THE TREATMENT OF PAPILLOMA OF THE BLADDER BY THE HIGH-FREQUENCY CURRENT.

By J. W. THOMSON WALKER, LONDON.

THE treatment of papilloma of the bladder has been a fruitful subject for discussion among surgeons during the last decade. Two classes of operative procedure have been used, namely, the open method by suprapubic operation, and the intravesical or transurethral method. Each has its advocates, and each has certain advantages and disadvantages.

The transurethral method is carried out by means of an operation cystoscope originally invented by Nitze, or through the open or direct cystoscope of Kelly and Luys. The advantages of removing a papilloma of the bladder through the urethra without an open wound are obvious, and the method is claimed by its advocates to give good late-results. There are, however, very distinct limitations to its use. The instruments are delicate, and their employment demands a considerable degree of mechanical skill. Only those papillomata which are conveniently situated, and are of moderate size and small in numbers, are suitable for treatment by this method. Further, unless the growth is very small, a number of sittings is required, and the treatment covers a considerable period of time. Operation through the open cystoscope of Kelly or Luys, by means of snarcs, forceps, or a fine electric cautery, has the special disadvantage that there is frequently great difficulty in obtaining a proper distention of the bladder by atmospheric pressure, even when the patient is placed in the full Trendelenburg position.

The open operation has in its favour, that all papillomata can be treated by it, whether small or large, single or multiple, and whatever position they may occupy. It has the disadvantage that it is a more serious undertaking, suitable for large or multiple growths, but too formidable for small papillomata, whether primary or recurrent. It is also true that recurrence of the papilloma is fairly frequent after an operation. Whether it is more frequent, in the same class of cases, than after operation by the transurethral method, is very doubtful. For some years I tried, by painting the interior of the bladder with 4 per cent silver nitrate solution after open operations, to prevent recurrence by destroying invisible papillomata, or implanted fragments, which might be the source of recurrence. This has not, however, been invariably successful, for recurrence has taken place in spite of it.

In 1910, Beer, of New York,¹ introduced an entirely new method of treatment of growths of the bladder by exposure to the high-frequency current. This method has revolutionized the treatment of papilloma of the bladder. The current had been used for some fifteen years for the removal of surface growths, and, as Beer states, the novel feature of his method consisted in

the use of these currents under water, and in the urinary bladder. I shall first describe the method, and then proceed to discuss its application.

Two forms of current are used, namely, the Oudin or unipolar, and the d'Arsonval or bipolar. In the Oudin or unipolar current, which is used by Beer and others, a single electrode is used, and is applied to the growth, the return current passing to earth from the surface of the body. In the d'Arsonval or bipolar current, one electrode is applied to the growth, and the second, by means of a moistened pad, to the surface of the body.

The nomenclature of the procedure has given rise to considerable difficulty, and no one term appears to be generally accepted as accurately describing the method.² Fulguration is the method used by De Keating-Hart for surface growths. It differs from Beer's method in that a spark-gap is employed between the terminal and the growth, and 'fulguration' refers definitely to the 'long, lightning-like sparks' produced in the De Keating-Hart method. In Beer's method the electrode is applied directly to the growth in a fluid medium, and no sparks are developed. The term 'fulguration' is therefore misapplied when used for Beer's method. Perhaps the term 'electro-coagulation,' employed by Doyen to describe the effect of the high-frequency current used to destroy growths elsewhere in the body, most nearly describes the process. As d'Arsonval demonstrated in 1896, a high-frequency current will produce a rise of temperature in the tissues between two electrodes, and this was used by Nagelschmidt³ in 1907, under the name of 'diathermy,' for the destruction of new growths. The bipolar or d'Arsonval current may be used in the Beer treatment of bladder growths, and the term 'diathermy' is correctly applied to this use of the bipolar current. The term 'electro-coagulation' expresses the effect of the high-frequency current either by the unipolar or by the bipolar method, and might well be applied to the whole procedure, the qualification 'unipolar' or 'bipolar' being added, if desired, to indicate the form of current used.

TECHNIQUE.

Beer uses the unipolar current, and the following description is taken from his account of the method. The essential instruments are (1) A high-frequency machine with Oudin resonator, (2) A catheterizing cystoscope, (3) A heavily insulated copper electrode. The source of the original current may be the main. If this does not alternate, the high-frequency machine must be fitted with an alternator. Beer employs a Nitze double-catheter cystoscope. In one catheter tunnel he places the electrode, and to the other he attaches a tube for irrigation. The application is made directly to the growth, the electrode being pushed a short distance in among the villi. The current is turned on at various points for fifteen to thirty seconds, a total of three to five minutes usually sufficing at one sitting. A few days later it should be repeated, provided any viable tumour tissue is visible. The applications are discontinued as soon as the whole growth appears necrotic. The sloughs are allowed to separate, and the base thus exposed is treated in a similar manner.

I have employed the bipolar current, and will describe more fully the method with which I am familiar. The high-frequency apparatus is contained in a

movable box, two feet square, which is connected with the main electric current. It is necessary that the apparatus should be specially constructed for the current which it is to modify. I have occasion to work in London with three different main currents, namely, a constant current of 240 volts, another of 110 volts, and an alternating current. The apparatus I employ is constructed for use with any of these. To one pole of the apparatus is attached a large flat electrode (6×4 inches), and to the other a terminal in the form of a fine copper wire, seventeen inches in length, and insulated in its whole length as far as a terminal platinum bulb which is left exposed. This insulated wire has the suppleness and calibre of a ureteric catheter (No. 5 or 6). The application is made through a catheterizing cystoscope. The procedure is as follows —

The apparatus is first tested the high-frequency apparatus is connected with the main current, and the pad-electrode well soaked in saline solution.

FIG. 177.—Series of charts indicating the positions of growths on the bladder wall at different stages of treatment of a case. *a*, Dec., 1915, *b*, April, 1916, *c*, May, 1916.

A small piece of raw meat is placed on the pad, and the platinum bulb of the other terminal placed in contact with it. The current is switched on, and very quickly a whitened area appears round the electrode. By shortening the spark in the high-frequency apparatus, the cauterizing effect can be intensified, and this should be adjusted to give the maximum effect. The apparatus is now ready for use. The electrode is placed in antiseptic solution, and the patient is prepared for cystoscopy.

The urethra is thoroughly anaesthetized by injecting a drachm of 4 per cent novocain solution into the anterior urethra, and massaging it back through the compressor muscle. The cystoscope is introduced, and the bladder washed and distended with boracic solution or sterile water. A distention of eight or ten ounces will usually suffice, but more may be required if the growth is in an inaccessible position. Before commencing the treatment, the surgeon

should construct a map, showing the position, character, and size of the growths (*Fig. 177*). This is necessary for checking the results of the treatment. The cautery electrode is introduced along the catheter tunnel, and the platinum bulb is made to approach the growth, under the eye of the operator. The pad is now applied to the patient, being placed in the suprapubic region, or under the sacrum, or on the thigh. When the growth is situated on the anterior wall, or at the apex, I apply the pad suprapubically, when at the base or on the posterior wall, the pad is placed over the sacrum, and when situated on the lateral wall, the pad is folded over the upper part of the corresponding

thigh, the object of these varieties being to facilitate the passage of the current from the periphery to the centre and base of the tumour (*Fig. 178*).

As the current flows, certain phenomena appear in relation to the terminal, which has been buried in the growth. At first a swirl of fluid and a movement of fine villi are seen, and then, after the current has been running for some seconds, bubbles of gas shoot out alongside the electrode. Occasionally, where the action of the current is very energetic, and the application prolonged, a miniature explosion occurs, and may be repeated, shaking the villi of the tumour. Some oozing of blood not uncommonly appears, and if the growth is on the anterior wall, a fine thread-like stream of blood may fall towards and past the window of the cystoscope. Visible changes occur in the growth itself. Around

FIG. 178.—To illustrate the application of the pad-electrode in growths on (a) the anterior and (b) the posterior wall of the bladder.

the electrode a pale-coloured halo appears, and this becomes opaque white.

When the electrode is withdrawn, the tumour may be adherent to it, and the whole tumour is drawn up towards the window of the cystoscope till the drag is too strong, when it falls back, showing a round dark hole surrounded by an opaque white area of necrosis (*Fig. 179*), which, compared with the rest of the growth, is firm and inelastic. Occasionally the electrode point comes in contact with the stem of a considerable branch of growth. The surface of this area changes in appearance. The tip of each fine pink villus becomes swollen and tense, almost cyst-like in appearance, and darker in colour,

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and the group of villi thus changed has the appearance of a bunch of very tiny grapes.

When the electrode is withdrawn, white, shreddy masses of necrotic, asbestos-like material adhere to it. Occasionally a branch of the papilloma of considerable size comes away on the point of the electrode.

Applications of twenty to thirty seconds may be made at first, and repeated a number of times. Later on, the current may be passed continuously for several minutes (three to six) without complaint from the patient. The longest continuous application that I have made is six minutes, and the greatest duration of current flow at one sitting, comprising a number of applications, is thirteen minutes twelve seconds. Apart from nervousness on the part of the patient, the bladder may, during a prolonged sitting, become irritable and spasmodic. This may be due to the temperature of the distending fluid being raised by the electric discharge, and is overcome by emptying and refilling the bladder.

The prolonged contact of the cystoscope with the urethral wall, and the effect of the local anæsthetic passing off, together with the movements of the cystoscope and electrode within the bladder, may stimulate the bladder to repeated contraction, which becomes at length uncontrollable. The levatores ani appear to take a prominent part in the spasm, for the whole base of the bladder, together with the prostate, is raised up spasmodically from time to time. Cloudiness of the fluid from admixture of debris and blood necessitates washing of the bladder.

When a small papilloma is being treated, the platinum terminal is sunk into its centre, and very quickly the whole of the growth is seen to whiten, and shreds of it, or the entire growth, come away on the point of the electrode.

In dealing with a larger mass of papilloma, an attempt should be made to treat segments of it at a time. A fortunate application may destroy the main branch of a large segment of the tumour. This may not, however, be possible, and the electrode is sunk among the villi, taking care that it is not deflected or pushed too far and thus brought into contact with the mucous membrane.

Sometimes, by sweeping the electrode beneath the papilloma, a pedicle may be found, and if contact with this can be maintained, the growth will be destroyed more quickly than if it were attacked in segments. In attempting this, however, the bladder mucous membrane may be cauterized, giving rise to severe pain.

I have several times attempted, by cauterizing the large blood-vessels passing into the base of the growth, to cut off the blood-supply, and thus strangle the growth. This has not, however, been successful in destroying the growth without further direct applications to the tumour mass. The blood-supply of these growths, although in large part derived from superficial vessels clearly visible on the surrounding mucous membrane, is partly obtained from vessels passing directly to them from the submucous blood-vessels.

Where multiple growths are present, it will be found convenient to destroy these situated at and around the internal meatus, before proceeding to deal with those in more remote parts of the bladder.

Papillomatous growths are insensitive, and the passing of the current does not cause any pain. If, however, the electrode should happen to touch the

bladder mucous membrane, a sharp pain like the sting of a wasp is experienced, and will continue until the electrode is removed from contact with the mucous membrane. Occasionally the electrode may be pushed through a luxuriant growth and inadvertently touch the mucous membrane at its base, when pain is at once experienced. When the growth lies at the lip of the internal meatus, it is difficult to avoid contact of the cautery with the mucous membrane, more sensitive at this spot than at any other part of the urinary tract. As a result, treatment of papillomata in this situation is usually painful.

After a time the fluid medium in the bladder becomes cloudy with débris and blood, and the bladder should be washed out before further applications are made. The sitting may eventually have to be suspended on this account. At the end of each sitting the bladder should be thoroughly irrigated with weak silver nitrate solution (1-10,000).

Where the papillomata are luxuriant and friable, I have found the instillation of nitrate of silver solution at the end of each sitting of great assistance. Half a drachm of two per cent or four per cent solution of nitrate of silver is instilled by means of a Guyon's syringe, and left in the bladder. This is

DESCRIPTION OF PLATE.

FIG. 179.—A papilloma after withdrawal of the electrode, showing necrotic tissue at the site of application and adhering to the electrode.

FIG. 180.—Partly-destroyed papilloma and oval ulcer with adherent slough and surrounding inflammation.

FIG. 181.—Ulcer after destruction of papilloma, showing oval shape and surrounding rampart of swollen mucous membrane.

FIG. 182.—Pitting of bladder wall after healing of ulcer (below and to right), ulcer from recent cauterization, with adherent slough and raised edges (above and to left), small ulcer with surrounding œdema (to right).

FIG. 183.—Trabeculation and sacculation occasionally observed some months after high-frequency treatment.

especially helpful where friable masses of growth crowd thickly around the bladder outlet. In this position, removal by means of the cautery alone is difficult, and repeated applications are necessary. The mucous membrane here is intensely sensitive, and the manipulation of the cystoscope and the heat of the cautery cause considerable pain, which is frequently accompanied by spasm of the bladder and heaving up of the prostate and bladder base by contraction of the levatores ani muscles. The destruction of these growths is brought about partly by the electric cautery and partly by the action of the silver nitrate solution.

A little hæmorrhage may follow this operation, but usually the urine rapidly becomes quite clear. Hæmorrhage is not infrequent ten days or a fortnight after the treatment, and then results from a slough of necrosed growth becoming detached. This hæmorrhage has seldom, in my experience, been alarming, and has been severe in three cases only, and beyond keeping the patient in bed for a day or two, no treatment is usually necessary. Should the hæmorrhage persist, irrigation of the bladder with very weak silver nitrate solution (1-10,000) will speedily check it.

The duration of an application of the high-frequency current will vary according to a number of factors. For very small growths, a few seconds will suffice; for large or multiple growths, the séance is prolonged, and a number of treatments is necessary. When this is the case, the longest possible application, and the maximum amount of treatment, should be employed at each sitting.

The type of individual has an influence on the duration of the application, and on the ease with which it is made. A placid patient renders invaluable assistance by remaining quiet, while a nervous, irritable subject increases the difficulties by restlessness and complaints. At first, the average patient may be apprehensive and hypersensitive, and short sittings are necessary; but as he gains confidence, more prolonged applications may be made. By care in avoiding contact with the bladder mucous membrane, there need be nothing more than discomfort caused by the presence of the cystoscope in the urethra.

After the destruction of a papilloma, a small area of ulceration is found, covered by an adherent slough (*Figs. 180 and 181*). The appearance is peculiar. A grey slough occupies the centre, in the position of the base of the growth. Around this is a raised rampart of bright red, velvety mucous membrane, with radiating folds and streaks of brighter scarlet. This falls to the surrounding level, and the colour fades at the periphery. This condition is seen a week, or as long as ten days, after the treatment. After this the slough separates, and a granulating surface is left. The raised rampart gradually disappears, and the colour fades. Three weeks after the treatment traces of the ulceration still remain, after that they rapidly disappear, and only a faint scar is left, and even this may disappear.

When repeated applications of the cautery have been necessary, small pits may remain in the bladder wall (*Fig. 182*) after the ulceration has completely healed. In three of my cases an area of about the size of a shilling showed prominent trabeculation, with deep intervening sacculæ, when the bladder was examined several months after the treatment (*Fig. 183*). In none of these cases was there any trabeculation present at the time of the operation, and there was no urethral obstruction. Two of the patients were females. This condition was undoubtedly due to a local atrophy of the muscular layer of the bladder wall, resulting from the application of the high-frequency current. Whether this will be found to occur in many cases after the application of the high-frequency current to the bladder, one cannot say. It is sufficient here to note that the condition has been observed.

In a few cases the patient has complained of abdominal pain for some days, or even weeks, after the application of the high-frequency current. This pain is not referred to the bladder, but to some area over the lower abdomen, not directly over that viscus. It is unconnected with micturition, or with distention of the bladder, and is unaffected by the condition of the bowel. It is possible that these pains may be due to the action of the current on sensory nerves.

The length of interval between each treatment will vary in different cases. At least a week should elapse, so that sloughs may be given time to become

detached. Where the growth has been cauterized down to the mucous membrane, a fortnight or three weeks' interval should be allowed before re-examining, so that the reaction which occurs in the mucous membrane may be given time to settle down, and the heaped-up edge of the ulcer may not be mistaken for a papilloma, or a small fragment of papilloma be hidden between the thickened folds.

The number of treatments necessary will vary with the size and number of the growths, the tolerance of the patient, and the smooth running of the electrical apparatus. In my cases the average number of applications was four, and the average time during which the current was passed in each case was twelve minutes.

Microscopical Changes occurring in the Growth.—In a case where I proposed to operate by the open method for a suspicious smooth growth, I took the opportunity of treating a clump of papillomas with the high-frequency current a few days before the operation, and thus obtained a specimen for microscopical examination.

The papilloma so treated showed the following features: A large part of the growth was quite unchanged, and differed in no way from the usual appearances presented by a simple papilloma. One part of the tumour showed changes of two types. In the first, the epithelial covering of the villi was unchanged, but the blood-vessels were involved; while in the second type the changes affected the vessels and epithelium of the villus.

In the first type (*Fig. 184*), the epithelial covering was intact, but the thin-walled blood-vessels of the core were engorged with blood, and dilated to several times their usual size. Tracing the villus back, it was found that towards the base the engorgement of the vessels disappeared, and the vessels might even be collapsed. In a more pronounced degree of this type there was, in addition to the engorgement, effusion of blood into the areolar tissue of the villus, so that the whole core became infiltrated with blood-corpuscles, embedded in which the dilated thin-walled vessels could be distinguished.

In the second type the change in the vessels resembled the preceding type, but there was, in addition, a loss of staining power of the transitional

FIG. 184.—Microscopical section through a papilloma, showing engorgement of the blood-vessels of the villi on the right, and necrosis of epithelium on the left.

epithelium covering the villus. The staining of the nuclei was dull, and the nuclear outline and that of the cell were indefinite. The epithelium still retained its structural form. A more advanced change showed destruction of the villus, which was transformed into a mass the elements of which were difficult to recognize. Careful examination showed very numerous capillary blood-vessels embedded in a mass of cells consisting of blood-corpuscles and isolated cells of the epithelium which had almost, or completely, lost their staining properties.

It seems probable that in the first type, in which the blood-vessels only were involved, the changes were brought about indirectly by coagulation of the blood and obstruction of the capillary vessels of the villi. The second type, where changes affected the epithelial structure and led to complete destruction of the villus, was probably the result of the direct cauterizing effect of the high-frequency current.

DIFFICULTIES.

It is a confession of inexperience to suggest, as some writers have, that the method is always simple and without difficulties. In the majority of cases the practised cystoscopist will carry out the treatment with ease; but there are cases where serious, and even insurmountable, obstacles are encountered.

FIG. 185.—To illustrate a papilloma lying below a fold in the bladder wall.

Difficulties are related to the growth, the condition of the bladder, the urethra, and to the build and temperament of the patient.

The position of the growth is an important factor. A papilloma lying in the region of the trigone, in the neighbourhood of the ureteric orifice, or low down on the pos-

terior wall, is in an ideal position for treatment by this method. Certain positions are, however, inconvenient for the application of the electrode. An area at the apex of the bladder is sometimes difficult to get at, and it is necessary to pay out a considerable length of the insulated wire before a growth in this region is reached; the long flexible wire is less under control than a short length, and the application is consequently less accurate. A small papilloma lying behind a fold is difficult of access (*Fig. 185*); such a fold may result from a previous cystotomy, and thus lies near the apex. I have known a trabecula in an obstructed bladder cause some difficulty; and a high interureteric bar may partly conceal a small papilloma, and intervene between it and the electrode.

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The least accessible position is on the lip of the internal meatus, or in the immediate neighbourhood of this orifice. Here the cystoscope must be withdrawn until the window lies just within the bladder, and the opening of the catheter tunnel lies in the prostatic urethra. The electrode is prevented by the lip of the internal meatus from coming into contact with the papilloma, and cannot be made to curve round sufficiently to touch it. A mass of papillomata spreading from the internal meatus into the bladder presents similar difficulties (*Fig. 186*). Patient and gentle manipulation may succeed in overcoming these obstacles. An open Luys cystoscope tube, or a posterior urethroscope, may be tried in such cases, and may be successful where the indirect cystoscope has failed.

Growths lying far out from the urethra, and low down towards the front of the lateral wall, are also difficult to reach in the male; in the female subject the broad pelvis and short urethra permit an easier approach to growths in this situation.

The bladder must permit of adequate distention and free intravesical manipulation.

The combination of cystitis with papilloma of the bladder makes the operation very difficult. The bladder holds an inadequate amount of fluid, and is hypersensitive and spasmodic, and the folds of swollen mucous membrane may conceal small papillomata, and make it difficult to estimate the progress made in cauterizing those growths that are visible. Every endeavour should be made to get rid of the cystitis before commencing the high-frequency treatment, and this is usually successful where the growth is small and benign. Where multiple papillomata are present, and in the cases where a luxuriant friable growth covers a large area of mucous membrane, it will be impossible to treat the cystitis with success. Such cases are on this account unsuitable for treatment by the high-frequency current.

Apart from cystitis, the bladder, in a few cases, is intolerant of prolonged intravesical manipulation; this is more often found in the male than in the female subject, and usually where considerable strain must be placed on the prostatic urethra by the rigid cystoscope in reaching a growth in a difficult position. Patience, gentleness, and efficient local anæsthesia will usually overcome this difficulty.

Enlargement of the prostate, with a prominent rim or lobes projecting into the bladder, may interfere seriously with the necessary manipulation,

FIG. 186.—To show the difficulty in treating papillomata extending from the internal meatus.

especially where the papilloma is at the bladder base, and protected by the rampart of prostatic tissue (*Fig. 187*). The age at which enlargement of the prostate commences, and that at which papilloma develops, are not usually the same, but the combination will be met with occasionally. Chronic prostatitis, with fibrosis of the gland and bladder neck, render the prostatic urethra rigid, and interfere in some degree with the freedom of movement of the cystoscope.

The urethra must not be over-sensitive. The female urethra, with its short, straight course, allows a greater degree of freedom, and the roomy pelvis a wider excursion of the cystoscope, than in the male.

The build and temperament of the patient are important. A stout heavy subject is much less suitable for the method than one of slight build. The limits which nervousness and irritability of the patient place upon the use of this method have already been discussed.

FIG. 187.—Papilloma protected by a bar formed by an enlarged prostate.

CASES SUITABLE AND UNSUITABLE FOR TREATMENT.

The ideal case for treatment by this method is a papilloma of moderate size situated at the base or posterior wall of the bladder, not too near the urethral orifice. Discrete multiple papillomata are easily treated. With the early diagnosis that results from cystoscopy, such cases come under observation very frequently, and a suprapubic operation is unnecessary.

In the early stage of recurrence after open operation, when the papillomatous buds are quite small, the high-frequency method is invaluable. The small papillomata, frequently multiple, are as yet too insignificant, and have caused too little in the way of symptoms, to justify a second operation. The adoption of some method of transurethral operation is imperative, and the high-frequency method is the simplest, and at the same time is completely efficient.

It cannot be said that all forms of growth of the bladder, or even that all cases of simple papilloma of the bladder, are suitable for treatment by this method. Certain multiple coalescing papillomatous growths are better treated by excision, by the suprapubic method. This is principally because open operation is the simpler and quicker method of treating such widespread growths. The prolonged application, and the large number of treatments necessary, make the high-frequency treatment of such cases impossible unless the surgeon has unlimited leisure, and the patient unbounded patience. With this happy

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combination there is no objection to the use of the method. For the same reason a very large papilloma, such as one sometimes meets with, is unsuitable for this method. But here, in addition, the difficulties of manipulation in the bladder are great, and it may be quite impossible, either from recurrent hæmorrhage, or from the great quantity of papillomatous material hoodwinking the cystoscope, to see the growth clearly in order to apply the electrode.

Again, septic growths are unsuitable for high-frequency treatment. Apart from the fact to which I have already referred, that the bladder is hypersensitive and spasmodic, the treatment tends to increase the irritability of the organ, and sloughs of papillomatous material destroyed by the current add fresh soil for the development of bacteria, and increase the cystitis. When the growth is small, there is a good prospect that treatment will cure the cystitis, and the high-frequency method can then be employed. Where, however, the growths are multiple and extensive, the cystitis will persist in spite of treatment, and the shortest and most practical method is to open the bladder suprapubically, clear out the growths, and by means of free drainage and continuous irrigation effectively treat the cystitis. At regular intervals after the operation the bladder is inspected carefully, and any recurrence is at once treated with the high-frequency current.

Some growths in the immediate neighbourhood of the urethral orifice are unsuitable for this treatment. Small growths, even when the mechanical difficulty of getting down to them with the cautery is great, are practically always open to attack; but in large growths spreading into the prostatic urethra and around the meatus, it is hardly worth while attempting; the more so that in these cases there are usually multiple growths in the bladder, possibly of considerable size.

It is generally agreed that malignant growths are unsuitable for treatment by this method. Although the high-frequency current causes destruction of tissue on the surface, this is very rapidly replaced, and it is stated that the effect on a malignant growth, apart from the localized necrotic effect, is to stimulate the activity of the undestroyed cancer cells.

I have not treated malignant growths by the high-frequency method, for the reason that I hold that if the growth is of suitable size for radical treatment, the most thorough method of resection of the bladder walls is the proper procedure; and, moreover, the true extent of the growth—that is, its intramural and extravesical extent—cannot be gauged by the cystoscope, and will not be known until the bladder is opened, and the growth examined by touch from within and outside the bladder wall.

The treatment of hæmorrhage in a malignant growth by this method should not be confused with the treatment which has a cure for its object. This symptomatic treatment has been used, and is advocated by some observers. I have not met with a case where it appeared to me to have any advantages. If the hæmorrhage is really severe, this method will be impossible, and the most effective and logical treatment is to open the bladder, and remove as much of the growth as possible by scraping. If the hæmorrhage is slight, it can be treated by washing the bladder.

The really difficult cases are those when a justifiable doubt arises in regard

No.	NAME AND SEX	AGE	PRIMARY OR RE-CURRENT	PREVIOUS OPERATIONS		GROWTH SINGLE OR MULTIPLE	CHARACTER OF GROWTH	POSITION OF GROWTH	BLADDER	URETHRA AND PROSTATE
				No. and Character	Date					
1	Mrs. O.	64	R.	1 Avulsion with forceps	8 weeks previously	Single	Size of large pea	Behind left ureteric orifice	Healthy	Urethra normal
[2	Mrs. B.	58	P	—	—	Single	Large soft papilloma, size of walnut. Pedunculated	Behind right ureteric orifice	Healthy	Urethra normal
3	J., male	39	R.	1 Dissection	3 years	Single	Pea size	Behind left ureteric orifice	Healthy	Normal
4	B., male	47	P	—	—	Single	Large pea size, feathery	Behind left ureteric orifice	Healthy	Prostate enlarged, projects as rim into bladder
5	Mrs. S.	36	R.	3 Old type	Last operation 6 months ago	Single	Large pea size	Outside right ureter	Healthy	Urethra normal
6	Mrs. S.	45	P	—	—	Single	Soft, friable, hazel-nut size	At apex of bladder	Spasmodic, no cystitis	Urethra sensitive
7	W., male	56	R.	1	6 months	Multiple	Readily bleeding	Posterior wall, left lateral wall, behind left ureteric and round urethral orifices	Cystitis	Urethra very tender
8	W., male	63	P	—	—	Single	Pea size	Behind left ureter	Healthy	Collar-like enlargement prostate, 1oz. residual urine
9	H., male	39	R.	2 Thorough	1905 1913	Multiple	Small ordinary type	3 near apex, 1 internal meatus	Healthy	Very sensitive
10	W. G., male	54	R.	1	4½ years previously	Multiple 6	6 small ordinary type	On posterior and lateral walls	Normal	Normal
11	R., male	54	R.	1 Growth wrenched away with forceps	15 years	Multiple 5	Large simple papillomata, and small buds	At internal meatus, round left ureteric orifice, and on posterior wall	Normal	Normal
12	C., male	30	P	—	—	Single	Sessile, very dark colour, walnut size	Anterior wall high up, very difficult to reach	Normal	Normal
13	L., male	59	R.	1	4 years	Multiple	Ordinary type	Posterior wall high up	Normal	Normal
14	Miss C.	40	R.	1 Thorough	5 months	Single	Small ordinary	Behind right ureter	Healthy	
15	W., male	60	P	—	—	Multiple grouped	Small, partly sessile	Near right ureteric orifice	Slight cystitis	Prostate enlarged
16	J. P., male	77	P	—	—	Multiple	3 small, 1 large	Behind right ureter; anterior lin of meatus	Cystitis, trabeculation	Previous prostatectomy, urethra rigid

TYPE OF PATIENT	TREATMENT		AFTER-EFFECTS	RECURRENT	REMARKS
	No. of Sitzings	Total Duration			
Placid	1	1 min. 45 secs.	Pain left groin, pricking in scar, no hæmorrhage	None 10 months	—
Placid	9	84 mins. 55 secs. (Longest continuous, 3 m. 40 s.)	Moderate amount of hæmorrhage	None 7 months	Attempt to cauterize pedicle failed
Placid	1	1 min. 28 secs.	0	None 2 years	—
Nervous	1	2 mins. 14 secs.	No hæmorrhage	None 1 year 6 months	Slight difficulty due to prostate
Nervous	1	1 min.	0	None 1 year	Considerable amount of pain during application
Nervous	1	2 mins. 10 secs.	Hæmorrhage, immediate	None 8 months	Very friable growth, quickly fell to pieces with the cautery
Sensitive	7	6 mins. 17 secs.	—	—	Removed papillomata from all parts except round internal meatus. Had to abandon treatment on account of great sensitiveness of urethra and spasm of bladder
Placid	1	1 min. 5 secs.	0	None 2 years 1 month	—
Nervous	2	7 mins. 10 secs.	0	None 7 months	Great difficulty in approaching papilloma at meatus
Placid	3		Hæmorrhage moderate	None 2 years 2 months	—
Placid	1st period } 11 2nd period } 9 3rd period } 1	5 months 10 months	0	Bladder free 4 months, recurrence at 6 spots. After 2nd treatment bladder free 5 months, recurrence. After 3rd treatment bladder still free, 2 months	Recurrence here was rapid, and took the form partly of discrete nodules and partly of carpeting of areas with sessile papilloma
Very nervous	13	40 mins.	Severe hæmor- rhage twice	Reduction in size not corresponding to num- ber of applications	Very difficult to reach and patient nervous and complaining. Still under treatment
Nervous	5	22 mins. 41 secs.	Slight hæmor- rhage	Bladder free, recurred in 6 weeks	Still under treatment
Placid	1	—	—	None 3 months	Local atrophy of bladder
Placid	1	—	0	None 5 months	Difficulty due to enlarged prostate
Placid	1	2 mins. 26 secs.	—	None 1 year 3 months	Prostatectomy 5 years previously

No.	NAME AND SEX	AGE	PRIMARY OR RE-CURRENT	PREVIOUS OPERATIONS		GROWTH SINGLE OR MULTIPLE	CHARACTER OF GROWTH	POSITION OF GROWTH	BLADDER	URETHRA AND PROSTATE
				No. and Character	Date					
17	Dr. C.	50	P	—	—	Multiple, 5	Ordinary, discrete	Right base, lateral and anterior wall	Irritable	Prostate enlarged. urethra long
18	Miss A. J.	58	P	—	—	Single	Ordinary, hazel-nut size	Behind left ureter	Healthy	—
19	Dr. H.	56	R.	1 Wrenching with forceps	6 years	Multiple	Ordinary, discrete	Anterior wall, left lateral wall, and behind left ureter	Normal	Normal
20	Miss F.	60	R.	1 Thorough	7 months	Single	Ordinary, hazel-nut size	Behind right ureteric orifice	Healthy	—
21	Mrs. T.	36	R.	1 Thorough	1 year	Multiple	Sessile and discrete sub sessile	At internal meatus and on posterior wall	Very sensitive, cystitis	—
22	B. H., male	48	P	—	—	Single	Ordinary, hazel-nut size	Behind right ureteric orifice	Healthy	Very sensitive
23	K., male	65	R.	1 Thorough. Very extensive multiple growth	7 months	Multiple	Extensive sessile and sub sessile	At internal meatus and base	Cystitis	Very sensitive
24	Miss R.	48	R.	2 Very thorough, great masses of papilloma removed	Last 5 months	Multiple	Discrete papillomata, and areas covered with sessile papilloma	Round ureters, on posterior and anterior walls	Slight cystitis, sensitive	—
25	Mrs. C.	65	P	—	—	Single	Simple, hazel-nut size	Over left ureteric orifice	"Cystic" cystitis	—
26	W S., male	44	P	—	—	Multiple	Size of hazel-nut	Behind right and left ureteric orifices	Healthy	Normal
27	Miss T.	35	P	—	—	Single	Size of large pea	Posterior wall	Healthy	—
28	G. H., male	58	R.	2 Old type	1909 1910	Multiple, large number	Large soft papillomata	Base, posterior wall, anterior wall, round internal meatus	Healthy	Normal, tolerant
29	Miss A. H.	56	R.	1 Thorough	4 months	Multiple	5 small, sub sessile, deep red	Anterior wall	Healthy	—
30	H. N. P male	50	P	—	—	Single	Small ped-unculated, long, loosely arranged villi	Behind right ureteric orifice	Healthy	Normal
31	A. J. T., male	41	R.	2	20 years 18 years	Multiple	Small, short pedicle	Behind left ureteric orifice	Healthy	Normal
32	B. R.	32	P	—	—	Single	Irregular, elongated, hazel-nut size	Posterior wall	Healthy	Normal
33	Mrs. L.	76	P	—	—	Single	Sub sessile, gooseberry size	Behind right ureteric orifice	Healthy	—

TYPE OF PATIENT	TREATMENT		AFTER-EFFECTS	RECURRENCE	REMARKS
	No. of Sitzings	Total Duration			
Heavy build, placid	7	—	—	Last treatment recent	Considerable difficulty owing to heavy build and enlarged prostate
Placid	3	7 mins. 58 secs.	—	None 7 months	Pain in suprapubic region
Nervous	3	8 mins. 44 secs.	0	None 3 months	—
Very nervous	1	—	Hæmaturia moderate	1 year 5 months	—
Very nervous and restless	4	—	Suprapubic pain	—	Became hysterical, and refused to continue treatment, which had therefore to be abandoned
Nervous	5	—	Hæmorrhage	None	—
Highly nervous, thin	7	15 mins. 25 secs.	Pain, some hæmorrhage	—	Under treatment. Very difficult owing to thick masses round urethra, and sensitive bladder, Instillation of silver nitrate solution after each treatment. Now reduced to a single growth
Stout, placid	5	32 mins. 54 secs.	Severe hæmorrhage twice	—	Still under treatment, number of growths much reduced. During treatment severe pain at right side of bladder base. After treatment, pain in lower abdomen
Stout, placid	2	12 mins.	—	—	Still under treatment
Placid	2	9 mins. 5 secs.	0	—	Under treatment. Tried to cauterize vessels, but without effect
Placid	1	4 mins. 25 secs.	—	None	Destruction rapid
Placid	1	4 mins. 40 secs.	0	—	Under treatment
Nervous	1	—	—	—	Growths easily destroyed at one sitting
Placid	1	—	—	—	Destroyed at one sitting
Placid	1	2 mins.	—	—	Complete destruction at one sitting
Placid	1	4 mins. 50 secs.	—	—	Major part of growth destroyed at one sitting
Nervous	1	—	—	—	Still under treatment

to the nature of the growth. Here, experience in cystoscopy and in operation on these growths is invaluable, and cannot be replaced by any amount of book learning.

RESULTS.

It is now about five years since this method of treating papilloma of the bladder was introduced, and some cases have been free from recurrence for that period of time. The great majority have, however, been treated and remained free for a much less period. The term 'cured' is, I notice, being freely used for cases free from recurrence for no longer than two years. The results of the method are being claimed as better and more lasting than those of suprapubic operation. That this will prove to be so I sincerely hope, but nothing that has been published up to the present time has given proof that this happy result will be attained.

Recurrence after periods of six, eight, or ten years after open operation is not uncommon (in *Case 31* symptoms of recurrence first appeared sixteen years after operation), and there is nothing to show us that the same may not occur after the high-frequency treatment. We know so little in regard to the causation and recurrence of papilloma of the bladder that it is wiser not to claim too much in regard to cure by this or that method. Recurrence does in fact occasionally take place after complete destruction of papillomata by means of the high-frequency current. In *Case 11*, recurrent papillomata appeared four months after the bladder had been pronounced clear. After a second course of treatment the bladder remained free for five months, and then recurrence took place. In *Case 13* there was a recurrence six weeks after the growths had been completely destroyed.

In the light of this experience, it is necessary to examine all patients cystoscopically at stated intervals after this method, just as after removal by suprapubic operation. My practice has been to examine in three months, then after an interval of six months, and then once a year.

Recurrence of papilloma of the bladder, whether after operation or electro-cauterization, is not now the serious matter it was before the introduction by Beer of the high-frequency method. If the patient is fully impressed by the importance of frequent inspection of the bladder, and submits to it, the recurrent papilloma can be easily destroyed in its early stage.

The 33 cases of papilloma of the bladder in the accompanying table comprise all the cases suitable for treatment by the high-frequency cautery that have come under my care during the last two years (up to May, 1916).

In 14 of these (42.4 per cent) the growth was completely destroyed at one sitting, and the patients were either not confined to bed at all, or rested only for one day. When this is compared with the circumstances of an open operation, where convalescence will necessarily extend over at least four weeks, the great advantage, in suitable cases, of treatment by the high-frequency cautery over open operation will be recognized. In 1 case two sittings, in 3 cases three sittings, and in 1 case four sittings were required for the removal of the growth, in 5 cases there were five or more sittings. The remainder were still under treatment, some of them having only had one or two applications.

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In the cases where five or more sittings were required for the removal of the growths, one of the great disadvantages of the method becomes apparent, namely, the time expended in some cases. In these, however, the growths were very extensive, and in two of the most troublesome (*Cases 23 and 24*), open operations of the most thorough kind had been performed very recently, and had failed to prevent rapid recurrence. In one case where the treatment was very prolonged, the growths were small, sessile, and scattered, and the case was not a promising one for open operation, had this method been selected, moreover, the two rapid recurrences after complete removal in this case could not have been dealt with by repeated operations.

The great value of the method in cases of recurrent growth is well illustrated by *Case 29*, where five small papillomatous growths were discovered four months after a complete open operation, and were destroyed completely by the high-frequency cautery at one sitting.

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