during the early stages of prostatic disease; but when the congestion of the kidneys is considerable there are usually albumin and a few casts. During the last stage of the disease, when polyuria has established itself, the specific gravity is low (1.003–1.006) and there is generally a small amount of albumin, although this may not be present. A few casts will generally be found at this time, too, but they may be absent even when the kidneys are extensively diseased.

In the presence of inflammatory complications the character of the urine is greatly changed, as we shall see later.

In addition to the more local symptoms which we have been considering, there are also certain general disturbances which are likely to appear in advanced prostatic disease. These are of two kinds, digestive and febrile.

Obstinate indigestion in an old man, especially if accompanied by nausea, should always lead us to take the condition of the prostate into consideration. These patients are also very liable to a low feverish condition, with extremely dry mouth and tongue, and this may announce the extension of inflammation from the bladder back into the kidneys.

We now come to the consideration of the complications which are likely to arise in prostatic cases, and of the symptoms, or variation in symptoms, to which they give rise.

They are cystitis, pyelitis (pyelonephritis), hæmaturia, and stone in the bladder.

Cystitis is so common in prostatic hypertrophy that it may be looked upon almost as a necessary result. It sometimes appears without apparent cause, sometimes in consequence of excesses in drink, or from exposure to cold, and in this case the infection probably comes from the rectum or through the blood. Far more commonly, however, it follows as a consequence of the use of the catheter or other instrument, and when it is once established it is rarely got rid of—but may, as we shall see, by appropriate treatment, be kept within very reasonable bounds.

When the inflammation of the bladder is at all acute, the pain and frequency of micturition are greatly increased. If the prostate shares in the inflammation, a great weight and bearing-down pain in the rectum may be felt, with a frequent urgent desire for defecation.

The urine becomes thick from the admixture of pus and mucus, which often settles at the bottom of the vessel in a thick, ropy mass. Presently, in the majority of cases, it undergoes alkaline fermentation, becomes ammoniacal, and has a strong pungent, often fetid odor. The sediment now contains, besides the pus, prostatic cells and abundant crystals of triple phosphates, often associated with finely granular amorphous phosphates.

If the inflammation extends from the bladder back through the ureters to the kidneys, the resulting pyelitis or pyelonephritis makes itself known by pain in the back, high fever, more or less diminution or even suppression of urine, and uræmic symptoms.

This course of things is especially liable to occur late in the disease, when neglect of catheterization has allowed the ureters to become greatly distended. Under these circumstances, any exposure to cold or instrumentation may be sufficient to start the fatal access of inflammation.

Occasionally, when the use of the catheter has been neglected after the time when it should have been begun, the final entrance upon the catheter life, instead of being a conservative measure, gives the final push toward a fatal issue. The existence of polyuria, with urine of a low specific gravity, should always lead us to fear this result.

Stone in the bladder not infrequently occurs in prostatic patients as a consequence of cystitis, in which case the stone is of the soft phosphatic variety; or a stone composed of uric acid, oxalate of lime, or cystin may form, and owe its origin primarily to a constitutional condition.

In either case the prostatic hypertrophy may be regarded as partly responsible for the formation of the calculus.

In the first case, that of the phosphatic stone, the obstruction, by causing the cystitis and fermentation of the urine, stands in a pretty close causative relation to the calculus. In the second case, in which the deposit of crystals from the urine is due to a constitutional tendency, the obstruction at the prostate may be the condition which decides whether a stone shall form or not. For, when the bladder is completely emptied at each urination, the crystals as they form are thrown out and do no harm, whereas when there has been formed behind the prostate a pocket in which there is always residual urine, the sand collects there and soon agglomerates itself into a concretion.

When a stone forms behind an enlarged prostate the pain is usually much increased, and is less amenable to treatment. It is referred often to the glans penis, and is greatly aggravated by motion, especially by riding in a jolting vehicle. It is commonly less marked at night or during rest.

Hæmaturia in case of stone is very likely to appear after exercise or riding, while prostatic hemorrhage from congestion seems to be independent of any jarring of the bladder—in fact, is rather more likely to come at night, when recumbency favors prostatic congestion.

The sudden stoppage of the stream in the midst of urination, by the rolling of the stone against the opening of the urethra, is less likely to occur in case of an enlarged prostate than in a healthy bladder, owing to the lodgment of the stone behind the prostate, below the urethral orifice.

If the presence of the stone affects the frequency of micturition, it tends to increase it rather in the daytime, when motion causes the stone to move about, than at night, when it is at rest.

Hæmaturia, as has been said, may result from the congestion of the prostate with or without ulceration, or from the presence of a stone. We may also have hemorrhage of considerable amount and duration, following the use of instruments; and, lastly, the too sudden emptying of an over-distended bladder may lead to an attack of hæmaturia, from the capillary oozing from the vesical wall.

Sometimes clots of large size may form in the bladder, and cause much pain and discomfort before they are broken up and expelled.

Physical Examination.—After it has been decided from the symptoms that there is a probability that prostatic hypertrophy exists, a thorough examination should be made of the prostate and bladder.

The objects of this investigation are to ascertain the stage at which the disease has arrived, to learn the amount of obstruction and the configuration of the prostatic urethra, and to discover any complicating conditions which may exist.

The patient should first empty the bladder, so far as possible by the natural efforts, and the hypogastrium should then be explored by palpation and percussion, to see whether enough distention of the bladder remains to be detected in this region. The normal variations in the position of the bladder and intestines render this examination often unsatisfactory, especially when the abdominal wall is thick or rigid.

The examiner should then explore with the forefinger the rectum. This is best done with the patient on the back.

If the prostate is enlarged it will be felt pressing down the anterior rectal wall. Its size, shape, and consistency should be noticed.

The relative enlargement of the lateral lobes can usually be well made out, and nodular projections are sometimes felt, caused by irregularities in the hypertrophy of different parts of the gland. Rectal examination, unfortunately, gives little or no information in regard to the condition of the third lobe, which is so often the cause of a serious obstruction to the flow of urine.

Incidentally, the degree of tenderness to palpation will be discovered.

The condition of the prostate itself having been determined, the examining finger should be carried up along the posterior vesical wall, if that be possible, and the condition of the bladder should be learned. In this investigation the bimanual manipulation between the finger in the rectum and the hand above the pubes, so commonly practised in examinations of the female pelvic organs, is useful, and by it the amount of distention of the bladder can often be most accurately made out.

Lastly, the urethra and bladder should be explored.

The existence of a stricture will probably be detected in the passage of instruments for deeper exploration. But in case of doubt the canal may be thoroughly examined with large bulbs. A short-beaked sound should be passed, and as it runs through the prostate deviations of the urethra will often be shown, by the feeling of resistance on one side or the other and by the turning of the handle.

The sound in entering the bladder may sometimes be felt to slip up over a bar, or may turn to one side around a prominent third lobe.

After a proper search has been made for a possible stone, the sound should be depressed until it lies in the axis of the body, and then withdrawn until the concave side of the beak comes against the neck of the bladder; it may then be rotated, and, as the beak sweeps the vesical face of the prostate, any irregular outgrowths or projections will be felt to arrest its movements.

If the sound has been felt to ride over an obstruction at the neck of the bladder and if, after it is in, it rotates freely, this points to a bar rather than to a globular enlargement of the third lobe, which last would arrest the beak of the sound in rotation.

As the instrument is withdrawn slowly through the prostate, the deviations due to projections into the urethra are often felt even more plainly than during introduction.

Finally, the urine may be withdrawn with a catheter and the exact amount of residuum thus discovered. This will be found to vary much at different times, and depends somewhat upon the amount of urine which the bladder contained before the last urination.

When the bladder is full and the urine consequently rushes out with some force in a considerable stream, it will often be found that there is much less water left in the bladder than is the case when urination is attempted before complete distention has been reached.

Diagnosis.—The conditions with which enlarged prostate is likely to be confounded are stricture of the urethra, stone in the bladder, atony of the bladder, cystitis, cancer or other tumor of the prostate, tuberculosis of the prostate, and tumor of the bladder.

The physical examination, if thoroughly made, usually enables us to eliminate the first two of these conditions, and if enlargement of the prostate with residual urine is found we may, in the absence of other discoverable cause, decide that an existing cystitis is dependent upon the prostatic trouble. It may, however, be impossible to demonstrate the absence of stone behind an enlarged prostate except by a thorough examination under ether with the lithotrite.

The decision between a tumor of the prostate and simple enlargement is extremely difficult, unless the tumor has assumed considerable proportions or has begun to invade surrounding parts. The physical examination by way of the rectum gives us our best help in diagnosis, but the irregular growth of a tumor may at first simulate the irregularities sometimes seen in hypertrophy.

The pain attendant upon the growth of a tumor is more severe than that appearing early in hypertrophy, though this is by no means constant.

In case of a cancer the enlargement of neighboring glands may help us to the right solution of the question, and occasionally the microscopic examination of the urinary sediment will show the presence of cells characteristic of a new growth. Not infrequently, however, it will be necessary to wait until the progressive growth of the tumor declares its character.

Tuberculosis of the prostate usually occurs earlier in life than we could look for hypertrophy. In case of doubt, tuberculous deposits must be sought for in other organs (epididymis, seminal vesicles, lungs, etc.).

A tumor of the bladder may give rise to hemorrhages and difficulties of micturition which simulate those caused by enlargement of the prostate. Also a tumor may be present in the bladder behind an enlarged prostate, and so complicate the symptoms.

The hemorrhage from a tumor is ordinarily very much greater than that from a congested prostate. But this is not always the case, and whenever there is persistent or intermittent hæmaturia, however slight, a careful search should be made for villi or other bits of the tumor which may be detached and passed in the urine, and which may be recognized under the microscope.

Examination of the bladder with the sound may, when a tumor is there, reveal a projection somewhere from its wall. But sensations of this sort are very misleading, and it is well, after a thorough sounding, to wash out the bladder with the litholapaxy evacuator, with the object of obtaining bits of the tumor, if one is there.

After definitely settling the diagnosis of prostatic hypertrophy, it is always important to go further and to decide in what stage the disease is, as we shall see that treatment should vary according to the varying conditions.

The steps to this decision have been sufficiently indicated above.

Treatment.—As has been described, the disease under consideration consists essentially in a tendency to congestion of the prostate, bladder, and kidneys, with an accompanying hypertrophy and sclerosis.

For convenience we have divided it into three stages: First, of congestion, with functional disturbances; second, of simple retention; and, third, of retention with distention, often incontinence, and perhaps involvement of the kidneys.

First we will consider those measures of treatment, hygienic and medical, which are applicable to all stages of the disease.

Anything which has a tendency to increase the congestion should be carefully avoided. A chill of the surface should be especially guarded against. The patient should wear flannels next the skin, and should carefully avoid draughts or long exposure to chilly and damp air.

The feet should be kept dry and warm, and if the patient gets up at night to pass water, use the catheter, or for other purpose, he should cover his feet and legs warmly. Neglect of these precautions may at any time bring on an attack of retention, of cystitis, or even of pyelonephritis.

Excesses in eating and drinking are to be avoided. Large quantities of rich or highly seasoned food must not be indulged in, and wine and beer are for the most part better left alone. This caution should be understood to apply only to overeating, as a sufficient quantity of nourishing food is of importance. If the patient has been in the habit of taking a stimulant, a little light claret, or some whiskey and water, may be allowed with meals.

Especial warning should be given against holding the water over the ordinary time, particularly if any call to pass it is felt. An attack of complete retention or of cystitis may result from disregard of this rule.

Venereal excesses are, of course, to be avoided.

The effect of sedentary habits and of horizontal decubitus in increasing the passive congestion must be borne in mind, and moderate gentle exercise is to be advised. The patient will do well, when engaged in any occupation that keeps him long in one position, to take an occasional turn through the room; and at night or in the morning, when he gets up for the purpose of emptying his bladder, a short walk about his chamber will often materially assist him in making his urination thorough and satisfactory.

Constipation should be carefully guarded against. In prescribing for this condition, the violently acting drugs,

which produce more or less congestion of the pelvic organs, should not be used.

The greatest assistance will often be obtained from rectal injections. These are especially useful when the mechanical obstruction of the prostate, pressing as it does upon the rectum, is largely responsible for the failure of the bowels to act.

Cold injections are usually to be avoided, though they may sometimes render good service in helping to restore the functions of an atonic bladder. Hot injections (112°–115° F.) will sometimes assist in reducing congestion.

The functions of the skin should be stimulated as far as possible. Rubbing and massage are to be employed to this end, and baths also serve a useful purpose if care is taken against a subsequent chill. A hot bath ending with a sponge off in cold water, and vigorous friction with a rough towel, may be of real benefit, by bringing the blood to the skin and so relieving internal congestion.

In selecting a climate for a prostatic patient, preference should be given to dry inland localities, where sudden changes of temperature are less likely to occur than on the seacoast. Sometimes, however, when the general condition is depressed and a stimulating climate is desirable, the seaside may be tried, special precautions being taken against surface chills.

General medication directed against the disease itself has but little to offer.

The iodides may have a trial, in virtue of their reputation in the treatment of sclerotic conditions of the blood-vessels and other organs. If used they should be persisted in for a long time, with occasional intermissions. They have the disadvantage of sometimes disagreeing with the stomach, and it may be necessary to discontinue them on this account.

Of the medication required in the various morbid conditions which may from time to time need correction, we shall speak in considering the treatment of the various periods.

Local treatment may be divided into palliative and operative.

Palliative Treatment.—Treatment in the first period is almost wholly hygienic and medical.

In the absence of complications, and before there is any retention, the less instrumentation the better, as it only aggravates the congestion, and introduces the danger of infection from dirty instruments.

If the urine is irritating from too great acidity, an alkaline diuretic, such as citrate or acetate of potash, is indicated.

In case of pain, belladonna or hyoscyamus should be administered either by the mouth or by the rectum. Opiates should be avoided, if possible, as they derange the stomach and constipate the bowels. When urgently required, however, they may occasionally be resorted to.

Ergot, strychnine, or nux vomica in some form and quinine are sometimes useful, and act apparently by diminishing the congestion, and perhaps also by stimulating the contractions of the bladder. If the circulation is not good, cardiac stimulants may be of assistance.

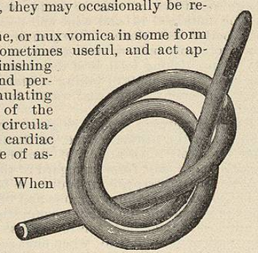

FIG. 3890.—Soft-rubber Catheter.

Second Period. When the stage of partial retention has set in and the patient passes water, but is not able completely to empty the bladder, it is necessary to resort to the use of the catheter. So important is this that every patient who is seen in the first stage and put upon general treatment, should be warned that the time will almost certainly come when catheterization will be required, and that as there is no sure means by which he can tell when he reaches this state, he should occasionally present himself for examination to decide this point.

Sometimes the partial retention is due to some accidental increase of congestion, which may disappear under the use of antiphlogistics. In such a case the patient may be put to bed with leeches to the perineum, followed by hot applications assisted by opiates, if necessary.

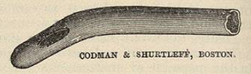

FIG. 3891.—Elbowed Catheter (Sonde Coudée of Mercier).

If these measures fail, it will be necessary to draw the water, and it will sometimes be found that, after a short systematic use of the catheter, the bladder will recover itself and again become able fully to expel its contents. Thus the disease may occasionally be moved back from the second period into the first.

When complete retention comes on suddenly the catheter is indispensable, but in this case again its use may perhaps later be given up.

When entering upon the use of the catheter, we may often learn whether it is really needed by noticing the effect upon the symptoms. If these are relieved or ameliorated, we are evidently on the right track.

It is to be remembered, however, that not infrequently, on commencing catheterization, a cystitis develops itself, owing either to the too sudden evacuation of a distended bladder, to the introduction of dirt upon the catheter, or simply to the irritation from the constant use of instruments. It is important that the aggravation of symptoms caused by this inflammatory onset shall not lead the patient or doctor to infer that the catheter is doing harm and should be given up, for it is by continuing its use that the attack of cystitis may be most quickly and surely relieved.

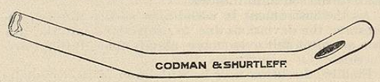

FIG. 3892.—Double-Elbowed Catheter (Sonde Bicoudée).

Let us now consider how and with what instruments the catheterization is to be carried out.

As has been described, the walls of the urethra are pressed together and may be somewhat deviated by the inequalities of the lateral lobes. The posterior part of the urethral floor is also often raised by the projection of the third lobe.

Our object is to reach the bladder through this sinuous passage with the least possible amount of irritation.

If a soft, red rubber catheter will find its way into the bladder, it is, by all odds, the best instrument to use. It requires no skill for its direction, and can do no damage to the urethral walls—a point of great importance, as it enables us to entrust its use to an unskilful patient.

When, owing to the narrowness or tortuousness of the urethra, the rubber catheter will not pass, we must resort to a stiffer instrument, and must adapt its form in reference to the difficulties which it has to overcome.

The obstructions which it will meet project from the lateral walls and floor of the canal, and our effort must be to carry the point of the instrument along the upper or anterior wall.

Mercier devised for this purpose a flexible webbing catheter with the point sharply turned up (sonde coudée), so that it might ride over the obstructions on the floor.

For those cases in which the hypertrophy of the third lobe was very pronounced, he used a catheter with a second bend, designed to lift its point still higher.

In introducing these instruments, care should be taken that the point be kept turned toward the roof of the canal, and after it has passed the triangular ligament the

penis should be depressed as much as possible between the thighs, so that the catheter may be pushed straight upward in the axis of the body.

The English gum-elastic catheter may often be used with advantage, either with or without its wire stylet. If it is introduced without a stylet it is a good plan to exaggerate the curve of the instrument, as has been suggested by Thompson. When used thus it should be introduced cold and carried as rapidly as possible through the anterior urethra, for as it warms it becomes flexible and loses its form. By passing it rapidly but carefully, its curve often carries it over the obstructing third lobe.

If it meets an obstruction and, warming in the urethra, becomes flexible, the forefinger in the rectum should be used to lift the point of the catheter into the prostate, while at the same time the handle should be brought down to the axis of the body, and the instrument, which is then practically straight, should be pushed steadily into the bladder. This should be done without the exercise of much force, as the point, when properly guided, slips along quite easily and when it catches there is danger of its making a false passage if pushed.

If the gum-elastic catheter is introduced with a stylet it should be curved into the form of a prostatic silver catheter. Sometimes, when the point catches it may be lifted over the obstruction by the simple manœuvre of slowly withdrawing the wire while slightly advancing the instrument. This curls the point upward and often enables it to ride over the obstacle

Occasionally, when other flexible instruments fail, the French conical bougie catheter will succeed in worming its way through the canal. It should be used with great caution, as its comparatively sharp point may catch in and perforate the mucous membrane.

Failing with other instruments, we may have recourse to a metallic catheter of large curve.

The beak of this instrument should be long enough to reach easily through the enlarged prostate, which may be one inch and a half longer than in the normal state. If the curve is too short the point does not reach the bladder, but being engaged in the prostate, runs considerable risk of making a false passage when the handle of the instrument is depressed.

The forefinger in the rectum may give great assistance in guiding the passage of this catheter.

In using any instrument in a urethra with false passages it is a good plan always to withdraw for a considerable distance when the point is caught, and then to try to pass the pocket by carrying the beak down first one wall and then another until the right passage is found. Ordinarily the false passages exist in the floor of the urethra; but this rule has many exceptions.

If, in a case of complete retention, after careful and thorough attempts we do not succeed in reaching the bladder, recourse must be had to puncture with trocar or aspirating needle.

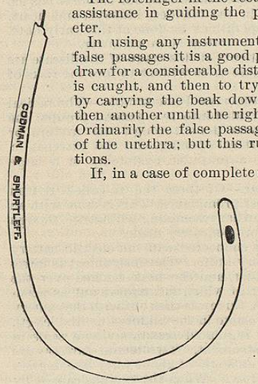

FIG. 3893.—English Gum-elastic Catheter with Exaggerated Curve on Stylet. (After Thompson.)

This was formerly done through the rectum with curved trocar, but as this method cannot be used antiseptically the suprapubic puncture is to be preferred. This may be done with a fine needle introduced close above the pubis, and, if necessary, may be repeated two or three times daily for a considerable time. Usually, however, drawing off the urine in this way is followed by such a subsidence of the swelling as presently to allow the introduction of the catheter. Leeching the perineum and the administration of ergot may also be of service in reducing the congestion.

The evacuation of a distended bladder, whether by catheter or by aspiration, should be performed slowly and carefully. When the distention is extreme, the bladder should not be wholly emptied at one time, for if the internal pressure is too suddenly relieved we are likely to have a great congestion of the vesical mucous membrane, with the escape of blood into the urine, followed often by considerable inflammation.

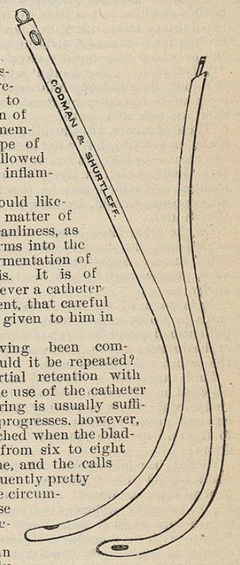

FIG. 3894.—Silver Catheters of Curve Appropriate for Use through an Enlarged Prostate.

The greatest care should likewise be taken in the matter of thorough antiseptic cleanliness, as the introduction of germs into the bladder may start a fermentation of the urine with cystitis. It is of course important, whenever a catheter is entrusted to a patient, that careful instructions should be given to him in regard to this.

Catheterization having been commenced, how often should it be repeated?

In the cases of partial retention with moderate residuum, the use of the catheter each night before retiring is usually sufficient. As the disease progresses, however, a point is presently reached when the bladder habitually holds from six to eight ounces of residual urine, and the calls to urinate are consequently pretty frequent. Under these circumstances the regular use of the catheter is required.

If now the patient can get along comfortably while using the catheter four times a day, he is fortunate, and may live for twenty or more years with his artificial urination. Not infrequently catheterization will be required six, seven, or even more times in the twenty-four hours. Especially is this the case when cystitis is present. The water should always be drawn when the desire to micturate is urgent and persistent.

When catheterization is required so often as to become a decided source of irritation, and if the bladder is so irritable as to be constantly liable to painful contractions, it will be found best to tie in the catheter for a time (sonde à demeure). Usually in a few days, after the bladder has had a rest, the catheter can be again left out and the patient can resume regular catheterization.

During the time while the patient is becoming accustomed to the use of the catheter and the bladder is acquiring a tolerance of instrumentation, it is wise to give some urinary antiseptic almost as a routine measure. Of the antiseptics now at our command urotropin and sandal oil are the most useful. Urotropin may be given in doses of five to eight grains two or three times a day, and is a most useful drug, but it will occasionally act as an irritant, especially in the presence of ulceration of the prostate, and in these cases sandal oil is to be preferred. Sandal oil is a more soothing drug, and is especially useful where the tendency to irritability of the bladder exists.

Third Period. In this stage of the disease, systematic emptying of the bladder is as urgently called for as at any earlier time. The serious changes, however, which

are likely to have occurred in the ureters and kidneys, with the condition of passive congestion which exists throughout the urinary tract, make the use of the catheter a matter of considerable danger, which in some cases may be so great that it will be better practice to leave the bladder undisturbed.

In these cases the patient's condition of comparative health—troubled, it is true, by frequent and often partly involuntary micturition, but not debarred from ordinary occupations—makes a striking contrast with the state of things which may rapidly develop upon entering on the "catheter life." For a slight added irritation to the bladder may be suddenly followed by a pyelonephritis, or even more abruptly by renal congestion with suppression, uræmia, and death.

These dangers are alarming and imminent enough to make us hesitate, but what is to be hoped from allowing the disease to take its course? Nothing but a certainly fatal issue, which is likely to come in a few weeks or months, and which may be precipitated at any time by an exposure to cold, by fatigue, or by a slight indiscretion in diet.

On the other hand, when catheterization is successfully established, the disease may be moved back from the third to the second stage, and the patient who was in such danger may be put in a state of comparative security.

It is, then, of the first importance to distinguish the cases in which catheterization is so dangerous that the patient had better be left to follow out the natural course of the disease; and in all except these most advanced cases the catheter should be used.

Each case must be decided on its merits, and so much depends on attention to detail that we should sometimes be deterred from commencing catheterization with a careless and slovenly patient, when we should have resorted to it could we have counted on his intelligent co-operation.

Guyon has laid down, for these advanced prostatic cases, a good rule of practice. He puts the patient upon general tonic treatment, and if he finds that he is wanting in strength sufficient to benefit by it, he does not regard him as in a state likely to be helped by interference with his bladder. If, however, he improves decidedly in his general condition, then Guyon regards it as wise to resort to the catheter.

The precautions to be observed in accustoming the patient to the catheter are the same that are required in the second stage of the disease, but they are now even much more important.

Especially should the sudden emptying of a distended bladder be guarded against. It may often require two or three weeks of catheterization before the bladder acquires such tolerance that it may safely be left empty.

During the preliminary period the catheter should always be passed with the patient horizontal, to guard against the too rapid flow of water; afterward, when the complete emptying of the bladder is desired, the vertical position is the best for this operation.

Operative Treatment.—It is impossible in the space at our command here to do more than suggest the outlines of operative treatment and of the more important procedures.

Radical operations aim at a cure; that is, at the complete restoration of the function of urination. While they often fall far short of this ideal, yet many cases are practically cured. Perhaps the main reason why operative treatment has not been more generally successful is to be found in the age of the patients, for in the majority of cases we have to deal with men between fifty and eighty years of age, and it is obvious that severe operations become more dangerous with advancing years. The willingness of the surgeon to operate in any individual case will also often be influenced by the social condition of the patient, for a man of the lower classes who cannot afford the time, trouble, and careful attention to detail necessary to make catheter life tolerable, may wisely be advised to have some operation done, whereas a man in easy circumstances may be kept comfortable by less radical and safer measures.

Operation during First Stage.—As the symptoms of the first stage are largely those of engorgement and irritability, comparatively few patients will be seen at this time, and as it is obviously impossible to decide definitely how long a time may elapse before a patient reaches the second stage, or whether this stage will be reached at all, it is seldom that patients in the first stage are to be advised that an operation should be done. Of course, it must be admitted that the earlier such operations are done, the better, if they are to be done at all, but the progress of this disease is so variable that sound conservatism will rarely be found in favor of operation at this time.

Operation in the Second Stage.—The second stage of prostatic enlargement is, as will be remembered, that of beginning obstruction. At this time, the bladder will usually be in good, or, at least, fair condition, and comparatively little damage will have been done to other parts of the urinary tract. This time is, therefore, in most cases the time of election for radical operative procedures. The patient is usually not too advanced in age, his blood-vessels are probably in good condition, and the bladder and kidneys have not been irreparably damaged. If, however, a patient, though in the second stage, be found to have evidences of a chronic nephritis, a damaged heart, or sclerotic arteries, the outlook will be correspondingly less favorable.

Operation during the Third Stage.—The third stage being that of complete obstruction accompanied as a rule by more or less damage to the kidney will be an unfavorable time for radical operation. The mortality at this time is almost prohibitory, and there is little hope of restoring completely, or even in great measure, the function of the bladder. These patients may sometimes, however, by careful catheterization or drainage of the bladder, be so improved that an operation can later be resorted to with reasonable hope of success. Hitherto the rule has been to resort to radical operations only in the more difficult and desperate cases. As a result of this practice the mortality of such operations has been high.

The ideal time to choose for interference is when the obstruction has become considerable, but before it has led to serious changes in the bladder, kidneys, and heart. Could most of the operations be done at this early date, the mortality would doubtless be much lower.

Unfortunately, patients at this stage of the disease are usually too comfortable to be willing to face the risks of operation.

The Various Operative Procedures.—The radical operations may be divided into two general groups: the internal ones, or those done through the urethra or through a small perineal opening, and the external, or those which involve suprapubic cystotomy or a large perineal opening.

Internal Operations.—Of these the so-called Bottini operation is the most prominent. This is done with an electro-cautery, somewhat resembling a lithotrite, though much smaller and more delicately made.

The male blade is connected with an electric battery and acts as the cautery knife. The instrument is introduced into the bladder, and the beak hooked over the prostate, the contour of which is mapped out as accurately as possible. A furrow is then cut with the cautery blade through the prostate in the middle line, the length of the furrow being regulated accurately by a scale in the handle of the instrument. Two lateral furrows are then also cut each at an angle of about forty-five degrees from the median furrow. When the sloughs caused by the cautery have come away, the urethral obstruction is often considerably lessened.

This operation is applicable to some cases which would not stand more radical procedures. The relief is often far from complete, and total failures are not uncommon. The operation may be done under local or under general anæsthesia.

Some operators prefer to introduce the instrument

through a small incision in the membranous urethra. In this way shorter instruments are required, and they are more easily guided by the hand. The operation does not, however, essentially differ in its results from the regular Bottini operation.

External Operations.—Of the external operations there are three general types: suprapubic, perineal, and combined.

Suprapubic Operations.—All of the suprapubic operations begin with an ordinary suprapubic cystotomy. The bladder having been opened, two types of operation are at our command. First, the partial operation in which portions of the prostate, such as a projecting third lobe or a prominent bar, are removed, and no attempt is made to remove the bulk of the prostate. This method may be carried further and the prostate may be nibbled away with cutting forceps, until the greater part of the obstruction has been removed. Operations of this type have been practised for a considerable length of time, and while sometimes giving almost or quite perfect functional results, they very frequently fail completely to remove the obstruction. In cases in which only a polypoid third lobe, or a small projecting bar is removed, the operation is of less severity, and carries with it a correspondingly lower mortality than in the cases in which complete removal is attempted, and it may, therefore, occasionally be applicable to cases in which the patient cannot stand a more extensive operation.

Of late years complete enucleation of the prostate by the suprapubic route has been frequently practised, and in selected cases it is an operation giving brilliantly successful results. The prostate is surrounded by a very distinct capsule, formed largely from the layers of the pelvic fasciæ. It is, therefore, possible to shell the gland out from this capsule without excessive hemorrhage, and in these cases the operation can be done rapidly and bleeding readily controlled by packing the cavity with gauze. When the enlargement is very great, and especially when the glandular type of hypertrophy exists, the hemorrhage may be alarming and the raw surface left behind is a great menace on account of absorption of septic materials and extensive sloughing of torn and bruised tissues. The cases likely to prove most favorable under the employment of this method are those in which the prostatic tumor projects chiefly into the bladder, is not of excessive size, and is of the fibrous rather than the glandular type. To avoid the obvious dangers of leaving a large wound upon the floor of the bladder the *perineal operations* have been devised. The underlying principle of all perineal operations is to bring the prostate into view by a free perineal incision, which may be vertical or crescentic; then to separate the prostate from the lower segment of the rectum, and, after incising the prostatic capsule, to proceed to enucleate the gland with the finger much as in the suprapubic operation. In favorable cases this may be done without damage to the floor of the bladder, and is at times also a very successful procedure. The obvious dangers, however, are those resulting from extensive tears of the floor of the bladder and prostatic urethra, and from the not very infrequent accident of tearing the anterior rectal wall in the course of the operation. The cases most suitable for operations of this type are those in which the prostate is well within reach of the finger, and in which the outgrowth has been toward the rectal aspect of the prostate, and in which ulceration of the bladder does not exist. In order more accurately to study the requirements of each case Alexander has devised a *combined operation* in which the bladder is first opened above the pubis, and then if the case be favorable for perineal enucleation, a perineal incision is made and the fingers of one hand in the suprapubic wound push the prostate down while enucleation is done with the other hand through the perineal incision. Some operators do not open the bladder above the pubis, but carry the suprapubic incision down to the bladder wall, and then with the fingers above press down the prostate and make it accessible from the perineum.

It is important to remember that the careful selection of the operation best suited to each case is of the first importance, and it is, therefore, often wise to examine the bladder carefully with the cystoscope before deciding which operation should be undertaken, or whether any operation is likely to give permanent relief.

Orchidectomy and Vasectomy.—The subject of operative treatment of prostatic hypertrophy can hardly be dismissed without making mention of two operations which have been advocated for the relief of the condition, and which may still be done from time to time.

The operation of double orchidectomy, which was ably advocated by White, had many advocates at the time of its introduction. In some cases it appears to give very marked relief in cases of congested prostates, but this relief is likely to prove but temporary, and in the most favorable cases does not result in radical cure. It has been followed in a few instances by very marked mental symptoms, amounting in certain cases to insanity, and this, together with the frequency of total failure to relieve the symptoms, has made it an operation which is very rarely to be advised, and the interest in it at present is largely historical.

Vasectomy.—This operation, which consists of the ligation and division of both vasa efferentia in the region of the external inguinal ring, was strongly advocated by Mr. Harrison. It was hoped that it would have a result equally favorable with that of orchidectomy, but without its unfortunate results. This hope has hardly been justified, and the operation seems to be valuable largely for the relief of those cases in which recurrent attacks of acute epididymitis are a serious cause of discomfort to the patient. It can be done if desired under local anæsthesia, and its technical details present no difficulty.

Treatment of Complications.—Cystitis, which is the most common complication of prostatic hypertrophy, is to be treated according to the rules laid down under *Bladder, Diseases of The*, on pages 795 and 796, in Vol. I. of this Handbook. When it occurs in the first stage of the disease, general treatment is first to be thoroughly tried, and local treatment through a catheter is to be resorted to only when simpler measures fail. In the second and third stages, when partial retention exists, the systematic evacuation and irrigation of the bladder is the most efficient means of treatment at our command.

Nephritis, or pyelonephritis, must be treated on general principles. Mustard poultices over the lower dorsal and lumbar regions are indicated during the acute stage, with, afterward, careful rubbing and friction to keep up the action of the skin; a bland, non-stimulating, but nutritious diet in abundant quantity; and regulation of the bowels. If uræmia threatens, pilocarpine and hot-air baths may be used to promote elimination, and to relieve the congestion of the kidneys.

A stone in the bladder can usually be removed readily by litholapaxy through an enlarged prostate, unless it is of great size and hardness, or unless the careless use of instruments has produced false passages. The pocket behind the prostate often holds a small stone concealed, and makes it hard to seize, in which case the hips may be raised so that the stone rolls back toward the fundus, where it is easily found and crushed.

When micturition is very difficult, it may sometimes be thought wise to remove small stones by perineal incision, in the hope of at the same time relieving the obstruction.

When litholapaxy is impossible on account of the size and hardness of the stone, it is usually necessary to resort to the suprapubic incision. By this operation, too, a prominent middle lobe, or other cause of obstruction, may sometimes be removed.

Atrophy of the prostate may occur as the result of mechanical pressure, or of destruction of portions of the organ by inflammation. It may also appear in the course of an exhausting disease, or as a consequence of old age. It gives rise to no symptoms and calls for no treatment.

Tumors of the Prostate.—These may be classified as follows:

Cysts	Retention cysts. Hydatids.
Myoma	Adeno-myoma.
Adenoma	
Sarcoma	Round cell. Spindle cell.
Carcinoma	Lympho-. Scirrhus. Colloid.

Retention cysts formed from dilated gland acini occur in many old prostates. They are always small, and give rise to no inconvenience. Their contents are sometimes inspissated, forming little concretions.

Hydatid cysts of the prostate are so rare that Thompson could, in 1883, learn of but one; and even in that case it is doubtful whether the cyst started in the prostate or near it. When discovered they should be at once emptied.

Pure myoma is very rare; adenoma is somewhat less so, but adenomyoma is the most common of prostatic growths. Paul thinks ordinary hypertrophy should be ranked under this head.

The universal, symmetrical enlargement can hardly, as it seems, be classified as a tumor, and yet the pathological process is the same in it and in the circumscribed masses which we recognize as new growths. These may project into the urethra, the bladder, and in other directions, or they may be buried in the midst of the gland tissue, from which they can be easily shelled out.

These tumors have sometimes been removed during section of the gland in lithotomy or other operations, and the removal of projections into the urethra has been considered above.

Sarcoma is occasionally observed in the prostate, where it may start primarily, or to which it may transplant itself from the testicle or elsewhere. It usually appears early, but may develop late in life.

Carcinoma is more common than sarcoma, and appears ordinarily after middle life. It may assume a scirrhus or a colloid type.

In either of these last two malignant forms of growth there may be a good deal of pain and considerable hemorrhages, especially after instrumentation.

In carcinoma the neighboring lymphatic glands are likely to be early involved.

Any cyst or tumor of the prostate may give rise to symptoms of obstruction. The difficulty of micturition may reach a point at which some operation for its relief will be required. In opening the bladder for drainage under these circumstances, either the perineal or the suprapubic incision may be used, and the selection would depend somewhat upon the size of the tumor.

If this is large and of a malignant character, which makes its removal evidently impossible, suprapubic drainage would be preferable.

On the other hand, in the case of a smaller or non-malignant tumor the perineal incision should be used, as by it the exact condition of things can be ascertained and possibly benefited. Harrison reports a case in which he removed a cancerous growth as large as the last phalanx of the thumb from the prostatic urethra. The operation was followed by great relief from distress in micturition, and the patient lived for fourteen months.

Tuberculosis of the Prostate occurs often secondarily to tuberculous conditions in other parts of the genito-urinary tract. It probably also sometimes appears primarily in the prostate.

As patients with genito-urinary tuberculosis usually die when the disease is far advanced, it is rarely possible to decide at autopsy where the disease originated; and as the organs are many of them deep-seated and beyond the reach of physical examination, it is likewise impossible during life to be sure that the prostate was primarily affected.

On the other hand, this gland is situated at the junction of the genital and urinary passages, is as it were at the crossroads through which any tuberculous material from the kidneys or testicles must go in its passage from the body. This situation makes it peculiarly liable to secondary infection, and, as a fact, it is almost always sooner or later involved.

The tubercles may appear as little isolated gray granules, scattered throughout the tissue of the organ, or they may be agglomerated into masses which, if they reach a moderate size, ordinarily become cheesy in the centre and finally break down into abscesses.

Sometimes almost the whole prostate is thus destroyed, and its place is occupied by an abscess which usually communicates with the urethra and bladder. It may break through into the rectum, forming a recto-vesical or a urethral fistula directly through the prostate.

The *symptoms* are those of a chronic prostatitis (see above) with a special tendency to hemorrhage. They may be associated with evidences of tuberculosis elsewhere.

Physical examination by the rectum may reveal little or no alteration in the gland. Ordinarily, however, inequalities are felt which may give it a distinctly nodular character. This may be associated with enlargement, or the prostate may preserve almost its normal size.

The ejaculatory ducts and the vesiculæ seminales should be felt for, and if the disease has affected them, they may be found as thickened, resistant, cord-like bodies. This is especially to be observed when the disease started in the testicle and worked its way up to the prostate.

Not infrequently a little shot-like mass is felt between the rectum and the prostate, or it may be a little behind and to one side of the gland. It is not attached to the prostate, rectal wall, or seminal vesicles, but is loose in the tissues between them.

Dr. Bryson, of St. Louis, thought that in one case, in which he had an autopsy, he made it out to be a cheesy mass within a vein. Possibly it is sometimes an infected lymphatic gland.

The testicles, epididymides, and vasa deferentia should also be examined, and the urine should be investigated for evidences of kidney complication and for tubercle bacilli.

These last are very difficult of detection in the urine, and their apparent absence does not argue against tuberculosis. When unmistakably present they are conclusive confirmatory evidence. In all cases of doubt the urinary sediment should be inoculated into a guinea-pig.

The physical investigation should also include the examination of the lungs, which may share in the tuberculous process.

Diagnosis.—The disease may be confounded with chronic prostatitis or cystitis, with stone or tumor in the bladder, or with pyelitis when accompanied by frequent micturition.

While a careful consideration of the symptoms and inherited tendencies of the patient may enable us to form a probably correct idea of the condition, it is only by a careful physical examination that we can reach a positive diagnosis.

Besides the examination described above, an exploration of the bladder, under ether if necessary, will be needed for the detection or elimination of stone and of tumor of the bladder.

There will be a certain number of cases in which a diagnosis is at first impossible, and in which the true interpretation of the condition can be reached only when time has developed characteristic symptoms.

Treatment.—Most important is the constitutional treatment with cod-liver oil, hypophosphites, and iodides. A healthy out-of-door life, with moderate exercise and good food, is to be enjoined.

Thompson advises against local treatment, and it is certainly important to avoid rough manipulation.

In the early stages of the disease, however, gentle local measures may serve rather to allay than to excite irritation, and should be tried.

Irrigation of the prostate and bladder and the introduction of iodoform pencils may be of service. Occasionally the passage of a sound is useful by removing the contraction of the constrictor muscle. The pain and frequency of micturition may sometimes be much relieved by these means.

While the prognosis is necessarily grave, and the permanence of improvement is always doubtful, still these cases are not always hopeless if seen early.

Prostatic Calculi.—In the ducts and dilated tubules of the prostatic glands are found not infrequently little yellowish or brownish bodies, composed of an organic substance allied to protein.

These, if they increase beyond a moderate size, begin to have earthy salts deposited in and around them, and finally become prostatic calculi, which may reach the size of a walnut or even of a larger object.

These calculi are usually multiple, and are facetted from mutual attrition. They are hard, take a high polish like porcelain, and are white or light brown in color.

Chemically, they are composed almost wholly of phosphate, with a slight admixture of carbonate of lime, and are to be distinguished from urinary calculi by the fact that they do not contain any of the triple phosphate of magnesia and lime, which is so large a constituent of vesical calculi.

When prostatic calculi are made out they may be removed by a median or lateral perineal incision. The operation is usually one of no serious danger, as the bladder is not opened.

Arthur T. Cabot.
Hugh Cabot.

PROSTITUTION, REGULATION OF. See *Camp Diseases.*

PROTAN is a tannin nucleo-proteid employed in dose of 1–2 gm. (gr. xv.–xxx.) as an intestinal astringent in diarrhœa.

W. A. Bastedo.

PROTEINOCHROMOGEN, PROTEINOCHROME. See *Tryptophan.*

PROTHROMBIN. See *Coagulation.*

PROTOGEN. See *Formaldehyde.*

PROTOPLASM. See *Cell.*

PROTOZOA, PARASITIC. See The Appendix.

PRUNE.—*Prunum*, U. S., Br. The partially dried ripe fruit of *Prunus domestica* L., or, according to the British and some other pharmacopœias, *P. domestica Juliana* De C. (fam. *Rosaceæ*). The fresh fruit of the latter variety is oblong, that of others subspherical.

The prune, coming originally from southwestern Asia, is now everywhere cultivated in temperate regions. Probably the best prunes for medicinal uses are those grown in southern Europe, since they are more acid. The prune requires no description. It should not be over-dried, should possess a very slight odor and a pleasantly sweet and acid taste. It owes its slightly laxative properties to the presence of acids, chiefly malic, free, and combined with potassium and other bases. There is present also sugar, to the extent of about one-third of the weight. The seed contains amygdalin and yields prussic acid, and should, of course, be removed.

Prunes have no other medicinal value than that of a very mild laxative, similar to many other fruits, but the concentrated juice is useful for administration to small children, because of its pleasant taste. The only official preparation is the confection of senna (see *Senna*). Prunes are very largely consumed upon the table for their laxative effects, as well as for their food properties. As served upon ocean steamers, they usually have some senna boiled with them.

Henry H. Rusby.

PRURIGO.—Prurigo is a malady *sui generis*. The condition usually appears about the end of the first year, but may appear as late as the thirtieth year. The affection usually starts as a lichen urticatus, the characteristic lesions of prurigo appearing later. There are two forms: prurigo ferox or Hebra's prurigo, and prurigo mitis, but a distinct line cannot be drawn between the two. In prurigo ferox there are repeated eruptions of pale red or skin-colored miliary papules, which itch violently. This eruption is generalized, but it is thickest on the extensor surfaces of the lower extremities. The papules are so small and project so slightly that they often cannot be seen, although they can be felt. Scratching produces excoriated tips, and these become covered with blood crusts. Other lesions appear as the result of scratching, such as excoriations, pustules, crusts, pigmented areas, and a dry, scaly, and thickened skin.

During the first few years wheals are frequently found, but they disappear as the papules increase. A secondary eczema in all forms may also be seen. In nearly all cases there is enlargement of the superficial lymphatic glands, the femoral being most marked. The flexures are usually free from eruption. As a rule, the eruption diminishes upon the advent of summer. This form is incurable, but the patient can be relieved to such an extent as to be free from the eruption at times. In prurigo mitis the papules are fewer and the itching is less; consequently the secondary lesions are much milder. Most of the cases met with in this country are of this type. In some of these cases a perfect cure may be obtained by careful and persistent treatment. When untreated, prurigo has a marked effect on the patient both mentally and physically.

Etiology.—In discussing the causation of this affection we can do no more than mention certain conditions with which it frequently occurs. It is usually found in poorly nourished and scrofulous children. Occasionally there seems to be an hereditary predisposition, several children in one family being affected. It is possible that there is some congenital anatomical malformation of the skin as is seen in ichthyosis.

Pathology.—The affection probably starts as a vaso-motor neurosis. Microscopically the papules are composed of a round-cell infiltration, with œdema of the papillæ. Swelling of rete cells occurs and later there is a hyperkeratosis.

Diagnosis.—The diagnosis is difficult at first, as in the beginning the eruption consists mostly of wheals. The condition is also misleading when large eczematous areas cover the lesions of prurigo. The following points are characteristic, and when they are present the disease cannot be mistaken for any other condition: A constantly recurring eruption of miliary papules, resembling in color the normal skin, appearing in early childhood, and most marked on the extensor surfaces; the enlarged glands; and secondary lesions from scratching.

Treatment.—Very little can be expected from internal medication, unless the patients are scrofulous or poorly nourished; in which case cod-liver oil and general hygienic measures will be beneficial.

Crocker speaks highly of cannabis indica as an effective remedy for controlling the itching, as in pruritus. The dose should be gradually increased to thirty minims of the tincture, well diluted, after each meal. Phenacetin and antipyrin are among the most valuable remedies for the itching. Rest, an even temperature, and alkaline or sulphur baths will make the patient more comfortable. For the local treatment, naphtol, sulphur, and tar are the remedies most likely to relieve the itching and decrease the papular eruption. The usual way of using sulphur is by the application of the official ointment or Wilkinson's ointment. Tar can be used pure or diluted with oil or lanolin. Naphtol should be used as an ointment in the strength of two to five per cent. Whatever local treatment is used, it should be vigorously continued until there are no fresh papules and the skin is smooth and flexible. Occasionally it will be found necessary to use first some bland ointment to cure the secondary eczema which so frequently accompanies this condition.

Howard Morrow.

PRURITUS.—Pruritus is an affection of the skin characterized by itching without any external cause. It is an independent disease, and must be distinguished from