ANNALS OF SURGERY.

THE RESULTS OF DOUBLE CASTRATION IN HYPERTROPHY OF THE PROSTATE.[1]

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I SHALL ask the indulgence of the Association, if in the paper I am about to read I seem to go a little beyond the exact limitation of the title. I have divided it into,—

(1) a Theoretical, (2) a Clinical, and, (3) an Experimental portion.

I shall consider in part first a theory of causation which, though I must admit it to be vague, has seemed to help me to an understanding both of the results of the operation and of some of the clinical features of the growths.

The second part contains a review of some illustrative cases; a summary of a considerable number (111 in all); and a consideration of the objections thus far urged against the operation and of its relative merits and future prospects.

In the third portion I have given the experimental and other evidence in regard to the value of,—(*a*) Unilateral castration; (*b*) Ligation of the vas; (*c*) Ligation of the spermatic and deferential arteries; (*d*) Ligation of the entire cord. Tables of the 111 cases and of the fatal cases are appended.

[1] Read at the meeting of the American Surgical Association, New York, May 28, 1895; and at the meeting of the American Genito-Urinary Association, Niagara Falls, May 29, 1895.

PART I.

When in 1893 I read a paper before this association on the "Surgery of the Hypertrophied Prostate," I went at some length into the theories of causation. That of Guyon, that the disease is only part of a constitutional condition peculiar to advancing years and characterized by arterial sclerosis, etc., and that of Harrison that the growth is compensatory in its character and secondary to certain bladder changes seem untenable in the light of the information we now have. It may be admitted at once that we can demonstrate nothing whatever as to the essential cause of senile enlargement of the prostate. There seems some reason to believe that it is favored by prolonged ungratified sexual excitement, but as there can be no doubt that it tends to bring about undue sexual excitability, it is obvious that the relationship of cause and effect can readily be transposed. The same remark applies to the observation of Mr. Buckston Browne, who thinks he has noticed enlargement of the prostate in an unusual proportion of cases among men who had contracted second marriages late in life. It is at least an open question whether such marriages are the cause or the effect of the hypertrophy.

The close relationship between the testicles and the accessory sexual glands—the prostate, Cowper's glands, and the seminal vesicles—naturally leads to speculation as to a possible connection of the overgrowth with testicular changes coming on with advancing years. The testicles, whose highest and most specialized function is to produce spermatozoa for the propagation of the species, seem, like the thyroid, to exert a wide-spread influence over general nutrition and development. This is also true of the ovaries. "In man, as in the rest of the vertebrate animals, the male and female organs in the original state of the germ are entirely the same, and the differences of the two sexes only gradually arise in the course of embryonic development (in man, in the ninth week of embryonic life), by one and the same gland developing, in the female as the ovary, and in the man as the testicle. Every change of the female ovary, therefore, has a no less important reaction upon the whole female organism than

every change of the testicle has upon the male organism."[1] The removal of either testicles or ovaries in early life usually changes profoundly all the characteristics—physical and mental—of the individual. There is, however, abundant evidence[2] to show that the testicles may lose, or may never have had, the sperm-producing power and still possess the quality which enables them to hold the organism in its normal groove and to invest it with the full attributes of masculinity. When both testes fail in their descent they are incapable of producing spermatozoa, and in consequence the person is sterile. This has been shown by Hunter, Astley Cooper, Curling, Griffiths, and others, and is undoubtedly the rule, although there are occasional exceptions. In spite, however, of the imperfection of the organs, such a person acquires all the external bodily characteristics of the male, and is in all respects, except in the power of procreating, like an ordinary man.[3] It is not known whether this influence is exerted through a chemical product or not, but the fact that some indubitable effects are produced on the whole system by the injection of watery extracts of the testicles would seem to favor this idea. "The function of the testes is therefore clearly twofold,—viz., (1) to control and determine the development of the characteristics of the male sex, and (2) to produce spermatozoa for the reproduction of the species. These two functions are usually exercised together, but that the former may be exercised when the latter fails seems to indicate that the production of spermatozoa is the more specialized property and attained with more difficulty. In what manner is this sexual effect of the testes upon the body produced? Is it through the medium of the nervous system as an ordinary reflex, or is it through the medium of some substance produced by the seminal cells (whether they form spermatozoa or not) and absorbed into the system, which by influencing the nerve-centres or in some other way controls growth and nutrition? Brown-Séquard tried upon himself, when he was seventy-two years of age, the effect of the subcutaneous injection of a watery extract of the testes of a vigorous

[1] Haeckel, The History of Creation, Vol. I, p. 244.

[2] Curling, 4th ed., p. 14.

[3] Griffiths, The Lancet, March 30, 1895.

dog two or three years of age, and relates that after five daily injections he lost his feebleness, felt many years younger, and was capable of doing more work. The testicle extract has since been used in various diseased conditions, chiefly those associated with nervous debility, but with only temporary results. During the last few years a watery extract of the thyroid gland has been administered with signal success in myxœdema, in which disease the thyroid gland atrophies and ultimately disappears. The disease myxœdema arises from the want of the influence of some unknown substance, which the thyroid gland, as is supposed, elaborates upon the nutrition centres of the central nervous system. It may be that the testis in like manner elaborates, irrespectively of its spermatic secretion, some chemical substance, which by a similar influence not only controls the growth and development of the body at puberty, but maintains the manly characters then acquired throughout life."[1] Cabot has tried the injection of testiculin in mania following castration in one case with improvement of symptoms, whether *post hoc* or *propter hoc* cannot be determined. Whatever its mode of action, however, it is probable that the need for this occult property of the sexual glands would begin to disappear after their essential purpose had been subserved,—*i.e.*, after full adult life had been reached and the individual was cast in the mould intended by Nature. This need abrogated there would yet remain the function common to both sexes, that of producing cells endowed with the property of perpetuating the species. The testicle and the prostate would thus at this time have a closer physiological resemblance to the ovaries and uterus than at any other period of life. Both ovary and testicle would still possess the power of propagation, and with it a marked effect upon all the accessory sexual organs, while at the same time the necessity for a certain controlling influence would have been removed and larger opportunity afforded for aberration in the growth and structure of the tissues involved. This may especially be the case, as with the cessation of the necessity for the exercise of this function (or for the evolution of the hypothetical product in question) the activity of the testicle does not cease. The organ (that it may be able

[1] Griffiths, loc. cit.

to perform the other half of its work,—the generation of spermatozoa) is still preserved from atrophy. Nothing in the little we know of the origin of the so-called benign growths in the body contradicts the theory that overgrowth of normal structures may be favored or hindered by changes in the nervous and vascular supply of the region. The disappearance of the necessity for a given product without the coincident disappearance of the vital energy which was expended in producing it might conceivably result in hypertrophy of organs intimately associated with those which were the source of supply.

The general law of correlation between the sexual organs and other parts of the body extends throughout the whole realm of organic life. "If one wishes to obtain an abundance of fruit from a garden plant, the growth of the leaves is curtailed by cutting off some of them. If, on the other hand, an ornamental plant with a luxuriance of large and beautiful leaves is desired, then the development of the blossoms and fruit is prevented by cutting off the flower buds."[1] This principle, called by Goethe that of "compensation of development," which is thus used practically to secure the increased growth of one system of organs at the cost of another, may apply equally to different organs of the same system. Griffiths[2] says, "The whole genital system is an apparatus the potentiality of which mainly depends upon the integrity of the testicles, one or both; they control the extent to which the remainder of the sexual apparatus grows, the growth of the vas deferens no less than that of the prostate and other accessory sexual glands. I make this statement because in observations upon castrated animals I have found that the testicle exerts such an influence upon the growth of the other parts of the sexual apparatus."

The theory of tumor formation, recently advanced by Roger Williams,[3] has a more or less direct bearing upon this question. He says that in the genesis of neoplasms, as in the genesis of other organic structures, we must take into consideration two factors,—the *cells* whence they originate and the *force* that regu-

[1] Haeckel, op. cit., p. 245.
[2] Op. cit.
[3] Diseases of the Breast, p. 138.

lates the cellular activities. He believes with Spencer that every component cell of the multicellular organisms has the inherent power of developing itself into the form of the parent organism; that the enormous reproductive powers of the somatic cells have not been fully realized by pathologists; and that these powers are only held or restrained in the normal individual by a "force" which regulates the growth and development of the tissues and organs in relation to each other and to the organism as a whole. He believes further that the essence of the neoplastic process is that certain cells of the affected part grow and multiply more rapidly than their congeners, and adds, "I explain this rejuvenescence as due to failure of the integrative force that normally restrains their activities within proper limits. Under these circumstances, whenever there is a sufficient supply of nutritive materials, capable of being utilized for growth by the cells of the parts, there a neoplasm will arise,—that is to say, the abnormally emancipated cells will there grow and multiply more or less independently, regardless of the requirements of the adjacent tissues, and of the organism as a whole."

If there is any truth in my theory, such a modification of the natural ovarian and testicular functions as I have suggested would, so far as the development of uterine and prostatic overgrowths was concerned, be equivalent to a failure of the general restraining force. It is not demonstrable and may be regarded as not reasonable, but I have thought that its provisional acceptance might serve as a step towards the understanding of the essential etiology of these tumors, which, on account of their enormous frequency and serious consequences, have a practical importance, that I hope may give even such metaphysical speculations as to their causation a certain amount of interest. The persistence of what might be called unexpended energy during the ovule- and sperm-producing life of the ovaries and testicles respectively, might thus offer a reasonable explanation of the overgrowths in question, while the final atrophy of the former organs would similarly be accompanied in many cases by such a withdrawal of nervous and vascular supply as to prevent the occurrence of hypertrophies or even to cause their disappearance if they had already formed. That this is the case as regards

uterine fibromyomata is a fact which clinical experience abundantly demonstrates. I have endeavored to show[1] that there is reason for believing that it is equally true of prostatic overgrowth. Unfortunately, what may be called the accidental concomitants of the condition,—accidental in the sense of being due to anatomical propinquity,—the vesical and renal changes, usually cause death in those subjects whose advanced years might of themselves, through sexual failure, prove curative. An examination of Messer's tables, founded on a dissection of 100 prostates in men over sixty years of age, discloses one interesting fact in this connection. Assuming arbitrarily that eighty may be taken as the age at which, in the great majority of men, the sexual life is absolutely and finally ended, we find that among those subjects whose prostates weighed over six drachms, the percentage of octogenarians or their elders was only 22.8, while among those whose prostates weighed less than six drachms, many of them less than normal, the percentage was 35.3, more than half again as great.

This is not only confirmatory of Desnos's observations, that after a certain period of life the frequency of notable hypertrophy diminishes, but it suggests the possibility that in many of these cases physiological atrophy had already begun. The subjects were not selected from among patients, but just as they happened to come within reach of the investigator. The uncertainty as to the exact duration of sexual life in the male also weakens the force of the statement that the condition does not manifest itself until after the period of life when it should occur if it were truly homologous with the uterine growth. In addition, it may be said that there is accumulating evidence that prostatic hypertrophy begins much more frequently than was formerly supposed during middle life, and that the statistics on which we have been accustomed to rely, based on museum specimens and on the experience of surgeons to whom the patients apply only when distinct subjective symptoms have developed, are, to an extent, unreliable.[2]

[1] ANNALS OF SURGERY, August, 1893.

[2] ANNALS OF SURGERY, August, 1893.

In some of the cases which I shall presently summarize living spermatozoa could not be found in the testicles at the time of removal, and yet the effect upon the prostate was as marked as in most of the others. If the theory which I have just advanced is the correct one, such cases indicate the persistence, but perversion of part of the twofold function of the testes after the reproductive factor had vanished. If the assertion that ovulation and menstruation are more independent of each other than has hitherto been believed[1] be correct, we have a similar explanation of some of the anomalous cases of uterine fibroids which have remained, or, more rarely, developed after what was a menopause but possibly not a true climacteric.

It was the apparent analogy between the uterine and prostatic growths which led me to the investigation that resulted in my suggesting this operation to the profession. This analogy, as it is part of the present argument (Velpeau, Thompson, White), may be briefly restated as follows: The prostatic vesicle is the analogue of the sinus genitalis in the female,—the uterine and vaginal cavities; the structure of the prostate and that of the uterus are strikingly similar, and would be almost identical if the tubular glands found. in the inner walls of the uterus were prolonged into its substance; the histology of the growths, from small encapsulated tumors, easily shelled out, or polypoid growths intimately connected with the uterus or prostate up to the enormous growths which far exceed the original bulk of the organ itself, are identical; or there may be in either case a general hypertrophic enlargement affecting the whole organ; lastly, these disturbances occur at about the same time in the sexual life of the two sexes,—that is, during the latter half of the reproductive period. This ends sooner in the female than in the male, and accordingly we find the growths appearing in the former at a somewhat earlier age.

This analogy is said by the embryologists to be without foundation as regards any true homology between the prostate and the uterus. The clinical resemblances between the

[1] American Text-Book of Gynæcology, p. 95.

two forms of overgrowth are, however, none the less striking, and it may now be said that the results of castration in such cases are equally similar and remarkable in both sexes. I am quite willing to accept Moullin's way of putting it: "Enlargement of the prostate bears the same relation to the testes that fibroid disease of the uterus does to the ovaries. But the fact that they bear the same relation to two different organs is no proof that they bear any relation to each other." I must add, however, that even although the prostate is not the absolute homologue of the uterus, as it contains and encircles the cavity which is said to be—*i.e.*, the utricle or "prostatic vesicle,"—the relationship between the two is remarkably close. So, too, although the uterine growths begin as fibromyomata and the prostatic as adenomata or adeno-fibromata, the difference merely corresponds with the differences in structure of the two organs, the prostate containing normally more glandular tissue than the uterus.

Pitfield Mitchell[1] believes the frequency of fibrous, epithelial, and fatty growths, as compared with growths of more highly specialized tissues, to be due to "that inverse relation between reproduction and specialization seen throughout the whole organic kingdom. It has been established as one of the laws of reproduction that whatever energy is used up for increase of mass, for increase of structure, and for functional work, is so much deducted from the energy that might be available for productive processes. So that the relative scarcity of myoma and neuroma is in consonance with the fact that reproductive power tends to diminish as specialization or structural complexity increases. The indications of this law both in the animal and vegetable worlds are unmistakable, nevertheless the evidence of it is almost inextricably entangled as the generalization applies to neoplasia. For, taking the organism as a whole, we see in the case of myoma that this is an uncommon tumour, whether of striated or non-striated muscle, yet it is far from being so in the uterus. Here we may be confident the exception is due to exceptional circumstances."

[1] The Philosophy of Tumour Disease, London, 1890.

He might have added as a corollary that when energy of any sort is set free, as it were, it must tend to favor the "increase of mass" of which he speaks, and possibly the reversion of the tissues to the mode of genesis of unicellular organisms for which he is arguing as a cause of all tumors. "The generation of a tumour must be regarded as a reversion to an ancestral mode of reproduction; as the resumption of a habit proper to the remotest ancestors of the metazoa, the protozoa. It is a seeding of the natural plastids of the body. As reproduction for the entire individual is effected by organs—ovaries and testes—specialized for the purpose, reproduction for the individual units is accomplished by the units themselves."

The relation between the reproductive function itself and the growth of the individual is a marked one at the very beginning of organic life. When the continued existence of the whole organism is endangered, its entire energy seems to be devoted to securing the reproduction of the species. This is seen in many of the diatoms, infusoria, moulds, algæ, and lowest forms of bacilli. In the latter it has the most widespread influence upon surgical practice, as the expiring effort of the microscopic organism whose life threatens the life of our patients is to produce spores which have still more obstinate vitality. "This primordial trait has left its mark even upon the highest plants and animals. If the flow of sap in still growing trees is diminished by ringing or other injurious action, they will cease to grow and begin to flower. In the shape of buds reproductive centres may be induced in bulbs by cutting out the embryo. The aphis, kept in an artificial summer, may for years be made to reproduce by parthenogenesis, but with want of food or a low temperature sexual genesis will set in. Similarly with the common hydra. A vestige of the trait probably remains even in man where death is often accompanied by the ejection of seminal fluid."[1]

All this goes to show the direct relationship which exists in all living things between processes of growth and the organs concerned in reproduction, and makes it more reasonable to imagine that a diversion of any of the powers of those organs might result

[1] Mitchell, op. cit., p. 11.

in grave modifications of those portions of the body most intimately associated with them. Even if it is thought that according to Mitchell's hypothesis the true explanation of the genesis of the uterine and prostatic growths lies in the gradual decline in the physiological life of the sexual organs which begins after middle age,[1] the continued growth and increase of these new formations might well be encouraged and stimulated by the persistence of energies which have survived their usefulness.[2]

There must be some explanation of the differences in the liability of different organs to new growths. "The most striking contrasts are met with. On one hand, primary tumours of the heart are scarcely known, and on the other, myomas of the uterus are so common that one woman in every ten is said to be afflicted," and the frequency of prostatic overgrowths is even greater. It is not in these instances, as Mitchell supposes it to be in some, the impending cessation of tissue vitality as a whole, permitting the reversion of cells to primitive conditions of growth and multiplication, for, as we have seen,[3] the evidence is demonstrative as to the uterine growths, and almost equally so as to the prostatic, that after a certain period of life is reached they cease to make their appearance.

He says himself[4] that innocent tumors are the products of centres of growths set free by tissue whose reserve of vitality is relatively large, and explains in this manner the fact that "mature" (benign) growths are found at an earlier period of life than the "immature" (embryonic, malignant). An excess of "vitality"

[1] It would appear that when the contained energies of the cell are insufficient to maintain the balanced functions needful for individual life, the remnant of contained energies, being equal to the less costly function of reproduction, is consumed in a last effort to continue the species. So that a necessary condition of histogenic dissolution is a more or less gradual decline of life in the individual cell.—Mitchell, op. cit., p. 14.

[2] Thus, the most general and invariable condition of tumour-genesis is the dissolution of pre-existing tissue accompanied by the birth of tissue; not the condition, be it most carefully observed, of tumour-growth. The genesis of a tumour is one thing, and the growth or increase of its mass is another. The processes are distinct in character and different, often quite opposite, as to their conditions.—Mitchell, op. cit., p. 15.

[3] ANNALS OF SURGERY, August, 1893.

[4] Op. cit., p. 43.

or of energy which has become purposeless, as I have suggested, would therefore seem to favor the occurrence of just such growths as those we are considering, and the withdrawal of the source of that energy (by oöphorectomy or castration) might be expected on theoretic grounds alone to be followed by the retrograde and atrophic changes which after middle life are beginning everywhere throughout the organism, and would be relatively more rapid in organs or tissues which had become functionless. Clinical facts appear to indicate that both the uterine and the prostatic growths have some relation to sexual activity. Winckel, Roehrig, Emmet, and others[1] have shown that uterine myomata (like mammary adenomata) are favored by marriage and fecundity. I have already alluded to the prevalent but unproved view that prostatic enlargement is related to sexual excess. It may be that in these facts there will be found further support to the theory I have advanced, as two separate but allied functions of a single gland are probably not readily dissociated, and activity of the reproductive and still purposeful function might cause or favor coincident but harmful activity of its fellow.

I may seem to hold to this view (including the apparent analogy between the uterine and prostatic growths) with unwarranted persistence, and I do not desire to undervalue the arguments against it; but it must be remembered that we have no other which at all explains either the causation of the growths, their spontaneous disappearance (or failure to appear) at a certain time of life or their cure by castration. So far as the theory of analogy is concerned, I said long ago that even if it were true it could scarcely be said to be a full explanation of the occurrence of the prostatic growths, but by allying them to a well-known group of tumors would certainly bring us a step nearer to their comprehension. Its provisional acceptance with this statement, and irrespective of the additional views as to causation which I have just advanced, is not therefore to be regarded as concealing our ignorance, as Mr. Moullin[2] fears, but gives us a sort of working hypothesis

[1] Quoted by Mitchell, op. cit., p. 169.

[2] Op. cit., p. 39.

which has certainly thus far stood the test of practical application.

PART II.

The clinical evidence of the truth of the statement that the hypothesis has stood the test of practical application will readily be found in the history of one hundred and eleven cases which I submit in tabular form for publication with this paper. It will, of course, be impossible for me to read them all to you in detail, but there are certain general facts which a few of them will serve to illustrate. I will take for this purpose three cases, each of which was seen by several observers and in regard to which I have fairly complete details.

CASE CVII.—The patient, aged sixty years, weight about 135 pounds, a carpenter by trade, was admitted to the University Hospital November 16, 1894. He was much broken down by long-continued suffering, but was exceptionally intelligent for a hospital patient. He had begun to have symptoms of prostatic obstruction eighteen months previously. He had undergone various forms of internal treatment in spite of which he was urinating hourly, and had used the catheter (with increasing frequency) for years. His distress had become so great that he came for advice and for a rest in the hospital. He was examined by me, by several assistants, and by two members of the class. His prostate was estimated to be of the size of a small orange. The finger could not reach the upper border. The lateral enlargement was very marked, the borders of the gland nearly touching the ischiatic rami. It was moderately firm, and slightly elastic upon pressure. A soft catheter went in with a little difficulty. Urine began to flow when the eye was about ten inches from the meatus. The amount of residual urine averaged six ounces. He was using a catheter from four to eight times daily and urinating, or attempting to urinate, from twelve to twenty-five times—occasionally oftener—in the twenty-four hours. The urine contained blood and pus, but no casts. It was stinking and loaded with mucus.

Castration was advised but was refused. He was admitted to the ward, the bladder was irrigated daily, and the urine sterilized as far as possible by the administration of salol and boric acid; recumbency with the pelvis slightly elevated was maintained and the diet carefully regulated, milk being given chiefly. He got some relief

from these measures, but there was no change in the quantity of residual urine. He was taught the proper use of the catheter and instructed how to keep it sterile, and left the hospital.

On December 5 he returned and said that he was so much worse that he was ready for operation. This was performed December 12 in the presence of the class. Ether was used; the time of operation, including stitches, was three minutes.

Improvement in urination became manifest in the first twenty-four hours after operation. In a week the patient emptied the bladder easily and painlessly; the urine was clear; the frequency of urination had decreased to five or six times daily. The residual urine as reported by Dr. Small, the resident physician, had diminished to half a fluid ounce, and on December 26, but one fluid drachm remained after urination. This was verified by Drs. Martin and Wood. He was examined (before the class) five days after the operation and the prostate was found to be merely a flattened fibrous mass, the upper border easily reached, the lateral borders shading off insensibly so that its limits in those directions were difficult to determine. The bulging into the rectum, previously so unmistakable, had disappeared. The prostate itself might almost be said to have done so. A catheter inserted eight and a quarter inches drew a few drops of urine. The patient described to the class the change in the character of his urination and said that he then felt as he did "when he was a boy in the fields."

He remained as a helper in the surgical wards for four months. During this time he had on three occasions a little increased frequency of urination, each time associated with digestive disturbances. He left the hospital apparently entirely cured.

Dr. R. H. Fitz, of Boston, examined the prostate per rectum a short time before the patient's discharge, and stated that "it was so soft and so small that its outlines were indeterminate. The prostate and the wall of the bladder felt very much alike."

I have operated upon other cases which are included in the table and which are equally striking, but I prefer to select for the remaining two examples cases by other operators in other cities.

CASE III.—Dr. Beach, of Boston, kindly sends me the following interesting notes which I transcribe exactly as he wrote them:

"Patient, seventy years of age; tuberculous family history. His habits had been good. Not addicted to the use of tobacco or alcohol. No history of venereal disease. Had always enjoyed good health until ten years ago, when he was obliged to pass his urine frequently and in small quantities. He had never been catheterized. Entered the hospital November 13 with his bladder much distended and his urine continually dribbling from him. By the rectum the prostate gland was found to be much and uniformly enlarged, extending nearly to the ischium laterally and as far as the finger could reach posteriorly. In front it projected at least an inch above the superior line of the pubes. The tunica vaginalis of the left side was moderately distended by a hydrocele. Upon examination of the urine it proved to be free from sugar, specific gravity 1020, containing a trace of albumen and a large quantity of pus and bladder epithelium. The urine was drawn by a soft rubber catheter carefully sterilized twice daily. Meantime there was some dribbling. Mentally, he had been failing for a number of weeks. He remained in bed all of the time, barely rousing enough to open his eyes when spoken to sharply, or reminded of the necessity for passing his urine, and then would lapse again into the same dull and listless condition. The drowsiness slowly increased to deep stupor. By the 23d he ceased to pass any urine and the quantity drawn by catheter each time became less. December 5, catheter entered with much difficulty on account of the obstructing prostate gland. December 6, no urine passed for twenty-four hours. It had become impossible to pass either a silver gum elastic, or a soft rubber catheter (this including various sizes of each and the probe pointed and Mercier tipped elastic instrument). Suprapubic puncture and withdrawal by aspirator of the bladder contents. The hydrocele has increased to three times its size upon entrance.

December 7. Same condition mentally and physically. Aspiration of bladder and an unsuccessful attempt made to enter by catheter afterwards. This was repeated on the 8th, 9th, and 10th, when after the aspiration it was possible to enter a soft rubber instrument and to tie it in place. As soon as the patient was left for a few moments he pulled it out. The patient was examined by Dr. J. C. Warren, who concurred with Dr. Beach upon the condition of the patient and the expediency of an attempt at relief by castration.

December 11. Castration. Afterwards the catheter was easily introduced and bladder emptied. 13th. No difficulty in catheterization since the operation. Bladder washed out twice daily. 14th.

Mental condition improving. A little dribbling of urine between the times for catheterization. 20th. Has improved steadily and to-day passed three ounces of urine without a catheter. 23d. Prostate examined carefully by those who had examined it before operation and found to be at least one-third in volume. It no longer projects above the pubes. 27th. Up to-day for the first time.

January 2. Improvement continues. Passed several ounces of urine without catheter. 8th. Patient passed catheter to-day without assistance, later eight ounces of urine without assistance. Has walked a few steps. Is clear and intelligent. 9th. During the past twenty-four hours has passed all of his urine without catheter. Wound healed. There has been as much improvement mentally as physically.

The third case which I have selected was reported in the *Medical Record* for April 20, 1895. I copy it as described by Dr. Howard Lilienthal, the operator. He remarks that the case was one which had been carefully watched, both before and after operation, by at least three observers who may be considered competent. There was no lack of attempt at palliation by the usual methods before resort to the castration.

CASE LIII.—M. M., a private patient in Mount Sinai Hospital (New York), in Dr. Gerster's service, was fifty-six years of age, and the father of a family. He was a merchant by occupation and lived in one of the Southern States. For about ten years he had been troubled with frequent micturition, with occasional attacks of vesical tenesmus, and with a gradual increase in the severity of his symptoms. About three years before coming to the hospital he had been catheterized for an attack of retention, but the exacerbation was of short duration.

Still from this time he had to be catheterized with gradually increasing frequency until, on admission to Mount Sinai, he was in constant pain and felt an urgent desire to urinate at least once an hour during the night. By day his condition was much worse, the attempts at emptying the bladder occurring about every five to fifteen minutes. His urine was alkaline, and there was a severe cystitis, with great quantities of pus and bloody mucus. A full-sized sound entered the bladder without difficulty. Dr. Gerster examined the prostate by rectum, and found it enlarged to about three times the

normal size, but the cystoscope showed a well-marked middle lobe, which was thought to be responsible for the trouble in evacuating the bladder. For six weeks the patient was treated by catheterization, washings of the bladder, diuretics, oil of winter-green, and other internal antiseptics, but without improvement. Indeed, the man grew constantly worse. He was now emaciated, was thoroughly exhausted, and in a truly desperate condition. Dr. Gerster had proposed castration, and the patient had refused. The service now changed and I came on duty. At my first examination of the prostate by rectum I found the body about as big as a good-sized egg, not particularly tender to touch, but very firm and resisting. I made no cystoscopic examination, but accepted the positive observation of Dr. Gerster. When castration was again proposed the patient had become so hopeless that he decided to take his chances with the operation. At my request Dr. Fluhrer saw Mr. M. and examined him. He also diagnosed the case as one of enlarged prostate, and on learning that the treatment above outlined had been followed by no improvement whatever in six weeks he agreed with me as to the advisability of castration.

On February 9, under chloroform anæsthesia, I removed both testicles, which were nearly normal. There were signs of very slight bilateral epididymitis. The wounds were closed without drainage and the patient was out of bed in six days. The patient was catheterized every six hours, and his bladder was washed twice daily. For the first twenty-four hours there was a slight remission of symptoms, but on the third day he was almost as bad as ever. From the fifth day there was, however, steady and miraculously rapid improvement. Before the operation and immediately after, he could urinate only by drops, and there was always four to six ounces of residual urine. If he had allowed his bladder to become distended, practically all the urine was "residual," so that frequently at such times, after the man had exhausted himself trying to pass his water, ten ounces were withdrawn by catheter. The first improvement noted was that the patient could pass a stream. The residual urine rapidly diminished, the cystitis vanished, and in four weeks I presented him at a meeting of the Genito-Urinary Section of the New York Academy of Medicine. At that time he could hold his urine two hours at a time without discomfort, he passed a moderately powerful and full stream, and best of all there was but one ounce of residual urine. The urine still contained some pus but no mucus. It was acid and of the normal

color. The man had gained many pounds in weight and enjoyed life. He could go to the theatre and could make the journey to Brooklyn, where he had relatives, without suffering by the way. It is needless to say that he is most grateful for what has been done for him. He does not for an instant mourn the loss of his testicles.

No cystoscopic examination was made after the operation, but by the rectum the prostate, though still enlarged, is only about half the size it was before and feels flaccid.

Both Dr. Gerster and Dr. Fluhrer have seen Mr. M. since his recovery, and express themselves as thoroughly convinced of the efficacy of the operation in this case.

A few days ago the patient returned to his home. Before leaving he again came to thank me and to say that catheterization was no longer necessary, the amount of residual urine being so small. I still advised the use of the instrument, however, once in two days, until there should be no residual urine.

I have chosen these three cases because they appear to me to bring up all the points which have thus far been in dispute as to the cases reported as "successful." The critics of the operation have said (*a*) that they still regarded it as a physiological experiment; (*b*) that the reported cases lacked detail and did not prove that the same results would not be obtained by rest in bed, careful catheterization, regulated diet, etc.; (*c*) that the subsidence of the symptoms and of the bulk of the gland, as reported, was too rapid to be due to atrophy, but must be owing to the disappearance of congestion and œdema; (*d*) that at any rate a true hyperplasia could not disappear in so short a time as has been reported; (*e*) that the estimates, both of the size of the hypertrophied gland and of its reduction in size, were inaccurately expressed; (*f*) that it was unreasonable to suppose that a long-standing cystitis would vanish even if the prostate did shrink; (*g*) that a vesical calculus in a post-prostatic pouch might be overlooked and only discovered later; and (*h*) that the cases had not been observed for a sufficient length of time to make the results reliable. I shall try to reply briefly to these assertions, basing my statements chiefly on the facts contained in the table.

(1) It seems to me that even a few such cases as those I

have described should remove the operation from the region of experiment to that of practical surgery, and show that it is at least as scientific and as certain in results as many of our accepted operative procedures. Of 102 cases contained in the table in which the condition of the prostate is noted, 65 or 63.7 per cent. are reported as showing some distinct decrease in size, while in twenty-four additional cases, eighty-nine in all (87 per cent.), the improvement in other symptoms renders the conclusion justifiable that the prostate had become smaller. In two cases autopsies have been made which demonstrate the exact nature of this shrinkage, and show that it is due to the same sort of atrophy, first of the glandular elements and then of the stroma, that I reported two years ago, as the invariable result in dogs. In one of these cases (No. 104, table) I confess I did the operation with scarcely a shred of hope for a cure. The patient was a broken-down hospital wreck, eighty-two years of age, with a very large prostate, and with absolute retention; catheterism was impossible, and the urine was loaded with albumen and casts; he was profoundly adynamic and alternated between uræmic stupor and delirium. I did the operation practically without ether and in three and a half minutes. He died comatose on the evening of the second day. It was thought by all those who examined him per rectum that the prostate was already smaller. But the microscopic report is conclusive as to the beginning of changes which are now well recognized as preliminary to full atrophy.

The report says:

"*Microscopical Examination.*—The stroma of the gland shows beginning proliferation of the connective tissue cells, but especially of the muscle-cells.

"The acini tubules are also becoming filled with proliferated columnar cells, and here and there some fine granular matter may be seen in the tubules; some of the cells appear to contain fine granules which have not taken the stain, evidently fat. The changes are typical of beginning atrophy."

In case No. 8 (table), in which the patient died of popliteal thrombosis and gangrene, eighteen days after double castration,

the same changes, further advanced, were noted by Mr. Joseph Griffiths, F.R.C.S., Hunterian Professor in the Royal College of Surgeons, England. He describes in detail and figures[1] the microscopical sections, summing up as follows: "In short, the cell elements first proliferate, and ultimately disappear, leaving a comparatively small amount of fibrous connective tissue in their place. . . . The gland, whether enlarged or normal, undergoes certain degenerative changes after removal of the testicles which lead to its conversion into a small, tough, and fibrous mass in which there are only remains of the glandular tubules and ducts."

I have here the sections from my own case for examination by any of the Fellows who may desire to look at them. It is obvious that this, with other evidence, has been convincing to some members of the profession at least, as Sir Joseph Lister feels warranted in speaking of the operation as "a valuable addition to our art;" Fenwick in stating "that there is no doubt that slow shrinkage of the prostatic tissue in many of the forms of senile enlarged prostate ensues upon double castration;" Moullin in writing, "Removal of the testes is followed in a large proportion of cases, if not in all, by complete and rapid absorption of the enlarged prostate. This has been proved conclusively. The gland entirely disappears; nothing is left but a little fibrous mass;" and Cabot, in saying that, "the effect of castration in reducing the size of the chronically hypertrophied prostate is undoubted. Enough cases have been reported to show that."

(2) There will be found also in the table, in addition to those I have detailed, many cases which had been previously treated by various palliative measures, including, of course, rest in bed, catheterism, vesical irrigation, etc. The statement that the reported improvement could have been brought about by these means rather than by operation, seems to me in the face of the evidence scarcely worthy of further attention. The palliative treatment of prostatic hypertrophy is now understood by every general practitioner, and I frequently find in cases which I see

[1] British Medical Journal, March 16, 1895.

in consultation that every possible care has been taken and the best judgment shown in the use of the catheter, the regulation of diet, the hygiene of the patient, etc. It is inconceivable that many of the operators in these cases should have overlooked such obvious preliminary measures. To be sure, their employment is specially mentioned in only a minority of the cases, but the omission was, I feel sure, a mistake of the writers, not of the surgeons.

(3) The assertion that the subsidence of symptoms has been due to the disappearance of congestion and œdema is largely negatived by the facts already given,—viz., the previous failure of palliative measures; and the pathological evidence of actual atrophy. Certain facts which seem to afford an explanation of the rapidity of the improvement in many cases, which as Lister has said, is "as remarkable as it is satisfactory," ought to be mentioned. All the varieties of enlargement have the same histological structure, but it is interesting to note the following observations, which seem to have a definite relation to one another. Sir Henry Thompson long ago[1] called attention to the fact that the posterior part of the so-called "median lobe" ("median portion," "prostatic commissure," etc.), contains a larger proportion of glandular structure than most other parts of the organ. This is demonstrated microscopically. It has been confirmed by others. Owing to its anatomical position the variety of hypertrophy, which affects this region, is of chief pathological importance. Watson has found it present in twenty-seven out of thirty cases examined by him. Nearly all the varieties of enlargement are probably originally adenomatous, but such growths would naturally begin where glandular tissue was most abundant. Griffiths[2] and Kirby[3] have shown that after castration it is the glandular tissue which first atrophies and disappears, and that this atrophy begins within a few days.

A consideration of these circumstances seems to make the rapidity with which favorable changes, such as ability to urinate

[1] Diseases of the Prostate.

[2] British Medical Journal, March 16, p. 579.

[3] ANNALS OF SURGERY, August, 1893.

(66 per cent.); ease of catheterism (about 75 per cent.), etc., have occurred in some of the cases more readily understood. A very little diminution in a growth largely adenomatous and occupying this particular region would, undoubtedly, be at once attended by a noticeable amelioration of obstructive symptoms.

(4) As to the disappearance of the hyperplasia, it must be remembered that the stroma consists largely of unstriped muscular fibres. Griffiths[1] has shown that "the intrinsic muscle-fibres of the prostate are subservient in function to the glandular tubules, and that in the developing prostate the muscle could be seen running in fine bundles in close relation to the tubules, and in such a manner as to be capable of exerting compression upon them; and also that after castration in the animals before mentioned (dog, cat, etc.) and in man, the prostate, after the lapse of a year or more, becomes transformed into a mass of fibrous connective tissue, which contains the remains of the once active gland tubules and a small number of atrophied muscle fibres scattered here and there. The complicated and much branched prostatic tubules, together with the non-striped muscle which forms a pronounced constituent of the normal prostate, have disappeared almost entirely, leaving, however, some remnants both of the gland tubules lined by epithelium, which has lost its glandular or secretory function, and of the non-striped muscle fibres."

Moullin says,[2] "the stroma of the prostate, like the glandular tissue it supports, belongs to the sexual organs. It has to do solely with the discharge of the prostatic fluid, and, as Dr. Griffiths[3] has shown, its development varies with that of the sexual organs. After castration it wastes as rapidly as the gland tissue." These facts would seem to explain satisfactorily the practical disappearance of the bulk of the gland, which has been said for *a priori* reasons to be impossible.

(5) As to the lack of accuracy in the estimation of the original size of the gland, and therefore in the statements regard-

[1] Journal of Anatomy and Physiology, Vols. XXIII and XXIV.
[2] Op. cit., pp. 7 and 8.
[3] Loc. cit.

ing the exact degree of reduction in bulk, it must, of course, be admitted that precise measurements are both desirable and difficult. But while it is not easy to express the dimensions of the enlarged prostate in figures, there is no trouble by combined instrumental and rectal examinations in making a close estimate and drawing a fair comparison with some well-known object like a "walnut," a "lemon," an "orange," or a "base-ball," all of which terms are used by the gentlemen reporting cases, and all of which convey a reasonably exact idea of bulk to the average mind. As to the change in size, almost any operator has enough of the *tactus eruditus* to know whether or not a given body has shrunken one-half or one-third, or has decreased from the size of a lemon to that of a filbert.

(6) The disappearance in fifty-two cases (about 52 per cent. exclusive of Moullin's ten cases of which I have no details) of a previously intractable cystitis has certainly been a surprising phenomenon. But, after all, it is in accord with certain well-known facts. The prostatic plexus of veins receives nearly all the return blood from the bladder. Congestion of the former plexus is one of the most common and invariable phenomena associated with enlargement of the prostate. The veins attain a relatively enormous size, their valves disappear, and the backward pressure inevitably produces congestion and swelling of the vesical mucosa.

Septic infection of a healthy mucous membrane by the pyogenic microbes of acute or chronic cystitis is not possible, as Guyon, Albarran, and others have shown, even though such bacteria are present in the urine. When, however, the vesical mucous membrane is congested in consequence of obstruction to venous return and by distention of the viscus and frequently recurring contractions of the detrusor muscles, it offers but slight resistance to the microbic invasion. The pyogenic microbes are generally carried to the bladder by dirty instruments, or, if these are rendered sterile, through failure to cleanse the anterior urethra before the instrument is introduced into the bladder. Often cystitis develops independently of the use of instruments, probably as a result of infection conveyed by way of the urethral mucous membrane. The pathogenic microbes usually found are the

bacillus coli communis and the staphylococcus pyogenes aureus. These cause vesical lesion either by direct action or indirectly through their ptomaines, and acting upon the urea produce ammoniacal decomposition. The ammoniacal urine in its turn acts as a powerful irritant to the bladder-walls, but is the effect, not the cause, of the cystitis.

Now, if the backward pressure is suddenly relieved and the vessels have an opportunity to regain their normal calibre and the bladder to empty itself more readily and more completely, it does not seem so unreasonable to suppose that microbic multiplication would cease; healthy epithelium with normal resistant powers would prevent further infection; the urine could be voided before its urea had undergone decomposition; its normal acidity would thus be re-established, and a virtual cure of the cystitis be effected.

According to Keyes,[1] "Fels and Ritter, by inoculating the bladders of dogs, produced ammoniacal urine and cystitis, but only on condition of ligating the urethra. Upon loosening this ligature the bladder promptly resumed its condition of health." The shrinkage of the prostate seems to be the "loosening of the ligature" in many of these cases. The subsidence of the tenesmus, which is often so severe as to produce lesions of the mucous membrane at the neck of the bladder, and the avoidance of similar lesions, often caused by even the most careful use of the catheter, are, of course, important factors in bringing about a disappearance of the cystitis.

(7) The lessening in the length of the urethra cannot possibly be, as has been suggested, merely the effect of relieving an overfull bladder, as Finger[2] has shown that on account of the inclusion of the pars prostatica in the bladder the urethra is considerably shorter when the bladder is full than when it is empty, a fact which he has demonstrated experimentally. "If, in an individual who as yet experiences no desire to urinate, an elastic catheter is introduced into the urethra until the first drops of urine begin to flow, and then the length of the por-

[1] American Journal of the Medical Sciences, June, 1894.

[2] Gonorrhœa and its Complications, 1894, p. 34.

tion of the catheter situated within the urethra is measured; and if the same procedure is repeated in this individual when the bladder is full and the desire to micturate already present, it will always be found that in the latter case the catheter needs to be inserted two to three centimetres less deeply before the urine begins to flow,—in other words, the urethra is so much shorter when the bladder is full. Repeated experiments, which I performed, as a matter of course, upon healthy individuals, showed that the length of the portion of the catheter when the bladder was moderately full and the desire to urinate absent, was eighteen to twenty-one centimetres; when the bladder was very full and the desire to urinate pronounced, the length was only sixteen to nineteen centimetres." Now, as a rule, the measurements in these cases of castration have been made originally with the bladder more or less distended and later with the bladder nearly or quite empty, so that the reported improvement is probably understated rather than exaggerated. If the atrophy of the prostate is once admitted, however, the change in the urethra requires no further explanation.

(8) The return of power in the bladder has been in some cases (66 per cent.) as surprising as the disappearance of the cystitis. It is now quite certain that Sir Henry Thompson's assertion, that the return of voluntary power in the bladder is impossible after two years' use of the catheter, is incorrect.

There has been much variation in this respect in the recorded cases. So far as I know, there is no certain method of determining in advance whether a particular bladder is hopelessly dilated and atonic or still possesses power of recuperation. Of course in many cases the evidence of continued contractility will be unmistakable. But even after complete retention with the withdrawal of urine exclusively by the catheter for years there has been noted a satisfactory return of power in the detrusor, in some instances almost amounting to perfect health.

(9) The possibility of operating in the presence of an undetected calculus does not seem to me a very grave objection to the operation. The most unfavorable subjects for litholapaxy and for all forms of lithotomy are the advanced prostatics with cystitis

and deep post-prostatic pouches. If castration will, in even a minority of such cases, mitigate the vesical inflammation, and wholly or partially obliterate the cul-de-sac behind the prostate, it will certainly be deliberately adopted as a preliminary operation by many surgeons. I did this in one case (No. 107) with the most satisfactory results.

If the stone chanced to be found after instead of before castration, I cannot see that any serious difficulty would follow. Its removal would certainly be an operation both easier and less dangerous if prostatic atrophy had occurred.

(10) The assertion that the cases have been reported too soon to make the results reliable is true of some, but certainly not of all. The successful cases may be grouped as to time of report in three classes:[1] (1) Those reported immediately after the operation,—*i.e.*, within the first two or three weeks, and from which nothing further has been heard; these number seven, or 8.7 per cent. (2) Those in which from a month to three months elapsed before the patient passed from observation, and in which the prostatic changes and the improvement in symptoms were carefully noted. These number sixteen, or 20 per cent. (3) Those observed after three months, and in which the local changes seem to have reached their culmination and the health of the patient appeared to be permanently re-established. These were fifty-seven in all, a percentage of 71.3.

It is obvious that enough cases have been followed for a sufficient length of time to warrant belief in the permanence of the cure when once effected. That there may be remote general effects from the operation not now known or appreciated is, of course, a possibility. But it seems unlikely that anything new will be observed in this respect as castration is one of the oldest known operations, and has been investigated both as to immediate and remote consequences with great detail and thoroughness.[2]

The unfavorable results remain to be considered. The fatal cases have been twenty, a percentage of 18. But I would re-

[1] Exclusive of Moullin's ten cases.

[2] Mojon, Mémoire sur les Effêts de la Castration dans le Corps Humain. Genes, 1813; Curling, op. cit; Launois, op. cit.

spectfully ask that in considering this apparently high mortality due consideration be given the attendant circumstances.

In the first place, while I have included the series of cases published by Mr. Faulds, of Glasgow, I do not believe they should figure in the statistics. I have put them in only to ask permission to throw them out again. They are absolutely lacking in all the details which would be necessary to give value to them. If the operation were one which was dangerous in itself, they should, of course, be admitted, as well as all the successful cases, some of which are equally without detail. But in this instance a mortality of 80 per cent. in a series of five cases certainly requires explanation.

In only two of the cases is the age given. In only one is the size of the prostate estimated. In two the urine is said to have contained "pus and blood;" no other urinary examination is alluded to. In only one is the amount of residual urine mentioned. The condition of the patient as to general health is not once described. In other words, nearly all the factors upon which prognosis is based have been omitted. Moreover, it is stated of these patients that "some had been relieved, so far, of bladder and kidney disturbance by perineal section, all with the object of minimizing the immediate and remote effects of the operation." Perineal prostatotomy in such cases has a mortality of its own. It seems to me inconceivable that any one familiar with the literature of the subject should perform it "with the object of minimizing" the effects of castration. It will doubtless often be the operation of choice, and its previous performance need not necessarily prevent a later castration, but the combined operation would certainly have a higher mortality than either prostatotomy or orchectomy alone.

It would, of course, be easy if patients were selected in the condition of the one I have already reported to you (Case 104) to keep the mortality at those figures. But it is only proper that, if the operation is done (as was mine in that instance), as a justifiable, although apparently hopeless, attempt to give the patient the only shadow of a chance that offered, it should be so recorded. For these reasons, in estimating the true mortality of

the procedure I would omit Mr. Faulds's four cases (Nos. 13, 14, 15, 16), and my own case (No. 104). Furthermore, it is remarked of case No. 36 (Glenn) that the patient was moribund at the time of operation. Case 103 (Watson) was delirious at the time of operation, and at the same time underwent operation for the cure of double inguinal herniæ. Case 52 (Lichty) was thought to be so unfavorable that the patient was only operated on when he expressed a preference for death as compared with a continuance of his sufferings. Case 43 (Haynes) lived for between two and three months. I have included it, but it can scarcely be considered an operative death. In case 13 (Faulds), a death from hemiplegia, nearly four weeks after the operation, seems scarcely chargeable to it, especially as the urinary symptoms were said to be "mitigated." Case 28 (Finney) had been insane at intervals before operation and died insane. Case 39 (Halsted) had a suprapubic cystotomy performed, as well as the castration. The prostate was "riddled with abscesses." Case 47 (Horwitz) was in "a desperate state," and it was merely a question as to what operation offered some hope with the least risk. Case 82 (Souchon) recovered power in the bladder, and died of pulmonary trouble at the end of six weeks. He had had a previous suprapubic prostatectomy, and had a permanent fistula.

Some of the others were scarcely less unfavorable, another of Halsted's being described as a "desperate case," in which *something* had to be done; but if I may be allowed to withdraw these thirteen cases from the list, so that we may get the legitimate average mortality in cases operated on with a reasonable expectation of cure, we have left a total of seven deaths in ninety-eight cases, a mortality of 7.1 per cent. I believe it will be less in the future. If so, it will accord with the history of every new operation in the matter of mortality. A table of ninety-five cases of suprapubic prostatectomy, arranged chronologically, shows, as I pointed out in 1893, a mortality of 20 per cent. for the whole number, but of only 15 per cent. for the last half; the mortality of the first half was 25 per cent.

I think a careful and impartial study of the cases in the

table of deaths will show that in every one as to which details are given there was little to be hoped for from palliative operations, and less from the unaided efforts of nature, while it seems highly probable that any other radical procedure would have been at least equally likely to result fatally.

Moreover, even in these desperate cases it is most interesting to note that fifteen (75 per cent.) showed some distinct improvement in symptoms or some shrinkage of the prostate before they died.

But while there is little or no risk in the operation itself, if it is applied in the future as widely as it has already been,—*i.e.*, to patients of all ages and all degrees of weakness, of uræmia and of toxæmia,—it will, undoubtedly, always have a considerable mortality.

The average age of the eighty-six patients included in the table, whose ages were given, is sixty-six and a half years; the average age of the fourteen cases among those who died, in which the age was given, is between sixty-nine and seventy. Although the years of the patient must be an important factor in determining the result in this as in other operations, it is the *real* age rather than that of the calendar which will tell. The senility of the tissues, the degree and extent of arterio-sclerosis, especially as affecting the integrity of the kidneys, are more important than the nominal age. This varies widely in just these cases, the relationship between general atheroma and prostatic enlargement being so close that so distinguished an observer as Guyon has, as I have already mentioned, based upon it a theory of causation. I am strongly of the opinion that when we have enough detailed cases for broad generalization, we will find that the mortality of this operation will have a very direct relation to a few factors, the most important being the presence or absence of renal infection, and the history of long-continued catheter life, or of a number of attacks of complete retention, or of a very large amount of residual urine. If these factors are conjoined, the case would be of the most unfavorable type, the suppurative disease of the kidneys following infection crippling to the point of uselessness organs already suffering from the effects of prolonged backward

pressure. In the forty-seven cases in which the duration of the prostatic symptoms was stated definitely the average is seven and a half years. In the six fatal cases in which the duration was specifically given the average is only four years. In the twenty-two cases in which the period during which the catheter was used is stated definitely the average is four years. In the five instances in the table of deaths it is 3.4 years.

Differences in the size, the density, and the shape of the prostatic overgrowth will probably be found to be minor factors in determining mortality, and more important ones in relation to the degree of improvement effected by the operation, and to the rapidity with which it occurs. After careful study of the cases, I do not think we have the data for positive conclusions on these points. Of the 111 cases only nineteen were not definitely stated to have been improved at the expiration of varying periods. Of these nineteen, nine were included in the table of deaths, leaving only 10 per cent. of apparent failures. But as in many of the whole number no mention is made of the density of the overgrowth and no estimate of the size, it is impossible to say whether or not these failures were due to the fact that in these cases the enlargement was of the hard and fibrous variety, with an abundance of connective tissue and relatively little glandular structure. Prostates thought to show this kind of enlargement have been reported as shrinking with rapidity, but, of course, the observers may have been mistaken. It is encouraging to note, however, that the microscopic studies thus far made seem to indicate an atrophy of the stroma almost as rapid as that of the glandular element.

The remote results of the operation cannot yet be determined. The cases of death with precedent mental symptoms described as "mania," "acute mania," "childishness," etc., are only such as every surgeon is familiar with in a certain proportion of cases of operation on aged persons whose mental equilibrium is easily disturbed, and can have no bearing on the question of later mental changes as a result of the castration. With greater accuracy we would probably classify the large majority of them as "uræmia," and some of the remainder as "traumatic

delirium." It is worthy of note that no mental or physical changes whatever (except favorable ones) have been noted in a single one of all the successful cases, some of them now dating back for nearly a year and a half. All the information we have on this subject—and it is far from scanty—leads to the belief that the removal of the testicles from persons who have reached full adult life, and *a fortiori* from aged persons, has no effect whatever on the mental functions or on the general physical characteristics. Impotence will undoubtedly be caused in the majority of cases, but even this is not inevitable (see Cases 7, 42, and 92).

Properly to compare this operation with the other methods employed in the treatment of prostatic enlargement it seems necessary, as its position is still so indeterminate, to review briefly the procedures appropriate to various conditions and stages of hypertrophy.

(1) *Dilatation.*—A patient who presents the symptoms of the prostato-vesical congestion of the early stages of hypertrophy, who is disturbed once or twice at night, who has an enlargement of moderate density, appreciable through the rectum, but not offering much resistance to the introduction of an ordinary catheter, and who has but little residual urine, is likely to derive great benefit from the systematic introduction of full-sized steel sounds. This treatment alone often seems to relieve existing symptoms and to prevent or, at least, delay the development of further trouble. Of course, while this is the case no more radical treatment would usually be considered.

(2) *Catheterism* should be systematically employed in cases in which the quantity of residual urine is three or four ounces or more, and in which the introduction of the instrument is easy and painless, and the urine is sterile. The frequency should be proportionate to the amount and character of the residual urine, a very good working rule (if the urine is sterile) being to use the catheter once daily (preferably at bedtime) for three ounces, twice for six ounces, and then once more for any additional two ounces. With sterile urine it is rarely necessary to use it oftener than once in every four hours.

It may be said at once that in those patients with but moderate obstruction, or with a high grade of compensatory hypertrophy of the bladder, with a small amount of residual urine, which remains sterile, and in whom catheterism is easy and painless, operation is not to be thought of. The time may come when, by perfecting our methods of diagnosis and our operative technique, this class of prostatics may be benefited by active surgical interference, but it has not yet arrived. Dilatation and catheterism, as above described, at present represent the best therapeutics, especially if the rigid observance of details of antisepsis is emphasized, insisted upon, and never lost sight of.[1] But it must be remembered that these methods are, in the majority of cases, merely palliative, and that, as a rule, the introduction of instruments gradually becomes more difficult, cystitis and atony of the bladder result from the catheterism, which increases in frequency and painfulness and some operative measure must be considered. At this time castration will probably be rejected in the large majority of cases on account of the sentimental objections to the operation. Launois has said truly that even men whose sexual powers have vanished desire to preserve the testes as evidence of a *virilité passée*. The dominating position of the sexual instinct throughout the whole animal kingdom makes this feeling on the part of the patient readily comprehensible. But I cannot so easily understand why the surgeon should be expected to regard this sentiment or, indeed, the function itself with reverence. I am strongly disposed to agree with a medical man who writes me, "When a man in advanced years suffers severely from the disabilities and dangers caused by an enlarged prostate, it is difficult to understand why the preservation of a sexual function which has become useless to humanity and a constant menace to his own comfort and safety should be considered as an especially sacred duty."

I hope that this operation will occasionally, at least, be considered at this stage when some operation is for the first time clearly indicated and justified, and when all operations would be

[1] ANNALS OF SURGERY, August, 1893.

attended by better results than if done later. It would then come in competition with,—

(3) *Over-Stretching of the Prostatic Urethra.*—This procedure is not likely to be followed by good results in cases in which the median lobe and the vesical neck are chiefly concerned. In those of lateral hypertrophy, in which the urethra is simply narrowed, and is narrowed and rendered tortuous, it might be of use. If it is tried it should certainly be conducted under ether, and should be carried to the furthest degree consistent with safety. This operation may be said to be indicated (tentatively or experimentally) in those cases in which palliative treatment has failed and more radical measures are declined. Its results are doubtful. There should, of course, be almost no mortality; but, on the other hand, nothing like a cure could be anticipated.

(4) *Perineal prostatotomy*, with prolonged drainage or the formation of a permanent fistula, will undoubtedly be preferred in many cases. Its mortality is only about 4.5 per cent. It often relieves the cystitis and will sometimes effect a cure,—*i.e.*, after withdrawal of the tube, or after cessation of the vesical irrigations through the wound, the latter will close and there will be no return of obstructive symptoms. The precise mode by which it acts has not been demonstrated, but it seems probable that it is a combination of mechanical dilatation of the channel with a certain amount of cicatricial contraction in the substance of the gland, reducing its bulk in the immediate vicinity of the urethra and thus diminishing its obstructive power.

I wrote, in 1893,[1] "The operation should be regarded as that of choice in all those cases in which, with marked diminution of expulsive force and with cystitis, there are also evidences of wide-spread degenerative changes or of distinct renal disease, and toxæmia and general feebleness are present. It is also to be preferred, as a rule, even in the absence of renal or constitutional symptoms if the bladder is rigid and contracted, and will hold only a few ounces of urine, or if the atony is nearly absolute and does not tend to improve under careful treatment." It must be

[1] ANNALS OF SURGERY, August.

said, however, that its proper place is among palliative operations; that in the majority of cases the fistula must be kept open throughout life; and that it will often refuse to close even when it is desired that it shall do so. The inconvenience of this condition, and the undoubted risk of renewed vesical infection attending a permanent fistula (which will often suppurate continuously), seem to me to compare very unfavorably with the results obtained in the average cases of castration. If the latter operation were done under the same circumstances as perineal prostatotomy, its mortality would probably be less and its results as regards re-establishment of function infinitely better.

(5) *Suprapubic cystotomy with prolonged drainage or with the formation of a permanent fistula* has a mortality but little greater than the previous operation, gives equally good drainage if properly performed, and has the advantage of permitting a more thorough exploration of the bladder and of being converted into a prostatectomy if the condition warrant it. It offers no prospect of cure, however, is altogether inapplicable to cases with small rigid bladders, and even with Buckston Browne's excellent apparatus, or with McGuire's or Morris's ingenious modification of the operation, the patient's person and clothing are apt to be urinous and offensive, and there are many minor inconveniences.

I believe that, with the "sentimental" objection put aside, there is little to be said in favor of the operation as compared with castration.

(6) *Perineal Prostatectomy*.—The chief clinical indications for this operation may be said to be those already enumerated as justifying prostatotomy, which may always be converted into a prostatectomy if the perineal distance permits the growth to be reached by the finger, and it is found to be of small size and limited to the median line posteriorly, or pedunculated and acting like a ball-valve at the neck of the bladder. The chief objections to the method as a formal procedure, when a radical operation has been determined upon, are that in only about one-third or one-fourth of the cases (Watson, McGill) could the growth be reached by the finger of the operator; that often, even when

accessible to the finger, it cannot be satisfactorily dealt with through the narrowed urethra; and that vesical projections are altogether beyond reach for accurate or careful manipulation. It has a mortality of 14.3 per cent., and on that account and on account of the comparative uncertainty of results should, I think, be only exceptionally employed, and will not often be weighed in the scale with castration. The practical advantages certainly seem to rest with the latter operation.

(7) *Suprapubic Prostatectomy.*—Of this operation I wrote in 1893[1] that it was "the operation to be preferred in all those cases in which, palliative treatment having failed, there are unmistakable indications that the local conditions are growing worse, the general health remaining as yet unaffected. The best possible period is that before the development of marked and continuous cystitis, while some power still remains in the vesical walls, and the bladder is neither thinned and dilated nor rigid and contracted. Under these circumstances, in the presence of a patient who reports that he is disturbed at night with increasing frequency; that he is obliged to use the catheter oftener, and not only does so with greater discomfort but with less relief in the interval; that the urine is occasionally turbid and offensive; that he has recently had one or more attacks of retention, and that he is beginning to lose flesh and appetite, it appears to me that the indications for operative interference are unmistakable, and that the suprapubic method is obviously the one to be selected."

Is this true to-day? If the operation of castration holds its own, it will be because it has manifest advantages over the one we are now considering. I believe that those advantages exist and are as follows: (*a*) The mortality of the first extensive series of suprapubic prostatectomies published was 25 per cent. The mortality of my table of a slightly larger number of cases is 18 per cent., including every known death even when it occurred months after operation. The true mortality, as I have already said, I believe to be about 7 per cent. The death-rate will be lower in the future in both operations, but the proportional difference in favor of castration will probably persist or increase, as castration

[1] Loc. cit.

is a simple, easy, rapid procedure, without danger *per se*, and requiring for its safe performance only a proper selection of cases. It seems to me not unfair to add that in the present instance the facts have been obtained largely by personal solicitation, and that unfavorable cases have not been suppressed. (*b*) The return to local and general health in the successful cases has been more complete and vastly more rapid than after prostatectomy. A re-establishment of almost perfect health appears to have occurred in fifty-one cases (51.2 per cent.[1]) within from four to twelve weeks. (*c*) Vesical contractility was re-established, cystitis disappeared, and all pain ceased in such a large proportion of the successful cases that it seems unlikely that any operation which opens the bladder and necessitates healing by granulation will secure equivalent results; certainly suprapubic prostatectomy has not yet done so. (*d*) A permanent fistula may follow suprapubic prostatectomy and prove a continual source of annoyance even when all the other results have been favorable. (*e*) It is too soon yet to compare the relative dangers of relapse. Case 81 (Souchon) is, however, interesting in this respect. The patient had been taught to use the catheter for himself after a suprapubic prostatectomy in October. In February he returned because the introduction of the instrument had become impossible. Although more than 70 per cent. of the cases of castration in the table had been observed for over three months, in not a single one did relapse occur.

I concluded my paper in 1893 with the remark "that if we ever reach a point in certainty of knowledge in this direction comparable to that already attained in regard to oöphorectomy in relation to uterine fibroids, and can promise equivalent results, there will be no lack of cases willing to submit to an operation almost painless, with a low mortality, and followed by no such unpleasant conditions as accompany persistent fistulous tracts, either suprapubic or perineal, even although the operation carries with it the certainty of sacrificing whatever sexual power has survived the excessive and often intolerable sufferings of such patients."

[1] Exclusive of Moullin's ten cases.

I find that Greig Smith[1] says that the general mortality of oöphorectomy for myomata is somewhere near 10 per cent. He adds, "As to the results, we may, in every thirteen cases of recovery after operation, reckon upon complete cure,—*i.e.*, shrinking of the tumor and menopause, in ten cases, improvement in two, and failure in only one." An examination of the table of castrations shows that with that as a basis we may in every thirteen cases of recovery count upon eleven being complete cures in the sense of shrinking of the tumor, one being improved, and one being unsuccessful.

The analogy which I have always thought so remarkable between the two conditions and the indications for operation is thus even more strikingly illustrated by the results of operation; and the number of cases already reported amply justifies the prophecy I ventured to make in regard to the willingness of patients to be operated upon.

Part III.

(1) *Unilateral Castration.*—A number of observations have been recorded from time to time seeming to show the same sort of relation between a single testicle and the corresponding lobe of the prostate that has now been demonstrated to exist between both testicles and the entire gland.

Godard[2] long ago showed that if a testicle undergoes an arrest of development, or if its migration is incomplete, the prostatic lobe and seminal vesicle of the affected side undergo atrophy. Others (Lennox, Watson) have made the same observation, and it is now quite clear that there is a definite relation or sympathy between each testicle and the lateral lobe of the prostate and the seminal vesicle on the corresponding side. A few illustrative cases will suffice.

Bezançon[3] has recorded a case which is of special value because it was possible to make a full histological study of the

[1] Abdominal Surgery, Second Edition, p. 187.

[2] Études sur la Monorchidie, Paris, 1857.

[3] Étude sur l'Ectopie testiculaire du jeune âge et son Traitement. Thèse de Paris, 1892.

prostate. Launois's[1] abstract shows that in a man twenty years of age, with an undescended and atrophied testicle, situated in the left iliac fossa, there was atrophy of the prostate and seminal vesicle on the same side. The patient died of pulmonary tuberculosis. The atrophy was of sufficient extent to be easily noticeable by sight and touch. The microscope showed it to be most marked as to the glandular tissue. Launois reports a similar case in a man forty years of age. He also records a case of one-sided atrophy of the prostate corresponding to a testicular atrophy following a number of attacks of gonorrhœal orchitis. Much similar evidence might be adduced, but a brief study of the literature is convincing as to the possibility of influencing one side of the prostate by castration on the same side. These facts led me to write to the *Medical News* (February 9, 1895), asking for information from surgeons as to the effect of unilateral castration upon the total bulk of the prostate. I remarked that existing evidence was scanty, but seemed to point clearly to one-sided atrophy of the prostate as a common result of the removal of one testicle and that some experiments which I was making on dogs corroborated this view, as did the observed condition of the prostate in monorchids. I added, "If it is found that the diminution in size extends to the other lobe, or if the shrinking of one lobe will in any large proportion of cases remove or lessen the mechanical obstruction to urination, the operation might at once be extended to a much larger number of patients and at an earlier and more favorable stage of the disease." Since sending this letter, the following communications have been published or have been received by me:

H. E. Clark[2] said that on February 25 he had performed unilateral castration in the case of a man sixty-five years of age, whose catheter history covered a period of five years. The patient had done well and was making a good recovery, but the time was too short to permit of changes in the prostate being noticed.

Mr. Fenwick[3] reported a series of interesting cases. In three

[1] Annales des Maladies des Org. Gen.-Urin., October, 1894.

[2] British Medical Journal, March 9, 1895.

[3] British Medical Journal, March 9, 1895.

cases of unilateral castration nothing definite was felt in two; in the third the prostatic lobe on the same side was larger than its fellow. In two cases of monorchidism there was one instance in which the prostate was smaller on the affected side and one in which that side was the larger. In six cases of extreme atrophy of a testis consecutive to inflammation there were two in which the prostate was symmetrical and four in which the larger lobe was on the same side as the atrophied testis. In nine cases of extreme atrophy (cause unknown), seven had both lobes of the prostate equal, one had a smaller lobe on the side of atrophy and one a larger lobe.

Mr. Fenwick adds, "I point out with some diffidence that these cases are mostly at variance with Dr. White's surmises. At the same time I am aware that rectal examination, however skilled, is as uncertain a guide to the activity of the prostate as it is unreliable for estimating the amount of urinary obstruction which may be present. Moreover, none of us know the normal shape of the prostate, for it varies with each decade and with each individual. Lastly, few seem to appreciate the fact that the prostate is often changed in rectal contour by posture, by vesical distention, and by excessive use."

The following letter was sent February 16, 1895, by Dr. W. G. Fulton, of Scranton, Pa., to the editor of the *Medical News*, and was kindly referred to me,—"Sir: In reply to the request by Professor White, in the *News* of February 9, for information concerning the effect of unilateral castration on the prostate, I have a case which may be of interest. In November, 1893, Patrick M. entered the Lackawanna Hospital suffering from a diseased testicle. He had also an enlarged prostate, and could pass his urine only by aid of a catheter which he had learned to use himself. On December 1, I removed the diseased testicle, and before leaving the hospital, January 13, he could urinate freely without the aid of an instrument. The prostate at that time had perceptibly diminished in size, but I did not observe that there was then any marked difference in the size of its two sides. I have not been able to see the case since."

Dr. H. W. Rand, of Brooklyn, wrote me that on examining the prostate of a patient, aged fifty-one years, whose right testicle had been removed for disease nineteen years ago, he found the right side of the prostate somewhat larger than the left.

Mr. Aslett Baldwin,[1] of the Middlesex Hospital, recorded the

[1] British Medical Journal, March 30, 1895.

result of an autopsy on a monorchid, aged forty-nine years, in which the prostatic lobe was only one-eighth inch smaller on the affected side than on the other.

Dr. P. C. Remondino[1] said that in four recent cases of unilateral castration for other diseased conditions in elderly subjects, two had had a well-pronounced prostatic enlargement, and in them the operation was soon followed by a remarkable diminution in size.

Dr. S. C. Graves, of Grand Rapids, Michigan, wrote me May 8, 1895, as follows: "On October 20, 1894, I removed the right testicle of a gentleman, aged twenty-four years, for syphilitic orchitis. I have examined his prostate, and find that the corresponding (right) side of the organ has undergone decided atrophy. The left side seems to be normal."

Mr. Charles Morton[2] publishes the following interesting communication: "Dr. J. William White[3] requests surgeons to report cases of unilateral castration in which examination of the prostate was made. On March 7, I removed from a young man, aged seventeen years, an imperfectly-developed right testicle, which was lying just over the pubes and was surrounded by a 'congenital hydrocele.' Probably it had been retained within the inguinal canal in childhood, and had thus failed to develop. It was in constant danger of pressure against the pubes, the hydrocele only filling when he moved about and disappearing again during recumbency. I removed the testicle and hydrocele sac together. Seven weeks after the operation, and when he came to show himself at the hospital on April 25, I examined the prostate and found most decided atrophy of the corresponding side. There was, indeed, nothing on the right side at all corresponding to the lobe on the left, which is very well developed. It is difficult to say whether this is due to the imperfect development or removal of the testicle. When we remember the rapidity with which atrophy has occurred in enlarged prostate after bilateral castration, it is quite possible that the small size of the right side in this case is due to atrophy following the operation, and I am inclined to think that this was the case, as, although the right testicle was much smaller than the left, yet it contained a fair amount of gland tissue which appeared normal in structure."

[1] British Medical Journal, April 6, 1895.
[2] British Medical Journal, May 11, 1895.
[3] British Medical Journal, March 2, 1895.

Dr. J. T. Haynes,[1] of Sandusky, Ohio, reports the case of a man, aged sixty-three years, with a hydrocele and a history of prostatic obstruction dating back for ten years. For several years he had to resort to catheterism. Tapping and injecting the hydrocele sac was followed by sloughing of the testicle and scrotum, for which unilateral castration was performed June 11, 1894. Dr. Haynes continues as follows: "The fourth day after operation the patient told the nurse that, much to his surprise, he had been able to pass some urine unassisted by the catheter. This condition gradually increased until the third week after operation, since which time he has not had the slightest difficulty in voiding his urine. He is to-day an inmate of the Home, enjoying the best of health, and perfectly free from dysuria or any complications resulting from operation. Rectal examination by finger shows a prostate gland much reduced in size, but possibly only atrophied on one side. I have given this case not to show any result as following the operation other than the effect produced upon the enlarged prostate, and, in honesty, I will admit that the atrophy of the prostate was not the point aimed at in the least in making the operation. But I am convinced of the beneficial effect to be derived from this procedure, and deem it, in all cases that will permit, the only course to pursue."

Dr. Haynes (Sandusky, Ohio) also sends me, May 25, 1895, the following interesting description of a recent case:

History.—Samuel H., aged seventy-two years; white; bachelor. Admitted to hospital of Ohio Soldiers' and Sailors' Home, August 13, 1894. Disability; hypertrophy of prostate associated with incontinence of urine and great vesical tenesmus during certain periods. In regard to past history, states that he has had gonorrhœa a great many times, and that he had syphilis during service in the late war. Has had frequent attacks of bladder trouble, and for seven or eight years has had gradually increasing difficulty in urination. States that at times physicians had failed to introduce catheter to relieve distended bladder.

Present condition is not good. Has pronounced valvular heart lesion and noticeable lack of good compensation; body fairly well nourished; odor of urine; examination of urine shows specific gravity 1021; no albumen; no sugar; pus found in large quantities and constantly present. By rectal examination prostate found to be exceedingly large, round, and the size of a lemon.

[1] Medical Record, May 11, 1895.

Treatment.—General condition of patient with condition of bladder and urethra received first attention. Strictures were dilated and bladder daily washed out with silver nitrate solution, which relieved to a considerable degree the vesical tenesmus and reduced in quantity the pus contained in the urine. Patient was told of operation for relief of hypertrophy and readily consented.

Operation.—August 22, 1894. Ether given without difficulty. Parts previously prepared for operation; were then washed with bichloride 1 : 1000. Incision about four inches. Entire scrotal contents of left side removed. Cord dissected up and tied. Wound closed by interrupted suture. Drainage. Iodoform dressing. Reaction good. August 24 dressings removed, but were a little soiled. Patient complained of pain at the internal abdominal ring, for which morphine was given.

Results.—August 27, dressings removed and drainage-tube removed; no pain to speak of; dressing as before. September 2. Dressings changed. Nurse stated that when patient stood he could make his urine much better than before operation. 8th. Dressing removed and scrotum placed in suspensory bandage. Patient urinates quite well at times, but occasionally is unable to void any. Examination per rectum shows prostate to be reduced in size and changed in form; no tenderness on pressure. 12th. Patient goes out walking; staying in ward but little. Rarely fails to urinate freely; states that he feels like a new man. Prostate becoming much smaller. 20th. No difficulty in urination. Prostate much reduced. Form rapidly assuming that of normal. Nothing more is known of the case, as patient left a few days after this and has never been heard from.

On February 20, 1895, I operated on a patient, aged seventy-four years, sent me by Dr. Black, of New Castle. The man had been suffering from obstructive symptoms for some years. He was markedly uræmic, passing only eighteen ounces of albuminous urine in the twenty-four hours. The urine also contained much blood and pus. Catheterism was difficult and painful. Urine began to flow through a soft instrument when the eye of the latter reached a distance of nine and a half inches from the meatus. By rectal examination the prostate seemed to be about the size of an orange. There were six ounces of residual urine. The patient had constant vesical tenesmus, and was attempting to use the catheter at such times as he aroused from his uræmic hebetude. His general condition was exceedingly unfavorable, and he and his family were strongly averse to complete cas-

tration. For these reasons I did a unilateral castration on February 20 in the presence of the class, expressing frankly at the same time my very unfavorable views as to prognosis, which had already been communicated to the family of the patient. The operation was completed in two minutes, and was done during the first stage of anæsthesia. Chloroform was used. Some improvement in the urinary condition was noticed on the fourth day, when he passed a large quantity of urine with more ease, and it was found that the residual urine was only two ounces.

But the uræmic symptoms gradually deepened, and the patient died comatose on the fourteenth day.

Autopsy.—Section of lateral half. (*a*) The side corresponding to the castration. The section marked *a* is filled with proliferated cells, both muscle and connective-tissue cells. Some parts of the field are more cellular than others, and where few cells are to be seen indicate the new connective tissue that is being transformed from the proliferated cells. There has been no special contraction of tubules, nor are they widely separated from each other. The tubules themselves are filled with small flat cells, and some still retaining in part their columnar shape; these are the original proliferated columnar cells which line the tubules.

The cells in the lumen of the tubules are filled with fine granular matter, which has not taken the stain.

Section of lateral half. (*b*) There is only a trace of the usual cell-proliferation in the stroma. In some of the tubules there is beginning proliferation of cells, but it has not advanced sufficiently to show much.

On March 1, 1895, Mr. B., a man aged seventy-two years, and weighing 215 pounds, came to see me on account of marked prostatic hypertrophy. He had all the typical symptoms, and was apparently just at the beginning of a break-down in his catheter life. His prostate was at least as large as a small orange and was symmetrical. He had a half-pint of foul residual urine. He had had one testicle removed by Dr. D. Hayes Agnew, in 1885, for suppurative disease. I recommended removal of the remaining gland, but have not since seen the patient.

Dr. R. W. Taylor, of New York (personal communication, May 29, 1895), has had two cases as follows:

An old gentleman with marked prostatic obstruction had a suppurating and sloughing testis. After the gland had disappeared there was distinct relief of all the most urgent prostato-vesical symptoms.

An elderly patient with a very large prostate, apparently almost filling the rectum, and with intractable cystitis, developed tubercular disease of one testicle, which resulted in its removal. The prostate soon afterwards was found to be much shrunken, the urine cleared up, and all the obstructive symptoms vanished.

Dr. Bryson, of St. Louis (personal communication, May 29, 1895), has seen two cases of atrophy and disappearance of one testicle, in one after an epididymo-orchitis, in the other after phlebectomy for varicocele. In the former, thirty-six years later, and in the latter, after eleven months, no difference could be observed between the two halves of the prostate.

Mr. Langton, at a recent meeting of the Clinical Society of London,[1] mentioned that many years ago, after removal of a senile tuberculous testis from a patient who also had enlarged prostate, that organ diminished in size on the corresponding side. Three years later the other testis was removed, as the tubercle had appeared in it, and this second operation was followed by diminution of the prostate on that side.

Mr. Gould[2] removed a tuberculous testis from a young man in 1893, and the second testis early this year. After the first operation there was no decrease of the prostate, but a great shrinking after the second.

It seems obvious that, in view of the contradictory character of the observations above recorded, no safe deductions can be drawn from them at this time as to the practical value of unilateral castration in cases of prostatic enlargement. The clinical history of the cases of Dr. Fulton, Dr. Remondino, Dr. Haynes, and Dr. Taylor, and the microscopic evidence in my case, together with the slight but unmistakable improvement in urination in the latter patient, seems to encourage the idea that in a minority of cases this operation will be followed by enough atrophy of the prostate to mitigate the obstructive symptoms. This view is favored by the observations of Dr. Graves and Mr. Morton, and by the unmistakable one-sided atrophy observed in monorchids, and in some cases of acquired disease causing atrophy of one testicle. It is opposed

[1] Quoted in Medical Record, June 1, 1895.
[2] Ibid.

by the observations of Mr. Fenwick, Mr. Baldwin, and Dr. Bryson.

Some experimental evidence was obtained during an investigation into the effect of ligation or section of various constituents of the cord. In some cases the testicle on one side sloughed or atrophied, while the other remained sound. The prostate, however, did not vary regularly with the testicle, but in some cases showed no change at all; in others marked and general atrophy comparable to that caused by double castration. On the whole, it may be said that the evidence in favor of the operation warrants further investigation into its merits or demerits, but that it seems probable that the results, even though occasionally favorable, will be slow and uncertain compared with those following the bilateral operation.

(2) *Ligation or Section of the Vas.*—At the meeting of this association, in 1893, it was suggested (Dr. Mears) in the discussion that followed my paper that perhaps ligation of the vas deferens might be as efficacious as double castration. In an interesting communication Mr. Reginald Harrison[1] briefly reported a case of prostatic enlargement, in which, after declining to castrate the patient, who had importuned him to do so, he had, "as a compromise," divided the vasa deferentia subcutaneously immediately below the external abdominal rings. The patient thought he derived some benefit from the operation in a short time. Six or seven years later he was alive and well.

Curling discusses at length the effects upon the testes of deficiencies or imperfections of the vas deferens. (Diseases of the Testis, Chapter I, Section II.) He shows from observations of Hunter (1775), Cooper (1823), himself (1842), Gosselin (1853), Godard (1857), and others, that the vas may be obliterated from birth, or may become so from injury or disease without, as a rule, interfering with the development or the apparent health of the testicle. He says, "The engorgement of the seminal ducts with sperm is liable, it is true, to cause inflammation of the testicle, which may end in atrophy, but this is only a secondary and, indeed, a rare effect of the interruption in the excretory duct."

[1] British Medical Journal, September 23, 1893.

Griffiths [1] has recently confirmed these observations by experiments upon young dogs. He details the results in four cases and sums up as follows: "Accordingly, when the vas deferens is ligatured in puppies there is no immediate result either upon the epididymis or testicle; nor is the growth of the latter in any way interfered with,—that is to say, the ligature of the duct does neither hasten nor retard the growth of the gland, and the testicle acquires its maturity both of structure and function just as if the duct had been left alone in its natural and previous state. Again, when the vas deferens is ligatured in full-grown dogs there occurs enlargement of the epididymis, with tenderness. This enlargement in part subsides, leaving it, together with the portion of the duct up to the seat of ligature, permanently enlarged from the accumulation of semen. The structure of the seminal tubules remains unaltered, and they are after a few days or a few months just the same, showing the active formation of spermatozoa, like those of the normal testis, the duct of which is left natural and undisturbed; therefore ligature of the vas deferens induces a slight enlargement of the epididymis and of the vas deferens up to the seat of ligature, but it does not interfere in any way with the structure of the seminal tubules or the production of spermatozoa."

In two other cases, however, the testicle showed structural changes, atrophy of tubules, disappearance of normal epithelium, absence of any traces of the formation of spermatozoa, etc. One of these cases was that of a hound eight to nine years old. The other was that of a man, aged twenty-one years, who had had the vas accidentally divided six weeks previously. Mr. Griffiths thinks it probable, in the light of his other experiments and of those that preceded his, that in these two instances some damage was done to the other structures of the cord.

In none of the foregoing investigations was any special attention paid to the condition of the prostate. I accordingly, during the month of January, 1895, with the help of Drs. Wood and Kirby, made a number of experiments upon dogs with a view to determining whether or not any practical benefit was

[1] Lancet, April 13, 1895.

likely to result from the procedure we are considering. The report of Dr. Kirby on the microscopical sections, taken after different periods of time, was as follows:

Dog No. 19.—Double ligature of the vas, without section, on both sides. Dog died on the eighth day. Weight of the animal, 10.850 kilos; weight of prostate, 9.070 grammes; about the normal weight for the prostate. Testicles apparently normal.

Microscopical Examination.—Little if any change can be noted in the prostate. It seems about normal. Possibly there is some cellular proliferation of the stroma. The time was evidently too short to demonstrate atrophic change. The testicles are not yet examined.

Dog No. 17.—Double ligature of vas, without section, on both sides. Dog died ten days after operation. Weight of the animal was 10.231 kilos; weight of the prostate. 4.310 grammes; showing a loss of weight in the prostate of 4.560 grammes. Testicles apparently healthy when removed from the animal.

Microscopical Examination.—Prostate.—There has been considerable proliferation of the connective and muscle cells, but only a small amount of fully-formed connective tissue has resulted. As a consequence the tubules are not so widely separated from each other. There is a proliferation of the cells of the tubules, the latter being lined by three or four layers of these cells. The cells are becoming flattened and in some parts of the field are undergoing fatty degeneration, as shown by the granular *débris* in the tubules.

Testicle.—In the testicle there has been a round-celled proliferation with no special change in the intertubular stroma. Some of the cells of the tubules are filled with fine granules (fat), and considerable granular material can be seen in the tubules showing that some of the cells have already undergone fatty metamorphosis.

Dog No. 20.—Double ligature of the vas, without section, on both sides. Dog killed on the twenty-fifth day. The weight of the animal was 15.419 kilos; the weight of the prostate was 6.630; showing a loss of weight in the prostate of 6.370 grammes. Both testicles were apparently sound when removed from the animal, but at the time of the preparation of this paper were not ready for the microtome.

Microscopical Examination.—Prostate.—There is a beginning proliferation of both the connective tissue and muscle cells, but as

yet they have not been fully transformed into true connective tissue; although in some parts of the field the spindle cells are disappearing and but few are to be seen. The tubules have contracted, are somewhat smaller than normal, and in most of the section are filled with the same proliferated columnar cells, but which have been transformed into the small, flat, cuboidal-shaped cells. Only a few spots of fatty degeneration can be made out in the tubules.

Dog No. 6.—Vas cut between ligatures on both sides. Dog killed on the thirty-third day. The weight of the animal was 13.605 kilos; the weight of the prostate 2.480 grammes; showing loss of weight in the prostate to be 10.520 grammes. Testicles apparently healthy when removed from the animal.

Microscopical Examination—Prostate.—The stroma of the gland is made up largely of fully-formed connective tissue, in which may be seen some small spindle-shaped cells. In other parts of the gland there is still evidence of marked proliferation of the connective tissue and muscle cells. In those parts of the field where the connective tissue predominates, the tubules are contracted and somewhat irregular in shape. The tubules themselves are filled with the proliferated columnar cells, which have become flat and cuboidal in shape, and fatty degenerated cells very difficult to make out; only a small amount of granular material is to be seen in the tubules.

Testicles.—Very little, if any, change is to be seen in the testicles.

Dog No. 7.—Double ligature of vas with section on both sides. Dog killed on the thirty-seventh day. Weight of dog 9.977 kilos; weight of prostate was 1.010 grammes; loss of weight in prostate was 4.656 grammes. Testicles were not ready to cut.

Microscopical Examination—Prostate.—There has been a great proliferation of the pre-existing connective tissue and muscle cells, and in some parts these cells have given way to the new-formed connective tissue, so that we find between the tubules broad bands of fibrous tissue running between and surrounding them. In those parts of the field where the connective tissue is mostly found only a few cells (spindle-shaped) are to be seen. The tubules are contracted and somewhat irregular. The lumen of the tubules is filled with these proliferated columnar cells, which have become cuboidal in shape, some are granular in character, while others have entirely disappeared, leaving only a fine granular *débris* as a mark of their former existence.

Dog No. 16.—Ligature of vas (two ligatures without section)

on both sides. Dog killed on the fifty-second day. Weight of the animal 22.222 kilos; weight of the prostate 4.350 grammes; showing a loss of weight in the prostate of 14.650 grammes. Testicles were apparently healthy when removed from the animal, but could not be cut in time for this paper.

Microscopical Examination—Prostate.—There is beginning rapid proliferation of the muscle and connective-tissue cells. Long chains of these proliferated spindle cells may be seen between the tubules in various parts of the gland. In other parts of the field the cell elements of the stroma have in part disappeared, and have been replaced by connective tissue, in which may be seen a few spindle-shaped cells. The tubules are considerably smaller than normal and quite irregular in outline. They are filled with these fatty cuboidal-shaped cells. In the lumen of some of the tubules fatty *débris* is observed.

Dog No. 18.—Double ligature of the vas on both sides without section. Dog killed on the fifty-second day. Weight of dog 19.300 kilos; weight of prostate 7.450 grammes; showing a loss of weight in the prostate of 11.650 grammes. Testicles when removed from the animal were apparently healthy.

Microscopical Examination—Prostate.—There has been great proliferation of the connective tissue and muscular elements. In some parts of the field there are large amounts of fully-formed connective tissue, in which may be seen a few spindle-shaped cells (connective-tissue cells). The tubules are filled with the proliferated columnar cells; some have undergone fatty metamorphosis, as shown by the granular material. In other tubules the proliferation has not gone far enough for beginning fatty change.

These results have been a surprise to me. Mr. Griffiths's paper was not published when the experiments were made, but the conclusions of Curling have never been disputed, and are doubtless correct. Indeed, as will have been observed, there are comparatively few changes in the testicles themselves. There was, however, a constant loss of weight in the prostate in every dog that died after eight days. Even at ten days this loss is perceptible. In the dogs which were kept for fifty-two days the atrophic changes are unmistakable, and they are to be found in

nearly every section. If these results are reliable it will certainly be worth while to investigate still further the effect of obliterating the vas, although outside of these experiments there would seem to be every theoretical reason to agree with Griffiths, who says, "With regard to the suggestion made by Mr. Reginald Harrison of division of the vas deferens in cases of enlarged prostate, I have not sufficient experience to arrive at a conclusion; but, seeing that obliteration of the vas deferens has so little effect upon the structure and secretion of the testis, it must be doubtful whether the operation will suffice to influence the enlargement of the prostate."

Possibly I have wounded other structures in exposing and tying the vas, but I was very careful and the operation is easy.

It may well be that the whole effect upon the prostate caused by the removal of the testicles is exerted through the medium of the nervous system. It would be easy to make a strong argument in favor of this view basing it on well-known physiological facts. And it may also be that in tying or cutting the vas certain nerves, more potential than others, are included or are themselves divided. In the dog they are all small and difficult of recognition without an extensive dissection.

I wanted to tie or divide the nervous constituents of the cord alone and in a separate series of experiments, but the difficulty of finding them all and of avoiding damage to other structures was so great that I gave up the idea after some trials. Still, I should think it feasible and hope to make the attempt at some future time.

Dr. King, of Toronto, has, in two experiments on dogs, had results from dividing the vas precisely similar to those I have detailed, a fact which increases my confidence in my own experiments.

(3) *Ligation of Vascular Structures of Cord.*—The following reports explain themselves: the changes here were less unexpected, but in two cases, as might also be expected, the testicles sloughed, and in the third the epididymes were necrotic.

Dog No. 9.—Ligation of spermatic and deferential arteries on both sides. Dog killed at the end of the tenth day; weight of animal was 15.873 kilos; weight of prostate was 4.510 grammes; average loss of weight in the prostate was 8.490 grammes. The testicles were apparently of the normal size when removed from the animal, but the epididymes appeared to be gangrenous.

Microscopical Examination—Prostate.—In this section some parts of the field are very cellular and apparently in that part of the gland in which the muscular tissue predominates, while that part between the tubules has been converted into true connective tissue with only a few spindle-shaped cells to be seen. Some of the tubules are greatly contracted in these connective-tissue areas and filled almost entirely with a fine granular *débris*, which has come from the fatty, degenerated, proliferated columnar cells lining the tubule. In other parts of the field the tubules may be seen filled with these cuboidal cells which, as yet, are not far advanced in the fatty change.

Microscopical Examination—Testicles.—There seems to be an increased amount of connective tissue between the seminal tubules, but very few cells are to be seen. The tubules themselves are filled with proliferated small, round cells which are in an advanced stage of fatty degeneration.

Dog No. 5.—Ligature of spermatic and deferential artery on both sides. Dog killed at the end of the nineteenth day. Weight of animal 38.547 kilos; weight of prostate 12.450 grammes; showing the loss of weight in prostate to be 18.550 grammes. Both testicles had sloughed away. The animal was very old.

Microscopical Examination—Prostate.—In some parts of this section the stroma is quite cellular owing to the proliferated connective tissue and muscle cells, while in other parts of the field the cells seem to have disappeared to a considerable extent, giving place to a connective tissue in which may be seen a few spindle-shaped cells. This is noticeable in those parts of the field where the tubules have undergone contraction. The tubules are lined with three or four rows of these same small flat cells, which are the proliferated columnar cells, and in some parts of the field they entirely fill up the lumen of the tube and are undergoing fatty metamorphosis.

Dog No. 4.—Ligation of the spermatic artery and veins in both cords. Dog killed at the end of thirty-four days. Weight of animal

29.024 kilos; weight of prostate 3.100 grammes, showing a loss of weight in the prostate of 26.900 grammes, Testicles sloughed away.

Microscopical Examination—Prostate.—There is a beginning proliferation of the connective-tissue cells, and much more of the muscle cells, but only a small amount of new connective tissue has been formed. As a result there is but little change in the size of the tubules in many parts of the field; where the connective tissue exists there has been some contraction. There has been some proliferation of the columnar cells lining the tubules; in some parts of the field they are beginning to take on the cuboidal shape, while in other parts of the field they have not entirely lost their columnar outline. Some of the cells of the tubules appear to be granular in character, while others have undergone fatty degeneration, as shown by the fine granular material in the lumen of the tubules.

It may be doubted whether any practical advantage would be gained by adopting this procedure. It would scarcely meet the sentimental objections, as the testicles would be lost finally, at any rate, not only functionally but actually. The same remark applies to the next group.

(4) *Ligation or Section of the Entire Cord.*—This was done subcutaneously, and by the open method, with and without section of the cord between the ligatures. The results follow:

Dog No. 13.—Ligature of the entire cord; one ligature without section and on both sides. Dog killed at the end of sixteen days. Weight of animal 10.231 kilos; weight of prostate 3.800 grammes. The average weight of the prostate in dogs of 10 kilos. is 8.666 grammes, showing an average loss of weight in the prostate of 4.866 grammes. One testicle had sloughed away.

Microscopical Examination—Prostate.—There is beginning rapid proliferation of the connective tissue and muscle cells. Great chains of these proliferated spindle-shaped cells being seen between the tubules in various parts of the gland. In some parts of the field the cell elements of the stroma have in part disappeared, giving place to connective tissue, in which only a few spindle cells can be seen. This change can be especially seen around the small and contracted

tubules. The tubules are somewhat smaller than normal, but not so irregular in shape as in the other specimens. They are filled with three or four layers of these small, flat, cuboidal cells. Some are granular in character, and the lumen of the tubes is filled with fatty, broken-down, columnar cells.

Microscopical Examination—Testicles.—The tubules of the testicle are filled with large quantities of fatty, degenerated and broken-down cells. A beginning proliferation of the connective-tissue cells in the intertubular tissue is observed.

Dog No. 1.—Subcutaneous ligature of both cords. Dog killed on the sixteenth day. Weight of dog 6.803 kilos; weight of the prostate 4.565 grammes. Testicles were large pus-cavities, so could not be cut.

Microscopical Examination—Prostate.—The stroma in this section is quite cellular from the proliferated connective tissue and muscle cells. Fully-formed connective tissue is not present to any great extent. The tubules are contracted somewhat and filled with the proliferated cuboidal cells. Some of the tubules are filled with these cells with beginning fatty degeneration, as shown by the granular *débris*. In some parts of the field the muscle-fibres can be seen gradually being transformed into connective tissue.

Dog No. 3.—Subcutaneous ligature of both cords. Dog killed at the end of twenty-one days. Weight of dog 13.152 kilos; weight of prostate 4.040 grammes. The average weight of the prostate in dogs from 13 to 15 kilos. inclusive is 13.000 grammes, showing a loss of weight in the prostate of 8.960 grammes.

Microscopical Examination.—Prostate.—There has been considerable increase in the intertubular connective tissue; a proliferation of the pre-existing connective-tissue corpuscle. In some parts of the field very few connective-tissue cells are to be seen in the intertubular tissue, having probably disappeared by fatty degeneration, leaving some fibres of connective tissue, followed by contraction of the tubules. The tubules themselves are somewhat contracted and irregular in shape, usually filled with the lining columnar cells. The cells on the basement membrane are very small, cuboidal in shape, often irregular and flat. The central proliferated epithelial cells can be seen in beginning granular degeneration.

Microscopical Examination.—Testicles.—The seminal tubules are filled with a mass of irregular-shaped cells and granular matter, evi-

dently fatty degenerated cells, and there is in some parts of the field a proliferation of cells in the intertubular connective tissue; in some parts small bands of fibrous tissue are to be seen between the tubules. The lining cells are very flat and irregular.

Dog No. 14.—Cord ligated with one ligature on both sides, open method. Dog killed on the sixteenth day. Weight of animal 7.029 kilos; weight of prostate .460 gramme. Average loss of weight in prostate was 5.490 grammes, assuming 5.950 grammes to be the average weight of the prostate for dogs of 7 kilos weight. Testicles had sloughed away.

Microscopical Examination—Prostate.—There has been considerable proliferation of the pre-existing muscle and connective-tissue cells, especially seen in that part of the field which is composed of the muscular elements.

In the intertubular tissue these proliferated cells have disappeared in part, leaving here and there broad bands of pure connective tissue in which may be seen the usual spindle-shaped cell.

The tubules themselves are small and contracted, however, more or less regular in outline, filled in most parts of the field with these small cuboidal-shaped cells, which are the proliferated columnar cells lining the tubules. Some of these cells have a decided granular appearance (fat), while others have entirely disappeared, as shown by the granular *débris* in the lumen of the tubules (fatty degeneration).

Dog No. 2.—Subcutaneous ligature of the entire cord on both sides. Dog killed on the twenty-first day. Weight of dog 7.369 kilos; weight of prostate 1.790 grammes. The average weight of the prostate in dogs of 7 kilos is 4.950 grammes, showing a loss of weight in the prostate of 2.370 grammes.

Microscopical Examination.—Prostate.—The stroma in this section is extremely cellular, owing to the proliferation of the connective-tissue cells and of the unstriped muscle-fibre cell. In other parts the field is made up of large amounts of connective tissue with a few spindle-shaped cells here and there, surrounding a few isolated gland tubules. The tubules themselves are in some parts of the field filled with the same small cuboidal cells, while in others three or four rows deep line the basement membrane. In some the proliferation has gone on to such an extent as entirely to block up the lumen of the tubules. Some of the tubules are filled with granular material (fatty

degenerated cells). In other parts of the field the muscle fibres can be seen in gradual transformation into the predominating connective tissue.

Microscopical Examination.—Testicles.—The seminal tubes are lined with four or five rows of irregular-shaped cells and proliferated cells, in some parts of the field almost entirely filling up the lumen of the tubules. In other parts of the field considerable granular matter is seen (fatty degeneration of the proliferated cells which lined the tubules). Many of the cells are filled with granular particles. The intertubular connective tissue shows proliferated connective-tissue cells in a few spots, but is otherwise unchanged.

Dog No. 15.—Both cords ligated with one ligature without section. Dog killed at the end of thirty-one days. Weight of animal 10.231 kilos; weight of prostate .980 gramme; showing a loss of weight in the prostate of 7.646 grammes. Both testicles had sloughed away.

Microscopical Examination—Prostate.—There has been great proliferation of the connective tissue and the muscle cells between the tubules; chains of these spindle-shaped cells can be seen running between the tubules, while in other parts of the field the cell elements of the stroma have in part disappeared, giving place to connective tissue in which only a few spindle-shaped cells can be seen. The tubules themselves are somewhat contracted, filled with masses of these proliferated cuboidal cells, which here and there have undergone fatty degeneration, and appear as a fine granular *débris* in the lumen of the gland tubules.

Dog No. 12.—The entire cord on both sides cut between ligatures. Dog killed on the thirty-first day. Weight of animal 14.866 kilos; weight of prostate 3.200 grammes; loss of weight in the prostate 9.800 grammes. Both testicles had sloughed away.

Microscopical Examination—Prostate.—In this specimen the cell elements of the stroma—namely, the proliferated connective tissue and muscle cells—have almost entirely disappeared, giving place to connective tissue. The gland tubules are widely separated from each other by the new connective tissue. They are very much contracted and irregular in shape, in some parts of the field filled with these small proliferated cuboidal cells, while in other parts of the field these have undergone fatty metamorphosis and appear as granular material in the lumen of the tubules.

Dog No. 11.—Cord cut between ligature on both sides. Dog killed on thirty-first day. Weight of dog 19.028 kilos; weight of prostate 4.730 grammes; loss of weight of prostate was 14.270 grammes. Testicles sloughed away.

Microscopical Examination—Prostate.—There has been great proliferation of all the cellular elements throughout the entire gland. This can especially be seen in the non-glandular parts of the gland. In the intertubular tissue the proliferated cells have almost entirely disappeared in some parts, having been converted into a true connective tissue, in which may be seen a few spindle-shaped cells.

As a result of this new-formed connective tissue the tubules themselves have undergone contraction and atrophy.

The true columnar cells have undergone proliferation, and, as a result of contraction, they have been changed into small cuboidal-shaped cells, which, in most parts of the field, fill up the entire lumen of the tubule. Some of the tubules show empty spaces filled with granular matter (cuboidal cells which have undergone fatty metamorphosis).

Dog No. 10.—Entire cord cut between ligature on both sides. Weight of dog 24.036 kilos; weight of prostate 2.490 grammes; loss of weight of prostate 18.510 grammes, taking the average weight of the prostate in dogs of 24 kilos. as 21 grammes. The testicles had entirely sloughed away. Dog killed at the end of sixty days.

Microscopical Examination—Prostate.—In this specimen the stroma is extremely cellular, being filled with immense numbers of spindle-shaped cells, which are the proliferated connective-tissue cell and muscle cells. In some parts of the field these cells have given away almost entirely to the connective-tissue element. The muscular elements have almost lost their identity as fibres and have been converted into bands of connective tissue.

The tubules themselves are small, contracted, irregular in shape, and widely separated from each other by the new connective tissue. They are filled up with the proliferated columnar lining cells, irregular in shape, and not unlike lymphoid cells as regards their outline. Some of them are filled with granular material, showing that fatty degeneration has taken place.

The results as regards the prostate in these cases are as

unmistakable as though a primary double castration had been done. I took many antiseptic precautions during the operations, but it will be noticed that even in those animals whose cords were tied subcutaneously, the testicles never underwent a quiet atrophic process, but invariably sloughed. It might be possible to get better results in that direction in human beings.

SUMMARY.

The conclusions which seem to me warranted by the arguments used and the facts set forth in the foregoing pages are as follows:

(1) The function of the testis, like that of the ovary, is twofold,—the reproduction of the species, the development and preservation of the secondary sexual characteristics of the individual. The need for the exercise of the latter function ceases when full adult life is reached, but it is possible that the activity of the testis and ovary in this respect does not disappear coincidently, and that hypertrophies in closely-allied organs like the prostate and uterus are the result of this misdirected energy. This hypothesis would increase the analogy between the fibromyomata of the uterus and the adeno-fibromata of the prostate, which, from a clinical stand-point, is already very striking, and is further strengthened by the almost identical results of castration in the two conditions.

(2) The theoretical objections which have been urged against the operation of double castration have been fully negatived by clinical experience, which shows that in a very large proportion of cases (thus far in approximately 87.2 per cent.), rapid atrophy of the prostatic enlargement follows the operation; and that disappearance or great lessening in degree of long-standing cystitis (52 per cent.); more or less return of vesical contractility (66 per cent.); amelioration of the most troublesome symptoms (83 per cent.); and a return to local conditions not very far removed from normal (46.4 per cent.), may be expected in a considerable number of cases.

(3) The deaths have been twenty in 111 cases, a percentage of 18. But of these there seem to be thirteen that may fairly be excluded in an attempt to ascertain the legitimate mortality in patients operated upon under surgically favorable conditions,—*i.e.*, before the actual onset of uræmia or, better, before the kidneys have become disorganized by the two factors rarely absent in advanced cases,—backward pressure and infection. This would leave a mortality of 7.1 per cent., which will probably be decreased as advancing knowledge permits of a better selection of cases. It is important to note that even in the desperate cases which make up this series of deaths, fifteen (75 per cent.) showed improvement of symptoms or shrinkage of the prostate before they died.

(4) Comparison with other operative procedures seems to justify the statement that, apart from the sentimental objections of aged persons on the one hand, and the real, entirely natural, and very strong repugnance to the operation felt by younger patients, castration offers a better prospect of permanent return to nearly normal conditions than does any other method of treatment. The relatively greater degree of improvement in successful cases should be considered, as well as the mortality, in comparing the operation with the various forms of prostatotomy and prostatectomy. So, too, should the absence of any risk of permanent fistulæ, peritoneal or suprapubic, the ease and quickness with which the operation can be performed; and the possibility of avoiding altogether the use of anæsthetics which, in these cases, are in themselves dangerous.

(5) The evidence as to unilateral castration is at present contradictory, but there can be no doubt that in some cases it is followed by unilateral atrophy of the prostate, and in two cases, at least, it has resulted in a very marked improvement of symptoms. It is worthy of further investigation.

(6) My experiments on dogs have shown in nearly every case in which the vas deferens was tied or divided on both sides, that, without much change in the testicles, there were beginning atrophy and considerable loss of weight of the prostate. These

experiments need repetition and confirmation, as the absence of corresponding testicular change seems to make the results somewhat anomalous. It is possible that the inclusion or severance of small but important nerves may account for the effect on the prostate.

(7) Ligation of the vascular constituents of the cord, or of the whole cord, produces atrophy of the prostate, but in my experiments only after first causing disorganization of the testis.

No.	Operator.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
1	Andrews, Chicago.	June, 1894.	Tri-State Med. Journ., Mar., 1895.	75	. . . . .	Power of erection had nearly ceased.	Severe and continued.	. . . . .	20 years.	. . . . .	Prostate began to enlarge at age of 50.
2	Bard, Ventura, Cal.	Dec., 1894.	Personal Communication, Feb. 9, 1895.	72	10 years.	. . . . .		Abundance.	. . . . .	Urinating 5 or 6 times every night.	Enlarged at least one-third.
3	Beach, Boston. (See p. 15.)	Dec. 11, 1894.	Personal Communication, May 1, 1895.	70	10 years.	. . . . .		. . . . .	. . . . .	. . . . .	Greatly and uniformly enlarged, nearly reached the ischium laterally, as far as the finger could reach posteriorly; in front, it projected an inch above the superior line of the pubes.
4	Bereskin, Moscow.	. . . .	Chirurg. Annalen, 1894, p. 802. (Russisch.)	70	. . . . .	. . . . .		. . . . .	. . . . .	Urinated 10 times during night.	Greatly enlarged; long diameter, 5 to 6 cm.
5	Reported by Moullin before the Clinical Society of London Case under the care of Dr. Birch.	. . . .	British Med. Journ., May 4, 1895.	74	. . . . .	. . . . .	Persistent.	. . . . .	. . . . .	Urinated 14 to 15 times at night.	Enormous size.
6	Bryson, St. Louis.	Jan. 17 1895.	New York Med. Journ., Apr. 27, 1895	74	. . . . .	. . . . .	Mild grade for 14 months.	. . . . .	. . . . .	. . . . .	. . . . .
7	Bryson, St. Louis.	. . . . .									Enlarged.
8 D.	Carver, London. Reported by Griffiths.	Nov. 16, 1894.	British Med. Journ., Mar. 16, 1895.	74	Severe cystitis for many months.	. . . . .	Yes, for many months.	. . . . .	2 years.	Urination very frequent and very painful, passed but a few drops at a time.	Medium-sized orange.
9	Cole, Buena Vista, Col.	Mar. 6, 1895.	Personal Communication, Apr. 4, 1895.	51	. . . . .	. . . . .		. . . . .	1 year.	Frequent.	Size of hen's egg
10	Collins, Providence.	Jan. 15, 1895.	Personal Communication, Jan. 30, 1895.	62	10 months.	. . . . .		. . . . .	6 months.	. . . . .	Fully half the size of an orange.

eneral Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
[H]ad not a day free from distress in twenty years. Frequent attacks of cystitis.	. . . . .	Prostate was diminished in size, but still caused an obstruction requiring the use of the catheter. Cystitis permanently cured.	Pain of testes and cystitis ceased at once (the latter had tormented him for twenty years). Patient has grown vigorous, has increased in weight, and resumed his business activity. The former remnant of his virility has disappeared. He has "hot flushes," like a woman after the menopause.
[M]icturition frequent, distressing and [i]nterrupted urine loaded with mucus, ammoniacal.	. . . . .	Reduction in size of gland and symptoms very materially relieved. Sometimes able to pass the night without urinating, and never has to rise more than once or twice (Feb. 2, 1895).	. . . . .
[B]ladder much distended and constant [d]ribbling of urine. Moderate hydrocele on left side. Urine contained pus and albumen. Urine carefully drawn twice daily, still there was some dribbling. Has been failing mentally for a number of weeks. He was in bed all the time and was dull and listless, and later became stuporous. Nov. 23, passed no more urine voluntarily. Dec. 5, great difficulty in passing catheter. Dec. 6, no urine passed in twenty-four hours. Impossible to pass catheter. Suprapubic puncture. Hydrocele had increased to three times its size on admission. Dec. 7, 8, 9, aspiration and failure to pass catheter. Dec. 10, aspirated and passed small catheter which was retained.	No difficulty in passing catheter after operation.	Dec. 20, has improved steadily and to-day passed three ounces urine voluntarily; prostate found at least one-third less in volume.	Dec. 27, out of bed, improving. Jan. 2, passed several ounces of urine without catheter. Jan. 8, patient passed catheter without assistance, later passed eight ounces of urine without assistance; mind clear, and patient intelligent. Jan. 9, passed all the urine without catheter; much improvement, mentally and physically. Results in this case confirmed by Dr J. Collins Warren.
[O]bstruction to passage of fæces.	Earlier than five weeks.	At end of five weeks, the prostate was greatly reduced in size, more force to stream of urine, urinated but three times in night.	Two and one-half months after operation: the prostate is smaller than normal; the patient declares himself entirely well. Is not obliged to pass urine at all at night.
[A]mmoniacal, bladder contracted [so] that it would hold but two [on]ces, intense strangury. Used [bella]donine suppositories constantly. [Longe]st period of sleep secured, [three]-quarters of an hour.	Ten days.	The patient had dispensed with morphine, could sleep one and one-half hours at times, prostate smaller, stream of urine larger.	One month after operation the urine was acid, the strangury had almost gone, the bladder could retain four ounces, and was much less sensitive, and the condition of the patient was immensely improved.
[P]atient had a weak and dilated [h]eart, irregular pulse, albumen and [ca]sts and pale granular casts. [He] came to the hospital to have [a] suprapubic prostatectomy performed, but his condition would not [permit] of so grave an operation.	Few weeks.	Reduction in size of prostate and greater ease with which catheter may be passed.	May 15, reduction in the length of the prostate, as measured by the catheter, from two and one-half to one inch. Distinct reduction in prostatic mass, as estimated by rectal touch. Frequency of urination day and night unchanged. Pus, albumen, and specific gravity unchanged; quantity slightly increased. Rises four to five times at night to urinate; catheter passes with greater ease.
. . . . .	One year.	Shrinkage of prostate.	Connection nearly a year afterwards. At end of year, improvement began in nocturnal frequency of urination, and prostate had apparently diminished in size. Fifteen months later had absolutely no trouble with urination.
[U]rine contains a large amount of [bl]ood and pus. Urination was very frequent and very painful, only few drops being expelled at a time. Had an attack of retention two years previously. As there was little improvement from washing out the bladder and the frequent use of the catheter, and as there was much pain with little prospect of relief, he consented to castration. Testicles of full size. In the left, a large spermatocele. In each there were numerous active spermatozoa.	One week.	At the end of a week, the patient could pass for the first time in some weeks a few ounces of urine without the aid of the catheter. During the second week, the general condition slightly improved, the bladder became quiet, and he was able to empty his bladder fairly well. Towards the end of the second week he became sleepless, delirious. On the fourteenth day, the right popliteal artery became blocked, and gangrene appeared on the leg. The condition grew worse, and he died on the eighteenth day.	*Post mortem.*—The right kidney much enlarged from chronic hydronephrosis, and there was suppuration of the distended pelvis and the remaining portion of the kidney substance. The bladder was much thickened, and the mucous membrane inflamed, as was also the right ureter. The prostate was still of large size, and was somewhat firmer than the gland is ordinarily.
[Bla]dder inflamed.	One week.	Voluntary urination.	One month later gland size of walnut. Has not used catheter since one week after operation. Bladder and urine normal.
. . . . .	Three weeks.	Feb. 6, patient passed all his urine voluntarily, something he had not done for seven months. Prostate estimated to be one-sixth smaller. The urine has cleared up and is perfectly normal.	The operation has produced a most happy result, and the patient declares that he has not felt so well in years.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
11	Crisand, Worcester, Mass.	Jan. 9, 1895.	Personal Communication, Jan. 21, 1895.	68	. . . . .	. . . . .	. . . . .	. . . . .	6 months.	. . . . .	. . . . .
12	Eastman, Indianapolis	April 20, 1895.	Indiana Med. Journ., May, 1895.	. . .	. . . . .	. . . . .	Yes.	. . . . .	Had not passed any urine except by use of catheter for 1 year.	. . . . .	Transverse diameter, 2½ inches. The third lobe extended up into the bladder, rendering the passage of any instrument except the most flexible impossible.
13 D.	Faulds, Glasgow.	Dec. 24, 1894.	British Med. Journ., May 4, 1895.	66	. . . . .	. . . . .	. . . . .	12 ozs. mixed with blood and pus.	3 years.	. . . . .	Very large; its upper limit could scarcely be reached through the rectum.
14 D.	Faulds, Glasgow.	Jan. 3, 1895.	British Med. Journ., May 4, 1895.	71	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
15 D.	Faulds, Glasgow.	Jan. 12, 1895.	. . . . .	. . .	Passed blood and pus 6 years.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
16 D	Case observed by Faulds, Glasgow.	Jan., 1895.	British Med. Journ., May 4, 1895.	. . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
17	Faulds, Glasgow.	. . . .	British Med. Journ., May 4, 1895.	. . .	4 years.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
18	Fenwick.	. . . .	British Med. Journ., Mar. 16, 1895.	46	10 years.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
19	Fenwick, London.	. . . .	British Med Journ., Mar. 16, 1895.	. . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
20	Fenwick, London.	. . . .	British Med. Journ., Mar. 16, 1895.	45	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
21	Fenwick, London.	. . . .	British Med Journ., Mar. 16, 1895.	76	Some years of feeble prostatic micturition.	. . . . .	. . . . .	Unable to pass any voluntarily.	. . . .	. . . . .	. . . . .
22	Fenwick, London.	. . . .	British Med. Journ., Mar. 16, 1895.	70	6 years.	. . . .	Yes.	. . . . .	. . . . .	. . . . .	Small per rectum, but by cystoscope the lateral lobes are seen to project into the bladder, and the bar at the neck of the bladder is œdematous.
23	Fenwick, London.	. . . .	British Med. Journ., Mar. 16, 1895.	76	Repeated attacks of retention and uræmia.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Plump and elastic, only moderately enlarged towards rectum.
24	Fenwick, London.	. . . .	British Med. Journ., Mar. 16, 1895.	76	5 years.	. . . . .	Yes.	. . . . .	. . . . .	Catheter had to be used every hour	. . . . .
25	Fenwick.	. . . .	British Med. Journ., Mar. 16, 1895.	81	Several years.	. . . . .	Yes.	. . . . .	3 years.	6 or 7 times during night and 3 times during day.	Large and elastic, especially the left lobe.
26	Fenwick, London.	. . . .	British Med. Journ., Mar. 16, 1895.	60	2 or 3 years dysuria.	. . . . .	Prostato-cystitis.	. . . . .	Occasional use.	. . . . .	Prostate large laterally and elastic.

General Symptoms and Condition	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
. . . . .	For two or three days after operation he passed a tablespoonful of urine several times a day.	Condition of urine improved, much less sediment and color much lighter.	In a month the prostate had reduced more than one-third. Catheter discarded.
The prostatic condition complicated by spastic spinal paralysis, ankle clonus, spastic gait, weakness and shooting pains in the lower limbs, exaggerated tendon reflexes, and temperature changes. (Lateral sclerosis.)	Twelve hours after operation.	Urine was voided naturally. It has been unnecessary to use a catheter since tenth day), if the patient was recumbent. In the erect position the urine passed naturally and easily.	May 24 (letter), patient is able to pass his urine freely and without help,—lying, sitting, or standing. The third lobe has shrunken very much, and the body of the gland is reduced nearly to its normal size, soft and still sensitive to the examining finger.
. . . . .	About a week.	Dysuria was mitigated.	Jan. 12, hemiplegia occurred, and the patient died on the following day.
. . . . .		. . . . .	Six days after operation acute mania developed, and death occurred on Jan. 13.
. . . . .			A week after operation the patient became somewhat childish, mania appeared, and death occurred on the twelfth day after operation.
Enlarged prostate with consequent distress.	. . . . .		A few days after castration the patient exhibited acute mania and died.
Patient suffered all the distress attending an enlarged prostate, for which he had undergone much unsuccessful treatment at various hospitals.	. . . . .		Thirty days after operation no psychical phenomena were observed; but there had been no mitigation in the urinary trouble.
Applied after ten years of skilled treatment for an aggravated prostatitis with great local pain, tenderness, and severe and intractable neuralgic radiations. Increased frequency of urination. Sitting or walking almost unbearable.	. . . . .	. . . . .	Prostate slightly smaller, but no other change as yet. Report too recent to determine result. Patient reports two months later that he "considers himself absolutely cured" (Brit. Med. Jour., May 11, 1895).
. . . . .			Patient says he is "decidedly relieved" (Brit. Med. Journ., May 11, 1895).
Entire genitals ablated for extensive epithelioma of the penis.	. . . . .	. . . . .	After six months the prostate had been reduced to the size of a small bean.
Sudden and prolonged retention, extreme difficulty in catheterization. Prostate unusually hard and enlarged, especially left lobe.	One week.	The patient began to void a little urine spontaneously, and in three weeks he was able to do without the catheter.	A later report says, "I have had no stoppage; the stream varies; sometimes it is feeble, at other times there is high pressure. Urinates sometimes every five to six hours, at others every two or three hours. Improvement maintained."
Slight cysto-prostatitis with some mild pyelitis present. The inflammatory conditions began a year before the operation.	First week.	Urine cleared, the stream improved in force, and the pain diminished. After three months the stream had markedly improved in force, and no symptoms remained except slight variability in the power of the bladder.	Improvement maintained.
Catheterization most difficult. Suprapubic drainage for months without improvement in the cystitis; double castration.	Cystitis rapidly diminished.	Voluntary micturition was recovered in a fortnight, prostate slightly smaller at end of third week.	Improvement maintained.
Dysuria, not much relieved by the catheter. Irrigations had no control over the cystitis.	Prostate slowly diminished in size.	Cystitis diminished, catheter needed only every six hours.	Active occupation renewed.
For past three months increasing difficulty in passing catheter, and the efforts were often followed by hæmorrhage.	For three days after operation, the catheter was needed only twice in twenty-four hours, then four times in same period.	At the end of three weeks, the prostate had slightly diminished in size, the cystitis had greatly decreased. The catheter still had to be used three times during the night.	. . . . .
Intense pain after every attempt at urination; finally, retention.	Third day, voluntary micturition.	Slight shrinkage of prostate after two weeks.	Pain gradually left, frequency of urination became normal, prostate still plump and elastic; perhaps diminished one-eighth by fourth week.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
27	Finney, Baltimore.	Sept. 22, 1894.	Johns Hopkins Hospital Bulletin, Dec., 1894.	64	2 years.	. . . . .	. . . . .	420 c.c.	. . . . .	Constant use of catheter.	Very much enlarged.
28 D.	Finney, Baltimore.	Very recently.	Johns Hopkins Hospital Bulletin, Dec., 1894.	63	5 years. Unable to urinate for 2 years.	. . . . .	. . . . .	. . . . .	. . . . .	Frequent.	Much enlarged and very hard.
29	Fowler, New York.	Jan. 1895.	Personal communication, May 21, 1895.	73	10 years.	. . . . .	. . . . .	6 ozs.	Partially dependent upon catheter for 3 years.	. . . . .	Moderate enlargement.
30	Fremont-Smith, St. Augustine.	Jan. 17, 1894.	Annals of Surgery, July, 1894.	69	1 year.	. . . . .	Yes.	Smallest amount, 6 ozs.	. . . . .	. . . . .	. . . . .
31	Gage, Worcester, Mass.	Jan. 18, 1895.	Personal communication, May 21, 1895.	67 Farmer.	Entirely dependent upon catheter for 8 years.	. . . . .	Yes.	All.	8 years.	Catheter used until Nov. last, every 3 hours; for last 2 months every 45 minutes, night and day.	Roughly, the size of a large orange.
32	Gage, Worcester, Mass.	Feb. 8, 1895.	Personal communication, May 21, 1895.	67 Moulder.	Symptoms of prostatic obstruction for 3 years.	. . . . .	. . . . .	6 ozs.	. . . . .	. . . . .	Size of closed fist.
33	Gavin, Boston.	Oct. 19, 1894.	Personal communication, May 2, 1895.	69	Frequent and scalding urination for 5 years.	. . . . .	. . . . .	Retention for 24 hours. Previously 5 ozs. residual urine.	4 months.	Catheter had to be passed every 4 hours, day or night.	Size of a large orange; dense, smooth, symmetrically enlarged; occluding the rectum to a considerable degree.

General Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
Inability to urinate and constant dribbling. Catheter withdrew four hundred and twenty cubic centimetres urine. Up to time of operation bladder was irrigated with boric acid solution without benefit.	Six days.	Urinated unassisted. Since this time has done well, barring one or two setbacks. Nov. 7, patient left hospital well. Prostate small and soft; no residual urine.	Patient put upon the regulation treatment of washing out bladder and internal medication, but he was still unable to pass urine voluntarily. Five weeks after operation, lateral lobes just palpable, are soft, not tender, and show marked atrophy. Not more than fifty cubic centimetres (one and one-half to two ounces) residual urine. April 20, patient re-examined; "same condition as when discharged,—well."
A false passage had been made by catheter, and the passage of an instrument was very difficult and painful; had retention and constant dribbling.	Fifth day.	Urinated spontaneously and without difficulty. The prostate diminished rapidly in size.	Patient died three weeks after operation from starvation. He was insane, and refused all nourishment. He had been subject to temporary fits of insanity for several years.
Double orchitis in summer of 1874, with suppuration of left testicle and consequent multiple fistulæ. Compelled, after using catheter at bedtime, to rise three or four times during night to urinate. After operation, was catheterized every six hours for six days	. . . . .	. . . . .	Three months after operation the prostate is reduced one-third in size, residual urine averages less than two drachms, he does not rise at all at night, and he urinates during the day about once in four hours.
Admitted to hospital Oct. 25, 1873. During the previous months, symptoms of increasing obstruction had set in. During seven and one-half weeks after admission he had irregular fever, urination was painful and frequent, especially at night; the urine was loaded with the products of decomposition and pus. Retention attacks were frequent. From Oct. 25 to Jan. 17, the usual and approved treatment, internally and by bladder douches, was carefully conducted by Drs. L. Alexander, A. Anderson, and the operator, but the patient steadily declined. Dr. J. William White saw him Jan. 1, and advised castration. The repeated attacks of acute cystitis, accompanied by increasing degrees of pus and septic fever, the harassing constancy of the desire to urinate, and the loss of appetite and sleep reduced the patient in seven and one-half weeks from one hundred and sixty-five to one hundred and thirty-five pounds.	One week.	During the week following the operation, the patient was catheterized twice daily; at the end of this time he voided urine naturally, and the catheter was used twice a week for the purpose of estimating the residual urine only. No local treatment was employed after the operation. March 1, patient was discharged.	After the castration there was no fever, his appetite returned, the weight increased from one hundred and thirty-five to one hundred and sixty-three pounds, and the mental state, previously weak and melancholic, made decided improvement. There was no recurrence of the retention, no cystitis, and the residual urine diminished during the final week from three to one and one-half fluidrachms. The nocturnal desire to urinate was reduced from 12–15 to 4–6. The urine now presented a sediment only on standing for hours, which contained under the microscope a moderate number of pus-cells. May 2, 1874, a brother writes, "the patient's weight is one hundred and eighty pounds; as to his water, he has no trouble at all, and no pain from that source."
Was able to sleep two hours consecutively but once in past month. Passage of catheter very painful, and often caused distressing erections. Had repeated hæmorrhages, becoming more frequent (now daily). Pain in bladder constant and severe. Perineum so tender he could not sit squarely on chair. Capacity of bladder, two ounces, urine ammoniacal, and contained blood and pus.	Two weeks.	Cystitis lessened.	March 25, his physician reports, "But one hæmorrhage since operation, can use soft catheter instead of one with stylet, and it passes with less pain and without erections. Sleeps from one to two hours, has less pain in perineum, and can sit down and walk more easily; cystitis nearly cured, and general condition is better." The condition of this patient, and his surroundings, absolutely precluded any thought of drainage or prostatectomy, and he refused to be removed.
For two years had passed urine every hour and a half, day and night. Jan. 27, acute retention. Feb. 3, passed some urine voluntarily, urine acid, no albumen. Feb. 4, complete retention again.	Third day.	Passed water freely without much effort, and has not used catheter since. Goes three to four hours without passing urine.	Recent report from patient states that he is perfectly well, so far as his control of urination is concerned.
The symptoms increased rapidly, and the constantly recurring pain demanded the use of the catheter more and more frequently, which was passed with difficulty. Came to hospital with distressing tenesmus, tremulousness, and prostration. Urine alkaline, and contained albumen and pus.	8 hours.	The junior house officer was not called to catheterize the night following operation. The patient passed urine eight hours after the operation, for the first time in three weeks. After forty hours the catheter was no longer needed. Morphine was omitted, the patient passed urine without pain or tenesmus, one week after operation stitches removed, wounds healed, prostate much smaller and softer. In five weeks, prostate one-fifth former size, urine acid, less pus, residual urine three ounces; passes urine every four hours during day and two or three time at night, prostate one-sixth former size, urine clear.	The usual remedies had been tried without any gain; in fact, the man was growing weaker. There is no question of the great benefit he derived from the operation. He has gained thirty pounds.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
34	Gerrat.	. . . .	Chirurg. Annalen., 1895. p. 97. (Russisch. Abstracted in Centralblatt f. Chirurgie, No. 16, 1895.)	75	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Size of apple, equally enlarged on both sides.
35	Ibid.	. . . .	Ibid.	60	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
36 D.	Glenn, Nashville.	May 16, 1894.	Personal communication, May 20, 1895.	82	3 years.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Size of lemon.
37	Halsted, Baltimore.	Nov. 27, 1894.	Personal communication, May 20, 1895.	67	3 weeks.	. . . . .	. . . . .	1000 c.c.	. . . . .	. . . . .	Much enlarged and very hard.
38	Halsted, Baltimore.	Mar. 23, 1895.	Personal communication, May 20, 1895	59 Colored.	Has bad dribbling of urine since Dec 1894.	. . . . .	Yes, severe.	. . . . .	. . . . .	. . . . .	Enlarged.
39 D.	Halsted, Baltimore.	. . . .	Personal communication, May 20, 1895	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
40 D.	Halsted, Baltimore.	. . . .	Personal communication, May 20, 1895.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
41	Hayden, New York.	Dec. 11, 1894.	New York Med. Rec., May 18, 1895.	70	5 years ago began with frequent urination at night, and soon after in the daytime also.	. . . . .	Severe.	4 ozs. Capacity of bladder, 6 ozs.	. . . . .	Urinated 5 or 6 times at night, and every half hour to hour during day. Drew off urine and irrigated bladder several times a day.	Prostate hard, smooth, and fully twice its normal size; pressure causes pain and intense desire to urinate.
42	Haynes, Los Angeles.	Dec. 12, 1893.	Pacific Med. Journ., Oct., 1894.	Old.	. . . . .	. . . . .	Chronic.	½ pint.	. . . . .	Catheter 1 to 3 times daily.	Moderate hypertrophy.
43 D.	Haynes, Los Angeles.	. . . .	Pacific Med. Journ., Oct., 1894.	Old.	. . . . .	. . . . .	Intense degree.	. . . . .	. . . . .	Uses catheter every hour.	Extreme hypertrophy.
44	Haynes, Los Angeles.	. . . .	Pacific Med. Journ. Oct., 1894.	Old.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Incipient hypertrophy.
45 D.	Haynes, Los Angeles.	Jan. 27, 1895.	Personal communication.	62	6 years.	. . . . .	For 5 years.	. . . . .	5 years.	Catheter had to be passed 11 times a day.	Large.

General Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
Entered hospital with retention. Emphysema of lungs, great atheroma of arteries, double hydrocele, and inguinal hernia.	Very soon after operation.	Two months after operation considerable decrease of prostate noted.	Operation under local anæsthesia. Condition always considerably better than before operation.
Bladder punctured for complete retention.	. . . . .	. . . . .	Complete cure resulted from the operation.
Urinating in drops every hour. Very feeble, suffered severely.	Four days.	Four days after the operation the patient could urinate freely without the catheter.	Died May 24. Death not charged to operation, as patient was nearly dead at time of operation. The author believes that operation three months earlier would have cured him.
Admitted to hospital Nov. 17, 1894, with retention of urine. Frequent desire to urinate, and the day before admission the act was difficult and painful, only a few drops of urine could be passed at a time. Bladder large and sacculated. One thousand cubic centimetres of urine were withdrawn.	Dec. 3.	Voided urine naturally. Dec 15, 1894; patient discharged as well. Prostate much smaller and softer.	. . . . .
Admitted to hospital March 15, 1895, with incontinence of urine and phimosis, and enlarged prostate.	March 25.	Voided urine in a stream. Discharged April 15; improvement had been uninterrupted during the stay in hospital. Prostate diminished in size and much softer.	April 17, patient returned on account of a return of the bladder symptoms. He was given irrigations of boric acid with great benefit. Patient passes his urine normally, but there is still some residual urine.
Desperate case, demanded immediate attempt at relief. Severe renal complications.	. . . . .	. . . . .	Death due to failure of the renal function. Autopsy showed stricture of the urethra. The prostate was riddled with sinuses, one of which communicated with the rectum. There was a very marked cystitis and a double pyelonephrosis. Before death, it was necessary to perform a suprapubic cystotomy.
Case desperate, pronounced nephritis, but the urgent prostatic symptoms would not permit of delay to carry out preparatory treatment	. . . . .	. . . . .	Death from nephritis, autopsy not allowed.
Vesical and rectal tenesmus. Urine cloudy and ammoniacal. While trying to urinate the penis becomes congested and there was a partial erection. Each act of urination is attended with intense vesical and rectal tenesmus, and severe shooting pain in prostate, urethra, and glans. Catheterization became very painful and almost impossible at times. Retention one year ago. Urine cloudy, alkaline, ammoniacal, sediment one tenth by volume. Catheter finds urine at nine and one half inches. No shock followed the operation.	Fifth day.	A small rubber catheter passed into the bladder, this had not been possible for many months. Urine clearer, and less tenesmus and pain. Tenth day, No. 18 F catheter passed readily. Gland softer and absolutely painless. Twentieth day, patient felt much improved, and passed his urine freely without the aid of the catheter.	Two months after operation the patient's general condition was greatly improved; he gained weight, and resumed his work. Passed urine during the day at intervals of from two to three hours, and, at night, three to five hours. Since operation, has had no erections or sexual desire. Can hold the urine for half an hour after the desire is felt. Residual urine, two ounces. The capacity of the bladder has materially increased. April 9, patient is gaining more control over bladder. Urethra measures eight and one-quarter inches (March 17). Bladder now holds fifteen ounces.
Almost urinated with ease for two days.	. . . . .	Shrinkage of prostate; disappearance of cystitis.	After three months considers himself cured. Urinates with ease, no cystitis, uses catheter once in four days, to estimate residual urine (3 drachms). Prostates much smaller. Later, entirely well. March 15, 1895, feels perfectly well, mind normal, prostate normal, three or four erections, accompanied with sexual desire in last five months.
Retention for three months. Passes urine without catheter. Moribund.	Sixteenth day.	Passes at least one-third urine naturally; catheter every six hours.	After two months is about his room. Cystitis almost cured, catheter twice daily. Passes all the urine naturally, except a residuum of two ounces. Takes no morphine. Prostate greatly diminished. Life saved by operation. Later, patient died suddenly from chronic renal suppuration. At autopsy, prostate natural size.
Prostatic urethra so deformed it was almost impossible to pass catheter.	At end of three weeks.	Doing very well.	Patient entirely cured.
. . . . .	. . . . .	Decrease in size of prostate.	Wound healed by primary union. Two weeks after operation uræmic symptoms developed. A week later the patient died in coma. The autopsy showed dilated and suppurating kidneys and ureters and pouched bladder. Prostate thought to have diminished in size one-quarter; still about the size of a base-ball.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
46	Horwitz, Philadelphia	Jan. 1, 1895.	Personal communication, May 21, 1895.	67 Farmer.	5 years.	Desire absent for past 6 years.	Yes.	. . . . .	5 years.	Catheter used every hour or hour and a half.	Enormously enlarged, it quite filled up the rectum; the overgrowth was fibrous.
47 D.	Horwitz, Philadelphia.	April 6, 1895.	Personal communication, May 24, 1895.	70 Farmer.	16 years.	None for 10 years.	. . . . .		Unable to pass urine without catheter for 6 years.	Catheter used every hour and a half.	. . . . .
48 D.	Reported by Moullin before the Clinical Society of London. Case under the care of Dr. Houchin	. . . .	British Med. Journ., May 4, 1894.	. . .	. . . . .	. . . . .	Repeated attacks.	All.	15 months.	Used catheter every hour, day and night.	Exceedingly large.
49 D.	Hughes, Meriden, Conn.	Jan. 3 1895.	Personal communication. May 1, 1895.	75	20 years.	. . . . .				. . . . .	Enlarged.
50 D.	King, Toronto.	Dec. 26. 1894	Personal communication, Jan. 9, 1895.	73	. . . . .	Inordinate cystitis.	4 ozs.		. . . . .	Catheter 3 or 4 times during night.	Apparently size of a small orange.
51	Frimann Koren and August Koren, Jr.	July 18, 1894.	N. Mag. f. Lægev., No 1, 1895.	66	For one year had noticed failure in force of stream.	. . . . .	Present.	1500 gm.	. . . . .	. . . . .	3 to 4 cm. high, about 6 cm. broad; not sensitive.
52 D.	Lichty.	Mar. 14 1895.	Personal communication.	57	2 years.	. . . . .	Yes.	2½ ozs.	. . . . .	. . . . .	Size of lemon.
53	Lilienthal, New York. (See p. 160)	Feb. 9, 1895.	New York Med. Rec., April 20, 1895.	56	10 years.	. . . . .	Severe.	4 to 6 ozs.	. . . . .	. . . . .	About 3 times normal size. Well-marked middle lobe.
54	McBurney, New York.	June 12, 1894.	Personal communication, Jan. 18, 1895.	63	9 years.	. . . . .			. . . . .	Catheter used for 9 years from 7 to 10 times in 24 hours.	. . . . .
55	Manseli-Moullin, London.	July 5, 1894.	Med. Press & Circular, Sept. 19, 1894.	81	Some years.	. . . . .	Yes.		. . . . .	. . . . .	Size of Tangerine orange.
56 to 65	Moullin, London.	. . . .	British Med. Journ., May 11, 1895.	. . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .

General Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
Frequent desire to urinate, especially at night; this increased until the desire was almost constant. Had attacks of hæmaturia; urine thick and offensive. Patient thin and anæmic. The urine was alkaline, and contained albumen and an abundance of pus and phosphates. Operation consumed but a few moments, but there was considerable shock. A medium-sized rubber catheter could be passed with difficulty.	Twenty hours.	The patient passed his urine for the first time in five years without the use of the catheter.	Feb. 16, discharged cured. Desire to pass urine much less frequent, does not use catheter, urine much clearer, and contains less pus. Prostate one-half its former size. March 4, patient in perfect health. Stronger than for years before. Does not use catheter. Passes urine six times in twenty-four hours, is not disturbed at all at night, urine normal, no sign of inflammation of bladder. Prostate not discernible to touch per rectum. Eighteen days after being discharged (Feb. 16) it had undergone almost complete atrophy.
Frequent attacks of hæmaturia, two attacks of retention, and one of uræmia attended with convulsions, and narrowly escaped death. Patient thin and anæmic. No. 8 F hard rubber catheter passed with great difficulty, usually requiring five minutes for its insertion. Defecation greatly interfered with. Urine contained albumen, blood, phosphates, and casts.	Four days.	Catheter could be introduced much more easily. The prostate had diminished fully one-quarter as shown by rectal touch. April 11, urine passed without aid of catheter. The instrument could be passed without causing pain. April 14, urine passed without the use of catheter, urine much clearer, no blood, wound healed, dressings removed. Prostate but one-half its former size.	April 16, symptoms of uræmia developed, and death occurred on the nineteenth, from suppression of urine. The prostate had shrivelled so as not to be detected by the finger. A large-sized catheter could be readily inserted without difficulty or pain. The urgent desire to pass urine had greatly diminished several days before death.
Enormously stout man; occasional hæmaturia. No urine passed except by catheter for fifteen months.	. . . . .	On the ninth day, blood stained urine was passed spontaneously on several occasions.	The operation was well borne, and everything progressed favorably for a week. He was then seized with extreme dyspnœa, which recurred again and again, and finally with hæmaturia and profuse diarrhœa, and death ensued on the eleventh day. At the necropsy the heart was found soft and fatty, the kidneys (one especially) cirrhotic, and all the abdominal and thoracic organs loaded with fat. The bladder contained a calculus, concealed behind the prostate; its walls were deeply congested and ulcerated in places. The prostate, which was uniformly enlarged, was soft and flabby, and there were evidences of its recent diminution in size.
It finally became impossible to pass a catheter.	Seventh day.	Patient passed urine without a catheter, a thing he had not done for years.	On sixteenth, albumen appeared in the urine, and rapidly increased in amount until his death, Jan. 20.
. . . . .	Twelve hours.	Patient had normal desire to urinate and did not wish catheter used. Catheter employed after this to estimate residual urine only.	The patient developed pneumonia on the twenty-ninth, and died on the thirtieth. The residual urine had been reduced to less than two ounces, and the prostate had diminished to less than half its former size.
. . . . .	Aug. 2, urinated spontaneously. Nov. 11, prostate diminished to two centimetres, and did not protrude in rectum.	On seventh day some softening of the prostate was noticed, and a decrease in its size 3 x 4 centimetres.	"The hypertrophy of the prostate, with all its symptoms, has disappeared. The patient rises but once at night to urinate."
Frequent and difficult micturition, left lobe being the larger. Urine foul, very alkaline, and contained pus and mucus. The patient was treated for the cystitis by internal remedies and daily irrigations of boric acid solution. There was no improvement at the end of three weeks.	. . . . .	Able to urinate with greater ease; residual urine, one-half ounce.	Chloroform anæsthesia, stitches removed on eighth day. Perfect union. Twelfth day after operation temperature rose, symptoms of uræmia developed, and death occurred on the fifteenth day. After death, prostate found to be about half its former size. The condition of the kidneys was fully appreciated by the operator and patient before operation, but the man insisted on the operation, as his distress was too great to bear.
Constant pain and an urgent desire to urinate at least once an hour during night. In daytime, every five to fifteen minutes. For six weeks he had been treated with vesical irrigations and internal remedies.	Slight remission in first twenty-four hours; fifth day, miraculous improvement.	Cystitis diminished, and passed full stream, one ounce residual urine.	Prostate flaccid and one-half former size.
Suppurative disease of both testicles, great prostatic enlargement, and great interference with urination. Lost sixty pounds.	Within two weeks.	Catheterization very much easier, urine has cleared, there is no longer any distress, the patient passes a few ounces (three) of urine voluntarily, and uses the catheter two or three times in twenty-four hours.	Fifty pounds of flesh have been regained. Jan. 18, 1895, patient in robust health. Has no annoyance from difficulty in urination, although he still retains a portion of it. "Upon my advice uses catheter two or three times a day."
Catheter could not be introduced.	Next day the urine came more freely.	Tenth day after operation the prostate was much smaller. Three weeks after it had disappeared.	The bladder was beginning to regain power. The urine had become acid. An ordinary silver catheter passed in easily, without requiring to be depressed more than usual.
. . . . .			Referred to ten cases not previously reported. The cases did well, and are not suffering in any way from mental troubles.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
66	Marks, Milwaukee. Reported by Andrews.	. . . .	Tri-State Med. Journ., Mar. 1895.	59	. . . . .		Chronic.	. . . . .	. . . . .	. . . . .	Enlarged.
67	Martin, Philadelphia	Nov. 9, 1894.	Personal communication, May 22, 1895.	68	10 years.	Lost.	Yes.	All.	80 days.	. . . . .	Size of half an orange, filling the rectum and preventing the examining finger from reaching the bladder wall.
68	Meyer & Haenel, Dresden.	May 16, 1894.	Centralb f. die Krankheiten der Harn und Sexual Organe, Bd. v, Heft 7, 1894.	70	Some time.	. . . . .	Present, urine ammoniacal.	120 to 150 c.cm.	. . . . .	. . . . .	Evenly enlarged and about size of fist.
69	Packard. Philadelphia.	Nov. 25, 1894.	Personal communication, May 27, 1895.	70	2 or more years.	. . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
70	Piercy, Placerville, Cal.	Aug. 8, 1894.	Med. Rec., Feb. 23, 1895.	71	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Prostate immensely enlarged.
71	Pilcher, Brooklyn.	Jan. 19, 1895.	Personal communication, May 25, 1895	74	For 20 years had frequent urination.	. . . . .	. . . . .	. . .	. . . . .	. . . . .	Marked enlargement.
72	Powell, Bengal.	1887.	British Med. Journ., Nov. 8, 1893.	65	For months had had retention of urine.	Not given.	Not mentioned.	Not given.	Months.	Not given.	Not given.
73	Ramm, Christiania.	April 3, 1893.	Centralb. f. Chirurgie, Sept. 2, 1893	73	15 years.	Not given.	Not mentioned.	Not given.	Catheter had not been used.	Hourly urination.	Small orange.
74	Ramm, Christiania.	April 25, 1893.	Centralb. f. Chirurgie, April 28, 1894.	67½	14 years.	Not given	Present for 1 year.	Not given.	7 years.	Sometimes used catheter 2 or 3 times hourly.	Very large; upper border could only just be reached by the finger in the rectum.

General Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
Had disease of both testes.	. . . . .	After several weeks the cystitis was greatly benefited.	Testicles removed for their condition, and not with any idea of influencing condition of prostate and bladder.
Urination most frequent between the early morning hours and noon. For three years has urinated every half-hour during night. Suffered great pain at each act of urination General failure of health for three months before coming under reporter's care. Often rises twenty times during the night. For eighty days there was complete retention with overflow Catheter always gave great pain, and at times could not be passed. Blood often followed the passage of the instrument. Urine ammoniacal, and contained large quantities of pus and mucus. At time of operation, temperature, 100⅘°, pulse, 89 and feeble. Mental hebetude, wandering delirium at times. The patient was emaciated and rapidly losing ground.	Fourth day.	Passed three ounces of urine. Fifth day, four ounces, temperature normal, pulse 74. Sixth day, passed ten ounces urine; from this time on the improvement was progressive. He suffered no pain from the time of operation, passed no blood, and there was a marked diminution in the amount of pus in the urine.	Forty days after operation there are two ounces of residual urine, which still contains pus He has gained twenty pounds, and says he is as well and strong as ever; he passes a good stream of urine without pain or irritation. Rises at night to urinate two or three times, and passes urine four or five times during the day. He never uses a catheter.
Great tenesmus during urination, fever, insomnia. Cystitis had been treated with vesical irrigations, but introduction of catheter caused great pain.	Few days after operation tenesmus had nearly gone, and catheter could be introduced with ease.	May 24, some diminution in size of prostate. May 31, had diminished one-third. July 3, two-thirds smaller. July 25, almost normal in size. After fourteen days, contractile power of detrusor muscle began to return.	July 25, the following note is made: the prostate is about normal in size, the urine can be retained four or five hours, and the bladder can be completely emptied without the use of instruments. The urine can be projected from the penis in the normal curve, and there is no dribbling.
Urinating every one to three hours.	. . . . .	At first prolongation of intervals; general improvement; patient now thinks the intervals are getting smaller.	The patient complains of "flashes" similar to those occurring in women at the menopause. No examination recently.
Occasional retention, becoming more frequent. Very difficult to pass catheter.	Day following passed urine more freely than before.	After two weeks he had no further trouble passing water.	Two months after operation prostate had diminished to one-half its former size.
First seen by Dr. Pilcher, Jan. 18, 1895. At this time bladder was distended and reached four inches above umbilicus; dribbling every few minutes, had existed some weeks. Catheter could not be passed.	Fifth day.	A catheter was passed easily and the urine drawn every eight hours, as the prolonged overdistention had so paralyzed the bladder that voluntary evacuation was not to be expected.	During the chloroform anæsthesia, efforts were again made to pass a catheter, but without success. There was no systemic disturbance. Patient has quite recovered, is able most of the time to urinate without the use of the catheter. Attends to business pretty regularly. May 25 (letter), by rectal touch, the prostate appears not diminished in size since before the operation, he uses a catheter every three hours with ease and comfort, is able to pass about one ounce of urine at a time, and can, by occasionally voiding this amount, go six hours without using the catheter, when eight or ten ounces will be withdrawn. The paralysis from overdistention present at the time of operation has been recovered from, and he thinks his ability spontaneously to void urine is increasing. His general health has greatly improved, and is now excellent.
Retention of urine requiring visits to out-patient department of hospital.	Not given.	Rectal examination showed marked diminution in the size of the prostate.	Left testicle small and useless; right testicle removed for a "nodule." Three months later no urinary symptoms.
Complete retention at time of admission to the hospital.	Three days.	Prostate was distinctly smaller.	Twelve days after prostate was a "flat" mass. After the operation, and during the first two months, the catheter was passed three or four times to relieve temporary retention. A year later he passed urine normally; only emptied bladder twice during night.
Catheterism very difficult. Bladder distended, reaching to the umbilicus.	The night after the operation. In eleven days. Six weeks.	Patient passed about eighty cubic centimetres of water. Prostate was distinctly smaller. Could pass a good stream.	One year later prostate was a small, flat mass, with a median ridge in position of urethra. He passed water four to five times only in the day, once at night, always without difficulty. The cystitis had disappeared.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
75	Ramm, Tromso.	July 10, 1894.	N. Mag. for Lægv. LVIt., p. 28–32. Abstracted in Revue Internationale de Médecine et de Chirurgie pratique, April 10, 1895.	57	For 10 years had retention more or less, and great inconvenience.	. . . . .	Yes.	. . . . .	. . . . .	. . . . .	. . . . .
76	Rand, Brooklyn.	May 18, 1895.	Personal communication, May 26, 1895.	69	Frequent urination for the past 9 years, most marked at night.	. . . . .	. . . . .	4 ozs.	. . . . .	. . . . .	At least double the normal size, moderate enlargement of the median portion.
77	Rand, Brooklyn.	Feb. 24, 1895.	Annals of Surgery, June, 1895.	58	More or less difficulty in urinating for 10 or 12 years.	. . . . .	. . . . .	5½ ozs.	. . . . .	. . . . .	Enlargement of the median lobe prevented passing Thompson's searcher; lateral lobes moderately enlarged, the right, more than the left.
78	Rand, Brooklyn.	. . . .	Annals of Surgery, June, 1895.	65	. . . . .	. . . . .	Yes, tuberculous.	None.	. . . . .	. . . . .	. . . . .
79	Ricketts, Cincinnati.	Oct. 26, 1894.	Times & Register, Phila., 1894. Personal communication, May 18, 1895.	74	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Urinated about 30 times daily, hourly at night.	. . . . .
80	Sinitzin, Moscow.	1894.	Lyon Médical, May 27, 1894.	75	7 years.	Extinct for 9 years.	. . . . .	. . . . .	Not given.	. . . . .	. . . . .
81	Smith, Norwich, Conn.	Mar. 29, 1895.	Personal communication, May 4, 1895.	80	Several years.	. . . . .	Yes.	. . . . .	. . . . .	Catheter.	Fearful condition, odor of breath and body that of decomposing urine.
82 D.	Souchon, New Orleans.	Mar. 4, 1895.	Personal communication, May 1, 1895.	63	4 years.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Half the size of a small orange.

General Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
Came under operator's care July 6, 1894, for retention. The bladder reached nearly to the umbilicus. The prostate protruded symmetrically into the rectum; it was smooth and slightly hard. The patient had a painful cystitis. The bladder was irrigated regularly with boric acid solution, sodium bicarbonate, or silver nitrate, with evident benefit.	. . . . .	The patient left the reporter's care Aug. 23. At this time he did not urinate more frequently than from one to three times at night, and three or four times in the daytime. The amount of residual urine varied from one to three ounces. On some days the urine is clear, at other times it contains pus and mucus. The prostate had diminished in volume, and was very much flattened.	Dec. 10, since the last report, the patient has never experienced difficulty in urinating. He has been exposed in his occupation as a gardener to rain, snow, and cold. He has had, however, mild, transient attacks of cystitis. The urine is clear, acid in reaction, and the specific gravity is 1016. The prostate remains as a flattened mass.
For some months prior to operation patient had urinated three or four times at night, and during the two or three years previous to operation every half-hour or hour, and always with pain and straining. Has lost weight and suffers from loss of sleep. Both testicles showed cystic degeneration. Temperature had been from 100° to 101°.	Five days.	Slept all night, some seven hours; the first time in months he had been able to pass through the night without being obliged to urinate. Urination diminished in frequency, less straining.	The day after operation the temperature fell to 99⅘° F., and was normal after the next day. No shock or pain followed the operation. May 19, 11 A.M., residual urine three ounces. During the next two days the pain and frequency of urination diminished. May 22, after three hours without urination, fourteen ounces of urine were withdrawn, showing an increase in tolerance of the bladder. May 26, slept five hours at one time last night, straining diminished more than one-half, and better every way. Prostate much smaller.
For several years he has had more or less incontinence, and for two years nearly constant dribbling. Has been treated at different hospitals during past year for enlarged prostate without any relief. There was great difficulty in passing catheter; as a rule, nothing would enter but a prostatic catheter. Length of urethra, eight and one-half inches.	Second day.	Voided twelve ounces of urine voluntarily, and with much less straining than he had been accustomed to. Six days after operation there was one-half ounce of residual urine; the next day, none, although a little remained at times during the following week. March 17, appreciable diminution in the lateral lobes,—a sound passed into the bladder as though the former obstruction had been largely removed.	April 5, there has been continuous improvement in the local symptoms. The urine passes naturally, without straining. Residual urine generally absent; if present, but an ounce or less. The interval between the acts of urination is growing longer. Length of urethra, seven and one-half inches. Prostate much smaller, and a small-sized sound drops in the bladder by its own weight.
The patient came under Dr. Rand's care a few months after having had his testicles removed for tuberculosis. At this time the prostate was slightly nodular, but there was no general enlargement of the lateral lobes, and no evidence of enlargement of the median portion. The urethra was not lengthened, and there was no residual urine. He had frequent and painful urination, and later, tubercle bacilli were found in the urine. The patient made the statement that after the removal of his testicles he had much less difficulty in passing urine than formerly, but the significance of this remark was not appreciated at that time.	. . . . .		As attention had not been called to this subject at that time, a close study of the subsequent course of the patient was not made. The following, however, seem worth noting: the small size of the gland, though tubercular, and his statement in regard to urination, coupled with his age. He lived nearly four years after coming under Dr. Rand's care, and died from tuberculosis of the bladder and kidneys. His prostate did not increase in size, and he never had residual urine.
Condition pitiable" Had severe pain. Could not obtain sleep. No kind of medication seemed to give relief. Could not pass catheter.	Second day.	Said he could urinate with greater ease, and that pain was less. Could sleep four hours at night; formerly had to urinate every hour.	Left hospital on sixth day, during which time the improvement was constant. Jan. 22, 1895, no obstruction, straining, or severe pain. Still passes urine too frequently, and has some burning and itching after micturition. Patient practically well.
Not given.	Two to three months.	Considerable diminution in size of prostate.	A year later all traces of hypertrophy had disappeared.
Blood followed catheter every time. Had not passed urine for seven years.	Forty-eight hours.	Catheter passed readily and blood disappeared.	No other treatment was employed. Sleeps all night, passes catheter every ten or twelve hours.
. . . . .	Fourth day.	Was able to pass a small quantity of urine through the urethra by closing the suprapubic opening with the finger. At end of a week and a half there was appreciable reduction in the size of the prostate, it was also softer.	The patient was aspirated four years before the castration for retention, after failure to pass catheter. Oct. 27, 1894, patient's condition desperate. Suprapubic cystotomy was performed. The middle lobe of the prostate was found much hypertrophied; this was excised, and the bladder drained. The patient still obliged to pass catheter after wound healed. A small fistula, however, remained. Feb. 23, 1895, the patient returned for treatment, as he was unable to pass the catheter any longer. On April 15, the patient was seen, and he passed a stream as large as an ordinary goose-quill, but he still used catheter to thoroughly empty it, and for the purpose of irrigation. April 15, the patient died suddenly, of super-acute pulmonary trouble.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
83	Spencer, Brandon, Mass.	Mar. 30, 1895.	Personal communication, May 4, 1895.	64	Several months.	. . . . .	Yes.	. . . . .	. . . . .	. . . . .	Medium-sized orange; left lobe larger and harder than right.
84	Steinbach, Philadelphia.	April 23, 1895.	Personal communication, May 22, 1895.	72	Has suffered intermittently for the past 12 years from retention on account of enlargement of the prostate.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
85	Stimson, New York.	Jan., 1894.	Personal communication, Jan. 8, 1895.	75	A long time.	. . . . .	. . . . .	. . . . .	. . . . .	Urine passed exclusively (?) by catheter at frequent intervals.	. . . . .
86 D.	Stretton, London.	Jan. 15, 1895.	Lancet, Mar 2, 1895.	6c	Some months.	. . . . .	. . . . .	. . . . .	6 weeks.	. . . . .	As large as a hen's egg.
87	Thayer, Waterville, Me	May 12, 1895.	Personal communication, May 24, 1895.	74	8 years.	. . . . .	Yes.	All capacity of bladder 6 ozs.	3 years no urine passed except by catheter.	Catheter used about every 4 hours; its introduction is painful.	Markedly hypertrophied, very tender and dense, median lobe most enlarged.
88	J. D. Thomas, Pittsburg.	. . . .	Pittsburg Med. Review, Dec., 1894.	65	15 years.	. . . . .	. . . . .	. . . . .	. . . . .	Urination very frequent.	. . . . .
89	Thomas, Pittsburg.	Aug. 5, 1894.	Pittsburg Med. Review, Dec., 1894.	60	10 years.	Virile powers lost for several years.	. . . . .	. . . . .	Tried use of catheter, but gave it up because so painful.	. . . . .	Both lobes uniformly and considerably enlarged.
90	Thomas, Pittsburg.	. . . .	Personal communication, May 24, 1895.	76	Several years.	. . . . .	. . . . .	. . . . .	2 years.	Used catheter every half hour or hour.	3 times normal size.
91	Tupper, Bay City, Mich Reported by Walker.	1877.	New York Med. Journ., April 20, 1895.	56	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Used catheter daily or oftener.	Very large
92	Tupper, Bay City, Mich Reported by Walker.	1882.	New York Med. Journ., April 20, 1895.	59	Several years.	. . . . .	. . . . .	. . . . .	Considerable period.	. . . . .	. . . . .
93	Tupper, Bay City, Mich. Reported by Walker.	1886.	New York Med. Journ., April 20, 1895.	58	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	Frequent use of catheter.	Very large.
94	Reported by Tupper to Walker.	Over 10 years ago.	New York Med. Journ., April 20, 1895.	Old.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .

Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
micturition, lack of force am, health broken down. lkaline.	. . . . .	The urine became acid. Incontinence of urine, attributed to paresis of sphincter muscle. Health improved, pains gone, sleeps without difficulty.	Prostate reduced to nearly normal size. Left lobe now smaller of the two (April 30).
nt employed a soft rubber , and at times required the physician, who occasionally ced much difficulty in intro- he instrument. In April it essary to perform supra- ncture to relieve the reten- his was followed by a pre- ocess, which was evacuated the bladder. Both testicles moved, and at the same time left inguinal entero-epiplo- operated upon. A small on the right side was left bed.	Second day.	On the day after the operation twenty-two ounces of urine were drawn off. Since that time the patient voids urine unaided and without any difficulty.	He left the hospital one week after the operation.
for chronic non-tubercular ation of both testes.	. . . . .	. . . . .	Holds the urine for several hours; rises only once at night. He has discarded the catheter.
assed any urine except by for six weeks. Urine con- s and *débris*.	Ten days.	Passed urine spontaneously. 28th, passed eight ounces at one time. The bladder was washed out three times a day, but the urine still contained pus, and the catheter was needed. The prostate was reduced to one-half its former size. The right testicle was found to be tuberculous.	When discharged from the hospital, Feb. 20, 1895, the patient was able to walk about, his urine was clear, and was passed naturally, A few days later he again became delirious, and, although he partially recovered, he relapsed again and died from exhaustion. The operation had materially reduced the size of the prostate, and restored the power of micturition. Had it been done earlier, it would probably have prolonged his life (Lancet, April 27, 1895).
e pain in perineum and is, causing him to grasp tightly a great part of the s strong erections and a exual desire, which he has ded. For three months from a quarter to a half morphine daily. Urine mmoniacal, and contains Catheter passed nine and inches before drawing	Seventh day.	The pain had somewhat decreased The pain in the glans is greatly lessened. Catheter draws urine at nine inches, prostate softer and less tender. The morphine was withdrawn, which caused some depression and an exhausting diarrhœa.	No shock followed the operation. May 24 (twelfth day), patient expresses himself as feeling decidedly better. The attacks of pain are much less frequent, and the irritation of the penis is decidedly lessened, and he scarcely touches it. The prostate has markedly decreased in size, and there is scarcely any tenderness.
. . . . .	. . . . .	. . . . .	Is now obliged to urinate but three times a day.
by drops and with severe	A few days.	Improvement in function of urination. Retains urine two to six hours in day, and two hours at night. Marked decrease in size of prostate.	Improvement kept up. The double castration was done for tuberculous disease of testicles.
ement followed rest in the t position and irrigation of der. Urine loaded with propulsive power in blad- quent attacks of epididy-	It has not been necessary to use catheter since operation.	. . . . .	Now urinates every three hours during the day, and three or four times at night, always without pain. Prostate diminished more than one-third in size; the urine contains very little pus.
nd painful right testicle, and painful micturition. cle removed more than a viously for supposed malig-	Few days.	By the time the wound had healed, all the bladder symptoms had disappeared.	In a personal interview some years later he said he had no further trouble with micturition. The removal of the left testicle had improved his micturition materially for several months, but the previous symptoms gradually returned, with greater intensity than before, and he decided to have the right one removed.
icles and persistent desire . Bladder had been as- r retention.	Second day.	Could pass urine without the catheter. In about two weeks but little bladder irritation remained.	Six months after the operation he said he could urinate as well as ever, and he could enjoy intercourse more satisfactorily than for six years past.
nd exquisite pain in testi- years' duration, irritable . Both testicles enlarged tive.	Three weeks.	Entire relief from pain, and freedom from all bladder trouble.	. . . . .
bladder condition due to nt of prostate.	. . . . .	. . . . .	This patient was confined, on account of a mania for exposing his person on improper occasions. He was castrated with a view to curing the mania. It "cured both the brain and the bladder troubles."

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
95	Van Pelt, Toledo, O.	May 11, 1895.	Personal communication, May 24, 1895.				Yes.				
96	Walker, Detroit.	Jan. 23, 1895.	New York Med. Journ., April 20, 1895.	65	8 years.		Yes.		Over a year.		
97	Walker, Detroit.	Feb. 6, 1895.	New York Med. Journ., April 20, 1895.	71	15 years.		Yes.	2 to 3 ozs.		Desire to urinate every 5 minutes to 1½ hours. Uses catheter.	Very much enlarged, with a median bar.
98	Walker, Detroit.	Feb. 26, 1895.	New York Med. Journ., April 20, 1895.	63	7 years.						
99	Warren, Boston.	Nov. 24, 1894.	Personal communication, May 1, 1895.	65	9 or 10 years.						Much enlarged, extending from one side of pelvis to the other, and upper border could not be reached by finger.
100	Warren, Boston.	Dec. 22, 1894.	Personal communication, May 1, 1895.	64	6 years.				Nearly 6 years.	Catheter more and more frequently, and several times at night.	Right lobe considerably enlarged, remainder slightly enlarged.
101	Watson, Boston.	Jan. 3, 1895.	Boston Med. and Surg. Journ., April 18, 1895.	58	Several years. Retention 1 year ago, and again 3 months ago.		Yes.	Could pass but 1 oz. of urine spontaneously.	3 months.	Voided a few drops of urine every 15 minutes or so.	Upper border could not be felt by finger in rectum, both lateral lobes markedly hypertrophied and very dense and hard, right more so.
102	Watson.	Jan. 21, 1895.	Boston Med. and Surg. Journ., April 18, 1895.	69	Symptoms of obstruction for 3 years.				1 year.	Had to be catheterized regularly.	Moderate hypertrophy of lateral lobes. Catheter passed 9½ inches before drawing urine.
103 D.	Watson, Boston.	Feb. 21, 1895.	Boston Med. and Surg. Journ., April 18, 1895.	70	Several years. Overflow of bladder for several months.		Yes.			Constant and painful desire to urinate, at times violent tenesmus, frequent dribbling.	Much enlarged.
104 D.	White, Philadelphia.	Jan. 13, 1895.	Philadelphia Hospital.	82	Increasing difficulty in urinating for 3 years.		Yes.	Retention.			Greatly enlarged.

General Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result: Other Remarks.
Urine contains mucus, pus, and epithelium.	. . . . .	Thirteen days after operation the prostate is only one-half its former size.	Operation: fistulous tract in perineum opened, and three calculi—two as large as walnuts, and one the size of a hickory nut—were removed. The bladder was then injected with one ounce silver nitrate solution, thirty grains to one fluid-ounce, and afterwards flushed out. The testicles were then removed. Condition verified by two medical friends.
All the symptoms of an aggravated cystitis. Frequent desire to urinate.	Third day.	Could retain his urine from three to five hours. On eighth day the use of the catheter was discarded, the urine was clear, and retained six to nine hours. Prostate diminished appreciably in size.	Letter in the latter part of March states that he is not cognizant of any difficulty in passing urine. The cystitis, which was very bad, has entirely disappeared.
Final cystic symptoms.	Within a week.	Held the urine one time nine and one-half hours. After getting about, the improvement was not so marked, and at times uses a catheter.	Examination of the urine shows a manifest betterment in its condition.
Four years ago the writer removed a pedunculated median growth by perineal cystotomy, but the old symptoms of obstruction returned.	. . . . .	Left operator's care in two weeks with decided abatement of his bladder symptoms.	Letter dated March 27, 1895, says, "There is but little pus in the urine, entire subsidence of pain, urinates but about once in four hours, and does not have to use a catheter."
Came into hospital with retention. Had been aspirated three times.	Three days.	Nov. 28, instrument appeared to pass more easily. Patient able to urinate for the first time since Nov. 5.	Attempts were made for two weeks to keep a flexible catheter in the bladder, but it was passed with difficulty, owing to a false passage. The patient continued to pass increasing amounts of urine. Jan. 2, marked diminution in size of prostate confirmed by Dr. Beach.
. . . . .	. . . . .	. . . . .	Jan. 12, 1895, much less smarting, and the intervals of catheterization had increased to four hours. There was no marked change in the size of prostate.
Painful desire to urinate every fifteen minutes, day and night. Symptoms seemed aggravated by use of catheter.	Thirty-six hours. Had an interval of one and one-half hours without pain or desire to urinate. Second night, after operation, slept undisturbed for two hours.	Sixth day passed from two to four ounces urine spontaneously, pain decreased. Tenth day, free from pain, and urine contained less blood and pus. Three weeks later but one and one-half ounces residual urine, which was almost free from pus; distinct diminution in size and hardness of prostate.	Two months after operation the prostate was smaller than normal, there was but one ounce of clear, residual urine. The patient slept five hours at a time undisturbed. Urinated in the daytime every three or four hours. Patient felt ten years younger, and worked at his trade (stonecutter) as hard as ever.
Could pass but a few drops of urine at a time spontaneously. Urine contained considerable pus.	. . . . .	. . . . .	Forty-four days after operation there had been no perceptible change in patient's condition, save a diminution in the amount of pain.
Admitted to hospital with retention. Patient beginning to be uræmic. Condition critical.	Third day.	Decided relief of bladder tenesmus and pain.	Patient had double inguinal herniæ of long standing, which were operated upon at time of castration. Patient was delirious before operation, and continued so. During night following operation, the patient got out of bed, tore off the bandages, and forced down the herniæ. His uræmic condition became worse, and he died on ninth day. Examination of testicles at time of operation showed spermatozoa to be absent. At the autopsy, marked enlargement of the prostate (fibro-adenomatous) was observed. There were no spermatozoa in the vesiculæ seminales. There was extensive pyelonephritis of both kidneys.
Stream slow in starting. Urinates ten times a night and with difficulty. Urine cloudy and foul. Six days before admission, complete retention. On admission, retention and delirium, alternating with stupor; general condition profoundly adynamic. No instrument could be passed, so bladder was aspirated above pubes, and sixteen ounces of decomposed urine withdrawn; albumen and casts.	Twenty-four hours.	Doubtful decrease in size of prostate, as felt per rectum.	Operation completed in three and one-half minutes. Patient reacted well, but the delirium deepened, and he died on the evening of the second day in coma (uræmia). The prostate was smaller than before operation. Microscopic section showed in the stroma of the gland beginning proliferation of the connective tissue cells. The acini tubules are also becoming filled with proliferated columnar cells, and here and there some fine granular matter may be seen in the tubules. Some of the cells appear to be filled with fine granules, which have not taken the stain, evidently fat. The changes are typical of beginning atrophy.

No.	Operation.	Date of Operation.	Reference.	Age of Patient.	Duration of Symptoms Previous to Operation.	Condition of Patient as to Sexual Power.	Cystitis.	Residual Urine.	Duration of Use of Catheter.	Frequency of Urination or of Catheterization.	Estimated Size of Prostate before Operation.
105	White, Philadelphia.	Jan. 26, 1895.	Philadelphia Hospital.	79	8 years.	. . . . .	Yes.	6 ozs.	. . . . .	Catheterized 4 to 6 times daily.	Prostate size of an orange.
106	White, Philadelphia.	Dec 12, 1894.	University Hospital.	60	18 months.	. . . . .	Yes.	6 ozs.	Had used catheter for years.	Urinated hourly.	Size of small orange.
107	White, Philadelphia. (See p. 25.)	Mar. 12, 1895.	Private patient, University Hospital.	74	Several years.	. . . . .	Yes.	4 ozs.	5 years.	Urinated every hour or two.	About 3 times normal size.
108	White, Philadelphia.	May 13, 1895.	German Hospital.	82	Several years.	. . . . .	Yes.	All.	Passed no urine without the use of catheter for several years. Catheter passed 10inches before drawing urine.	Catheter had to be passed every 4 to 6 hours.	Size of large lemon. The finger could barely reach the upper margin.
109	White, Philadelphia.	Jan. 31, 1894.	Medical News, June 2, 1894.	69	12 years.	Extinct for some years.	Present and marked.	Complete retention.	Many years.	6 to 12 times daily.	Half the size of an orange.
110	Worthington, Los Angeles	. . . .	Personal communication, Mar. 12, 1895.	65	6 years.	. . . . .	Chronic.	. . . . .	. . . . .	. . . . .	Enlarged.
111	Worthington, Los Angeles.	. . . .	Personal communication, Mar. 12, 1895.	70	. . . . .	. . . . .	Chronic.	. . . . .	. . . . .	. . . . .	Enlarged

General Symptoms and Condition.	Time at which First Improvement was Noticed.	Character of Improvement.	Subsequent Course and Final Result; Other Remarks.
Urinated five or six times at night. Occasional complete retention Urine cloudy, contains albumen, pus, and mucus.	Three days.	Incontinence replaced retention.	Operation completed in four minutes. April 1, incontinence has ceased; empties bladder only about five times daily; prostate greatly reduced. May 2, no return of urinary troubles. Urine clear.
Frequent urination accompanied with distress; loss of sleep due to frequent calls to urinate; the urine contained albumen, pus, and mucus. The patient was put to bed two weeks, salol and boric acid were given internally, and the bladder irrigated night and morning with silver nitrate solution, 1:6000, with but slight improvement. Patient left hospital and returned to work, but applied for admission again Dec. 5, 1894, with the symptoms much aggravated. Urinating every hour.	Twenty-four hours.	Urinated only eight times in the twenty-four hours following operation. He said the urine passed much more freely than before operation, and he had less pain in bladder Dec. 15, albumen, pus, and mucus diminishing in quantity in the urine. Urinated five times in twenty-four hours. Dec. 17, general condition much improved, the prostate has practically disappeared, the lateral lobes cannot be felt at all. Very little sediment in the urine. Dec. 19, residual urine, one-half ounce. Dec. 26, residual urine, one drachm. Dec. 28, urine normal.	April 19, the patient continued to be entirely free from bladder symptoms. All his urine was passed naturally, he was healthy and strong, mental condition unchanged, and resumed active employment. The patient experienced "flashes," such as occur in women during the menopause. May 25, patient considers himself cured.
Had a stone in the bladder crushed in winter of 1893, but the vesical distress was but slightly relieved, which grew constantly worse. Urination was painful, and the least jar caused great pain. Urine contained albumen, pus, and mucus.	Two days.	Pain on passing urine perceptibly diminished. March 19, prostate about one-half size before operation and much softer. March 28, prostate smaller than normal. Before castration, passed fæcal matter of small calibre. One week after operation it had assumed the normal size.	This patient had a vesical calculus, which added very much to his sufferings; the enlargement of the prostate was so great as to contra-indicate litholapaxy; one stone had already been crushed and removed by another operator, but with rapid recurrence; double castration was performed especially to facilitate the crushing and evacuating of the stone. On March 28, the operation of litholapaxy was successfully performed. Convalescence was rapid. The patient left the hospital April 4. His cystitis had disappeared, urination was entirely painless, and he felt well in every particular. The frequency of urination had diminished, but was still above the normal. The patient experienced "flashes" like those occurring in women at the menopause.
The patient was feeble, there was a general atheromatous condition of the vessels. Urine alkaline, and contained albumen, pus, and phosphates.	Forty-eight hours.	Passed about three ounces of urine voluntarily. On the next day, varying amounts of urine were passed at different times. The examination of the prostate showed appreciable lateral diminution in the gland.	Operation performed in less than six minutes Ten days later (time of this report), patient was passing about half of his urine voluntarily and naturally, and said that if he were stronger, and could stand up he thought he could pass all of it. The urine was clearing.
General condition good. Catheterism difficult and painful.	Four to six weeks.	Disappearance of blood and pus from urine. Reduction in length of urethra from nine and one-half to eight inches.	Nineteen weeks later, prostate normal in size. One year later still using catheter, but with ease and without pain. All symptoms of cystitis have disappeared. Dec. 4, began to pass a little urine (one-half fluidounce) at a time for a few days.
Cachectic, in low, nervous state from pain and constant desire to urinate. Could not pass more than No. 4 English bougie.	. . . . .	No. 28 instrument passes easily now, there is no bladder trouble, urine normal.	Patient increased fifteen pounds in weight. General condition excellent. Looks twenty years younger. Prompt disappearance of all his symptoms.
Could pass only No. 3 English instrument.	. . . . .	Prompt disappearance of all symptoms in three weeks.	Patient entirely free from any bladder trouble No. 22 passes easily.

TABLE OF DEATHS.

No. of Case.	Operator.	Age of patient.	Time of Death.	Improvement after Operation.	Cause of Death.	Remarks.
36	Glenn.	82	8 days.	Urinated spontaneously four days after operation.	Uræmia.	"Nearly dead at time of operation." No autopsy.
104	White.	82	2 days.	Prostate thought to be a little smaller. Autopsy showed beginning atrophy.	"	In profound uræmia at time of operation.
49	Hughes.	75	17 days.	Seventh day patient passed urine without a catheter, a thing he had not done for years.	"	Four days before death urine became albuminous. Proportion of albumen rapidly increased up to time of death.
103	Watson.	70	9 days.	Decided relief of bladder pain and tenesmus.	"	Delirious at time of operation; old double inguinal hernia operated on at same time; night after operation tore off the bandages; forced down the hernia.
8	Carver.	74	18 days.	Passed urine spontaneously at end of a week, first time for weeks; during next week could empty bladder fairly well.	Uræmia and gangrene.	Pyelonephritis. Thrombosis of popliteal artery. Spreading gangrene.
43	Haynes.	Old.	Betw'n 2 and 3 months.	Sixteenth day.—Operator decides patient's life was prolonged by the castration. Passed one-third of his urine naturally; cystitis almost cured, prostate greatly diminished, later passes urine naturally; about two ounces residual urine.	Uræmia.	No autopsy.
52	Lichty.	59	15 days.	Able to urinate with greater ease; residual urine one-half ounce instead of two and one-half ounces; prostate about half its former size.	"	"Condition of kidneys was fully appreciated by both patient and operator; but the man insisted on operation because he preferred death to a continuance of his sufferings."
45	Haynes.	62	3 weeks.	Prostate thought to have diminished one-fourth in size, still about the size of a base-ball.	"	Autopsy showed pyelonephritis, dilated ureters.
50	King.	73	4 days.	At end of twelve hours patient had desire to urinate naturally and did not want catheter used any longer. Residual urine had decreased to less than two ounces, and the prostate was less than half its former size.	Pneumonia.	Autopsy showed distinct beginning of atrophy.
48	Moullin.	(?)	11 days.	Ninth day blood-stained urine was passed spontaneously on several occasions. At the autopsy the prostate was found soft and flabby and appeared to have decreased in size.	Heart failure, Hæmaturia.	Kidneys cirrhotic; fatty heart; had had complete retention for fifteen months.
13	Faulds.	66	26 days.	The urinary symptoms were mitigated a week before death.	Hemiplegia.	No autopsy.
14	"	71	10 days.	None.	Acute mania.	Probably uræmia. No autopsy.
15	"	(?)	12 days.	"	Mania.	" " " "
16	"	(?)	A few days.	"	Acute mania.	" " " "
39	Halsted.	(?)	(?)	"	Uræmia.	Autopsy showed double pyonephrosis. Prostate riddled with sinuses. Patient described as "desperate case."
28	Finney.	63	21 days.	"	Uræmia; insane.	Patient had had attacks of insanity for years.
40	Halsted.	(?)	(?)	The patient voided urine naturally on third day and continued to do so until his death. The prostate diminished rapidly in size.	Nephritis.	Patient described as "desperate case;" no autopsy.
47	Horwitz.	70	13 days.	Prostate had almost disappeared and the urgent desire to pass urine had almost disappeared also.	Uræmia.	"Patient's condition absolutely required operation of some kind."
86	Stretton.	60	About 6 weeks.	The operation had materially reduced the size of the prostate and had restored the power of micturition. If it had been done earlier it would probably have prolonged his life. Passed urine spontaneously on tenth day; prostate reduced to one-half its former size.	Exhaustion.	
82	Souchon.	63	6 weeks.	Improvement began on fourth day. Patient passed a stream of urine before his death.	Pneumonia.	Patient had had a suprapubic prostatectomy performed previously and had a permanent urinary fistula.