A Clinical Lecture

ON

TUMOURS OF THE BLADDER.

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GENTLEMEN,—Tumours of the bladder may occur either as *primary* or *secondary* growths. The former alone are of practical importance to the surgeon and in the following remarks I shall deal exclusively with them.

Tumours of the bladder, like tumours in any other region of the body, may be classified most conveniently according to the tissue from which they have their origin or of which they are composed: (1) epithelial tumours; (2) connective tissue tumours; (3) dermoids; and (4) cysts. Those of the latter two groups are rarely found in the bladder and require merely passing notice. New growths of the first group are those most frequently encountered and they demand particular attention. Of these, the most important—as most common and most amenable to treatment—is the papilloma,

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

of which there are two typical forms: (1) villous papilloma and (2) fibro-papilloma.

Papillomata of the bladder have their origin apparently in an overgrowth of the normal mucous membrane and are analogous to the cutaneous warts. The type of papilloma most frequently met with is the pedunculated "villous papilloma" (Figs. 1, 2, 3, and 4) which consists of a fleshy mass, varying generally in size from that of a cherry to that of a walnut, attached to the bladder wall by means of a pedicle and covered partially or wholly by villous processes or papillæ, from which the tumour derives its designation. If we immerse a typical specimen of this kind in water immediately after removal and examine it we find that the pedicle terminates in an expansion named the "core" or "framework," which is clothed by villi projecting from its surface and giving the whole a shaggy, flocculent appearance of greyish-white colour. If we then lift it out of the water and examine it in air we find that the villous processes have collapsed and adhere, the tumour resembling a mass of wet grey velvet or a miniature deck-mop. Viewed through the cystoscope in the bladder before removal the villi, or fimbriæ when long, influenced by the artificial currents set up by the movements of the instrument, are seen to wave about in the fluid, the growth as a whole presenting a bright pink appearance, of rare beauty sometimes, due to the blood circulating in the villi being visible through the almost translucent structure. Occasionally hæmorrhagic spots, or even ulcers, may be seen, the result of contusions.

Directing attention now to the component parts of a papillomatous growth, we find that the pedicle may be either cylindrical or somewhat flattened. It varies in length, as a rule, from a quarter of an inch to one inch, but occasionally attains to several inches. It varies in thickness from that of a slender thread to that of a cedar lead-pencil, the very fine variety being rare. This pedicle is composed mainly of connective tissue, interspersed with which are found unstriated muscular and elastic fibres derived from the sub-mucosa, the surface being covered by epithelial cells similar to those found in the bladder. Vessels and nerves pass through its axis. The pedicle is attached to the mucous covering of the bladder alone, and when pulled on the latter is raised off the muscular coat in pyramidal fashion. There is no infiltration of the adjacent mucous membrane or sub-mucous tissue—a point of vital importance in distinguishing this growth from those of a malignant type.

The structure of the core, or body of the tumour, is similar to that of the pedicle, of which it is, indeed, merely an expansion. Frequently the framework is merely a prolongation of the pedicle, covered with tufts of villi; and occasionally there is little or no body, the tufts of villi springing directly from the end of the pedicle, the whole resembling a pollard tree. The body, again, may be lobulated, composed of several distinct, more or less rounded masses, each covered by short thick-set villi, the whole presenting a cauliflower-like appearance. Indeed, innumerable varieties of this tumour, as regards shape, number, and attachment of the villi, are found.

The villousities covering the surface of the growth vary much in length and shape. Some are so short as to be recognisable only by a hand lens. These short, thick, compactly set villi may give the tumour a velvety appearance. Other long and slender fimbriæ may reach a length of one or two inches and are more sparsely arranged. Between these extremes all varieties of villi are found. They may

spring from the tumour as simple thread-like cylinders or as miniature flattened blades of grass. Some bifurcate, others digitate, or they may branch and rebranch like a tree. Portions of the surface of the tumour may be devoid of villi, giving it a bald appearance in patches. Hæmorrhagic spots or ulcers may be present from traumatism, and deposits of phosphates may take place on its surface, particularly on, and in the vicinity of, the ulcers. Microscopically an individual villus is found to be composed of delicate connective tissue, covered by layers of columnar epithelial cells, and traversed by a capillary loop

of blood-vessel. Isolated fibres of unstriped muscle, continued from the core, are sometimes found entering the base of the villus for a short distance.

When a tumour is attached to the bladder wall by means of a pedicle it is termed "pedunculated," and this is the most common variety. It may, however, spring from the mucous membrane by a broad base, without the intervention of a pedicle, when it is termed "sessile." If the base or attachment of the tumour be contracted, forming a neck, the term "subsessile" is applied. Sometimes the simple villi spring directly from the mucous covering of the bladder, either in clumps or scattered broadcast over an extensive surface without the intervention of any body or core—a condition which may be described as "diffuse" papilloma. When the villi are arranged on ridges or crests of mucous membrane the term "coronoid" is sometimes employed.

Though papillomata may arise from any portion of the mucous membrane of the bladder, except, perhaps, the trigone, they are most frequently found in the vicinity of the ureteral openings. In my own practice I have found them most commonly attached to the bladder wall to the outside and in front of the ureteral orifices. Instances of benign papillomata growing solely from the trigone are extremely rare, if ever found. I have not met with an instance of this kind in my own practice. But springing from the mucous membrane close to the trigone the base of the tumour not infrequently encroaches by growth on that area. The exemption of the trigone from growths of this nature is attributed to the fact that the mucous membrane of this area is firmly bound down to the subjacent muscular coat without the intervention of any loose areolar tissue. Laxity of the mucous membrane seems to be essential to the development of these soft villous tumours. Papillomata spring occasionally, though rarely, from the inner orifice of the urethra.

Papillomata, whether sessile or pedunculated, vary in size from that of a pea to an enormous mass almost filling the bladder. The largest which I have removed was of the size of an orange and was attached to the outer edge of the left ureteral orifice by a pedicle an inch long and as thick as a goose-quill. This was in a patient sent by Dr. J. W. Erskine of Chelsea, who was present at the operation in June, 1897. The symptoms, which were not severe, had existed for only two years. On the other hand, a papilloma may be of extremely slow growth and, though small in size, may give rise to very grave symptoms. On June 20th, 1899, I removed a pedunculated papilloma of the size of a cherry (Fig. 3) from a patient, aged 36 years, sent by Dr. J. J. C. Constable of Kennington Park. This gentleman had suffered from hæmaturia for 18 years, and at the time of operation was extremely anæmic from constant loss of blood. There has been no recurrence and the patient is now in sound health.

Papillomatous tumours occur singly in the vast majority of cases. When multiple the number, as a rule, does not exceed three or four. Occasionally numerous growths are found scattered over the surface of the bladder. In cases of multiple growth there is generally a largish tumour with one or more subsidiary growths. It has been suggested—without any tangible proof, however—that the subsidiary growths are derived as seedlings from the main growth.

There are instances on record of spontaneous detachment of a pedunculated papilloma. This accident probably occurs through spasmodic contraction of the bladder on the tumour, thus rupturing the pedicle, or through twisting of the pedicle on itself, giving rise to strangulation and death of the tumour owing to the cutting off of the blood-supply. Papilloma is most frequently found between the ages of 25 and 50 years, though it may occur in childhood or in old age. Males are more frequently affected than females.

A pedunculated growth may from time to time be carried during the urinary flow against the neck of the bladder, or even into the prostatic portion of the urethra, and block the passage, thus giving rise at first to hypertrophy to overcome the resistance but eventually to atrophy and pouching of the walls of the bladder. Cystitis is not an infrequent sequela of the presence of a tumour in the bladder. A growth, whether pedunculated or sessile, growing close to, or from, the margins of a ureteral opening may block the canal and thus give rise to dilatation of the ureter with other backward pressure changes resulting in destruction of the corresponding kidney.

Papillomata are occasionally found devoid of elongated fimbriæ, consisting of more or less dense fleshy masses covered

by extremely short thick-set papillæ, giving the general contour of the tumour a more or less smooth, though sometimes lobulated, appearance. These are termed "fibro-papillomata." Structurally they are composed of the same elements that enter into the villous papillomata but more densely arranged. Tumours of this type are, as a rule, sessile, slower in their growth, and do not attain the large size of the fimbriated papillomata.

When a growth is recognised by the cystoscope to be covered by villi we must not at once come to the conclusion that it is necessarily of a benign type, for malignant tumours are sometimes clothed with villi and these growths may occur as more or less pedunculated tumours. It is characteristic of a benign growth that there is no hardness about its base or pedicle and that the mucous membrane in its vicinity is soft and devoid of infiltration. The existence of hardness of the base or infiltration in the adjacent mucous membrane at once arouses suspicions of malignancy.

Intermediate between the typically benign papillomata and malignant tumours comes a type known as "transitional." Tumours of this nature on first removal present all the appearances of simple growths, both macroscopic and microscopic, save that the ground-work is more dense and irregular, and the "presence in it of irregularly shaped cells which do not belong to normal tissue on the one hand, or to distinct new growths on the other" (Heneage Gibbs). Tumours of this type have a tendency to recur after removal, becoming more and more fleshy, with infiltration of the surrounding mucous membrane on each recurrence, the patient eventually dying from undoubted cancer. A typical case of this kind occurred in a lady, aged 54 years, sent to me by Mr. W. Armstrong of Buxton. The tumour (Fig. 5),

FIG. 5.

which was sessile and of the size of a large walnut, showed no signs of malignancy on first removal, but it recurred, and after being four times removed, together with the adjacent mucous membrane from the vicinity of the left ureteral opening, eventually recurred as carcinoma on the right side of the bladder, to which the patient succumbed.

Adenomata rarely if ever occur in the bladder, as might be expected, seeing that it is doubtful if true glands exist in its mucous membrane. In the few instances that have been placed on record by writers the tumours were found in the vicinity of the neck of the bladder. There is nothing in the descriptions of these cases to indicate that they were other than adenomata of the prostate, projecting into the bladder. In my recent practice of total extirpation of the prostate I have found that barnacle-like adenomatous outgrowths of the prostate may appear in the bladder at a considerable distance from that organ, connected therewith by long, slender, fibrous pedicles, or "runners," lying beneath the mucous membrane. These might easily be mistaken for adenomatous tumours of the bladder.

Epithelioma, or squamous-celled cancer, as a primary disease of the bladder is not uncommon, ranking next in frequency of occurrence after papilloma. It occurs in the latter half of life, being extremely rare before the age of 40 years.

It has its origin in the mucous membrane and may commence as a warty outgrowth, a simple fissure, or an irregular ulcer. In whatever form arising the disease advances rapidly, spreading over an extensive area of mucous membrane and invading the underlying tissues. Large, elevated, fungating masses and hard nodules soon project into the bladder, sloughs are thrown off, accompanied by foetid discharges, and life is rapidly destroyed through loss of blood, infection of the lymphatic system, as well as from the pain and constant distress due to frequency of micturition and perpetual straining, the bladder being unable to retain more than a small quantity of urine. The glands affected are the pelvic, retro-peritoneal, inguinal, and lumbar. Secondary deposits in other organs are, however, rare. As already stated, a cancer may have villi projecting from its surface; it is then termed a "villous carcinoma." In the later stages of the disease an epithelioma of the bladder may ulcerate into the bowel, a fistula being thus established and faeces passing through the urethra and urine by the rectum. Or it may appear in the groin, causing pressure on the nerves and vessels and giving rise to severe pain and oedema in the corresponding lower limb. It may make its way through the sacro-sciatic foramen and involve the sacral nerve.

Tumours of the connective-tissue type are of rare occurrence in the bladder.

1. *Fibroma*.—This tumour, though nearly allied in structure, must not be confounded with the fibro-papilloma already described. The latter has its origin in the mucous membrane, whereas the fibromata spring from the sub-mucosa or fibrous tissues in the muscular coat and have the mucous membrane simply stretched over, but not involved in, the growths. The fibromata are rarely pedunculated, being usually sessile, or subsessile, polypoid outgrowths, and they are usually single. They are almost invariably found in adults. As a rule, they spring from the base of the bladder, but the only instance of this tumour that I have met with in my practice sprang from the summit of the bladder near the orifice. It was of the size and shape of the adult thumb and hung down over the neck of the bladder, obstructing the urinary flow. Fibromata are composed of adult connective tissue, with a few elastic fibres and fusiform cells interspersed. They are smooth-surfaced and on section present a white, glistening appearance.

2. *Myxoma*.—The myxoma, closely allied to the fibroma, is the soft, gelatinous, mucous polypus, similar in structure to the nasal polypus except that the covering epithelium is squamous. It is, as a rule, composed of a soft, gelatinous, proteid substance, identical with that found in the umbilical cord; but some varieties are harder, containing a considerable admixture of normal fibrous tissue. Growths of this type occur only in young children and may be either sessile or pedunculated. They are generally multiple.

3. *Myomata*.—These are composed mainly of unstriped muscle fibres, interspersed with scanty fibrous tissue. They are of extremely rare occurrence. They have their origin in the muscular coat of the bladder and may project inwards, forming "intra-vesical" sessile or pedunculated growths, loosely covered by the mucous membrane. They may remain "interstitial," or project outwards from the surface of the bladder, covered by the peritoneum, forming "para-vesical" tumours. When growing inwards they rarely attain a large size and are easily enucleated. The largest intra-vesical growth of this kind on record, as far as I am aware, occurred in my practice. The patient and tumour were shown at a clinique in the Medical Graduates' College and Polyclinic on Jan. 15th, 1902. The details of the case have been already reported¹ and briefly are as follows.

A married female, aged 24 years, had suffered from hæmaturia, increased frequency of micturition, and stoppage of the flow of urine for four years, with a tumour gradually increasing in size and eventually projecting into the anterior portion of the vagina. When she first came under observation in October, 1901, the tumour was as large as a cricket ball. It projected into the vulva and was covered by the anterior wall of the vagina which was pushed down before it. With a finger in the vagina and a hand placed above the pubes the tumour could be rolled about a fixed point in the left half of the pelvis. The patient had to push it up from the vulva before micturition which sometimes required the catheter. Cystoscopy revealed a large, smooth, globular, sessile tumour of the bladder, with large veins coursing over it, springing from the trigone and left side of the base of

the bladder and in front of the left ureteral opening. On Oct. 30th, 1901, I opened the bladder suprapubically and snipped the mucous membrane over the tumour which was rapidly and easily enucleated. The patient made a rapid recovery, leaving St. Peter's Hospital within a month. She is now in excellent health, untroubled by any urinary symptom. The tumour weighed nine ounces and was found on microscopic examination to be a pure myoma.

4. *Sarcoma*.—This is the most common of the tumours of the connective-tissue type found in the bladder, but even this is rare in comparison with epithelial growths. It may occur at any age, arise in any part of the bladder, and is invariably sessile. It occurs as a smooth, dense, rapidly growing tumour, involving the entire thickness of the bladder wall. The round- and spindle-celled varieties are those most frequently found.

Other tumours of the connective-tissue type are of extreme rarity in the bladder.

SYMPTOMS AND DIAGNOSIS.

Hæmaturia is the most important, as it is almost invariably the earliest, symptom in all forms of tumour of the bladder. If a patient consults you for hæmaturia coming on spontaneously without apparent cause you should at once suspect the presence of a vesical growth, and if the hæmaturia be painless the growth will in all probability turn out to be benign. The hæmaturia is, as a rule, intermittent, the attacks lasting from one to several days and completely ceasing in the intervals. In the early history of the disease the intervals may be prolonged, weeks or even months elapsing before a recurrence of bleeding takes place, but as the disease progresses the attacks of hæmaturia increase in frequency and intensity. Eventually the urine may never be quite free from blood, though at times the bleeding will be more profuse than at others. The urine is not uniformly mixed with blood, as in hæmorrhage from the kidneys. During the act of micturition it will be noticed that the earlier portions of the urine will be clear and free from blood—at least, to the unaided eye—and that the stream gets gradually deeper in colour till eventually pure bright blood is passed. Occasionally the urine may be tinged with blood even at the commencement of micturition, but the tinge gradually deepens and some pure blood is invariably passed at the end. Clots are frequently present—dark and irregular masses contrasting with the worm-like clots found in connexion with renal hæmorrhage. The hæmaturia is generally independent of position and motion, occurring as frequently when the patient is sitting or lying down as when getting about, thus presenting a marked contrast with the bleeding attendant on stone, which is always worse when the patient takes exercise. Profuse hæmaturia is rare in connexion with stone, whereas with tumour it is the rule. The extent and frequency of the bleeding do not bear any proportion to the size of the tumour. A growth may attain a very large size before it is attended by hæmaturia and quite a small growth, as in the case of Fig. 3, may involve profuse and constant bleeding, endangering life. Soft growths, and particularly those clothed with villi, bleed more freely than the dense and bald varieties, and pedunculated more than sessile growths.

Increased frequency of micturition occurs sooner or later with all vesical growths, and once it sets in it never disappears till the tumour is removed. It is most marked in cases of growth situated near the neck of the bladder. Exceptionally it is the initial symptom and may exist for lengthened periods before hæmaturia supervenes. In the case of a lady, aged 53 years, whom I attended in consultation with Dr. W. H. Bourke of South Kensington, increased frequency of micturition (attended latterly by some scalding) had existed for two years, but there had never been any hæmaturia. The cystoscope at once revealed a pedunculated villous growth, of the size of a large strawberry, springing from near the right ureteral opening, which I successfully removed suprapubically. Two symptoms—viz., increased frequency and pain—are not uncommon in women who have passed middle life, and are, as a rule, due to pressure of the womb on the bladder. I was inclined to attribute the symptoms in this case to this cause, and it was only after Dr. Bourke had assured me that he had satisfied himself that this was not the case that I consented to examine the patient cystoscopically. This and other cases in my practice have taught me a lesson—viz., that when these symptoms are due to no apparent cause the cystoscope should be employed, even when hæmaturia is absent. The hæmaturia

¹ Journal of the British Gynæcological Society, vol. i., 1902.

and frequency of micturition due to non-malignant growths are in the earlier stages of the disease, as a rule, unattended by pain; but in malignant growths pain is present almost from the beginning.

Pain is nearly always present in the later stages of all kinds of tumour, due to a variety of causes, such as cystitis, passage of clots, blockage of the urethra by the growth, or pressure of the growth as it enlarges on the nerves. Sessile and infiltrating growths are more painful than pedunculated ones. The pain will, as a rule, be referred to the perineum, or as shooting along the whole urethra, in contrast with the pain of stone which is referred to the end of the penis and that of prostatic disease which is usually felt suprapubically.

Retention of urine, partial as a rule but occasionally complete, may occur, due to clots, fragments of tumour tissue, or even a pendulous growth itself blocking the urethra.

With these symptoms we may find detached *shreds of tumour tissue* in the urine, microscopic examination of which may give a clue to its nature, always bearing in mind that benign villousities may grow on a malignant base.

Pus in the urine will be present when cystitis occurs. This is rare in benign growths, particularly in the earlier stages, unless from septic instrumentation. It frequently occurs early in malignant growths and is always present in their later stages as a terribly painful and distressing complication.

Not infrequently the inflammation from cystitis extends along the ureters to the kidneys, giving rise to pyelitis, nephritis, and suppuration of the kidneys. Blockage of a ureter by the tumour may give rise to hydronephrosis; blockage of both ureters may cause anuria and uræmic symptoms. Rectal examination in the male and vaginal in the female will aid us in forming a diagnosis, but only in cases of malignant growths in which the base of the bladder may be felt nodulated and unyielding from infiltration of its walls, or in the case of large fibrous or myomatous growths arising in this position. A papillomatous benign growth, whether sessile or pedunculated, will not be felt per rectum. When the tumour attains a large size, whether malignant, fibrous, or myomatous, it may be felt bimanually by placing one hand above the pubes and a finger of the other hand in the rectum or vagina.

With the presence of the symptoms described a sound will probably be employed to ascertain if a stone be present in the bladder. No definite information as to the presence of a growth can be obtained by this means, though a sensation as of the existence of an undefined soft, or even tough, mass in the bladder, and limitations of the movements of the instrument, may lead us to suspect the presence of a tumour.

Washing out the bladder by means of an evacuator and catheter and the introduction of a lithotrite with a view to detaching and bringing away portions of the tumour for examination were formerly employed; but such methods have now been abandoned since the introduction of the electric cystoscope, which provides us with a scientific and accurate means of arriving at a definite diagnosis as to the presence of a tumour as well as to its size, physical characters, position, and form of attachment to the bladder wall, as also to a fairly accurate forecast as to its nature.

CYSTOSCOPY.

Leiter's cystoscope (Fig. 6), which is the instrument now almost universally employed for illumination of the bladder, consists of a metal tube, bent near the end at an obtuse angle, resembling somewhat a bladder sound in shape. The bent portion, or beak, consists of a cylindrical cap which can be screwed on and off the shaft at the elbow of the instrument and is furnished with an oval rock-crystal window (E) on the upper or concave aspect. Encased in this metal cap and situated opposite the window is a miniature electric lamp connected with the end of the shaft, through which, inside the metal tube, run insulated wires to the connecting screws (C, C'). By the detachable nature of the beak the lamp, when defective, can be replaced by a new one in a few seconds. The arrangement as a whole forms a water-tight compartment for the lamp which illuminates the bladder through the glass window without coming in contact with the fluid in which it must necessarily burn, in order to protect the bladder walls from injury. In the shaft, just above the elbow, is inserted a glass prism (F), by which the rays of light from the bladder are refracted along a

telescope inserted in the shaft and capable of being removed for the purpose of being cleaned or for use in another instrument. The rim of the ocular end (B) through which the observer looks is covered by a thin plate of ebonite to prevent shock in case of contact of the eyebrows with the cystoscope. A knob (D) on the edge of the ocular end indicates the aspect of the bladder towards which the beak and prism are directed from

FIG. 6.

time to time. By means of a screw (D) the circuit can be closed and opened. This screw, together with the connecting screws, are carried on a rotatory plate, or swivel, so that with the finger and thumb of one hand placed on the cylinder (A), the beak of the instrument can be revolved so as to bring any part of the bladder into view, while the connecting cords remain in position, being held downwards by the other hand.

The standard cystoscope employed for adult males is in size 22 of the French scale: and with this a surface of three or four inches in diameter can be seen at one time. Cystoscopes are specially made larger, up to 40 of the French scale, for employment in females, giving a more brilliant illumination and bringing a larger surface into view at the same time. They are also constructed smaller for children, but the diminution in thickness of the instrument involves a rapid narrowing of the field of vision, as well as a darkening of the picture presented to the eye. Formerly, a second instrument was employed, with the window on the under aspect of the beak and a simple pane of glass in the convexity of the elbow, for the purpose of viewing the base of the bladder, and particularly the trigone; but this is now little used, as since the introduction of the swivel arrangement referred to all portions of the bladder can be brought into view by the instrument already described.

In cystoscopy the patient is most conveniently examined in the supine position on an ordinary operating-table, with his buttocks raised on a hard cushion and his legs slightly separated. The lithotomy position may also be employed and is, perhaps, best for females. As a rule a male requires an anæsthetic for careful and thorough examination, though sometimes this may be dispensed with, the urethra being locally anæsthetised by means of cocaine. An

anæsthetic is rarely required for females who, as a rule, feel no pain or inconvenience from the examination.

A clear fluid medium is, of course, necessary to obtain a satisfactory view of the bladder and its contents. The best medium is the patient's urine, provided this be sufficiently clear; and this can frequently be attained by keeping the patient in bed for a few days previously to examination and directing him to retain his urine for three or four hours beforehand if possible. But if the urine be clouded with blood, pus, or muco-pus it will be necessary to wash out the bladder through a soft catheter by means of warm boric lotion or boiled water. This should be done very slowly and gently so as not to excite fresh bleeding. When the fluid flows quite clear from six to eight ounces should be introduced and left in the bladder. Glycerine should be employed for lubricating the catheter instead of oily substances which would adhere to the windows of the cystoscope and obscure the view. Some diseased bladders resent the introduction of more than three or four ounces of fluid even under deep anæsthesia; but even this quantity may suffice to give us important information.

The cystoscope should be examined beforehand to ascertain that it is in working order and that the illumination is of the proper strength. It is rendered aseptic by thorough washing with soap and warm water and immersion in warm carbolic lotion. It is then smeared with glycerine and introduced like an ordinary sound, very slowly and gently, to avoid even the slightest bleeding if possible, and pushed as far into the bladder as the rim will permit. Care should be taken that the light is well switched off before introduction of the cystoscope. The observer's eye is now applied to the ocular end and the light is switched on, when the bladder will suddenly appear illuminated. The beak being directed upwards, the first portion of the bladder that comes into view is the apex, and if a growth has its origin in this position, which is rare, it will be observed at once. If the medium be quite translucent the surface of the bladder will be seen as clearly as if it were exposed to broad daylight, corrugated more or less according to the quantity of fluid introduced, greyish-white, with the minute blood-vessels visible, the general appearance recalling that of the retina as seen through the ophthalmoscope.

A methodical survey of the bladder is now made. It is best in the first instance to bring the ureteral opening on one side into view and then that on the other side—small slit-like openings, placed obliquely, directed downwards and inwards, at the extremities of the inter-ureteral bar. These objects afford landmarks from which we take our bearings in surveying the bladder. In the vast majority of instances tumours if present will be found in their vicinity. The cystoscope should then be withdrawn till the prism approaches the neck of the bladder, the collar of which will be recognised by its dark crimson colour and smooth rounded edge, and a complete revolution of the beak slowly made in this position. Similarly the fundus is examined by pushing the cystoscope in as far as the rim will permit and revolving it in this position. The beak must not be allowed to remain in contact with the bladder wall at one point for more than a few seconds, for fear of scorching the mucous membrane, but kept constantly on the move, the light being periodically switched off for a few seconds to cool the lamp. Before withdrawal of the cystoscope from the bladder the light should be switched off for half a minute to avoid burning the urethra. To make assurance doubly sure in this respect I always detach the connecting cords from the instrument before its withdrawal. The fluid is then drawn off by a catheter, when the examination is completed.

It is impossible in a lecture of this kind to teach all the details necessary for a successful cystoscopic examination and a correct appreciation of the appearances observed. These can only be acquired by practice and are best learnt under the guidance of an experienced cystoscopist. It must be remembered that objects are observed reversed in position, and greatly magnified when close to the prism. The current is supplied from a small battery, an accumulator, or from the main through the medium of a transformer.

Should there be bleeding during the examination we may be unable to obtain a clear view, or merely for a short time, so that it may be necessary to withdraw the cystoscope and to wash out the bladder once more till the fluid runs clear. Should the bleeding still continue it will be necessary to postpone the examination to a future date, the patient being kept quiet in bed in the meantime and the re-examination undertaken when bleeding has quite ceased.

Apart from the diagnosis of tumours of the bladder, which may be regarded as the chief function of the cystoscope, it may be well to state here that this instrument is now employed in clearing up the nature of many other obscure diseases of the urinary track—viz., (1) hypertrophy of the prostate, to ascertain the extent and nature of the out-growth in the bladder; (2) encysted calculus of the bladder; (3) tuberculosis of the bladder; (4) chronic ulcer of the bladder; (5) foreign bodies in the bladder; (6) hæmorrhage or discharge of pus from one or both ureters in various diseases of the kidneys; (7) stone impacted in the lower end of the ureter in its descent from the kidney; and (8) to ascertain the conformation of the ureteral openings in certain diseases of the kidneys, &c.

TREATMENT.

Though the hæmorrhage, pain, and other symptoms attendant on tumours of the bladder may be temporarily held in check by astringents and narcotics, administered internally or locally applied, the only line of treatment that offers a prospect of permanent relief consists in complete removal of the growth. Following the lead of Sir Henry Thompson, for some years after 1880 surgeons generally accomplished this by means of perineal cystotomy. I myself have removed several tumours through this route with considerable success. But this method has now for several years been practically abandoned in favour of operation through the suprapubic route, which possesses the advantages that not only can a more thorough survey of the bladder be made in this way by the finger, but by means of an electric forehead light and appliances that will presently be described the interior of this viscus and its contents can be brought into view, so that the tumour can be removed with greater precision than by the perineal route.

Suprapubic cystotomy.—The patient, previously prepared by shaving the pubes and applying an antiseptic compress over the pubes and hypogastrium, is placed on his back on the operating-table. The Trendelenburg position advocated by some surgeons is quite unnecessary. A rubber catheter is introduced, the urine is drawn off, and the bladder is thoroughly washed out with warm boric lotion by means of a six- or eight-ounce syringe. Petersen's bag for inflating the rectum previously to distending the bladder with a view to raising the peritoneum out of the way was formerly much in vogue. I constantly employed it for some years after its introduction, but have now entirely abandoned this adjunct to the operation as unnecessary for the purpose for which it was introduced and attended by inconvenience and considerable danger. It distorts the bladder out of shape, is liable to lacerate the mucous membrane of the bowel, and cases are on record where rupture of the bladder attended its employment. The bladder is simply distended with from 10 to 14 ounces of warm boric lotion and the catheter is left *in situ* with a clip forceps applied to prevent the lotion flowing out.

An incision of from two to three inches in length, according to the stoutness of the patient, is now made in the median line of the abdominal wall terminating at the symphysis pubis. This incision is carried at once through the skin and subcutaneous tissues as far as the muscles. Any bleeding vessels are clamped and the incision is continued either between the recti muscles or through one of them till the prevesical fat comes into view. The point of the forefinger is then introduced through the wound and passed down close behind the symphysis, the prevesical fat is scraped through by the finger-nail till the bladder is reached, and is drawn upwards off the bladder for the whole length of the wound—the peritoneum if extending low down being pushed up before it. As a rule, the peritoneum is not seen, being covered by the fat.

The bladder will now have come into view, presenting a greyish glistening appearance, with purple, gorged, tortuous veins coursing in its wall and visible on its surface. The scalpel is at once plunged through the bladder wall in the middle line, with its edge directed downwards towards the symphysis, and an incision an inch or one and a half inches long is made in this direction. Neither a sharp hook nor sutures inserted in the bladder, to hold it up in position, is necessary; but if the patient be stout retractors may be required to separate the edges of the wound in order to bring the bladder into view before incising it.

The knife is now withdrawn and laid aside and as the fluid rushes out the forefinger is introduced into the bladder, plugging the opening. If a tumour of considerable size be present it will be felt at once projecting into the fluid in the

distended bladder. The fluid is allowed to trickle away slowly by the catheter and the finger makes a methodical survey of the bladder, ascertaining the size, consistency, position, and mode of attachment of the growth, many of which particulars will have previously been recognised by the cystoscope.

Removal of the tumour.—A suitable tumour forceps (Figs. 7, 8, 9, and 10) is now introduced beside the finger, but before

FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

the growth can be grasped flush with the mucous membrane of the bladder and removed partly by biting it away and partly by torsion. If the sessile growth be a large one it will have to be removed piecemeal, the forceps being introduced over and over again, the bladder being kept distended by an assistant throughout the manipulations; otherwise there would be danger of the rugose folds of the bladder getting nipped between the jaws of the forceps and thus injured.

When the tumour has been excised as far as possible in the manner indicated an ordinary glass Fergusson's vaginal speculum is introduced—the largest size that will readily pass through the incision in the bladder being employed—and directed on to the site of attachment of the growth. The lotion is allowed to flow away and any remaining fluid is mopped up by sponges introduced on holders through the speculum. An electric forehead lamp is employed to illuminate the bladder through the speculum. The distal end of the speculum being pressed firmly against the site of attachment of the growth and the fluid being thoroughly mopped up by sponges, the site of the growth is brought clearly into view by means of the electric forehead lamp. Any shreds of growth or nodules left behind will be observed in this manner and can be removed by forceps introduced through the speculum. The electric, or Paquelin's, cautery can also be introduced through the speculum to burn away the roots of the growth or to arrest hæmorrhage. Tincture of perchloride of iron can also be introduced on a sponge for the latter purpose. If the growth be sessile, and particularly if there be any doubt as to infiltration of the adjacent mucous membrane, the tumour may be grasped boldly by forceps and brought well up into the wound. This will be facilitated by an assistant placing his finger in the rectum and pushing the base of the bladder up towards the suprapubic wound. The mucous membrane of the bladder is incised all round the base of the growth but quite clear of it, and this together with the tumour is removed by broad serrated or cutting forceps (Figs. 7 and 10). It is unnecessary, and, indeed, inadvisable, to attempt to bring the edges of the mucous membrane together over the site of the tumour by sutures. It is difficult to introduce sutures at the base of the bladder. It is inadvisable to employ other than catgut sutures and they are absorbed too rapidly to be of any practical use; silk sutures should never be used, as they form nuclei for the formation of calculi. The tissues are so crushed by the forceps in the removal of the growth that it is doubtful if direct union could take place in any case. Healing of the wound takes place by granulation.

The bladder is now thoroughly irrigated by warm boric lotion through the catheter and out by the suprapubic wound till all clots are removed and the fluid flows away clear. A drainage-tube with two eyes cut in it on opposite sides at distances of about half an inch and one inch respectively from the end is introduced by means of forceps, so as to reach the base of the bladder. This should be sufficiently thick to fill the wound in the bladder, so that the whole of the urine may flow by this route and thus avoid its trickling beside the tube and entering the prevesical space. No object is gained by employing a narrow tube, as in practice it is found that the suprapubic wound heals as rapidly when a large tube is used; and a narrow tube has the disadvantage of allowing the urine to flow beside it, thus infecting the loose areolar tissue in the prevesical space, which in consequence would slough away in gangrenous masses, and of preventing clots from passing out of the bladder.

The abdominal wound is now brought together round the tube by means of three or four silkworm-gut sutures, which are passed through skin and muscle, and, finally, the drainage-tube is fixed in position by means of a superficial suture. Buried sutures should not be employed in suprapubic cystotomy, as they almost invariably get infected by urine and lead to suppuration. I never entirely close the bladder wound, invariably introducing a drainage-tube, but when for any reason the incision in the bladder is extensive I bring the wound partly together by catgut before introducing the tube. The drainage-tube is cut short half an inch from the superficial wound, cyanised gauze, well wrung out of boric lotion, is applied, and the front and sides of the abdomen are covered by large pads of cotton- or wool-wool. The dressings are changed every three or four hours as they become saturated with urine. I have tried appliances of all kinds for conducting the urine directly from the bladder to a receptacle beneath the bed, but have found

doing so the bladder is distended with lotion through the catheter, which should be withdrawn till its end just reaches the inner orifice of the urethra, so as to be out of the way of the forceps. Keeping the point of the finger in contact with the tumour, the blades of the forceps are opened and the pedicle of the growth—if it be pedunculated—is grasped as near to the bladder wall as possible and the growth is twisted off. If the tumour be sessile forceps with broad serrated jaws (Fig. 7) will be necessary, by which

them one and all unsatisfactory, and I now employ only the simple method above described. The skin sometimes has a tendency to get irritated by the saturated dressings; at the earliest indication of this it should be protected by rubbing in lanolin or oxide of zinc ointment at each dressing after thoroughly washing and drying the surface. The drainage-tube is removed in three or four days, when plastic lymph will have been thrown out along its track and the tissues thus protected from infiltration of urine. The bladder should be irrigated through the drainage-tube daily, or more frequently if the tube gets blocked by clots, by warm boric lotion. After the tube is removed a soft catheter is introduced daily and the bladder is irrigated through this and out by the fistula. The sutures are removed on the seventh or eighth day, but should the temperature rise and the wound appear "angry" one or more sutures should at once be removed to give vent to pent-up fluids in the prevesical space. The fistula takes from a fortnight to a month to close as a rule.

When a malignant growth is so extensive that no attempt at its removal is desirable or practicable it may be necessary to open the bladder and to establish permanent drainage for the purpose of ameliorating the terrible pain and strangury that exist, particularly when general infective cystitis sets in, and so to allow the patient to pass away in comparative comfort. The perineal or suprapubic route is chosen, according to the nature and position of the growth, so as to afford free drainage and at the same time to avoid pressure of the tube on the growth.

Resection of that portion of the bladder wall involved in a malignant growth, and even of the entire viscus, has been undertaken—the ureters in the latter case being implanted in the rectum in the male or in the vagina in the female—hitherto, however, with but poor success. When the growth is confined to the apex of the bladder, where the resection can be performed extra-peritoneally by stripping off the peritoneum over an extensive area, I consider that the operation is not only justifiable but advisable. Unfortunately, however, these growths are rarely confined to this region. When involving the base of the bladder I consider any attempt at resection futile, and that if the patient does not succumb immediately to the shock and hæmorrhage attending the operation life is materially shortened thereby.

ON REFLEX CONVULSIONS IN GROWING BOYS AND GIRLS.

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THE convulsive attacks so often seen in rickety or highly neurotic infants as a result of teething or other form of reflex irritation are familiar to everyone, but it is not so well known that similar nervous seizures, due also to pure reflex worry, may be found in children beyond the period of infancy and even as late as the eleventh or twelfth year. The children thus affected are usually members of families which show distinct neurotic tendencies although, perhaps, they may be free from the graver signs of nervous instability. The children themselves are highly strung, excitable, and easily moved to tears, but by no means necessarily spiritless or timid. They may have suffered from convulsions during infancy, but often their special nervous susceptibility is of later origin and seems to be quite independent of the rickety state in early childhood.

Occasional convulsive attacks in a child who has passed the period of infancy, and especially in one who is of an age to take regular lessons and to play at boisterous games, are often classed at once as "epileptic" and treated accordingly, but before labeling such a case as one of epilepsy it is wise to consider carefully all the circumstances of the attack with a view to discover some exciting cause to which the seizures may be referred. On inquiry we can often detect premonitory symptoms common to all the attacks and find that on each occasion the patient for some hours or days before the seizure had shown very obvious signs of ill-health. The seat of trouble is usually the alimentary canal and the

irritation appears to be excited by the presence in the stomach and bowels of undigested and fermenting food. The children suffer almost invariably from languid circulation and cold feet. In consequence they have but little resisting power against the evil effects of damp and cold and sudden changes of temperature. When exposed to these influences they are liable to contract a more or less severe gastric or gastro-intestinal catarrh and the digestive turmoil thus engendered is often sufficient to throw the unstable nervous system off its balance.

As a rule the nervous attacks are separated by long intervals during which the health, although not, perhaps, quite satisfactory, for the nutrition is rarely good, yet presents no unusual features which seem to call for medical notice. In most cases they are single convulsive seizures which occur once and are not repeated in the same bout of illness; but sometimes they fall into groups or batches, the child having two or three in the 24 hours for several consecutive days. In other cases, again, the convulsive seizures are repeated frequently over a period of weeks. They then cease for a time to return in the same way after a longer or shorter interval. In the common case where the fits whenever they occur are preceded or accompanied by gastro-intestinal derangement the inference that there must be some connexion between the digestive trouble and the nervous commotion is obvious. The isolated attacks are probably purely reflex, as in the case of a teething fit; but when the seizures are repeated frequently day after day for weeks together the mechanism is probably less simple. The urine at these times is always very acid and I have thought that the absorption of acid formed in large quantity in the alimentary canal as a result of fermentation of food might tend to keep up the irritation of the nervous system or that the same result might be brought about by microbic infection from the bowel.

The special feature of these attacks lies in the fact that they invariably coincide either with a digestive disturbance or with some other form of local irritant and cease at once when the local condition is relieved. To produce its effect the local irritant need not be violent, but if mild its action must be sustained; indeed, the continued working of a mild irritant seems to produce a more striking effect than that of a more powerful stimulus which operates only for a short time. It would appear as if the endurance of the nervous system was gradually weakened more and more until the breaking point was reached and the fit occurred. This result is arrived at more quickly when the stimulus acts upon a system already in a state of disquiet. This is well seen in the case of adenoid growths in the naso-pharynx. Children who suffer from these vegetations often show symptoms of nervous unrest, and the addition of a post-nasal catarrh may be enough to determine the onset of convulsions. The irritation of hard scybalous masses acting upon a mucous membrane already in a state of catarrh may have the same effect; and even the strain upon the eye set up by hypermetropia and astigmatism will sometimes, I have reason to believe, under favourable conditions prove a cause of convulsive fits in neurotic subjects. The irritation of worms in the alimentary canal has been often said to be a cause of convulsions, but in my experience this consequence of parasitic irritation is rarely seen. The nervous breakdown is said to be more likely to occur in the case of lumbrici than in that of ascarides, but when it is found I am disposed to attribute the commotion less to the creatures themselves than to the gastro-intestinal disturbance which is always associated with them and by means of which they breed and develop. In all these cases the nervous seizure no doubt is as purely reflex as are the fits which arise from similar causes in susceptible infants, for such disorderly response to reflex stimuli may long outlast the period of babyhood and the rickety state. We may find it in school-boys and schoolgirls and even in young adults, for there can, I think, be little doubt that many of the so-called "hysterical" attacks in young unmarried women are of this nature. In the common case where the fits are the outcome of a gastro-intestinal disturbance the account we generally get is that the child every few months has an attack of illness in which he lies about looking dull and listless, is perhaps feverish, loses his appetite, and may complain of nausea or try to vomit. The bowels are disordered—loose or constipated—and the tongue is thickly furred. In the midst of these signs of digestive derangement the child is suddenly taken with a mild fit; he loses consciousness and either twitches or lies with his body stiff in a tonic spasm.