

# A PHYSIOPATHOLOGICAL BASIS FOR THE DESCRIPTION AND CLASSIFICATION OF BILATERAL RENAL DISEASES\*

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The classification the authors have proposed is based on the physiopathological interpretation of renal disease. The primary consideration is modern knowledge of renal function, quantitative and qualitative, as revealed by clearance methods. It must be realized that, by the renal arteries, one-fifth of the circulatory flow of the

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body passes through the kidneys, i.e. approximately 1 litre of blood every minute; that the blood as a whole is purified in its course through the glomerulus by the passage through its wall of about 130 c.c. of plasma ultra-filtrate; that the glomerular capillary behaves like an ultra-filter, exactly as a systemic capillary; and that a limited quantity of the plasma ultra-filtrate becomes reabsorbed selectively by the tubular cells.

Renal function is mainly circulatory and the tubule is equivalent to an interstitial space, receiving a capillary filtrate absolutely similar to that from systematic capillaries, but differing from the interstitial spaces of other tissues because it is provided with an epithelium attached to the venous capillary, which operates selectively on its contents.

The valuation, in relation to modern physiopathology, of the facts arising out of the functional examination of bilateral renal disease makes it possible to extract the fundamental common factors and points of contact from which, in the opinion of the authors, the most natural description emerges. The classification they suggest is as follows:

#### *Renal Disease due to Arteriolar Disease*

1. Renal disease due to arteriolar disease with chronic manifestations: i.e. essential hypertension
2. Renal disease due to arteriolar disease with acute and subacute manifestations:
  - (a) From malignant hypertension
  - (b) From pan-arteritis nodosa
  - (c) From sclerodermia
  - (d) From thrombo-angiitis obliterans
  - (e) Symmetrical necrosis of the cortex

#### *Renal Disease due to Capillary Disease*

1. Renal disease due to inflammatory capillary disease:
  - (a) Haemorrhagic glomerulonephritis
  - (b) Proteinuric glomerulonephritis
  - (c) Renal amyloidosis
2. Renal disease due to non-inflammatory capillary disease.
  - (a) Diabetic renal disease
  - (b) Renal disease in pregnancy
  - (c) Simple arteriosclerotic renal disease
  - (d) Renal disease due to myeloma

#### *Renal Disease due to Circulatory Insufficiency*

1. Central: kidney of stasis
2. Peripheral: kidney of shock

#### *Toxic Renal Disease*

#### *Interstitial Renal Disease*

#### *Renal Disease due to Idiopathic Tubular Defects*

#### *Renal Disease due to Arteriolar Disease*

Normally the stream of blood to the glomerular tuft, and consequently the pressure which controls the glomerular filtration, are dependent on the tone of the afferent artery. Now the basis of some renal dysfunctions is known to be the functional and organic modification of this first regulator of the renal purifying mechanism, viz. the glomerular afferent; which modification produces an increase of the resistance offered to the intrarenal circulation. This produces a decrease in the outflow of glomerular filtrate and in the purifying activity of the nephron.

This is the common physiopathological characteristic of *renal disease due to arteriolar disease*. The prototype is the renal disease which develops in the course of essential hypertension; then come those respectively determined by malignant hypertension, nodose pan-arteritis, sclerodermia, thrombo-angiitis obliterans and, lastly, symmetrical cortical necrosis, from which the distinction of ischaemic necrosis due to shock is not always easy.

The symptoms of renal insufficiency in the various pathological conditions of arteriolar origin are due to altered haemodynamic conditions arising in the glomerulus and in the arteriolar capillaries which send blood to the tubule; the anatomical and functional state of the glomerular walls remaining fundamentally unchanged.

#### *Renal Disease due to Capillary Disease*

For other renal pathological conditions, on the contrary, the vascular tract fundamentally concerned is the capillary one; from which arises the authors' terminology of *renal disease due to capillary disease*. A lesion in the glomerular part of the renal capillary and the consequent manifestations of altered function determine the fundamental objective characteristics. The capillary membrane of the glomerulus, like that of all systemic capillaries, may be compared to the membrane of an ultra-filter: through it, impelled by an effective filtration-pressure, only molecules of a certain volume can pass, while molecules of a greater volume cannot; amongst the latter being the protein molecules. Now, in renal disease due to capillary disease the objective urinary signs and symptoms are the result of altered function following a lesion of the renal capillary—in its glomerular tract—and a modification of its characteristics of permeability. In proliferation of the glomerular capillary and the consequent thickening of the capillary wall, the amount of plasma filtrate is reduced; this is the common physiopathological characteristic of intracapillary glomerulonephritis. In an inflammatory or other lesion of the basement membrane of the capillary wall, with or without participation of cellular element, there is the passage of plasma protein substances in the primary urine. This happens in proteinuric glomerulonephritis (membranous glomerulonephritis of Bell, nephritis type II of Ellis), in amyloidosis, in renal disease of pregnancy, and in diabetic nephropathy.

Although it is a separate entity because of its *milieu* and its anatomical and functional aspects, renal disease due to myeloma is included in this group, because it is characterized, at least at first, by the passage through the capillary wall of heterogeneous protein substances which is the cause of developments in the tubular sector that are the inevitable outcome of nephropathy.

In the senile kidney, the fundamental disturbance—differing from that in the arteriosclerotic kidney—is found in the thickening of the glomerular wall and therefore in the progressive decrease of its filtering activity.

Substantially, it is on the basis of capillary disease that most of the renal pathological conditions described as interstitial nephritis have their origin. A capillary lesion on an inflammatory or toxic or ischaemic basis is in fact the cause of the haematogenous variety of interstitial nephritis, either in its 'serous' form or in the 'proliferative' form. The increased interstitial pressure thus produced clogs the more delicate structures, viz. the small veins and peritubular capillaries. The picture of the disease, reflecting its basic ischaemia, is consequently characterized by variation in urinary volume.

*Renal Disease due to Ischaemia and Altered Haemodynamic Equilibrium*

Under this heading—in this classification—are grouped: the kidney of congestive cardiac failure and the various nephropathies due to shock—the result of trauma, intravascular haemolysis, grave haemorrhage, and crush. The decrease in the supply of blood to the glomerulus and the tubules, as an indirect consequence of diminishing cardiac output and as a direct consequence of afferent vasoconstriction, is the main factor in the insufficiency found in the disease states mentioned above.

*Toxic Renal Disease*

In the pathogenesis of the renal diseases which are called 'toxic', ischaemia and consequently anoxic lesions of kidney tissue are again amongst the leading factors; this happens in the serous forms, when the massive onset of toxic conditions in the organism

provokes the shock phenomena responsible for immediate death.

Lesions directly produced on the tubular surface by toxic substances filtered through the glomerulus are not considered here.

In the acute ischaemic or toxic forms of renal disease, the chain of events starts outside the kidney and the lesion in the organ is produced secondarily, which is contrary to what happens in the forms due to capillary or arteriolar disease. Therefore, as specifically tubular disease, either in the physiopathological sense or in the clinical sense, only *renal diseases due to idiopathic tubular defects* are considered in the authors' classification, and that means those pathological renal conditions which originally and fundamentally arise from and show themselves in the isolated loss of one or more attributes of tubular function. In this group are included normoglycaemic diabetes, phosphaturia and amino-aciduria.