

Summary.—Thus catarrh of the neck of the bladder is characterized by the fact that—first, tenesmus and sensitiveness are felt at the close of urination ; secondly, a discharge from the urethra is wanting ; and, thirdly, in the urine passed into two glasses, only the first part appears turbid, or, if both are somewhat turbid, the first is the more so of the two.

III.

SUPPURATION OF THE BLADDER.—CYSTITIS.—CATARRH OF THE BLADDER.

By catarrh of the bladder, in general, we understand a catarrhal inflammation of the mucous membrane of the bladder. This inflammation has usually the property of liberating a ferment at the same time as the catarrhal secretion is formed, which changes the urea at once into ammonium carbonate, and which immediately produces alkaline fermentation of the urine. Cystitis and ammoniacal fermentation are so well known as inseparable terms, that formerly the differential diagnosis between cystitis and pyelitis was always made by litmus-paper. To-day we know that there are vesical catarrhs with a urine of acid reaction ; and that, on the other hand, we not seldom see an alkaline urine which has no relation whatever to a catarrh of the bladder.

We may divide catarrhs of the bladder into *acute* and *chronic*, further into *partial* and *total*, according as only a part of the bladder (in the neighborhood of the opening of the urethra) or the entire bladder is involved. Partial vesical catarrh is usually a process propagated from the urethra, and one of the accompaniments of every severe catarrh of the neck of the bladder. A total catarrh of the bladder, on the contrary, is usually caused by changes which involve the entire wall of the

bladder (excentric hypertrophy of the bladder—paralysis, etc.).

According to the extension in depth of the inflammation of the bladder, we may speak of a *catarrhal* or a *parenchymatous* cystitis; in the first case, only the mucous membrane of the bladder is involved; in the second, its muscular coat also; or, according to the character of the inflammatory product, we speak of it as a *mucous*, a *purulent*, or an *ichorous* cystitis, according as the urine contains mucus, pus, or a grayish-red, shreddy, putrid matter. Primary catarrhal inflammation of the bladder is one of the greatest rarities. Thanks to its protected position and its difficult communication with the outer world, the bladder is quite shielded from the common causes of catarrhs of other mucous membranes. While injurious substances easily make their way into the lungs or alimentary canal, this is not the case with the bladder. When no urine is flowing through the urethra, it is a long, closed canal which perfectly hinders the entrance of anything harmful into the bladder. Then an intact vesical mucous membrane is scarcely capable of any absorption whatever. If we inject a solution (one half to one per cent) of iodide of potassium into the healthy bladder, we can soon be convinced that no iodine appears in the saliva, even after the lapse of an hour. Again, as is well known in cases of retention of urine, the bladder may be distended to a tumor the size of a man's head, and remain so for days, without any absorption of the constituents of the urine ensuing.

It is only when the bladder in its totality is involved, that is, when all its coats are more or less altered by inflammation (parenchymatous cystitis), that foreign matter from the immediate neighborhood can get into the

bladder. As a matter of fact, in parenchymatous changes which involve the entire thickness of the bladder, we get a feculent urine (i. e., one which smells like fæces). If we were to mention percutaneous, catarrh-causing factors, the influence of so-called chilling, or "catching cold," would come first. This is an etiological moment brought about by unknown influences, atmospheric, telluric, or due to changes of temperature, to which we must often appeal when the real cause is not easy to discover. If we *are* entitled to assume taking cold as a cause of inflammation in those viscera most exposed to atmospheric influences, we must be very cautious in adopting this as a factor in bladder-catarrhs. By virtue of its perfect occlusion from atmospheric air, the bladder is far more removed from injurious influences than is the gastro-intestinal tract, or the respiratory organs; indeed, it is well known that catarrh of the bladder is of extreme rarity in men who have never had any disease of the generative organs, especially gonorrhœa. Again, it seems strange that childhood and boyhood show an especial immunity from vesical catarrh, although the so-called "colds," the catarrhs of the gastro-intestinal tract, and of the organs of respiration, are very common in these periods of life. It becomes common only in youth, and then generally either as an immediate consequence of gonorrhœa, or perhaps only first appearing several or even many years after. These latter cases are the very ones which people are apt to refer to "catching cold," drinking imperfectly fermented beer, sexual excess, etc. When we examine these cases more closely, we find that at some previous time, it may be many years before, the patient had a gonorrhœa, lasting a good while, and perhaps accompanied by epididymitis or cystitis. We also find that the urine

commonly contains whitish threads, that it is perhaps rendered more turbid at times by increased secretion of mucus, and that now and then, especially at the end of urination, the patient has a peculiar, uncomfortable feeling which may even amount to slight tenesmus. All these patients consider themselves otherwise as in good health, and never think this a consequence of the previous gonorrhœa, especially since that occurred years before, and on that account they have supposed themselves well long since.

But this is not the case. Gonorrhœa, and especially those forms which have penetrated as far as the prostatic portion—the deepest part of the urethra—seldom forsake this region without leaving behind traces of their presence. Such a liability to a recurrence of the inflammatory process still remains, that a sexual excess, or the use of poor beer, etc., is quite enough to set up inflammatory phenomena or catarrh at the vesical neck. If these processes extend to the bladder, a cystitis arises. Another etiological factor—although a far rarer one—is to be sought for in those low constitutional conditions closely allied to scrofula or tubercle. In such individuals these bladder-catarrhs usually get worse in the severer seasons of the year, and not infrequently vanish in summer, when the entire organism shows that it is improving under a strengthening and appropriate diet. Swellings of the epididymis—painless and chronic—not infrequently accompany this form of catarrh of the bladder.

We not infrequently find rectal fistulæ, scrofulous glandular swellings, and diseases of the bones at the same time. We can not always determine tuberculous disease of the lungs in such cases; likewise the examination of the prostate and seminal vesicles for hard in-

filtration does not always give a positive result. The appearance of the individual, as if he were by inheritance anatomically predisposed to phthisis, is often our only ground for believing this the etiological factor. Moreover, daily clinical experience teaches that various acute febrile diseases, especially such as are apt to localize on the skin and mucous membranes (exanthemata), may give rise to catarrhs of the bladder. It is also well known that in consequence of lithiasis, of new growths in the bladder or in its neighborhood, and of injurious chemical and mechanical action, catarrh of the bladder may be excited and kept up.

Advanced age affords no small proportion of cases of cystitis.

The most frequent factors in catarrh of the bladder, after the age of sixty years, are to be sought for in senile changes in the bladder and prostate. Sometimes it is a hypertrophy of the prostate, sometimes hypertrophy and dilatation of the bladder, or again paralysis of the latter, which causes vesical catarrh by reason of the retention of urine; or, in fact, any obstacle to the free escape of urine may cause it. Finally, it is not to be denied that certain resins, balsams, and ethereal oils, which have an especial selective action on the genito-urinary tract, may sometimes cause catarrhs of the bladder. In view of these etiological factors which we have just considered, we are obliged to believe that a primary vesical catarrh as such, does not exist; or at least, that it is one of the greatest rarities. It is also clear that a mere diagnosis of catarrh of the bladder is quite an insufficient one, and that we must in every case, after making such a diagnosis, look for some other cause than the very convenient one of "catching cold," or using too fresh beer or wine; and, finally, we see,

from the preceding, that it is only by exactly weighing and considering all these factors that we can begin any proper and successful treatment, whether local or general. The *diagnosis* of catarrh of the bladder is based moreover upon two symptoms usually present, in addition to other characteristic signs, and which may be very deceptive, although their great importance can not be denied. If the practicing physician does not carefully examine the urine in these cases, he may be led astray by the presence of these symptoms, and make a diagnosis of catarrh of the bladder (or cystitis) where no such thing exists. These two symptoms, most commonly misinterpreted, are "*frequent micturition*" and "*alkaline reaction of the urine.*"

Frequent micturition is no attribute of cystitis alone; on the contrary, there are many general diseases as well as various local irritable conditions about the "neck of the bladder" which cause a very troublesome desire to micturate when there is not a trace of bladder-catarrh present. Among general diseases, there are disturbances of nutrition, which run their course with polyuria, diabetes mellitus, diabetes insipidus, hydruria, or spasm of the detrusor vesicæ in consequence of a central lesion of the nervous system. In local conditions of irritation (and it is precisely these states that are most often mistaken for cystitis) there is an especial sensitiveness of the neck of the bladder, such as not infrequently follows masturbation, sexual excesses, or occurs after a gonorrhœa has run its course, and from this a frequently occurring desire to urinate is originated as a reflex impulse. In all these cases, by a careful examination of the urine alone, we can make a negative diagnosis that no cystitis is present, because the urine in these cases is usually very clear and transparent. If

there is no catarrhal secretion in a given urine, we can not very well say a bladder-catarrh is present.

The alkaline reaction of the urine is still more deceptive than frequent micturition. We must always distinguish two kinds of alkaline urine. The urine may be alkaline from the presence of fixed alkalies, or at another time it may owe its alkalinity to ammoniacal fermentation. Alkalescence through fixed alkalies, such as we usually see in phosphaturia, is easily recognized by the fact that the lime and magnesia salts in the sediment show no combinations with ammonia. In such a urine we find calcic carbonate, crystalline calcic phosphate, and sometimes also the crystalline magnesium phosphate, but we never find the great colorless crystals of ammonia-magnesian phosphate. We not infrequently find these urines in central and peripheral diseases of the nervous system, and therefore often in paralysis of the bladder. In these cases the fixed alkali is separated from the blood by the kidneys, and the bladder receives a urine, already alkaline, to store up. In quite the same way, by an unusual diet (vegetable diet), or by the plentiful use of mineral waters, or of the so-called "digestive powder" (which consists mostly of fixed alkalies), we may thus artificially get an alkaline urine with a plentiful phosphatic sediment, which, of course, has no connection whatever with a catarrh of the bladder. In all these cases it is easy, as a rule, to gradually make the urine acid by prescribing a suitable diet, and by such medicines internally as phosphoric acid, hydrochloric acid, nitric acid, salicylic acid, and especially by giving carbonic acid, in the form of pure carbonated water (a "siphon").

The carbonic acid acts in a striking way, since it very soon appears in the urine, and clears it up by

transforming the lime and magnesia salts of the sediment into the easily soluble bicarbonates.

It is somewhat different when the alkalinity seems to be due to carbonate of ammonia. Here we find in

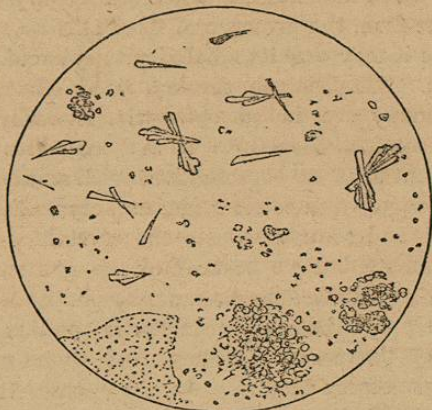


FIG. 4.—Sediment of a phosphaturia. Finely granular calcic carbonate and crystalline calcic phosphate. (Three hundred diameters.)

the sediment, along with the amorphous calcic phosphate, the crystalline ammonia-magnesian phosphate, and sometimes ammonium urate in addition; that is to say, ammonium combinations, which make it clear that the alkalinity of the urine in question is due to ammonium carbonate.

Although we can exclude the supposition that the alkalinity may be due to fixed alkalies, as soon as we find these combinations containing ammonium in the sediment, yet this alone does not by any means entitle us to assume that a catarrh of the bladder is *necessarily* present in every such case. For example, we sometimes get a turbid and alkaline urine in the course of acute inflam-

matory and febrile diseases, both after the febrile stage and during convalescence, which owes its alkalinity to ammonium carbonate. The old physicians used to call this "broken urine," and explained it by supposing that the diseased matters were cast out of the body with the stinking, turbid, and slimy urine. They greeted this as a visible sign of beginning recovery. It is thus clear from the preceding statements that an alkalinity of the urine caused by ammonium carbonate can not always justify the diagnosis of catarrh of the bladder (or cystitis). In addition to this, the presence of a *catarrhal secretion* must be determined in order to permit such a diagnosis; for there can be no catarrh without a catarrhal secretion, and therefore no catarrh in the bladder without a catarrhal secretion in the urine. Triple phosphate crystals and ammonium combinations do not make a catarrhal secretion. On the other hand, it must be acknowledged that ammoniacal fermentation of the urine is a complication of bladder-catarrh in the vast majority of cases, and therefore we can not disallow its diagnostic value in a certain degree. Corresponding to the character of the secretion, catarrh of the bladder is divided into mucous, purulent, and ichorous, as we mentioned at the beginning. A mucous or catarrhal cystitis is the least severe of the catarrhs of the bladder. Such a urine contains neither albumen nor pus. It is of a normal, wine-yellow color, and is rendered slightly turbid or cloudy by mucous secretion. The reaction to litmus is weakly acid, or neutral, according as ammoniacal fermentation is present or not. The specific gravity of the urine is normal. With the microscope we find in the cloudy sediment, along with numerous leucocytes and bladder epithelium, very many bacteria. Such a urine is very often seen

in paresis of the bladder, in excentric hypertrophy of the bladder, in prostatic hypertrophy, and in many like cases where frequent and regular catheterization has been performed. Purulent catarrh of the bladder is the genuine cystitis, and the best known of all.

The urine in these cases is of a wine-yellow color, and has a distinct smell of ammonia. The turbidity is uniform and intense. The specific gravity is normal. As abnormal substances we find more ammonium car-

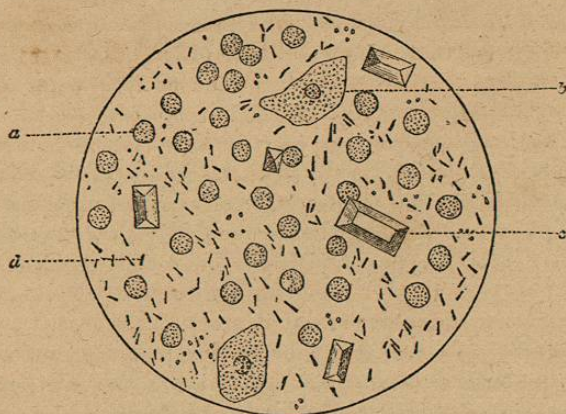


FIG. 5.—Sediment of a purulent bladder-catarrah with ammoniacal fermentation. *a.* Pus-corpuscles. *b.* Bladder epithelium. *c.* Crystals of phosphate of ammonia and magnesia. *d.* Bacteria.

bonate and albumen than corresponds to the amount of pus. The sediment is usually greenish-yellow, slimy, can be drawn out in threads, and sticks to the glass. Most of this consists of alkaline pus. Microscopically, we discover pus-corpuscles and bacteria in considerable amount; further, crystals of ammonia-magnesian phosphate and bladder epithelium. The pus-corpuscles are

at the same time often greatly swollen, so that in isolated cases we can not see their contours at all.

Ichorous or gangrenous catarrh of the bladder is characterized by a brownish-green color of the urine, and by a penetrating fecal stench; and this stench is especially developed when we mix the urine with a mineral acid. The odor reminds one of putrefying meat, of fæces, and of ammonium sulphide. The urine is very turbid, and has generally a lower specific gravity than the normal. As abnormal substances, we find ammonium carbonate in abundance, also ammonium sulphide; further, blood coloring-matter and a great deal of albumen. The sediment is like thin pap, and will not draw out into threads. It consists of numerous bacteria, crystals of triple phosphate, of amorphous calcic phosphate, and cellular *detritus*. The cellular elements, both of blood, pus, and epithelium, can no longer be distinguished. These are all dissolved in the strongly alkaline urine, and have thereby lost their identity. Now and then only, can remnants of tissues be plainly seen with the microscope (as, for example, new growths). We find such a urine in all the diseases accompanied by extensive ulceration in the bladder, as in ulcerating new growths, in tuberculosis with formation of ulcers, in diphtheria, etc.

The ammoniacal fermentation of the urine; so often found in cases of catarrh of the bladder, takes place in the bladder itself, differing in that point from the urine of phosphaturia, which is secreted from the kidneys, already alkaline. Acid urine is secreted from the kidney, and this becomes gradually alkaline during its stay in the bladder. One may convince himself at once of the truth of the matter in a given case in this way: If we wash out a catarrhally-inflamed bladder, containing

ammoniacal urine, with a solution of carbolic acid, or with such neutral saline solutions as those of sodium sulphate, sodium chloride, sodium salicylate, etc., until the washings are clear and have a neutral reaction, leave in the catheter of vulcanized India-rubber ten minutes, with the opening closed, and then test the urine which is allowed to flow from it, we find that in these few minutes the urine just secreted by the kidneys has a distinct acid reaction. This experiment shows that the ammoniacal fermentation of the urine in catarrh of the bladder takes place in the bladder itself.

Ammoniacal fermentation of the urine arises from the fact that the urea is acted upon by a ferment in such a way that it combines with water and is transformed into ammonium carbonate. Exactly what this ferment is, has not been made entirely clear up to the present time. A great many writers are devoted to the bacteria theory, and attribute the change of the urea into ammonium carbonate to the development and increase of these micro-organisms. It is not to be denied that, as a matter of fact, alkaline urine contains bacteria in considerable numbers, and especially when albumen, pus, or catarrhal secretion are present in the ammoniacal urine. At the same time, we can oppose another fact to this, viz., there are urines with a strongly acid reaction which contain both the small bacteria of one or two cells, and the long chain-bacteria. Thus, for example, the urine in diabetes mellitus never has an alkaline reaction when catarrh of the bladder is present; on the contrary, it is strongly acid; and yet bacteria are sometimes present in such numbers as to give the urine a peculiar glistening, prismatic appearance, like the contents of old cysts containing cholesterin. Again, the urine of those patients who are obliged to

use the catheter frequently on account of hypertrophy of the prostate or paresis of the bladder is usually acid, and still it contains bacteria in considerable numbers. Since bacteria and other micro-organisms develop according to the nourishing value of the fluid containing them, it is not improbable that they are an accompaniment, and not always a cause, of the ammoniacal fermentation of the urine. This supposition appears all the more likely, since Musculus has succeeded in isolating a ferment, itself perfectly free from bacteria, which, being added to normal urine, kept at the temperature of the body, quickly changes the urea into ammonium carbonate.

As in these experiments with Musculus's ferment, bacteria soon appear after the urea is changed into ammonium carbonate, it appears very probable that, in the ammoniacal fermentation of the urine in a bladder catarrhally inflamed, the bacteria have a subordinate significance only.

This ammoniacal fermentation is, in all probability, induced by a ferment produced by the inflamed or diseased mucous membrane of the bladder itself, and which does not seem to be always of an organized nature. Probably the mucous glands of the lining membrane of the bladder produce this ferment. If the bladder is affected as a whole, patients complain of pain above the symphysis pubis, which not seldom shoots out in various directions. Pain is increased by pressure over the fundus of the bladder, and a painful desire to urinate is felt immediately. If, on the contrary, the bladder is but partially affected, and then in or near the vesical neck, no pain is felt on pressure above the symphysis. The disagreeable sensation is concentrated in the perinæum, in the rectum, and along the course of

the urethra, as has already been described in detail. In acute bladder-catarrh, fever is sometimes present, yet, in the majority of cases, there is no rise of temperature or increased frequency of the pulse. In chronic bladder-catarrh, the pain is considerably less as soon as the urine is passed, if stone or new growths are not the cause of the catarrh; but the intolerance of the bladder to its proper contents, the urine, still persists, as frequent micturition shows.

The pathological appearances vary greatly according to the degree of inflammation. In acute cystitis of brief duration, all the tissues soon resume their normal condition. If the cystitis has lasted longer, the mucous membrane is usually found hypertrophied, and its veins enlarged. In acute cystitis, the mucous membrane shows only slight swelling and reddening. Sometimes this reddening is due to overfilling of the smallest vessels in the mucous membrane; sometimes to punctiform extravasation. These appearances are usually most pronounced around the neck of the bladder and near the trigonum. Sometimes the inflammatory process in the mucous membrane assumes a croupous or diphtheritic character. In these cases we find grayish-white false membranes in circumscribed patches (sometimes consisting of necrotic mucous membrane, again of fibrin) on a deep-red background of mucous membrane. The size of these false membranes occasionally exceeds that of the palm of the hand; they are, however, usually much smaller. On the surface which was toward the bladder-wall are seen dots of a red color, like ecchymoses. These pseudo-membranes often have a thickness of several millimetres. Moreover, in parenchymatous cystitis, we occasionally find abscesses in the bladder-walls, which may attain considerable size. A

consequence of inflammation in the muscular layer of the bladder is, that the bladder sometimes loses its elasticity and shrinks. Such a bladder—also called cicatricial bladder by the French—has but a very small capacity, and frequent micturition is a necessary consequence of this condition, even in those cases where the bladder-catarrh seems to amount to very little.

Trauma, tuberculosis, and finally new growths, may modify the condition of the bladder in a characteristic way.

Real catarrh of the bladder is distinguished from catarrh of the "neck of the bladder" in that, first, ammoniacal fermentation of the urine is generally present at the time; second, the painful sensations of the patient are localized more above the symphysis, in the body of the bladder itself; and, third, the urine being passed into two glasses, the first half appears just as turbid as the second half.