**GIDADO JENNIFER BUSAYO**

**18/MHS01/166**

**PHS 212**

Discuss the disease of renal system

Renal system disease, any of the diseases or disorders that affect the human urinary system. They include benign and malignant tumours, infections and inflammations, and obstruction by calculi.

Which of these congenital disorders is characterized by an extra chromosome?

Diseases can have an impact on the elimination of wastes and on the conservation of an appropriate amount and quality of body fluid. Many of the manifestations of renal disease can be accounted for in terms of disturbance of these two functions, and the alleviation of symptoms in those renal diseases that cannot be cured depends on knowledge of how these two functions are affected.

The eliminatory process does not, of course, end with the formation of urine; the urine has to pass down the ureters to the bladder, be stored there, and voided, usually under voluntary control. The whole mechanism can be deranged by structural changes in the lower urinary tract, by infection, or by neurological disorders that lead to abnormal emptying of the bladder. Disturbance of the lower urinary tract is an important cause of pain and distress, notably during pregnancy and in the elderly; and it can lead to serious and progressive damage to the kidneys, either by interfering with the drainage of urine or by allowing bacterial infection to have access to the kidney.

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Effects of abnormal renal function on body fluid

Renal disease in its diverse forms can lead to bodily deficits or excesses of water, sodium, potassium, and magnesium, and also to protein deficits occasioned by great losses of protein in the urine. Inability of the kidney to function normally may lead to retention in the blood of the waste products of protein metabolism, such as urea and uric acid, and of other nitrogenous compounds such as creatinine. There may be abnormally high levels of phosphates in the blood, which in turn can lead (for reasons about which there is still some disagreement) to low blood levels of calcium. The calcium deficiency can cause tetany, a condition marked by muscular spasms and pain, and calcium may be lost from the bones in the process of restoring normal calcium levels in the blood and tissue fluid. For descriptive purposes, changes in volume, changes in composition, and protein depletion of renal origin will be discussed separately, but these disturbances can and often do coexist.

Though body fluid is most readily apparent in the bloodstream, it is present, and in larger amounts, in the tissues, both between the cells (interstitial fluid) and within them (intracellular fluid). Extracellular fluids, which include interstitial fluid and blood plasma, amount to 25 percent of body weight and contain sodium as their predominant cation (positive ion; metals and hydrogen in solution are cations). Intracellular fluids, amounting to 33 percent of body weight, have potassium as their predominant cation. These various “compartments” of body fluid are in osmotic equilibrium, so that if solute (e.g., sodium chloride) is added to the extracellular compartment so as to increase the concentration of the extracellular solution, water will join it to reduce the concentration, and that compartment will increase. An increase in extracellular fluid, if it is considerable, may be clinically apparent as edema, a swelling of the tissues by fluid, which can usually be displaced by firm pressure. Edema is present in acute inflammation of the kidney (nephritis), in protein deficiency of renal origin, and in chronic nephritis complicated by heart failure associated with abnormally high blood pressure; a factor common to all these states is failure of the kidneys to excrete sodium and water in adequate amounts.

The kidneys in such edematous states need not themselves be diseased; for example, normal kidneys, in a patient with heart failure, may retain sodium when handicapped in their function by poor circulation and by abnormal amounts of sodium-retaining hormones, such as aldosterone. Increase in extracellular fluids is the only volume change that is both common and easily discernible in renal disease, but the opposite condition, sodium depletion or clinical dehydration, is more commonly the result of vomiting and diarrhea when they are complications of terminal renal disease. Sodium and water depletion can be recognized by a lack of elasticity in the superficial tissues and by poor filling of the blood vessels, as well as by signs of impaired circulation, including a fall in blood pressure and an increase in pulse rate. Though changes in intracellular fluid volume occur in some diseases, especially when the potassium content of the body is affected, there is no easy way of detecting them.

Diseases of renal system

Obstruction

While it is possible for the urinary tract to be obstructed by a large mass (tumour, stone, or foreign body) lying in the bladder, the tubular portions of the tract (urethra and ureters) are much more vulnerable to obstruction. The urethra may be obstructed by stones (calculi) formed in the bladder or kidneys; by fibrous contraction of the urethral wall (urethral stricture); and by congenital valve or diaphragm (membranous malformation). Although not a part of the excretory tract, the prostate lies close to the bladder neck, and in older men it is an important cause of obstruction; fibrous disease of the bladder neck can also cause obstruction. The ureters can likewise be obstructed by calculi and stricture (narrowing); by fibrosis—scarring—of surrounding tissue (retroperitoneal fibrosis); and by tumour, though this is more likely to cause blood in the urine (hematuria).

Urinary calculi vary greatly in size. Mostly they contain calcium phosphate, calcium oxalate, uric acid, or cystine. Predisposing factors include infection, a high rate of calcium excretion, a low rate of urine formation, and various metabolic disorders, notably gout. They may cause trouble by their size or by entering the ureter or urethra, giving rise to colic, to hematuria, and, in the event of impaction, to obstructive kidney disease. The direct treatment of calculi is surgical, but sometimes the stone can be fragmented in situ by a lithotriptor. The sufferer needs general investigation for any underlying cause (e.g., a functioning parathyroid tumour that causes excessive excretion of calcium).

In the past at least, a common cause of urethral stricture was gonorrhea, in which inflammation of the urethra is followed by scarring and stricture. Bruising of the urethra by instruments during treatment can also occur. The affected person has increasing difficulty in passing urine, and the bladder becomes distended. Treatment may be either by repeated dilation of the stricture or by surgery.

Trauma

Apart from the urethra, the urinary tract is likely to be injured only in massive general injury or by accidental ligation (tying) of the ureters in a pelvic operation. The urethra can, however, be ruptured by a blow or fall on the perineum (crotch). If there is no external wound, the damage is indicated by the appearance of a swelling containing blood and urine, by the inability to pass urine, and by bleeding from the urethra. The patient becomes shocked and urgently needs surgical repair of the urethra and drainage of the potentially infected swelling.

Tumour

The occurrence of papillomatous tumours of the renal pelvis has already been mentioned. Similar tumours in the lower urinary tract give rise to painless hematuria. Workers with the chemicals naphthylamine and benzidine have a high incidence of bladder tumours, often multiple and recurrent. Blood in the urine is the most frequent symptom, but bladder irritation with difficulty in urination appears later. Removal when practicable or destruction by diathermy are normal treatments.

Infection of urinary tract

Infection of the urinary tract is a common and important cause of both minor and major illness. At one extreme, an attack of cystitis—inflammation of the bladder—may cause only trivial discomfort; on the other hand, infection once established may cause lifelong discomfort, may be largely unresponsive to treatment, and may greatly shorten life itself. Infection may be with a great variety of organisms, but the most common are those that normally inhabit the bowel, where they are relatively harmless, becoming a cause of disease only when they enter vulnerable tissue. Because of the short female urethra, urinary infections are more common in women than in men and occur especially during pregnancies, when there may be partial stagnation of the urine from pressure on the urinary tract. In later life, as prostatic disease becomes more common, urinary infection becomes more of a problem in men. Another vulnerable period is infancy, when the use of diapers probably facilitates entry of organisms into the urethra. The introduction of a catheter into the bladder may be necessary to relieve urethral obstruction, but since the procedure always carries a risk of introducing infection, it is not lightly undertaken.

In all forms of urinary infection the urine may be cloudy and may contain more ammonia than usual. Urination tends to be painful if the urethra is inflamed, and both painful and frequent if inflammation involves the bladder. Bladder infection may also cause fever, dull pain in the lower part of the abdomen, and vomiting. If the infection reaches the kidneys, symptoms are even more severe, and there is pain in the loins, on one or both sides, and sometimes high fever.

Urinary infection may generally be diagnosed from the symptoms and from laboratory examination of the urine. The treatment is usually the administration of sulfonamides or broad-spectrum antibiotics. The extent to which repeated, or recurrent, urinary tract infection may lead to chronic pyelonephritis (inflammation of the kidney and lining of the renal pelvis) and renal failure remains a controversial issue. It is agreed that, in the presence of obstruction to the flow of urine, urinary infection is prone to ascend the urinary tract and cause intractable infection within the renal pelvis and kidney tissue. Infection can rarely be eradicated by antibiotics until the obstruction is removed or relieved. Although many patients have signs of progressive renal damage they have sterile urine and no signs of infection. Investigations, including direct histological examination of the kidneys, however, reveal that chronic inflammation has been present for many years within and between the renal tubules (interstitial nephritis). Some of these patients admit to excessive and prolonged use of nonsteroidal analgesic drugs such as phenacetin. In others it is possible that urinary tract infection and renal damage began in infancy, possibly encouraged by regurgitation of urine into the ureter and pelvis as a result of an incompetent ureterovesical valve (vesicoureteric reflux). This process not only damages the kidneys directly at an early age but favours the development of infection and leads in later life to the development of kidneys distorted by fibrosis and scar tissue. In any event, pyelonephritis and glomerulonephritis are by far the two most common causes of chronic renal failure sufficiently severe to necessitate dialysis or renal transplantation.

Like other tissues, the excretory system can be involved in tuberculous infection. This is now relatively uncommon and, when it occurs, can often be managed by the general chemotherapy appropriate to tuberculous infection. Advanced renal tuberculosis requiring removal of the kidney rarely occurs.