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Treatment of benign hypertrophy of the prostate

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SENIOR THESIS

TREATMENT
OF
BENIGN HYPERTROPHY
OF THE
PROSTATE

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History of Treatment

In studying the treatment of any disease, it is necessary, before considering modern methods, to review and summarize older methods.

The ignorance of the ancients as to the anatomical existence of the prostate gland may be explained by the fact that they did not practise dissection of the human body. According to Galen, Herophilus first employed the term "prostate". He appears, however, to have applied this term to the seminal vesicles (prostate glandulosae). It should be recalled, however, to excuse Herophilus for his apparent confusion of terms, that the prostate gland of the lower domestic animals, as well as that of the monkey, is a bifid organ, much resembling, in some cases, the human seminal vesicles.

No mention whatever of the prostate gland is to be found in the literature until the sixteenth century. Its discovery is attributed to Nicole Massa, a Venetian physician, who died in 1563. Riolanus, about the middle of the sixteenth century, was the first to suggest that the bladder could be obstructed by a swelling of the prostate. In several cases of urinary retention, this surgeon successfully practised incision of the neck of the bladder through the perineum, but it is not recorded whether the cause of the retention was enlargement of the prostate gland.

The symptoms of this malady, if we may believe Sir Everard Home, have been recognized from time immemorial. This ingenious

author surmised that the enlargement of the prostate gland met with so universally in old age is alluded to in the beautiful description of the natural decay of the body as seen in the Bible. The sixth verse of the twelfth chapter of the Book of Ecclesiastics reads "or the pitcher be broken at the fountain, or the wheel broken at the cistern". This expresses two of the principal effects of this disorder, the involuntary passing of the urine, and the total retention. (1)

Prostatic hypertrophy was looked upon by the ancients as "excrecence and carnosity" of the neck of the bladder. This demanded destruction to re-establish the flow of the urine; this destruction was attempted by the erosion of the supposed carnosities with metallic instruments. Certain of the ancient authors recommended incision of the neck of the bladder through the perineum in patients with retention of urine who were "nearly dying with pain"; this was to be done in extreme urethral inflammation when it was impossible to catheterize, even if no calculus existed, to serve as an excuse for lithotomy. It is not known that they actually performed such an operation.

Later, when the nature of the disease was better known, the obstacle was perforated by metallic catheter sounds. This was recommended and practised by Sir Everard Home and by John Hunter, and still others; but it was finally abandoned as uncertain and dangerous.

Dr. Philip Syng Physick of Philadelphia employed hydraulic compression and retrograde dilatation of the urethral vesical orifice to overcome prostatic obstruction. His method consisted in the introduction of an elastic balloon tube through the compressed pro-

static urethra, as a catheter, and then distended it by fluid pressure. Some success attended this remedy, which was repeated every two or three days, the pressure being applied for as long a time as the patient could endure - usually for from five to fifteen minutes.

Caustics were used for the purpose of destroying the prostatic obstruction, particularly by the followers of Ducamp. Electricity, applied to the urethra and rectum had its day of use, but proved to be harmful.

The idea that certain medicinal agents, taken by mouth or otherwise, can reduce the enlarged prostate, though long since exploded, is, from time to time, revived. All of the drugs in the pharmacopeia have been used for this purpose. Substances such as ergotine, iodine, and other irritants have been used in injections to no avail.

In 1825 J. Leroy d. Etioilles endeavored to make depression and compression by means of a rectilinear metallic sound, and, afterwards, by a flexible catheter, substituting a straight for the curved styilet after introduction. Actually, he only pushed the obstacle back, without dilating the neck of the bladder. This was also extremely painful. Meyrieux and Tauchou used an articulated catheter to give the same results. Mercer used a rectangular sound for depression of the prostate. He also used a flexible catheter. Neither were left in the urethra longer than ten minutes.(2)

Probably the best known advocate of systematic compression was Mr. Reginald Harrison, of London. This surgeon, in 1881, devised special olivary bougies, of gum elastic, and having a stem that was

two to four inches longer than the ordinary instruments. There was an expanded portion an inch from the tip, which was made to enter the bladder. By this means the olivary swelling caused dilatation of the urethra and compression of the prostate, both as the instrument was introduced into the bladder, and, again, as it was withdrawn, it being allowed to remain in place for several minutes. (3)

Covillard, in 1639, after performing a trachelocystotomy, tore off a prostatic tumor, and gave relief. In doing a lithotomy, he did the same thing.

In 1875, William Bizzard, William Fergusson, and Dr. Williams and Beckersteth, in performing perineal lithotomy, removed prostatic tumors of various sizes. Amussat, before 1832, in performing suprapubic lithotomy, excised a small tumor at the neck of the bladder.

Dr. Mercier was led to devise an instrument to excise a portion of the obstruction, and thus make a channel through which the urine could be expelled from the bladder. His first instrument was made in 1837, and at this time he experimented with it upon a cadaver. In 1838 he described two instruments which were later named by Gowely the prostatome and prostatectome, and the operations, prostatotomy and the prostatectomy. External prostotomy and prostatectomy were first suggested in 1834 by Guthrie under the name of "division of the bar at the neck of the bladder". His operation was preceded by perineal urethrotomy.

In 1860, the Italian surgeon, Bottini proposed and practised galvano-cautery for the purpose of avoiding hemorrhage in the destruction of prostatic obstruction, and obtained good results.

Gowely, in 1875, made an instrument, the prostectome, and practised transurethral resection with it. (2)

Although the electro-cautery operation was originally developed by Bottini, who made linear incisions in the floor of the prostate with resultant local sloughing, the operation was not generally accepted until 1897, when Freudentberg presented to the profession a greatly improved instrument, which he followed with many convincing articles. He obtained a mortality rate of 4 - 6 %, which was very good. He also decided that castration was of no value. Young used a shorter blade in his operation, and had remarkable success. (4)

Dr. Willy Meyer, of New York, practised the Bottini operation only, and had great success. (5)

Fergusson, in 1870, performed 200 lithotomy cases via the urethra, and found in many of them enlarged prostates, nodules, and polyps, which he pulled out or excised when breaking and removing stones. He was afraid of criticism, but did start prostatic surgery through the urethra. (6)

Next came the use of the perineal puncture, the suprapubic punctures, and the rectal puncture. These methods were used when it was found to be impossible to introduce a catheter through the urethra. Perineal puncture, which was practised during the seventeenth and eighteenth centuries fell into disuse during the nineteenth, the rectal route becoming the favorite method.

Suprapubic cystotomy was first practised in 1590, but it was feared by most surgeons in the early part of the nineteenth century,

that in employing suprapubic puncture there would be great danger of urinary infiltration among the layers of the abdominal wall. (1)

From these various procedures arose finally a new method of treatment - that of urinary fistula. Sir Henry Thompson, in 1875, did several suprapubic drainages by introducing a balloon sound into the urethra and pushing it up above the pubis so that it could be externally felt through the abdominal wall. Then a median incision was made above the pubis into the bladder, guided by the hollow catheter in the urethra. A rubber tube was attached to the catheter and pulled into the bladder, and then the catheter removed, leaving the rubber tube draining over the pubis. He later abandoned this method for drainage through the perineum. (7)

Hunter McGuire, in 1888, produced a permanent suprapubic drainage for the relief of obstruction. He formed an artificial urethra in the hypogastric region by establishing a fistulous tract upward from the bladder, so that the fistula "bore the same relation to the bladder that the spout of a coffee pot does to the bowl." By this method he was able to completely relieve his patients of their cystitis and residual urine, with no leakage occurring in the supine position, and the patients sometimes being able to project a stream of urine several feet by voluntary contraction of the bladder. (8)

In 1888, McGill of Leeds, reported three cases in which he excised "piecemeal" the obstructing parts of an enlarged prostate by suprapubic cystotomy. Several others had done the same operation, but McGill was the first to bring the operation before the profession. (9)

J. William White, in 1893, advocated a mode of treatment by castration which was employed by surgeons for some time. He reported fourteen operations on dogs in which double castration was done, with resultant atrophy of the prostate gland. This was attempted by many others, but the mortality rate prevented its wide acceptance - the mortality rate was 8 - 18 %. He also experimented with medical treatment, as ergot, bromides, boric acid, and belladonna. These all failed.

In 1893 he reported his first perineal prostectomy in which a perineal incision to the apex of the prostate via the urethra was made. He divided the obstructing portion of the gland by means of a probe-pointed bistoury, cutting from within outward. The canal could be further enlarged by division with the finger. At this time the mortality rate for perineal prostectomy was 13.6%; for suprapubic operations it was 25%; and for perineal prostectomy it was 4.5%. (10)

Eugene Fuller, in 1894, reported six cases of successful suprapubic prostatectomies. He removed the whole gland, in pieces. (11).

Mr. P. J. Freyer, in 1901, brought before the medical world a plan of operation where-by an attempt was made to enucleate the whole organ. Through a suprapubic incision he opened the bladder, and incised, by a cut parallel to the urethra, the mucous membrane overlying each of the two lateral lobes of the affected gland. Then, by working merely with the finger he was able to enucleate the whole organ leaving the urethra intact. He reported four successful cases in 1901. (12)

C. S. Wallace, in 1902, stated that the whole gland could not be

taken out with the capsule intact, (13) but C. Roberts, in 1902, after working upon several cadavers, said that the entire gland in capsule could be taken out intact, even if the gland were normal. (14)

In 1903, Freyer reported 31 cases of suprapubic prostatectomy, done with the urethra intact. 27 cases were successful. (15) In 1904 he reported 32 cases of total suprapubic prostatectomy on smaller glands and older men. (16) Later, in 1904, he also reported 57 cases. (17)

Prostatectomy by a perineal route followed close on the practice of perineal prostatotomy, and preceded by a number of years McGill's introduction of the suprapubic method. It was used at first mostly for malignant disease of the prostate, but its field of application soon broadened to include benign enlargement. At first, only portions of the prostate were removed by this route, but later it was even used more than the suprapubic method.

Harrison, in 1895, removed a tumor from the bladder by this route. Dittel, in 1889, removed a prostate via the perineal route. Nicoll, in 1894, combined suprapubic and perineal cystotomy, removing the prostate intact. Fuller, in 1894, performed a suprapubic prostatectomy leaving a perineal drainage. Goodfellow, in 1891, performed the first actual perineal prostatectomy. He left a fistula, which later healed. His entrance was by median incision. (18)

Murphy, in 1902, advocated using the inverted Y shaped incision. He also told Freyer that he performed the perineal operation because

there was less tendency to hemorrhage. He stated that the suprapubic operation should be limited to large prostates. (19)

Alexander, in 1895, removed the prostate through a suprapubic incision with the aid of the fingers of the other hand in a perineal wound. Chetwood combined the Bottini and perineal prostatectomy - the bladder was entered through a perineal incision. Galvano-cautery instruments were introduced, and by this means, incisions were burned through the neck of the bladder and the prostate, each incision being made to lower the neck of the bladder. (20)

Syms, thinking that the extraperitoneal opening of an infected bladder too dangerous an operation, proposed free opening of the peritoneal cavity and conducting the manipulations for counterpressure through the unopened bladder walls, while the prostate is extracted through the perineum. He also used a special hollow rubber retractor, introduced into the bladder through the perineal incision, into the membranous urethra, the instrument being kept in place by distending its bulbous extremity in water. (21) Murphy employs a special hook to retract the prostate. Young used a common steel sound.

Ligation of both internal iliac arteries to induce ischemic atrophy of the prostate was introduced by Bier, in 1893, but he had a mortality rate of 26%, so this method was discontinued. (1)

Dr. William T. Belfield, of Chicago, deserves the honor of being the first to follow a deliberate plan for the removal of the middle lobe through a suprapubic incision. (19)

Freyer, between 1901 and 1906, performed 312 suprapubic operations on the prostate. 22 of these cases died, 290 being successful. The mortality rate, then, was about 4%.

The growing tendency in 1919 was to expose the prostate by a wide retraction of the bladder incision. (22)

In 1933, E. Davis and C. Owens, in reporting 479 cases of perineal prosectomy, had a mortality of only 2.5% (28)

Transurethral resection was first attempted during the Franco-Prussian War. After the efforts of Guthrie and Mercier, the cautery method devised by Bottini was the first distinct advance. The results, however, were so unfortunate that it was not extensively used. The modification of Chetwood did not seem to improve the results.

Wishard worked out an ingenious operation by inserting a small rectal speculum through a perineal incision. He cut with a galvano-cautery knife, and illuminated the field with a head mirror. This was probably the first time that the operation was guided by vision. The method, however, must not have been an unqualified success, since the method was not generally accepted. (23)

In 1902, H.H. Young, using Bettini's method of electro-cautery and incision, and a larger blade reported 41 cases, with but 3 deaths. (25)

After using the Bottini operation without satisfactory results, and finding the perineal and suprapubic methods suitable, H.H. Young, in 1913, made an instrument to cut the median bars at the neck of the bladder. It consisted of an outer tube about 18 cm. long with a curve at the inner end, and a urethroscopic disc at the other, containing a post upon which an external urethroscopic light could be attached.

Near the inner end, on the under surface, a large, deep window was provided. Within the instrument was a second tube, which had a sharp cutting inner edge made of steel, which, when pushed home, could excise anything appearing inside the outer tube. The object of the instrument was, when pushed through the urethra into the bladder, to engage the median bar in the window, and then to excise it by means of the inner cutting tube, while observing the operation through the inner tube, illuminated with an external urethroscopic lamp. At this time, he reported 100 cases without a death. (24)

In 1914 Lays of Paris practised forage of the prostate. He constructed a urethroscopic lamp with direct circular vision. (28)

In 1918 Braasch described his median bar excisor, which was much like Young's, but provided more adequate vision. It was, however, quite limited in its application, as it failed to provide for hemostasis.

Caulk, in 1920, presented a modified Young's punch in which hemostasis was provided for by substituting a cautery blade for the tubular knife of the older instruments. Although Caulk's instrument was faulty in vision, the control of hemorrhage was a great improvement, and he must be given the credit for keeping the attention of the medical profession centered upon transurethral resection. Following the use of this modified instrument many infections resulted, due to the necrosis of the cauterized areas. (26)

In 1922 Colling introduced his electrotome knife for cutting the median bar; this was the first attempt to cut with a high frequency current. This was originally done in a medium of oil; later a medium of water was used. (27)

While these changes were being developed in the direct vision instrument, Stern, in 1925, was perfecting a lens instrument with which the obstructing tissue was resected by a reciprocating wire loop, through which a high frequency current was passed. This instrument was popularized by Davis, of North Carolina, in 1931. He presented a modified Stern's resectoscope and a diathermy machine to the profession. With this equipment he was able to cut cleanly and coagulate bleeding points - the first successful demonstration of the removal of pieces of the prostate gland through an endoscopic instrument. Curiously enough, the members of the American Urological Convention in Memphis received this new method with mild enthusiasm; Davis, however, deserves great credit in the promotion of progress in transurethral resections of the prostate.

Following Davis's success, J. F. McCarthy, in 1932, produced his panendoscope, which is unexcelled as respects vision; it is equipped with a reciprocating loop which reaches out beyond the end of the instrument and resects the tissue as it is drawn back into the sheath. The loop was larger than in the original Stern instrument, thus decreasing the time required for the performance of the operation. The instrument has become popular among urologists who prefer a lens instrument for doing this type of work. (26) (27)

Bumpus, of the Mayo Clinic, did use a flexible electrode for coagulation, but now uses a multiple electrode needle, which is thrust before the knife into the tissue, thus rendering the course of the knife through the tissue more bloodless. (26)

Other urologists, such as Day, Cecil, Kirwin, and Foley have developed instruments, which, in the hands of their designers, have proved to be efficient.

Section II
Conservative Treatment

Some degree of disturbance of micturation is so common in late adult life (55 to 65 years of age) that it is perhaps not an exaggeration to say that one in every four of us will, at some time, begin to take a personal interest in our own prostate, and will begin to wonder whether a prostatectomy will become necessary.

More than a century ago, Sir Benjamin Brodie wrote the following: "When the hair begins to turn gray, when about the periphery of the cornea there is an opacity, when the arterial tree begins to show sclerosis, frequently or invariably, the prostate increases in size". Hypertrophy of the prostate occurs in 35-40% of all males past fifty years of age.

For some years there has been a tendency to neglect old, well dried, and simple methods of management of minor prostatic obstruction. Not every man will submit to an operation for the difficulty, and not every man is able to stand the operation. Thus, there are methods of relieving minor cases of prostatic obstruction.

These patients of this class will have to get up once or twice during the night, and they will have a little difficulty in starting the stream.

If the rectal examination reveals nothing even faintly suspicious of malignancy; if the residual urine is no more than an ounce or two, and if the blood urea is less than 40 mg./100 cc., we may assume that there is no irreparable damage.

The life of the patient with mild prostatic attacks such as nocturia once a night, and some difficulty in starting the flow must

be regulated to avoid attacks of retention, or even partial retention. There must be no serious loss of sleep; the urinary symptoms during the day must not cause intolerable social inconvenience, and there must be no progressive renal damage.

The patient should be put through a complete general and urological examination, and the severity of his prostatic condition determined before conservative treatment is instituted. Further, examination should be repeated at intervals of six months in an effort to determine further developments of the condition.

Attacks of retention are precipitated by postponement of micturation. Prolonged postponement of emptying the bladder is a real danger. Excessive use of alcohol is a factor; but moderate use probably does no harm. Chills are to be avoided, with especial attention to such details as the changing of wet clothing, thus preventing the occurrence of an attack. Sexual excitement without satisfaction is to be avoided.

Loss of sleep can be avoided by restricting the fluid intake after 6 P.M., and by using the urine bottle in bed.

There is no need to suggest any special diet, but it is necessary that condiments, spices, and other articles of food that irritate the tongue be avoided if they tend to induce urinary difficulty.

Drugs play a minor role in the treatment. Old fashioned remedies as hyoscyamus and the bromides, in their full dosage, and the Elixir Saw Palmetto and Santal Compound (Parke-Davis) often have remarkable sedative effects. (29).

Another essential non-surgical procedure of treatment for benign hypertrophy of the prostate is massage. It is believed that massage, following the stage of acute congestion, will prevent hypertrophy. The effect of massage upon an already hypertrophied gland will depend almost entirely upon the amount of scar tissue formed.

Massage increases the flow of blood through the gland, thus promoting the removal of toxins and cellular debris, and emptying any pus pockets that may be present. Engorged lymphatics and the blood vessels of the stroma are relieved of their congestion. Through massage the amount of secretion is lessened, the edematous texture of the gland returns to a normal consistency, sensitivity is decreased, and the frequency and the difficulty in the voidance of the urine is lessened. Frequently the residual urine disappears.

The prostate should be massaged once a week, or, more often, to allay symptoms and reduce inflammation and edema. The amount of pressure used must vary with the sensitiveness of the gland.

Error may be made in attempting to prevent hypertrophy that already exists, the patient being misled. Hypertrophy can only be prevented in the stage of acute congestion - before scar tissue has formed. (30)

M. Huhner states that conservative treatment of a senile prostate, in the hands of an experienced diagnostic urologist, is of distinct and important value in many cases, even if, later on, a prostatectomy may become necessary. In many cases, he states, surgery can be avoided. (30)

Conservative treatment will be either palliative or curative. The term palliative refers to any form of treatment that does not include satisfactory removal of the obstructing pathology.

In most cases drainage of some kind is needed. Three methods of achieving this end may be offered:

1. Catheterization, at intervals, is usually unsatisfactory because both patient and physician tend, after a time, to neglect it. It is often a tiresome chore, and due to the unpleasantness of the procedure, it will be used less and less frequently, until it is no longer done at all.
2. Indwelling catheters furnish adequate drainage if properly placed, and if kept open by daily irrigation with some mild antiseptic solution. They usually set up a urethritis, however, with possible involvement of the whole urinary tract in an infection spread by direct extension.
3. The most preferable of the possible methods is that of suprapubic drainage, carried out under local or spinal anesthesia. This becomes the only method possible if a catheter cannot be passed through the urethra. Emergency suprapubic stab, with a trochar, is not safe, even with a full bladder, because the peritoneum may extend down over the bladder. This would lead to the development of a peritonitis.

The above procedures will relieve the symptoms for a time, but the doctor must decide whether he will allow the patient to revert to the original condition, or proceed on to surgical treatment. (32)

J.C. Webb and S.L. Mucklow claim that in early cases of hypertrophy of the prostate they can keep the symptoms down to a minimum by the use of X-ray in combination with diathermy and static wave applications. They claim that this treatment is indicated in all early cases where there is no large amount of residual urine, and no definite enlargement of the gland into the bladder, as shown by cystoscopy. These signs, as well as evidence of back pressure of the kidney, and the presence of a cystitis contraindicate the use of X-ray and diathermy.

Their technic will not be discussed; their treatment is based, however, on the following principles:

1. The selective action of rays of short wave-length in destroying newly formed cells and leucocytes.
2. The effect of diathermy in providing better circulation to the part.
3. The action of the Morton wave current in causing cellular contraction, and thus aiding the increased circulation to remove debris of cells destroyed by X-ray radiation.

This method of treatment is advocated in (1) early cases, (2) in cases where the heart, lung, or the general condition or age of the patient contraindicates surgery, and (3) in cases where the patient, or his friends, are unwilling to allow surgical interference. If this method is followed, periodic examination of the effect and progress should be made. (33)

S. D. Whitten states that X-ray does not cause fibrosis which will later interfere if surgery is resorted to. The fibrosis is the

result of the pathological process, not the radiation. He states that diathermy also promotes absorption, relieves pain, and attenuates or kills bacteria. He points out that 16% of the enlargements are carcinomatous, and that X-ray will do no harm in these cases.

The X-ray treatment is usually supplemented by diathermy, which is instituted soon after the radiation begins; diathermy is used daily for two or three weeks. (34)

By the use of diathermy the patient experiences immense relief; the discomfort quickly and appreciably lessens, and life is made worth while for men so afflicted in their declining years, who would otherwise be doomed to chronic invalidism. (35)

F.D. Glouback, in 1932, reported four successful cases in which radon seeds enclosed in platinum jackets were put into the obstructing lobes of the prostate. These caused regression of the prostate. (36)

Wm. E. Lower recommended castration, or the tying off of the blood supply to the testicles, because he thought that hypertrophy of the prostate was the result of excess of gonad hormone. (37)

Section II
Pre-Operative Treatment

Apart from the recognition of the various types of pathological prostatic obstruction and improvements in the technic of operative relief, the greatest single advance in the therapy of prostatism was undoubtedly the recognition of the necessity of preparing the patients for surgery.

Infection is a thing that most surgeons dread. The infection here met with is usually acute or chronic pyelonephritis, or possibly a pyogenic infection in or about the urethra, genitals, bladder, or a metastatic infection outside the tract, as a peritonitis of pulmonary embolism.

The need of preparation is based upon the fact that even partial retention of the urine increases the susceptibility of the whole urinary tract to infection. This was observed clinically by Goodhard in 1874, and since verified experimentally by Melchoir and Rovsing. Cabot, in 1899, in an effort to reduce the mortality rate in prosta-tectomy, was one of the earliest discoverers of preliminary drainage.(38)

The principles of adequate urinary drainage for the control of infection and impairment of renal function has become so well established during the past generation that today preliminary drainage is generally considered essential in all cases of prostatism.

Its mechanism is two fold - first, the expulsion of urine through a partially obstructed urethra requires an increased intravesicular pressure, which often rises above the venous pressure thus producing venous stasis, at first confined to the bladder and prostate, but later involving the ureters and kidneys. This stasis leads both to deficient

oxygenation of the tissues and to inadequate supply of white blood cells in the affected tissue, thus reducing the tissue resistance to infection. Secondly, the stagnant residual urine in the bladder and the slowing of the stream of urine in the renal pelvis and ureter tend to favor bacterial growth.

Another predisposing factor is that of trauma, which has been verified clinically and experimentally. The cause is usually the catheter. In a high percentage of cases a chronic prostatitis is present and may supply the organisms for an infection in spite of catheterization. While the patient is more or less immune to his own organisms, the combination of retention and trauma may reduce local resistance, making the organisms highly virulent. Also, the chill, which may follow urethral manipulations, in such circumstances, is usually associated with bacteremia. This becomes serious if there is a venous stasis of the kidneys, since the consequential slowing of the circulation increases their susceptibility to the infecting agent. Thus, patients with a bladder-neck obstruction are in a dangerous state as far as infection is concerned. (39)

Before operation the patient should be in the best possible general condition. This should be determined by routine physical and laboratory examination. The ordinary and differential blood counts should be taken, and clotting and bleeding time recorded. It is well in many cases to do a great deal of blood chemistry, such as determination of urea clearance, NPN, blood sugar, and creatinine in toxic patients. Routine examination of the urine should be done on several occasions.

Just before the operation the scrotum and the penis should be prepared, and the bladder distended with water. (40)

Four essential factors must be determined before surgery can be undertaken. These are:

1. The degree of retention - When the bladder cannot be palpated this must be determined by catheterization, which, in acute retention, is an emergency method. In chronic retention, it may be deferred until a convenient time. The importance of asepsis in catheterization is inestimable. A soft rubber catheter should be used to prevent trauma, and it should be thoroughly lubricated. The urethral meatus should be prepared with alcohol, and the catheter should be passed with sterile forceps.

It was thought that sudden relief of a long standing urinary retention was dangerous in the olden days. The idea was mentioned in the Eber Papyrus, rediscovered by French and English urologists in 1845, and again, in 1912, by Pilcher, and von Zwalenburg in 1920. It was believed, at that time, that the sudden emptying of the bladder caused a sudden fall in intravesicular pressure, leading to venous stasis in the bladder and kidneys, and, later, hemorrhage into them, this resulting in oliguria, hypotension, and death.

At present it is known that it makes no difference whether the bladder be emptied suddenly or rapidly, provided the catheter be sterile and gently used, and

provided redistention is prevented. Redistention of an infected bladder is especially likely to be disastrous because urgent attempts to void the urine may cause such a pressure rise in the bladder that venous stasis, hemorrhage, and even necrosis of the mucosa may result. These conditions produce extremely favorable conditions for the culturing of bacteria.

If catheterization seems impossible, local and regional anesthesia may be attempted. The gentle injection of 20 cc. of freshly prepared 1% cocaine with an urethral syringe, with retention for five minutes may be of value. The presence of hemorrhage contraindicates the use of cocaine.

Caudal anesthesia (30 to 40 cc. of 2% novacaine) can be used when cocaine fails. The last resort is cystotomy.

2. Infection - After the amount of the residual urine has been measured, the next step is to determine the presence or absence of infection of the urinary tract. If there is an acute infection, with fever, continuous catheteral drainage is done, with forced administration of fluids (3000 to 5000 cc. daily). Rest in bed, and the administration of urinary antiseptics are useful agents. If the catheter is too irritating, cystotomy may be done.

Chronic infections are treated the same way, with the addition of bladder lavage, and the use of a ketogenic diet. Sometimes it is necessary to operate in the presence of chronic infections. If the patient is well immunized, as shown by the

absence of a febrile reaction during the preparatory period, it may be rather safely disregarded.

3. **Kidney Function** - This is most easily estimated by means of the fractional phenolsulphothalein test. 6 mg. are given intravenously. Four specimens of urine, taken at half hour intervals with an indwelling catheter are used, then, for the estimation of the percentage elimination for each period. The minimum normal is 40%, with nearly half the total appearing in the first one-half hour. The object of the drainage period is to get the dye excretion as near as normal as is possible. This may require a few days or several months.

Some urologists use the indigo-carmin colorimetric method. Operation may be done when the excretion has reached a constant level.

4. **Local Complications** - Acute prostatitis, urethritis, or periurethral abscess may subside under conservative treatment, or catheterization, cystostomy, or surgery may be needed. Vasectomy should be a routine procedure before the operation to prevent epididymitis.

Stone in the bladder may impair the end result. They should be excluded by X-ray, and, when present, removed by litholapaxy, unless too hard or too large, when suprapubic cystostomy is required.

Diverticula may cause trouble. They can be seen by X-ray with the bladder distended with a solution of 5% AgI. If

small, they may be left alone; if medium sized, they may be taken care of at the time of the operation; if large, preliminary diverticulectomy may be done to avoid persistence of retention, infection, and urinary symptoms. Those diverticulae which empty upon catheterization may be left alone.

Hematuria demands a thorough cystoscopic examination, including pyelography, thus excluding vesicular and renal neoplasms.

Atony of the bladder is usually due to long standing over-distention, with atrophy or fibrosis of the detrusor muscle. It is recognized by the fact that the urine dries from the catheter and by cytographic study. The presence of atony means long continued preliminary drainage, because if the wall is flaccid it will fail to empty after removal of the prostate.

Lesions of the central nervous system which impair the expulsive power of the bladder are tabes dorsalis, taboparesis, and arteriosclerosis of the spinal cord. In these cases a complete neurological examination and cystoscopic examination should be made. The presence of incontinence, and loss of sensation with prostatic obstruction need not contraindicate its operative relief unless they are entirely on a neurologic basis. Preparation, in these cases, is the same; the transurethral method is best.

The chief indications for preliminary cystotomy are: inability

to pass a catheter; serious local complications, such as periurethral abscess; a progressively severe infection, in spite of catheter drainage; and the presence of complicating diseases, such as large bladder stones, bladder tumors, and large diverticula, which fail to empty.

If cystotomy is to be done, it should be done at once, without waiting until the patient is prostrate from the toxemia of an infectious process. (39) R.M. Nesbit has shown that, while experience has shown that drainage is essential in those cases having definite impairment of function or serious infection, it is questionable whether drainage in their absence is advisable. To the contrary, the unaffected case is undoubtedly contaminated by indwelling catheter drainage, and cases having mild or unimportant infections are often rendered distinctly worse by it. One should bear in mind, that, while a catheter drains the bladder, it does not drain the urethra and prostate. The recent studies of Hugh Cabot have shown further that the introduction of infection into an uninfected genito-urinary tract, or lightening up of a pre-existing mild urinary infection by catheter drainage produces a definite impairment of renal function. Nesbit states that in patients having less than 240 cc. of residual, with little or no infection, and normal renal function, there is invariably better success without preliminary catheteral drainage. (41)

Bumpus, of the Mayo Clinic, also believes this to be true. He never hesitates to remove the obstructing part of the prostate (through the urethra) if the kidney function is normal, acute prostatitis lacking, and the diagnosis established. (26)

Those patients having more than 240 cc of residual can be put on catheteral drainage. The average length of catheteral drainage is six days.

A.B. Cecil believes that intermittent catheterization is much better than continuous catheterization. He states that the patients coming in for operation today come in at an earlier stage of the disease, rather than later, when they are in need of emergency treatment, and their kidneys are completely damaged. The patients, therefore, are in a much better condition to stand the operation. Patients of this kind do not need the extreme preliminary treatment as do those with damaged kidneys and uremia. In many cases, the infection introduced causes many post-operative complications. Cecil believes that if the catheterization is intermittently done, the morbidity is much lower. He also states that a permanent catheter causes the formation of pus behind it.

In patients with little or no residual urine, he uses intermittent catheterization, and does not confine patients to bed. In patients with large residuals, he withdraws all urine at once, and then instills 20 cc. of 1:500 silver nitrate solution, to combat infection. He gives such patients 500 cc. of glucose morning and night, and heart stimulants, with repeated catheterization at short intervals. In patients who are run down, and who show a high urea nitrogen, he does suprapubic drainage, sending them home for three to six months, and then having them return for operation. (42)

Proper pre-operative anesthesia as morphine and atropine, with the spinal or caudal anesthesia has been shown to give better results.(23)

The time of operation is a problem always to be considered; it is often a difficult question to answer. The renal function should be the best obtainable in the particular patient. A phenol-sulphonophthalein test should be run on the patient when first seen. If it is normal, no further preparation is needed as far as kidney function is concerned. If it is diminished, drainage should be continued till the excretion reaches its highest possible level, especially if an open operation is to be performed. A moderate reduction in function is no contraindication if the condition of the patient is otherwise good, the operation short, and the transurethral method used.

If infection is absent, the kidney function normal, and less than three ounces of residual urine are present, primary operation may be performed. Mild chronic infections, good kidney function, and a small residual urine require no preliminary drainage, while a more severe chronic type, with functional impairment, requires drainage, forced fluids, urinary antiseptics, and bladder lavage until the infection has subsided. Acute renal infections, with fever, are absolute contraindications.

The patient should move about in his bed; take deep breathing exercises to avoid lung complications after operation.

The presence of considerable residual urine, and of functional impairment, are definite indications for operation, while persistent complete retention is an absolute indication.

Patients with little or no residual urine, but with definite obstructive symptoms may respond to intermittent catheterization,

prostatic massage, bladder instillation, and bladder lavage for awhile before operation.

In conclusion, it is known that a low mortality in prostatic surgery depends upon a proper selection of patients and upon their thorough preparation. Once the patient is in proper condition, any capable surgeon can remove the prostate suprapubically, through the perineum, or trans-urethrally. (42)

Section II
Suprapubic Prostatectomy

With the development of modern methods of operating, and the introduction of asepsis, the suprapubic method of prostatectomy has come into view.

The suprapubic approach to the prostate has been defined in two stages. In early days, the operation was always done in one stage. Surgeons learned that much of the mortality associated with the operation resulted from putting the added burden of operative shock upon the kidneys that had been previously overloaded by the obstruction and resultant infection. In mildly infected cases, wherein the kidneys are not seriously affected, the one stage operation is allowable. This type of operation deserves consideration in patients with clear urine, good functional tests, and less than 250 cc. of residual. (40)

When doubt exists, or in infected bladders where the infection is of a character that will produce toxemia and morbidity, the two stage operation should be done.

The tendency among the surgeons of today who are experienced in these matters has been more and more for the two-stage operation, for the following reasons: Cystostomy has been preferred to catheter preparation because it puts the prostate and posterior urethra at rest, free from irritation, and with an opportunity for hyperemia and swelling to subside. When there is infection of the bladder, it has been felt that to open up the prostatic bed to absorption at the same time as the suprapubic wound is created and opened up to absorption, is to place added burdens upon the kidneys and other vital organs. The preliminary cystostomy performed under infiltration anesthesia, often

a period of catheter drainage, permits the peri-vesicular tissue spaces to become sealed off. (44)

In the two stage operation, cystostomy is the first thing to be done. An incision is made in the upper half of the median line between the umbilicus and symphysis, allowing downward extension of the excision for the subsequent prostatectomy. The trochar is thrust into the bladder for introduction of the catheter high in the dome of the bladder, after deflection of the peritoneum and pre-peritoneal fat. The catheter is then brought out in the upper end of the incision, thus facilitating extension of the incision downward rather than upward, for the subsequent prostatectomy.

In the one stage suprapubic operation, after caudal anesthesia of one per cent novacaine, an incision is made extending from just above the symphysis to within four-fifths of the distance to the umbilicus, providing adequate exposure of the operative field. The distention of the bladder with air or solution is not necessary for its identification, because the retraction upward of the peritoneum and the pre-peritoneal fat exposes the collapsed bladder, which is readily recognized by its longitudinal muscle fibers. A bladder retractor is then inserted, which enables one to inspect the entire bladder and see the entire procedure of removing the gland.

As the first step in the actual removal of the gland, the mucous membrane around the internal urethral orifice, or that overlying the intravesicular part of the prostate is carefully excised with scissors, in order to avoid irregular laceration in the subsequent enucleation.

The absence of an anterior lobe favors establishing the cleavage plane for the enucleation in the antero-lateral wall of the prostatic urethra, which may be established by the index finger. The enucleation may then be completed with the finger or with instruments, throughout the entire circumference, within the capsule. In cases of adenomatous hypertrophy the cleavage plane is very indefinite and entirely within the capsule of the gland. It is most readily established anteriorly, and, when accurately obtained, favors the enucleation of the entire adenomatous enlargement of the median and lateral lobes intact, and, at times, with the entire circumference of the prostatic urethra. In approximately 15% of the cases, prostatic obstruction is the result of inflammatory enlargement of the gland, so-called prostatitis, in which a distinct cleavage plane does not exist. The visible operation makes possible a careful excision of the gland or its obstructing portions with scissors.

Inspection of the prostatic capsule is essential to demonstrate that small adenomata do not exist. After the gland has been dissected, irregular tags of mucous membrane may become agglutinated to form a diaphragm, with subsequent obstruction of the vesical neck. This is obviated by obtaining the exposure of the one-stage operation and incising the mucous membrane with scissors before the enucleation, or trimming off the tags after the removal of the gland.

After removal of the gland, accurate control of the bleeding is absolutely essential to the safe termination of the operation. Many

ingenious methods of providing hemostatic control following prostatectomy have been advocated. Massage of the prostatic capsule immediately after removal of the gland will to some extent control bleeding from the interior of the capsule. The capsule has been irrigated with hot liquids, such as boiling water, boric acid solution, and not bichloride solution. Various tampons inserted into the prostatic capsule, and methods of suturing the capsule have accomplished a certain degree of hemostasis. Thromboplastic substances, chiefly kephalin, have served to reduce post-operative hemorrhage. Before the advent of the Hagner bag and Pilcher's modification of it, probably the most effective means was to pack the prostatic capsule with iodoform gauze, and allow it to remain a few days. While gauze has usually been effectual, its effectiveness is the result of the gauze becoming enmeshed in the granulation tissue of the capsule. When removed, bleeding of variable degree is often precipitated, and occasionally severe secondary hemorrhage occurs.

The use of the Pilcher bag is usually adequate in controlling bleeding not only from the capsule but from the vesical neck as well. The bag is put into place and filled with water, the amount of distention varying with the size of the prostate. Distention of the bag to the point of hemostatic effect exerts a pressure within the bag of about 140 mm. of Hg.

Post-operative treatment is very important. The patient should receive at least 3000 cc. of fluid a day, and routine care which

will be discussed later. Considerable difference of opinion exists regarding the length of time the bag is required. In most instances six hours is probably long enough, and there may be little reason for prolonging it more than twelve hours. However, deflation of the bag twelve to sixteen hours after the operation insures the greatest prevention of secondary bleeding. In about four per cent of the cases, even after this time, reinflation for several additional hours is necessary. After deflation, the bag is allowed to remain in place for a few hours in order to insure against additional bleeding. The bag is withdrawn through a number 30 male catheter, through the supra-pubic incision. It is not necessary to maintain prolonged supra-pubic drainage when hemostasis has been accurate and complete. It prolongs healing, and delays the establishment of urethral urinary function. The urethral catheter is maintained in position for from ten to fourteen days, by the end of which time the supra-pubic wound will be closed. Usually upon withdrawal of the catheter, voluntary urination occurs. This method of drainage obviates a persistent supra-pubic urinary sinus, reduces the length of time to a minimum, and gives excellent functional results. (44)

The advantage of the supra-pubic route may be summed up as follows:

- 1) The approach is practically bloodless.
- 2) Emucleation may be done by the aid of sight or touch alone.
- 3) Stones or other diseases of the bladder are most easily dealt with.

- 4) If there is a large hypertrophy, particularly of the median lobe, it is more accessible.
- 5) The prostate is more accessible and, by digital pressure, in the rectum, it can be brought still closer, without the use of instruments. (45)

Section II
Perineal Prostatotomy

Perineal prostatectomy has undergone the most radical changes within the last thirty years, and the mortality, in consequence of the operation, has been reduced from thirty or thirty-five per cent to as low as one per cent and even lower. Various operators have had long series without any mortality at all.

The patients who present themselves for prostatectomy are usually old men, most of them being more than sixty-five years of age; and most of them present a multiplicity of pathology. Not only is there found a large amount of residual urine in most cases, but by reason of back-pressure, the kidneys are also involved in the great majority of cases. Under such conditions, prostatectomies were formerly performed, until the surgeons began to realize that these very conditions were responsible for the high mortality. (45) At the present time, the statistics on perineal prostatectomies upon the aged correspond favorably with the statistics obtained for herniotomy upon the young and the old.

The three essential factors contributing toward this conspicuous lowering of the mortality rate, according to E. Davis, are:

- 1) Proper pre-operative care,
- 2) Sacral block anesthesia, and
- 3) Complete hemostasis.

He reported 221 cases (consecutive), in 1929, with a mortality rate of 2.2 %. (46)

In 1933 E. Davis and C. A. Owens reported 479 cases. The table following shows their results.

Results in Perineal Prostatectomy
(1933, E. Davis and C.A. Owens (28))

Total Consecutive Cases - - - - -	479
Average Age - - - - -	70
Deaths - - - - -	12
Mortality Rate - - - - -	2.5%

Late Functional Results

Well - - - - -	82.3%
Improved - - - - -	16.5%
Unimproved - - - - -	1.2%
Incontinence	
Complete - - - - -	0
Moderate, but definite - - - - -	4
Slight, or doubtful - - - - -	5
Perineal Urinary Fistula, requiring closure - -	7

H. Young reported 1,049 cases, from 1902 to 1923, with a mortality rate of 3.4%. (47)

The pre-operative treatment has been discussed above. Sacral anesthesia has proved its merit and can be used.

The technic of the operation is as follows: Through an inverted "U" incision the prostate is reached by blunt dissection on each side of the central tendon, opening up the space behind the transversus perinei muscle and triangular ligament. After division of the central tendon and rectourethralis muscle, the posterior surface of the fascia of Denonvilliers is exposed. Division of the posterior layer of this fascia gives entrance into the space between the two, which, in fetal life, was peritoneum, and opens up a ready access to the prostate, seminal vesicles, and vasa deferentia. By means of the prostatic tractor, introduced through the posterior part of the membranous urethra, the hypertrophied mass can be drawn down into the field.

The urethra is opened by means of an inverted "V" incision, which makes it possible to enucleate, in one piece, the entire adenomatous hypertrophy, including the anterior commissure, if it is involved. With the tractor held vertically, beak directed downward, the lateral lobes having been freed, the mucous membrane in front of the middle lobe is divided transversely with the scalpel, exposing the ejaculatory ducts. These are covered with the index finger and pushed back. This procedure preserves the ejaculatory ducts and offers the opportunity to remove every vestige of the hypertrophied tissue without injury to the neck of the bladder and internal sphincter. It also makes it possible to follow the hypertrophied tissue beneath the trigone and remove a group of glands, which, when hypertrophied, are usually not removed by the suprapubic operation, thus remaining to give trouble by future obstruction. (45)

After the operation, a perineal prostatic bag should be inserted and left for a few hours after the operation. This will control hemorrhage. (28)

The advantage of the perineal prostatectomy is as follows:

- 1) Abdominal distention from obstipation or intestinal obstruction or undue gas formation is not so common.
- 2) The subtrigonal lobe can be brought into view, and can be separated from the sphincter.
- 3) By making an inverted "V" incision into the urethra, the entire adenomatous tissue, including the anterior commissure and every vestige of the hypertrophied tissue can be removed.

- 4) The drainage, being downward, is much more effective, and the care of the wound is much simplified.
- 5) Micturation is more perfect.
- 6) The tearing and cutting into the peritoneum in suprapubic operation has a mortality of its own.
- 7) Sterility is caused less often in the suprapubic operation. This is a matter of great importance, particularly in the younger patients, by reason of its psychic effect.
- 8) There is an easy access to all bleeding points, and thus hemorrhage can be more thoroughly controlled. (45)

Section II
Transurethral Resection

Almost four years have elapsed since Davis published a startling and almost unbelievable report of spectacular results obtained in a series of 123 cases of transurethral resection. Severe criticisms from some quarters were heaped upon him, just as is the case with every pioneer in a new field. Many of those who were most skeptical are now ardent advocates of the endourethral attack upon the prostatic obstruction, and their enthusiasm of the procedure is increasing with each presentation of the subject. (48) The enthusiasm of Davis, Alcock, the Mayo Clinic group, and Caulk, whose reported series of cases amply justify their enthusiasm, has been shared by all of those who have utilized this method. The ultimate evaluation of trans-urethral prostatic resection must be based, not only upon the brilliant success of the few leaders, but also, upon the failures of those who follow the trail they have blazed. (41)

Since the early days of resection, thousands of cases have been reported of resections throughout the country. There is no field of surgery which has been more intensively cultivated, as evidenced by a bumper crop of prostates submitting daily to this so-called simple operation, which in some instances seem to follow an erroneous slogan of "in one day and out the next". It is unfortunate that this valuable field has been given such wide publicity as a minor procedure which can be carried out with complete safety. There is no logical reason why complications common to other surgical procedures should not arise, plus all the dangers of operation along the urinary tract.

It is against all the well established principles of surgery to instill the idea in the minds of the public, as well as of the profession, that tissues, especially those of the vesical neck and urethra of old men, can be excised, incised, and traumatized at will, without a ripple of convalescence. It should be understood that pre-operative care and post-operative care is as important in transurethral surgery as in prostatectomy. Many cases have been reported which did not have due preparative care. As the result of inexperience, faulty technic, and the improper selection of cases, many unfavorable results have been reported in the medical literature. After the first prostatectomies, the mortality rate was high and the complications were many. It takes time to learn how to prepare and how to care for patients who are to be operated upon by this method. (39)

Transurethral prostatic resections may be described as the removal, bit by bit, by means of an electric cutting current, through an endoscopic tube (during one or more sittings) of a sufficient amount of the obstructing prostatic tissue to permit the patient to empty his bladder. Very complicated and elaborate electrical equipment is required, in order to provide both cutting current, to remove the tissue, and a coagulating current, to control the hemorrhage. The mechanism of the modified endoscope (or resectoscope) employed for this purpose, provides a small wire loop 7 mm. in diameter, which, through a system of lever control, makes an excursion of 27 mm. in length, cutting out a piece of prostate tissue all of approximately the same size. A large number of cuts may be made at

at one sitting, permitting of the removal of 5 to 10 grams of prostatic tissue, or considerably more, As is necessary. the coagulating current is switched on to control the individual points. Through a gradual process of evolution, this instrument has reached the stage approaching mechanical perfection, so that, in skillful hands, there is no limit to the number of grams of tissue which may be removed. Furthermore, the excellent vision afforded through the more modern lens systems permits this tissue to be removed with great exactness, and, together with the coagulation current, permits the control of immediate hemorrhage in a good manner. (28)

Walker pointed out that modern transurethral methods are of three kinds:

- 1) Simple fulguration, the coagulated tissue being left to slough away.
- 2) Electrocoagulation followed by immediate punching out of the coagulated tissue.
- 3) Removal of obstructing tissue by means of the McCarthy loop.

He states that infection is the grave danger in the case in which coagulated tissue is left behind. For that reason he expresses the strong preference for operations which include immediate removal of the coagulated tissues. This is best accomplished by the McCarthy loop, and at the same time, bleeding points are sealed.

Bumpus, of the Mayo Clinic, reported 488 cases of prostatic resection, from January 1, 1932 to July 1, 1933. He had only one death. (49)

Caulk states that, in his experience, the removal of the obstructing tissue with the cautery punch is far more safer than the use of high frequency currents in extraction. The cautery seems to obviate hemorrhage and absorption through mild coagulation; it is not attended with complications that can be ascribed to cautery, whereas the high frequency currents appear to possess natural inherent dangers, and seem to create certain post-operative complications that can definitely be attributed to the effects of the current. Caulk's results with the cautery punch are as follows:

	Punch	Resection
Total cases	7,415	8,073
Total deaths	81	302
" sepsis	20	91
" embolism	1	13
" apoplexy	2	7
" cardiac	6	24
" shock	2	19
" septicemia	2	8
" pneumonia	13	30
" uremia	3	21

Punch - 6,008 cases		Resection - 4,885 cases	
Primary hemorrhage	0.5%	Primary hemorrhage	1.3%
Secondary " "	0.2%	Secondary " "	0.7%
Mortality	0.9%	Mortality	4.7%

(50)

I could go into detail discussing the technic of the different operations and the different methods of prostatic resection, but I believe that each operator has his own instruments and his own technic, and the description of any one of these would be no means be the best. I think the operator learns by experience which method is best, so

I will not consider these details in this thesis.

Transurethral prostatic resection determines accurately what portion or portions of the gland are involved in producing the obstruction, and then accurately removes only those portions. It thereby restores bladder function.

An instrument that will enable the operator to determine accurately what portion of the gland is causing the obstruction, and remove accurately only the portion involved must give the operator:

- 1) Good vision,
- 2) Facilitate perfect hemorrhage control,
- 3) and remove adequately any amount of tissue.

The Sterns-Davis resectoscope was the first instrument that approached these requirements, and the Sterns-McCarthy instrument is an improvement upon that of Sterns-Davis.

In the majority of cases now being done, Alcock removes 15 to 35 g. Usually it is not particularly difficult, with experience, to remove from 25 to 40 g. at one sitting. In 1933, Bumpus reported 545 cases in which the average amount resected was 2 to 4 g. (51)

In the beginning, the time consumed at a resection was an hour and a half to two hours and a half. At present, the patient is seldom kept on the table more than fifty minutes, and in the average case, the resection is completed in from twenty to twenty-five minutes. In general, it may be said, that from one-third to three-fourths of the gland is removed. (52)

The following tables show Alcock's results in resection and prostatectomy:

	Number		Percentage	
	Resection	Prostatectomy	Resection	Prostatectomy
Total cases	600	600		
Benign	490	557	81.7	92.8
Ages				
90-100	2	0	0.3	0.0
80-90	43	20	7.2	3.3
70-80	333	202	35.5	33.7
60-70	200	305	33.5	50.9
50-60	22	68	3.7	11.3
40-50	0	5	0.0	0.8
Over 70	378	222	63.0	37.0
Under 70	222	378	37.0	63.0
Average Age	72.8	66.3		
Hospital Days	16.2	71.4		
Deaths	28	134	4.6	22.3

(52)

The type of operation for prostatic benign hypertrophy is a delicate subject to discuss. In most instances it is a question of the operator's personal preference, there being very few absolute indications for any one type of procedure. In very large benign hypertrophies, suprapubic prostatectomy is to be preferred. A very large prostate is one which makes transurethral resection technically very difficult, or one which will prolong it unduly. The actual criterion depends upon the operator's preference and ability. In this connection, one must emphasize the fact that the size of the gland may feel very large by rectal examination, before drainage, but, after drainage, the hypertrophy may actually be slight.

Transurethral methods are required for small firm glands,

particularly those presenting a fibrous median bar, since these can rarely be enucleated, and suprapubic or perineal prostatectomy yields poor results.

Creevy resects all glands that are not too large to present technical difficulties. By this method the hospitalization is shorter, the expense of dressings is less, and the mortality is low. (3.7% in his cases).

The question of recurrence in benign hypertrophy, because of necessary incomplete removal of the abnormal tissue, cannot be settled for some years yet to come. (39)

Transurethral resections must be reserved for the experienced cystoscopist. For the men who occasionally look into the bladder, the attempt is foolhardy, and is often attributed to the activities of a salesman who pictures the operation as easy "with his instruments".

Randall's classification of bladder neck obstructions does away with loose terms, accurately describes the lesions, and aims at individualization in each case. At the present time, his classification of pathology clearly points out the indications for endovesical revision and for prostatectomy.

The following pathological classification of Randall's clearly shows when transurethral resection should be done, and when prostatic enucleation should be done.

Randall's Classification

- I. Simple bilateral lobe hypertrophy. Intra-capsular, and producing symptoms without signs. Prostatectomy should be done.
- II. True middle lobe hypertrophy. Submucous or subcervical Albarran gland hypertrophy. Its strategic position presents true mechanical obstruction. Superficial in origin, and in growth; rarely great in size. Resection should be done with complete cure of the obstruction.
- III. Combination of middle and lateral lobe hypertrophy: The sphincter dilates, with intrusion of the lateral lobes through the sphincter. Growth is often gigantic, and may exhibit large, unsuspected residuals. There are atonic, weak bladder walls, and cardio-vascular-renal complication. Prostatectomy is indicated.
- IV. Median bar formation (Contracture of vesical neck). Prostatism sans prostate; prostatism is miniature. Sclerosis of internal sphincter. Atrophy of the prostate and fibrosis of the vesical orifice. Secondary to long standing prostatic infection, with inevitable stenosis of the bladder orifice. Produces residual urine, and all the symptoms of prostatism. Resection gives good clinical results. (27)

The advantages of prostatic resection are:

- 1) Less hospitalization
- 2) It appeals to the patient, who does not consider it a major operation, and the
- 3) Elimination of shock (28)

The objections to resection are:

- 1) The results may not be permanent
- 2) Fibroadenomatous hypertrophy having taken place, the process will continue
- 3) Removal of only obstructive tissue will of necessity be followed by new obstructive tissue.
- 4) Complete enucleation will later become necessary.
- 5) Infection is more common.

Transurethral resections are major surgical procedures. The fatalities from this operation have been far greater in some cases than its devotees care to admit. In a considerable number of cases of benign hypertrophy the results are unsatisfactory, requiring re-operation, either by resection or prostatectomy. The future development of carcinoma and regrowth of adenoma must be considered. Removal of the obstruction from fibrous bars and in certain selected cases, the method is par excellent.

In any event, we have, in this operation, a most valuable aid to urological surgery, which time and experience will put in its proper place. (23)

Majority opinion is that this procedure will partially replace,

but will not supplant prostatectomy. Transurethral resection is unquestionably a procedure that will be used extensively in the future. The recognition of early obstruction and treatment by resection while the patient is still in good health will greatly reduce the incidence of advanced prostatism and its need for extreme surgery.

Section II

Post-Operative Treatment

The post-operative treatment in suprapubic and perineal operations is principally the care-taking of complications as they arise. Of these, the first attention is given to shock, since most patients are old and feeble. They must be given water in large quantities up to the time they are taken into the operating room, for this helps them against loss of blood. A quick careful operation and painstaking hemostasis are required to lessen shock. All hemorrhage must be controlled. This is accomplished by the use of the Filcher bag in the suprapubic prostatectomy, and by the Hagner bag in the perineal operation. If a bag is not used, the area should be thoroughly packed with gauze. If, after the gauze or bag is removed, there is still hemorrhage, it may be necessary to go in and tie the bleeding points or reintroduce a hemostatic bag. Even then, with the most careful attention given to it, hemorrhage at times cannot be stopped.

Next in order are pulmonary complications, primarily pneumonia. Since the application of local anesthesia, either sacral in suprapubic, or epidural in perineal prostatectomy, this complication is met with much less frequently, and the mortality of the operation has been greatly reduced by this reason. However, pneumonia may develop two or three weeks after and entirely independent of the operation. This disease can best be prevented by getting the patient up and out of bed at the earliest possible time - at most, into a wheel chair within a few days. In ten days the patient should be up and walking in a warm room with plenty of fresh air, but protected from draught.

If there is considerable impairment of the kidneys, due to the back-pressure or ascending pressure, before or after the operation, it most often results in uremia, frequently with death. This must be prevented by proper pre-operative treatment. It is imperative that water be given in large amounts after the operation, by mouth, proctolysis, subcutaneously, or intravenously. This is especially true if fever or localized symptoms should indicate an oncoming pyelitis.

Of all of the cardio-vascular complications pulmonary embolism is by far the most common. While it may be caused by some cardiac disease, it may appear as a result of some cause in the operative field. Where there is a high blood pressure with arteriosclerosis, cerebral hemorrhage must be considered. Myocarditis is a complication which is very difficult to combat.

Aside from shock, it seems infection is to be most dreaded, and, therefore, everything must be done to prevent it. Urethral and suprapubic drainage will usually have infection as a sequence. The bacillus coli communis is usually the offending organism, but, as a rule, it is not virulent. However, it may become virulent in a short space of time, causing cystitis, epididymitis, prostatitis, or ascending infection toward the kidneys. Any of these complications must be promptly treated; in epididymitis, incision and drainage are effective; for a cystitis, irrigation with some mild antiseptic is used. Internal hydrotherapy, thoroughly washing out the kidneys, will most often overcome an ascending infection. Intravenous use of mercurochrome - five milligrams per kilo of body weight in a 1% solution seems to be of use.

A regular evacuation of the bowels must be insisted upon, and measures to procure this must be taken. Nausea and vomiting, which by reason of pressure upon the operative field, doing great damage, are a very annoying occurrence, and must be treated in a vigorous manner. Liquid petrolatum with agar-agar and extract of colcynth will usually prevent trouble along this line. If there is flatus, a small high-colonic tube may be inserted. Enemas must not be used.

In caring for the wound, the drainage tubes and gauze can be removed after twenty-four to thirty-six hours. In the perineal operation, urine is permitted to escape through a lateral perineal wound, which is irrigated with a mild antiseptic solution after each change of the dressing, and after each bowel movement. A week after the operation, for the purpose of making the membranous urethra patent and encouraging the wound to close, fluid is forced through the penile urethra. If after two weeks normal voiding has not been established, it may be necessary to pass sounds into the membranous urethra.

In the perineal operation, after the removal of the drainage tube, the fistula will close, as a rule, within twenty-five days. It seems that a persistent fistula is more common after a suprapubic than after a perineal operation. Should a fistula persist, it will be found that the use of a sharp curette will be of great assistance in attempting to close it.

It must be remembered that by reason of the condition prevailing before operation, as a rule, the bladder has become contracted, and micturation may be more frequent than would be normal. The loss of

tonicity of the internal or external sphincters may be responsible for the leakage of urine upon coughing or sneezing. But if the patient is instructed to retain his urine as long as possible and keep exercising the cut-off muscles during the act of micturation, this loss of tone will lessen rapidly, and micturation will become more normal in a very short while. Permanent incontinence of urine is a very uncommon occurrence. (45)(46)

C.O.Ritch recommends: (1) Alcohol if the patient is accustomed to it, (2) Three liters of fluid every 24 hours, (3) Blood transfusion if needed, (4) Propping up in bed on fifth or sixth day, (5) Physical examination daily, (6) Good nourishing diet, (7) A support for the scrotum, to prevent epididymitis, (8) and diathermy, after operation, to prevent infection. (54)

T.M. Davis of South Carolina summarizes the post-operative care for transurethral resection patients. Patients are kept in bed quietly for fortyeight hours. The retention catheter is connected to a bottle at the side of the bed, with a rubber tube. There is, here, the essential factor of fluid intake, which must not be neglected, or post-operative complications will arise in this method also. During the first twelve hours following operation the patient must take at least one-half gallon of fluids. If he fails, the deficit must be supplied by intravenous saline. Subsequently, the patient must consume one gallon or more of fluids every twenty-four hours, or intravenous administration must be done. In the first few days the urinary out-put should be recorded.

Should there be oozing from the operative site, the catheter is irrigated with sterile water as often as is necessary to remove any small clots that may occlude the catheter and prevent free drainage. This may be necessary during the first twenty-four hours. If diverticula are present in the bladder, it may be irrigated.

Soft diet is given on the day of the operation, and full diet is permissible on the third day if the patient is free of fever. The patient is usually up in the wheel chair on the third day. One fourth grain of morphine every four hours may be given for pain. Laxatives and enemata may be given.

The catheter is usually removed on the fourth or fifth day, and the patient in most instances voids without difficulty. If not, the catheter is reinserted for several days. This is not due to insufficient removal of the gland, but due to the edema incident to the operation.

During the second week there may be terminal tenesmus, which can be controlled by tincture of belladonna, minum 7 every four hours, or, if severe, codeine, gr. $\frac{1}{2}$ every four hours. In slight oozing or pink or red urine, fluidextract of ergot, minums 10, is given every four hours. It is very effective. The urine usually contains pus cells in varying amounts for six to eight weeks. It is customary to give one of the urinary antiseptics before meals after the second week and for four weeks or longer afterward.

Patients who live nearby may be dismissed from the hospital at the end of a week. Those from distant locations should be requested to remain close by for observation for two weeks. (55)

I will not discuss the complications of prostatectomy or trans-urethral resection, but the most common ones are (1) Hemorrhage, (2) Urethral stricture, (3) Pyonephrosis, (4) Periurethral abscess, (5) Reoccurrence of obstruction, (6) Incontinence, (7) Sepsis, and (8) Pulmonary embolism.

In conclusion, I have not attempted, in this thesis, to cover the subject of treatment of benign hypertrophy of the prostate, but have presented a discussion on the history of treatment and the ideas of treatment as they are to-day.

Section III
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