

spots. Silver nitrate, thirty grains to the ounce, will often cause considerable temporary pain or tenesmus; if it does, a ten or twenty grain solution must be used for subsequent applications, every four or five days. Pure ichthyol applied in the same way causes less burning, in many cases promotes more rapid healing of ulcers, has a very beneficial effect upon any portion of the mucosa to which it may be applied, and exhibits a marked effect in reducing pus formation.

## OPERATIVE TREATMENT.

*Emmet's Button-Hole Operation.*—In some cases of cystitis which persist in spite of active treatment, and in others in which such treatment is impracticable, the bladder can be put at rest and perfect drainage obtained by the establishment of an artificial vesico-vaginal fistula.

Operation: Incise the bladder in the manner described for the removal of vesical calculi, and with a continuous catgut suture unite the vesical mucous membrane to the vaginal mucosa around the whole circumference of the opening. This will prevent spontaneous closure of the opening. Protect the vulva and thighs by an ointment, and give vaginal douches two or three times daily. If the thighs become excoriated, avoid the use of soap, and apply a two-per-cent. solution of silver nitrate once or twice daily.

When in the course of several months the cystitis has subsided, the edges of the fistula should be freshened and the fistula closed.

*Clark's Vesical Balloon Treatment.*—Kelly says that Dr. J. G. Clark's balloon treatment is applicable to all chronic cases in which the disease is not so far advanced as to render any active local interference dangerous, on account of the weakened condition of the patient. The plan, in brief (see Johns Hopkins Hospital Bulletin, February-March, 1896), consists of:

1. Cocainization of the external urethral orifice.
2. Introduction of No. 10 vesical speculum. Patient in knee-chest position.
3. Rolling the rubber bag into cigarette shape, and coating it with ichthyol-gelatin.
4. Introduction and dilatation of the bag, to the point of extreme tolerance; the bag to be allowed to remain in situation for from ten to twenty minutes.

*Precautions.*—The external meatus must be carefully cleansed, the hands of the operator thoroughly scrubbed and disinfected, and the solution sterilized.

The introduction and distention of the bag produce considerable tenesmus, and the after-pain necessitates the use of opium suppositories; but vesical irritation is said to diminish from day to day as the treatment is persevered in, and the bladder mucosa assumes a more nearly normal appearance.

*Curetage of the bladder* through the larger-sized speculum, through the vaginal incision, or through a suprapubic opening, has been successfully practised for the cure of a tuberculous ulcer and an intractable cystitis involving the superficial layers of the mucosa. It has also been used successfully in removing a limited area of diseased mucous membrane, which is afterward rapidly replaced by healthy tissue. First determine by previous cystoscopic examination just what portion of the bladder must be attacked. Place the patient in the dorsal position, insert the speculum, and thoroughly irrigate the bladder with saline or boric solution. Withdraw the speculum, introduce the curette into the bladder, and with the finger in the vagina for counter pressure, scrape the base and other predetermined areas. After curettagé again irrigate the bladder, preserving shreds of the tissue for microscopic study.

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## PRINCIPAL REFERENCES.

- Hart and Barbour: Manual of Gynecology, 1891, fourth edition.  
Kelly, Howard A.: Operative Gynecology, 1898, vol. 1.  
Bryant, J. D.: Morrow's System Genito-Urinary Diseases, etc., 1893, vol. 1.  
Watson, F. S.: *Ibid.*  
White, J. W.: *Ibid.*

Skene, A. J. C.: Diseases of the Bladder and Urethra in Women, 1882.  
Senn, N.: The Etiology and Classification of Cystitis. International Clinics, vol. II., eighth series.

**BLADDER OF THE MALE. (PATHOLOGICAL AND CLINICAL.)**—MALFORMATIONS.—The development of the bladder may be arrested at various stages in its progress. Occasionally the septum which divides the rectum from the bladder is wholly or partially wanting, so that they freely communicate with each other, or, in extreme cases, form together a large pouch (cloaca) into which the intestine and ureters open. This condition of things may be associated with imperforate anus. Entire absence of the bladder has been reported, in which case the ureters opened directly into the urethra.

The most common fault of development, however, is the absence of the anterior vesical wall. This deformity, known as *exstrophy of the bladder*, is far more common in males than in females. It consists in a failure of union of the two halves of the body along the abdominal surface. The anterior wall of the bladder, and the abdominal wall over it, are wanting, and the pubic bones are generally separated by a considerable interval. The posterior vesical wall is consequently exposed to the air, and is pressed forward by the intestines behind it, thus forming a prominent tumor which may reach the size of the palm of the hand. This bulging bladder wall, owing to the constant irritation to which it is subjected, is much reddened and inflamed, and is usually covered with stringy alkaline mucus. In the lower part of this protruding mass may be seen the openings of the ureters, which are revealed by the constant little jets of urine escaping from them. They are sometimes much dilated. The rudimentary penis, which is always in a condition of complete epispadias, usually exists merely as a slight prominence, but may be of considerable size. It sometimes even retains a considerable power of erection, a point to be considered in the fitting of an apparatus. In connection with exstrophy are associated not infrequently herniæ of one or both sides. In the female, exstrophy is generally complicated with prolapse or procidentia uteri.

If the fault of development be not so extensive as in complete exstrophy, the abdominal walls may unite entirely up to the umbilicus, which fails to close and leaves a fistulous communication with the bladder through the still patent urachus. An even lesser degree of the same deformity is represented by a prolongation of the bladder up into the lower portion of the urachus. Sometimes the canal may be shut off from the bladder and form a cyst, or a series of cysts.

The suffering in a case of complete exstrophy is usually very great.

The treatment may be briefly summarized under three heads:

I. *Treatment by Apparatus.*—This method is applicable to—

1. All cases in which the defect is moderate and the condition of the patient is not sufficiently distressing to lead him to desire operation.
2. Cases in which plastic operations have been tried and have failed.
3. Cases in which the coexistence of other disease makes any operation inadvisable.

The rubber urinals manufactured for these cases are unsatisfactory, as they press upon and irritate the mucous membrane. The best apparatus is a silver or German silver shield, which arches over and protects the bladder, with a dependent portion into which the urine runs, and which communicates by a tube with a rubber bottle strapped against the leg. In order to get a well-fitting apparatus, it is a good plan to have first made a flexible, metallic ring, large enough to encircle the bladder. This is then bent and adapted to the inequalities of the surface, and, finally, the edge of the shield is fitted and soldered to it. The whole is held in place by a belt and perineal straps.

II. *Treatment by Plastic Operations.*—The utmost that we can reasonably expect to gain by any plastic opera-

tion for the relief of exstrophy is the greater comfort of the patient and greater ease in fitting apparatus. A truly retentive bladder cannot be obtained, and while the mortality of these operations is commonly supposed to be insignificant, Martin and Taylor believe it to be as high as thirty to forty per cent., so that it is obviously unwise to expect brilliant results from operations of this class. Plastic operations may be divided into two classes:

1. Those in which the skin of the abdomen is used in making the anterior bladder wall.

The flaps may be taken from a variety of sources, but the most satisfactory is Wood's operation, by which a flap large enough to cover the defect is taken from above and turned down so that the skin surface is innermost,

operations and the discomfort incident to all forms of apparatus have led to attempts at radical cure of the condition by the removal of all that remains of the bladder wall and suturing the ureters into the bowel. The advantage of such an operation is the entire relief from the discomforts incident to the condition. The bowel soon becomes accustomed to its new function and the urine is passed at intervals closely approaching the normal. The dangers are twofold: those arising from the immediate effects of the operation and those resulting from infection of the kidneys by intestinal bacteria. The immediate mortality of the operation is by no means small, and though the statistics on the subject are too meagre to warrant a definite opinion, it is probably not

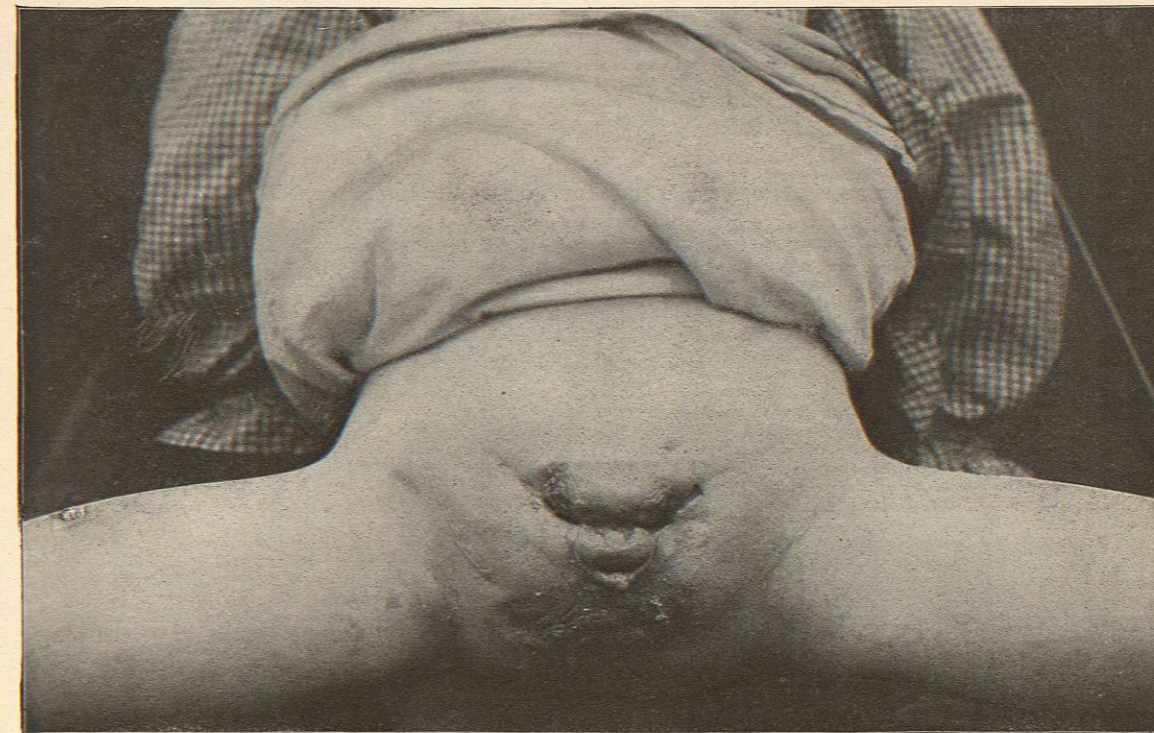


FIG. 496.—Exstrophy of Bladder in the Male (case of Dr. C. B. Porter). Boy of five years. Complete exstrophy. Penis rudimentary, showing condition of epispadias. Both testicles undescended and double inguinal hernia. Loose puckered skin below penis is the scrotum, and suggests the possibility of using it as a skin flap to cover the defect.

and stitched in position. The raw surface of this flap may be covered by flaps drawn over it from the sides, by skin grafts, or left to granulate.

The objections to all operations in which the skin is used to restore the defect are the great tendency to calculus formation and the danger of irritation from hair growing into the bladder.

2. Those in which the mucous membrane alone is utilized. These operations depend on the possibility of getting enough mucous membrane to make a continuous canal from the openings of the ureters to the base of the penis. The urethra is then restored by an operation for epispadias, and thus in some cases the problem of fitting a urinal may be greatly simplified and the discomfort of the patient proportionately lessened. In selected cases this is an excellent procedure.

III. *Radical Cure by Implantation of the Ureters into the Bowel.*—The unsatisfactory results obtained by plastic

far from that of other operations involving resection of the bowel. The more remote effects are those resulting from infection of the kidneys, and it is upon this issue that the ultimate value of the operation must be decided. The protection of the normal ureter from infection from the bladder is largely due to the anatomical arrangement by which the distention of the bladder closes the orifices of the ureters. This cannot be reproduced artificially and it has proved the most serious stumbling block. The tendency of the operation to produce stenosis of the lower end of the ureter, resulting in dilatation of the ureters and pelves of the kidneys, probably favors infection in the same way in which retention of urine favors the occurrence of cystitis.

The procedure is still too much in the experimental stage to permit of a positive opinion being given, but we cannot but regard it as an operation so dangerous as to be applicable only to a limited class of cases. Children

who will later be obliged to work, and adults who are competent to decide the question for themselves, would seem to be the most favorable subjects for this operation.

The limits of this paper will not permit of an extended discussion of the various forms of operation that have been proposed, for as yet no one method has attained a stable position.

Besides the malformations due to defective development, there are sacculated bladders in which occasionally the sacculi may even exceed the bladder in size. They are formed by herniæ of the mucous coat through the interstices of the muscular fibres, and may be recognized by the absence of a muscular coat over them. The bladder may also be divided into chambers, by partitions springing out from the walls.

**HERNIA OF THE BLADDER.**—This displacement may be congenital or acquired. Like other herniæ, it is sometimes brought about by violence or over-exertion. It may appear at any of the orifices in the lower abdomen through which other herniæ occur. The most common forms are inguinal in men, and vaginal or femoral in women. The hernial sac usually contains also portions of intestine and omentum, but may be occupied by a part of the bladder alone. The portion of the bladder in the sac is usually not covered by peritoneum, although exceptionally it may be. The presence of the bladder in a

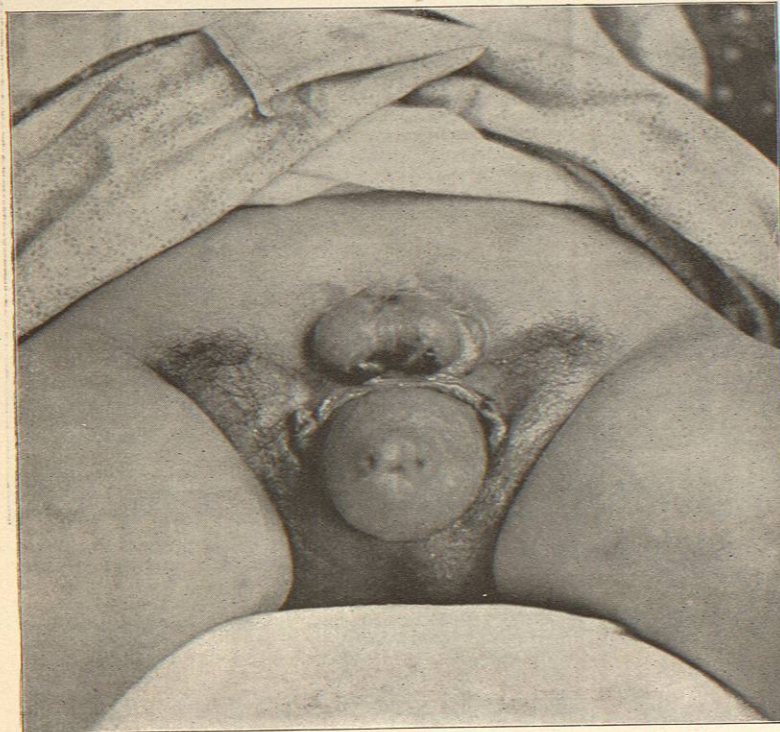


FIG. 497.—Exstrophy of Bladder in the Female (case of Dr. M. H. Richardson). Girl of sixteen years. Complete exstrophy. Pubic rami are separated four inches, the position of the ends being approximately shown by the pubic hair. Above is the bulging posterior bladder wall, while below, the thickened hypertrophied cervix protrudes from the vulva.

hernial sac is sometimes brought about by its adhesion to the intestine or omentum, which then drags it down with it. M. Berger observed such a case of inguinal hernia in which a portion of the bladder wall was drawn into the sac by adherent omentum. The bladder was opened by mistake, but was closed again by sutures, and the vesical wound was then fastened close to the inguinal

opening. Some days later a fistula formed, which discharged urine intermittently, and closed spontaneously at the end of two months.

The *diagnosis* is to be made by the aid of the catheter, the tumor being emptied when the urine is drawn from the bladder. Pressure on the tumor, too, hastens the flow of the urine.

The *treatment* of hernia of the bladder is essentially that of hernia of other viscera except in so far as its existence brings with it additional dangers if treated palliatively—namely, those incident to the presence of cystitis; for inflammation may occur in a sacculum as the result of stagnation and consequent fermentation of the urine. Unless some concomitant disease forms a distinct contraindication, an attempt should be made to cure the condition by radical operation. If this cannot be done, the sac should be supported by a pressure bandage, and the escape of urine should be aided by pressure during micturition. If, in spite of these precautions, the bladder is still incompletely emptied, the dangers arising from the constant presence of residual urine may to some extent be obviated by the routine use of the catheter, emptying the bladder at least once a day, preferably in the evening.

**WOUNDS OF THE BLADDER.**—The protected situation of the bladder renders it little liable to injury. In fracture of the pelvis, a sharp point or fragment of bone may penetrate its wall, or it may be injured by gunshot wounds, or by puncture with a sharp instrument. The treatment of this class of cases will be considered more at length under Rupture of the Bladder. The bladder may also be wounded by the unskilful use of instruments in lithotomy, or may be incised by accident during ovariectomy, hysterectomy, or other abdominal operation. In this latter case, if at once carefully stitched up, the wound usually heals without serious trouble.

The question of the advisability of closing openings in the bladder intentionally made, as in suprapubic lithotomy, must be decided in each individual case according to circumstances. While the ideal procedure is to close the bladder by immediate suture, the patient is often subjected to fewer risks if the wound is left open. The question must be decided by taking into consideration the general condition of the patient, the local condition of the bladder, and the trauma to which the bladder walls have been subjected during the operation.

**RUPTURE OF THE BLADDER.**—Ruptures of the bladder are either idiopathic or traumatic. According to their location, they may be also classed as intraperitoneal and extraperitoneal. Among the extraperitoneal are to be reckoned the partial and the subperitoneal.

Idiopathic ruptures usually occur in bladders altered by disease. A long-continued obstruction to the passage of the urine, as from a stricture or enlarged prostate, favors the formation of little herniæ

of the mucous membrane through the meshes of the muscular tunic, and an over-violent strain during some exertion, or in the effort to empty the bladder, may rupture one of these little thin diverticula. The vesical wall is also sometimes weakened by ulceration, simple or malignant, and is thus rendered especially liable to give way. During labor, the distended bladder may be rup-

tured by compression between the abdominal wall and some part of the child or instrument used in the birth. The rent in this case may be into either the vagina or the peritoneal cavity.

Rupture of the healthy bladder is rarely produced, except by external violence in the form of a blow or crush. Probably it is sometimes also brought about by great

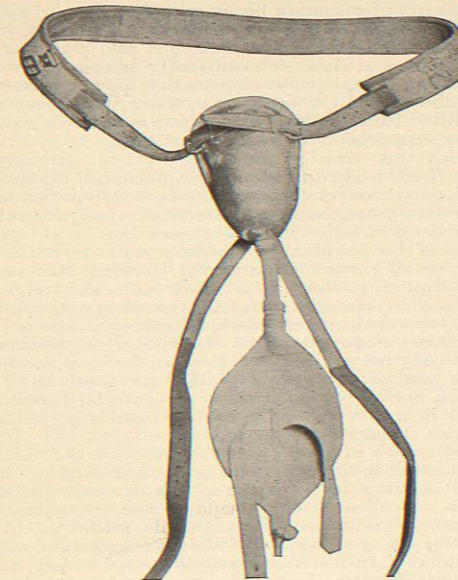


FIG. 498.—Apparatus for Palliative Treatment of Exstrophy. Above is shown the belt to go around the body, holding in place the metal shield of silver or German silver with a cup-shaped dependent portion into which the urine runs. On either side below are the perineal straps which fasten to the belt behind, and between them is the tube connecting the shield with the rubber receiving bottle fastened to the leg.

muscular exertion when the bladder is distended, even though it be healthy. In traumatic ruptures, the bladder is almost always full at the time of the traumatism.

Great violence to the hypogastrium is capable of producing a tear in the anterior wall of an empty bladder. This accident is to be explained as follows: The force applied to the hypogastrium carries the upper portion of the bladder, which is attached to the abdominal wall by the peritoneum and urachus, violently backward. The lower part of the bladder is held by the prostate, which is fixed by the pelvic fascia, and consequently a rent occurs in the anterior vesical wall just above the prostate. This is often accompanied by a considerable stripping up of the peritoneum. Intraperitoneal rupture uncomplicated can occur only when the bladder is full.

**Symptoms.**—When a rupture occurs a feeling of giving way or of a tear is often experienced. If the bladder has been painfully stretched by long retention, the first feeling may be of relief. Soon, however, pain follows, and is referred to the whole abdomen or to the pelvic region. This is followed in the majority of cases by shock and inability to walk. There may be desire, but want of ability, to micturate. Catheterism is usually easy, but obtains only a little bloody urine; not infrequently, on pushing the catheter further, a "second escape" of fluid is obtained.

Many of these symptoms may, however, be wanting. The pain is sometimes not very great; micturition may be possible, though even then usually difficult. The catheter may draw clear urine.

The principles of treatment in rupture of the bladder may be summarized by the following rules:

1. When an intraperitoneal rupture is made out, an immediate laparotomy, with suture of the bladder wound and subsequent drainage of the bladder, should be done.
2. When a reasonable doubt exists as to whether the rupture is intraperitoneal or not, an immediate laparotomy should be done.

3. If an extraperitoneal rupture is made out, and uncertainty exists as to the direction in which the urine is extravasated, a laparotomy should be done for exploration to ascertain how the drainage may best be placed.

4. In the case of fracture of the pubes, with evidence that urine is extravasated in the prevesical space, an incision should be made in the suprapubic region, a tube should be carried to the bottom of the effusion, and a median or lateral lithotomy should be done for drainage of the bladder.

Exception: Occasionally, in cases of severe injury with much shock, when a long operation could not be borne, a median lithotomy may be hastily done for drainage, and the opportunity may be taken for exploration of the position of the rent, to serve as a guide for further interference in case the patient rallies sufficiently.

In short, a laparotomy should be done in all cases of bladder rupture except in those which come under Rule 4, or those of such severity that they cannot bear more than the median operation.

**TUMORS OF THE BLADDER.**—Tumors of the bladder may be classified as follows, in the order of their frequency: Papilloma, carcinoma (carcinoma papillosum, epithelioma), myoma, fibroma, sarcoma.

**Papillary tumors** form, according to Professor Guyon, nine-sixteenths, according to Sir Henry Thompson, six-tenths, of all the new growths of the bladder. They are made up of very vascular branching papillæ, clothed with irregularly cylindrical epithelium. They are either pedunculated or sessile, and upon their character in this respect depends the difficulty of their removal. Their favorite seat is in the neighborhood of the trigonum, and they may attain the size of a pigeon's egg, or even larger.

They give rise to intermittent hæmaturia, and generally there is no pain in the early stages. Pain generally appears later, however, and may finally become quite constant and severe. Occasionally, by their pressure, they cause obstruction to micturition or to the entrance of the urine through the ureters. Finally, cystitis is usually associated with them. The hæmaturia may, however, exist for a number of years before other symptoms appear. Although benignant in their character, they finally cause death by the changes that they bring in their train. That they may take on a carcinomatous character seems also borne out by facts.

The *diagnosis* of papillary growths may be confirmed by means of the cystoscope, but the procedure is often complicated by the tendency of these tumors to bleed and render the fluid in the bladder turbid. This may to some extent be obviated by the use of an irrigating cystoscope through which the fluid in the bladder may be constantly renewed, but even then the view obtained is often unsatisfactory.

The *treatment* should consist in radical removal if possible. The suprapubic route is the best, as it gives a far better view of the bladder and enables the operator to plan his procedure with greater precision. If possible, the whole tumor, including its base, should be removed down to the muscular layer or even including it. In the latter case an immediate suture of the hole should be done. The suprapubic wound in the bladder may in some cases be closed, but this is possible only in favorable cases and when the hæmorrhage is complete. In any case it will be well to provide constant drainage with an inlying catheter or perineal tube.

**Primary carcinoma** of the bladder occurs either in the form of papillary cancer, in which an indurated cancerous base is covered by papillæ resembling those of the simple papilloma, or as an epitheliomatous ulcer with hard indurated base and edges. Scirrhus is rarely met with, as is also an encephaloid form of the disease.

The *symptoms* resemble those of papilloma, but are

sooner or later associated with severe lancinating pains in the bladder and its neighborhood. The cancerous cachexia is often very marked.

The very noticeable tendency to late metastasis has led many operators to try to extirpate the growth. Recently, several attempts have been made to obtain radical cure by the removal of the whole or a large part of the bladder. This promises success only when the growth is confined to the fundus and has not invaded the surrounding tissues. In case the whole bladder has to be removed the ureters should be implanted in the vagina in the female and in the sigmoid flexure in the male.

In less promising cases much relief may be afforded the patient by suprapubic cystotomy and curetting the growth. This procedure may be repeated if necessary, and may decrease the suffering and lengthen the life of the patient considerably. Death ultimately takes place from generalization of the disease with symptoms which vary according to the organs implicated, the liver being almost invariably the seat of secondary deposits.

The *myomata* and *fibromata* can hardly be considered separately, as they usually occur in a mixed form, myofibroma or fibromyoma containing both fibrous and muscular elements. They are very rare. Gussenbauer, Volkmann, and the writer have removed tumors of this character. Gussenbauer's and the writer's patient recovered, while Volkmann's died. Tumors of this class may give rise to symptoms of obstruction, but do not as a rule cause hæmaturia or cystitis.

The writer has called attention to the condition known as pachydermia vesicæ, in which the mucous membrane of the bladder is changed into a membrane consisting of epidermoid cells. The relation to carcinoma appears to be close, and in the case reported\* death ultimately occurred from that cause.

*Primary sarcoma* is extremely rare. The author has seen tumors of the prostate and bladder secondary to a round-celled sarcoma of the testis.

Besides the regular tumors mentioned above, *cysts* may rarely occur. They are sometimes congenital and contain hair, bones, etc.

**NEUROSI OF THE BLADDER.**—Spasm of the bladder, when not due to inflammation, is probably in the great majority of cases dependent upon an increased sensibility of the prostatic urethra (neuralgia of the neck of the bladder), causing by reflex action an excessive contraction of the detrusor urinæ muscle (see *Prostate, Diseases of the*).

In this connection we may mention the retention of urine which not uncommonly follows surgical operations, especially those involving the region of the perineum. It is due apparently to a reflex inhibition, the stimuli starting from the seat of the operation. This condition can often be relieved by the use of hot applications to the hypogastrium or perineum, and in women by spraying the vulva with warm water. If, however, all efforts to induce the patient to pass his urine fail, the catheter must be used before the distention of the bladder becomes extreme, and when once started the use of the catheter may have to be continued for several days before the power of voluntary micturition returns.

**PARALYSIS OF THE BLADDER** is usually consequent upon some disease or injury of the nervous system. The lesion may exist in peripheral nerve trunks, or may be located either in the reflex or in the motor centre (spinal cord or brain).

The loss of power may be total or partial. When the paralysis is complete (which occurs usually in connection with paraplegia), the sphincters, both voluntary and involuntary, are also paralyzed, and after the accumulation of the urine produces a tension in the bladder great enough to overcome the resistance in the urethra, a leaking of the overflow commences. As sensation is lost in these cases the distention of the bladder and escape of the urine are often not perceived by the patient.

If the paralysis comes on slowly, as it may do in cases

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of spinal sclerosis, tabes dorsalis, and in Pott's disease, it first makes itself known by the diminution in the force of the stream, and the increase in the time occupied in urination. When the paralysis is extreme, the pressure of the abdominal muscles furnishes almost the only driving power, and the stream dribbles perpendicularly from the meatus.

As the act of urination becomes more and more incomplete the amount of residual urine slowly increases until finally the bladder becomes distended and the overflow begins to escape, either intermittently or constantly. In either case a partial power of urination may be preserved. When the distention becomes extreme, the pressure is transmitted back to the kidneys, and may be so great as to cause suppression of urine and uræmia.

Besides this true paralysis, dependent on nervous lesions, there is also occasionally a partial or temporary loss of power, dependent upon general disturbances of the nervous system, such as hysteria, nervous prostration, and the debility following sexual excesses.

*Atony* of the bladder, by which is understood a weakness or loss of contractile power of the muscular coat, is not infrequently seen as a result of overstretching, which may be brought about by voluntary retention, or may be the result of obstruction in the prostate or urethra. It is considered in this connection, not because it is due to any nerve lesion, but because the local condition and its treatment are closely allied to paralysis. The condition is closely analogous to the enfeebled condition induced in any voluntary muscle which is persistently kept upon the stretch.

The *diagnosis* of paralysis or of atony of the bladder, when existing in any marked degree, is usually not difficult, although sometimes the constant escape of urine from an overfilled bladder leads to the erroneous idea that true incontinence exists. This mistake will be avoided by an examination of the hypogastrium, where the bladder, if full, will be easily detected. Any doubt as to the character of a central tumor above the pubes should lead to the passage of a catheter.

*Atony* of the bladder, if dependent upon some condition that can be relieved, may be recovered from. The chance of a favorable termination is, however, much more doubtful in old and worn-out subjects.

True paralysis occasionally depends upon some nerve lesion (meningitis, apoplexy, syphilitic inflammation, fracture of spinal column), which admits of more or less complete recovery. In the majority of cases, however, the loss of power is permanent. The cystitis, which is its most uncomfortable accompaniment, may be kept under control by proper care.

The *treatment* in cases of paralysis and atony should consist, first, in the systematic use of a catheter. The bladder ought to be emptied at least as often as once in the twenty-four hours when the loss of power is partial, while in complete paralysis this should be done four or five times a day. In addition to this, irrigation should be regularly employed, especially when cystitis has already started. If the loss of power be partial, the washing may be done with cold solutions, which have a stimulating influence upon the detrusor muscle. The systematic use of urotropin in doses of gr. v. to x., three times a day, appears to have a distinct influence in postponing the advent of cystitis and in rendering it less severe. Cold bathing of the abdomen and sacral region may also be useful.

Electricity is sometimes used with advantage. One electrode should be placed over the sacrum, and the other just above the symphysis pubis, in the perineum, or within the bladder itself.

Besides these local measures of treatment, the strength of the patient should be supported as far as possible by regulation of the diet, by exercise, and even by change of climate if it seem wise.

Strychnine and ergot are both thought to have a beneficial effect upon the muscular wall of the bladder, and general tonics are of use by their effect upon the general system.

When the power of retention is lost, a urinal becomes a necessity.

**INFLAMMATION OF THE BLADDER (CYSTITIS).**—If we could confine the term cystitis to those cases only in which true inflammation exists, the task of making a clear and concise statement with regard to the etiology would be much simplified; but there are many cases in which some of the symptoms are present and which have long been considered as a variety of cystitis in spite of the fact that the process never goes farther than an active hyperæmia. The more recent methods of examining the female bladder have shown that congestion may and does exist without true inflammation, and it is probable that the same causes may act on the male bladder and cause the cases of transient cystitis which are so difficult to classify.

The *etiology* of cystitis has been the subject of much careful bacteriological study of late years, as a result of which the importance of the rôle played by infection has been more and more appreciated. Many varieties of cystitis which have long been believed to be the result of "irritating urine," "taking cold," "gout," etc., have been shown to be due to infection, and while we are as yet hardly in a position to deny that certain conditions of the urine may cause an aseptic inflammation, the number of cases properly referable to this cause is comparatively few.

There are five routes by which bacteria may reach the bladder:

- I. By the urine from the kidneys.
- II. Through the urethra on instruments.
- III. Through the blood.

IV. From the rectum and sigmoid flexure, either by passing through the peritoneum or through retroperitoneal lymphatics.

V. By direct extension from adjoining areas of suppuration, *e.g.*, infected urethra, prostate, or pelvic abscess.

A discussion of the comparative frequency of these various sources of infection would exceed the limits of this paper, but a few interesting observations may be noted.

Posner and Lewin found that after ligation of the rectum in animals, intestinal bacteria soon appeared in the urine and disappeared when the ligature was removed. Werden succeeded in producing cystitis by causing an artificial retention and making an abrasion on the rectal mucous membrane.

The constant presence of the typhoid bacillus in the urine of typhoid fever is now generally accepted and is doubtless the cause of many of the cases of cystitis occurring in this disease; but the discovery is even more valuable as suggesting the possibility that a similar condition exists in other acute infectious diseases, as the acute exanthemata, acute polyarthritis, etc., with the bacteriology of which we are less familiar.

The bacteria most commonly found in cystitis are:

- I. The group of bacteria of which the bacillus coli communis is the type and which are found in more than one-half of all cases of cystitis.
- II. The proteus vulgaris of Hauser, a common intestinal saprophyte.
- III. The staphylococcus aureus, albus, and citreus.
- IV. The streptococcus pyogenes.
- V. The tubercle bacillus.

All of the above-mentioned bacteria are capable, under favorable circumstances, of decomposing urea, but the colon group and the tubercle bacilli do so much less rapidly, and in the cases in which they occur the urine is more likely to be found acid.

In rare instances the gonococcus causes a true cystitis, but it is probable that most of the cases occurring in the course of a gonorrhœa are due to pyogenic organisms or that the true condition is one of posterior urethritis rather than cystitis.

Of late years several observers have called attention to a condition which they have called bactinuria, in which bacteria are constantly present in the urine without, however, causing any cystitis, showing that under normal

conditions the bladder is not very susceptible to infection. The injection into the bladder of pure cultures of virulent bacteria has also failed to cause cystitis in all but a very small proportion of cases, showing that some predisposing cause is necessary in order to allow the bacteria to obtain a foothold, and this cause is to be found in the presence of hyperæmia, which is a very constant precursor of cystitis.

*Causes of Hyperæmia.*—White and Martin have summarized the causes of hyperæmia as follows: (1) Retention of urine; (2) trauma; (3) muscular contractions of abnormal frequency; (4) abnormal conditions of the urine; (5) tumors or calculi; (6) surface chills; (7) sexual excesses; (8) heart lesions; (9) lesions of the central nervous system.

Hyperæmia may be considered a predisposing cause of cystitis; and of the various causes of hyperæmia, retention of urine is by far the most common. It is the constant precursor of the cystitis associated with hypertrophy of the prostate, stricture of the urethra, paralysis of the bladder, and many of the cases of cystitis occurring in acute infectious diseases and after surgical operations. In all these cases the use of a catheter may lead the way to infection, but it must not be forgotten that in many cases the urine itself contains the infectious agent, even before the catheter has been used.

Under trauma we may include all cases following fracture or injury to the pelvis, injuries to the bladder during childbirth, or surgical or gynecological operations.

Abnormal conditions of the urine may produce a hyperæmia by the presence of drugs, as cantharides, turpentine, cubeb, and copaiba. A very acid urine may act in the same way, more especially if it contains minute crystals of uric acid or oxalate of lime. Here we may include the obscure cystitis occurring in gout and chronic rheumatism, provided always that another cause, such as obstruction to the flow of urine, does not exist.

Tumors and calculi by their very presence cause hyperæmia, and it is indeed surprising how long one of the above conditions may exist without the occurrence of cystitis.

Surface chills may cause acute pelvic congestion and in this way lead to congestion of the bladder, but except in the case of old men with enlarged prostates, this cause is probably not of frequent occurrence.

Sexual excesses, by giving rise to congestion of the neck of the bladder, may in some cases cause true vesical hyperæmia; but in many cases, at least, it is only the lighting up of an old posterior urethritis that causes the symptoms.

Heart lesions, by producing a chronic passive congestion of the whole venous system, may readily be a predisposing cause of cystitis.

We may summarize the etiology of cystitis as follows:

1. Infectious cystitis, due to the action of bacteria on the mucous membrane of the bladder, already rendered susceptible by the presence of hyperæmia. This class includes the vast majority of all cases, and we are tempted to suppose that when our knowledge of the bacteriology of the bladder becomes more complete, the number of cases properly ascribed to other causes will be found to have dwindled still more.

2. Aseptic cystitis due to the action of irritants the nature of which is uncertain. To this class we may refer some cases occurring in gout, but we are inclined to question the soundness of the classification, and also some cases of so-called idiopathic cystitis the etiology of which cannot be defined.

3. Cases of mild, transient cystitis in which it is questionable whether true inflammation exists and which are probably akin to the vesical hyperæmias which we see in women.

*Pathology.*—The pathological appearances vary with the severity of the inflammation. In simple catarrhal cystitis, the mucous membrane is more or less swollen and reddened, with the minute vessels sometimes visibly injected. This redness is usually most marked on the summits of the folds or rugæ, which may be studded