technic should, therefore, be modified. The thread tears the wall very easily. It is necessary to use U-shaped stitches like those of Jaboulay, although this kind of suture does not give a strong scar if the operation is very aseptic. This inconvenience could be avoided by a reinforcing continuous suture. The immediate results of the anastomoses and of transplantations are excellent. There is no reason to think that the ultimate results would be less satisfactory than those of the operations on the abdominal aorta, which are perfect even after several years.

The problem of operating on the aorta without interrupting the circulation presents several different solutions. In a case of sacciform aneurism, it would be possible to extirpate the sac and to close up the opening without interrupting the circulation, in performing the operation which I described some years ago as longitudinal exclusion. But if it is necessary to resect a large part of the wall or even a whole segment of the aorta, the problem is more difficult. Two other methods are theoretically possible: definitive or temporary lateral derivation and the temporary tubing. I have not yet attempted on the aorta the lateral derivation of the blood. But I have implanted a vein, preserved in cold storage, on the right auricle, in order to establish a collateral substitute for the superior vena cava. The operation was not very difficult. Unfortunately, the animal died of pleurisy two days later. The inconvenience of these methods is their complication. Temporary tubing is much simpler and more rapid. It permits of performing the operation as slowly as necessary, since the circulation goes on through the tube. I do not mean to imply that it is an ideal method, but it renders possible long and difficult plastic operations on the thoracic aorta.

DILATATION OF STRICTURE OF THE MALE URETHRA

WITH SPECIAL REFERENCE TO THE AUTHOR'S IRRIGATING
TUNNELED AND GROOVED AND STANDARD SOUNDS *

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A stricture may be defined as an obstruction or closure, partial or absolute, of the lumen of any passage in the body. Thus, as familiar examples, the term "stricture" is applied to obstructions of the nose, throat, intestines and the urinary passages.

Among the commonest strictures are those of the male urethra, because trauma is not infrequent and infections of the urethral mucosa, especially gonorrhea, are common diseases. These always leave behind them, at one or more points of the mucous membrane, damage of sufficient degree and depth to cause the formation of scar-tissue, which, by the process of contracture or shriveling, leads to more or less closure of the canal. This narrowing progresses steadily for the worse as the years go by, in the vast majority of patients.

In a mill-stream the closure of a dam causes a backset or up-stream pressure of water along the main channel and all its tributaries in regular order. When the spillway is reached by the level of water a balance of back-pressure and overflow is established, and thus a certain

degree of relief is afforded. So in the urinary system, a urethral stricture by more or less closure checks the freedom of the passage of urine and causes back-pressure on the urethra, bladder, ureters and kidneys, in regular ascent from one to the other. The higher the dam in the stream and the tighter the closure of the stricture in the urethra, the more far-reaching and greater the changes in the mill-stream and the urinary apparatus, as the case may be.

Such are the "hydraulics" of stricture and are purely mechanical and truly physical effects of stricture on the balance of the urinary system—a poise which for life-long health thereof should never be disturbed. This is, moreover, exactly the reason why stricture is the most dangerous result of gonorrhea, whose degree and progressiveness are all too little appreciated by the average practitioner.

In selecting the method of treatment of stricture of the urethra, early diagnosis of incipient obstruction is the first step. By this statement is meant the dogma that no victim of injury or infection of the urethra should be discharged as "cured" without gentle, complete examination of the urethra for infiltrations or thickenings which are the starting-points or foundations of stricture. About a month after all other treatment of a gonorrhea, for example, has ceased, and presumably all the inflammation ended and doubtless the limit of Nature's own absorption of the infiltrations established, gentle dilatation of these points may be begun and continued until they disappear either fully or reasonably within the boundaries of all mucous membrane recovery. Unless they are fully resolved or absorbed, examination and perhaps treatment of them are indicated at fixed intervals, which may be determined only in each case as a law to itself. To attempt treatment of such infiltrations earlier than after a month of rest is usually to invite stricture-formation by mechanical irritation, and may be regarded as premature and incompetent interference with what may prove curable by Nature's own processes.

The foregoing method of curing urethral infections and traumatisms may be called prophylaxis and prevention of the many types of stricture which may later, and perhaps repeatedly, require radical and dangerous operations for permanent relief or for maintenance in a condition of even comparative safety for the patient.

The purpose of this monograph is to discuss dilatation of stricture of the urethra. Strictures vary so greatly, however, in character and behavior that no one method will be alone wise or efficient for all forms and manifestations of the disease. A very cogent resumé of the whole question of the treatment of stricture is given by White and Martin,¹ whom I quote below. The bracketed portions at the end of each paragraph are my own comments, and, it is trusted, will be accepted as offered with due deference.

SUMMARY OF TREATMENT

"1. Gradual dilatation is indicated as the treatment of choice in all recent, soft, or dilatable strictures found in any part of the urethra, without regard to the caliber of such strictures." [The key-term here is "recent stricture." If intervention with newly formed infiltrations is begun too soon they will be stimulated to form a traumatic stricture whose character will vary according to the nature, frequency and violence of the treatment and the reaction of the patient's tissues in such cases.]

"2. Continuous dilatation is indicated in uncomplicated strictures which are so tight that no instrument larger than a filiform can be made to pass. This continuous dilatation is prac-

* Read in the Section on Surgery of the American Medical Association, at the Sixtieth Annual Session, held at Atlantic City, June, 1909.

1. White and Martin: Genitourinary and Venereal Diseases, ed. 8, pp. 255-256.

ticed till a small metal instrument can be introduced—No. 12 to No. 16 [French scale]. Then the normal caliber of the urethra is restored by gradual dilatation or by cutting, in accordance with the nature of the clinical behavior of the stricture." [To carry a tight stricture which accepts at first a filiform up to 12 to 16 F. by continuous dilatation might in many cases result in infection of the bladder. In my experience one or two filiforms will dilate the stricture to 7, 8 or 9 F., after which tunneled and grooved sounds may be employed. Uncomplicated strictures are, of course, understood as alone concerned in these statements.]

"3. Internal urethrotomy is indicated in all fibrous, irritable, and resilient strictures anterior to the bulbomembranous juncture. Narrowings at or near the meatus should be treated by the knife whenever it is apparent that they are responsible for definite symptoms. The division is here made on the floor of the urethra. All other anterior strictures are divided along the roof." [Before internal urethrotomy is ever attempted, except in emergencies, a bacteriologic examination should be made of pus present. If vicious germs are present local treatment should be attempted for their destruction before any operation whatever is practicable.]

"4. External perineal urethrotomy is indicated in all fibrous, resilient, or irritable strictures situated behind the bulbomembranous juncture." [The best or one of the greatest indications for external urethrotomy is the presence of pus which would be benefited by the drainage of this operation. The same comment is warranted with regard to the following paragraph.]

"5. Combined internal and external urethrotomy is indicated in the treatment of anterior strictures which are unusually dense or nodular and which are complicated by fistulas."

"6. Perineal section, or external perineal urethrotomy without a guide, is indicated in the treatment of impassable stricture of the deep urethra. When the proximal urethral end cannot be found, suprapubic cystotomy and retrograde catheterization are justifiable."

"7. Excision is indicated in cases of impermeable stricture, nodular or fibroid, where there has been complete destruction of mucous membrane. When so much tissue is removed that it is impossible to bring the divided urethral ends in apposition, transplantation of mucous membrane is indicated." [The majority of strictures are inflammatory. The end result of any excision operation must in greater or lesser degree be an annular traumatic stricture which, probably without a single exception, is the most intractable form of stricture, therefore the application of excision is deservedly a question of the gravest possible doubt.]

"Formulating the operative indications in accordance with the clinical features of the stricture, the following summary of treatment is given:

"1. Narrowings at or near the meatus, if treated at all, are always cut.

"2. Strictures of large caliber (greater than 15 F.) are treated by gradual dilatation. Cutting is almost never required when such a stricture is in the deep urethra; it is sometimes necessary when the stricture is anterior to the bulbomembranous juncture.

"3. Strictures of small caliber are treated by gradual dilatation if possible; when in the deep urethra they often require external urethrotomy; when anterior to the bulbomembranous juncture they usually require internal urethrotomy.

"4. Impermeable strictures are treated by perineal section, followed at times by excision and mucous membrane grafting.

"5. Soft, recent, uncomplicated strictures are always dilated.

"6. Fibrous, nodular, irritable, strictures complicated by urinary fever, fistula, etc., are always cut."

The logical points of the subject of treatment of stricture by dilatation might be designated as the questions of diagnosis, armamentarium, preliminary treatment, actual treatment, and after-treatment.

DIAGNOSIS

Diagnosis is almost synonymous with selection of the case as available for dilatation. It rests on minute history, strict examination and careful observation. All these are essential before the systematic and progressive dilatation may be begun. The matter of diagnosis may be immediately dismissed on the ground that it is sufficiently covered by the foregoing quotation from White and Martin and my parenthetical comments:

ARMAMENTARIUM

The instruments ordinarily required for the dilatation of stricture are filiform whalebone guides; tunneled and grooved silver catheters; tunneled and grooved metallic sounds; soft, flexible lead-core, cone-pointed or olive-pointed, silk or lisle-thread bougies; standard metallic urethral sounds, and assorted, flexible, rubber, silk or lisle-thread catheters.

One great danger of all strictures of the male urethra is that of reflex minor and brief, or major and prolonged anuria. In my careful observation of patients under the dilatation treatment of stricture, a very reliable and rational means of preventing reflex renal inhibition is to provide a reflex vesical action at the end of each treatment by filling the bladder with a blood-warm antiseptic solution. This "artificial urine" the patient voids before leaving the office, the evacuation thus quieting possible mental apprehension by permitting him to perceive the normal action of his bladder and also thus irrigating antiseptically his bladder and urethra under Nature's own pressure and process, and finally soothing the invaded portions of the urinary tract in a degree and manner which almost always forestall balking of the kidneys, with its consequent danger of even minor anuria. In passing, it may be noted that quinin, gr. 5, with fluid extract of aconite, minims 3, and morphin sulphate, gr. $\frac{1}{4}$, for sthenic patients; and quinin, gr. 5, nitroglycerin, gr. $\frac{1}{50}$, and codain, gr. 1, for asthenic patients, are admirable combinations for internal administration with the purpose of preventing reflex complications.

In order to produce the physiologic effect of an acting bladder on the kidneys, at the end of each treatment I have, in years gone by, always used the tunneled and grooved silver or the standard catheter, not only to evacuate the bladder as a preliminary to dilatation in selected cases, but also to provide, as a termination of treatment in all cases, artificial urine in the form of warm antiseptic solution just described.

Thus it will be noted that all cases have suffered at least double invasion of the urethra and bladder—once by the dilating instrument and once by the irrigating instrument. Predominant over all other considerations are the strict asepsis of the bladder and urethra and the prevention of reflex renal inhibition. Hence, this plan of procedure is justified, both as preventive and curative.

The doctrine is well established, however, that the less actively, less violently and less frequently the genito-urinary apparatus is invaded within the limits of reasonable indications of treatment the safer for the constitution as a whole and the better for the urogenital tract focally in the stricture and generally as a physiologic unit in the system.

Activity of treatment is indicated by the character and conditions of each case in itself, and is a matter for the judgment and experience of each individual specialist or surgeon to determine.

Violence of invasion is likewise subject to judgment and experience, and is also a factor of choice between soft

flexible instruments and rigid metallic instruments. The soft flexible lead-core cone-pointed or olive-pointed woven-silk or lisle-thread bougies have largely met the objections to soft instruments set forth by Lydston² in the following words:

Soft bougies and catheters are not so easily managed as stiff metallic instruments, as their flexibility permits them to bend on themselves when they come in contact with a tight stricture. It is difficult, however, to produce injury with them, and, inasmuch as instruments should be coaxed rather than forced through a stricture, their function in the treatment of strictures of small caliber is of great importance.

Skill, gentleness, patience and persistence largely or even totally, in my opinion, give rigid instruments preference over flexible instruments, except in extensive, tortuous strictures. In this particular type of stricture steel instruments produce not only centrifugal dilatation, but also axial traction. Both these effects combined are usually more severe than the delicate urethral and peri-urethral structures will tolerate; therefore, inflammation and aggravation, rather than alleviation and absorption, usually follow the use of steel instruments in extensive tortuous obstructions. The lead-core dilators provide centrifugal dilatation but avoid axial traction in the hands of experts by accommodating themselves to the irregularities of direction of the urethra due to the tortuosities and extent of this type of stricture.

Nevertheless, the fact remains true to-day as when stated originally by Van Buren and Keyes³ in 1874:

In trained hands, however, the steel sound is perfectly safe; it is smoother than any soft instrument, and certainly can be passed into the urethra with less pain than can any other instrument, and is capable of effecting more dilatation, in the same length of time, with the employment of less force.

To this may be added the fact that steel instruments, being smoother, are much more aseptic than the best varnished instruments, and consequently in the long run are the better type of instrument to use.

Frequency of dilatation implies not only actual recurrence of visits to the operator, but also the number of times the obstruction is passed during each treatment. In order to reduce to a single passage of one instrument both irrigation and dilatation, I was led to devise my irrigating tunneled and grooved sounds and my irrigating standard sounds, recently described and illustrated in the *Annals of Surgery*.⁴

By the use of these instruments the armamentarium for the dilatation treatment of stricture is reduced to whalebone filiform guides and a set of my sounds.

PRELIMINARY TREATMENT OF STRICTURE

The preparation of the patient is the next detail for consideration. Rigid asepsis and antisepsis comprise not only proper sterilization of all instruments used and due cleansing of the penis and urethra, but also the establishment of the highest possible germicidal state of the urine. Except, therefore, in totally closed strictures, which require immediate intervention (which does not necessarily mean cutting operation), the visit at which the minute examination and accurate diagnosis of the stricture, so far as possible, are made, should be followed by a few days' course of urinary antiseptics before the actual and repeated dilatation begins. These drugs should always be continued during the treatment in

order to minimize the danger of infection. The most effective combination I know is from 5 to 10 grains each of benzoate of soda and hexamethylenamin three times a day in a glassful of hot water two hours after eating.

One very important detail undoubtedly practiced, but rarely mentioned in preliminary treatment by authors, is care of and relief from the pus-organisms and chronic urethritis whenever possible, before the dilatation begins. Many strictures which are permeable to urine may remain undilated for a short time in order to remove as much infectious material as possible, provided always and, of course, there are no symptoms of urgency or indications for immediate intervention.

Irritability and congestion of many strictures may be greatly reduced by hot sitting or general body baths before each treatment. A few minims of fluid extract of aconite are very serviceable for the same purpose by internal administration.

G. Frank Lydston⁵ states:

The preliminary administration of anodynes, the continuous use of nerve sedatives and antispasmodics, and, if necessary, anesthetics, are frequently useful adjuncts to treatment by dilatation.

In the experience of most genitourinary specialists, the belladonna group (more especially hyoscyamus) is the most serviceable and reliable anodyne sedative and antispasmodic. The tincture may be given in doses of from 10 to 30 drops, three times a day, combined with the antiseptics previously mentioned.

A stricture which requires a general anesthetic is in no sense suited for the dilatation method of treatment. Therefore, only local anesthetics are probably considered in the foregoing quotation. I have obtained the best results with eucain, 2 to 4 per cent., and alypin, 2 to 4 per cent., solutions. There is a point, however, against the promiscuous use of even local anesthetics which will be elucidated later in this paper. It concerns, in brief, the likelihood of misleading the operator.

ACTUAL TREATMENT OF STRICTURE

The actual treatment must concern the two broad types of the lesion—the open or large-caliber and the tight or small-caliber stricture. From the standpoint of facility of instrumentation itself, an open stricture may be regarded as one which accepts a 20 F. sound in the hands of an ordinary practitioner or an 18 F. sound in the management of the skilled and experienced specialist.

It probably was noted that the foregoing quotation from White and Martin in the early part of this paper described size 15 F. as an open stricture. It might be said in this connection that a stricture smaller than 18 F. is rather inclined to be on the border-line between complicated and uncomplicated manifestations. It is doubtless, therefore, better judgment to make the distinction on a broader basis and take the limits 18 and 20 F. as specified. Such a rule for the general practitioner is vastly safer than any other.

Dilatation of the open type of stricture at the rate of one or two numbers of the French scale at each sitting, combined with all the foregoing precautions, is, comparatively speaking, a simple matter. It is rendered still more simple and safe and likewise more agreeable to the patient by the use of the standard irrigating sounds of my pattern, precisely for the reason of comfort afforded by the minimum of instrumentation and by the final function of the bladder at the end of each visit.

2. Lydston, G. Frank, in Bangs and Hardaway: *American Text-Book of Genitourinary Diseases, Syphilis and Diseases of the Skin*, 1899, p. 176.

3. Van Buren and Keyes: *Genitourinary Diseases with Syphilis*, 1874, p. 113.

4. Pedersen, V. C.: *Ann. Surg.*, October, 1909.

5. In Bangs and Hardaway: *American Text-Book of Genitourinary Diseases*, p. 178.

Strictures which are of smaller caliber than 20 or 18 F. usually are combined with atrophy of the urethra in front and dilatation with hypertrophy or atrophy behind, so as to render the passage of whalebone filiform guides of supreme and final importance, and a manipulation of no small delicacy. In passing, it must be noted that only genuine whalebone guides are safe. Rubber guides are treacherous and hazardous. Either through age or disease whalebone finally dries, splinters or splits. Consequently no filiform should be applied without first careful inspection, because if the filiform breaks within the bladder immediately a serious operation is necessary. I have already reported a case of fragmented filiform removed from the urethra without operation.⁶

The passage of the filiform must be accomplished with gentleness and precision, and without irritation, pain or bleeding, as far as possible. Gentleness and precision of insertion of the whalebone guide rest with the personal equipment of the operator in terms of his skill, delicacy, patience and experience. Irritation, pain and bleeding are avoided or reduced by instilling local anesthetics, as previously mentioned, or preferably and advisedly by instilling local hemostatics, of which none is more reliable or satisfactory than 1 in 1,000 adrenalin chlorid solution. In this solution eucain or alypin may be dissolved. The patient holds this medication in the urethra five minutes. As previously implied, the use of local anesthetics is frequently inadvisable, and may be avoided by gentleness and deliberation. Otherwise the patient's sensation is abolished, and the operator, therefore, loses one of the best guides as to the degree of dilatation being accomplished and perhaps the degree of traumatism caused.

A urethroscope passed to the face of the stricture is often the means of finding and passing the lumen. Otherwise a number of whalebones are variously and differently bent at their tips and passed into the urethra in turn. Each filiform, after failure to pass, is left *in situ* until the urethra is reasonably filled with them. After every three or four have been inserted without passing the obstruction, each filiform of the whole number within the urethra is again tried in succession until, by mutual guidance and support, finally one enters the lumen of the stricture and its tip is passed into the bladder. All the other filiforms are then cautiously removed from the urethra.

I prefer filiforms two feet long. The half-length is coiled within the cavity of the bladder, and next nine inches are within the urethra and the remaining three inches outside the penis. Thus it is possible always to prove the freedom of motion of the filiform within the tunnel of the sound. This is, indeed, a most important detail, because at all times the operator must be sure that the sound, as it progresses through the stricture, is not buckling or folding the filiform on itself as it is advanced forward. In the original description⁴ of my special sounds it was noted that the tunnels for all the sizes are identical in diameter and length. The object of this design was to provide a uniform "feel" or sensation to the operator as to this matter of freedom of the filiform within the tunnel of the sound.

I determine the freedom of the filiform in two ways, more or less interchangeable at will. First, as the sound is advanced by a true and actual "coaxing" through the urethra, every moment or two the filiform is pulled out by perhaps an inch or less. If it moves freely, the next advance by "coaxing" is accomplished. If the filiform

does not move freely, the sound is retired by the amount of the last advance, the filiform again tested, and if it moves without resistance the advance of the sound is renewed and continued, step by step, until the stricture is fully passed. The second method of proving the freedom of the filiform within the tunnel is to hold the free end of the filiform fixed in the left hand and to advance the sound steadily over it. If any feeling of binding or resistance is perceived, the advance of the sound stops and then the first method of passing along the filiform is applied. Frequently, however, the sound will advance so easily that only the second or less troublesome test of the "play" of the filiform within the tunnel will be required.

Occasionally the difficulty of passing a filiform is so great that the wisdom of a temporary continuous dilatation is indicated. By this term is meant that one or two whalebone guides are left in the urethra and bladder, passing through the stricture, for several days. During this time they gradually swell, and gently induce, both by swelling and by mechanical presence, an opening of the stricture. After this has occurred, almost always instrumental dilatation may be begun and continued.

It may be noted that I have not mentioned woven filiform guides. This has been because, like other woven instruments, they are in ordinary experience and probability not as easily sterilizable as the whalebone guides. They also not infrequently possess the disadvantage of too great flexibility. This was set forth admirably by Gouley⁷ as follows:

Though the soft bougies of Leroy answer well in many cases, I have often verified the fact that the instrument coiled in front of the stricture, and sometimes doubled itself so that the point appeared at the meatus when it was believed to have passed into the bladder; these very common failures are due to the too great flexibility, and to the want of spring of such bougies. For these reasons I have, for many years, used in their stead slender probe-pointed shafts of whalebone . . . which possess great advantages over both the French and English capillary gum bougies, being more elastic than either of the latter, and less liable to coil in the urethra, while they adapt themselves admirably to the inflections of the canal, and can be made so small as to enter the narrowest constrictions.

As a rule, at the first treatment all strictures which are suitable for dilatation at all may be enlarged by two or three numbers from size 7 F., which is the size of the smallest sound of my pattern for irrigation and dilatation considered advisable and safe on the ground stated in the original description.⁵ A stricture which will not take 7 F. usually demands treatment other than dilatation.

Thus, when the patient leaves the office the urethra has been brought up to 9 or 10 F. caliber.

The question might be asked why the size 7 F. is taken. The grounds are two: First, Maisonneuve probably had had large experience with stricture of urethra before devising his urethrotome. The guide of this instrument is size 7 F., apparently because this diameter is about as small as may wisely be employed in a rigid instrument from the standpoints of injury to the urethra and of stability of the guide for passing the knife. Second, strictures smaller than 7 F. are almost invariably complicated in varying degrees and manners; particularly common is chronic infection of the urethra with dilatation and hypertrophy or dilatation and atrophy of the bladder-side of the lesion. Any and all these conditions are benefited by the drainage of an open operation. Thus it will be seen that selection of the

6. Pedersen, V. C.: Med. Rec., New York, Nov. 20, 1909.

7. Gouley: Diseases of the Urinary Organs, 1873, p. 51.

size 7 F. is warranted by clinical observation and judgment, and does not rest on merely arbitrary opinion.

The efficiency and prolongation of each dilatation are increased by leaving the sounds *in situ* five or ten minutes. This fact is analogous to that taught by gynecologists, namely, that slow dilatation of the cervix uteri is more lasting than rapid. Such diets hardly need discussion or argument.

Either in open or close strictures, as previously defined, when the proper degree and duration of a given enlargement are accomplished, the obturator of the sound is withdrawn and the bladder treated according to indications, namely, evacuated and irrigated until as clean as may be, and finally filled with the antiseptic solution, the artificial urine previously described. The sound, carrying the filiform with it, is now withdrawn and the patient allowed to rest a few moments and thereafter to empty his bladder.

Instead of withdrawing the filiform with the sound, the filiform may be left *in situ* in order to maintain the dilatation and to avoid the difficulties and dangers of passing it again at the next visit, provided there has been great difficulty in so doing at the initial session.

The application of these sounds to dilatation of stricture has been made by myself and my associate, Dr. Walter B. Brouner, for more than a year,⁸ with unbroken success and unquestioned satisfaction. Patients on whose intelligence reliance may be placed, who have had non-irrigating dilators applied by the hands of others and of myself and then have had my irrigating sounds passed, state that there is no comparison between the two as to comfort at the end of the treatment. These statements by patients hold true no matter whether the tunneled grooved irrigating or standard irrigating sounds are employed. For this reason at the present time I employ no other form of sound than the irrigating type, and rarely enter the bladder without providing the patient with antiseptic fluid as an artificial urine as the last step of treatment.

AFTER-TREATMENT OF STRICTURE

Careful inquiry among patients coming from general practitioners elicits the fact that the after-treatment of stricture is more or less neglected. It comprises two steps, the after-treatment of active instrumentation and the later prevention of relapses of the strictures. During active treatment the patient should always have a few moments' rest in the office, and should be told to observe between treatments sexual rest as far as possible and urinary rest by the avoidance of alcohol, condiments and adherence to proper, that is, simple diet.

Urinary antiseptics are wisely administered for at least the first twenty-four hours after each dilatation. Antispasmodics are best provided for by the free drinking of water, light diet and abstinence from sexual intercourse and alcohol. Mental reassurance of the patient is very necessary, as to the facts that there will necessarily be a little pain on urination, occasionally a little discomfort during erection, and sometimes a little discharge for the first day or more after instrumentation. The patient should know that all these things are normal results of the mechanical treatment, are unavoidable and not matters of concern.

As to the terminal after-treatment, that is, the avoidance of recurrence of the stricture, a patient with stricture should be taught that, since the stricture is funda-

mentally only a scar, it cannot ordinarily be literally removed from the passageway; only its power of obstruction is corrected. He should know, therefore, that, like all other scars, strictures with age and time tend to dry or harden and shrivel or contract and thus to reclose or reobstruct the urethra. When he understands that this is the law of all scar-tissue, and therefore the law of stricture, he will be only too ready to report once or twice a year for observation, and, if necessary, correction of any slight relapse present.

Attention to these details and the employment of the irrigation method of dilating the strictures as embodied in these sounds will, I am convinced, render the management of stricture-cases far more felicitous. If one might utter an epigram to sum up the dilatation treatment of stricture for the general practitioner and general surgeon, it would be in the majority of cases: Maximum results, minimum interference.

NOTE.—In addition to the authorities already cited, the following, which were consulted in the preparation of this article, may be found of interest by the reader:

Lett: Practitioner, 1908, lxxx, 45.

Watson: Boston Med. and Surg. Jour., 1907, clvii, 549.

Desnos and Minet: Traité des maladies des voies urinaires, Paris, 1909.

Tevass: Med. Press and Circular, 1881, xxxi, 27.

Englisch: Wien. Klinik, 1887, pp. 121-216.

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ABSTRACT OF DISCUSSION

ON PAPERS OF DRs. JUDD, BARTLETT* AND PEDERSEN

DR. LINCOLN DAVIS, Boston: I have been especially interested in tumors of the bladder and in the transperitoneal operation advocated by Dr. Judd. My experience has been limited to three cases, but I have been very favorably impressed with the advantages of this method in the way of giving accessibility to the field of operation, and allowing a thorough and complete removal of the tumor. The operation is especially indicated in cases of broad-based tumors, or where there is infiltration of the bladder wall, or in cases of simple papillomata, where it is difficult to reach the tumor through the ordinary suprapubic incision on account of a thick abdominal wall. In two of the cases in which I went into the peritoneal cavity I made the ordinary suprapubic incision, but found it impossible to reach the tumor, which was very sessile. By enlarging the incision and making an opening into the peritoneal cavity, and packing off the intestine, it was an easy matter to split the posterior wall of the bladder and bring the tumor within reach. After opening the peritoneal cavity and posterior bladder wall I feel safer if a drainage tube comes out through the suprapubic space extraperitoneally. I do not think that it prolongs convalescence to any extent, and it is much safer. I do not believe that this operation is necessary in all cases of papilloma, but I do think it is especially indicated where there is any evidence of malignant disease. As to its dangers, I suppose that there is a slight increased danger, but I do not believe it to be very great. Preliminary cystoscopic examination is of the greatest importance in the case of tumors of the bladder. One can determine accurately the number of growths present, their size and position, and usually one can make a pretty shrewd guess as to the nature of the growth. I think it is very important to go over the whole surface of the bladder because a growth which is very apparent to the cystoscope, a villous growth floating in the fluid medium, may collapse and lie against the wall of the bladder, so that it is difficult to find it after the bladder is opened. In this country the tendency seems to be toward more radical operations for tumors of the bladder, as is evidenced in the work of the Rochester clinic. In Germany and in France they use the operating cystoscope more than we do. Of course, in the hands of Nitze, wonderful results have been achieved with the operating cystoscope, and clinicians are returning to that method with the idea that there is less liability to recurrence. I think that the data gathered during

* The papers of Drs. Judd and Bartlett appeared last week.

8. The shop drawings for these sounds bear the following dates: Beniqué curve irrigating sound, March 15, 1907; standard curve irrigating sound, March 29, 1907; short curve irrigating sound, Dec. 21, 1907; tunneled and grooved irrigating sound, Jan. 27, 1908.

the next few years will be very interesting, showing which method will give the best results.

DR. WILLIAM E. LOWER, Cleveland: To secure early diagnosis of tumors of the bladder, it will be necessary to continue to do more missionary work among the general practitioners, and teach them that all cases of hematuria must be investigated, because in a large percentage of cases the bleeding is caused by some form of tumor of the bladder. It is important to determine the location and the attachment of the tumor. Of course, this can only be done by cystoscopic examination. Then a sufficient exposure of the field of operation by way of the peritoneum, if necessary, but outside of the peritoneum, if possible. There is no doubt that in cases with infection there is increased danger in going through the peritoneum, not in the skilled hands of the expert clinician, but in the hands of the occasional operator. The patient should be placed in an exaggerated Trendelenburg position. Hemorrhage must be controlled, and the wound in the bladder closed immediately. I insist that it is important that the bladder be closed immediately after operation, no drainage to be inserted, and no retention catheter to be introduced. In the majority of cases there is no leakage, and if a few drops of urine escape, no harm is done. The patients are up and about in a week or ten days, and the results, as a rule, are extremely satisfactory. I do not believe that it is possible to operate on all patients with malignant tumors. What does Dr. Judd do in unquestionably malignant tumors if he cannot do a radical operation?

DR. STEPHEN H. WATTS, Charlottesville, Va.: In connection with stricture of the urethra, I wish to direct attention to the value of resection in very extensive, almost impermeable cases. My attention was called to this by two cases that have recently come under my care, very extensive strictures, accompanied by fistulous openings in the perineum. Several openings were situated in the scrotum at the junction with the penis. I went into the perineum and divided the scrotum into two parts, turning the testicles out on either side. In that way I obtained a good exposure of the entire urethra up to the penoscrotal junction. I excised the stricture, took away all scar tissue possible to get good tissue approximation. You do not have to loosen up the ends of the urethra to any great extent, but it is surprising how easily you can free the urethra and how readily the ends come together. In one of my cases I excised an inch and a half and in another case an inch and a quarter, the ends coming together with little tension. The approximation was made over a rubber catheter in the urethra. Both patients did beautifully. I want to emphasize the importance of excising these extensive strictures and bringing the ends together. I believe that this is not done often enough. I saw one patient who had been operated on four times, and you can readily imagine the condition of the perineal urethra. It was nothing but a mass of scar tissue. In this case I could not have done anything else. I would like to have this procedure more universally adopted.

DR. J. BLOCK, Kansas City, Mo.: I was very much delighted with all the papers and particularly with Dr. Judd's, dealing with the removal of vesical tumors by the transperitoneal route. Of course, every case becomes practically a law unto itself. We ought to determine the size and location of these growths, especially in the case of a small tumor. If there is only one tumor the intravesical removal is relatively easy. As was stated before, the Nitze operating cystoscope, in the hands of a competent man, will accomplish all that is desired without a major operation, but I can very readily see that in the case of a very large tumor, especially when situated at the base, broadly attached, it will be necessary to select a more accessible route, and that is where the transperitoneal operation has its place. I was somewhat astonished a short time ago to read a report of three or four such cases in which an operation was done by a prominent operator, and where after reading the description of the operation one could readily perceive that the same work could have been done by the suprapubic method without incurring a possible risk of infecting the peritoneum.

Dr. Pedersen's paper is of unusual interest, especially since he includes every form of stricture, but I was surprised that he did not lay more stress on the feasibility and appropriate-

ness of treating all strictures, except the most resilient, by dilatation. You can accomplish as much by dilatation as by a cutting operation, and inasmuch as no form of treatment is an absolute guarantee against the recurrence of the coarctation, the easier method would seem the best to adopt. Like Dr. Watts, I prefer excision. I have excised strictures where it was necessary to divide the scrotum to get access to the part, for the reason that the stricture was situated near the triangular ligament. Several times, in boys not over 10 or 12 years old, suffering from traumatic stricture, as much as half an inch was removed and excellent results were obtained by simply coapting the freshened proximal and distal ends of the tube with suture catgut stitches and allowing a Nelaton catheter to remain in place to serve as a splint.

DR. JOHN H. GIBBON, Philadelphia: I first saw this operation Dr. Bartlett describes performed by Dr. Richard H. Harte, of Philadelphia, six or eight years ago. Up to that time I did not know that it was possible to excise the hydrocele sac without rupture. I have done it on one occasion since then, but the Doyen operation is so much simpler and gives such good results that I usually employ it. There is no doubt that the operation which he describes is the perfection of the excision operation.

DR. F. C. VALENTINE, New York City: Posner, in speaking of the so-called impermeable stricture, defined it as an evidence of the physician's inaptitude and the patient's lack of patience. He holds, and my experience has confirmed his view, that there is no such thing as an impermeable stricture. With patience, and if the patient will submit, I have found that all strictures are permeable to at least the smaller filiform bougies. A permeable stricture was defined by the essayist as one admitting a 20 French in the hands of the general practitioner, and an 18 in the hands of the specialist. With a lumen of that size, the patient can always empty his bladder, and therefore the principal danger of that class of stricture, that of an ascending vesical infection, is most unlikely. If I understood Dr. Pedersen correctly, he considers the whalebone sounds safe, as compared with woven filiform bougies. I cannot agree with him, for the very reason that the whalebone bougie is likely to splinter, and yet there are cases in which it is useful. He also said that a 7 French is the smallest stricture that would admit of dilatation, and therefore one would have to resort to other remedial measures, alluding, of course, to urethrotomy. In this, again, experience leads me to differ. For the treatment of apparently intransitable stricture I would start from the proposition that if conditions do not permit traversing the urethra, suprapubic puncture twice or even three times daily will give the needed immediate relief. Within a day or two, a fine filiform can usually be coaxed through the urethra. This accomplished, the way to effective dilatation is prepared. Of course, with an infected bladder, under the circumstances now being considered, cystotomy is imperatively required. When, however, dilatation, which the author so ably advocates, is feasible, the cardinal objects of treatment—reestablishment of free normal vesical evacuation, restoration of the urethra's suppleness, and a normal mucosa—are best attained.

DR. E. S. JUDD, Rochester, Minn: With reference to the point which Dr. Davis made, that he felt safer in making suprapubic drainage,—while we have drained in some cases, it has always been in cases in which we interfered with the prostatic urethra; otherwise we prefer not to drain.

I class these cases with resection of the intestine or gastroenterostomy. There is here no more reason for draining than there is in those operations. The convalescence is shortened considerably if one is able to close up the bladder.

As to the difficulties in complete removal of the bladder, we have not as yet satisfactorily removed the entire bladder, and conservative operations in cases where the growth is too extensive for removal have not been satisfactory. We have removed the small growths with the cystoscope, but it has been in unsatisfactory cases and had showed the greatest number of recurrences. My point in this paper is that in most cases of tumor of the bladder the growth is situated at the base, a part of the bladder that cannot be reached easily through a suprapubic incision. If the tumor is in one of the

upper quadrants, we prefer to remove it through a suprapubic incision.

DR. V. C. PEDERSON: With regard to incision of the urethra, I intended to lay down the general rule that no other method should be adopted until dilatation has been given a fair trial. It has always seemed to me that excision of the urethra, substituted for an inflammatory condition, a traumatic condition, and every one knows that the most intractable of all strictures to treat are the traumatic ones, consequently I have never found a stricture which to my best judgement required excision.

With regard to Dr. Valentine's proper criticism, in an abbreviated paper one can hardly do the subject of stricture justice. He has assumed that I did not say that some strictures are so tight as to require the retention of a filiform bougie for two or three days, whereas the limit I stated, namely 7 French, applied only to the initial application of tunneled sounds in a closed stricture. A 15 French sound is a little too small for the average case unless a guide is also used. Dr. Valentine stated that the acme of cure is the restoration of the mucosa to its normal condition. I do not believe that that is possible in the preponderating majority of cases of stricture because strictures proceed from destroyed mucous membrane which cannot be restored. Stricture is sometimes periurethral scar tissue which cannot be removed but only dilated or stretched so as to obviate the obstruction. The cutting operation must be followed up by the passage of sounds and only recently I saw a case in point that had been operated on a number of times ineffectually simply because no bougies were passed afterward.

A COMPARATIVE STUDY OF DIGALEN

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Among those drugs which act as direct stimulants to the heart's action none have been found which are able to replace the preparations of *Digitalis purpurea*. It has long been clearly recognized, however, that digitalis medication is complicated by a number of undesirable secondary effects. Briefly, these are its accumulative action, its tendency to produce disorders of appetite and digestion, and, finally, its irritant action, which interferes with its use by the hypodermic method. These untoward effects are so marked at times as to prevent the use of the drug; they always make great caution necessary in the administration in order that dangerous toxic effects may not follow.

The use of digitalis is further complicated by the fact that its therapeutic effects often do not appear until about the second day after medication is started, a drawback which makes it of practically no value in cases of acute heart failure. In certain cases the effect fails to appear even after several days, while in others the first indication that the drug has been absorbed is the appearance of symptoms of poisoning. These latter disagreeable features of the drug's action are usually ascribed to differences in the reaction of the patient, but it seems equally or even more probable that they are often due to variations in the potency of the drug used, the preparation being in one case much weaker, in another much more active than the normal.

Many attempts have been made from time to time to secure a digitalis preparation without these various undesirable qualities. Unfortunately, however, these efforts have not resulted in much success, although a large number of special formulas have been used in preparing the crude drug for therapeutic use. In this connection, the so-called pure principles of digitalis have been suggested

as offering a solution of the problem. These, however, although possessing the desirable effects of the crude drug are by no means free from its undesirable secondary effects. Of these digitoxin, the glucosid which occurs in the greatest amount in digitalis leaves, is by far the most potent. The use of digitoxin in therapeutics is made practically impossible, however, by its excessively irritant action, its tendency to produce disorders of digestion, its marked accumulative action, and, less important, its insolubility in water, which makes its administration difficult excepting in tablet form. In 1904, however, Cloetta¹ announced that as a result of several years' labor he had been able to isolate a digitoxin from digitalis leaves which was almost entirely devoid of these drawbacks. This new digitoxin (for sale under the trade name digalen) from a physical standpoint differed from the crystalline product of Schmiedeberg and Kiliani in being amorphous and in being much more soluble in water. From the therapeutic standpoint, according to Cloetta, it differed even more widely, being easily absorbed, the digitalis effect appearing within twenty-four hours, being without accumulative or toxic action and being so free from irritant qualities as to make it suitable for subcutaneous, intramuscular or intravenous injection. Moreover, being a definite chemical substance, it afforded a preparation entirely devoid of the variability so often present in the crude drug.

Aside from Cloetta's own investigation, the only work done regarding the identity of digalen with crystalline digitoxin was carried out by Kiliani,² who has done far more work on the chemistry of digitalis than any other investigator. He was unable to accept Cloetta's view, but rather pointed out that the formula given by Cloetta³ for digalen does not correspond to that for the crystalline substance, the former having a formula of $C_{14}H_{23}O_5$ with a molecular weight of 287, the latter of $C_{34}H_{54}O_{11}$, a molecular weight of 638. Kiliani concludes that digalen is only a high percentage of digitalein.

Clinical results would seem to indicate that Cloetta and a number of the clinicians who reported invariably good effects from digalen were in error (or based their conclusions on an inadequate number of cases) regarding the superiority of amorphous digitoxin over the older preparations of digitalis. A review of the literature (Reitter,⁴ Vlach,⁵ Frankel,⁶ Mueller⁷) shows that digalen is not devoid of cumulative action; that it possesses marked irritating properties, so irritant as to make subcutaneous injection practically impossible, causing edema and pain, lasting in some cases for two and three days and often causing great pain when given intramuscularly, or if given intravenously causing in some cases edema and thrombosis (Kottmann,⁸ Hochheim,⁹ Liverato,¹⁰ Veiel,¹¹ Teichmann¹²); that it causes disturbances of digestion apparently as often as the older galenicals, with loss of appetite, nausea and vomiting (Eichhorst,¹³ Veiel,¹¹ Teichman,¹² Mueller⁷), and that its effects do not appear more rapidly than from corresponding doses

1. Cloetta: München. med. Wehnschr., 1904, li, 1466-1468.
2. Kiliani: München. med. Wehnschr., 1907, liv, 886, 1112; Ber. d. deutsch. chem. Gesellsch., 1907, xi, 2996.
3. For Cloetta's reply to this criticism see München. med. Wehnschr., 1907, liv, 987.
4. Reitter: Wien. med. Wehnschr., 1905, lv, 2245.
5. Vlach: Prag. med. Wehnschr., 1906, xxxi, 43.
6. Frankel: Arch. f. exper. Path. u. Pharmakol., 1907, lvii, 123.
7. Mueller: München. med. Wehnschr., 1909, lvi, 904.
8. Kottmann: Ztschr. f. klin. Med., 1905, lvi, 128.
9. Hochheim: Zentralbl. f. inn. Med., 1905, xx, 545.
10. Liverato: Cron. d. clin. med. di Genova, 1905, xi, 276.
11. Veiel: München. med. Wehnschr., 1906, liii, 2140.
12. Teichmann: Therap. d. Gegenw., 1907, xlviii, 199.
13. Eichhorst: Deutsch. med. Wehnschr., 1908, xxxi, 49.