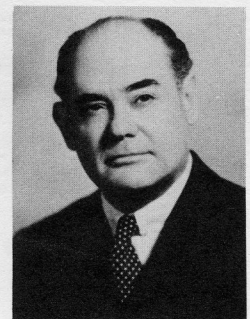


**TRANSURETHRAL
TREATMENT OF BLADDER
NECK OBSTRUCTIONS
Endoscopic Prostatic Resection
Part I**

ROBERT GUTIERREZ, M.D.



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INTRODUCTION

The history of transurethral resection (TUR) of the prostate has been primarily an American story. It is an article of faith that TUR, intimately bound to the treatment of prostatic and bladder diseases, emerged from an era in the United States when access to the operating room and surgery of the urinary tract were dominated by general surgeons to the extent that a urologist had to remove the prostate via the urethra (diameter measured in millimeters) in order to survive. There is truth to this bit of folklore, but what is perplexing is the nagging question of how any clear-thinking general surgeon would want to tackle the potential – and formidable – postoperative complications from every prostatectomy when there were other individuals who were willing to assume that responsibility. Perhaps this is why urology became a specialty.

What follows is a reprint, with minor revisions, of a chapter written half a century ago by Dr. Robert Gutierrez for the 1933 History of Urology sponsored by the American Urological Association and now considered a collector's item. At present Dr. Gutierrez is retired and lives in New York City. This chapter recounts those events that led to electroresection of the prostate and presents a contemporary's concerns and view of developments in the two decades 1910-1930 that were crucial to the establishment of TUR in the urologic repertory.

The references have been deleted from this revision but may be found in the original edition. The editors hope that this glimpse into Dr. Gutierrez's effort will prove interesting and informative.

Adrian W. Zornio, M.D.

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TRANSURETHRAL TREATMENT OF BLADDER NECK OBSTRUCTIONS Endoscopic Prostatic Resection* Part I

ROBERT GUTIERREZ, M.D.

INTRODUCTION

During the last two decades the medical profession has witnessed with phenomenal interest the reintroduction of endoscopic prostatic resection in the transurethral treatment of bladder neck obstructions. This interest has been manifested in the popularity that the method has attained with the advent of new high-frequency current, which makes it possible to cut and coagulate at the same time under water, and, by means of new devices and ingenious instruments, to remove obstructing pathologic tissues at the vesical outlet and remodel the prostatic urethra.

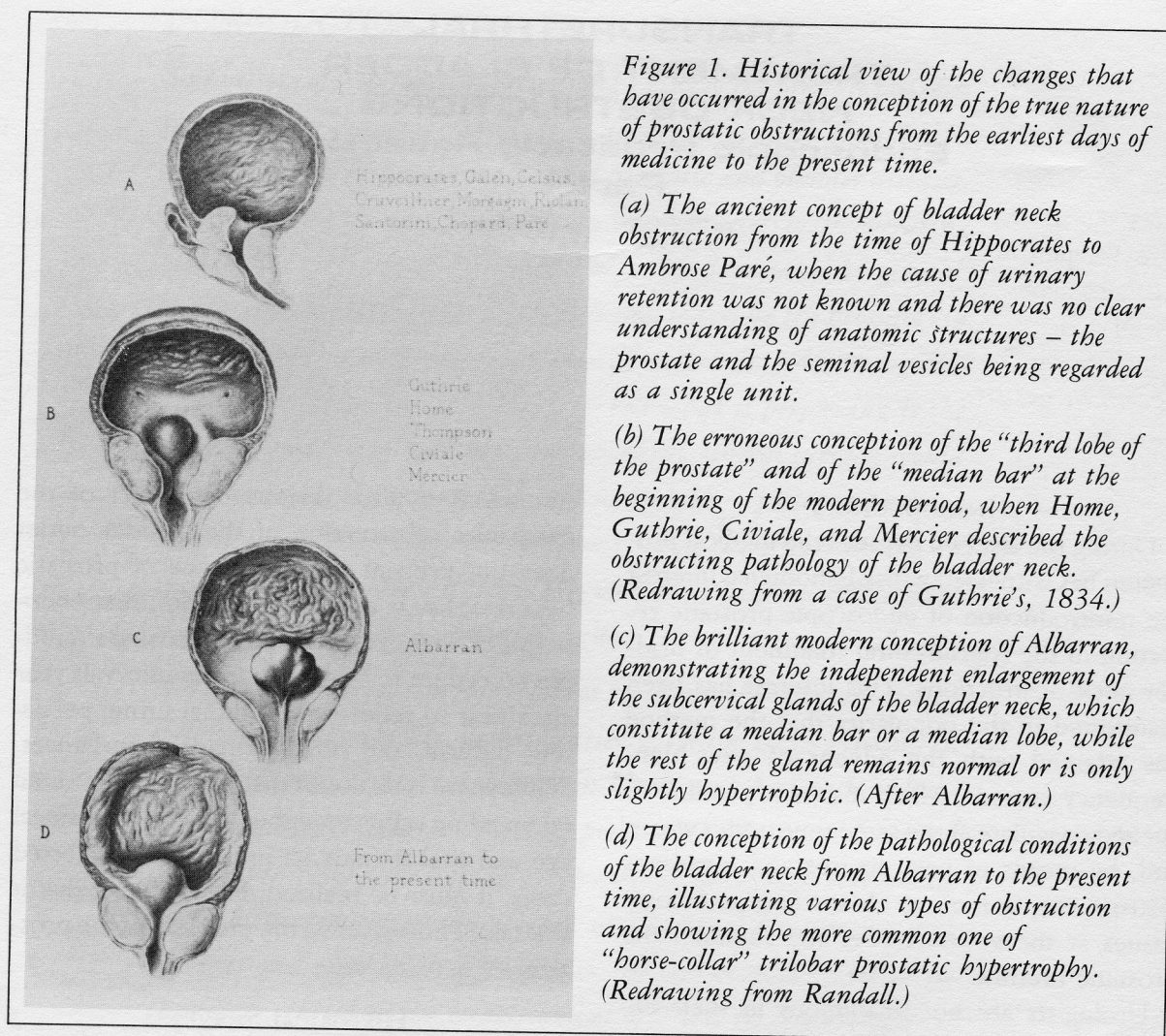
Urologists are not unanimous in their endorsement of this procedure and insufficient time has elapsed to justify a final judgment as to its value. Also it is beyond question that this procedure, apparently minor in its character and execution, is a major one if judged by the many resulting complications and fatalities on record. Nor should we forget that in adenomatous hypertrophy of the prostate there is always the possibility that a benign lesion partially removed may turn into a malignant one, controllable only by total enucleation or a total prostatectomy in its incipency. Furthermore, it is a matter of common knowledge that the clinically diagnosed benign adenomatous hypertrophy of the prostate has proved in many instances, upon histopathological examination of the specimen removed, to be adenocar-

cinoma. It is also obvious that relief of the mechanical obstruction of the bladder outlet does not prevent the recurrence of prostatic hypertrophy. It appears, therefore, that endoscopic prostatic resection must become a multiple procedure to be carried out at intervals year after year to relieve the residual urine, persistent dysuria, and other urinary disturbances. While there is no doubt that the procedure is an outstanding achievement of this electrosurgical age and that it finds its indication in selected cases, it must be realized, nevertheless, that it does not entirely solve the problem of the prostate.

HISTORICAL SURVEY

Obstruction of the outflow of the urine and instruments to relieve this condition have been known to exist since prehistoric days — long before the Christian era and the beginning of medicine — but the true pathological conception of vesical neck obstruction in its various phases was not known or clinically recognized, and the subject remained in a distressing state of confusion for many centuries (Figure 1). Even during the early days of anatomical dissection in the cadaver, such investigators as Hippocrates, Galen, Celsus, Cruveilhier, Morgagni, Santorini, Riolan, Chopart, and

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other anatomists failed to recognize this condition. They were in such a state of ignorance with regard to the type of lesion and the anatomy and physiology of the genitourinary organs adjacent to and surrounding the contiguous structures of the bladder neck and posterior urethra that they considered the prostate gland and seminal vesicles as a unit constituting one single organ (Figure 1a); in describing it, they made no differentiation, nor could they clinically explain the etiology of the retention of urine.

THE ANCIENT PERIOD

Civiale was among the most noted genitourinary surgeons of his day and wrote extensively a

century ago on the pathologic lesions of the urethra and prostate; bladder neck conditions; and more precisely on disease of the prostate gland and its cause. He stated that the idea of carrying a cutting or piercing instrument into the urethra either to open a way for the outflow of urine or to facilitate the dilatation of contracted parts, or even to form a new channel, must have presented itself at nearly the same time as the idea of having recourse to sounds of bougies during the early days of medicine and science.

Galen, in fact, speaks of callosities of the urethra which were destroyed by means of a catheter. Amatus Lusitanus tells us that long

before his time, when bougies failed to pass, they were raveled out at the end in order to make them engage with greater ease. Jean de Vigo already speaks of "forced catheterism," as does Alphonse Ferri in no uncertain terms. Tolet relates that "carnosities" in the urethra were scraped, and many other early writers have also stated that urethrotomies for the relief of stricture or obstruction and perineal lithotomy for crushing *pierres*, using the *grand appareil* or the *petit appareil*, have been in use since the prehistoric days of medicine.

All these references are vague and lack precision, and it is not until we come to Ambrose Paré that we find the description of a definite operative procedure in which a sound with several sharp ridges on its surface, one finger-breadth from its tip, was inserted into the urethra and turned this way and that until the obstruction was overcome. Far from fearing hemorrhage, Paré actually invited it, encouraging the "carnosity" to bleed and thereby "discharge part of itself," with a view to shortening the duration of the treatment. His catheter, terminating in a hemispherical button with a cutting edge, was designed to pick up and crush the obstruction to any desired degree at a single sitting. It is evident that Paré had, in the sixteenth century, the very ideas that were put forth as new in the first half of the nineteenth century, such as that of scarification and of passing and withdrawing the bougie after it had cleared the obstruction, and then repeating the same procedure on different occasions. The fenestrated cannula of Paré has served as the model for several later rongeurs (Figure 2).

We also learn from Civiale that operations designed to puncture strictures of the urethra were sufficiently in vogue at the end of the sixteenth century to make the *Faculté de Paris* think it ought to interfere, so that on December 5, 1603, it passed a vote of censure against Turquet de Mayerne as unworthy to practice the art of healing "*propter temeritatem, impudentiam et ignorantiam*"; this did not, however, pre-

vent him from becoming a man of great learning, to whom the King of England entrusted the care of his health.

The type of instruments used by these early surgeons and the mode of operation have not come down to us. The stories with regard to them are too incomplete for any authority to be attached to them, but it can be safely asserted that the transurethral approach to the bladder was known from very early times, and there are records of procedures of this kind being carried out with full confidence in grave cases, even upon eminent members of the medical profession. Thus it is recorded that in 1726 the life of Astruc, who was suffering with a tumor of the neck and the bladder, was prolonged for 10 years by La Faye, whose instrumentation and technique did not differ in any marked degree from those used in the nineteenth century for impassable contractures. He used a sound of usual curvature, open at both ends, containing a silver stylet terminating in a triangular point, which could be made to pass beyond the end of the cannula for a distance of 8 mm. As soon as this point, which was drawn back into the sound, had reached the obstacle, the surgeon inserted a finger in the rectum, pushed the stylet forcefully, after which, the bladder having been reached, he withdrew the stylet and left the sound in place for a few days.

On La Faye's instrument others were modeled including those used by Physick, Doerner, Stafford, and others who were the chief promoters of the method. All these instruments were more or less alike, varying only in such details as the amount of curvature, the cutting or piercing nature of the operating end, the greater or lesser projection of this from the cannula, and the emergence of this tip from its sheath by simple pressure, or by a spiral or other device.

THE MODERN PERIOD

During the modern period we must take into account three eras:

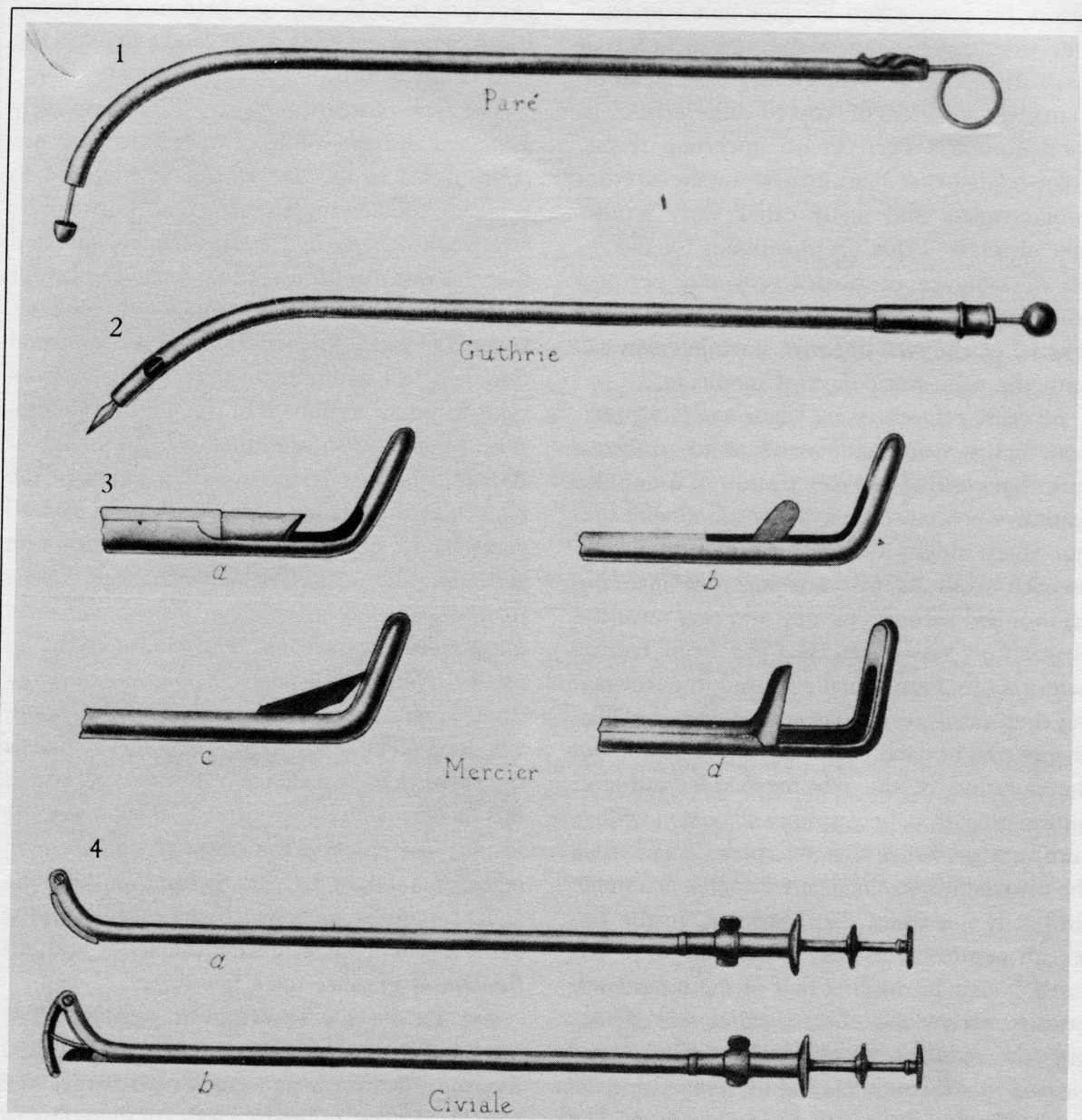


Figure 2. Historical view of early transurethral instruments for the relief of bladder neck obstructions.

(1) Paré's instrument used in 1575 to relieve obstructing "carneities" of the bladder neck.

(2) Artist's conception of Guthrie's instrument for cutting the "bar at the neck of the bladder."

(3) Mercier's instruments for the removal of "valves" of the bladder neck. (a) Combined prostatic excisor and incisor, 1839-1841. (b) Incisor, 1844. (c) Incisor, 1847. (d) Excisor, 1850.

(4) Civiale's prostatic "kiotome" for the relief of urinary retention caused by "engorgement of the prostate." Redrawing of the instrument (a) closed and (b) open.

First era

The first era of the modern period comprised the early days when the anatomical conception of the third lobe of the prostate was described and considered as an independent unit in the evolution of prostatic hypertrophy. It was also the beginning of a new conception of the median bar or bladder neck obstruction as the potential cause of the retention and the resulting surgical pathology. To this period are attached the names of Guthrie, Home, Henry Thompson, Charles Bell, Civiale, Mercier, Leroy d'Etiolles, Velpeau, Béniqué, Rochet, and others. These men had the glimmerings of the true clinico-anatomical conception of the *maladie des vieillards*.

It was not until a little over a century ago that the nature and treatment of bladder neck obstructions became the subject of serious scientific study, through the investigations of Everard Home and the work of George James Guthrie, an English surgeon who was famous during the historic days of Wellington and Napoleon and whose name occupies a significant place in modern urology. It was Guthrie who, in 1830, first described under the title "The Bar at the Neck of the Bladder" a condition whose pathology and treatment now constitute one of the most debated questions in the entire field of urology. Guthrie was the first investigator to describe nonprostatic obstruction of the outlet of the bladder. In a lecture that was one of a series delivered before the Royal College of Surgeons in London, he laid down two important propositions as follows:

"1. That the elastic structure at the neck of the bladder may be diseased without any necessary connection with the prostate gland.

"2. That the prostate may be diseased without any necessary connection with the elastic structure."

Guthrie thus established a differentiation between hypertrophy of the glandular tissue of the median lobe and the "bar at the neck of the bladder." The transurethral operation he re-

garded, in the state of knowledge then current, as applicable only in the case of the bar. In this connection he wrote as follows:

"That there are periods in many cases of this disease [prostatic hypertrophy] in which the division of the prostate gland would be very advantageous, and might prolong the lives of many sufferers in comparative comfort, I am quite satisfied; but I am no less satisfied that the surgeon who should propose at present such an operation, unless in an extreme case, would soon be without patients to propose it to. The time will, however, arrive when a more accurate discrimination of these diseases will be made; and operations can then be recommended with a confidence proportioned to our knowledge. . . . The bar formed at the neck of the bladder has, I believe, been mistaken for an enlarged prostate; it has not, at all events, been considered as a separate disease; and the use of the catheter has generally given such degree of relief as to render the patient tolerably comfortable. When, however, in spite of the continued use of this instrument the disease increases and renders life miserable, the question is then, simply, whether the person shall be allowed to die without a further effort being made for his relief: I think not, and in such case would suggest that an operation be performed. The object is to divide the bar, dam or stricture with as little injury as possible to any of the neighboring parts."

The instrument used by Guthrie was made by Everill and Mason; it was an improvement on the central perforator or lancet of Stafford, rendering it capable of cutting on the side and of being easily cleaned. It was characteristic of Guthrie that he wished the instrument to be called by their names, keeping for himself only the credit of having made the suggestion. This instrument consisted of a metal bar curved like a No. 20 F. prostatic catheter, carrying at its extremity a small concealed knife, which was made, by means of a spring, to project by the side, or by the end, or by both, as far as might be thought advisable (Figure 2).

"The knife being projected just as the instrument is felt to be passing over the bar, will cut it; and if, after it has just passed into the bladder, it be withdrawn, the little knife in coming back will enlarge the original cut; or it may be made al-

together by the withdrawing motion of the instrument, the knife being sprung after it has just entered the bladder. If the bar be thin or narrow, I have no doubt of the possibility of dividing it in this way without doing mischief; and in two cases in which I have tried it, I have reason to believe the object was effected, from the greater facility with which the catheter afterward entered the bladder, and from the relief obtained by the patient in passing the urine. I do not, however, believe that when the bar is complicated with an enlargement of the middle of the left lobe passing behind it, the division can be effected in this manner; and I am disposed at present to confine this mode of operating to the pure cases I have described, and in those only when relief can be obtained by no other means. If the bladder is full, or contains a fair quantity of urine for its size, no injury can easily accrue to any part in the operation; and there are no large vessels to divide."

The farsighted wisdom of Guthrie in his conservative application of his method cannot but command our admiration, and puts to shame the trivial squabbling for priority that was to follow on the part of certain later workers.

The importance of Guthrie's work was denied by Mercier in an article published in 1836, followed by other articles on the same subject in 1839 and 1841, which gave specific descriptions of his own operative methods and discoveries, and discounted everything done by anyone before him in the exploration or treatment of the prostate. In a work entitled *Recherches sur les Valvules du Col de la Vessie*, Mercier put forward the claim:

"1. That there exist two kinds of valves of the neck of the bladder, one muscular and one prostatic.

"2. That up to 1836, the time when I first insisted on the existence of prostatic valves, only vague or erroneous views had been published on the subject.

"3. That I was the first to recognize the muscular valves, in a precise way."

Again, Mercier wrote:

"I distinguish two kinds of valves:

"1. Those produced by uniform hypertrophy or supramontanal granulations of the prostate, which were little known before me.

"2. Those formed by spasm, contraction or retraction of muscular fibers which surround the neck of the bladder — which had completely escaped the notice of observers."

Mercier's minimizing of Guthrie's work was expressed in the following terms:

"All Guthrie recommended was the repeated or permanent use of the catheter, but most of the patients who came to me had already been using catheters for a long time, without any relief. True, his instrument-maker made for him a sound that was slightly curved and was furnished with a small concealed blade, which, by means of a certain device, could be made to come out of its sheath at the end, but such an instrument offers no certitude in its action, and no protection to the walls of the urethra and bladder, and might do a great deal of mischief.

"This was the state of the science previous to the publication of my own 'Recherches.' ... I believe, therefore, that I am quite right in reiterating that, even supposing that the muscular valves at the neck of the bladder had been glimpsed by some persons before me, they were certainly not recognized as such.

"I have proved by anatomy that the bar described by Guthrie was only the result of a uniform hypertrophy or supramontane prostatic granulations, which I myself have called the 'prostatic valve.' ...

"... Guthrie spoke of what he called a 'bar at the neck of the bladder,' produced by retraction of elastic tissue; but looking at his plate one sees that what he saw was evidently a prostatic valve. The author probably mistook fibro-glandular tissue of the prostate for purely fibrous tissue."

Mercier likewise scoffed at the work done in this field by Home, who in 1806 had laid before the Royal Society a paper entitled "An Account of a Middle Lobe of the Prostatic Gland in the Human Body, Which I Have Recently Discovered," in which he described a nipple-like projection of the prostate forming a valve-like obstruction to the outflow of urine (Figure 1b).

Similarly, the work of Howship, who in 1825 wrote a treatise "On the Complaints That Affect the Secretion and Excretion of Urine," in which he spoke of "a curious and rare affection of the internal membrane forming a transverse

fold of valve at the neck of the bladder" aroused Mercier's derision. Of Home, Mercier said that the English writer had described not the valvular form of prostatic hypertrophy, but rather what Mercier had called "prostatic tumors with a broad base, presenting a transverse bar flattened from above downward, so that from the side of the bladder no prominence was seen," while with reference to Howship he promised to prove that the latter had "an imperfect view and that what he saw was really a muscular valve and not a membranous one."

Having thus disposed of his English rivals, Mercier summed up his own view of the priority situation by saying:

"These few documents comprise all that has, so far as I am aware, been done before me, with reference to the valves at the neck of the bladder."

Mercier's wrath was unbounded when, in 1841, three months after the appearance of his own work *Diseases of the Urinary and Genital Organs, Especially in Old Men*, his French contemporary Civiale, 20 years his senior, published a treatise on *Diseases of the Genito-Urinary Organs*, in which he gave a clear description of a nonprostatic obstruction of the bladder neck, of which he identified three types, giving also a long and thorough account of their etiology and treatment. In Mercier's next book he flayed Civiale in a long letter addressed to him preceding the text, in which he openly accused him of plagiarizing his own observations. He also attacked him bitterly in a medical journal of which he was coeditor, peppering its pages with footnotes containing caustic criticisms of Civiale's book and attempting to show at every step that the latter was claiming originality for ideas already put forward by Mercier.

Randall, who has written the history of this episode in some detail, has thus admirably summed up Civiale's reaction:

"Civiale's only reply to his accusation of plagiarism was a short letter written in the calm

terms of a man of broader mind. He couched his letter in the form of three questions, each of which he answered as follows: Did Mercier question his originality? He asserted none, and stated that the priority belonged to some English surgeon. Did Mercier criticize the exactitude of his descriptions? Civiale says: 'I never pretended to lay down a limit to science: I have but described what I truly saw.' Did he dispute his treatment? 'From that point of view experience alone ought to speak.' "

Mercier, however, continued to attack Civiale in public on every occasion that offered itself, and finally asked the *Academie des Sciences* to appoint a commission to determine the priority, or, in essence, to corroborate his own assertions. The commission never reported, perhaps because of the death of one or both of its two members soon after. Nine years later, however, in 1850 the *Academie* honored Mercier with a prize of 1500 francs for his work on the valves of the bladder neck, and again he was awarded in 1852 a prize, this time by the National Academy of Medicine, which appointed a commission to examine the works of Mercier and of others before him. The commission diplomatically concluded that the muscular valves of the neck of the bladder had in fact been recorded by a number of observers before M. Mercier, but that "no one contests that to him belongs the credit of having studied them more precisely than any investigators before him and of having established the proper treatment for them."

The publicity given the award of these prizes seems to have been the cause of the general lack of recognition of Guthrie's rightful priority, although there can be no question, in the light of later experience, that the structures described by Guthrie in 1830 were those whose pathology and treatment have occupied a large part of the attention of urologists ever since his time.

Mercier, Civiale, and Leroy d'Etiolles (1840) were all advocates of the incision of the obstructing bar at the neck of the bladder as a means of relief for the condition. Each con-

structed his own form of instruments for the work.

The instruments of Mercier included not only an incisor but also an excisor which removed pieces of tissue and was thus more or less of the nature of a punch (Figure 2). The incisor consisted of a silver cannula, containing a blade cutting from either the concave or the convex aspect of its curve. By means of a screw the distance was regulated to which the blade was permitted to slide out of the beak and along the shaft. By drawing the circular handle toward himself, the operator incised the bar and divided the tissues more or less perfectly, the process being repeated, if necessary. The excisor somewhat resembled a lithotrite with two blades which, when closed upon a previously fixed bit of tissue, excised the portion contained between them.

Mercier confessed that he had some trouble with hemorrhage, but claimed that he had never yet failed to overcome it and that his experience covered 300 cases. He regarded incision as a greater source of danger than excision, since the vessels were crushed more in the latter process. For his "prostatic" variety of obstruction he advocated excision, removing three portions, a median and two lateral ones; but for the "muscular" variety he regarded incision as the correct course. There is every evidence that Mercier obtained very good results from his operative procedures; many of his patients willingly returned for further treatment, thus expressing their satisfaction with the relief he had given them on a former occasion.

Civiale made the claim in his 1841 publication that he had been using an instrument since 1823 to open the meatus and divide constrictions near the navicular fossa, employing a sheathed knife which he called a urethrotome. In this connection he says:

"I'll add that the use of the cutting instrument for fungous tumors and prostatic engorgements has not yet emerged from the state of pure speculation, and that, although some modern surgeons

have been bragging about it, a prudent practitioner will always hesitate to have recourse to it."

A larger number of cuts are reproduced by Civiale, showing different types of instruments for urethral and bladder neck incision and excision already in use (Figure 2).

Sir Henry Thompson, in an essay on diseases of the prostate, which was awarded the Jacksonian prize for the year 1860, wrote as follows:

"The late Mr. Guthrie, to whose experience, as the first to call attention to the subject we naturally turn, says that the treatment by simple dilatation and by permitting the catheter to remain permanently in the bladder, although often useful, does not always succeed; in which case, he adds, 'the bar, or dam, at the neck of the bladder must be divided, and the question is, how is it to be done with the greatest safety.'"

While regarding these operations as a matter for very cautious consideration, and asserting that the cases must be rare and exceptional in which the proposal to employ endourethral treatment can be entertained in England, he adds:

"At the same time, with care to avoid constitutions which are obviously bad, or the subjects of advanced renal disease, I can conceive that there are cases, as Mr. Guthrie has observed, in which the operation might be advantageously practiced, and I have been the more induced to enter upon its consideration on account of the recognition by that distinguished surgeon of the existing necessity for some mode of overcoming the obstructions in question. Such a proceeding should be employed by none but those who have been thoroughly familiarized by the use of instruments in the urethra and bladder, and then much caution and judgment must be exercised in the selection of suitable cases."

Demarquay, of the *Maison Municipale de Santé*, in Paris, stated in 1861 that he had performed excision 10 or 12 times; and while it was reported that he had lost one case by hemorrhage, the results were otherwise good, one patient suffering temporarily from orchitis, but ultimately recovering satisfactorily.

With the exception of these allusions to the

procedure it appears from the literature that little interest was taken in bladder neck surgery, the medical profession apparently regarding it with little favor at this time. The fact that the operation was done in the dark without the advantage of modern cystoscopy caused it to be regarded with considerable skepticism.

Accordingly, there was a lapse of some 30 years from the time of Mercier's work before we next hear of fresh undertakings in this field.

In 1873 Hutchinson came to the disheartening conclusion that all methods of overcoming prostatic hypertrophy were ineffectual; the only resource was the permanent catheter, in his opinion, and this was almost sure to cause cystitis.

In 1874, however, Bottini introduced his galvanocautery (Figure 3a), designed not only to act upon the mucous membrane, as Mercier's instrument could do, but also to produce thermogalvanic destruction and incision of the morbidly enlarged lobe of the prostate to any extent. Without the least sacrifice of intensity of heat, a prostatic lobe of any size could be attacked and destroyed in a few minutes' time. The instrument consisted of two parallel brass arms attached to a rod, but capable of complete insulation from one another by a thin ivory plate lying between them.

Musati, a physician upon whom Bottini did an operation, said of it:

"The pain is so easily borne that I would advise everyone against the use of chloroform. I can place on record that I have suffered more with burning of the prostate by silver nitrate than during the galvanic division."

Bottini's method had the advantage over Mercier's instruments of not producing hemorrhages, and during the next 20 years it attained a considerable vogue. Designed by Bottini to relieve prostatic hypertrophy, the instrument without a doubt did some of its best work in cases of median bar formation.

The danger of too destructive action in the dark, however, caused most surgeons to fear

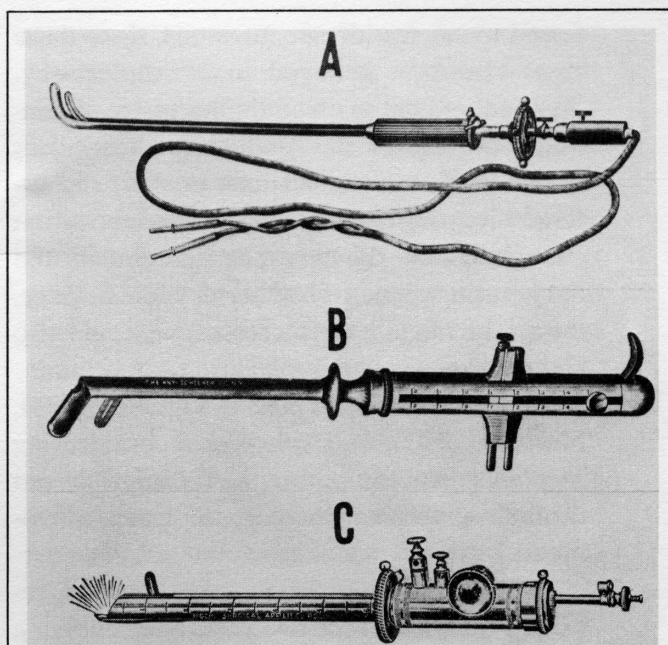


Figure 3. Early instruments used for the galvanocautery procedure to relieve prostatic obstruction.

- (a) The Bottini instrument as modified by Freudenberg (1873-1897).
- (b) Chetwood's prostatic galvano-incisor.
- (c) The Wishard instrument for galvanocauterization of the enlarged prostate through a perineal buttonhole.

using Bottini's procedure; therefore, in 1897 Freudenberg made certain improvements designed to overcome its danger and to achieve greater accuracy of application (Figure 3a). He even invented a visual cautery instrument by combining Bottini's galvanocautery blade with the irrigating cystoscope which had now come into use.

After some six years of using the improved instrument, Freudenberg wrote of the "brilliant results" he had obtained, "such as have hitherto not been secured by any other method." He had no deaths to report, yet pointed out that he had never refrained from operating because the patient was in too far advanced a stage of the disease. In the early stages, however, he pre-

ferred to use less drastic measures, since these cases could be relieved in a simpler way. Freudenberg emphasized the necessity of confining the use of the method to those cases where the correct indications existed, and uttered a warning that any surgeon who thought it enough to have the necessary instruments and the necessary patients had better avoid it, since, though he might have successes, he would also be certain to have failures.

Meantime Harrison (1884), Gouley (1885), Norton (1892), and others had been using Mercier's procedure, but had carried it out through a perineal incision, all using instruments of their own.

In 1892, W.N. Wishard, of Indianapolis, reported that he had for two years been applying the cautery through a median perineal opening with the operative area under direct observation. He introduced a very small tubular rectal speculum through a perineal opening with light reflected from a head mirror, and then applied a free-hand cautery directly to the area under observation. Ten years later, in 1902, he developed an instrument for this purpose (Figure 3c) and included in this method use of the Koch air-dilating cystoscope through the perineum, which was later employed through the natural channel. He also devised a cystoscope embodying the use of a movable cautery in the manner adopted in his perineal instrument, and including direct visualization of the operative area. Owing to faulty workmanship on the part of the American instrument-makers, this combined cautery-cystoscope proved unsatisfactory. Several years later Goldschmidt devised an instrument that embodied the identical features of Wishard's invention but had the great advantage of better workmanship in its construction.

Fuller expressed the opinion in 1897 that these obstructions were due not to neoplastic or hypertrophic tissues, but to contracture or spasm of the bladder neck, for which he too advocated incision by way of a perineal buttonhole.

Chetwood, in 1905, reported a series of 36 cases in which he likewise had performed a perineal buttonhole operation. With an instrument of his own (Figure 3b) he modified the Bottini-Freudenberg procedure, providing better control of bleeding as well as more accurate diagnosis by palpation of the bladder neck (Figure 5). This Chetwood procedure was widely generalized during the early part of the twentieth century, and many interesting reports were published.

In 1913 a report submitted by Keyes stated that he had used the Chetwood operation in about one-fourth of his cases of prostatic hypertrophy, and also for bars and contractures of the bladder neck. Beginning with two operations in 1901, Keyes had a record of 57 in 1913, with two deaths, both due to sepsis. Of the rest, some failed to be cured for two reasons: either the prostatic obstruction was not sufficiently removed, so that residual urine continued with the same or more symptoms, or the obstruction was too fully removed, leaving the patient in a state of incontinence. Of 27 patients followed for one or more years, 17 were cured; of the other 10, 3 had grave incontinence at the time of the report and 7 were incompletely relieved.

In France, Legueu and others regarded the method as useless or too dangerous to be risked, and it never came into general use. It also appears that the technique of prostatectomy was advancing so rapidly both here and abroad and was achieving such brilliant results that the Bottini and Chetwood methods soon passed into oblivion. The procedure, however, had its relative merits and historical interest, although it did not stand the test of time.

Second era

The second era of this modern period was inaugurated with the work of Albarran, who revolutionized the ancient anatomic conception of the obstructing bar and the so-called third lobe of the prostate. He described in a

very lucid manner his clear-cut histo-anatomoclinicopathological conception of the subcervical group of glands of the bladder neck, which lie under the mucosa and the submucosa in the trigonal and suburethral, or subcommissural, area, which may undergo hypertrophy independently of the prostatic hypertrophy, causing dysuria and the clinical symptoms of prostatic disease. Albarran, therefore, pointed out that the lateral lobes in prostatic hypertrophy may or may not be associated with enlargement of the subcervical group of glands, and that when this condition occurs the two lateral lobes enlarge so much that they reach the subcervical group of glands, forming in many instances a collar type of trilobar hypertrophy. This important discovery became classic and since then bears his name. It prompted Guyon and other writers to describe the so-called *prostatisme sans prostate*, and this condition has remained a classic entity in the literature since Albarran's time.*

This new conception of the nature of the obstructing pathology at the vesical orifice has received considerable attention in the urologic world, both clinically and surgically, particularly since the advances of cystoscopy and endoscopy have made possible the direct observation and visualization of the bladder and urethra, not only for diagnosis, but for proper transurethral treatment. During this period as well an exhaustive study was made of the frequency and variety of types of prostatic obstruction.

It is of interest in this connection to note that in 1812, the year after Home had published his findings of the "middle lobe," an English surgeon by the name of Jesse Foot published a satirical brochure entitled *A Review of Mr. Everard Home's Practical Observations on the Disease of the Prostate Gland and of His Important*

Anatomic Discovery, in which he railed at Home's "newly acquired anatomical fact, his discovery of a diminutive stranger, the middle lobe of the prostate gland." Regardless of the origin of the obstructing tissue, however, the name median bar or median lobe had become too firmly entrenched to be discarded, and it persists today in common urological parlance as the designation of the type of obstructions these various procedures have been designed to overcome.

Albarran further stated that the condition of vesical neck obstruction is most commonly due to hypertrophy of the subcervical glands, and he cites the following statistics of such cases:

Cases of prostatic hypertrophy without median lobe	86
Cases of prostatic hypertrophy of all the lobes, including the subcervical glands	119
Cases of prostatic hypertrophy in which hypertrophy of the subcervical glands predominates	88
Total	293

These figures show, therefore, that out of 293 prostatic hypertrophies 207, or 71 percent, were due to lesions of the median lobe, and that 88 cases, in which hypertrophy of the subcervical glands predominates, represent 36 percent, thus clearly demonstrating the frequency of the incidence of subcervical gland hypertrophy in the genesis of prostatic and vesical neck obstructions. The importance of Albarran's anatomic discovery lies in the fact that it disclosed that prostatic hypertrophy almost always begins in the subcervical glands and ultimately involves the vesical sphincter, elevating the floor of the vesical neck and pushing down the prostate, thus constituting the middle lobe or the horseshoe collar of trilobar adenomatous hypertrophy (Figure 1d). This assertion of Albarran's was confirmed by Motz and Perearnau in 1905.

Since that time many anatomical names have been bestowed upon the obstructing condition

*The terms *third lobe* and *middle lobe* are used interchangeably. Indeed, during the eighteenth and nineteenth centuries, prostatic obstruction was thought to be due mainly to the third lobe.

of the bladder neck and many authors have written on the subject. The various names under which it has been discussed in the literature include: median bar formation, the valve at the neck of the bladder, contracture of the vesical neck, median lobe hypertrophy, atrophy of the prostate, submucous fibrosis of the bladder neck, *prostatisme sans prostate*, sclerosis or atony of the vesical orifice, musculoglandular hypertrophy, hypertrophy of Albarran's subcervical glands, hypertrophy of the subtrigonal glands, aberrant or isolated median lobe prostatic hypertrophy, *maladie du col vesical*, congenital hypertrophy of the bladder neck, *disectasia del cuello de la vejiga*, isolated fibroadenomata of the prostate gland, median lobe enlargement, commissural and submontanal gland hypertrophy, microscopic adenomatous hypertrophy of the bladder neck, etc. All of these are characterized histopathologically either by a true membranous valve or, more commonly, by a median bar of hyperplastic tissue composed of all the elements that surround the vesical neck, including primarily hypertrophy of Albarran's subcervical, subtrigonal, and prespermatic or commissural glands, and sphincteric fibromuscular hypertrophy.

Third era

The third era of this modern period, comprising the progress made since Albarran's discovery, embraces the perfecting of prostatectomy together with use of the electric current for fulguration of tumors of the bladder, and the application of the same to certain types of prostatic hypertrophy. As this is perhaps the period of the most extensive accomplishments in the history of modern urology, we may be permitted to summarize its achievements in the order of their importance:

1. Through Albarran's anatomical discovery the different types of prostatic hypertrophy have been put on a sounder basis, and other lesions of the prostate have been properly described, such as adenoma, carcinoma,

adenocarcinoma, sarcoma, cyst, calculus, abscess, and tuberculosis.

2. Many other obstructive lesions of the bladder neck, producing retention of urine but nonprostatic in their origin, have also been correctly identified, among them hypertrophy of the interureteric ridge of the trigone, long known as Mercier's interureteric bar, and more recently discussed by Wesson and other writers.* Other such pathologic obstructions that have been properly classified are: ureteroceles, valves of the urethra, diverticula of the urethra and bladder, bars, contractures, cysts, pedunculated tumors, neurogenic lesions and foreign bodies, all of which can be differentiated by careful cystoscopic examination.

3. The refinement in diagnosis with the proper preoperative preparation of the patient, including introduction of the renal functional test, blood chemistry, gradual decompression, the two-stage operation, and improvements in technique in both suprapubic and perineal procedure, together with the advantages of selected anesthesia, have combined to make this a surgical era of safety, accuracy, and great accomplishment, reaching its maximum of efficiency in the operation of prostatectomy with its permanent good results, its total relief of symptoms, and its very low operative mortality — the rate being approximately 2 percent in the hands of an average competent urologist.

4. The instrumental era of endoscopic prostatic resection was inaugurated in America by the so-called punch operation or punch pros-

*Mercier's bar should not be confused with median bar which, when present, lies at the bladder neck. Mercier's bar, also called *torula vesicalis*, is actually not pathologic. In the presence of bladder neck obstruction, the interureteric ridge becomes prominent, especially in the presence of *bas fond* formation, giving a distinctive appearance to this structure. I have known an old-school urologist — Dr. Sprague Carlton — to say that he could feel hypertrophy of the interureteric ridge on rectal examination, something that was then confirmed on cystoscopic examination. [AWZ]

tatectomy. The transurethral method owes its resurrection or its improvement to the evolution of new instruments along this line and also to the introduction of the new electric current with high power, which makes it possible to cut the offending tissue and to coagulate under water and under direct vision through the sheath of an endoscopic tube without removing the instrument. It permits the excision of a considerable amount of tissue and the more or less complete remodeling of the outline of the channel of the prostatic urethra and the vesical orifice. The enthusiasm of American urologists has been aroused by the innumerable and ingenious devices made by Mr. Reinhold Wappler in his attempt to refine the transurethral operation. And finally, in this era of enlightenment and scientific progress, a place in the history of urology must deservedly be awarded to electrosurgery for having revolutionized surgical urology.

Young, who was the pioneer of the modern transurethral technique, the so-called punch operation, devised in 1909 an instrument that would remove the transverse median bar formation by an approach through the urethra under full view of the eye through an endoscope. His first series of 20 cases was reported before the International Congress in London, in 1911, at which time he stated that 14 of the cases had resulted in complete cure. Two years later he made an additional report before the American Medical Association, presenting his record of over 100 cases in which his instrument had been employed. Fifty-one of these cases were instances of true uncomplicated median bar formation; he was able to report a complete cure in 23 of these cases and an approximate cure in another 11.

Young's instrument consists of an outer tube or sheath, 18 cm long, with an elbowed curve at its distal end. On the under surface is a large fenestra, just proximal to the elbow, which is closed by an obturator after being introduced. When the beak is felt entering the internal

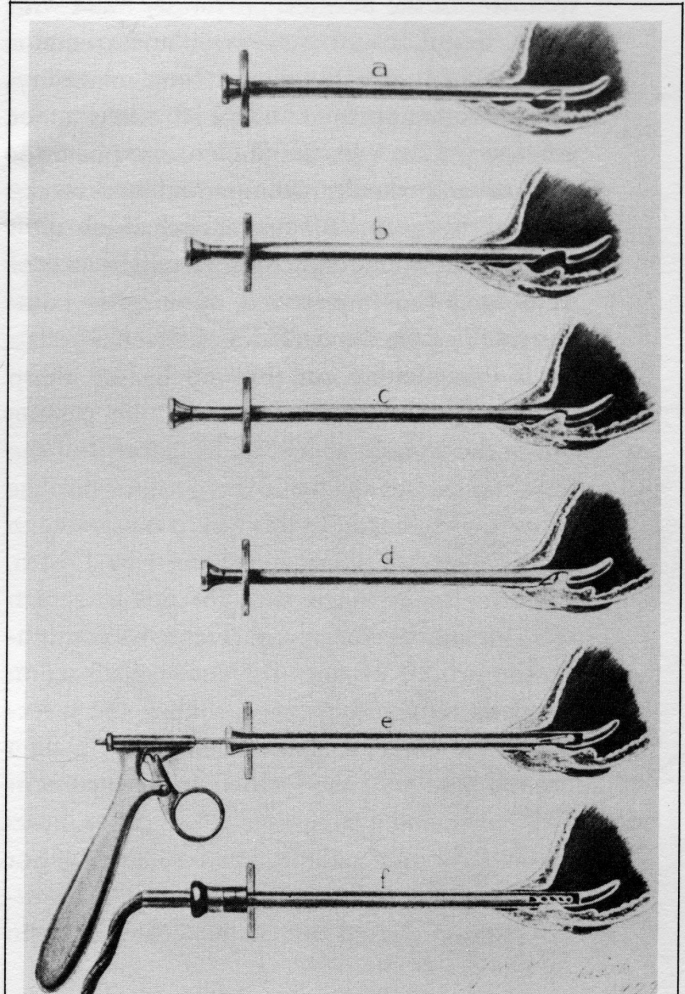


Figure 4. Steps in the technique of Young's punch operation.

- (a) The instrument has been inserted in the bladder.
- (b) The cutting tube has been partly withdrawn and the fenestra opened, allowing the fluid to escape from the bladder.
- (c) The instrument has been withdrawn and has engaged the median bar, which is seen caught in the fenestra.
- (d) The cutting inner tube is pushed down, excising the median bar.
- (e) Removal of the excised tissue with forceps through the endoscopic tube.
- (f) Spiral electrocautery introduced to arrest hemorrhage. (After Young.)

sphincter of the bladder, previously filled with water, the obturator is removed and an endoscopic light attached to the proximal extremity. The instrument is then further advanced under guidance of the eye, the floor of the posterior urethra and the verumontanum are recognized as they pass the fenestra, after which upon reaching the obstruction there is a slight gush of water and the fenestrated opening is completely filled by the occluding barrier. The latter is immediately cut through by the sharp cutting distal edge of a second tube passing within the sheath, which, under control of the operator, excises any tissue that projects into the lumen of the sheath. In this way, it is possible to excise a piece of tissue measuring 1 by 1.5 cm, and after removing it with forceps to return again for another such piece (Figure 4), continuing the procedure until the entire obstruction has been removed, the eye guiding the direction of the excising blade. The bladder is then washed free of blood clots, the instrument withdrawn, and a large two-way catheter introduced to provide a continuous irrigation of hot water to control bleeding. The whole procedure can be carried out under local Novocain anesthesia.

At a later time, owing to postoperative difficulties, the continuous irrigation was changed to a kephalin-coated catheter (26 and 27F)* which more effectively controlled hemorrhage, although Young still advised that a piston syringe be kept at hand to secure prompt evacuation of all clots. He claimed that all his instrument was designed to do was to remove small obstructions at the prostatic orifice and stated that it was not an operation for general use. Young's method attained a wide vogue, and on it are founded all the later punch instruments of which his served as a model.

The year 1910, however, ushered in the beginning of a complete new era in the treatment of bladder neck obstructions, through the an-

nouncement by Edwin Beer of his successful application of high-frequency current to tumors of the bladder. Early in 1909 Beer had conceived the idea of procuring an intravesical cautery that could be used through an ordinary catheterizing cystoscope in the same manner as the intravesical set of operating instruments. In Vienna, where he had purchased his Blum set of instruments, he could find no such cautery, and upon returning to America he decided to look into the possibility of using high frequency for this purpose, having already made use of this method in treating skin warts. In a paper read before the New York State Medical Society in April 1911, he wrote:

"I took the matter up with the Wappler firm, where I had bought my high frequency apparatus, and was thoroughly disappointed when Mr. R. Wappler told me I could not use these currents as I wished, because, first of all, an air gap between the tumor and the electrode was essential, and second the current would burn out my cystoscopes. Others whom I consulted, who had more experience with these currents in dermatological conditions, told me that Mr. Wappler's views were absolutely correct. Despite this information I ordered through the Wappler firm a very thoroughly insulated copper (6-ply) electrode so that I might experiment with these currents and test the validity of these expert views. I wasted some time in trying to fit the end of the electrode with a cup-shaped depression which would retain a small amount of air even under water and thus give me a small air gap. In treating warts under water, I quickly found that no such air gap was essential, and that the warts could be readily removed by direct application of the electrode and current to the warts. I then tested my cystoscopes (Nitze type, catheterizing-Loewenstein make) and found that they carried the current without in any way interfering with the illumination. I then treated skin warts through the cystoscope under water and obtained most satisfactory results. I was then ready to employ the method in bladder tumors as originally conceived."

The novel feature of Beer's method was that he adapted to underwater use in the urinary bladder the Oudin monopolar current, which had been employed for 15 years in the removal

**Kephalin* is an early name for thromboplastin.

of surface growths. Its great simplicity, rapid action, and the fact that any trained cystoscopist could use it with perfect ease to destroy large growths at the bladder neck led to widespread adoption of the procedure.

In his new form of therapy, Beer used as the essential instruments: (a) a high-frequency machine with Oudin resonator, (b) a Nitze catheterizing cystoscope, and (c) a heavily insulated copper electrode. Having previously distended the bladder with distilled water, he pushed the cystoscope, armed with the electrode, in among the villi under complete guidance of vision and allowed the current to play for 15 to 30 seconds at each application.

He found that a total of three to five minutes at a sitting was sufficient, repeating the application a few days later, and continuing treatments at like intervals until the entire growth became necrotic and was voided in small pieces as it disintegrated.

Certain authors, impressed by Beer's work with papillomata, bestowed the name *fulguration* upon his method, a name that Beer himself was unwilling to accept, pointing out that the procedure if properly used seldom causes sparking, in the sense of the long lightning-like spark observed in de Keating and Hart's mode of using high frequency, which was then current. He believed that the use of this term would lead to confusion if applied to his method of destroying intravesical neoplasms. Beer also emphasized the fact that his method directly destroys the growth itself, while the de Keating-Hart fulguration method seems to act not upon the tumor itself but upon the soil in which it grows. He could think of no better name for this procedure than *Oudin high-frequency current*. In 1927 during the Third International Congress of Urology held at Brussels, Beer was awarded a gold medal for his outstanding achievement in the treatment of tumors of the bladder.

In 1913 Stevens as well as Bugbee, working independently of one another, announced their

successful employment of the method in certain cases of vesical neck obstruction in which an operation was contraindicated. Stevens's report, in July 1913, was based on two cases, one of contracture of the bladder neck, and the other of median lobe; in both, the method was easily applied, with very little discomfort to the patient and with excellent results. Both patients had tolerated the cystoscope so well that no anesthesia was used. With the same technique

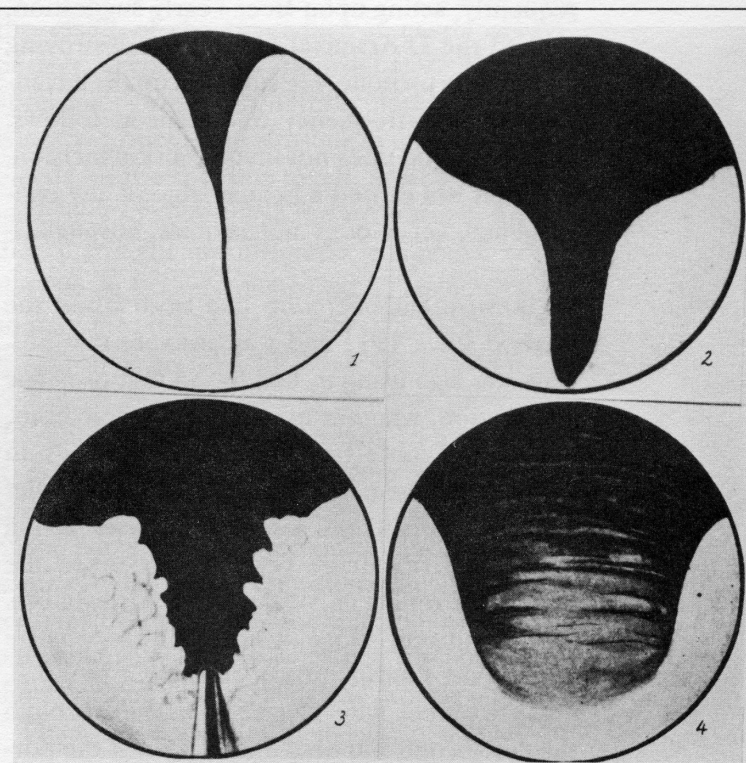


Figure 5. The method of endoscopic treatment of prostatic obstruction by high-frequency current.

- (1) Typical endoscopic view of the vesical orifice, showing prostatic obstruction.
- (2) Widened furrow resulting from application of electrocoagulation.
- (3) Appearance of the vesical orifice during the fulguration, showing the wire electrode at work on the obstructing bar.
- (4) The final result obtained after destruction of the median bar and prostatic obstruction. (After Bugbee.)

as that employed in cauterizing the bladder papillomata, using a steel wire electrode in an indirect vision catheterizing cystoscope, with about 1/10-inch spark in the muffler, Stevens attacked the prostate at the posterior aspect of the vesical neck. In order to note the effects better, he gave treatments at rather long intervals, four cauterizations of about three minutes each being done over the course of three months. Although in both these cases the Oudin current was employed, Stevens subsequently, acting upon Beer's early suggestion, applied the D'Arsonval current for destroying lobes of the prostate. He summed up the advantages of high-frequency treatment as follows: (a) the method does not involve a skin incision, (b) it has not caused a hemorrhage of any consequence, (c) it does not require hospitalization.

Likewise Bugbee, who had been using the method since 1911 and was unaware that Stevens was also using it, had found that prostatic obstruction, whether malignant, adenomatous, or fibrous, could be destroyed sufficiently in this way to give partial or even complete relief from the obstruction, some of the cases having maintained their cure permanently up to the time of his report in August 1913. Using a No. 18 F. indirect close vision cystoscope, he applied the Oudin current through a No. 5 F. insulated steel wire electrode passed through the cystoscope and held tightly against the portion of the prostate to be destroyed (Figure 5). A 1/4-inch spark was employed, and the electrode held in contact with the prostate until the hydrogen bubbles ceased to form. The cut thus burned through the tissue at the first sitting was widened and deepened at later sittings until the vesical orifice was freed posteriorly. Of 13 cases reported, 7 were median bar or small median lobe enlargements, and in these complete relief of symptoms was obtained after three to six applications. Bugbee observed no reaction of any marked degree following the applications, nor any bleeding. He had the impression that

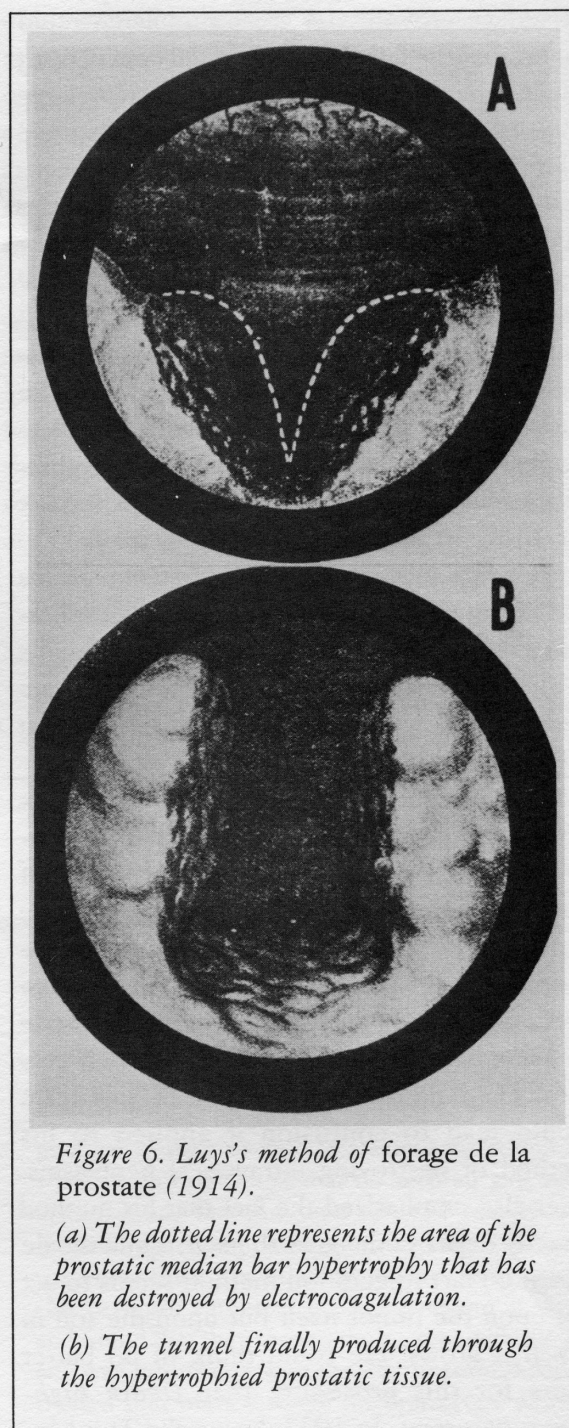


Figure 6. *Luy's method of forage de la prostate* (1914).

(a) *The dotted line represents the area of the prostatic median bar hypertrophy that has been destroyed by electrocoagulation.*

(b) *The tunnel finally produced through the hypertrophied prostatic tissue.*

these operations, performed under the eye, without shock, bleeding, or leaving a raw surface, were superior to other methods in cases where it was necessary to destroy only a small amount of tissue.

The advantages Bugbee claimed for his high-frequency treatment were:

1. The patient is not incapacitated.
2. The work is accomplished by sight without pain or hemorrhage.
3. No raw surfaces are left after the application; infection will not take place if asepsis is maintained during the operation; the amount of tissue destruction is definite; there is no resultant cicatrix. Subsequent observations show a smooth permanent furrow.
4. Added applications are made after the slough comes away, so that the amount of necessary destruction is carefully ascertained.

The following year (1914) Luys of Paris reported success with a method of endoscopic electrocoagulation that he termed *forage de la prostate*. This was an intervention done under full vision and capable of complete graduation both as to intensity of action and extent of surface removed. Luys described the median bar as a structure that nearly always resembles a roof with two slopes: one vesical, presenting as a rule a gentle declivity, the other urethral, usually more abrupt or almost vertical. The ridge of their union may be a plateau or may form an angle. The effective treatment, according to Luys, is to approach the bar and effect its destruction by way of both slopes. Electrocoagulation is begun on the vesical slope and finished on the urethral, employing in the latter part of the procedure the simple urethral tube to carry the electrode.

Luys's technique was to introduce the cystoscope — which, owing to the elbowed shaft, usually penetrates the bladder easily — along the normal furrow between the two lobes of the prostate, and then to draw the tube back a little, very slowly, under direct vision. As soon as the

vesical side is seen, it is time to apply the first touches of the electrode, after using a few drops of cocaine. The operator then proceeds to hollow out an actual tunnel in the prostate to permit the free flow of urine. In the hands of an expert, it is surprising, says Luys, to see how little hemorrhage occurs. The electrode produces a small dry black eschar, with no oozing. One should never dream of completing the operation in one sitting. Very deep electrocoagulation does not give good results; but with a rest of a week or so between treatments, the result of the procedure is nearly always perfect, according to its originator. The first applications are the most difficult since the road is not yet open. The prostate is congested and bleeds on the slightest touch; great patience is necessary to accomplish the early steps. An ordinary straight urethroscope will reveal when the bar is entirely destroyed, since it will go straight into the bladder without difficulty. The results as described by Luys are twofold: (a) complete disappearance of residual urine and (b) renewed force of the stream. In some cases it may be three months before treatment is completed and the bladder neck entirely freed of the bar. Luys regarded this method of treatment as indicated in cases where the gravity of a transvesical operation would be out of all proportion to the relatively minor discomfort of the symptoms suffered by the patients.

Heitz-Boyer, in 1919, began to employ in hypertrophy of the prostate a very strong electrocoagulation through a cystourethroscope of his own, and he reported excellent results. But this method of electrocoagulation never gained popularity in France, and so prostatectomy or open operation remains the procedure of choice in that country.



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