease necroses in renal tubules, liver cells, petechial haemorrhage in brain accompanied with signs of disseminated intravascular coagulation are found. The pathogenesis of this condition is not clear. Attention is focused mainly on renin-angiotensine-aldosterone system and sodium balance. It is generally accepted, that during the pregnancy sodium is retained expanding the volume of circulating blood. When the symptoms of praе-eclampsia appear the volume of the plasma is lower in comparison with normal pregnancy. It is not well understood why the plasmatic volume is reduced. In this condition the signs of utero-placental ischaemia are stated. It is generally known that in uterus the renin and prostaglandins are synthesized. Thus, it could be supposed, that the renin production in uterus might be responsible for the hypertension. The hypertension is accompanied with oedemas and later with proteinuria.

If seizures appear induced termination of gravidity becomes inevitable. This is the most effective therapeutic intervention. All disorders disappear in some weeks. It is not univocally clear if the women with

praе-eclampsia or eclampsia are the candidates for later developing of hypertension.

4.14 Hereditary renal diseases

4.14.1 Polycystic kidney disease

Is inherited as an autosomal dominant trait. It is relatively uncommon, occurring in 5 per cent of all terminal renal conditions.

Globular cysts of various dimensions, with diameter measuring from 1 mm to some cm, occur in kidneys. Among the cysts are islets of normal tissue. The cysts are pressing the nephrons and cause so intrarenal obstruction. The cysts may occur also in other close, or distant organs.

The disease becomes clinically manifest in adults by lumbosacral pains or haematuria appearing following trauma or physical exertion. The condition is in many cases associated with hypertension and leads to the progression of renal failure. Proteinuria is present very frequently. Acute renal failure may be due to the obstruction, resp. compression of ureters by large cysts.

One form of polycystic kidney disease is combined with congenital hepatic fibrosis and portal hypertension; it is a relatively severe hepatic disturbance, therefore the hepatic symptoms prevail.

4.14.2 Disturbances of tubular functions

4.14.2.1 Bartter's syndrome

This condition is characterised by hypokalaemia due to potassium loss induced by renal disturbances. Renin plasmatic activity and aldosterone secretion are elevated. The pressor reaction following angiotensin II administration and the cellular hyperplasia in juxta-glomerular apparatus are evident. Weakness and polyuria appear in patients. Histological examination reveals hyperplasia of interstitial cells producing prostaglandins E and F in renal medulla.

Decreased NaCl reabsorption in proximal tubules and in ascending limb of Henle's loop are thought to be the cause of above mentioned alterations. The sodium transport may be disturbed also in erythrocytes and skeletal muscles. The sodium loss due to decreased reabsorption is associated with water loss. These alterations stimulate the juxta-glomerular apparatus to increased renin production leading to rise in aldosterone secretion. The sodium reabsorption increase is slight and the potassium is lost. The pressor effect of angiotensin II can not be asserted. The angiotensin II intravenous infusion has no effect, its blood level being already extremely high. The PGE 2 production may be due to hypokalaemia or to high angiotensin II level.

Pharmacologic inhibition of aldosterone effect can prevent further potassium loss.

4.14.2.2 Nephrogenic diabetes insipidus

Distal tubules and collecting tubules do not react to the antidiuretic hormone. It is usually a drug-induced disorder, (e.g. by lithium treatment) and only rarely it can be an inherited disturbance. The patients urinate large volume of hypotonic urine. Polyuria and the resulting water loss are the cause of polydipsia and hypertonic dehydration. Decrease in cAMP production in collecting tubules epithelial cells might be the cause of irreactivity to antidiuretic hormone. Another possibility could be the inability of cAMP to increase the permeability of collecting ducts to water. Both disorders might be combined.

If the symptoms are present from the first week of life, the permanent dehydration, hypernatraemia and hyperthermia may produce brain damage leading to mental retardation.

4.14.2.3 Renal tubular acidosis

Can be an inherited defect, or it can develop following various diseases, like: chronic interstitial nephrosis, hydronephrosis, polycystic renal disease, kaliopenic and hypercalcaemic nephropathy.

Metabolic acidosis is due to excessive accumulation of hydrogen ions in blood. The excretion of other ions is not impaired. The kidneys reabsorb an extremely large amount of chlorides to maintain the electroneutrality of extracellular fluid. This results in hyperchloraemic acidosis. Four types of renal tubular acidosis are known. Type 1 and 2 are of

hereditary origin, type 3 is a combination of type 1 and 2. Type 4 is characterised by insufficient urine acidification and concomitant hyperkalaemia. Hyperkalaemia is caused by hyporeninaemic hypoaldosterinism, or by insensitivity of distal tubules to circulating mineralocorticoids.

Type 1 – the collecting tubules enables the reabsorption of hydrogen ions from lumen into the blood, or the ability to transport the hydrogen ions against electrochemical gradient into the lumen is decreased. Chronic acidosis reduces the tubular calcium reabsorption. Hypercalciuria and secondary hyperparathyroidism appear. In children leads this disturbance to growth retardation.

Type 2 – in this type a defective bicarbonate reabsorption is present in proximal tubules. Plasmatic bicarbonate level decreases. Bicarbonates are lost by urine in form of potassium salts. Hypokalaemia is developing.

4.14.2.4 Phosphaturia

Reduced reabsorption ability of proximal tubules causes an excessive excretion of phosphates in the urine resulting in plasmatic hypophosphataemia. Patients may have no symptoms. Relatively frequently osteomalacia with all consequences is developing.

4.14.2.5 Cystinuria

In this condition the transport of cystine and of other aminoacids having a common transport mechanism (lysine, arginine and ornithine) is defective. The disturbance leads to an excessive urinary excretion of mentioned aminoacids. Cystinuria is clinically manifested by urolithiasis with cystine hexagonal concretions.

4.14.2.6 Renal glycosuria

Is a defect of tubular glucose transport. Glycosuria appears therefore during normal glycaemia values. Glycosuria does not depend on diet. Patients with this disturbance have a normal results of glucose tolerance test and normal carbohydrate utilisation.

4.14.2.7 Fanconi syndrome

The transport defect in this condition is concerned with aminoacids, monosaccharides, sodium, potas-

sium, calcium, phosphates, bicarbonates, uric acid and proteins. The impaired transport may lead to aminoaciduria, glycosuria, salt wast, hypercalciuria, hypophosphataemia, proximal tubular acidosis and tubular proteinuria. Inherited disturbance occurs commonly. Similar condition may develop in adults owing to the renal disorders and dysproteinaemia. In Wilsons type amyloidosis and in Love's type a complex of occulo-cerebro-renal alterations occur.

4.15 Urolithiasis

Urolithiasis is a relative common disease occurring in about 1 per cent of inhabitants, mainly in men. In one tenth of cases is the nephrolithiasis diagnosed during their life. In remaining cases is the nephrolithiasis asymptomatic.

The calcium salts are the basis of urinary concrements. 75 to 85 per cent of urinary calculi contain calcium oxalate and calcium phosphate. Apart from the calcium salts the uric acid and cystine contribute to the concrement formation. Uric calculi occur commonly in patients with hyperuricaemia. Magnesium- ammonium- phosphatic concrements appear during urinary tract infections. Urinary calculi are formed when the balance becomes impaired between the water volume and excreted crystal forming material. Under physiological circumstances the calcium salts do not form crystals. If urine is supersaturated with calcium salts the crystallization can start. The supersaturation of urine is considered to be the main mechanism responsible for concrement formation. Another important factor is the pH of urine. Alkaline urine contains more urates and dissociated phosphates. The calcium oxalate solubility however, does not depend on pH of urine. The third important factor is the dehydration, and the fourth is the overloading of organism with some substance which could become the basis for stone forming.

Kidneys release several lyotropic protective substances preventing the stone formation: citric acid, glucuronic acid, magnesium, glycine and other substances. The concentration of all substances impor-

tant for concrement formation in urine depends on water rediffusion in tubuli and on filtered amount of these substances. Thus, increased diuresis reduces the concentration of stone-forming substances in urine. Among further important factors belongs urine stasis, commonly accompanied with infections of urinary outflow tract, enhanced excretion of stone-forming substances and changes of urine colloidal qualities. The stasis of urine and the concomitant infection create favorable conditions for formation of concrements. The calculi commonly originate by a process of crystal nucleation in tubules, or in bends of renal calyces. The crystal nucleation occurs frequently in renal papillae, but they can be formed also in renal pelvis, urinary bladder or elsewhere. The changes in excretion of stone-forming substances appear in metabolic disorders or in primary tubular disturbance in reabsorption of stone-forming substances. Supersaturation of urine with stone-forming substance constitute favorable conditions for crystal nucleation. Further layers of the concrement are formed around it by apposition of stone-forming salts and organic substances.

The hypothesis of colloid protection significance supposes an imbalance between mineral substances and organic substances, termed protective colloids in urine. When the balance has been disturbed by an excess of mineral substances or by deficiency of protective colloids the concrements arise.

The mucoprotein occurring in urine has some qualities identical with the mucoprotein in bone. The origin of urinary mucoproteins is unknown. They can be products of tubular cells or of the substance occurring among the epithelial cells. The mucoprotein, at last could originate in basal osseous mass. Following the parathyroid hormone application depolymerisation of bone mucoproteins occurs. The products of depolymerisation are subsequently filtered in glomeruli and reabsorbed in proximal tubules Calcium binds with mucoprotein forming microlith, which can pass the renal outflow tract. This mechanism may explain the concrement formation during hyperparathyroidism.

The pathogenesis of urolithiasis is not well understood. The mechanism of concrement formation might not be the same for each type of stone. According their composition the concrements are divided into oxalate-, urate-, phosphate- carbonate-, xantine and cystine stones. The succession in the list