II.

SUPPURATION IN THE PROSTATIC PORTION OF THE URETHRA.—CATARRH OF THE NECK OF THE BLADDER.

FROM a practical stand-point it seems best to consider the urethra as divided into an anterior and a posterior portion. The anterior part consists of the whole length of the urethra as far as the compressor urethræ muscle. The signs and symptoms of suppuration of this part have been discussed in what has just preceded. The posterior portion of the urethra, on the other hand, comprehends the membranous and prostatic parts as far as the internal sphincter muscle, the so-called neck of the bladder. The term "neck of the bladder" is denominated unscientific by many writers as a synonym for the prostatic portion, and not justified by the anatomy of the part. In point of fact, if we take a bladder which has been dried and blown up, we do not find a dilatation similar to the neck of a bottle in the prostatic portion, opening directly into the bladder. On the contrary, the sphincter internus is seen to be closed, and in this way the prostatic urethra shut off from the bladder by this muscle. In spite of this, the fact that this portion really belongs to the bladder, or, conversely, that the trigonum Lieutaudi belongs to the prostatic urethra, is evident from the fact that both the lateral limbs of the trigonum can be followed anatomically far into the prostate, and, moreover, the muscular layer of the prostate

represents simply a prolongation of the muscular coat of the bladder.

The term "neck of the bladder" has, however, a practical significance. The neck of the bladder, or the posterior part of the urethra, comprehends the portion between the internal sphincter and the external cut-off muscle, the compressor urethræ. Now the strength and resisting power of these two muscles are very unequal. While the external cut-off muscle forms a barrier to fluid pressing either toward the bladder from without, or from within the bladder outward, which is only removed by the volition of the individual, we find that the inner sphincter yields to very slight pressure, and, therefore, offers but slight resistance either to the urine in the bladder pressing outward, or to secretion arising in the posterior urethra pressing its way backward. Thus the desire to urinate, as a rule, is caused by the pressure of the urine overcoming the resistance of the internal sphincter, and getting into the "neck of the bladder."

In the moment of the strongest desire to urinate, the neck of the bladder and the bladder itself form one common cavity, and the further escape of urine is only hindered by the cut-off muscle (compressor urethræ) dependent on the action of the will.

Any one can convince himself of the unequal power of these two muscles by injecting fluids into the bladder. For example, if we try to inject the bladder simply through the anterior urethra, without using a catheter, by means of an irrigator or syringe, we find the greatest resistance from the compressor urethræ muscle, and in isolated cases, in spite of the strongest pressure, and painful distention of the anterior urethra, we do not succeed in causing the fluid to pass into the

bladder. This difference between the two sphincters of the urethra is seen, however, most clearly in case of disease of the posterior part of the urethra itself.

For example, if catarrhal secretion, blood, or any other fluid accumulate in this part, it will (since it is hindered by the compressor urethræ muscle) never appear in the anterior urethra as a visible discharge, or as stains on the linen, but, on the contrary, it will overcome the weaker sphincter, and enter the bladder. Thus we find, in bleeding from the prostate, the blood flows back into the bladder, tinging the urine, as a whole, as if it came from the bladder itself. Likewise the purulent secretion, in cases of prostatitis, we not infrequently see flow back into the bladder, causing it to take on inflammation. It is, moreover, a very well known fact that, as soon as a gonorrhœa in its abnormal course has passed the boundary of the compressor urethræ, the most violent symptoms connected with the function of the bladder, such as constant desire to urinate, and tenesmus, usually ensue.

It is clear enough, from the facts just mentioned, that the posterior portion of the urethra belongs more to the bladder than to the urethra, and that, therefore, the name "neck of the bladder" is justified from the practical point of view also. Therefore, in diseases of the "neck of the bladder," the urine in the bladder will be made turbid or not, according to the quantity of the secretion of the part. If only a little secretion has collected in the posterior urethra, the urine in the bladder remains uninfluenced, and if we have the patient urinate successively into two glasses, only the first portion of the urine passed will appear turbid, while the second half remains clear and transparent.

If, however, the secretion in the posterior urethra is

considerable in amount, it will flow back into the bladder, make the urine more or less turbid, and even irritate the bladder itself. In this case, both specimens of urine (passed into two glasses) will appear turbid. However, as a distinction from a primary cystitis, the first half of the urine will appear *more* turbid than the second, and will contain more compact flakes, which all come from the urethra, and which accordingly are absent in the second portion of urine passed. An additional characteristic of diseases of the neck of the bladder, and as a distinction from urethritis of the anterior urethra, is the fact that there is never any discharge from the meatus when the disease is limited to the "neck" of

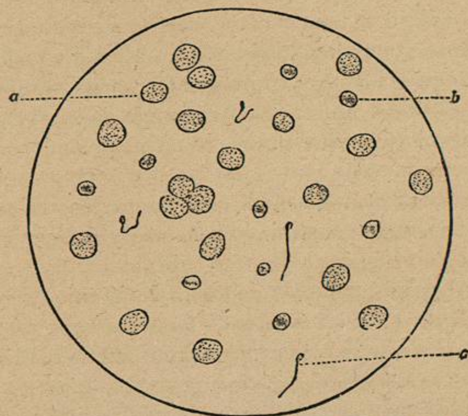

Fig. 3.—Urinary sediment from a case of catarrh of the neck of the bladder. *a.* Pus-corpuscle. *b.* Blood-corpuscle. *c.* Spermatozoön.

the bladder. The secretion of the "neck of the bladder" is sometimes copious, sometimes very scanty, and may consist of increased mucous secretion, or again of pus. If the secretion is scanty, it usually appears in

the form of flakes or particles of membrane; if more copious, it will make all the urine turbid.

Not seldom the catarrhal secretion is mingled with spermatozoa, or even blood. The admixture of blood is by no means a rarity when there is at the same time strong and painful tenesmus. In these cases, at the end of urination, the inflamed, swollen, and vascular mucous membrane is usually squeezed by the spasmodic contraction of the sphincter. Hence, we here see drops of blood only at the close of urination, which spot the linen in a characteristic manner.

The ætiological factor for the catarrh of the neck of the bladder varies widely. Gonorrhœa is the most frequent cause. Still we very often find mild catarrhs of the vesical neck after masturbation and sexual excesses. While the gonorrhœal catarrhs generally cause a purulent secretion, those coming after masturbation and sexual excesses are usually accompanied by numerous flakes and an increased mucous secretion.

No small contingent is afforded by tuberculosis of the genito-urinary tract, which may appear in the most varied forms, and is sometimes extremely difficult of diagnosis.

Finally, all primarily acute and chronic diseases of the prostate gland cause inflammatory processes in the neck of the bladder. New growths and calculi are also factors.

The alterations which are present in catarrhs of the vesical neck, and which can be determined by the endoscope, are swelling, folding, and reddening of the mucous membrane. A slight touch causes the latter to bleed readily. Not seldom we find the blood-vessels much dilated, and the mucous membrane partially robbed of its epithelial coat, so that on endoscopic ex-

amination the surface appears not unlike that of a granulating wound.

Sometimes alterations can also be detected on the caput gallinaginis, and it appears in certain cases much enlarged, hypertrophic.

The neck of the bladder is that part of the urinary tract whence tenesmus most frequently starts. So it is clear that in diseases of this part increased frequency of urination will be a constant symptom. If the catarrh be acute, the desire to urinate will be strong, and very painful at the same time. On the contrary, if the process is a chronic one, the pain is reduced to a vague and disagreeable sensation at the end of urination, the frequency, however, remaining. Frequent micturition in disease of the posterior urethra is such a very characteristic symptom that from the presence of this sign alone we can always conclude with certainty upon a lesion in the neck of the bladder.

If we investigate the different portions of the urinary tract from a pathological stand-point in relation to the desire to urinate, we find, as a matter of fact, the "neck of the bladder" is affected most often, and in a more intense degree than the other portions. Thus diseases of the kidney are only accompanied by frequent micturition, and then but temporarily, when, at the same time, a catarrhal process invades those parts of the tract which carry off the urine, as sometimes occurs in acute cases. On the contrary, in chronic nephritis, in tumors of the kidney, or in renal hæmaturia, we find this symptom wanting. Also *primary* pyelitis, which is partly a renal affection, is never associated with this abnormal frequency of micturition in distinction from an ascending pyelitis from gonorrhœa, which *has* this symptom, since the "neck of the bladder," as well as the bladder

itself, is affected at the same time. Again, in calculous pyelitis, we only have vesical tenesmus when the concretions are passing off. Even very large stones may be present in the pelvis of the kidney without causing tenesmus, unless at the same time the neck of the bladder be irritated. In hydro- and pyo-nephrosis this symptom is also wanting. Even in diseases of the bladder itself, when primary in origin, and especially when the causes are to be sought in the walls of the bladder, or when the disease is situated at the fundus, there is little tenesmus present; but when the neck of the bladder becomes involved, strong tenesmus sets in at once.

This phenomenon is illustrated best by stone in the bladder. If the stone be near the fundus, as is usually the case when the patient is in bed, frequent micturition disappears, or at least is very much less; but as soon as the stone gets near the neck of the bladder, as is generally the case in the vertical position and in walking, annoying and painful desire to urinate sets in at once. In the same way, inflammation of the anterior urethra has no frequent micturition accompanying it, but it immediately follows an extension of the inflammation to the membranous or prostatic portions. On the other hand, the most annoying and painful tenesmus comes with the different forms of prostatitis, with new growths, and in tuberculosis of the prostate. The tenesmus may in these cases increase to such an extent that in acute cases the patients hold the chamber-pot in their hands almost day and night, or, in chronic cases, are obliged to wear a rubber urinal. In addition, the tenesmus is so painful at the end of urination that the patients cry out with pain. From this description it is clear that diseases of the vesical neck are usually accompanied by an annoying, and in many cases painful, frequency of urination. A further symptom of disease of the neck of the bladder is, that at the end of urination (especially if frequent), when painful tenesmus occurs, at the same time a few drops of thick pus or blood, or a mixture of both, escapes from the meatus.

In eminently chronic cases, semen, or a "white sand," is passed at the end of micturition. This "white sand" consists principally of granular carbonate of lime, which appears in the aggregate as spherules the size of poppy-seeds. If we examine these spherules with the microscope, we find among them many pus-corpuscles which seem coated with the calcic carbonate. Reflex neuroses are a frequent phenomenon in diseases of the prostate and neck of the bladder. These may be of purely local occurrence, and affect the genito-urinary apparatus alone, or they may consist of general phenomena, which show that the entire nervous system is involved.

The local reflex neuroses show themselves sometimes as disturbances of a sensory or motor nature, or again of a secretory nature, which may all appertain to either the urinary or to the genital apparatus. The reflex neuroses of the general nervous system appear either as a strongly increased general reflex excitability, as nervousness, or as a greatly lessened nervous activity, as apathy or melancholia. (See "Neuroses of the Male Genito-urinary System," Ultzmann, "Wiener Klinik," 1879).

This circumstance finds its explanation on the one hand in the fact that the prostate (neck of the bladder) is that part of the urinary tract richest in nerves and in ganglia, and on the other in that the hypogastric plexus of the sympathetic (which by means of its vesical plexus in man supplies the seminal vesicles and the prostate as well as the bladder) stands in direct commu-

nication by nerve-fibrils with the sacral ganglia as well as with the pudendal plexus of the sacral nerves.

Catarrhs of the neck of the bladder are sometimes accompanied by alterations of this part of the urinary tract, which may be determined by digital examination per rectum, or by investigating the urethra by means of a sound. Thus we often find, in cases of long-standing catarrh of the vesical neck, the lobes of the prostate irregularly formed, flattened, or grooved; or its surface uneven, hard, and rough. Again, sometimes we find hard, circumscribed infiltrations in one or more lobes (chronic prostatitis).

In catarrhs of the neck of the bladder consequent upon masturbation or sexual excesses, the entire prostate is not seldom atrophic, and, indeed, sometimes to such an extent that we can no longer detect the contour of the separate lobes with the finger. In catarrh of the neck of the bladder, in consequence of tuberculosis, we sometimes find the prostate irregularly uneven and hard ; at the same time, one or the other of the seminal vesicles changed into a hard cord. Sometimes, too, the epididymes are felt as large, hard, insensitive bodies. But there are catarrhs of the neck of the bladder where no considerable alteration can be detected by the finger per rectum. Indeed, this is the most frequent result, especially when the catarrh is not a very old one. In examining with the sound, we find the anterior urethra as far as the compressor urethræ normal; the walls soft, elastic, and but little sensitive ; but as soon as we arrive at the region of the membranous urethra and prostatic, we feel an increased resistance, the sound passes with difficulty, and only with an increase of pressure, into the bladder. At the same time we notice a greatly increased sensitiveness of this part. These are

changes which find an easy and complete explanation in the chronic inflammation of the part.

We also find in these cases, and especially in the very slight catarrhs, such as usually follow masturbation, not infrequently a spasm of the compressor urethræ, which has been denominated "spasmodic stricture" by some authors. The spasm in the compressor urethræ finds its analogue in the spasmodic contractions of the circular muscular fibres of the rectum, when catarrhal or ulcerative processes are present. Not seldom we find spasmodic contractions in both rectum and urethra at the same time, where the lesion can be detected in but one of these. Thus we find spasm of the rectal muscles in cases of catarrh of the neck of the bladder, and *vice versa.* This is explained by the fact that both regions are supplied by the same nerves, viz., the middle and inferior hæmorrhoidal. Since the spasmodic contraction of the compressor urethræ which follows the introduction of a sound is most surely overcome by the use of thick, metallic sounds, it is clear that in these cases we should never use conical instruments, or those of small calibre, and always perform the introduction *lege artis* with great care. A constant pressure with a smoothly rounded and thick sound will overcome the spasm of the compressor. On the contrary, an unsteady catheterization, especially if performed with a small instrument, will only excite the muscle to increased activity. One can thus only do injury, and still not get into the bladder. The subjective sensations of the patient in catarrh of the neck of the bladder are concentrated in the perinæum, in distinction from actual cystitis, where the tenderness and pain are felt mostly above the pubes. Patients complain sometimes "as if something in the rectum were drawing

itself together" ; sometimes of a sensation of fullness in the perinæum ; again, of a burning in the course of the urethra, or of a lancinating pain in the glans penis, while pressure with the hand over the fundus of the bladder is well borne by the patient without any pain whatever.

If we did not carefully examine the genito-urinary apparatus, we might frequently make a wrong diagnosis of pyelitis from an examination of the urine, when the case was actually one of disease of the neck of the bladder. That is, such a urine has usually an acid reaction ; it contains pus, and sometimes also a larger amount of albumen than corresponds to the quantity of pus present. A microscopic examination of the sediment shows an absence of triple phosphate crystals ; and the small, round, swollen (from inflammation) epithelial cells from the neck of the bladder are not always easy to distinguish from altered renal epithelium. Since, now, in disease of the neck of the bladder, we frequently get radiating neuralgic pains in the sacral region, the deception is the more complete. The increased separation of albumen in disease of the neck of the bladder is explained by the hindrance to the outflow of urine from the ureters. This hindrance may be caused either by inflammatory swelling of the prostate and its surroundings (prostatitis and peri-prostatitis), or by pericystitis, and in women by parametritic exudations, by which a mechanical compression is exerted in the neighborhood of the openings of the ureters into the bladder. Then it may also be present when no such infiltration in this region can be detected, when severe and painful tenesmus is present, whereby a hindrance to the flow of the urine from the ureters also results. In these cases the albuminuria present is to be explained by the partial setting back of the urine in the ureters, toward the kidneys—analogous to those cases of chronic retention with insufficiency of the bladder, or where there is some other obstruction to the evacuation of the urine, as hypertrophy of the prostate, or a narrow stricture of the urethra.

This albuminuria occurring in diseases of the neck of the bladder, and especially in acute inflammatory processes here localized, is often very characteristic and pronounced in a gonorrhœa in its abnormal course. As long as the clap is limited to the urethra in front of the compressor urethræ, the abnormal frequency of urination (Harndrang) is absent, as well as renal albuminuria. But if the gonorrhœa passes the limit of the compressor urethræ, both albuminuria and frequent micturition frequently set in at once. The albuminuria is in direct proportion to the tenesmus. Now, if in such cases we give narcotics, and in this way cause the constant desire to urinate to vanish, the albumen also disappears at once from the urine, or, at least, it considerably diminishes. At the same time, we find that during the tenesmus but a small amount of urine is passed, in spite of the frequent micturition, while the urine begins to flow more abundantly after the disappearance of this symptom. This is certainly a proof that there is a sympathetic albuminuria in diseases of the neck of the bladder, accompanied by strong tenesmus, that has nothing in common with pyelitis, but which from the microscopic and chemical examination of the urine has been confounded with it. Only when pyuria and albuminuria are present at the same time with polyuria, and when no painful micturition exists, can we infer in doubtful cases that a pyelitis is present also, or that pyelitis is the only disease at the time.

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