The septic type of chronic urinary septicemia is the grave condition that precedes the fatal termination of any chronic retention and suppuration in the bladder or kidneys. It may last for years, or death may close the scene within a few weeks of its onset. While the mildness of its symptoms may at first contrast vividly with those of urethral chill or acute urethral septicemia, it is in still more marked contrast to them, in that it always terminates fatally if left to itself. The approach of the fatal issue is betokened by accentuation of the polyuria and buccal dysphagia, and by the appearance of vomiting, hiccough, and diarrhea.

Treatment.—The treatment of urethral chill has already been described. The *prophylaxis* of urinary septicemia consists in the relief of retention and the prevention of inflammation.

The *curative treatment* of urinary septicemia, in whatever form, is conducted along the same general lines. Retention and suppuration are to be relieved by drainage (catheterization, urethrotomy, cystotomy, or nephrotomy), irrigation, and the administration of urinary antiseptics (pp. 371, 373), while the patient's vitality is reenforced by rest in bed and stimulants, his toxemia combated by diuresis, catharsis, and diaphoresis, and his symptoms appropriately relieved. Urotropin (or salol), diuretic waters, saline infusion, saline cathartics, nitroglycerin, and strychnin form the basis of treatment, while drainage is afforded according to the requirements of the case.

It is impossible to particularize beyond this. The treatment is reviewed in general elsewhere (p. 367), and the particular methods by which drainage should be obtained are discussed under the various appropriate sections. This much may be said, however, that, while the existence of urinary septicemia is evidence of retention and absorption of bacterial toxins through the kidneys, the retention to which the infection is attributable often occurs in the urethra or prostate, and hence, to relieve renal retention and suppuration in such cases, it is the bladder, and not the kidney, that must be drained.

CHAPTER XXXIX

SPECIAL SYMPTOMS, DIAGNOSIS, AND TREATMENT OF SURGICAL INFLAMMATIONS OF THE KIDNEY

SYMPTOMS AND DIAGNOSIS

Acute Catarrhal Pyelo-nephritis.—This inflammation is characterized by total bacteriuria, fever, and a few local symptoms. It seems to be caused solely by the bacillus coli communis and the typhoid bacillus. It occurs during pregnancy or in the course of a typhoid fever. It may also be the first stage of many ascending renal infections.

It is an ephemeral inflammation. I have known it to begin with repeated chills and a sharp rise of temperature, though it may commence less acutely. In the few cases I have seen the temperature ran a septic course, low in the morning, high in the evening, and was associated with little prostration and no evidence of urinary toxemia or septicemia. After a few days the temperature runs lower, and becomes normal between the fourth and the fourteenth day.

Meanwhile the local symptoms amount to nothing more than a slight ache and tenderness in the loins. The urine, however, shows a characteristic acid total bacteriuria (p. 363) and contains albumin and casts.

As the acute inflammation subsides, it is possible for the infection to be overcome spontaneously and for the kidneys to return to their normal state. Otherwise chronic catarrhal or suppurative pyelo-nephritis supervenes.

Diagnosis.—Acute catarrhal pyelo-nephritis is not an uncommon inflammation, but practically it is always overlooked. When it occurs in the course of a pregnancy the obstetrician recognises the albuminuria, but pays no attention to the bacteriuria. If the fever is low it is overlooked, if high it is misinterpreted. The inflammation soon becomes chronic, and so continues indefinitely, or disappears without any diagnosis or treatment other than that of puerperal nephritis.

The acute catarrhal pyelo-nephritis of typhoid fever is also misinterpreted. Whatever rise of temperature or albuminuria it causes is attributed to the enteric inflammation, and the bacteriuria is treated and cured without any clear recognition of the nature of the lesion.

Acute catarrhal pyelo-nephritis occurring in the course of a cystitis is still more obscure. The urinary evidences of cystitis overshadow the renal bacteriuria, and the general and local symptoms are not sufficiently definite for a diagnosis. Hence the renal inflammation is overlooked until the cystitis is controlled and the pyelo-nephritis has become chronic.

To diagnose acute pyelo-nephritis it is only necessary to distinguish the symptom-complex of bacteriuria, albuminuria, and fever. This can often be done in the puerperal cases, sometimes in the typhoidal cases, and rarely in the cases of ascending infection.

Chronic Catarrhal Pyelo-nephritis.—The symptoms of chronic catarrhal pyelo-nephritis are acid renal bacteriuria (p. 363) and urinary toxemia. In the earlier stages of the disease bacteriuria is the only symptom, but as the renal sclerosis alvances the evidences of kidney insufficiency gradually appear. There are no local symptoms.

I suspect that chronic catarrhal pyelitis always begins acutely or remains as the last trace of a suppurative inflammation of the kidneys. Yet I have encountered many cases that gave no history of either origin. The inflammation is habitually encountered as the result of stricture or of prostatic hypertrophy. In many such cases the cystitis may be conquered, leaving the patient with no evidence of disease other than the passage of acid bacterial urine containing casts, a mere trace of albumin, and a few pus, blood, or epithelial cells. Less frequently a chronic catarrhal pyelitis persists after pregnancy or typhoid fever. In other cases the catarrhal pyelitis originates as a suppurative inflammation. After the kidneys have been thoroughly emptied of pus, an acid renal bacteriuria still persists.

The course of the inflammation is much the same whatever its origin. It may resolve spontaneously or under treatment during the first months. The typhoid cases usually resolve, while those originating from a retention cystitis or from suppurative pyelo-nephritis very rarely do. More often it continues indefinitely. At first it gives no subjective symptoms. Unless the patient's attention is called to his urine by its haziness or its odour, he is quite unconscious that there is anything wrong with him. But the interstitial sclerosis progresses slowly as the months and years go by and the renal parenchyma is slowly destroyed, so that the patient passes into a condition of chronic interstitial nephritis.

As the vital forces weaken nocturnal polyuria occurs, while the quantity of albumin in the urine remains slight. There may be occasional hematuria. The heart undergoes compensatory hypertrophy, and general arterio-sclerosis is likely to ensue. The digestion is not good. Constipation is the rule. Edema does not often appear. In short, there is renal insufficiency and the patient suffers from urinary toxemia. While he would not style himself actually ill, he is obviously not well. He has an unhealthy look, an impaired digestion, a poor circulation, and damaged kidneys. He may still be able to endure hard work and severe mental strain, but sooner or later he is smitten down. A slight cold brings on pneumonia, edema of the lungs or acute congestion of the kidneys, with suppression of urine; an excessive exertion or emotion induces apoplexy. Or, if he is more fortunate, his eyesight fails, and the ophthalmoscope reveals the origin of his troubles, or a chance examination for life insurance discloses the urinary conditions. Such is one side of the picture—what might be termed its medical aspect. It is that of chronic interstitial nephritis from whatever cause.

In many instances, however, the surgical conditions overshadow the interstitial nephritis. Perhaps the retention of prostate or stricture has never been relieved, or perhaps it recurs; perhaps the suppurative nephritis has left pockets in the pelvis of the kidney that invite a local retention; perhaps stone forms. From one or other of these causes there is an ever-present possibility that suppurative pyelo-nephritis may ensue. Hence the treatment is directed almost as much against this mishap as towards curing the disease.

Diagnosis.—The diagnosis of chronic catarrhal pyelo-nephritis is the diagnosis of bacteriuria and of chronic interstitial nephritis. Both diagnoses are essential to appreciate and treat the case. If it has originated in a chronic cystitis, the surgeon is peculiarly prone to neglect the kidneys and to torture the bladder with syringes, cystoscopes, sounds, and section in vain efforts to check an inflammation that is in the pelvis of the kidney. A careful urinary examination (p. 365) will set him right, and on this alone he must depend.

On the other hand, the general practitioner will be quick enough to appreciate the renal aspect of the case, but, through neglect to note the obvious haze in the urine, he overlooks the bacterial cause, and all his medical treatment avails nothing. The diagnosis of chronic catarrhal pyelo-nephritis is simple enough, if one only suspects its existence.

Suppurative Pyelo-nephritis.—Suppurative pyelo-nephritis is caused by stone, tubercle, injury or abscess of the kidney, or by ascending infection from the bladder. Suppuration from the first three causes is usually confined at first to one kidney; but ascending infection attacks the two kidneys simultaneously, and it is this form of the inflammation that concerns us here.

Ascending suppurative pyelo-nephritis has been termed *the surgical kidney*, and such it is in every sense. It is a surgical disease; it demands surgical treatment; it is caused, often enough, by the careless surgical treatment of retention cystitis.

The *lesions* of surgical kidney are commonly bilateral, but the suppuration is almost always more severe in one kidney than in the other.

The course of the disease may be acute or chronic.

Acute Cases.—The symptoms of *acute suppurative pyelo-nephritis* are urinary septicemia, pyuria, and local evidences of abscess. The infection of the kidney is announced by a chill, perhaps by a succession of chills. The temperature rises abruptly and runs a septic course. Already worn out by a severe cystitis, the patient is greatly prostrated. At this time there may be no urinary evidences of the renal infection, for the pus may be pent up in the kidney or its pelvis. But there pain and tenderness to pressure over the kidney exist—a tenderness best elicited by Guyon's ballottement—though bimanual examination reveals little or no enlargement of the organ. The tumour and septicemia increase day by day, and the patient may succumb to the infection or pass into what might be termed the second stage of the disease. The abscess bursts. Exceptionally it bursts into the perirenal tissue and gives only temporary relief; habitually it bursts or overflows into the pelvis of the kidney and down the ureter. The aspect of the case is immediately altered. The urine is loaded with renal pus; pain, tenderness, and tumour disappear from the loin, or at least perceptibly diminish, and the septicemia abates. If the patient is able to rally, his condition greatly improves and the inflammation becomes catarrhal, or the abscess refills and the suppuration becomes chronic.

Chronic Cases.—The symptoms of *chronic suppurative pyelo-nephritis* are general, local, and urinary. There is urinary septicemia, renal pyuria, intermittent or continuous, pain, tenderness, and tumour of the affected organ. The symptoms habitually run a remittent course. While the pus is draining well the fever is low, the local signs obscure, the urine full of pus. As the abscess fills up the general and local symptoms become more marked, while the pus disappears from the urine. So definite may be this association of symptoms that the patient himself learns that when his urine is foul and muddy he feels far better than when it is comparatively clear.

In other cases the course of the disease is more steady. The collection of pus in the kidney drains badly. There is little variation in the general, local, and urinary symptoms. Such cases may pursue one of several courses.

1. *The symptoms are all referable to the bladder.* It may be that a severe cystitis obscures the symptoms of pyelo-nephritis; but more often it is the symptoms of the pyelo-nephritis itself that are referred to the bladder. It is a singular fact that suppuration in the kidney—and this is especially true of calculous pyelo-nephritis—may cause the most torturing tenesmus in the bladder without any pain in the loin. The association of pyuria and dysuria encourages the surgeon in his treatment of the bladder, while he neglects a suppurating kidney that may fill the whole loin. The records of innumerable futile cystotomies attest this fact, and the only way to avoid such a mistake is by a careful urinary examination. Renal pus will be found in quantity, or else there will be a suggestive bacteriuria, albuminuria, and cylindruria. Following up this suggestion, the surgeon will obtain unmistakable confirmatory evidence from the tongue, the temperature, and an examination of the loin.

2. In other cases the *local symptoms in the loin* attract the patient's notice. The *tumour* may not be so large as to compel his attention; but the *pain* may be marked. It varies from a slight soreness and tenderness to the excruciating agony of renal colic. These painful types of the disease commonly occur in calculous cases (p. 589).

3. *Dyspeptic and septic cases,* in which the symptoms of urinary septicemia (p. 563) predominate, are often obscure, especially if the kidney is not notably enlarged or tender. Yet here again a careful urinary examination will disclose evidences of renal inflammation.

The inflammation runs one or other of the above courses for weeks, months, or years before it *terminates.* It may end in resolution. The foci of renal suppuration are effectively drained, and there is no further accumulation of pus. In the process of cure the inflammation passes through a catarrhal stage that may be prolonged indefinitely. The kidney does not recover from its sclerosis unless by hypertrophy of its remaining parenchyma cells.

On the other hand, the patient may die of sepsis or of suppression of urine. The fatal event may be hastened by extension of the inflammation to the perinephritic tissue, or by recurrent pyonephrosis from ureteral obstruction.

Diagnosis.—The most important suggestions as to diagnosis have been made in the preceding paragraphs. Whether the symptoms assume a vesical, dyspeptic, or septic type, the urine affords ample evidence of the involvement of the kidney. But, given a suppuration in the kidney, it may be extremely difficult to distinguish between the simple, the calculous, and the tubercular forms of suppurative pyelo-nephritis. The history is of some value in this regard, and so are the X-rays (p. 590), while exploratory nephrotomy is a perfectly legitimate means of determining the question and treating the condition found. I have on several occasions been able to discover which kidney was the source of pus by cystoscopy, which revealed a congested ureteral orifice emitting cloudy urine.

Pyonephrosis.—Pyonephrosis is not a primary condition. It may develop from suppurative pyelo-nephritis (whether simple, calculous, or tubercular) by occlusion of the ureter, or from hydronephrosis by infection of the contents of the sac. Like hydronephrosis, pyonephrosis may be fixed or intermittent. It is usually the former; yet, however intermittent the pyonephrosis, it does not (with the rarest exceptions) empty itself completely.

The symptoms of pyonephrosis may best be expressed by comparison with those of pyelo-nephritis. They are more severe in almost every respect. The symptoms of pyonephrosis are habitually constant, not remittent. There is grave chronic urinary septicemia with considerable fever. The pains, vesical or renal, like those of pyelo-nephritis, may be of any intensity; but the tumour is marked. The kidney is much enlarged; it may be enormously dilated. If the ureter is entirely shut off the urine offers no indication of the renal condition. If not entirely occluded, pus and bacteria appear as in pyelo-nephritis.

The striking features of pyonephrosis are the lumbar tumour and the septic condition of the patient. The lumbar tumour may be felt by almost any method of palpation; indeed, it may often be seen. The urinary septicemia is always marked.

The outcome of the disease is death by sepsis or suppression, or rupture into the ureter, into a neighbouring viscus, or into the perinephritic fat. Exceptionally the contents of a pyonephrotic sac undergo a sort of caseation and become aseptic, so that the urinary septicemia disappears while the renal tumour remains. A cure may result if the sac empties into the ureter.

Diagnosis.—Pyonephrosis is diagnosed from hydronephrosis by the presence of urinary septicemia. It is not always possible nor is it necessary to distinguish between a small pyonephrosis and a pyelo-nephritis. The distinctions between the pyonephrotic tumour and other abdominal growths are discussed elsewhere (p. 624).

Abscess of the Kidney.—Many cases that we clinically classify as pyelo-nephritis and pyonephrosis the pathologist might justly term abscess of the kidney. But there is a marked clinical distinction between suppuration of kidney and pelvis together and suppuration confined—for the time, at least—to the substance of the kidney.

Suppurative nephritis without pyelitis is rare. It is usually unilateral, and due to a descending infection. It occurs most commonly in the course of a pyemia, less frequently as the result of embolism, or as a complication of any severe constitutional infection. It may result from wounds or contusions of the kidney.

The course of the disease may be either acute or chronic. Abscess of the kidney occurring during any severe infectious disease may not add any definite symptoms to those already existing, and may only be discovered post mortem. Indeed, it may be difficult to make a diagnosis even when there are no overshadowing symptoms. There is hectic fever and evidence of suppuration somewhere in the body, *but there is neither renal tumour nor any urinary evidence of renal suppuration.* The disease runs its course as an obscure internal suppuration. There may chance to be tenderness to ballottement, or a history of injury to the loin to guide the surgeon. But in the absence of these signs he may remain in complete ignorance, unless enlightened by the appearance of lumbar pain, tenderness or tumour, or by the rupture of the abscess into the pelvis of the kidney or into the perinephritic tisuse.

The prognosis is bad. Renal suppuration lessens the prospects of recovery from pyemia. If the abscess bursts into the perirenal tissues, perinephritis ensues; if it opens into the pelvis of the kidney the suppuration becomes pyelo-nephritic. Morris believes that "in some cases it is pretty certain that the contents of the abscess, instead of escaping in any of the directions mentioned, become inspissated and remain quiescent for the rest of life."

Diagnostic Table

I have classified the chief distinguishing features of chronic cystitis and the various forms of surgical renal inflammations in the appended diagnostic table.

	Chronic cystitis.	Catarrhal pyelo-nephritis.	Suppurative pyelo-nephritis.	Pyonephrosis.	Kidney abscess.
Appearance of urine	Bladder pus.	Bacteriuria.	Renal pus.	Usually no pus.	No pus.
Reaction of urine ..	Usually alkaline.	Acid.	Usually acid.	.....	.....
Albumin	From pus or blood.	Present.	Present.	Usually.	Usually.
Casts.....	Absent.	Present.	Present.	Usually.	Usually.
Bladder symptoms .	Present.	Absent.	Sometimes.	Sometimes.	.....
Renal symptoms...	Absent.	Usually none.	Pain, tenderness, tumour.	Large tumour, pain, tenderness.	Indefinite.
Urinary toxemia...	Absent.	In later stages.	Present.	Present.	.....
Urinary septicemia.	Absent.	Absent, unless acute.	Present.	Present.	Present.

PROGNOSIS

As to prognosis, the various surgical inflammations of the kidney have been dealt with separately. Dealing with them collectively we may say that the prognosis depends upon the damage done to the kidney tissue (*a*) by the bacterial inflammation, and (*b*) by the interstitial nephritis. When an acute catarrhal pyelo-nephritis is cured, the casts and albumin disappear from the urine after a few months, and no sign of the inflammation remains. With chronic catarrhal pyelo-nephritis the case is different. While this inflammation does not directly threaten life, and while the bacteria may usually be driven from the kidney by a prolonged course of suitable treatment, the interstitial sclerosis remains, and the kidneys never return to a normal state. Whether this sclerosis continues stationary after its bacterial cause has been eliminated, or whether it progresses slowly after the fashion of the medical chronic interstitial nephritis, I cannot say.

When there is actual suppuration in the kidney substance, whether the condition be a suppurating pyelo-nephritis, a pyonephrosis, or an abscess of the kidney substance, the prospect is still less encouraging. The patient often escapes with his life, and the suppuration may be controlled by appropriate measures, but in many instances the resultant catarrhal pyelo-nephritis cannot be entirely conquered; and even if it is, the kidney is always left badly scarred. But one of the most striking features of renal pathology is compensatory hypertrophy of the kidney. Not only will one kidney do the work of two after nephrectomy, but the merest shell of a kidney, the dense fibrous sac of a pyonephrosis in which the naked eye detects no secreting structure whatever, is still a functionating organ. Its power of excreting solids may be much diminished, but its capacity for transmitting water is practically unimpaired; and it is still a useful organ, one that should be spared to the patient if the inflammation in it can be cured.

The prognosis as regards life and death depends chiefly upon the treatment.

TREATMENT

Prophylaxis.—All ascending infection of the kidney may be prevented by prompt and efficient treatment of the cause of retention, be it stricture, prostate, or what not. Descending infections do not so readily lend themselves to prophylaxis; yet it is often possible to nip acute puerperal or typhoid pyelo-nephritis in the bud, if the possibility of this renal infection is borne in mind. The operative prevention of calculous pyelo-nephritis does not concern us here.

The condition of the bowels is of the utmost importance in the prevention of infection of the kidneys. The bacillus coli is the infective agent in almost every case of descending renal infection. This bacillus reaches the general circulation from the intestine only when the bowels are constipated or otherwise diseased, and is excreted from the general circulation through the kidneys. Hence as long as the regular daily movements of the bowels are uninterrupted there appears to be little danger of spontaneous infection. It is intestinal stagnation that applies the spark.

Hence renal inflammations are preventable in two ways: The retention that prepares the kidney for infection and the intestinal stagnation that supplies the infectious agent may both be prevented.

Curative Treatment.—The inflamed kidney may be considered an abscess cavity. What it requires is drainage and irrigation with an antiseptic fluid.

Drainage.—The kidney affected by *catarrhal pyelo-nephritis* is habitually normal in shape and size. There is no abscess cavity in its parenchyma, no pouch in its pelvis; yet as a rule it is not properly drained. The outflow of urine is impeded by stricture, hypertrophied prostate, pelvic tumour, peritoneal adhesions, or pregnant uterus. In order to establish proper drainage this retention, whatever its nature, must be relieved. Without this it is quite impossible to relieve the renal inflammation (p. 380).

Suppurative pyelo-nephritis (not calculous or tubercular) may sometimes be relieved by the same indirect method of drainage that applies to catarrhal inflammations. Thus a surgical kidney due to cystitis from prostatic retention may usually be cured by draining