

medicinal effect upon the inflamed surfaces of the urinary tract. But, after all, water is the diluent upon which we depend most.

Diluent Waters.—There are waters and waters. Some are diluent and some not, entirely apart from their chemical ingredients. The general test which may be applied to any given water consists in drinking it freely and noting whether it lies heavy on the stomach. The water that can be drunk in greatest quantity without overloading the stomach is in practice the best diluent. Thus rain water is more diluent than well water, as a rule; still water more than charged water; alkaline more than acid water. Yet, quite apart from these broad properties, some waters are more diluent than others, quite as gin is more diluent than brandy, and beer more diuretic to some persons than to others, and for reasons equally obscure. For ordinary dilution of the urine, such as is a part of the treatment of every one of the inflammations in question, rain water or re-aerated (not charged) distilled water suffices, if drunk freely up to 3 or 4 pints a day. For more marked dilution, such as is useful in the treatment of bacteriuria and pyelo-nephritis, Poland water, or any of the alkaline or lithia waters may be employed. In some cases, notably in acute or severe pyelo-nephritis, in obstinate bacteriuria, and in partial or total suppression of urine, post-operative or other, the greatest possible diuresis is required. Apart from drugs, such as potassium acetate, urotropin, etc., the best means I have found of overcoming these conditions is the use of Suwannee water. This water is more diluent than any other with which I am familiar. Like all mineral waters it is most efficient at its own spring, where as much as 5 gallons have been drunk in a day by one man. Stafford water is said to be equally good.

RADICAL TREATMENT

The radical treatment of any inflammation of the urinary organs is the removal of that predisposing retention, irritation, or congestion, which gives the bacteria their opportunity to attack the tissues. This implies special treatment for each special disorder. At the same time the palliative measures must be applied in order to help allay the inflammation. The cure of an inflammation by palliative measures alone, without recourse to radical treatment, is too often only temporizing with the main issue.

CHAPTER XXV

CYSTITIS

Classifications.—The inflammations of the bladder are reducible to a very small number of clinical types, though each of these types has many variations. Authorities differ so widely in their classifications of cystites that an accepted classification can hardly be said to exist. The following simple scheme will suffice for our purposes:

Non-bacterial Cystitis	{	Traumatic.
		Chemical.
Bacterial Cystitis: Simple	{	Acute.
		Chronic { Acid.
		Alkaline.
Tubercular Cystitis		Interstitial.
		Pericystitis.

The non-bacterial cases will be dismissed briefly. Tubercular cystitis is considered in a subsequent chapter.

NON-BACTERIAL CYSTITIS

Non-bacterial cystitis is the natural reaction of the vesical mucous membrane to a mechanical or a chemical irritant.

Traumatic Cystitis.—A mild cystitis or irritability of the bladder, as it is often called, may be caused by the passage of concentrated urine containing phosphates, urates, or oxalates. There is more or less urinary frequency and distress, and besides the crystals the urine contains a certain amount of pus. The so-called gouty or rheumatic cystitis is of this nature.

A more severe inflammation without infection is commonly caused by stone in the bladder (p. 435) and by rough instrumentation. In such cases there may be much tenesmus and distress together with an abundance of blood and pus in the urine.

Treatment.—The irritation due to concentrated urine may be dispelled by diluting the urine and correcting the cause of the urinary

concentration. Urinary dilution may be obtained by cutting down the patient's nitrogenous foods and instituting a course of diuretic waters. To prevent a recurrence of the trouble, the patient's gouty, rheumatic, neurotic, or dyspeptic tendency must be appropriately treated. The use of the hot rectal douche (p. 131), or of deep urethral instillations (p. 218), or the administration of a urinary sedative or alkalizer (p. 370) may be useful.

For phosphaturia dilute hydrochloric acid, gtt. v to xv *t. i. d.* in water, is often serviceable. Urotropin has also been found useful (p. 373).

For the irritation of stone, its removal is the logical treatment.

The cystitis caused by instrumentation is not a cystitis at all, but a traumatic prostatitis, which may or may not become bacterial and extend to the bladder (p. 357).

Chemical Cystitis.—Any strong irritant entering the healthy bladder, whether from above or below, causes cystitis. The intense strangury caused by the administration of cantharides has acquired an undeserved notoriety on account of the alleged sexual excitement accompanying it. As a matter of fact, the acute prostatic congestion induced by this drug is said to cause priapism, but the sensations of the patient in this condition are anything but pleasant. Rehn, and later Lichtenstein,¹ have called attention to a similar strangury occurring in coal-tar workers, apparently due to inhalation of irritating vapours. Rehn believes that sarcoma of the bladder occurs in some of these cases. The irritation due to urotropin is more important, since that drug is so freely used nowadays (p. 374).

While hyperacid urine is somewhat irritating to the bladder, ammoniacal urine is far more so, and the reason why an ammoniacal cystitis is likely to be so much more intense than an acid cystitis is doubtless for this very reason—that the ammonia adds fuel to the fire of bacterial attack.

Cystitis may equally be caused by irritants introduced through the urethra. Nitrate of silver is so often used in concentrated solution that it bears an unenviable notoriety in this regard.

Treatment.—Removal of the cause constitutes the essence of treatment. To allay the irritation the sedative remedies employed in bacterial cystitis may be used.

SIMPLE BACTERIAL CYSTITIS

This is the disease that is generally spoken of as cystitis. It may be acute or chronic, superficial or interstitial.

¹ Deutsche med. Wochenschr., 1898, xxiv, 709.

ETIOLOGY

The etiology of cystitis has been considered in the preceding chapter. The conclusions therein reached may be summed up as follows:

I. Bacteria may reach the bladder (1) from the urethra, (2) from the kidney, and less often (3) by irruption of a neighbouring focus of inflammation, and (4) from the blood or the lymph vessels.

II. Bacteria reaching the bladder will not cause any inflammation of that organ unless there is congestion due to (1) retention, (2) trauma by instruments, stone, or foreign body, (3) disease of the bladder wall, such as neoplasm, tubercle, or simple ulcer, or (4) unless the disease extends directly to the bladder from the neighbouring tissues, the ureter or the urethra (gonorrhoeal cystitis), or (5) unless the bladder is paralyzed.

III. A cystitis thus begun will disappear spontaneously unless it is perpetuated by some of the accessory causes enumerated. Of these causes the most common, clinically, is retention, which retention is almost always caused by stricture of the urethra, hypertrophy of the prostate, or contracture of the neck of the bladder.

IV. Acid cystitis is caused by the bacillus coli, the tubercular bacillus, the typhoid bacillus, or the gonococcus. Alkaline cystitis is due to staphylococcus, streptococcus, or proteus infection.

Guyon, recognising the importance of the accessory cause, has described—

1. Gonorrhoeal cystitis.
2. Tubercular cystitis.
3. Calculous cystitis.
4. Cystitis of stricture.
5. Cystitis of prostatitis.
6. Cystitis of neoplasm.
7. Cystitis in women.
8. Painful cystitis.
9. Membranous cystitis.

This division, which does not pretend to be scientific, has no practical indication. On the contrary, so long a series based on etiological (1, 2, 3, 4, 5, 6, 7), symptomatic (8), and pathological (9) factors is anything but lucid. For our present purposes we may at once eliminate gonorrhoeal cystitis (p. 74), tubercular cystitis (p. 402), and the cystitis of women. The striking features of the cystitis of stone (p. 435), of stricture (p. 184), of prostatitis (p. 266), and of neoplasm (p. 417) are due in each case to the etiological factor. The resultant inflammation of the bladder is much

the same. In any case it may be acute or chronic, acid or ammoniacal, superficial or interstitial. Painful cystitis and membranous cystitis may be dismissed with reference to their special features.

Thus it seems advantageous, while recognising the influence of predisposing causes and special characteristics in modifying the course of the disease, to describe cystitis, not as a variable condition, but as an entirely typical inflammation with certain characteristics to distinguish it, however much it may be modified by accessory circumstances.

MORBID ANATOMY

The lesions of cystitis are usually unevenly distributed over the bladder. Indeed, in many acute or mild chronic cases the lesions are entirely confined to the neck of the bladder and the trigone. This so-called inflammation of the neck of the bladder is commonly due to some prostatic inflammation, which latter must be attacked in order to cure the "inflammation of the neck." It may be noted here that in every acute cystitis and in every chronic cystitis of long standing the prostatic urethra as well as the bladder is inflamed, and the vesical inflammation is most intense about the neck and the trigone, unless some special feature of the disease (tumour, stone, pouch) produces a distinct focus of more intense inflammation elsewhere in the organ.

Acute Cystitis.—At first there is a sharp congestion most marked about the trigone and the neck, or entirely confined to that region. The mucous membrane is swollen and bright red in colour. The capillaries are dilated, the epithelial cells swollen. Then the epithelial cells begin to desquamate. The angry crimson of the mucous membrane is blotched by petechiæ, its gloss is lost, and here and there minute vesicles or abscesses appear. After these break small ulcers remain. If the acute condition persists the muscular and peritoneal coats may become inflamed.

The urine is filled with epithelium, pus, and red blood-cells.

Chronic Cystitis.—The *mucous membrane* is irregularly thickened and dense. Its surface is rough, red or gray in colour, perhaps mottled by purple or brownish blotches left by submucous hemorrhages. Here and there may be seen areas of ulceration and granulation. Sometimes the granulations grow to be distinct little villousities several millimetres long. The ulcerations may extend deep into the substance of the organ and communicate (rarely) with abscesses in the muscular tissue. In long-standing cases the epithelium may become cornified in spots, the superficial epithelia being replaced by dense shiny scales resembling the horny layers of the skin (*leukoplasia vesicæ*).

The microscope shows multiplication of the epithelial layers and desquamation of the superficial cells. All the tissues are infiltrated with new connective tissue. The vessels are congested and hypertrophied.

The general irregularities of the mucous membrane depend upon the changes in the muscular tissue.

The *muscle* of the bladder is usually hypertrophied. The whole bladder wall is thickened, and individual bundles of muscle stand out in bold relief under the mucous membrane, throwing it into numerous folds. In long-standing cases the mucous membrane forms cellulæ and pouches between these folds. The varieties of hypertrophy and atrophy have been described (p. 341).

The microscope shows an *interstitial cystitis*, more or less marked according to the age and intensity of the superficial lesions. The muscular bundles are separated and infiltrated by new connective tissue. The hypertrophy of the muscle is evidently more apparent than real (p. 343). In extreme cases almost all the muscle is replaced by fibrous tissues. Abscesses are rare.

Pericystitis.—The changes that occur in the connective tissue surrounding the bladder are usually of a protective character. An intense chronic cystitis often provokes a thickening of the perivesical tissue and of the peritoneum. Less frequently a diffuse fibro-lipoma occurs, comparable to the perirenal fibro-lipoma (p. 540), and like it protective in character. In such cases the fibrous masses may often be felt through the rectum, and I have known them to be mistaken for cancer of the prostate until cystotomy showed the prostate to be normal and the whole bladder to be thickened. When there is much pericystitis the bladder is usually found in a state of concentric hypertrophy with fibrous, undistensible walls.

Suppurative pericystitis is usually due to rupture of the bladder.

Abscess.—Abscess of the bladder is rare. Small abscesses of the mucous membrane may run their course unnoticed. Abscesses within the wall of the bladder may begin in some infected interstitial focus or in a pocket of the mucous membrane. They burst into the bladder, leaving deep necrotic pockets, which may continue to suppurate indefinitely, or lead to perforation of the wall of the bladder. Purulent venous thrombosis has been seen.

Membranous Cystitis.¹—*Exfoliation of the mucous membrane*, partial or complete, may occur as the result of an intense cystitis or of trauma. It is rarely seen except as a complication of prolonged and difficult parturition.

¹ Cf. Harrison, Twentieth Century Practice, i, 264. Fenwick, Lancet, 1894, i, 209.

True *diphtheritic cystitis* is so rare that its etiology is not well understood. It is encountered in connection with intense ammoniacal cystitis; but whether the intensity of the inflammation is the cause or the effect of the false membrane is not entirely clear. There may be small shreds or a cast of the greater part or the whole of the bladder. The membrane may even extend up the ureters to the kidney. The only clinical features of the disease are: (1) Intense ammoniacal cystitis; (2) fetid urine; (3) the expulsion of the false membranes, and (4) the necessity of cystotomy to relieve the tormented bladder and to extract the membranes.

SYMPTOMS

The three characteristic symptoms of cystitis are:

1. Pus in the urine—Pyuria.
2. Frequency of urination—Pollakiuria.
3. Pain, notably pain with urination—Dysuria.

While pain, frequency, and pus are certainly characteristic of cystitis, they may also be caused by pyelitis. Moreover, in mild chronic cases the frequency and pain are not at all notable; the pyuria is the only definite symptom. There are other symptoms of cystitis, notably certain urinary changes, but these are special to certain forms of the disease and will be discussed with them.

Pyuria.—Whenever there is cystitis pus may be found in greater or less quantity in the urine. To distinguish that the pus comes from the bladder the two-glass test must be employed. An ounce or two of urine (the first flow) is passed into a glass beaker, the remainder (the second flow) into a similar vessel. The first flow shows the contents of the bladder combined with the washings from the urethra. The second flow shows the contents of the bladder to all intents undiluted. Pus in the urine causes a general cloudiness, which after standing settles to the bottom, leaving the supernatant fluid relatively or absolutely clear. The cloudiness cannot be dispelled by heat or chemicals. The addition of liquor potassæ to the urine causes the pus to agglomerate into flocculent gelatinous particles that are quite characteristic. The pus cells may also be recognised under the microscope. Unless there is some pus in the second flow of urine there can be no cystitis. Yet the presence of pus does not prove that there is cystitis (p. 391).

Frequency of Urination.—Except in very mild cases, or in case of retention or suppression of urine, frequency of urination is a constant symptom of cystitis. It is a fair index of the severity of the inflammation. In mild cases the patient urinates every three hours or so by day and empties his bladder only once or twice during the

night. On the other hand, a patient suffering from acute cystitis spends day and night in urinating. The calls to urinate occur every ten or fifteen minutes, and, if not obeyed, result in the expulsion of the contents of the bladder, no matter how much the patient strains to retain his water. This is the so-called false incontinence, quite different from true incontinence (p. 347). Frequency of urination is by no means pathognomonic of cystitis. It may be purely neurotic, or due to stone, to prostatitis, to hypertrophy of the prostate, etc. The frequency due to prostatic hypertrophy is chiefly nocturnal; that due to cystitis or to stone is usually diurnal.

Pain.—The pain of cystitis (unless there is abscess) is due to the presence of urine in the bladder. If there is no retention the pain is intermittent. If there is retention the pain is constant or remittent. It is most severe at the time of urination, and in the milder cases it is felt only at that time (dysuria). It is felt chiefly in the glans penis and the perineum. It may radiate along the under surface of the penis, up the rectum, to hypogastrium, groin, hip, testicle, thigh, or loin. When the inflammation runs high there is often a continuous ache in the perineum, the hypogastrium, or the hip. With the dysuria there is an irritative cramp or spasm of the bladder and its sphincter as the last drops of urine are passed and for a few moments thereafter (tenesmus). The patient strains away after the bladder is empty, thus markedly adding to the irritation already present. There may be a sympathetic tenesmus of the rectum excited by the urinary straining, sometimes with most unpleasant results.

Systemic Disturbance.—Though patients suffering from cystitis often exhibit such symptoms as chills, fever, sleeplessness, anorexia, and loss of flesh and strength, these symptoms are not directly referable to the inflammation of the bladder. All the febrile symptoms are due either to inflammation of the prostate or to implication of the kidneys, and the loss of appetite, sleep, and strength is due to the distressing symptoms of pain, dysuria, and tenesmus.

Having thus briefly summed up the chief symptoms common to all forms of cystitis we pass to a consideration of the types of the disease—viz., acute cystitis, chronic acid cystitis, chronic ammoniacal cystitis, interstitial cystitis, and pericystitis.

COURSE OF THE DISEASE

Acute Cystitis.—Excepting the acute cystitis of mechanical or chemical origin (p. 381) and the acute exacerbations that occur during the course of a chronic inflammation of the bladder, acute cystitis is always of gonorrhœal origin. This *acute gonorrhœal cystitis* may be accepted as a type of all acute cystitis, since it is the most

acute as well as the most common of all. It may or may not be due to the gonococcus. It occurs during a gonorrhoea, during severe simple urethritis, or even during gleet—if the gleet depend upon stricture—by direct continuation of the inflammation backward upon the mucous membrane. The inflammation is confined to the region of the neck, and does not attack the body of the bladder.

It rarely appears until after the first week of a gonorrhoea, and is commonest during the third week, when the inflammation has reached the posterior urethra. It is frequently seen in practice as a result of simple extension of inflammation later in the course of the disease. Often, however, a second or provoking cause has been in action, and without its assistance the complication of gonorrhoeal cystitis might have been escaped. These provoking causes are anything which will irritate the urethra: alcoholic beverages, sexual intercourse, abortive treatment of gonorrhoea, catheterism, jolting, violent or sometimes even moderate exercise. Any of these causes may light up a cystitis of the vesical neck in any patient with urethritis.

The symptoms of gonorrhoeal cystitis vary from a hardly appreciable irritability—with congestion—up to the very highest grade these symptoms (of irritability) can assume, with a tenesmus so constant as to amount to actual incontinence, the patient voiding a few drops of blood or milky fluid every few minutes. The tenesmus is particularly painful, although the mere passage of urine is often attended by great pain. A noteworthy feature of gonorrhoeal cystitis is the absence of general phenomena. Fever is sometimes inappreciable, and rarely runs high. Anxiety, *malaise*, and nervous distress are, however, disproportionately prominent. Constipation is habitual. The urethral discharge becomes greatly lessened, or even disappears on the advent of the bladder symptoms; as the latter disappear, however, the former returns. Gonorrhoeal cystitis varies in duration from a few days, in abortive cases, up to many weeks, and sometimes leaves permanent trouble behind in the pelvis of the kidney, in the prostate, or in the seminal vesicle. It is not followed by chronic cystitis unless retention, stone, or tumour perpetuates the inflammation.

The Urine.—The urine of acute cystitis is usually acid, thickly purulent throughout and often bloody. If an attack of acute cystitis occurs during the course of a chronic ammoniacal inflammation the urine remains ammoniacal, but the other symptoms are the same as described above. Chemical examination reveals the presence of albumin derived from the blood in the urine. The microscope shows great quantities of pus cells and bacteria with a variable number of red blood cells and desquamated epithelia.

Chronic Cystitis.—Chronic cystitis is very common, so much so that there are few diseases of the lower urinary passages of which it does not form a part. Chronic cystitis, moreover (unlike many other chronic inflammations), rarely commences as an acute disease, but is chronic from the first. It never occurs as an idiopathic affection, but is invariably a secondary result arising from other morbid conditions of the urinary passages (p. 359). Once started, it does not tend to get well spontaneously, but to become slowly and steadily worse. Fortunately, its causes are well known, and most of them easy of demonstration. Many of these can be removed, and with them the chronic inflammation which they keep up. Some cases are incurable on account of permanent structural alterations in the bladder walls, or because the cause cannot be reached. All, however, may be benefited by careful and judicious management, and there are few abnormal conditions of the body whose amelioration is more satisfactory to the surgeon, or more grateful to the sufferer.

The symptoms of chronic cystitis resemble those of the acute form, in a degree proportionate to the grade of the inflammatory process. They are often complicated by retention (p. 346), by atony (p. 344) or hypertrophy of the bladder (p. 341), by stone, by tubercle, by tumour (pp. 402, 417), etc. There may only be slightly increased frequency of urination, with slight cloudiness of the fluid, in very chronic cases; or the calls may be very frequent, and the pains excessive, varied, and constant, as in the acute disease. In fact, chronic cystitis is liable at any time to be lighted up into an acute state by the continued action of its own cause, or by the super-vention of other causes (cold, violent exercise, abuse of alcohol, acid urine, instrumentation, etc.). Between these acute attacks the symptoms of the disease are so slight that the patient may fancy himself well, and rejoice over the fancied cure while the spark of future and worse inflammation is yet smouldering within him. Even the surgeon might be deceived by such a case were it not for the persistent urinary evidence of disease.

The Urine.—The urine in chronic cystitis is clouded by pus and bacteria. It is rarely bloody unless there is tubercle, stone, or cancer. It may be acid or alkaline.

Chronic Acid Cystitis.—When the urine is acid and the cystitis chronic the vesical inflammation is usually mild (unless it be tubercular). The amount of pus in the urine is not great, and the subjective symptoms are slight or entirely absent. This form of cystitis is often encountered with hypertrophy of the prostate, associated with slight pyelo-nephritis. The inflammation, though mild, is usu-