a great deal of leukoplakia sometimes from smoking and from unknown causes, which he is sure is not syphilis. The diagnosis is often very difficult. He concluded by saying that we are just entering on the right aspect of what has been called dentistry.

EARLY DIAGNOSIS OF SURGICAL DISEASES OF THE URINARY TRACT.*

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For the purposes of this paper the urinary tract will be limited to the kidney, ureter, bladder and prostate. The prostate, although essentially a genital organ, when diseased, interferes more with the urinary function than with the genital function, and must not be left out of account in any discussion of the urinary tract.

That early recognition of diseased conditions in these organs makes the desired "cure without undue risk, delay or pain" more often possible needs no argument, and to the physician who uses his trained brain, fingers and eyes, especially if he has access to a good microscope, there is little difficulty in recognizing the indications for further careful investigation of the urinary tract by the most modern methods of special diagnosis.

Interesting as these special instruments are, and fascinating as is their use, this paper is to deal briefly and solely with the indications which should lead to the employment of one or more of them.

In order to obtain some idea of the frequency of diseases in these organs as compared with general surgical diseases, the annual reports of the Massachusetts General and Boston City Hospitals have been taken for the last five years. During this period there were over 35,000 cases in the surgical beds of the two institutions. More than 1,100 of these are said to have presented some lesion of these organs, being about 3.1 per cent. of the total surgical admissions. The prostatic diseases lead, with 427 cases; the kidney follows, with 373 cases; the bladder next, with 304 cases, and the ureter last, with 7 cases. The grouping in this table is my own and requires further evidence before it is fully accepted, though it is in accord with the more recent theories.

SYMPTOMS.

Most patients with disease in the urinary tract consult their physician on account of one or more of three conditions. First, localized pain; second, altered function; third, hematuria. When all three symptoms are present, there is hardly a doubt of the presence of some definite surgical condition in the urinary tract.

That there may be some condition outside which reflexly excites symptoms is indicated by a case recently seen with Dr. Mitchell of Portland, Maine. Dr. Mitchell had done a complete and satisfactory perineal prostatectomy a few days previously; the healing was perfect and urethra free, but the man continued to have pain referred to his bladder, and he urinated every half hour. Naturally, blood and some pus were present in his urine. Finding tenderness over the right kidney and along the ureter, I suggested exploration, but both kidney and ureter were found to be normal.

At autopsy two months later, a bony tumor of the bodies of the lumbar vertebrae was found, not causing direct pressure on either kidney or ureter, but presum-

ably irritating the nerve supply of the bladder. This combination of conditions is so very rare that it may be disregarded in making a preliminary diagnosis.

When any two of these symptoms are found, I believe that all surgical conditions in the urinary tract should be ruled out before attention is directed to other organs, or the patient is left to Nature somewhat upset by the various so-called urinary antiseptics and sedatives.

SURGICAL DISEASES OF THE URINARY TRACT IN BOSTON CITY HOSPITAL AND MASSACHUSETTS GENERAL HOSPITAL FROM 1900 TO 1905.

KIDNEY.

Inflammatory:	
Pyelitis.....	13
Pyonephrosis.....	33
Perinephritic abscess.....	26
Tuberculosis.....	46
Calculus.....	73
Total.....	191 = 51%
Mechanical:	
Hydronephrosis.....	27
Movable.....	89
Rupture.....	26
Total.....	142 = 38%
New growth:	
Sarcoma.....	19
Carcinoma.....	6
Hypernephroma.....	7
Adenoma.....	1
Cystadenoma.....	1
Neoplasm.....	1
Total.....	35 = 9%
Other disease.....	5
Grand total.....	373

URETER.

Inflammatory:	
Tuberculosis.....	1
Abscess.....	1
Ureteritis.....	1
Total.....	3
Mechanical:	
Stricture.....	2
Calculus.....	2
Total.....	4
New growth.....	0
Grand total.....	7

BLADDER.

Inflammatory:	
Cystitis.....	100
Tuberculosis.....	24
Total.....	124 = 41%
Mechanical:	
Calculus.....	98 = 32%
New growth:	
Carcinoma.....	29
Papilloma.....	11
Sarcoma.....	1
Total.....	41 = 13%
Other disease.....	41
Grand total.....	304

PROSTATE.

Inflammatory:	
Hypertrophy.....	329
Prostatitis.....	40
Abscess.....	20
Tuberculosis.....	3
Total.....	392 = 91%
Mechanical.....	0
New growth:	
Carcinoma.....	26
Adenoma.....	4
Sarcoma.....	3
Total.....	33 = 8%
Other diseases.....	2
Grand total.....	427

"Other diseases" includes all cases with diagnosis of hemorrhage and others without definite diagnosis.

Of the single symptoms pain is of little value in directing attention to the urinary tract, and the great majority of pains without disturbance of function or blood in the urine will be found to be caused by some other organ or system.

*Read before the Surgical Section of the Mass. Medical Society, June 13, 1905.

Disturbance of function is almost worthy of being called pathognomonic. The normal adult individual, under average conditions of heat, excitement and drinking, empties his bladder from four to seven times a day, and should be able to sleep seven or eight hours undisturbed. There should be no difficulty, discomfort or urgency about the act. Regular variations from these habits are the first of all symptoms to appear in several urinary diseases and must be inquired into carefully and regarded with grave suspicion when persistently present.

Hematuria always means something wrong in the urinary tract and when persistent or when recurring intermittently it should lead to careful study as to its source and cause, not because the loss of blood is always dangerous, although it may hasten the end in some conditions, but because it is almost invariably an indication of some serious and possibly curable condition.

It is possible for a patient to have some surgical disorder of the urinary tract in which none of these symptoms appear for months, but under continuous observation something will be found if these organs are kept in mind.

So far as I have been able to look up records, there is only one of these surgical conditions which may not be found at any age. Infants and children have been reported as having movable kidneys, calculi, malignant growths, and in fact all these diseases except prostatic hypertrophy.

Beyond the fact that most of the movable kidneys recorded are female and all the hypertrophied prostates male, either sex may suffer from any of these conditions.

Instead of discussing the symptoms of each disease separately, I have grouped the most important symptoms and attempted to show why they appear under different conditions.

PAIN.

Pain from disease of the kidney may be felt at the point of injury or may be referred to the opposite side or to some distant point. Any mechanical condition which interferes with the outflow of urine, such as a kink in the ureter, or stone, or clot, or swollen lining, or tumor pressure, or stricture, or ligature, which prevents the free flow of urine from the kidney, will cause pain varying in degree according to the location and character of the obstruction. The same sort of pain may be felt in certain infections of the kidney in which the bulk of tissue within the capsule is increased, or in which there is hemorrhage under the capsule, or after artificial distention of the pelvis.

As has been previously pointed out, there are some observations which go to show that the kidney is extremely tolerant of all conditions which do not stretch its capsule, and that simple slitting of this capsule for a time will relieve the pain of pelvic distention, even when caused by stone in the ureter. How much, if any, sensation is possessed by the kidney beyond its reaction to capsular stretching or to what is sometimes called internal pressure I do not know.

Many malignant growths cause no pain for a long time, especially in children. The same is true of some renal calculi, but just as soon as a blood clot or fragment of tissue, or bit of calculus plugs the ureter, the typical attack of pain begins.

Palpation of a normal kidney, even if considerable force be used, causes no pain; packing, washing out or removing drains in the pelvis causes no pain in an ex-

posed but uninfected kidney. Possibly its only sensory nerves lie in the capsule or walls of the pelvis. Of this we ought to know more.

If there is any characteristic of pains arising in the kidney it is their radiating character. They may be referred to any point between the shoulder and ankle on the same side, to the region of the opposite kidney, to the pelvis, or to the abdomen generally, and all at the same time.

Pain in the ureter is produced by stretching or distention. Passing a ureteral catheter into a normal ureter, even if purulent urine is flowing through it, causes less pain than passing a soft rubber catheter into a urethra. Apparently there is little sensation except that of tension in any case, but this may become extreme pain when a concretion is being forced down by the peristaltic contractions.

There is no possibility of being sure whether a pain which a patient describes is due to a renal or to a ureteral condition without other evidence. The patient's sensations may be precisely the same in either case. The bladder is not sensitive unless inflamed, and then it tolerates catheters and drainage tubes which are not moved about. Most of us are aware of the location of the dull ache of an acutely distended bladder, yet many patients carry from a few ounces to some pints of urine constantly without being conscious of it. From one woman who was not suffering very greatly I drew six quarts and half a pint of urine within one-half hour, and this is much below the greatest record.

Some patients with tuberculosis and new growths in the bladder suffer very little during the early stages, when radical treatment may be expected to produce the best results. One of my patients with cancer of the bladder had pain only on urinating until the growth reached a size which mechanically obstructed the urethral orifice. Many patients with calculi are reported to have suffered little until the bladder mucosa became damaged and infected.

In prostatic cases the patients suffer pain like that in kidney disturbances caused by stretching of the capsule in acute inflammatory conditions and from the secondary changes which occur in the obstructed bladders. Pain from prostatic trouble alone is usually referred to the rectum, glans penis, or perineum. When the bladder is involved there is the local discomfort before referred to, and often the almost constant tenesmus due to irritation at the orifice of the bladder and in the prostatic urethra which may amount to pain.

Of the diseases presented in the cases from the two hospitals, those representing acute infections are most likely to cause constant pain, those representing or producing foreign bodies, such as calculi, or clots of blood or pus, or good-sized fragments of tissue almost always produce intermittent pain, while the new growths may be painless for years.

In a general way, pain is more likely to be referred to a point below its origin than above it, but disease of the lower part of the tract is so likely to lead to infection or to painful distention above it that there is always a possibility of being led astray.

ALTERED FUNCTION.

Somewhere I have read that the act of urination begins with a pull of the ureteral muscle fibers which bound the trigone and are continued into the verumontanum of the prostatic urethra or to a corresponding point in the female urethra.

This muscular pull opens the internal orifice and al-

lows some fluid to trickle into the urethra. The voluntary sphincter may now contract and force the fluid back for a time or allow it to pass on. If this description be correct, and I know of no anatomic, experimental or personal reason for doubting it, it explains how the function may be altered by conditions remote from the bladder.

Frequency.—Frequency of micturition may be increased by any condition which diminishes the capacity of the bladder or causes irritation of these lower ureteral fibers.

In cystitis, therefore, when the capacity of the bladder may be reduced to a few cubic centimeters, in tumor and calculus cases in which there is constant irritation of the trigone, and especially in the occasional acute inflammations which accompany an enlarging median lobe of the prostate, and which directly affect these fibers, we may expect increased frequency of micturition. To explain its occurrence in renal and ureteral conditions, it is only necessary to recall the continuity of the ureteral fibers from the kidney pelvis to the verumontanum or the corresponding point in the female urethra.

We have all known the frequent dribbling overflow of a distended bladder to be mistaken and treated—or neglected—as an “inflammation of the bladder” or a little “kidney trouble.” There is no excuse for a physician’s making an error of this sort. He has no right to guess when he can find out.

Urgency.—Some individuals find it impossible to resist the impulse to urinate. If they attempt to prevent the flow, they leak. In every case there is an uncontrollable contraction of the bladder, due possibly to irritation of the lower ureteral fibers, to a calculus in the ureter or bladder, to a new growth in the bladder, to an enlarging median lobe of the prostate, to an inflamed condition of the urethra nearest the bladder outlet, or else to an incompetent voluntary sphincter. Any of which conditions may disturb the normal relation between bladder capacity and contraction.

I have seen examples of all these conditions and doubtless there are others that will produce the same symptom. It is too suggestive to be neglected and must bear an intimate relation to

Incontinence.—Except in the overflow of distended bladders and as it may suggest search for and removal of all irritations wherever found, incontinence of urine has no surgical significance in this paper.

Difficulty in Urination.—This is perhaps as common a symptom as any and results from either mechanical obstruction or from some fault in the nerve supply. It occurs in conscious patients with paralysis of the abdominal muscles and competent sphincter, as well as in those who are in a comatose or delirious condition.

My observation has led me to believe that paralytic and comatose patients are quite as apt to be incontinent as to have retention, unless there is some obstacle which they had previously been able to overcome by voluntary abdominal pressure.

The mechanical obstruction of which we hear most to-day is the hypertrophied prostate, and while unable to discuss it as I should like, I would remind you that it is not a disease of advanced life exclusively. Several cases have been reported in the thirties, and between forty and forty-five the number of men whose prostate begins to produce some discomfort and residual urine is very considerable.

Anuria.—This may occur in the course of certain acute diseases, as a result of some forms of poisoning,

after trauma to the urinary tract below the kidney, or to the kidney itself, from vaguely understood reflex disturbances outside the urinary tract, and from any condition which mechanically obstructs the flow of urine into the bladder. The last group of cases is not always easy of separation from the others. Fortunately patients usually go from two to five days before symptoms of uremia appear, and this allows sufficient time, if properly used, for decision and for operative measures if necessary. Absence of urine in the bladder during twelve consecutive hours, if proved by a catheter, may well arouse grave apprehensions, and twenty-four hours is a limit beyond which the responsibility lies very heavily on any single practitioner.

HEMATURIA.

Red blood may show in the urine in amounts recognizable to the naked eye, with or without clots, or in such quantity as only to be recognized by the aid of the microscope. In either case, it may be intermittent in appearance, but in the first case blood is likely to be found on microscopic search long after it has apparently disappeared.

While it may come from any part of the urinary tract and from several causes, persistent or recurring hematuria is so strongly suggestive of a new growth that, next to anuria, it is the gravest single symptom of all.

According to Albarran, hemorrhage was the first symptom in 78 per cent. of 140 malignant bladder tumors and was present at some period in nearly all. According to Israel, 70 per cent. of 66 malignant renal tumors were first indicated by hemorrhage, and 93 per cent. showed it at some period. Deneclara, in 168 cases of tumor of the kidney in the adult, found that hemorrhage was the first symptom in 69 per cent. Even under exceptionally favorable conditions the cause and source of the hemorrhage may remain in doubt for years.

A patient of mine had hematuria for three years without renal symptoms or palpable tumor. There was no loss of weight or strength and he was particularly active physically. He had a slowly growing prostate with considerable swelling and redness of the median portion, as seen through a cystoscope, which was supposed by one of our most experienced men as well as by myself, to be the source of the hemorrhage. A third surgeon, seeing him six months later, found a distinct renal tumor and a hypernephroma at operation. This experience has taught me never to accept a probable cause of hematuria without ruling out other possible causes.

While hematuria may possibly be due to some harmless condition, its almost constant association with malignant disease and calculi, make it, to my mind, quite as grave, though not so urgent a symptom as anuria of a few hours’ duration.

All writers agree that blood in the urine appearing without reference to any physical violence, exertion, or jarring, is very suggestive of new growths. When the hematuria follows such violence, even if slight, they consider it more probably due to the presence of a calculus. In either case it is a hematuria.

If there be also a pyuria, the diagnosis is complicated by an infection which may wholly account for the hematuria or which may be a secondary process grafted on to the original disease.

Continuous or Recurring Discomfort.—This brings

us to the most frequent of all urinary conditions—continuous or recurring discomfort rather than pain, often poorly localized, little if any disturbance of function, little if any blood in the urine, but pus in the bladder, urine continuously in varying amounts. The majority of patients with these symptoms can be cared for by any man who will handle a catheter and his solutions in a cleanly way; many will recover if they will wash themselves out by drinking enough water, but the other sort who continue in about the same condition for months, swallowing everything from hexamethylenamine to various nostrums, are the patients who appear later with incurable tuberculosis, or inoperable cancer of bladder, ureter or kidney, with trabeculated and rotten bladders, with kidneys ruined by calculus obstruction, or honey-combed with pus, or transformed into that puzzle of the pathologist—amyloid. These are the cases which arouse regret in the mind of the surgeon, or of the pathologist.

If these symptoms will disappear at all under irrigation and monosyllabic or polysyllabic treatment, they will go within a few weeks at most. If they persist longer, either the infection is not reached by the bladder irrigation or controlled by the chemicals, there is an infection in the deeper tissues, or else the pus is masking some condition like a calculus or a new growth, which is entirely distinct from the infection, though it may be the predisposing cause.

This is the time to study the case by every available method until the condition is understood and proper measures and time for treatment are determined. A patient neglected at this stage may get well from a colon bacillus pyelitis or may pass a small calculus through the natural channels, or possibly make a spontaneous recovery from a tubercular infection, but who can tell which patient will do this and which get steadily worse.

Of pyelitis, Kelley of Baltimore says in substance: "It is of the utmost importance, but is rarely recognized in the earlier stages, or when found is often thought unworthy of attention because not immediately provocative of serious symptoms. The kidney is an organ more necessary than the uterus or Fallopian tubes, but there is a general indifference to mild cases of pyelitis, while the large pus kidneys are noticed. It is important to recognize any grade because the severe cases may result from the mild."

Pyelitis, pyelonephrosis, pyonephrosis, perinephritic abscess, all infective processes, cover one-fifth of all surgical kidney admissions to the two hospitals. If to these we add the cases of tubercular infection which may also show early purulent urine, we take in nearly one-third of the surgical kidneys.

If we follow modern theories and include the calculus cases as caused by an earlier inflammatory condition which might possibly have been recognized, we find that one-half of these surgical kidneys might have been suspected in an early stage from the presence of pus in the urine, and that the patients might possibly have been spared some suffering at least.

Inflammatory processes in the bladder are likely to be recognized earlier because of the alteration in function which nearly always accompanies them and because of the pain which also impresses the patient with the idea that something is wrong.

The inflammatory condition which persists longest without symptom is found in prostatic hypertrophy. Often nothing is noticed by the patient until he suddenly realizes that he has to rise one or more times at

night to empty his bladder. This symptom in a man over 40 is always suggestive and characteristic of a bladder with residual urine.

General Symptoms.—Patients with surgical disease of one kidney are apt to sleep on the affected side; varicocele may develop on the same side as a kidney tumor; kidneys with acutely distended pelvis and capsules are exquisitely tender, while some hydronephrotic kidneys and very large tumors may be little sensitive. Rectal or vaginal touch may discover tenderness over the lower end of one ureter indicating trouble higher up on that side; median obstruction in the prostate is not always to be felt by the rectum. A tender "Israel's point"—junction of twelfth rib with the outer border of erector spinae, is valuable in identifying the kidney as a source of vague abdominal pain. The normal kidney, ureter, bladder and prostate are not painful under reasonable pressure.

SUMMARY.

Localized pain, altered function, hematuria, with or without pus—these are the cardinal symptoms of surgical disease in the urinary tract. Tumor, tenderness and residual urine do not require complicated apparatus for their recognition, and their presence or absence can be determined by any physician who will take the trouble to examine his patients properly. These preliminary points are simple, sufficient for a correct diagnosis sometimes, and always trustworthy in indicating the urinary tract as a source of trouble. Nothing in surgery requires more concentrated attention, more accurate observation, or a finer technic, than a complete and correct preoperative diagnosis of the more obscure conditions in the urinary tract which stand between our patients and health.

LATERAL DISPLACEMENT OF TENDON INSERTIONS FOR THE CURE OF STRABISMUS.*

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The recti muscles act on the eyeball from a common origin. Their normal directions prolonged backward would pass practically to a common point in the outer, lower wall of the optic foramen. Their differences of action depend on differences of insertion. By lateral displacement of its insertion one rectus might be made to take up the function of either of the others. A displacement of not more than 15 mm. up or down, and out, would cause the internus to perform the function of the superior or the inferior rectus.

Some lateral displacement of the insertion of the recti tendons is possible; and any portion of such lateral displacement can bring about a corresponding change of function. Conceive a plane passed through the insertions of the recti muscles roughly perpendicular to the antero-posterior axis of the eyeball, intersecting the sclera in the circumference of a circle. Then the new function of the muscle, produced by the lateral displacement of its insertion, corresponds to the sine of the arc of that displacement.

Let Fig. 1 represent such a circumference with the internal superior, external and inferior recti insertions at A, B, C, D, respectively. If the insertion of the internus be removed from A to E, it will continue to turn

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