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ORIGINAL ARTICLES

TRANSURETHRAL OPERATIONS UPON THE PROSTATE

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The 1933 operation of transurethral prostatic resection has not suddenly grown over night, but represents a gradual and orderly evolution which has matured hand in hand with our knowledge of the pathological process underlying the disease, and the slow development and improvement of endoscopic instruments both for the diagnosis and treatment of endovesical disorders. To gather an historical understanding of our present resectoscopic armamentarium one must hark back to 1830 when Guthrie¹ presented to the Royal College of Surgeons a knife concealed in a catheter to sever "bar formed in the neck of the bladder." This represented the simplest type of instrument, merely a concealed knife in a sheath, whose function was to incise, not excise, the obstruction. A prize was awarded to Mercier in 1850 by the Paris Academy of Sciences for his work in perfecting an incisor. We observe a distinct advance in Bottini's² platinum cautery blade of 1874, a substitution of Mercier's² bare knife.

Formerly working, as it were, in the dark, it was only logical that the next improvement should be visualization of the operation. Wishard, in 1890, used a rectal speculum through a perineal incision by means of which a cautery (Fig. 1) was applied to the prostate. This procedure was reported at a meeting of the American Association of Genito-Urinary Surgeons at Washington, D. C., in September, 1891, and published in the *Journal of Cutaneous and Genito-Urinary Diseases* in February, 1892.⁴ So far as he is aware, this is the first reference to visualization of the operative field other than by means of open operation.

Freudenberg⁵ applied visualization to his urethral instrument in 1897; Chetwood⁶ in 1901 used

an instrument without visualization through a perineal incision. Indeed, with the appearance of open surgical attack upon the prostate, the continued advantage of a visualizing urethral instrument for relief of median bar formation and the smaller prostatic hypertrophies was repeatedly recognized. Starting in 1890 and for twenty years thereafter Wishard at times used a cautery and snare (Figs. 1 and 3) through a perineal tube for the relief of prostatic obstruction under view, being among the first to call attention to the subsequent atrophy of prostatic tissue. He also reported the use of the cautery through a Koch's air dilating cystoscope (1902).^{4a} His cystoscope of 1900 armed with an adjustable cautery blade of the Bottini type (Fig. 2) had the advantage of visualization through the

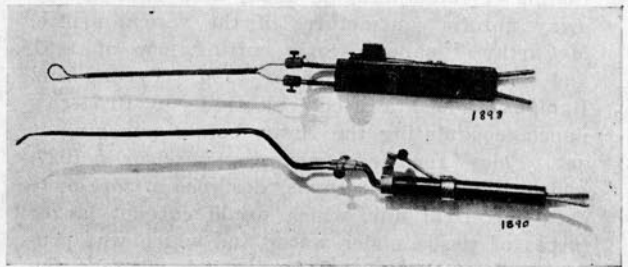


Fig. 1

Above: Wishard's cautery snare for use through perineal tube.

Below: Wishard's cautery knife (1890).

Each used under visualization through perineal tube.

urethra but was later regarded by him as inferior in mechanical construction when compared with Goldschmidt's subsequent instrument. He finally concluded that the electro-cautery's value was confined to a restricted group of cases and should not displace open surgical removal of the larger prostates.

Up to 1909, then, we find the following basic principles involved in the transurethral attack, namely, a knife blade or a cautery, used through an endoscopic instrument under direct visualization for the purpose of incising the obstructing growth. Then it was that Young⁷ contributed a tremendous advance by designing an instrument dubbed by his house officers "the punch," which had all the virtues of previous instruments plus the very real advantage of actually removing the obstructing

tissue rather than merely incising it. From that time on advance has been rapid, but has progressed along the line of removing more and more of the obstructing tissue, rather than in the development of any new or basic fundamental principle. Thus we find Stevens⁸ in 1913 applying Beer's suggestion of 1910 by fulgurating the vesical neck obstruction with a bipolar high frequency current. Luys⁹ in 1913 announced his "forage" of the prostate, and

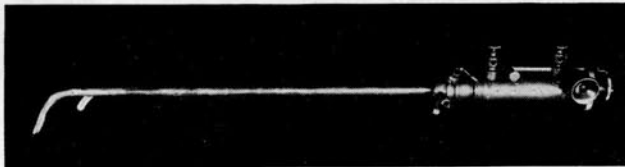


Fig. 2
Wishard's Cautery Cystoscope, (1902).

Braasch¹⁰ in 1918 devised a modification of Young's punch. It remained for Caulk¹¹ in 1919 to present a cautery punch which minimized the troublesome factor of operative hemorrhage, coupled with all the advantages of previous instruments, and by means of which he was later (1926) able to report a large series of lateral lobe enlargements successfully removed.

The turn of the tide from the actual cautery, knife, or punch to the use of powerful high frequency electric cutting currents is illustrated by Colling's¹² radiotherm of 1926, used first to cut away fibrotic contractures of the vesical orifice, McCarthy's¹³ panendoscopic cutting loop of 1931 and Stern's¹⁴ resectoscope of 1926. Tyvand and Bumpus¹⁵ added a needle electrode to Braasch's punch, coagulating the tissue before punching it out. Foley¹⁶ reported a cystoscopic excisor in 1927, and in the same year Davis¹⁷ designed a more powerful electrical unit which would cut out larger pieces of tissue under water and which was provided with an electrical foot switch whereby the operator could turn from cutting to coagulating (hemostatic) current at will. McCarthy then assembled his panendoscopic cutting device, equipped with the Stern control of the cutting loop, in an insulating bakelite sheath with an open-ended fenestrum, resulting in an instrument which, when used with one of the powerful modern electrical units, removes almost any desired amount of obstructing prostatic tissue. Day has likewise designed a resector, while Kirwin¹⁸ in 1931 used an instrument whose electrode moved in a circular arc rather than to and fro. Brevity forbids description of other useful instruments, both here and abroad, for kindred purposes; lack of technical understanding prevents a critical discussion of the pros and cons of the spark gap and radio tube electrical units.

To the patient, the greatest recommendation for transurethral prostatectomy is that it is accomplished without surgical opening of the bladder. The obstruction to the passage of urine is removed

by means of an instrument introduced into the bladder through the urethra. While it simplifies the patient's problem, it is a more difficult procedure than an open operation in its accomplishment. If the punch method is used, whether a cold or a cautery punch is employed, the small field of vision, the expert interpretation of the visual findings necessary, and an appreciation of the limitations of the instrument, make a prolonged apprenticeship necessary before the results of the advocates of this operation can be equaled by the average operator. Foley's instrument which proposes to remove large sections of the obstructing tissue is still in the experimental stage and its ultimate effect upon transurethral operations upon the vesical neck can not now be known. The resectoscope, an instrument intended to remove small ribbons of tissue by means of an electric current passing through a small loop, is the most generally employed at present. The type of instrument, the source of the current, and the mechanical construction of the instruments vary; however, all have in common the ability to cut under visual control. The success of the operation depends upon the removal of sufficient tissue through the taking of repeated bites, to enable unrestricted urination. While the instrument is not mechanically difficult to operate by one acquainted with urethral

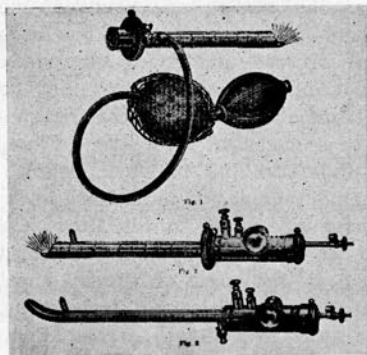


Fig. 3

Above: Wishard's diagnostic tube for inspection of bladder and urethra with obturator removed.

Middle: Wishard's diagnostic tube with cautery.

Below: Wishard's cautery incisor for use without light where conditions impair vision.

instrumentation, interpretation of existing conditions during the operation and judgment as to the extent of the resection necessary to accomplish free urination are not simple. It is a highly technical procedure, and if much tissue is to be removed, or if bleeding should become troublesome, a great deal of time may be necessary to complete the operation. It is a procedure which can be repeated within short limits of time, four of our cases having had more than one resection. Or, should the growth recur in the future the operation can be done again.

HOW UNIVERSAL IS THE METHOD?

The future of transurethral prostatectomy will probably be much influenced by a just appreciation

of the limitations of its applicability to the various types of vesical neck obstruction as met in an average practice. This is at present a difficult question to answer because of the wide variation of opinion among operators as yet. Stern²¹ says, "To place the figure of amenable cases at 90 per cent, as several writers have done, is highly misleading. . . . Twenty-five to 30 per cent of all prostatic intrusions are amenable to transurethral resection, and that 60 to 65 per cent are for one reason or another doubtful or frankly unfit."

Day²² thinks that 35 to 50 per cent of cases of prostatism as observed in average practice, can be resected satisfactorily; that in another 25 per cent, fair functional results can be attained; that, while technically possible in from 85 to 90 per cent of all cases, it is not to be recommended in so high a percentage. Ryall²⁰ concludes the procedure should not be applied to more than 75 per cent of all cases. Cabot²³ suspects that with growing experience and improvement of technic something like 75 per cent of all cases will, within the next few years, come properly within the field of this operation. Livermore²⁴ thinks resection the choice in most prostatic hypertrophies. Caulk²⁵ says that with increasing experience and skill he now finds his punch operation applicable in 85 per cent of all prostatic obstructions, and in January, 1933, he states 80 per cent of all growths, benign or malignant, can be removed by transurethral methods.

This brief review gives an idea of about what proportion of the cases seen with prostatism can be expected to be cured when operated by the authors quoted. All these references are too recent reports, and are quite different from earlier ones, and reflect a somewhat greater conservatism than was formerly expressed—an observation more significant because such change in opinion has occurred in the face of increased skill acquired in the technic of the operation due to greater experience.

We have considered certain type cases as unsuitable for resection, and during the period covered by our use of the transurethral operation we have removed the prostate surgically in forty-nine cases (40 per cent), or during this time we have considered resection feasible in 60 per cent of our cases.

CONTRAINDICATIONS

The introduction of a new method of operation upon the prostate should not in the least result in a lessening of our vigilance and care in the general survey of the patient in deciding if he is surgically fit. If a question exists as to his being so, liberties should not be taken with his life, but he should be treated by the time-proved methods of drainage.

In the acute retention case, difficult to catheterize, suprapubic drainage should be done, and then later, conditions at the bladder neck being suitable, resection may be undertaken.

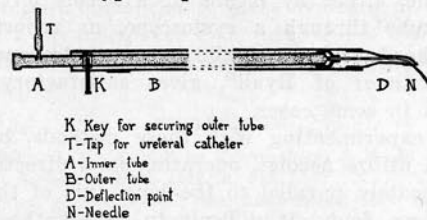
In the presence of an acute urinary infection, resection should not be done. Under proper pre-

operative regime the patient's condition will often justify resection later.

In a markedly infected, atonic bladder, one can not expect results from resection alone. Thorough drainage should be instituted before resection, as has been found most satisfactory in finger enucleation in such cases.

In carcinoma extending onto the wall or base of the bladder, especially when the patient has stranguary and tenesmus, permanent suprapubic drainage will prove more effectual than resection, both in resulting comfort and duration of life.

From our own experience we believe good sized median lobe hypertrophies can be successfully re-



Needle for prostatic infiltration

Fig. 4. Instrument devised by W. N. Wishard, Jr.

moved by resection, while it would seem that the very large, bilateral lateral lobe enlargement should best be removed by surgical enucleation. Thus with these contraindications for the employment of resection well in mind, it appears that the greatest value of the operation will be found in those instances of difficult urination, the median bar and the vesical neck contracture forms of obstruction, moderate sized median lobe hypertrophy, small lateral lobe hypertrophy, subtrigonal gland hypertrophies, and in certain borderline patients who have improved following preliminary suprapubic cystotomy. It may also be employed with advantage in carcinoma of the prostate when not accompanied by much bladder distress or extension.

COMPLICATIONS

Hemorrhage, whether primary and slight, controlled at the time of the resection, or severe, necessitating opening the bladder for its control, or delayed and secondary in character, occurring in from one to three or more weeks after the resection, is a big factor; and our inability to control it adequately is the resectionist's great problem at present. It is possible that electrical shrinkage of the hypertrophied tissue before resection is attempted, as advocated by Stern, may lessen the incidence of hemorrhage.

Infection, local or systemic, may occur. It is probable that an appreciation of the significance of oedema and inflammation of the tissues about the bladder neck will be the greatest factor in preventing this complication. In the serious form there may develop an abscessed kidney, perineal abscess, or a blood stream infection. Failure of a patient to urinate voluntarily after all operative oedema has subsided may occur and further resection be necessitated.

Accidents due to faulty manipulation of the instrument include perforation of the base or wall of the bladder from inaccurate application of the cutting loop, resulting in sepsis and at times death. Epididymitis may prove troublesome. A preliminary vas section will prevent its development.

Postoperative stricture of the urethra may develop, either due to the use of too large an instrument in the urethra, as Day concludes, or to some other cause not as yet appreciated, as was true in two of our cases.

ANESTHESIA

Local infiltration of the prostatic area with novocaine, either by means of a needle on a flexible tube through a cystoscope, as reported by Frischer¹⁹, or by a needle in a resectoscope after the manner of Ryall²⁰, gives satisfactory anesthesia in some cases.

In experimenting with these methods, both of which utilize needles, operating in a direction approximately parallel to the long axis of the urethra, we found it difficult to deflect the needle sufficiently to penetrate deep enough into the prostatic tissue to infiltrate the larger obstructions. A needle whose construction is shown in the accompanying illustration (Fig. 4) was therefore devised by W. N. Wishard, Jr., which could be deflected at an acute angle to the resectoscope and which was long enough to penetrate the prostate sufficiently to anesthetize the deeper portions of the tissue about to be resected.

The principle of this instrument is simple. An outer tube, with a small bent deflecting tip through which an inner needle passes into the fenestrum of the resectoscope at an acute angle, is of over all dimensions the exact size of the cutting loop used to remove the prostatic tissue. This tube is secured against rotation and slipping by a key which fastens to the rack at the back of the resectoscope and over the end of this outer tube. Within this outer tube is an inner one, and on its outer end is a detachable, rustless steel, 25-gauge dental needle. When the device is inserted in the cutting electrode slot on the lower side of the resectoscope, the back end of the inner tube is screwed into the movable handle. Into the side of this tube screws a small nipple to which a ureteral catheter connects it to a 10 cc Luer syringe. The instrument is used in the Stern-McCarthy resectoscope without any alterations in the latter. The needle is operated under direct observation with the handle of the resectoscope which ordinarily controls the cutting electrode.

The purpose of this paper is not to go into details about the technique of local infiltration, which will be reported later. However, we have resected over twenty cases under this anesthesia, and in only one patient (an early one in the series) have we been compelled to resort to a supplementary anesthesia. At present we are using local infiltration almost exclusively with eminent satisfaction to the patient and to ourselves, thereby avoiding

much of the immediate risk of spinal, sacral, or inhalation anesthesia.

MORTALITY

It is difficult in many instances of resection to know what influence the operation may have had upon a patient's death. As the literature accumulates, however, it becomes more evident that the operation is not without its own mortality rate, which must vary inversely with the operator's training and experience. It is encouraging to note that in a review of the reported instances of death, had the limitations for the employment of the method, as now advocated, been followed, the death rate directly attributable to the operative procedure would have been much lower. It is still more important to note that with the early workers in this field, in their most recent reports, the death rate is decreasing, indicating a better understanding of the problem involved in a successful resection, and an increase in their skill in performing the operation. This is best illustrated in the statistics of Alcock²¹ who lost eighteen patients following resection in one hundred seventy-five cases. Lewis,²² in a questionnaire, recently collected a series of eighty-seven deaths. Day,²³ in seventy-four resections, had three deaths, while Kirwin²⁴ lost three of eighty patients.

That transurethral operations, even in their present day perfection, are entirely devoid of danger, an impartial observer can but deny. The current wave of popularity now accorded this method is in part at least fostered by commercial enterprise giving the procedure a "wide publicity to the medical profession," propaganda which studiously endeavors to minimize the danger of the operation as well as to encourage its indiscriminate employment. Unbiased, forward-looking urologists have accepted the method, employing it in their daily work but withholding their final decision as to its advantages and limitations until they have accumulated sufficient experience to justify such an opinion. To enable an early understanding of the procedure's possibility for good or harm, all operators should give a true recital of their experiences. This knowledge is imperative that the general physician and the operator may benefit the patient in their decision as to the method suitable for a given case, especially as the present reaction of the profession to the operation is in part founded on an apparently false appreciation of its gravity.

Inasmuch as many of our cases have been done in the recent past, we deem it unwise to proffer our final opinion about the ultimate efficacy of the operation in relation to the permanent cure of the patient, directing our attention rather to his immediate course in the hospital both as to preoperative treatment and the operation itself, coupled with the postoperative hospital period.

This report is based upon eighty-four operations for transurethral relief of vesical neck obstruction in seventy-four patients. Twenty of these were by punch, and sixty-four resections. During this

period forty-nine suprapubic prostatectomies were done.

The average age of the patients subjected to transurethral operations was sixty-five; the oldest being ninety and the youngest twenty-seven.

The average stay in hospital was 29.8 days. The longest stay was one hundred ninety-four days. The shortest stay for resection was four days. Two patients went home the same day a punch operation was done.

Postoperative complications include epididymitis (6), postoperative hemorrhage (4), incontinence (2), perineal abscess (1), extravasation of urine (1), angina pectoris (1), conary occlusion (1), pyonephrosis (1), hypostatic pneumonia (1), pyelonephritis (1), erysipelas (1), and phlebitis (1).

Associated lesions included vesical calculi (11), vesical diverticula (7), carcinoma of bladder (3), renal calculi (2), prostatic calculi (2), renal tuberculosis (2), urethral stricture (2), and suprapubic fistula (1).

Of the seventy-four patients, thirty-three, or 44.6 per cent, had complete retention of the urine.

There were fourteen, or 19 per cent, cases of carcinoma of the prostate.

Mortality—Four of the seventy-four patients died following operation, a mortality of 5.4 per cent. The causes of death follow:

1. Cancer of the prostate; died ninety-three days after punch operation, of pulmonary tuberculosis.
2. Cancer of the prostate; died thirteen days after resection, of hypostatic pneumonia.
3. Adenoma of the prostate; died forty-eight days after resection, of coronary occlusion.
4. Adenoma of the prostate; died sixty-one days after resection, of uremia due to pyonephrosis.

Several of the series had multiple operations as follows: Suprapubic lithotomy and resection; suprapubic lithotomy and punch (2); suprapubic prostatectomy (one year before) and punch; suprapubic cystotomy and resection; suprapubic prostatectomy and punch; punch and resection; suprapubic cystotomy, one punch and two resections; prostatectomy and resection; suprapubic lithotomy and three resections; suprapubic cystotomy and three resections; suprapubic prostatectomy previously and resection; two resections; suprapubic prostatectomy, punch and resection; suprapubic prostatectomy (six years before) and resection.

The types of vesical neck obstruction in these cases include contractures, bars, varying grades of hypertrophy of median and lateral lobes up to grade four, carcinomata of the prostate and contractures and nodular obstruction following prostatectomy.

CONCLUSION

The morbidity and mortality of suprapubic and perineal prostatectomy can be compared favorably

to those of other major surgical procedures. Nevertheless, any new method of treatment of vesical neck obstruction which would lessen either will be eagerly accepted by urologists. If it should further shorten the period of hospitalization, lessen the cost and be accompanied by less pain and discomfort during convalescence, it would have much to recommend it to both doctor and patient. Transurethral resection of the vesical neck seems to answer favorably these requirements.

Only time will tell if it is ultimately to be classed as a palliative or a curative measure. While in the final analysis its applicability to all types of bladder neck obstruction may be much restricted, from the present tendencies it gives evidence of certain distinct advances over older procedures which will remain to enrich our methods of treating this disease.

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THE ROLE OF GLUCOSE IN DIAGNOSIS AND THERAPY*

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The importance of glucose in the metabolism of living tissue is an accepted fact. With time this sugar plays an ever increasing and important role in the diagnosis and treatment of disturbed physiological processes; therefore, I feel that a brief review of the subject, as we understand it today,

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