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(THE GATEWAY TO DISEASE)

BY

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INTRODUCTION

THIS book is admittedly approaching a series of difficult problems, and in so doing is attempting to link a group of syndromes together by postulating a common basis for them all.

The paradoxical position therefore arises that although the suggestions put forward are novel and unorthodox, they are in many cases also tacitly sanctioned by ancient authority.

We are of opinion that although medicine claims to be both a science and an art, at the present time it is more of an art. We appreciate that it is necessary, and fortunately necessary, to have the art of quietening the apprehensions of our patients. We in no way decry the possession of that rare gift, a " good bed-side manner ", but strongly plead for the establishment of medicine as a science.

In a true science there are predictable consequences of given sequences of happenings. In other words, the laws of causality are inviolable once they have been established. In medicine at present there is a great temptation to fall into the error of the ' schoolmen ' of the middle ages. These unfortunates, it will be recalled, read all the available literature in their time, but so uncritical were they, that even when their senses manifestly disproved the truth of the authorities consulted, they still accepted the authorities.

Medicine has made and is making great strides, greater strides than ever before, but there is a host of unsolved problems ever with us. Unfortunately these problems range from the enigma of malignant disease, through a whole range of conditions, right down to the common cold.

Among conditions responsible for vast misery and inefficiency are such apparently diverse states as gastro-intestinal

ulceration, piles, varicose veins, cholecystitis, nephritis, toxæmias of pregnancy, jaundice, ulcerative colitis, and allergy, to name a few.

It is the aim of the authors in this work to attempt to show that there is a common factor in all these conditions. That common factor is a liver which is not functioning efficiently.

We can adduce, for the refreshment of the truly authoritarian, the name applied by the ancients to the portal fissure —namely, *porta malorum*. The literal translation is obvious, " the entry, or gate, of *ills* ". In our opinion this might be more precisely rendered in one of the following ways : " the envenomed gate ", or " the portal by which all noxious things gain access to the body proper ".

It must be clearly recognized that every substance which enters the body can only do so by one or more of three routes : (1) through the alimentary tract ; (2) through the lungs ; or (3) through the skin. Once any substance has really entered the body, it must gain access to the circulation in one way or another.

The circulation of the blood was not understood until the work of Harvey. Great disservice has been done to the understanding of the circulation by the publication in every elementary book, and some advanced books of physiology, of the stylized schema of the twin circulations. In this the unwitting student is left with the impression that there are only capillary beds at the extremities and in the lung fields. It is also responsible for the complete disregard of other vitally important facts about the circulation : (1) It leaves out all mention of the portal circulation ; (2) It fails to emphasize the vulnerability of the integrity of the venous return ; (3) It cannot make clear the vital conception that each functioning organ requires two sets of efferent and afferent vessels. As a corollary to this it cannot show clearly that the afferent

vessels are not always ' arteries ' in structure, and that the efferent vessels do not necessarily convey unaltered blood within their lumina.

We are seeking to emphasize the importance of the venous systems in the production of many imperfectly understood syndromes. It is clearly understood by every elementary student of pathology that in gangrene of the bowel wall it is the obstruction to the *venous return* that leads to increasing and often irreversible signs of local necrosis of the bowel.

It is also hoped that we can explain the diversity of the signs produced by liver damage, and resultant portal hypertension, by understanding that not every patient has identical shunts, or pre-existing communications, between the portal and caval systems, patent at the same time.

The variation in these originates in fœtal life, and is dependent upon the greater or less persistence of pre-existing circulations into later fœtal or adult life. The variation in degree of effect varies with the degree of damage to the liver. When the liver has partially recovered from such damage, then portal hypertension tends to fall and the incidence of toxic signs to diminish.

In our opinion the key to the understanding of many obscure medical and surgical conditions lies in the grasping of the importance of the liver as a detoxicating organ.

We must endeavour to get away from preconceptions, and above all to try to grasp the fact that the body is an entity. It is not a loosely aggregated collection of single organs. There is therefore no disease which will not affect the whole body.

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THE LIVER

CHAPTER I

VASA PRIVATA AND VASA PUBLICA

WITHOUT circulation there is no life, and the converse also applies. The Ancients appreciated this, and Heraklitos pithily expressed it as παντα ῥεῖ.

With the cessation of circulation death at once ensues. All living things, be they men, animals, or plants, are bound by this inescapable law. Circulation develops in stages; the first of these is the vitelline, and the second is the placental. Obliteration of the first stage takes place at the same time as the development of the second. It is, however, important to emphasize that structurally the evolution of each stage is gradual, and that one type of circulation imperceptibly merges into the other. Consequently, opportunities must inevitably arise for remnants of both circulations to persist after the obliteration of any of the pre-existing ones is apparently complete. The placental circulation is fully developed at the end of the third month, but, as the fœtus grows and new organs develop, the circulatory system and its pump, the heart, constantly adapt themselves to the changing conditions. Some vessels are obliterated as others develop.

As we know, lung and liver take over their proper functions post partum. There is no need for them during fœtal life, and they are dormant, as a tree or a hibernating animal in the winter. Although not in use, these organs must be nourished. Nature has solved this problem in an ingenious way, and adapted the vascular tree to the peculiar requirements of life by providing all organs with two pairs of blood-vessels, the first to nourish the tissues proper, and the second to supply blood to the organs during their periods of work. A working muscle needs more blood than

a muscle at rest ; a functioning organ needs a source of blood additional to its requirements when at rest.

During fœtal life lung and liver are not yet in use, therefore the pair of vessels which supplies them when at work, ' the public vessels ', are by-passed. These ' public vessels ' of the lung are the pulmonary artery and pulmonary veins ; the corresponding vessels of the liver are the portal vein and common bile-duct. These names are confusing ; they reveal ignorance of their function on the part of the anatomists who coined them.

The job of the ' public vessels ' of the lung is to provide oxygen for the whole body. They are respiratory vessels, and should be termed vasa respiratoria afferentia and efferentia. This nomenclature, if brought into general use, would avoid the confusing definitions of artery and vein, as a ' vein ' may carry arterial, and an ' artery ' venous blood. The ' private vessels ' of the lung are the so-called bronchial arteries and veins. During fœtal life, the ' public vessels ' are by-passed by the arterial duct of Botallus (ductus arteriosus Botalli). The ' private vessels ' of the liver are the hepatic artery and the hepatic veins. The liver tissue has no detoxication to perform during the fœtal period, but it is supplied with blood by these vessels, which are to be considered as ' private ' vasa afferentia and efferentia. After the liver has begun to function, the ' public ' vasa afferentia and efferentia are concerned with the metabolism of the liver. They were called the *portal vein* and the *common bile-duct* by anatomists who had completely misunderstood their function. The latter is the eliminating vessel of the liver ; it runs parallel to the portal vein. Before birth these vessels are by-passed by the venous duct of Arantius (ductus venosus Arantii).

These by-passes connecting two ' public ' vessels solve the problem of the organs temporarily at rest.

In the heart itself an analogous by-pass, the foramen ovale connecting right and left heart, remains open as long as the pulmonary circulation is not in use. In other organs, such as the intestine, kidneys, brain, skin, etc., arteriovenous anastomoses are widely used for the same purpose. The heart, for example, has its own ' private ' vessels, the vasa coronaria,

and these in turn have their private nutrient vessels, their vasa vasorum. The ' public ' vessels of the heart are the aorta and the caval system. Post-partum respiration and metabolism become permanent functions, therefore the by-passes normally become obliterated. In organs with occasional functions (e.g., the sex-organs), a cycle of intermittent vascular supply is established.

The corpora cavernosa are an essential part of the male reproductive organs. The greater part of their blood-supply is intermittent, dependent on sex activity. This is possible only if the organs are provided with two sets of vessels, one for nutrition, and one for the intermittent sexual activity. Some arteries supply blood directly to the corpora cavernosa without passing through the capillary network of the penis. The intermittent mechanism works by opening the afferent arteries and closing the efferent channels. According to C. Langer's description, part of the arterial blood of the penis passes into the capillary network of the organ (vasa privata). In females the analogous organ of reproduction is the uterus. Is it not likely that Nature has solved the problem of blood-supply to this organ in a similar way ?

A number of vascular phenomena suggest that identical arteriovenous shunts function from puberty to the climacteric ; one of these is utilized in menstruation, in which vascular changes prepare the mucous membranes of the uterus for the nidification of the ovum.

Another phenomenon is known as the first sign of pregnancy ; it consists in venous congestion of the external genitalia, characterized by a dusky hue of the vagina and labia. A third vascular phenomenon is the so-called post-partum involution of the uterus. As we shall explain later, involution is characterized by the obliteration of porto-caval anastomoses, and by the opening of venous channels which drain the organ once more into the caval system. A fourth phenomenon is the climacteric, and for this no plausible current explanation exists. It is characterized by a permanent obliteration of the porto-caval shunts. A similar obliteration of afferent public vessels may be responsible for the climacteric of the male, causing cessation of the corpora cavernosa as erectile organs.

On the other hand, priapism of long duration may be caused by thrombosis of efferent public vessels. Haler has seen a case of priapism of 20 years' duration which must have originated in a thrombosis of the public vessels, and yet there was no degeneration of the essential structure of the organ.

We know that with the cutting of the umbilical cord we suddenly change the whole course of the circulation, not only in the child but in the mother as well. The mother no longer needs to provide oxygen, proteins, carbohydrates, fats, and mineral salts for the child ; neither has she to detoxicate the waste-products of the fœtus as before, and thus her own liver is freed from its additional burdens.

It would be surprising if no readaptation of the mother's vascular tree were to occur ; but occur it does, and the process is called involution of the uterus, the end-result of which is obliteration of porto-caval anastomoses.

To understand these changes better, we shall have to re-adapt Harvey's theory about the general circulation in the light of newer knowledge. We shall have to revise our views about the functioning of the vascular tree, so far studied from a morphological angle only. We need to realize that the vascular tree and its pump are constantly changing from birth to death.

Disease can be defined as life under pathological conditions. Any disorder, dysfunction, or disease results in inadequate adaptations of the vascular tree to the morbid anatomy of the affected organs. Therefore we have to consider obliteration of vessels, dilatation, thromboses, re-canalization of thrombosed vessels, formation of new vessels, death of tissue, or necrotic changes such as scars resulting from thromboses, incompetence of valves, varicosities, dilatation of pre-existing porto-caval anastomoses, and the establishment of new connexions with the portal tree through adhesion of the omentum to organs in danger of becoming necrosed, as particular adaptations of the vascular tree to the conditions of disease. Even diseases of the heart are nothing more than adaptations of the pump to the changed morbid anatomy of organs co-ordinated with its function.

The term '*vasa publica*' *for the pulmonary artery and veins was known to Harvey.* The Dutch anatomist, Ruysch, introduced this term in the seventeenth century. In 1925 Havlicek re-introduced the names 'vasa privata et publica'. A vessel nourishing the tissue proper of an organ is defined as 'vas privatum', and a vessel connected with the function of such an organ as 'vas publicum'. Organs are, as a rule, provided with two pairs of vessels, in all four vessels, two vasa afferentia and two efferentia.

The 'private' vessels of the lung, inaptly termed the bronchial arteries and bronchial veins, are concerned with the nourishment of the lung tissue; a better name would be 'vasa privata pulmonis', since they provide blood not only for the bronchi but for the whole of the organ. It is possible to fill the entire capillary network of the lungs by injecting dyes into the bronchial vessels. It would be unnecessary for two capillary systems to exist in the lung. The blood-pressure for the 'private vessels' of the lung comes from the left side of the circulation, and is controlled by the left side of the heart, whereas the blood-pressure of the 'public vessels' comes from the right side of the circulation, and is controlled by the right side of the heart.

The subdivision of circulation into *nutrient vessels proper* and vessels connected with the function of organs is strictly maintained in all organs; it varies only according to their specific function. Havlicek rightly saw in the hepatic artery and hepatic veins the 'vasa privata afferentia' and 'efferentia'. He considered the portal as *the* 'vas publicum afferens' of the liver, and was of the opinion that the liver is provided with *one public vessel only.* Havlicek's mistake is understandable. The present muddle in the nomenclature of vessels, and in the definitions given by morphologists for arteries and veins, made him overlook the fact that an *efferent public vessel of the liver really exists.* Morphologists have named this vessel the *common bile-duct.* There can be no doubt that the extrahepatic bile-ducts are the efferent vessels of the liver, running together with the intrahepatic portal branches in the liver; the anatomical relations of the two main trunks are analogous to those seen where other vessels run parallel.