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Question: discuss the diseases of the renal system

1. Acute renal failure

Acute renal failure occurs when renal function suddenly declines to very low levels, so that little or no urine is formed, and the substances, including even water that the kidney normally eliminates are retained in the body. There are two main mechanisms that can produce acute renal failure. When the cardiac output the amount of blood pumped into the general circulation by the heart is lowered by hemorrhage or by medical or surgical shock, the renal circulation is depressed to an even greater extent. This leads directly to inefficient excretion, but, more importantly still, the kidney tissue cannot withstand prolonged impairment of its blood supply and undergoes either patchy or massive necrosis (tissue death). Given time, the kidney tissue may regenerate, and it is on this hope that the treatment of acute renal failure is based. The form of acute renal failure that is due to a poor supply of blood (ischemia) has many causes, the most common and most important being multiple injuries, septicemia (infections invading the bloodstream), abortion with abnormal or excessive bleeding from the female genital tract, internal or external hemorrhage, loss of fluid from the body as in severe diarrhea or burns, transfusion reactions, and severe heart attacks; a special case is the transplanted kidney, which commonly goes through a phase of acute renal failure that is independent of possible rejection.

2. Chronic renal failure

The term uremia, though it is sometimes used as if it were interchangeable with chronic renal failure, really means an increase in the concentration of urea in the blood. This can arise in many acute illnesses in which the kidney is not primarily affected and also in the condition of acute renal failure described above. Uremia ought to represent a purely

chemical statement, but it is sometimes used to denote a clinical picture, that of severe renal insufficiency. As with acute renal failure, there are many conditions that can lead to chronic renal failure. The two most common causes are pyelonephritis and glomerulonephritis (kidney inflammation involving the structures around the renal pelvis or the glomeruli), and other common causes are renal damage from the effects of high blood pressure and renal damage from obstructive conditions of the lower urinary tract. These primary disorders are described below. They have in common a progressive destruction of nephrons, which may be reduced to less than a 20th of their normal number. The quantitative loss of nephrons can account for the majority of the changes observed in chronic renal failure; the failure in excretion is due directly to loss of glomerular filters, and other features such as the large quantities of dilute urine represent a change in tubular function that could be accounted for by the increased load that each remaining nephron has to carry. There are many other causes of chronic renal failure aside from the four common ones. They include congenital anomalies and hereditary disorders; diseases of connective tissue; tuberculosis; the effects of diabetes and other metabolic disorders; and a number of primary disorders of the kidney tubules. Of the many causes, there are some that have importance out of proportion to their frequency, by virtue of their reversibility; these include renal amyloidosis (abnormal deposits in the kidney of a complex protein substance called amyloid), whose causes may be treatable; damage to the kidney from excessive calcium or deficiency of potassium; uric acid deposition in gout; the effects of analgesic agents (substances taken to alleviate pain) and other toxic substances, including drugs.

3. Glomerulonephritis

Glomerulonephritis is the disorder commonly known as nephritis, or Bright's disease. The primary impact of the disease is on the vessels of the glomerular tuft. The suffix "-itis" suggests an inflammatory lesion, and glomerulonephritis is indeed associated with infection, in the limited sense that it may begin soon after a streptococcal infection and may be aggravated in its later course by infections of various kinds. Nevertheless, there is convincing evidence that glomerulonephritis does not represent a direct attack on the kidney by an infective agent; it appears to be, rather, an immunologic disorder, in the

sense of the formation of antibodies in response to the presence of a foreign protein (antigen) elsewhere in the body; these form antigen antibody complexes that lodge in the glomerular tuft or, in a small number of cases, themselves become deposited on the capillary glomerular walls. In each case the antibody or the antigen antibody complex reaches the kidney via the circulation, and the mechanism is usually referred to as circulating complex disease. Glomerular damage is a consequence of the reaction that follows within the glomeruli. These deposits of foreign protein and complexes react with other protein components of blood and attract to the site white blood cells and platelets, which also are circulating in the blood; these in turn release protease enzymes and other chemical mediators of tissue injury.

Glomerulonephritis is based partly on analogy with the renal damage that can be induced in animals by allergic mechanisms and partly on finding that a protein component of the allergic reaction is deposited in the diseased glomerulus. Within the general concept of an immunologic disorder, there is ample room for a variety of primary stimuli and of later immunologic disease causing mechanisms. These include the possibility of primary glomerular damage, causing the glomerulus itself to become antigenic and so to provide a secondary antibody response, and also the participation of (or lack of participation of) T lymphocytes. Such a diversity is strongly suggested not only by the variations in the glomerular tissues observed both with the ordinary and with the electron microscope but also by the varying manifestations of the disease observed in the affected person. Typically, glomerulonephritis appears as an acute illness one to two weeks after a sore throat, or less commonly after a persistent streptococcal infection of the skin. Other infective agents may be responsible, however, including some viruses and protozoans.

4. Vascular disease

In the discussion of chronic renal failure, attention was drawn to the cycle in which high blood pressure secondary to renal disease can produce further damage to the kidneys. Clearly, primary vascular disease disease affecting the blood vessels could equally well be a cause of renal damage. The most dramatic instance of this is the condition known as malignant hypertension, or accelerated hypertension, which arises when the blood

pressure attains extremely high levels, the diastolic figure (the blood pressure between heart contractions) being 140 millimeters of mercury or higher (the normal being around 80). Sustained levels of this magnitude cause serious damage to the arterioles, the smallest of the arteries; this damage is widespread, but as it affects the kidneys it produces rapid destruction of renal substance, with a scarred kidney. Unless the blood pressure is controlled, malignant hypertension can cause death in a few months; since treatment at an early stage is notably effective, the condition represents an important medical emergency. Since the retinas are damaged as rapidly as the kidneys, the affected person May first notice blurring or loss of vision and will typically have a severe headache. Prompt treatment is necessary to avoid stroke, as well as damage to other organs.

More modest, but still elevated, levels of blood pressure can cause more gradual renal damage in elderly people or in those made prematurely aged by widespread arteriosclerosis (“hardening of the arteries”). In this condition the damage is in the larger arteries rather than in the arterioles, and the condition is one of slowly progressive scarring. Renal damage can also arise, by various mechanisms, in a large number of diseases that impair the proper functioning of the blood vessels, such as diabetes mellitus, the collagen disorders, bacterial inflammation of the heart lining, and many more.

5. Tumors

Tumors in general are covered in the article Cancer. In this section, those tumors peculiar to the excretory system, and their local effects, are discussed briefly. In the case of benign tumors, these effects include pressure on local structures and obstruction to hollow organs; with malignant tumors, one must add the possibilities of local invasion and of spread by the bloodstream or lymphatics to other organs (metastasis).

6. Carcinoma

The most common tumor of the renal substance is a carcinoma, renal cell cancer (formerly called a hypernephroma), which is a malignant tumor, arising from epithelial

cells (the cells of the bodily coverings and linings). It was formerly thought to arise from adrenal cortical cells lying within the kidney substance. This has since been disproved. One to 2 percent of all tumors are renal carcinomas, and most affected persons are aged from 40 to 60. The tumor may be symptomless or may first be apparent from the occurrence of metastases in the lungs, causing spitting up of blood; or in the bones, causing pathological fracture. Much more commonly, the first evidence of the tumor is blood in the urine, which may be painless or may cause colic of the ureter, if clots are being passed. There may also be a dull pain in the loins, from stretching of the kidney capsule. The tumor may be directly palpable, or it may be revealed by x rays or ultrasonography. The silhouette of the kidney may be distorted by a rounded swelling; or the renal pelvis, made visible by the injection of a contrast medium, may be displaced or distorted. Less common first indications of renal carcinoma are an obscure fever, or polycythemia (excess of red blood cells in the blood), due to excessive production of erythropoietin. Direct visual examination of the urinary tract with an instrument called a cystoscope may demonstrate the side that is affected, blood coming from one ureteric opening only. Since this bleeding can equally arise from a tumor of the renal pelvis, examination of the renal pelvis is usually called for. An exploratory operation may sometimes be needed; if carcinoma is found to be present, the kidney must be removed. There is some evidence that the results of surgery may be somewhat improved by radiation therapy. The overall outlook is poor, with a five-year survival rate no better than 50 percent. This is, however, one of the forms of malignant tumor in which arrest or even regression has been described.