These facts having been obtained, there remains for investigation the response to tests of scholastic and general intelligence.

The Binet-Simon tests as commonly used are certainly of great assistance in defining the degree of intelligence when these tests are faithfully and intelligently carried out—otherwise they may be most misleading. The scholastic standard set in the associated tests commonly used is, on the whole, I think, high. There is no special difficulty in carrying out the tests, but the value of their results depends on strict adherence to instructions. In fact, there is a right way and a wrong way in which to carry them out, and they are worse than useless unless carried out in the right way.

As regards guidance in the care of borderline children, the doctor naturally advises about physical treatment. He must also act as guide in home and school management, and make clear to parents the methods peculiarly suitable for the child. Is there call for restraint or stimulation, exercise or rest? Is it encouragement—is it punishment? If the latter, what is the place of corporal punishment? It is common for children with an inconspicuous physical ailment or defect to be "naughty," and certainly corporal punishment is illogical and bad treatment for them. For most borderline mental children corporal punishment is likewise bad, but I cannot agree that there is no place for such treatment.

The advances of modern psychology and the probings and criticisms into so-called mechanistic physiology in relation to mental processes have introduced into the life of the child an intensified atmosphere of psychical attention which is not only common among the educated classes but is developing rapidly in the form of schemes—child guidance, mental hygiene, social welfare—for the benefit of the less well-to-do.

In the case of the wealthier brother, parent, school-

master, and doctor usually together decide the course of events, and it is well that the doctor guide the school-master by information regarding the make-up of the child if the child requires special attention. For the poorer brother it is no less necessary that the doctor should guide the ship of health—bodily and mental—but for this child, with possibly more stormy seas to sail, there is at the same time more tendency to divided command.

The difficult child, the "maladjusted" child, the conduct case, may be a physically and mentally normal child, likewise so may be the dull and backward child. But many of all types are not. It is necessary in all cases where difficulty or doubt as to conduct or mentality arises that both the physical and mental capacity of the child be determined, and that full inquiry be made into all circumstances of the environment, material and mental. For this latter work, when done by child guidance clinics, psychologists and psychiatric social workers are essential, and team work is invaluable.

Two important points have, however, to be remembered. All children—and particularly borderline children—can have too much attention, can have their paths made too clear for their own good. Whether these children require to be dealt with by team work, or only the care of an individual, the medical man is the only suitable person to control the case.

With the diffusion of superficial medical information, however, there is a tendency for both physical and mental borderline children to be dealt with in association with very tempered medical control, and to take his rightful place in guidance the young practitioner must be fitted to aid both puericulture and pedagogy by defining indications for each borderline case. For the young graduate to carry out this work efficiently he must be fully and widely trained in the functions of normal childhood and in the beginnings of childish disease and disorder.

PAPILLOMA OF THE BLADDER.*

BY

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THE name papilloma indicates a tumour made up of hypertrophied papillae, and is a generic term applied to any of the warty growths of the body. A vesical papilloma is, however, a unique tumour, having no counterpart in human pathology outside the urinary tract, and one about which the most divergent views are expressed by men of standing in urology, a fact which I will illustrate as I proceed. Two problems invite brief preliminary discussion.

1. Do all papillomata if left to themselves eventually undergo malignant transformation?

It is a prevailing opinion that whilst many papillomata are definitely malignant in the earlier phases all the so-called benign papillomata are to be regarded as pre-malignant tumours, and if left untreated they will in course of time undergo malignant degeneration and destroy life, a view which was first advanced by Civiale, the French urologist. Statements to this effect occur without discussion in many leading textbooks, and the assumption forms a working hypothesis to which, I think rightly, we all conform, giving an allegiance which in practice is desirable because it produces a degree of vigilance and solicitude which would not otherwise be attained, and which helps to safeguard many patients in whom recurrence does actually occur. It is a view, however, which is not by any means universally accepted. Nitze himself, on an experience of 177 of these tumours, was emphatic in his view that most papillomata are actually benign, and considered that by christening them "Zottenkrebs" (tufted cancer) Rokitsky had caused much confusion. Again, Syring in 1911, during a careful study of this subject, found

astonishingly little evidence in support of the hypothesis of metaplasia. For the present the question remains an open one, but recent literature tends to support the views of those earlier writers who regarded all papillomata as definitely malignant. It is hard, however, to agree entirely with this view, for many cases are on record running for ten years or more—in my own series there are three—and cases are reported by Fenwick and Geraghty having histories extending over twenty years and ultimately ending fatally from carcinoma. The long history in such cases appears to me definitely to preclude malignancy in the earlier period, whilst, on the other hand, their termination suggests that even very benign tumours will eventually take on malignancy.

2. How shall the nature of the growth be decided?

The problem of differentiating a simple from a malignant papilloma, or of deciding at what stage a simple papilloma has taken on malignancy, has baffled both clinicians and pathologists. It is remarkable that after all these years the criteria of malignancy are still uncertain. There is much divergence of view in the copious literature regarding papillomata as to whether they shall be judged by their clinical or by their pathological features. At the outset I would invite your consideration of the desirability of attempting a pathological diagnosis. The uncertainty of the pathological opinion regarding these tumours is almost a byword, and different pathologists have not infrequently reported differently on the same section. It has happened, in the experience of many surgeons that a tumour has been reported as malignant and its recurrence as simple; or that a tumour reported as simple has destroyed life by metastasis; or again, that of one reported malignant a clinical cure has been achieved. Further, a tumour regarded by the pathologist as simple has recurred in the suprapubic scar as a malignant growth and has destroyed life.

It is not uncommon for two papillomata to be encountered in the same bladder, of which one is apparently benign and the other malignant. Moreover, it is stated that malignancy may be observed in one part of a tumour

* Read in opening a discussion in the Section of Surgery at the Annual Meeting of the British Medical Association held in Manchester, July, 1929.

of which the remainder is apparently benign. In a viscous seen comparatively recently a large area of the base was infiltrated by a hard scirrhous mass, whilst on the lateral wall close to the exit was a villous covered tumour the size of a cherry of quite different macroscopical appearance, which on section proved to be a malignant papilloma. Such mixed growths are not very uncommon, and Fenwick¹ believed that "certain epitheliomata of the bladder are able so to irritate the surrounding healthy vesical surface that . . . benign papillomata spring up." An alternative explanation would be that a portion of a papilloma had undergone malignant degeneration which was not shared by the remainder of the growth. These features afford a convenient explanation when pathological reports and clinical course do not correspond, but emphasize the importance of serial sections of these tumours. They illustrate the occasionally peculiar behaviour of the neoplasm under discussion, and, I hope, provide some excuse when we are decoyed into error by a papilloma's idiosyncrasies.

Moreover, there is disagreement regarding whether the pathological material shall be acquired from the intravesical prominence or from the tumour's base. Each site has its advocates. Thus Burger,² Beer,³ Young and Davis,⁴ and others recommend the superficies, whilst Geraghty⁵ states that "the base of a papilloma may show no signs of infiltration and yet the tumour may be distinctly malignant in its body and periphery." Later he agrees that "probably in no other tumour have so many mistakes been made by pathologists." In another communication, however, the same writer⁶ states that "in the vast majority of cases there was not sufficient evidence to indicate whether a tumour would respond to fulguration." Other writers (Ziegler,⁷ Orth,⁸ etc.) who are in favour of pathological investigation advise that the base be examined, and many indeed deny that any opinion can be formed from an examination of the intravesical prominence.

Quite apart from the question of whether microscopical examination of the tumour is worth while it must be acknowledged that there are practical objections which concern the methods of obtaining such pathological material. If it is decided to examine the superficies of the growth this will be acquired by the cystoscopic rongeur. But gentleness is fundamental in dealing with papillomata because of their great tendency to disseminate, and though the danger may to some extent be mitigated by immediate lavage with fluids intended to destroy grafts I have always held that the use of the cystoscopic rongeur violates first principles. I am disposed to think that the microscopy of the superficies of a bladder tumour is valuable, but greatly doubt the wisdom of practising it. If, on the other hand, the base is selected for microscopy it can only be obtained by open operation, and this is unfortunate, for the excision of the growth must then be completed at the time of this operation, and the uncertainty with regard to the diagnosis may lead to lack of boldness in removal.

These practical difficulties and the demonstrated uncertainty of the pathological diagnosis have led me to rely solely on clinical, which in fact, means cystoscopic, data for my diagnosis. Moreover, in my practice growths which are judged to be simple are treated by perurethral diathermy, and as the pathological material is thus destroyed, it is but rarely that the opportunity occurs for the microscopical examination of early benign papillomatous tissue. Only those cases which are submitted to open operation because they are regarded as carcinomatous supply pathological matter.

CYSTOSCOPIC DIAGNOSIS.

"In the diagnosis of bladder tumours cystoscopy celebrates its greatest triumph," said Nitze,⁹ the originator of modern cystoscopy. Written by the one who first possessed means of looking into the interior of the living bladder these words disclose an explorer's zeal on first experiencing the wonders of a new world. Since his day, through reiteration, such expressions have lost their early freshness and have even grown trite; yet I suppose that each of us has experienced some like emotion on first discovering a papilloma and realizing the scope and value of cystoscopy in the diagnosis and treatment of bladder growths. For cystoscopy

is our single yet sufficient approach to a knowledge of these structures. Through it we determine the presence, the position, the shape, size, variety, and nature of the neoplasm, whether it is single or multiple, and we furthermore decide what treatment is appropriate.

Composed of clumps of dainty mobile villi, a shade darker in colour than the vesical mucosa, a benign papilloma when still small is an elegant object, whose attractive appearance would seem to preclude its eventually malign propensities. The longer and more delicate its villi the more benign the growth. The less these features are in evidence the more it is suspect. In rare instances long fragile streamers float in the bladder fluid like seaweed in a rock pool. As the papilloma grows, however, this mobility and elegance recede, the villi becoming more stunted and swollen, their epithelium getting more granular and losing its lustre. Many growths, indeed, when quite small show this coarser exterior, and must already be regarded with misgiving. Finally, surface necrosis appears, a feature which is indicative of malignancy, though when sepsis is present, as so often happens, it requires some acumen to differentiate between ulceration and a film of muco-pus adhering to the villi.

The surface appearance of a papilloma is related to its microscopic features. The villi of a benign growth are clothed with an epithelium which in arrangement imitates the transitional epithelium of the bladder quite closely. It therefore has a colour similar to that of the bladder wall, and reflects light well. In the less benign varieties the layers are more numerous and therefore thicker, which accounts for their coarser and paler appearance. They are also less evenly arranged and stain less uniformly, whilst the epithelium of adjacent villi coalesces—a fact which is responsible, in some degree at least, for the apparent shortening and for the stunted appearance of their villi.

The appearance and characteristics of the pedicle should supply strong evidence with regard to the presence or absence of malignancy, but this evidence is more often than not denied to us because the pedicle is hidden beneath the mass of the papilloma. When the pedicle is exceptionally long it may remain uncovered. In early growths it is sometimes visible before the villi have developed, but as a rule one must judge of its development by deduction, noting whether the contour of the growth's rounded lower margin suggests a high or a low origin for its inferior branches.

After the earliest stages development chiefly concerns the main body of the tumour. The pedicle, however, gets thicker, and in due course may overtake the superstructure in breadth. I have often diagnosed a stiffening of the pedicle through employing a manoeuvre which Jocelyn Swan¹⁰ suggested. By running the high-frequency current through a diathermy electrode whilst it is in contact with the neoplasm, adhesion between the two may be obtained, whereupon gentle traction on the growth will indicate the degree of its mobility on the pedicle. A thin, flexible, and relatively long pedicle occurs with a benign papilloma; a stout, stumpy one indicates malignancy. A large villous covered growth which is completely sessile is certainly malignant.

The type which is sessile over a wide area without much projection into the bladder has a very unfavourable outlook. Moreover, if swollen mucosa or actual bullous oedema can be detected near the base it must be regarded as of evil omen. This is one of the points which should be looked for when the growth is first seen. After it has been treated endovesically there may be some inflammatory swelling at the base due to the burn, and it may be quite impossible to distinguish this from true neoplastic infiltration. Its presence or absence should therefore be remarked when the first cystoscopic examination is made. Beer¹¹ called attention to the danger of this mistake in 1911, within a year of the first use of diathermy. Cabot¹² called it a "pseudo-carcinoma," and states that it takes anything up to three months to subside. I have on two occasions had patients referred to me on account of such a "pseudo-carcinoma." In each instance the surgeons had reburnt the supposed growth to obtain a cure. In each, as might be expected, the lesion was aggravated, but when allowed time it subsided completely. If, after a

reasonable period of waiting, the cystoscopic appearance is still indeterminate, a portion of the bladder wall may be removed by the cystoscopic rongeur and submitted to the microscope; but there is some danger of acquiring the inflammatory part of the tumour only, as in five instances recorded by Frater¹³ in which such material was reported upon as inflammatory, and in each the disease eventually proved to be malignant. Prolonged cystoscopic vigilance is probably easier and more satisfactory than any other means of investigation, as, if the lesion is due to the burn, it will recede, whereas if it represents malignant infiltration it will be progressive. The opposite mistake has also occurred, a "pseudo-carcinoma" being excised by open operation, after which its inflammatory nature was recognized by microscopy (Barney).¹⁴

In about one-third of all patients the papillomata are multiple. Usually not more than two or three are to be found, but occasionally I have seen them so numerous as to be uncountable, a condition which has been termed a "diffuse papillomatosis." When multiple the appearance of the secondary growths denotes a degree of malignancy in excess of that which the parent growth showed at a corresponding stage in its own development. Opinion is divided regarding the significance of multiplicity in these papillomata. Thus Swan¹⁰ and others believe that multiplicity is no evidence of malignancy, whilst Young and Davis⁴ say that they are "almost surely malignant," and Fenwick¹⁵ says "the prognosis of cure after operation will never be so good or so hopeful in multiple as in single papillomata." Whatever the truth regarding the significance of plurality it unquestionably portends a great tendency to return, and successive recurrences are progressively more malignant. Such daughter growths are generally small and are quite easily destroyed by diathermy, a measure which is very suitable for these small splashes.

This is a thumbnail sketch of a papilloma and its malignant successor. For the former there is unanimity as to the suitability of perurethral diathermy. For the latter there is almost equal accord that, if it is operable at all, open operation must be employed. But in the transition lies the difficulty. Once malignancy has supervened, diathermy must be abandoned. All features of the growth must be reviewed before a decision is arrived at. It cannot be expected that different surgeons will express identical interpretations regarding the individual members of these borderline types. This probably accounts for the wide discrepancies in the numbers of benign papillomata and malignant ones which make up the lists of different writers. Thus Barringer,¹⁶ out of a total of 53 growths, gives 7 papillomata, 40 carcinomas, and 6 which are of types not now being considered, whilst Egger,¹⁷ out of a total of 80, gives 38 papillomata and 42 carcinomas. It is presumed that these surgeons draw their cases from similar sources and that the differences in percentage are explained by the different standards of the several investigators. When in doubt it may be wise to try the lesser measure of cystoscopic desiccation first, a practice which I have largely followed. A simple tumour reacts thereto much more favourably than does a malignant one, and the result of treatment is helpful in forming an opinion. Many authorities, indeed, rely so much upon this reaction of the tumour to diathermy in forming an opinion regarding its nature that it has been called the "therapeutic test."

But this method also is not without its disadvantages, for there will be delay before it gives its verdict, during which the tumour may be becoming inoperable. Furthermore, we are hazarding the dissatisfaction of our patient, who, having undergone treatment which held promise and has failed, is now advised that more radical measures are desirable. The danger of losing the confidence of a patient at the end of a series of unsuccessful treatments is a real one, and one which must be taken into account, for he may decide against further treatment, to his own disadvantage and with serious loss of prestige to his adviser. The task of at first sight placing these borderline growths in their correct categories is a difficult one, and one on which finality is by no means yet reached. In view of the improvements in the technique of partial cystectomy I feel that if diathermy is not plainly succeeding there should

be no delay before adopting open operative treatment. When diathermy was first introduced it was thought that all tumours might show themselves responsive to it, but it was soon evident that whilst the benign varieties are very susceptible thereto the malignant ones do not react favourably, and may even be stimulated by it to more rapid growth. All writers are now insistent that as soon as malignancy is an established fact perurethral desiccation shall be dispensed with; but, more than that, a review of the recent literature makes abundantly clear the growing consensus of opinion that if there is a definite suspicion of malignancy superior results will be obtained in a series of cases by assuming malignancy and proceeding to resection of the whole thickness of the bladder wall.

Cystography.

Unfortunately a number of patients are not seen by the surgeon till the tumour is so advanced that even its cystoscopic recognition is difficult or impossible. The difficulty may arise because the bladder is almost or quite filled by the growth, or because, owing to cystitis or infiltration, it is small or intolerant. Haemorrhage, however, is the commonest cause, and it may be severe and intractable, or may be excited by even the gentlest of vesical washings. In any one or a combination of these circumstances cystoscopy may be so much hampered that little or no information is obtained. We may then with advantage resort to cystography. By filling the bladder with some solution which is radiographically opaque a silhouette of its cavity may be obtained on an x-ray plate. A tumour present in that cavity will be shown by an area of diminished opacity within the x-ray shadow. Though not capable of giving us the detailed information obtainable from cystoscopy this examination will nevertheless confirm the suspicion that a tumour is present, indicating its size, the site of its origin, the extent to which it projects into the vesical cavity, and as a rule will show whether its surface is villous covered or smooth. Moreover, it will indicate the shape and size of the bladder itself, and thereby it is often possible to judge the likelihood of infiltration. The bladder in epithelioma gives some quite characteristic distortions which experience makes recognizable.

I have during the last ten years seen 91 cases of papillomatous disease, with the majority of which I have been in communication recently, and, indeed, they are followed and periodically cystoscoped for two years after the bladder appears to be free from growth. It appears to me preferable, in the limited space at my disposal, to select points of interest from the series and to outline my conclusions on diagnosis and treatment, rather than attempt an analysis of these cases.

ANILINE DYE WORKERS.

In this series there are 6 cases which have occurred in workers in aniline factories, 5 of these being from this city and 1 from elsewhere. It has been known since 1895 that those employed in aniline factories are unduly prone to suffer from this disease. Rehn, at that date, reported 3 cases in Frankfort-on-Main, and his communication aroused considerable interest in many dye manufacturing districts, particularly in Germany, where this industry was mainly centred. In the British Isles sporadic cases also cropped up in the years prior to the war, but owing to the then slight development of dye factories they were few in number and did not attract much attention.

Among the cases which I include is one in which the patient was operated upon by Mr. Burgess in 1911 for a papilloma. It is particularly interesting to recall that this patient was well until 1928, a period of seventeen years, when he again showed symptoms and a papilloma was treated by cystodiathermy in the Ancoats Hospital. It is hardly to be believed that this tumour was a recurrence of a growth which had lain dormant for seventeen years. It would appear more likely that it was a fresh tumour occurring in a patient who was unduly susceptible, either naturally or as a result of his occupation. Yet it is not unknown for patients to have recurrences late, and Simon¹⁸ reports instances where he has seen death occur from local recurrence seven, ten, and twelve years after operation.

The patient was submitted to me for inspection by Mr. Heritage, and now remains under my care and treatment in the event of further relapses.

A somewhat similar case was seen recently suffering from cystitis, haematuria, and obstruction to micturition. In 1915 this patient had an ulcer the size of a half-crown excised from a situation above the left ureter by Mr. Hey, and the section was reported as carcinomatous. At the present time he is under my care for a small villous-like structure lying just above and to the left of the urethral orifice, the bladder itself being mildly inflamed. There is some thickening of the left ureteral bar—probably at the site of the original operation—which, however, is not regarded as neoplastic.

Prior to the onset of a vesical neoplasm in these aniline workers there is a premonitory period in which the patient suffers from symptoms of cystitis, such as frequency of micturition, with strangury, and sometimes haematuria. The haematuria is generally terminal, and may be suggestive of tumour formation. This stage of cystitis may be the forerunner of a neoplasm, but if the patient changes his occupation the symptoms sometimes disappear and no tumour occurs. Occasionally, in spite of a change in employment, a growth ensues, and this may happen several years after the factory has been left.¹⁹ It is hardly necessary to emphasize the importance of cystoscopy during this prodromal stage. It is undertaken so that the neoplastic degeneration, if it occurs, may be caught early. The cystoscopic picture I have found to differ from that seen in a septic cystitis, particularly in the absence of exudate. The bladder shows a bright erythema with a tendency to mottling. It is more brightly red or pink than the usual colour in cystitis. Its surface is free from exudate, and apparently the superficial epithelium is not exfoliated. Perhaps this accounts for the brilliant appearance of the mucosa. There is, however, a fair degree of evenly distributed oedema, though I have not observed the bullous variety.

In addition to these 6 cases, I have, through the courtesy of Dr. Wignall, had the advantage of studying the records of 9 other cases which have occurred in dye workers in this city since 1920. As Dr. Wignall is reporting these cases at the discussion on industrial cancer I shall not further refer to them, save to remark on the long period of contact with the dye which appears to be necessary. There is one case which developed cystitis after eight to ten years, but in this small series all those who have developed growths have had twenty to thirty years of service.

A not uncommon situation for the development of a papilloma is the vesical orifice, and I have seen 4 cases in which the primary growth occurred there. Secondary growths are not uncommon here also, and are probably accounted for by a large frond getting caught in the meatus during micturition and forming a "kiss cancer." Such patients are liable to suffer from intermittency of the stream and even acute retention. Growths situated at the bladder outlet cannot be reached by the usual catheterizing cystoscope, and to meet this difficulty Swift Joly has introduced an ingenious instrument capable of retrograde vision and retrograde treatment. Prior to the invention of this instrument I have had to open the bladder to destroy a tumour surrounding the urinary outlet. Indeed, such tumours situated near the neck may still have to be submitted to cystotomy because instrumentation, however gentle, may cause bleeding sufficiently severe to debar endoscopy. I have used Joly's instrument with much satisfaction on several cases, but on occasion I have found it difficult to approach the urethral margin sufficiently closely, and have therefore had to complete its work with the posterior urethroscope. More than once I have had to treat implants actually occurring within the proximal half of the posterior urethra, and these also may be reached with the posterior urethroscope. It is an interesting fact that they are unknown in the anterior urethra, where wart formation is almost invariably a complication of gonococcal infection.

A papilloma of the bladder is itself occasionally secondary to one in the upper urinary passages. Of this I have seen

two instances. In the first a small papilloma was seen protruding from the ureteric orifice into the bladder. An illustration of this I have published elsewhere.²⁰ In a second case a papilloma of the ureter was removed, but the tumour recurred in the adjacent ureteric stump, and also in the bladder. In the latter organ it grew from the actual lips of the ureter. I excised the greatly distended and thickened lower end of the ureter, together with an area of bladder surrounding its opening.

Implants from the kidney have also been known to grow in the bladder, and Murchison²¹ records one in which there were papillomata in each of the renal pelves and an implant at the orifice of each ureter. Bland-Sutton²² states that papillomata of the renal pelves, though rare, are often bilateral. This, however, I have not corroborated from the literature. In the museum of the Royal College of Surgeons²³ there is a specimen showing a papilloma attached by a narrow pedicle to the neck of the bladder immediately above the urethra. One end of the right kidney was occupied by a soft spongy mass of cancerous material.

I remember a case where I removed the kidney for papillomatous disease of the pelvis some eleven years ago. I was perhaps less alive then than now to the advisability of removing the ureter together with the kidney. The patient had a haematuria of moderate severity several days after the operation, which caused me some anxiety, as it suggested that I might have left a papillomatous secondary in the ureter. In spite of prolonged observation, however, this patient did not develop further trouble.

TREATMENT.

The treatment of small benign papillomata was revolutionized in 1910, when Beer²⁴ conceived the idea of applying the then comparatively new high-frequency current to their destruction. For a time after their introduction opinion wavered between the monopolar and bipolar diathermic currents, but it finally settled down to the latter so far as this country is concerned, and is now, I believe, universally employed here, though Beer²⁵ in America has recently emphasized some advantages of the Oudin monopolar current. The difficulties of adequate insulation are greater with the Oudin than with the d'Arsonval current. This probably accounts for the preference shown for the latter on this side, as with the small calibre cystoscopes which we favour these difficulties cannot be overcome.

Technique of Bipolar Diathermy.

A large flat indifferent electrode is closely applied to the sacrum or thigh, and the active electrode, a fine, insulated copper wire with a platinum terminal, is passed through the catheterizing cystoscope for application to the growth. These electrodes connect with the terminals of a diathermy apparatus, and the papilloma is burnt piecemeal under cystoscopic vision. The movements of the active electrode are controlled in the same way as the catheter is moved for ureteric catheterization. When commencing the operation the surgeon selects an area to apply his electrode. It is prudent not to start on the easiest areas first, but to reserve them until later, for the operation becomes increasingly difficult as it proceeds, and it is as well to destroy the more inaccessible portions of the tumour before the bladder conditions become unfavourable, leaving the easier ones to the end. A weak current is employed in the first instance and is gradually increased in strength, the surgeon judging the necessary strength by its effect on the growth and not by the reading on the ampeter. When the current first runs a gentle swirl is observed amongst the fronds of the papilloma, followed by the formation of a few minute air bubbles. A blanching of that portion of the growth in contact with the electrode is soon visible, and it extends till the tip is surrounded by a whitened ring of coagulum, one or two millimetres in width. The current may now be broken and a fresh situation for the electrode chosen, the treatment being repeated at different points till the whole surface has been desiccated, when the treatment is suspended for a period to allow the separation of the sphacelus.

A slough should be given time to separate. Between two treatments I am accustomed to allow three or four weeks to elapse. At the end of this period a benign papilloma should be definitely smaller, should have separated its burned areas, and we should find that the parts which have survived lie on a lower plane, being recognizable by

their deeper and redder colour. Their surface appearance simulates that of fine healthy granulation tissue. If slough still adheres to the growth malignancy must be suspected. I am much impressed by this property of a malignant growth to retain slough on its surface after diathermy, and agree with Young⁴ when he says, "the adherence of the slough to the surface of the tumour seems to be in direct ratio with the malignancy of the growth." Sometimes a growth is completely hidden by slough, though with the electrode you can generally displace the deposit and so expose the papilloma. Experience with these growths will show that this feature is one of the most certain evidences of malignancy which we possess. It is related to the tendency shown by bladders containing a malignant neoplasm to become septic and to remain so in spite of treatment.

An alternative plan is to apply the current rather fiercely for a longer time at one spot. When it has run for a short time it will be noticed that adhesion between the two has occurred. The electrode is now slightly withdrawn so as to elevate the papilloma from the bladder base. This little manoeuvre lifts the lowest lying villi from the vesical wall, thus eliminating alternative routes by which the current may gain the indifferent electrode and concentrating it upon the pedicle. Heat is developed in greater or less degree along the whole course of the current between the two electrodes, but varies in intensity directly as the current density. It will be very intense at the point of the active electrode and least intense where it is spread out to reach the large surface of the indifferent electrode. Between these two lies the pedicle of the papilloma—in many instances a narrow isthmus. If alternative routes can be eliminated by means which I have already suggested, this pedicle must carry the whole current. The heat will therefore be high and the pedicle, if it is a narrow one, may be devitalized. The tumour will then in due course be cast free in the bladder and passed with the urine. I have witnessed this several times; thus a growth $1\frac{1}{2}$ inches in length and half to three-quarters of an inch wide was passed through the urethra by one patient, whilst in another instance, through the cystoscope, I actually saw the papilloma lying free in the bladder cavity. In yet a third case a papilloma grew from within a vesical diverticulum. Diverticulum and growth should have been excised by open operation, as was done in a similar case which I shall describe shortly; but the patient being in feeble health I resolved to employ diathermy to the papilloma as it lay in the diverticulum. This I did vigorously, with the result that, for a period of two years, during which the patient was under observation, no recurrence was seen, and I believe that destruction of the growth was accomplished through overheating of its pedicle as just described.

Large growths, either because they are fast-growing and therefore of high cellular activity, or because they have been long in the bladder and have had time to degenerate, are more likely to have undergone metaplasia than small ones, and size is therefore in favour of malignancy. A bulky growth hampers diagnosis, but it also impedes treatment, whether endovesical or open. When a large neoplasm is benign, one must decide whether to set out on a protracted course of diathermy or to open the bladder and, by the use of a combination of excision and burning, to destroy the main mass of the tumour. There are disadvantages with each method, for, on the one hand, prolonged and repeated endovesical treatment is trying alike for patient and surgeon, whilst on the other hand is the danger of implantation, the prolonged convalescence, and the fact that the patient does not entirely escape subsequent cystoscopies and perhaps diathermies. If the growth is *malignant*, excision offers the only hope for its unfortunate host.

Open Operation.

Whilst the introduction of endovesical treatment marked a revolution in its own line, an advance scarcely less important has since been registered in the technique of the open operation. As you know, until recently it has been customary to proceed in the first place to a suprapubic cystotomy and then to attack the tumour from within the vesical cavity. This limited operation permitted the

removal of the mucosa and other superficial layers of the bladder wall surrounding the base of the tumour. The intimate contact and adhesion of the bladder to extra-vesical structures prohibited a bold removal of the whole thickness of its wall, much less a wide resection. Moreover, as the lymphatics run in the deeper coats of the viscus and are absent from the mucosa and submucosa the avenues of spread for malignancy were left behind, and it is little wonder that recurrence was frequent.

It is largely due to the work of Bentley Squier²⁶ that the methods of mobilizing the bladder have been put on a satisfactory basis. In the operation which I practise, and which I have based on Squier's technique, a median incision extends from above the umbilicus to the pubis. By gauze dissection the lateral aspects of the bladder are raised from the pelvic parietes and the dissection is continued in an upward direction till the peritoneal reflection is encountered and the peritoneum is stripped off the fundus of the bladder. This order of progression is adopted with a view to reaching the urachus late. Where the urachus leaves the bladder the peritoneum is closely adherent to both these structures. When the urachus is divided the peritoneal cavity is entered and the opening is used for the investigation of the peritoneal surface of the bladder and for the determination of the presence or absence of pelvic and iliac secondaries. The peritoneum is then closed and the remainder of the operation is strictly extraperitoneal.

After this stage the patient is placed in the Trendelenburg position and the dissection (in the absence of perivesical inflammation or adhesion) is rapid and easy, and gauze stripping can completely mobilize the viscus, leaving it attached only by the structures around its neck. Deep in the pelvis two bands—the uretero-sacral bands—pass backwards and outwards. They contain the ureters, which are thus located but not necessarily seen, and can easily be better exposed if the circumstances demand it. When required the dissection is continued till the prostate and seminal vesicles are exposed.

Not until the bladder has been sufficiently freed is it opened. The organ is drawn forward over the pubis and the incision is made into the posterior wall of the viscus, but its exact site is chosen with reference to the position and dimensions of the growth which have already been ascertained by cystoscopy. The neoplasm is removed together with a generous area of bladder wall. The division is effected by scissors, the work being conducted from within the viscus so that the tumour shall be in full view. Owing to the customary situation of these tumours it will often happen that the area removed will include a ureteric orifice. When the incision is complete the ureter will therefore anchor the excised growth. Being fixed for identification by a pair of forceps this will be the last structure calling for division. It will subsequently require reimplantation, though sometimes when this is not possible satisfactory results may be got by ligaturing it, as recommended by Judd and Harrington.²⁷ The kidney then gives no trouble unless it is severely infected. Many kidneys are in any case dilated and valueless.

Squier²⁸ has, however, shown that the area of bladder to be excised cannot be dismissed as lightly as the above description might indicate. Having described the lines of lymphatic drainage within the bladder wall, he has demonstrated that the area to be removed must be regulated by a knowledge of these drainage routes if recurrence is to be avoided. Space forbids me to go into the subject of these routes in greater detail. Frequently it happens that a half or more of the viscus must be removed, yet when healing is complete it is astonishing how rapidly the bladder regains its full capacity, even after an extensive resection.

That this operation is superior to its forerunners is unquestionable. In none of my cases has there been trouble from deep pelvic suppuration due to the extensive dissection and soiling of the wound with urine, the healing of the posterior surface of the bladder being, so far as can be judged, prompt and more easily obtained than that of the anterior. The operation becomes more formidable when ureteric resection has to be practised, however, and it carries a higher *immediate* mortality. Resection of the

ureter is not necessary when growths originate at a distance, but, as is well known, the areas above and external to its orifice are the sites of election for these tumours. In my experience papillomata arising high on the bladder walls run a very benign course, and I have seen several which have gone for ten years or more and remained small and benign, and therefore good subjects for cystodiathermy. Yet when malignancy does occur excision has to be exceptionally free because the vesical apex is a watershed for the lymphatic fields, and the routes of dissemination are therefore numerous. For this reason, though the growth involves the most accessible part of the bladder wall, the late operative results are not so good as those following operation on growths arising at the site of election (Squier²⁸). Moreover, the dome of the bladder "resembles the silent area of the stomach, the greater curvature, where tumours occasionally become large before localizing symptoms appear" (Scholl²⁹).

The preliminary mobilization of the bladder which I have described is an invaluable method of attack in other operative procedures on the deeper-placed areas of the viscus—as, for example, when a diverticulum has to be removed or a stone in the lowest segment of the ureter calls for open operation. In one of my two cases of papilloma springing from within a diverticulum the whole sac was excised together with the papilloma. In another patient, of whom I have already spoken, the lower end of the ureter contained a recurrent papilloma together with an implantation in the bladder at the ureteric outlet. The ureter was removed by a similar exposure, together with an area of bladder surrounding its orifice.

Whatever method of open operation is employed the tendency for implantation to occur in the wound itself must be guarded against by protecting all exposed surfaces with tetras and swabs soaked in silver nitrate solution (1 in 1,000). The greatest care is exercised in the handling of the growth itself, and every preparation which can shorten the time that it is exposed is undertaken before the bladder is opened. Here again the advantage of the preliminary wide mobilization of the organ is evident. In the final toilet the wound is again sponged with silver nitrate 1 in 1,000, resorcin 50 per cent. (Young and Davis)⁴ or alcohol (Beer), according to the choice of the surgeon.

This is a large and severe operation, yet it represents a material improvement on its predecessors. When the tumour is small it is less difficult, but when it is large the difficulties are much increased. The fact which must strike one, of course, is the wide difference between the treatment of a small benign and a large malignant growth, the one being successful and rapid, the other very dangerous and very difficult. The problem therefore lies in getting the cases in their early stages as soon as ever the earliest haematuria gives warning of a lesion in the urinary tract which calls for cystoscopy. It is the relative infrequency of bladder tumours which militates against their early reference to the surgeon, for the importance of immediate examination is not borne home so easily to the medical attendant. "Had symptomless haematuria been as common as the acute appendix, it would have gone through the same phase as that condition experienced twenty years ago, and would now be invariably submitted to immediate cystoscopy, just as the acute abdomen is promptly submitted to laparotomy."³⁰

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THE COMBINATION OF COLLOIDAL LEAD SELENIDE (D4S) AND RADIUM IN THE TREATMENT OF CANCER.

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In view of the recent increase in the use of colloidal lead selenide (D4S, British Drug Houses) in the treatment of cancer it is considered that the findings to be narrated should not await the second edition of our monograph. This early report is sent out in the hope that other centres may avoid the regrettable result of incorrect combination of this preparation with radiation.

We found that therapeutic α radiation subsequent to administration of D4S was nothing less than disastrous. Five cases were so treated, and the growth of the neoplasm appeared to be promptly and markedly stimulated. The combination of these two methods of treatment was considered to be dangerous, and a warning was given.¹ Two of the cases were as follows:

Case 1.—Male with inoperable carcinoma of lip and involvement of submaxillary glands. He was treated for five months with D4S, which resulted in increased feeling of well-being, gain in weight, fairly marked reduction in size of the growth with disappearance of the glands. Then the case remained stationary, and as the patient had had as much lead as we thought advisable we decided to try the effect of α radiation. He had received only half the usual carcinoma dose when it was found that rapid growth had extended into the tissues of cheek and jaw, and fistulae developed within two weeks. More lead was given, and the growth appeared to be checked, but by this time there was a large ulcer with much sepsis. Ultimately he died, apparently of sepsis, for there were no metastases.

Case 2.—Young female with large medullary carcinoma of breast. After five months of treatment this case was considered to be operable as the growth had become sharply circumscribed, much smaller, and glands had regressed. However, we decided to try α radiation instead. By the time half the dose had been given the mass was very much larger. The radiologist considered this to be oedema at first, but very shortly widely spread nodules in the skin of the chest and consolidation of the underlying lung dispelled optimism. After improving on D4S enough to be a fair operable risk the patient died of general carcinomatosis within six weeks of commencing α radiation.

In three other cases, with variation only as regards site, we had similar results—stationary or diminishing carcinoma began to extend quickly immediately after α radiation.

Later, when radium became available, we had a very similar experience. Some cases, not responding to treatment with D4S, were treated with radium. Marked oedema, shortly followed by necrosis of the tissues around the growth and sepsis, was the result. Two of these cases are worthy of note, for they appeared to give a clue to success in the combination of the two methods of treatment.

Case 3.—Male, recurrence of carcinoma of lip in submaxillary glands. He had been treated with D4S for three months, and had gained in strength and weight, but though the masses had become so soft as almost to fluctuate they were steadily growing. On the advice of one of the leading radium workers, who saw the patient and advised the dose and its application, radon was implanted in screened seeds of 50 per cent. strength. Oedema and necrosis followed immediately, and fungation into the pharynx