urine in the tissues of the corpus spongiosum. Stilling's experience has evidently coincided with mine in regard to its temporary character. In his great work on Stricture of the Urethra (Cassel, 1870), page 1013, chapter on Rational Treatment, he says "infiltration of urine after urethrotomy can only occur if the flow of urine is prevented by coagulated blood or other causes. It is therefore of the greatest importance to remove any obstacle which might prevent the free escape of urine. This can easily be done, and if infiltration of urine should occur after internal urethrotomy, it is the surgeon's fault and not a necessary consequence of the operation. The same may be said of pus. The introduction of a catheter into the urethra prevents all these consequences, urine and pus escaping between it and the urethra."

If infiltration of urine has ever followed any operation by dilating urethrotomy with my instrument, it has only been of the limited degree producing a temporary and localized *spongio-corporitis* such as that just described. Bearing in mind however the very positive statements of Stilling as to the security against such accidents by keeping the urethra patent after operation, I have been in the habit of introducing a full sized sound daily for the first three or four days, and on the occurrence of any swelling, in addition to this to draw off the urine with a soft catheter, and wash out the urethra with a weak solution of carbolic acid until the swelling and tenderness have subsided. My own opinion in regard to the localized swelling is that it is caused by irritation of the parts in immediate locality of the incision by contact with acrid urine, and has been so rare, of so little discomfort and apparently of so little importance that I have not noticed it in the tabulation of cases.

CHAPTER XV.

STRICTURES OF LARGE CALIBRE.

IN this place I desire to call attention to the pernicious effects of Strictures but slightly invading the urethral lumen, and for the purpose shall relate a single typical case which is fresh in my experience.

Mr. A. D., aged sixty-four, came under my care complaining of a slight urethral discharge and a sense of irritation at the neck of the bladder. He had had no recent venereal contact, but had experienced several gonorrhœal attacks in early life. Examination showed a penis $3\frac{3}{4}$ inches in circumference, and a meatus urinarius of a capacity of 32 mm. Examination with the urethra-metre demonstrated a normal urethral calibre of 36 mm., and detected three narrow bands of Strictures at between two and three and a half inches from the meatus, each of the value of 6 mm. I advised immediate division of these comparatively insignificant Strictures, explaining and asserting my belief that the urethral discharge and the irritation referred to the neck of the bladder were a legitimate result of the holding and detention of gouty urine or its débris behind these barriers. Mr. D. declined any operative procedure with considerable warmth, and a palliative treatment (alkaline and diluent) addressed tc his gouty diathesis was adopted. Improvement in the quality of the urine, which soon took place, caused a temporary relief from the irritation, and the discharge, which had never been profuse, gradually disappeared. The irritation returned, however, at the least indiscretion, and I was consulted about it every few weeks until February 2d, 1877, when he again presented, not only with return of the discharge and irritation at the neck

of the bladder, but with pain in the glans penis and frequent painful urination. A small amount of pus was also found in the urine. Recognizing the fact that the urethral inflammation had extended to the bladder, I at once put Mr. D. to bed, and by posture, milk diet, local and general sedation, did what I could to afford relief. Notwithstanding this, a general cystitis supervened with great prostration, and came very near terminating his existence. He finally recovered (after some six weeks in bed), so that pus was no longer seen as a sediment in his urine, and urination occurred only once in six hours. Mr. D. was then sent to the seashore; there he improved in general condition up to June 2d, when he returned, complaining of a recurrence of old irritation and a gradually increasing frequency of micturition. This, as on former occasions, was preceded by, and now associated with, a slight, painless, purulent discharge. I advised a prompt division of the Strictures, claimed by me at the outset to be the cause of the urethral and vesical trouble, and now believed by me to be restoring the grave perils from which my patient had scarcely escaped. The gravity of any operative procedure in the face of threatened or advancing cystitis was fully appreciated. Professor Thos. M. Markoe (who previously had seen the patient with me during the height of the acute inflammation of the bladder) was called in consultation.

Notwithstanding the age of the patient (sixty-four), and his still somewhat feeble condition, resulting from previous disease, and the imminent threatening of another attack of acute cystitis, it appeared so evident that the return of trouble depended upon the presence of the Strictures that an immediate operation was decided upon.

In the presence and with the fullest approval of Professor Markoe, I divided the meatus from 32 mm., so that a bulbous sound of 38 mm. was freely admitted. No. 36 was then passed easily down 2½ inches, where it was arrested by the first Stricture. The (my) dilating urethrotome was then introduced so that when dilated its blade would rise just behind the posterior of the three Strictures previously measured and

located between 2½ and 3½ inches. The instrument was then turned up to 38 and the Strictures divided. No. 36 bulb was then passed easily through the entire canal to the bulbo-membranous junction, and, on withdrawal, demonstrated an entire freedom from Stricture. The urine was then drawn off with a soft catheter and six grains of quinine administered. The hæmorrhage following the operation was insignificant. A slight chill occurred about six hours afterwards, immediately following the act of urination; this apparently occasioned a rise in temperature of two degrees (101) for a few hours. Aside from this there was not the least constitutional disturbance and but slight pain on urination. Within twenty-four hours the intervals between the acts of urination had increased from two to three hours, and by the fourth day to six hours.

On the seventh day after the operation he was dressed and walking about, and claimed not to have been so wholly free from discomfort since his original irritation, more than a year previous. The intervals between acts of urination gradually increased. The urine became more and more free from pus without other treatment than that directed to general health, so that in a month he was apparently well in every respect; micturition once in five or six hours, and urine free from pus as a visible sediment. A few pus cells still found by microscopic examination.

October 7, 1877, Mr. D. called at my request for a reëxamination of his urethra. The urethra-metre was introduced, closed, to the bulbo-membranous junction, turned up to 36 F., and by gentle traction drawn through the length of the pendulous urethra without meeting with the slightest resistance, thus demonstrating the complete absence of Stricture, over three months from the date of operation, no instrument having been introduced in the interval. Recovery from the cystitis may be said to have been complete, although under the microscope a few pus cells are still found. There are also a few hyaline casts, but the case appears to me to prove fully the possible influence of Strictures of large calibre

in producing urethral inflammation, which, extending by continuity of surface, may produce a cystitis, and even a nephritis.

In the foregoing case I feel confident that an early division of the Strictures would have cured the urethral inflammation by removing its cause, and that this would have prevented the cystitis in the first instance as surely as it subsequently did. The urethral discharge, which had been more or less profuse for the year previous, disappeared entirely a short time after the division of the Strictures, and has not been seen since.

Up to June 1878, this gentleman has remained well in every respect, not the least trace of pus or casts in the urine, and a critical examination of the urethra gave not the slightest evidence of re-contraction at the site of former Strictures.

URINARY INFILTRATION and perineal abscess not unfrequently occur as the result of Strictures which do not greatly impede the passage of urine, and through which an ordinary sound can be easily passed. The rupture of the urethra behind a Stricture, from urinary pressure, rarely if ever occurs. A urethral follicle constantly bathed in the irritating debris behind even a slight contraction, finally becomes involved in an inflammation of its deeper structure, suppuration follows, the urethral wall is penetrated and urine finds its way through the minute opening thus formed into the surrounding cellular tissue. Let me cite a case, which will serve to exemplify this statement in a striking manner.

Mr. Z., aged twenty-seven, a patient of the well known and accomplished surgeon, the late Dr. Julius Thebaud, was seen by me in consultation in February 1875, with the following history. Gonorrhœa twelve years previous, recurring gleet for four years, urethral Stricture recognized, treatment by steel sounds, size No. 24 passed with some pain. This was repeated at intervals of several days for a month; dilatation not well borne, pain and increase of discharge following. A few days previous some uneasiness in the perineum was complained of and a slight swelling was detected in that locality. Circumference of penis 34. Strictures defined, one at 2

and another at 3 inches, 24 F., one at 4 inches, 28 F. It was my opinion that a follicular ulceration had occurred behind the deepest and largest Stricture (size 28 F.); that in this manner the urethral wall had been perforated; and that extravasation of a limited amount of urine had taken place (an accident similar to that described by Dittel in Pitha and Billroth's Handbook of General and Special Surgery 3d vol., 2d div., 6th Book, page —.) In this case immediate external perineal section was imperative for security against possible sub-fascial extravasation. A general consultation was at once called, consisting of three more surgeons. After careful examination the presence of pus was considered probable, but doubts were expressed as to the origin of the abscess in the urethra. After a brief discussion it was decided to pursue a medium course by operating at once and thus to avoid the danger of a possible grave urinary infiltration, but to limit the incision to the peri-urethral tissues. The requisite operation was performed by Dr. Thebaud. A little bloody serum exuded from the engorged deep tissues, but no pus was found. The case went on for a week without much diminution of the swelling or of the aching in the testicles after urination, which had been a source of complaint previous to the operation. Another general consultation was called; consisting of the same gentlemen previously associated in the case. Before convening some 48 hours had elapsed, during which, without apparent cause, a favorable change had taken place; the swelling had begun to decline and the perineal wound presented a more healthy aspect. The improvement being fully recognized it was deemed best to avoid interference. At the end of a fortnight the perineal opening had healed completely when there was a sudden accession of discomfort and the swelling was found to have reappeared. The case was again seen by me in consultation with Dr. Thebaud and Dr. Reynolds (Dr. Thebaud's partner), some 48 hours after the discovery of the recurrent swelling. External perineal urethrotomy was again advised and promptly done by Dr. Thebaud and the Stricture at 4 inches (just anterior to the perineal incision) was

divided with a blunt pointed bistoury. An ounce or so of pus and grumous blood was evacuated. Immediate relief of pain succeeded and the wound healed kindly and perfectly. The aching in the testicles previously spoken of as occurring after urination did not entirely disappear. This was attributed to the presence of the anterior Strictures at three and two inches from the meatus. These were thoroughly divided with the dilating urethrotome to 32 F., the previously ascertained normal calibre of the canal. A slight *spongio-corporitis* followed the operation, which delayed the progress of the case about a week; after which, recovery was steady and rapid, resulting in a complete cure of all trouble. A reëxamination three years after showed complete freedom from any trace of Stricture. This case appears to me to demonstrate the occurrence of urinary infiltration behind a slight Stricture, though in quantity so slight that a slowly forming abscess only resulted. The persistence of the trouble until the urethra was laid open, and the prompt recovery after that was effected, served to clear up any doubts that might have been entertained in regard to the urinary origin of trouble.

The case of Mr. X.,* detailed in my forthcoming volume on Reflex Irritations and Neuroses, may be referred to as one proving the follicular origin of a urinary infiltration of small but persistent character. In this instance an enormous swelling of the scrotum was caused by it, and persisted for five and a half years before it terminated in the series of abscesses through which the final character of the difficulty was ascertained. The statements of Dittel in Pitha's and Billroth's Handbook of General and Special Surgery, confirm in the fullest manner the foregoing views and cases. Thus in vol. iii, 2d div., 6th Book, "On Strictures of the Urethra" he says:

"A remarkable follicular ulceration of the urethral mucous membrane is found in some cases of infiltration of urine.

"The ulceration of the follicle is preceded by catarrh. The signs of catarrh are the threads washed out by the urine which escapes first. They are sometimes single, sometimes ring

* Originally published in the New York Medical Journal of Feb., 1875.

shaped or in masses, suspended in the urine. Though these threads are harmless, we must not forget, that the urethra is in a diseased state as long as these threads are found, and that this sequel of gonorrhœa, which is not unfrequent, may produce death by infiltration of urine and pyæmia, if the catarrh degenerates to a catarrhal ulceration of the follicles, even if only one follicle is involved.

"The following case is an instructive illustration. Count L. R., 59 years of age, had gonorrhœa repeatedly. An attack, from which he suffered 20 years ago, lasted nine months. Since then he had a burning sensation during micturition. March 5th, 1863, he suffered from occasional stinging pain at the perineum, which did not prevent him from continuing his former mode of life. On the next day, a red, somewhat tender diffuse swelling of the perineum, scrotum, skin of the penis and prepuce appeared, with moderate febrile reaction.

"March 13th he came under my care. The patient is a well developed and well nourished man. The scrotum forms a tumor of the size of a child's head, covered by a red, tender and tense skin which is connected anteriorly with the œdematous bloated up integument of the penis. The œdematous prepuce was phymotic in the highest degree. A bright redness extended even above the symphysis towards the anterior and lateral regions of the abdomen, which had become hard and tender. The patient is conscious, but is inclined to sleep. Skin, tongue, lips are dry. Great thirst. Pulse 96.

"Urine escapes in drops. Catheter No. 2 can be introduced, though with difficulty and some pressure, into the bladder, and meets an obstruction at the bulb. On the same day I made deep incisions into all swollen parts and used moderately cold applications, which did not prevent gangrene attacking the parts around the incisions. The pulse rose to 108. Tongue, pharynx, lips are as hard as a board. On the 16th a pretty large quantity of pus of urinous odor escaped from the wound; the redness extended up to the axillæ. There is fluctuation at a point above the symphysis. This was opened on the same day. Soon after he had a chill.

"On the 19th, after repeated rigors, he fell into a constant soporous condition. The integument is deeply yellow, the eyes have lost their lustre. The dryness of the mouth has increased wherever it was possible, the integument covering the abdomen is hard and bloated up, especially at the right iliac region. Thin and profuse purulent discharge from the

wounds; urine acid, containing chlorides, sulphates, albumen, and carbonate of ammonia, hyaline casts, renal epithelium.

"Patient died March 21st.

"At the bulbous portion of the urethra there is a Stricture, thin and callous, which extends to the membranous portion, and admits catheter No. 2. At the middle of the inferior wall of the urethra there is a perfectly round opening as large as the head of a pin, surrounded by a round and smooth margin which evidently corresponds to the mouth of a mucous follicle. If a thin sound is passed into this opening, we come to a very narrow passage in the spongy tissue, and ultimately reach the cavity of a large abscess in the subcutaneous connective tissue. From this point the infiltrated and gangrenous tissues extended in all directions.

"Every competent anatomist, after seeing this specimen, had a decided impression, that the infiltration was caused by the perforation of a single follicle. In this case, the mucous membrane is healthy, neither gangrenous nor softened all around the follicle. Only the ulceration of a single follicle caused the infiltration terminating in death.

"It is obvious, that even without the existence of Stricture the ulceration of one or several follicles may progress to perforation. I remember a young man twenty-five years of age, who had a bridle as thick as a knitting needle (after a gonorrhœa) which, running obliquely forwards from the fossa navicularis, terminated at the inferior wall of the urethra, leaving an opening as large as the point of a needle through which urine escaped.*

"The ulceration may be confined to one follicle or may extend over an entire group of follicles which occurs, as we know from experience, most frequently at the bulb.

"If perforation occurs in a group of follicles there appears a larger inflammatory swelling (accompanied by pretty intense phenomena) in which the various follicular perforations unite, to confluate in one abscess, or which may cause infiltration of urine before an abscess could be formed.

"From one follicle one passage only may be produced, or several channels may result. The same is the case if perforations occur in several follicles."

It is interesting to note the fact that Dittel in his preface to the recital of the foregoing cases very distinctly

* Since that time I have had three patients with perforating follicular ulcerations at the bulb after blennorrhœa without Stricture.

recognizes the connection between the perforating follicular ulceration and a urethral catarrh which is associated with "*threads of mucus sometimes single, sometimes ring-shaped, which are washed out of the urethra by the urine.*" "Though these are harmless," he says, "we must not forget that the urethra is in a diseased state as long as these threads are found and that this sequel of gonorrhœa, which is not infrequent, may produce death by infiltration of urine and pyæmia if the catarrh degenerates into a catarrhal ulceration of the follicles, *even if only one follicle is involved.*" Since the efficient examination of the urethra behind a contracted meatus or a Stricture has been possible through the use of the urethra-metre, we now find that the threads of mucus referred to by Dittel "sometimes single, sometimes *ring-shaped*," are, *in all cases*, accumulations *behind urethral co-arctations—Strictures more or less salient, which keep up the gleet and hold behind them the threads of inspissated mucus and pus*, and, finally, in such cases as are referred to, induce a folliculitis with occasional results of the character so graphically described by Dittel.

REFLEX IRRITATIONS AND NEUROSES, resulting from slight Strictures: The importance of recognizing the earlier stages of urethral Stricture has not hitherto been conceded, and the statement of Mr. Berkeley Hill, if accepted as true, will render this obvious. He says, (see page 216) "If the balance between the natural expulsive force of the bladder and the friction of the stream along the urethra is disturbed, the bladder is irritated, the kidneys are affected, and the beginning of the long chain of events which terminates not infrequently in death is made." It is true that in many cases no apparent trouble is experienced until the calibre of the urethra is infringed upon to the extent of interfering with micturition, and yet in other cases, slight Strictures, reducing the urethral calibre not more than three or four millimetres in circumference, are capable of producing frequent micturition, inflammation of the bladder, and various neuralgic disturbances. Deep organic urethral Stricture is often simulated

by muscular spasm the result of irritation caused by slight anterior Strictures, even by a slight contraction of the meatus urinarius alone. *The great proportion of cases treated by gradual dilatation are treated for deep Stricture which does not exist.* The presence of a contracted meatus urinarius or a Stricture of large calibre, often unnoticed, is capable of exciting chronic spasmodic closure of the membranous urethra quite undistinguishable from true organic Stricture, but which disappears completely on the thorough division of the anterior contraction. A large number of cases of this character may be found described in my volume on "*Reflex Irritations and Neuroses throughout the Genito-urinary Tract*," soon to be published by Putnam's Sons. In some of these cases, frequent retentions of urine are proved to have been the consequence of a contracted meatus which would easily admit what has been considered a large or full sized sound. Two of these cases,* are so significant and suggestive that I shall take the liberty of quoting them in full.

Case 1. J. W., frontiersman, aged 45, presented November, 1874, with a history of first gonorrhœa 20 years previously and several subsequent attacks. Five years ago began to have difficulty in passing his urine; stream grew gradually smaller, until, after a debauch, he had complete retention, and was obliged to seek relief at a neighboring military post. After 36 hours suffering, he was relieved by the passage of a very small, flexible catheter, in the hands of the post surgeon. After this he submitted to treatment, by gradual dilatation, for several months. He then learned to pass No. 12 English soft bougie. From neglect, he has had some half a dozen attacks of retention during the past year. At last only the smallest instrument could be passed by the military surgeon, and he was advised to go East and have a radical operation performed, as there were no instruments at the post suitable to operate upon so small a Stricture. His habit for a long time has been to pass his water very frequently during

* Extracted from Reflex Irritations and Neuroses throughout the Genito-urinary Tract, by F. N. Otis, M. D. Putnam's Sons, New York, 1878.

A cursory glance over the two hundred and eighty one tabulated cases to be found at pages 264 and 324, will show the frequency of reflex irritations, more or less grave, connected with urethral Stricture.

the day, in a very fine, irregular stream, and several times during the night. Examination. Is of large stature, looking like a strong man, who had endured much exposure and hardship. Made his water in my presence, in fine, short jets, chiefly dribbling. Circumference of the penis, three and one-half inches; size of meatus, 23 F. No. 23 F. steel sound passed easily through a very sensitive urethra to the bulbo-membranous junction, where it was arrested. Gradually decreasing bougies were introduced, until, finally, No. 12 F. passed into the bladder, closely hugged in the deep urethra. Allowing it to remain for a few moments, I found it free. I then withdrew it, divided the contracted meatus and Stricture, extending for nearly half an inch back, and passed 34 F. solid steel sound slowly down to the bulbo-membranous junction, when it *slipped by its own weight into the bladder.* After the withdrawal of the sound the patient passed his water in a full large stream. From this moment he had no further trouble in urination, passing his water at intervals of six or eight hours during the day, and not at all at night, for the week subsequent to the operation, when he left for his home in the far West, apparently well in every respect.

Case 2. Mr. W., aged 27, had first gonorrhœa four years previous, lasting in acute form for one month, and with painless discharge for six months longer. He had frequent returns of the discharge without fresh exposure; had been under treatment for close, deep Stricture for the past year, by several surgeons. Passed his urine in a small irregular stream, once in two or three hours. His last surgical attendant, after two months' treatment by injections and internal remedies, sent him to me, not being able at any time to pass an instrument into the bladder. Examination showed external organs large, meatus contracted to 24 F., red and pouting, and bathed in a profuse muco-purulent discharge. Twenty-four F. sound is arrested at five inches. Only fine filiform will pass, and that is closely hugged. Three days after, pass filiform with ease and follow with No. 10 F.; then, with some effort, with No. 16 F. After this the filiform was again snugly held in the membranous urethra. I divided the Stricture at the meatus freely, and introduced No. 30 F. steel sound, which passed, literally by its own weight, through into the bladder.

The results of my earlier observation on the influence of slight contraction of the urethra in producing various forms of reflex troubles were first published in Dr. Brown-Sequard's Archives of Medicine in 1873. Since that date I have in published cases and in reports to societies claimed a credit for originality in the