ON
DISSEMINATED SUPPURATION OF THE
KIDNEY,

SECONDARY TO CERTAIN CONDITIONS OF URINARY
DISTURBANCE.

BY

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I PROPOSE to describe the peculiar suppurative condition which is sometimes spoken of as the "surgical kidney," and is produced, as I shall presently show, by the contact of unhealthy urine. Of all renal disorders, next to the varieties of albuminuria, it is the most destructive to life. It may almost be said to form the natural termination of stricture of the urethra, and is the especial danger which attends the use of the catheter and lithotrite. The attention which has been directed to this affection, however, is scarcely commensurate with its importance.

The post-mortem appearances, such of them at least as are evident to the naked eye, were well described and depicted by Rayer* under the term pyelo-nephritis. He associated the disease with inflammation of the pelvic mucous membrane, which as he thought produced a similar change in the kidney by extension along the excretory ducts. This view has practically held its ground to the present time. Sir Benjamin Brodie,† who seems to have regarded the disorder in a different

* 'Maladies des Reins,' 1841, vol. iii, p. 241.

† Brodie on 'Diseases of the Urinary Organs,' 1849, edit. 4, p. 145.

light, has described the pathological appearances in these cases with all his wonted accuracy. He speaks of the vascularity of the kidney, of the deposits of yellow lymph and the small abscesses scattered through it, of the offensive mixture of pus and urine in the renal outlets with phosphatic precipitations on the pelvic membrane, and refers to the constant association of these conditions with cystitis; but strangely for so careful an observer he appears to have inverted the morbid relation which we must believe to hold between the kidneys and the urinary receptacles, and regarded the suppurating state of the kidney as the cause instead of the consequence of the vesical disturbance. This view appears to have met with little acceptance. The condition has since been occasionally referred to by practical surgeons, among whom I may mention Mr. Charles Hawkins,* who connects it with the presence in the bladder of decomposed and ammoniacal urine. The process has been generally regarded with Rayer as the spreading of inflammation from the bladder to the kidney by continuity of structure. Dr. Wilks† alone, who has been more precise than other writers, describes this variety of renal suppuration as connected not only with inflammation of the bladder, but with purulent absorption. From the bladder, as he says, "the inflammation extends up the ureter to the pelvis of the kidney; thus an absorption of the purulent elements takes place into the tissue (a more probable process than an extension of the inflammation up the straight tubules), and a suppuration occurs in the cortical part of the organ."

My inquiries, which were made some time ago, though hitherto unpublished, are pathological rather than surgical in their design. Where I trench upon the outskirts of surgery and tread upon ground foreign to my habitual experience I must ask for the indulgence of the surgical Fellows of the Society.

The change usually affects both kidneys, though in rare cases it is limited to one. The pelves are generally more or

* 'Holmes's System of Surgery,' article on "Lithotrity."

† 'Lectures on Pathological Anatomy,' p. 358.

less dilated, and give evidence of inflammatory action in the state of their mucous membrane. This is commonly injected, often thickened, creamy, and suppurating, frequently encrusted with phosphatic salts, and not seldom partially or superficially sloughing. The kidney, if the primary obstruction be, as it generally is, of considerable standing, shows the results of wasting pressure and chronic vascular disturbance. The cortex is thinned, the capsule is thickened, and holds with unnatural tenacity both to the glandular surface and more closely still to the surrounding fat, which itself is often markedly increased, probably in consequence of undue vascular injection around the kidneys. Disseminate renal suppuration may, however, take place without any preceding chronic change, though inflammation or congestion of some part of the urinary mucous membrane, possibly of recent date, appears to be an invariable antecedent.

The glandular condition nearly resembles to the naked eye, and also, as will presently appear in more minute respects, the renal manifestation of general pyæmia. The kidney becomes swollen and full of blood, much of which remains fluid after death, though some vessels contain clot evidently of ante-mortem origin. The tissue is variegated with blotches and streaks of intense injection; it is soft, friable, discoloured, and prone to decomposition.

The cones usually display to the scrutinising eye sharply defined white lines, which start from the tips of the mammillary processes in the pelvic cavity and pass into or through the cones in the direction of their striation. These streaks look like, what indeed they are, distended tubes, and are important witnesses of perverted action. Close to them swollen blood-vessels are often conspicuous.

Next, or possibly without such evidences of chronic change as the swollen tubes give, appear small, softly defined, fawn-coloured patches which streak the cortex from cones to capsule, or take the shape of wedges with the base against the capsule, the point entering the medullary tissue. These are at first scarcely less hard though more friable than the natural substance of the organ. They are surrounded and

intermingled with vascularity. As the disease progresses they become large, irregular, and confluent, soften in their centres into ordinary liquid pus, and finally take the shape of scattered abscesses, varying from mere points up to the size of peas or even larger. These are often thickly sprinkled through the gland, occupying the cones, where they keep more or less of a linear arrangement, and are less regularly but more numerous distributed through the cortex. They appear on the surface sometimes as purple blotches in which suppurative centres can be seen, or as discrete or confluent pustules, often nearly resembling a cutaneous pustular eruption.

With this condition the microscope shows more or less dilatation of the straight tubes, distension or morbid occupation of the associated blood-vessels, and disseminated inter-tubular suppuration, the distribution of which is regulated by the course of the veins.

Passing to detail, and taking the straight tubes first as the parts of the organ first affected, these as they converge upon their outlets are often strikingly dilated apparently from the backward pressure of the retained urine. The dilatation is irregular, widening the cylindrical shape of the tubes or converting them into ovoid, globular or shapeless cavities. They are variously occupied by saline matter, purulent secretion, fibrin, or epithelial growth (see Plate V, figs. 1 and 2). The straight tubes, thus stretched and filled, form the white lines which are evident to the naked eye. The change does not extend to the convoluted tubes, which remain for the most part natural.

The veins, which appear to be next involved in the disease, are generally distended with blood. The straight veins of the cones often display in section a partial distension which is probably the result of coagulation which has occurred during life (see Plate V, fig. 3, and Plate VI, fig 1).

The larger veins of the cortex are often similarly filled, and it sometimes happens that the arteries which pass in companionship with them are likewise permanently occupied (see Plate VI, fig. 2). As a general rule, however, the arteries are natural, as also are the Malpighian vessels.

The venous position of the clot in the condition under consideration differs from the similar result of ordinary pyæmia, in that the obstruction there is essentially arterial.

The third stage of the disease is the scattered suppuration which is the most obvious result of the complicated process. The disseminated abscesses, or regions of cellular infiltration antecedent to abscesses, are intertubular, and have relation to the course of the veins. Cells gather at isolated spots, sometimes obviously accumulated around a minute distended vessel. Occasionally the new formation overspreads considerable districts, insinuating itself more or less evenly between the tubes, its vascular origin being chiefly evinced by its obvious intertubular position (see Plate VI, figs. 3 and 4). The Malpighian bodies remain unaffected by the disease, though the adventitious corpuscular formation often collects abundantly outside them. The convoluted tubes are generally clear, though where they cross the districts of infiltration their epithelium is sometimes superabundant, and sometimes they appear to be encroached upon, or confused by, the cellular formation around them. They are sometimes displaced or compressed.

Taking the structural changes in their mutual relation, the dilatation of the tubular exits, the morbid occupation of the veins, and the general absence of signs of tubal inflammation, the nature of the process is clear.

This disorder has its origin in the regurgitation of urine charged with morbid products. This, forced backwards by the retention general in these cases, distends or occupies the straight ducts. Thence by transudation, or similarly, it enters the neighbouring blood-vessels, and charges them with an infection resembling in its results that of pyæmia. This is distributed by the veins to the rest of the gland, sowing abscesses in their course, and ultimately causing constitutional symptoms analogous to those of pyæmia otherwise derived.

The condition of the kidney may be described as one of pyæmia arising within itself. It has a close general resemblance to that caused by a distant infection, differing from

it in the usual dilatation of the urinary outlets, and in the fact that, while with pyæmia from a remote source the *materies morbi* is necessarily distributed by the arteries, in the condition under discussion it is scattered by the veins into which it was first received.

The disorder in its frequency and fatality has great practical importance. Inflammation of the bladder, or of the pelvis of the kidney, either as antecedent to the change, or associated with it, is so invariably present as to give a seeming warrant to the old view which regarded the disease as a mere extension by contiguity of inflammation beginning in the urinary cavities. The nature of the organic change, however, plainly declares its origin, not in the mere creeping of inflammation from membrane to gland, but in the absorption of morbid matter. Of this the urine is obviously either the source or the vehicle. It remains to inquire whence and in what circumstances the poison is engendered.

To help in answering these questions I have collected the particulars of 69 cases of the disease from the post-mortem books of St. George's Hospital. The following table shows the urinary disease upon which the suppurative condition of kidney followed.

*Disease antecedent to disseminated suppuration of kidney
in 69 cases.*

Obstacle to escape of urine.	{	Stricture of urethra	...	...	19
		Disease of prostate, enlargement, tumour, or abscess	...	...	12
Loss of expulsive power.	{	Paralysis of bladder from fracture of spine	...	...	5
		" " disease	"	...	3
		" " " of cord	...	...	4
		" " " of brain	...	...	3
		" " consequent upon exhaus- tion from disease or accident	...	...	2
Vesical calculus.	{	Stone in bladder, no operation	...	...	6
		" " lithotritry	...	...	6
		" " lithotomy	...	...	3
Cystitis from other causes.	{	Cystitis from vesical growths, &c.	...	...	3
		" unexplained	...	...	1
		" from discharge of lumbar abscess into bladder	...	...	1
Complicated.—Stone in kidney, with enlarged prostate		...	...	...	1

I have next classified the descriptions of the urine in each case. The state of this secretion was noted in 47 of the number, in the following terms :

State of the urine in 47 of the cases previously referred to.

Reaction stated.	{ Ammoniacal or foetid, and mixed with various products of vesical inflammation ...	21
	{ Ammoniacal	1
	{ Alkaline and turbid, or containing mucus ...	3
	{ Alkaline, bloody, and purulent ...	1
	{ Alkaline or "phosphatic"	3
Reaction not stated.	{ Ropy, containing mucus, pus, and blood ...	1
	{ Containing mucus and pus	1
	{ Purulent and bloody	4
	{ Purulent	6
	{ Bloody	4
	{ Albuminous and turbid, or purulent ...	2
		<hr/> 47

Looking first at the urine as directly connected with the origin of the disease it appears that three conditions of this secretion usually concur—retention, ammoniacal decomposition, and admixture with the products of mucous inflammation. Of these an essential circumstance appears to be ammoniacal decomposition, which retention may induce and cystitis either precede or follow. The urine was generally foetid and more or less mixed with vesical products, pus, mucus, and blood. There is reason to believe that it was invariably ammoniacal. Wherever the reaction was stated it was persistently alkaline except in one instance. In this exceptional case the secretion was alkaline when the inception of the disease was declared by rigors, then for a short time acid, and alkaline again before death.

In the cases, comparatively few, in which the reaction was not stated, the condition of retention or the state of the urinary mucous membrane was generally such as to point unmistakably to ammoniacal change. The simple presence of pus or mucus in the urine, though lasting for years, does not appear to set up the renal disorder so long as the urine retains its acidity and resists putrefaction.

I have myself known no instance in which the mischief has arisen except in connection with ammoniacal urine.

On this point I appeal to the more ample experience of the surgical fellows of the society.

The ammoniacal change, however, though it may arise independently of mucous inflammation, produces it so constantly that the origin of the disease is always thus complicated. Sometimes, as with stone, the inflammation of the bladder has led to the change in the urine; sometimes, as in cases of paralysis, the change in the urine has caused the inflammation of the bladder. Whichever comes first, so long as the necessary foulness of the urine is attained, a condition which is promoted by the admixture of diseased vesical secretion, the renal suppuration may follow. Whether primary or secondary the inflammation of the urinary mucous membrane is invariable. This is usually of the bladder, though the renal change has been known to follow inflammation and retention confined to the pelvis caused by a stone situate in that cavity.

Passing from the state of the urine to its clinical antecedents they may generally be stated to be of three kinds: obstacles to the escape of the urine, loss of expulsive power, and vesical or very rarely pelvic irritation.

Stricture of the urethra is of all causes the most common, giving rise as it does to the needful urinary putrefaction, and in its chronic form ensuring the dilatation of the glandular exits which makes them ready recipients of the poison.

Enlargement of the prostate, scarcely less common as a cause of the disease, acts in the same way.

Next in order of frequency to such impediments come the diseases and injuries of the nervous system by which the expulsive power of the bladder is destroyed. These, giving rise to retention and decomposition of urine, and its contamination by the products of vesical inflammation, cause changes in the same sequence as those which arise from stricture, but more rapid in progress. The loss of vesical innervation in these cases hastens the disorganisation of the mucous membrane, which gives the extreme foulness to the urine observed in such circumstances, and sets up early and severe renal mischief. Similar symptoms may follow from

cerebral disease, and occasionally from the general prostration which follows from disease or accident not directly connected with the nervous system.

Lastly, severe vesical irritation, though unconnected with retention, may cause the same results. The disorder was traced to stone in the bladder in 15 of the 69 cases previously referred to. Though differently begun a similarly putrescent state of urine to that of retention is here in the end produced, contamination by mucous discharges which promote decomposition being apparently the incipient evil. Putrescence appears to be always present. In connection with the frequent origin of the renal suppuration from vesical stone its extreme rarity as a consequence of stone in the kidney is worth remarking. The difference probably lies in the less putrefactive tendency of the discharges from the pelvic membrane or of the urine in this cavity.

As giving a deadly finish to the several causes to which the disorder has been ascribed, it is a matter of common experience that it has often been apparently lighted up in cases otherwise so tending, by catheterisation, lithotrity, and other mechanical procedures. The fact that the disorder is stigmatised as the "surgical kidney" bears witness to this liability. But, although the discredit to surgery involved in the term is not entirely without foundation, yet it would seem that this form of renal suppuration would be better distinguished by the term *uriseptic*, which would declare its general clinical relations more comprehensively.

Linking the secondary renal mischief with ammoniacal or putrid urine, and having regard to recent researches which have connected the lower kinds of organic life with pyæmia,* it is worth noting that the condition of urine which causes the disease now in question is one in which vibriones and bacteria abound; but considering the different circumstances in which such organisms appear it would be unsafe to draw any inference as to the nature of the virus beyond the broad fact that it is associated with, and apparently dependent upon, decomposition of urine.

* Dr. Sanderson, 'Pathological Transactions,' vol. xxiii, p. 303.

The frequency of the disease after the introduction of instruments may lead to a surmise—but in the present state of our knowledge to nothing more than a surmise—that the essential virus is capable of being conveyed into the bladder by their means.

In connection with the pathology of the disease I may briefly sketch the symptoms, drawing chiefly from the cases to which I have already alluded. The disorder, particularly when the abscesses, as is too often the case, are widely disseminated, runs a rapid and fatal course. The patient generally dies within three weeks of the first symptom, sometimes within a few days. In 14 cases in which the dates and symptoms were carefully recorded in the hospital books the duration of the complaint varied from two to eighteen days. As an example of its rapid course I may refer to an old woman who was brought into the hospital with a simple fracture of the thigh. Two days after the accident she became unable to pass water. A catheter was used, and the urine found to be natural. It then quickly became offensive and loaded with mucus, and death occurred within a week of the accident, three days after the urine changed its character. Small purulent deposits were scattered through both kidneys.

The course of the disease resembles that of pyæmia, differing from it in the usual exemption of other organs from the suppurative process. The symptoms are general rather than local; they point to contaminated blood rather than to disturbance of glandular function. Pain in the loins, however, sometimes occurs; and often the urine is much diminished, or even for a time nearly suppressed. Shivering happens early and is apt to be repeated. Febrile symptoms rapidly follow with typhoid prostration. The pulse becomes rapid and feeble, the tongue dry and brown, the appetite absent. Vomiting is a frequent and often an urgent symptom. Not seldom hiccough occurs, and sometimes diarrhœa or profuse sweating. The countenance becomes anxious and haggard, the complexion cadaverous or yellow, and possibly with low delirium, the patient sinks into utter prostration, unconsciousness, and death.

Erysipelas is an occasional complication, as also is a condition of pulmonary congestion or œdema short of that which results in pyæmic deposits.

Dropsy is uniformly absent.

The disease is not always fatal. In examining the bodies of persons who have long suffered from disease of the urinary organs it occasionally happens that there are found upon the kidneys obvious scars, often much pigmented, in place and dimension such that they may fairly be attributed to ancient abscesses. Dr. Wilks tells me that he has made the same observation, and a case of the sort was related by Dr. Moxon in the last volume of the 'Pathological Transactions.'

As complicating the less rapid forms of the disorder must be mentioned perinephritic abscess. This results from perforation of the capsule of the kidney by a superficial pustule and its discharge into the areolar tissue.

In a body recently examined at St. George's Hospital a pint of pus lay outside the suppurating kidney; and preparations in the museum of St. Mary's Hospital illustrate a case in which a vast collection of pus reaching from the diaphragm to the groin, pushing forward the bowels and infiltrating the lumbar muscles, had the same origin.

In the treatment of the disease it is sufficiently clear that our efforts must be directed rather to prevention than cure, and to this end, beyond cautious surgery, measures of two kinds suggest themselves. The first is the preservation or restoration of the acid reaction and consequent chemical stability of the urine; the next is the use of antiseptics. When the urine has become ammoniacal it is difficult to restore its acidity by medicine. I have been more successful in doing so with mineral acids than with vegetable; and with sulphuric acid more than with nitric or hydrochloric. I have had no experience of the introduction of carbolic acid or other antiseptics by injection into the bladder, but the pathology of the disease is suggestive of such experiments.

To sum up: the form of renal suppuration, which may be termed urisepptic, has its origin in ammoniacal and putrid urine, poison from which is conveyed by the veins into the

substance of the kidney, and thence infects the system; causing symptoms which are characteristic of blood disorder rather than of change limited to the kidney, and resemble those of pyæmia excepting in the respect that organs other than the kidney seldom share in the suppurative process. As this diseased condition, though not necessarily fatal, is, when developed, little obedient to medicine, our efforts must be directed towards the correction of the state of urine from which it springs.

DESCRIPTION OF PLATES V & VI.

PLATE V.

FIG. 1.—Enormous dilatation of straight tubes, some of which contain fibrinous plugs. Longitudinal sections. The lower outline (fig. 1 *a*) gives the size of the tubes in health. Abscesses after lithotripsy.

FIG. 2.—Enormous dilatation of straight tubes as seen in transverse sections. The sketch (fig. 2 *a*) represents a similar section (identically prepared and magnified) from a healthy kidney. Abscesses after lithotripsy.

FIG. 3.—Obstructed veins among straight tubes, from a case of scattered renal abscesses after lithotripsy.

PLATE VI.

FIG. 1.—Accumulation of corpuscles, preparatory to the formation of an abscess around an obstructed vein in cone.

FIG. 2.—Coagulum in a vein and not in its companion artery. From a case of scattered renal abscesses after lithotripsy.

FIG. 3.—Matrix of kidney swollen by enormous production of corpuscles antecedent to abscess. The condition was circumscribed.

FIG. 4.—Ditto. The same tissue from a part of the organ which remained unaffected.

Fig. 1.

Fig. 1.(a)

Fig. 2(a)

Fig. 2.

(x 60 diameters)

Fig. 3.

Mintern Bros. imp.

Fig. 1.
(x 225 diameters.)

Fig. 2. (x 20 diameters.)

Fig. 4.
(x 225 diameters.)

Fig. 3.
(x 225 diameters.)