with negative roentgenologic findings in whom gastric disease is suspected, (2) for classification of many cases with indeterminate, suspicious, or inconclusive roentgenologic findings, and (3) for elucidation of certain obscure conditions such as unexplained gross hemorrhage and gastrointestinal allergy.

Gastroscopy in combination with roentgenoscopy and study of gastric content removed by fractional method of gastric analysis has made the diagnosis of organic disease of the stomach comparatively simple. The diagnostic study of many patients cannot be considered adequate and complete without gastroscopy. When indicated, gastroscopy provides convincing evidence of its diagnostic value.

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CYSTOSCOPY

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In 1805 Bozzani of Frankfort devised an instrument that for the first time permitted visualization of the male urethra. This was the first of three contributions that established principles upon which all later cystoscopes were constructed. In 1883, three years after the invention of the incandescent light by Edison, Newman of Glasgow applied this new source of light to the cystoscope. Boisseau du Rocher, however, is credited with inventing the incandescent light cystoscope with the direct view and megaloscopic optical arrangement.

At the beginning of the twentieth century American workers directed their attention to improvement of the cystoscope. The Kelly indirect endoscope was perfected by Reinhold Wappler and Otis. In 1904 Lewis introduced the operating cystoscope, which permitted transurethral treatment of various pathologic lesions in the bladder. Accessory instruments included forceps, scissors, dilators, and extractors.

The classification of cystoscopes is according to the lens system. Nontelescopic instruments are based on the principle of direct vision through a simple tube, and magnification by lenses is not used. Tele-

scopic instruments are further classified as direct, that is, with the plane of vision perpendicular to the axis of the telescope, or indirect with the field deflected 90 degrees.

Cystoscopy is indicated in practically all chronic disturbances of the urinary tract when no contraindication exists. Accordingly intravesical investigation is indicated in persistent urinary frequency, dysuria, or nocturia. In pyuria cystoscopy may be necessary to determine if the causative lesion is in the urethra, bladder, or upper urinary tract. Painless hematuria demands immediate cystoscopy and pyelography to determine the origin and the cause of the bleeding. This type of hematuria is not a disease requiring medication but a symptom demanding complete urologic survey. Although a clue as to the source of bleeding may be elicited from the history and the nature of the hematuria, this may be misleading as will be evidenced by cystoscopy. The bleeding is often intermittent, and a long time may elapse between attacks. Such remissions may lull the physician into a false sense of security, so that a lesion such as a bladder tumor may be surgically incurable when it is finally revealed by cystoscopy. That the clinical significance of hematuria is minimized is evident from the interval usually reported between the onset of hematuria and an accurate diagnosis.

Persistent or intermittent pain in any quadrant may be associated with renal or ureteral pathology, and cystoscopy or intravenous urography is warranted if it cannot be satisfactorily explained. Frequently a diagnosis of chronic appendicitis is made when actually a stone lodged in the lower right ureter is responsible for the pain. It is well to recall that in obstructive lesions of the upper urinary tract gastrointestinal symptoms may predominate. Therefore when gastrointestinal study fails to reveal the cause for ill-defined gastrointestinal symptoms, the upper urinary tract should be studied even though the urine is normal. A noninfected hydronephrosis may be the source of the trouble. Pain in the suprapubic region may be of sufficient severity to warrant cystoscopy, since a calculus, Hunner ulcer, or other lesion may be present.

Case 1—A dentist, aged 51, entered the Clinic July 24, 1944 with the complaint of "trouble with the colon and frequency of urination." Burning and frequency had been present for several years, frequency occurring every two hours. A full bladder caused suprapubic pain. Symptoms seemed to be aggravated by episodes of colitis. Previous urinalyses were normal. The urinary symptoms were becoming more pronounced but were attributed to nervousness.

A roentgenogram was normal. An excretory urogram showed prompt function of both kidneys. The kidneys and ureters were normal without evidence of obstruction or retention. Total renal function was normal. The urine was normal and the culture sterile. Cystoscopy revealed a bladder capacity of 130 cc.; further distention produced supra-

pubic pain. On the anteroposterior wall of the bladder was an area measuring several millimeters which was bright red in contrast with the adjacent normal mucosa. The area was bleeding slightly from overdistention of the bladder. Adjacent blood vessels stood out prominently. Touching the ulcer reproduced the suprapubic pain. Superficial fulguration of the ulcer through the operating cystoscope relieved the symptoms.

Comment—Although the symptoms suggested Hunner ulcer of the bladder, the diagnosis could only be confirmed by cystoscopy. Since the urine is usually normal, the omission of cystoscopy increases the possibility of error in diagnosis.

The presence of a mass in either of the upper or the lower quadrants or in the suprapubic region warrants cystoscopy to determine whether the genitourinary tract is involved. If the mass is not in the kidney region, the possibility of an ectopic kidney must be considered. Obviously if clinical symptoms suggest a lesion in the gastrointestinal tract, this investigation should be made before cystoscopy.

Case 2—A woman, aged 48, entered the Clinic with the complaint of constipation, pain in the left side of the abdomen, and headaches. For ten years the patient took mineral oil with agar every other day for the chronic constipation. Diets failed to relieve the symptoms. The pain in the left abdomen was aggravated by gas and eating and was not relieved by bowel movements or enemas. Deep pressure over the left upper abdomen caused pain.

A scout film of the abdomen showed a large opaque shadow in the region of the right kidney. Intravenous urography showed prompt function of both kidneys and a large stone in the left kidney pelvis. The diagnosis was confirmed by cystoscopy and a retrograde pyelogram. There was some retention of dye in the left kidney and hydronephrosis. The bladder appeared normal, and the total function was normal. Urinalysis was normal. In a previous x-ray of the colon which was reported normal barium in the bowel evidently obscured the stone. The symptoms were completely relieved by surgical removal of the calculus.

Comment—In this case symptoms produced by the calculus were referred to the gastrointestinal tract. A normal urine and the absence of kidney symptoms favored the assumption that the urinary tract was not involved. In x-ray study of the colon the renal calculus was obscured by the barium. As a precaution a scout film of the abdomen should be taken before barium is introduced into the gastrointestinal tract.

In children cystoscopic examination of the bladder and pyelograms may be readily made with modern baby cystoscopes. The presence of congenital lesions such as urethral valves and ureteroceles, which would eventually destroy the kidney, may be diagnosed and successfully treated.

In acute inflammatory conditions of the bladder and kidney, cystoscopy should be delayed until the acute symptoms subside under medication and general treatment. Likewise small caliber stricture, acute infection of the prostate, and prostatic abscess may contraindicate cystoscopy. Cystoscopy may be performed only with considerable risk in the elderly debilitated patient with an enlarged prostate. Cystoscopy may be sufficient to activate an incipient uremia and cause the death of the

patient. In such patients blood chemistry studies may be secured; a high blood urea contraindicates immediate cystoscopy.

In most adults local anesthesia suffices for a complete cystoscopic study. In patients with pronounced bladder irritability pentothal anesthesia may be very effective. For children, however, gas-oxygen or ether anesthesia may be advisable. For local anesthesia I prefer diothane hydrochloride, 1 per cent; 2 ounces may be instilled into the bladder and urethra with a bulb syringe. Four per cent metycaine or 1:250 nupercaine may also be used. Whether or not general anesthesia is given, gentleness in handling the cystoscope is of prime importance.

Comfort for the patient on the cystoscopic table should receive first attention, and the cooperation of the assisting nurse is essential. It is well to adopt a specific routine for the inspection of the bladder; this permits more rapid and complete visualization and eliminates unnecessary manipulation of the cystoscope. After the cystoscope is gently introduced into the bladder, a specimen of urine is obtained for analysis. Approximately 150 cc. of fluid is then introduced into the bladder to permit adequate visualization. By gently rotating the cystoscope the bladder is completely inspected, after which catheters are passed up each ureter to the kidney pelvis. After catheterization of the ureters the instrument is gently withdrawn leaving the ureteral catheters in place. If the cystourethroscope is used, the urethra is inspected prior to catheterization of the ureters. Specimens of urine may now be secured from each kidney for analysis, after which phenolsulfonphthalein studies are made. This is followed by pyelograms, and as a general rule I prefer bilateral ones. The ureteral catheters are then gently removed. If pyelograms are made, it is well to have a bed available where the patient may rest for half an hour before going home. Gentleness in cystoscopy is rewarded by absence of reactions.

With modern instruments many lesions of the urinary tract can be successfully treated without recourse to open surgery. Benign tumors of the bladder (papillomata) may be adequately treated transurethrally with the resectoscope or operating cystoscope. Beer first used the insulated wire electrode for fulguration of papillomata of the bladder. One of the most useful electrodes employed today was designed by Bugbee and permits complete destruction of the tumor with the fulgurating electrode. I prefer to resect large tumors with the McCarthy resectoscope.

Case 3—An executive, aged 48, entered the Clinic with the complaint of hypertension. An examination for insurance a year before revealed that his blood pressure was

175 systolic and 104 diastolic. The systolic pressure rose to 195 with exercise. He was advised to lose weight and was given medication by his physician.

He was referred to the department of urology for investigation of the possibility of a Goldblatt kidney. Urinalysis showed 15 to 25 red cells by high power field and a trace of albumin. An x-ray showed that both kidneys were normal in size, shape, and position and that no calculi were present. Cystoscopic inspection of the bladder revealed one tumor the size of a cherry and several smaller ones above the left ureteral orifice. The ureters were not obstructed, and specimens of urine from the kidneys were normal. Bilateral pyelograms were normal. Biopsy report of a specimen secured transurethrally was "papilloma." The tumor was completely destroyed by transurethral fulguration. Cystoscopy revealed no evidence of recurrence two years later.

Comment—Although no clinical symptoms were indicative of a tumor of the bladder, 15 to 25 red blood cells per high power field were found in the urine specimen. The diagnosis could be established only by cystoscopy. Thus the lesion was detected early, and the necessity for open operation obviated.

A resectoscope may be used to resect small malignant tumors on the floor of the bladder. After this radon seeds may be accurately implanted in the base of the tumor by means of a special carrier. Large malignant tumors, however, require more radical treatment.

The operating cystoscope may be used to manipulate stones in the ureter to hasten their spontaneous expulsion without recourse to open surgery and to dilate or cut abnormally small ureteral orifices. Depending upon their size and shape foreign bodies in the bladder may be removed immediately by utilizing special grasping forceps introduced through the operating cystoscope.

Specimens from bladder tumors may be secured by use of the operating cystoscope and biopsy forceps. This provides material from which one can determine whether the tumor is benign or malignant. Thus information is provided on the basis of which adequate treatment may be instituted.

In certain selected cases of Hunner ulcer overdistention of the bladder and superficial fulguration of the ulcer may be performed to alleviate the patient's symptoms and progressively increase bladder capacity. This is not so often employed as conservative treatment by instillation of 1 per cent silver nitrate after overdistention of the bladder.

I do not believe cystoscopy is complete without urethroscopic survey with the urethroscope or cystourethroscope. I prefer the latter instrument because the inflow of water unfolds the urethra and permits excellent visualization. Likewise the relation between ureteral orifices, trigon, sphincter, and juxasphincteric area as well as the posterior urethra is noted and well visualized. The presence of cysts, hyper-

trophied verumontanum, polyps, or tumors may be detected and adequate treatment instituted.

When indicated ejaculatory ducts may be catheterized, thus making radiographic study of the seminal vesicles possible.

SUMMARY

Patients with symptoms referable to the urinary tract should have a complete urologic survey before irreparable damage is done or a malignant lesion becomes surgically incurable. An accurate diagnosis can usually be accomplished by cystoscopy, intravenous urography, and retrograde pyelography. With our present instruments transurethral surgery may be advocated and is attended by the most gratifying end results.

OPHTHALMOSCOPE

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Of almost equal importance to the ophthalmologist are the ophthalmoscope, the retinoscope, and the slit-lamp biomicroscope. The anatomy of the eye lends itself to accurate study by direct observation with various types of illumination. The latter limits the magnification here as it does with all other magnifying apparatus.

The opthalmoscope is undoubtedly the most widely known of these scopes because of its value to general medicine. Méry in 1704 accidently held a cat's eye under water and saw the blood vessels and color of the retina. In 1851 von Helmholtz reported an instrument which he called the ophthalmoscope by means of which "all the alterations of the vitreous body and of the retina which, until now, have been found in cadavers, will also permit of recognition in the living eye—a possibility which appears to promise the most remarkable advances for the hitherto undeveloped pathology of this structure." This promise has been more than fulfilled. Now less than 100 years later the examination of the eyegrounds is an important adjunct in the diagnosis of general disease. The ophthalmoscope was a tremendous boost to the medical man's ability to diagnose vascular disease as well as early cerebral lesions.

The ophthalmoscope is a simple instrument with a perforated disk to look through and a light for illuminating the inside of the eye. Since all eyes are not emmetropic, the lens, which is attached in various ways, is necessary to neutralize errors of refraction of patient and observer.

Although early instruments were obviously not as streamlined as those of today, observations made with them were usually without error.