A British Medical Association Lecture

ON

THE SIGNIFICANCE OF HAEMATURIA *

BY

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When blood is seen in the urine it is not wise to belittle its presence. Its cause may be simple and its cure easy ; but, on the other hand, it may ultimately end in the patient's death after a period of extreme misery and suffering.

When your patient asks you what the bleeding is due to, tell him frankly you do not know. At the same time you can reassure him that after further examination, for which no anaesthetic, general or local, will be required, and during which no serious discomfort will be felt by him, an exact diagnosis can be made, followed by appropriate treatment. Refuse to treat any patient for haematuria from an unknown cause, and also resist the temptation to reach a diagnosis by an incomplete examination, as by a simple *x*-ray examination, the analysis of the urine, or by other means.

IMPORTANCE OF CLINICAL HISTORY

At the outset get permission for a complete and full investigation in every case. Later I will suggest a scheme of examination, but at present I wish to emphasize that, although you employ these exact methods, their use does not diminish the importance of a most careful clinical investigation, by which it is often possible to obtain a provisional diagnosis which will frequently prove to be accurate.

Let the patient tell his story. If blood has appeared in the urine suddenly, painlessly, and profusely, in one who was previously in perfect health, it is safe to assume that the cause is a villous papilloma of the bladder. I have a letter from a patient in which he says: "I drove over rocks in a jolting farm cart for half an hour yesterday, with the result that my urine was full of blood, the colour of port. It became normal in a few hours, but I suppose this means that I have stones in my bladder." Further investigation proved his clinical diagnosis to be correct, and later he was successfully operated on for vesical calculi.

Sometimes the story the patient gives appears to be typically that associated with a villous papilloma of the bladder. He claims that previously he has been in perfect health, and suddenly, painlessly, and profusely, haematuria develops from no apparent cause. On examination, however, you will find that he is about 50 years of age, shows evidence of early arterio-sclerosis, and has a high blood pressure ; the cause is ultimately found to be spontaneous rupture of a blood vessel within the bladder wall.

The source of the bleeding can be inferred not infrequently from the clinical examination. If the patient's linen is blood-stained, observe whether blood clot is present at the meatus urinarius, and inquire whether the bleeding occurred independently of the act of micturition ; if so, it is urethral in origin. When this occurs the patient is naturally alarmed. Although I have observed several such cases, I have never yet had one that proved serious. I have noticed it in the healthy, virile young man, where it was found to be due to the congestion of the verumontanum. In the elderly male I have also seen it where it was prostatic in origin and subsided naturally.

It is important to discover if the bleeding occurs at the

end of micturition or is present throughout the entire act ; if at the end, it occurs when the bladder base is being compressed, and is frequently due to a localized inflammation of that part (a trigonitis), or comes from the ulcerated surface of a prostate which is the site of intravesical herniation. Examine the urine for the presence of clots, and if thin pencil clots are present, these having been formed in the ureter, there is a strong suspicion that the primary haemorrhage has been renal—possibly a hypernephroma exists.

Malignant disease of the bladder never gives rise to painless haematuria, whereas innocent tumours produce characteristic painless bleeding. The bleeding in malignant disease is usually associated with suprapubic discomfort and perineal uneasiness. It is scanty in amount, persistent, intermittent, and is accompanied by frequency. Bleeding due to stone in the bladder occurs especially after exercise. It is thus more evident in the evening and absent in the morning urine. If the bleeding becomes profuse after a bimanual examination, the presence of a malignant ovarian tumour adherent to the roof of the bladder is suspected. When a patient suffers from tuberculous disease of the kidney he seldom seeks advice until the bladder is involved. The initial complaint in over 75 per cent. of more than 200 cases I have examined has been frequency of micturition. Occasionally the initial complaint may be haematuria.

The association of renal colic and haematuria usually indicates the presence of a mobile renal calculus ; and the larger the stone, the fewer the symptoms. The fixed arborescent renal calculus may cause renal neuralgia but not colic. Vigorous exercise in such a case, however, may demonstrate occult blood when the urine is examined microscopically. It is customary to assume that renal colic in the absence of haematuria is due to intermittent hydronephrosis, but this is not an invariable rule. Occasionally intermittent hydronephrosis may be associated with severe haematuria. If blood in the urine first appears painlessly and later is associated with mild renal colic, the latter may be caused by the presence of clotted blood in the renal pelvis, and this may be due to a tumour, or more probably to a hypernephroma. In such a case examine very carefully for pencil-like clots in the urine. Renal haemorrhage may also be caused by a villous papilloma of the renal pelvis, or may be accounted for by essential haematuria. The possibility of renal infarction or tumour of the ureter as the source of bleeding has to be borne in mind. Haemorrhage is also occasionally met with in the later stages of congenital multiple cystic disease.

PHYSICAL EXAMINATION

When the patient has told his story, the physical examination is proceeded with, and further valuable information about the source of the bleeding is often obtained. If one kidney is made out to be palpably enlarged, what does this signify? Perhaps he has only one functioning kidney, a condition which in my experience occurs in one in every hundred persons. The other kidney may be diseased, and the enlarged kidney may be healthy—the site of compensatory hypertrophy. The enlargement may be due to tumour or to other diseases that cause bleeding.

The commonest cause of bilateral enlargement is congenital multiple cystic disease, a condition in which the kidneys are enlarged by many cysts. The amount of renal tissue is, however, markedly diminished, and the renal reserve perilously low. In these cases haematuria sometimes occurs, or even bleeding from the bowel may take place, and the surgeon in attendance may be tempted to perform a hasty operation without complete examination. Even an exploratory operation in such cases may be followed by fatal consequences.

* Delivered to the Northampton Branch, November 10th, 1931.

OTHER METHODS OF EXAMINATION

The routine side-room examination is now carried out. Is it possible to determine the presence of a tumour or even its nature from the examination of a cellular deposit present in the urine? I have never known this prove a success, except where a portion of a villous papilloma has been detached after instrumental examination.

Although it is wise in every case of urinary disorder to commence the examination by taking a plain *x*-ray photograph of the entire urinary tract, this very seldom indicates the source of the bleeding when haematuria is present. Its origin can only be recognized by using the cystoscope, an examination which, if carefully carried out, should cause the patient no appreciable discomfort, and be devoid of all risk. In my experience the best "anaesthetic" is to employ an instrument of a small enough calibre to give no discomfort when it is being passed into the bladder.

HAEMORRHAGE FROM THE BLADDER

Villous Papilloma.—If a simple villous papilloma is present, there is observed a structure closely resembling a small oak tree growing from the healthy mucous membrane of the bladder. It has a squat and sturdy stem, with branches from which delicate villi hang waving in the clear fluid. In such a case you can confidently promise cure. You can tell the patient that this can be obtained without the use of an anaesthetic, without causing pain, and without the loss of a day's work. It will be effected by fulguration, or the destruction of the growth by high-frequency d'Arsonval current. Two, or possibly three, treatments may be required, and a routine follow-up of his case should be insisted on. In carrying out the treatment, remember that the growth itself is insensitive, but that the adjacent mucous membrane is tender. There are, however, cases of villous papilloma where the solution of the problem is not so simple. In some of them, careful inspection round the base of the growth may reveal an area of granular congestion. From this "brushwood" area daughter tumours readily spring. In such a case I would recommend that the treatment be carried out under a general anaesthetic, and the brushwood area fulgurated and the tumour destroyed.

The observation of a simple villous papilloma on the bladder wall does not necessarily prove that it has been the source of the bleeding, and this emphasizes the importance of investigating the case, where possible, when the bleeding is active. Examine also the ureteral orifices carefully, and see if blood-stained urine is escaping from either channel; if so, it is probable that the tumour observed in the bladder is a secondary implantation from a primary villous papilloma in the renal pelvis.

Sometimes in an older patient a tumour is seen where the stalk is more sessile, and the villi are fused to form a crocodile-hide-like surface. In this case a malignant papilloma is present. It may appear wise in such circumstances to remove a portion for examination to confirm the diagnosis: this is easily done. The portion obtained, however, is usually from the summit, and histologically it may be innocent, as the malignant changes are first evident at the base of the growth. In such a case I would recommend the operation of cystotomy and careful removal of the growth, care being taken to avoid implanting tumour cells and further fulguration of its base.

Lastly, in cases of villous papilloma, you may be tempted to achieve too much by transurethral fulguration, if the growth is very large, or if there are numerous tumours. If it is large and is destroyed at one treatment, the slough which results, if not voided readily, forms the nucleus for a vesical calculus. If the growths are numerous the patient's endurance may be tried unduly by the number of treatments necessary. Open cystotomy, followed by fulguration, gives the best results in these

cases. Similarly, if the small tumours form a ruff round the vesical outlet, their destruction by transurethral treatment is most difficult, and in these cases I would also recommend cystotomy.

When the haematuria is due to a ruptured vein on the bladder wall, this is observed as a stream of blood passing like smoke into the clear medium filling the bladder cavity. In such a case a natural arrest of haemorrhage may be confidently anticipated: saline or boric lotion, at a haemostatic temperature, is helpful.

Malignant Tumour.—The appearance of a primary malignant tumour of the bladder is characteristic, and is exactly comparable to that seen in a malignant tumour of the bowel when laid open for inspection. The observation of such a growth within the bladder indicates the necessity of operative treatment. The nature and the extent of that treatment, however, I am not prepared to determine until the bladder is opened. If the growth should be observed on the summit of the bladder, there is a possibility that it may be due to invasion from a tumour originating within the abdominal cavity, such as a growth in the bowel. A subsequent barium enema examination is indicated in such cases. It is only when the bladder is opened that the extent of invasion can be accurately determined by touch, and the degree and nature of infiltration of the neighbouring parts estimated. If neither ureter is involved, a partial cystectomy is performed; if one ureter, a hemi-cystectomy. If both are implicated, a serious problem presents itself, for it is probable that both kidneys are damaged in consequence of the involvement of the lower end of the ureters in the spread of the growth along the cellular tissue outside the bladder. If nothing is done, the patient is condemned to a life of increasing misery, and ultimately an extremely painful death. Radium, so valuable in treating malignant disease in other regions of the body, has been tried in these cases. It is not a cure; it does not afford relief. The palliative operation of ureteral transplantation might be assumed to give relief; in fact, it has been advocated with this object in view. I regret to say it does not relieve the patient from the recurring painful spasmodic vesical contractions, for these are not due to the presence of urine in the bladder cavity, but to nature's effort to expel the tumour invading its wall. To obtain relief the ureteral transplantation must be followed by total cystectomy, an operation I have performed successfully in a number of cases in three stages. A single-stage operation is the ideal we are aiming at, but so far it has not been achieved. Lastly, in those cases where even total cystectomy is impossible, there still remains the question of alleviating the patient's suffering by sympathetic denervation of the bladder. This operation is being tried out, and I am sure will be freely employed in the near future. I am hopefully and confidently looking to Learmonth's work in this direction.

Prostatic Hypertrophy.—In cases of simple prostatic hypertrophy bleeding is not uncommon. It is usually due to an ulcerating patch on the summit of an intravesical herniation of the gland, but not always. It may be due to an associated villous papilloma, or result from the presence of a stone. It may even be renal in origin. This last cause was illustrated in a most dramatic manner in a case that came under my care. The patient was 64 years of age, with a history of simple prostatic hypertrophy. Recently he had suffered from occasional haematuria. A cystoscopic examination was carried out; 6 ounces of residual urine was found to be present, and the prostate gland showed marked intravesical herniation but no ulceration over the projection of the summit of the gland into the bladder cavity. Over this mound the ureteral orifices could just be seen, and careful observation showed the escape of slightly blood-stained urine

from that on the right side. Ureteral catheterization was carried out with considerable difficulty, owing to the intravesical protrusion. Pyelographic examination showed, on the right side, signs of an early carcinoma involving the middle of the kidney, and naturally this was first of all dealt with. When exposed by operation the kidney appeared normal in every respect, except that its consistence was firmer in the middle. Confident, however, of our pyelographic findings, we performed a nephrectomy, and section showed an early epidermoid carcinoma in the situation diagnosed, obliterating the middle calyx, as had been demonstrated pyelographically. Subsequently the prostate was treated. A better demonstration of the value of a routine cystoscopic examination in all cases of prostatism, and of the importance of localizing the source of the bleeding in all cases of haematuria, would be difficult to find.

Bilharziasis.—Fortunately in this country bilharziasis is not endemic. It is met with especially in Egypt, where 75 per cent. of the workers in the field, the fellaheen, are infected with this disease, and all of these in their day pass red water, and as youths may take pride in the depths of its tint. Although initially not distressing, it is a dire and persistent disease, with most serious ultimate consequences. During the war, in the East, a number of men were sent home infected with this ailment, and as a possible cause of haematuria it has to be borne in mind when the patient has lived in a country where the condition is endemic. Examination of the urine may fail to reveal the ova. On cystoscopic examination, however, they are easily recognized. In the earlier stages they are seen on the bladder wall as minute sago points of a chalk-like colour, which are surrounded by a vascular ring. In a later stage of the earlier phase characteristic bilharzial granulations are observed. Fortunately, by treatment with tartar emetic, introduced by Christopherson, good results are now being obtained.

Tuberculosis.—Haematuria due to tuberculosis of the urinary tract is usually vesical in origin, and is due to bleeding from active tuberculous ulcers. There is usually a history of antecedent pyuria, some dysuria, and frequency of micturition, but occasionally these may be absent. The treatment of tuberculous cystitis is to locate the primary source of the infection, which is most commonly in the kidney, and to remove it. In the majority of cases this is followed by a spontaneous natural cure of the cystitis.

Cystitis, trigonitis, and vesical calculi frequently cause haematuria, and are easily recognized on cystoscopic examination.

HAEMORRHAGE FROM THE URETER

When haematuria owes its origin to a cause situated above the bladder, this is most commonly the kidney. It may have an intermediate origin. Thus, villous papillomata may occur in the ureter, particularly when they are already present in the renal pelvis—a point to bear in mind when treating the latter, as occasionally after nephrectomy for villous papilloma of the renal pelvis, to the alarm and disappointment of the patient, haematuria may recur. On cystoscopic examination in such a case no evidence of a daughter tumour in the bladder is observed, and the possibility of the disease being present in the remaining kidney crosses the mind. This is unlikely. The most probable explanation is that it is localized in the stump of the ureter remaining on the side where the excision was carried out, and the passage of a ureteral catheter up this channel will be followed by bleeding. Complete excision of the ureter as well as the kidney should be carried out at the original operation, when it is being performed for papillomata of the renal pelvis.

Ureteral Calculus.—It is common knowledge that perhaps the most frequent error in surgical diagnosis is to mistake a case of right-sided ureteral calculus for acute appendicitis. An error in the opposite direction is possible. Haematuria may owe its origin to acute appendicitis, and, when the appearance of blood is combined with frequency of micturition, a mistaken diagnosis of urinary disease may readily be made. The explanation in such cases is that the inflamed retrocaecal appendix is adherent to the ureter, causing congestion and irritation. The passage of a ureteral catheter is usually arrested at the level of the pelvic brim, and its introduction followed by slight bleeding. These signs, combined with the symptoms of appendicitis, will usually be sufficient to establish a correct diagnosis, but if doubt still lingers I would recall the wise advice of Professor Rutherford Morison of Newcastle: "If you see a bird sitting on the house-tops it may be a canary; most likely it is a sparrow."

HAEMORRHAGE FROM THE KIDNEY

Haemorrhage of renal origin has several causes, which a careful pyelographic examination will differentiate. When a catheter has been advanced 30 cm. it enters the renal pelvis. Note at once the nature of the fluid that escapes. If bright blood flows for a few seconds and then stops, from clotting in the catheter, it is safe to diagnose that the point of the catheter has come in contact with a vascular tumour, and that a hypernephroma invading the renal pelvis is present. If urine tinged brown from old altered blood escapes, a pathological lesion is situated within the cavity. The appearance of a tinge of blood after the catheter has been *in situ* for some minutes is of no clinical significance, and is due to the point of the catheter impinging on the delicate vascular mucous membrane of the channel. It occurs occasionally with all of us.

A bacteriological and cytological examination of the fluid from both kidneys is always carried out, and the presence or absence of infection determined. As already mentioned, the identification of tumour cells by microscopical examination is impracticable, and, further, it should be remembered that the introduction of a catheter frequently dislodges normal epithelial cells from the mucous membrane lining the ureter and pelvis, and these may be present in abundance in a normal case.

A careful examination of the contour and capacity of the renal pelvis, as revealed by pyelography, frequently enables an exact diagnosis to be made. Pyelography has rendered possible the positive diagnosis of early malignant disease of the kidney—a triumphant achievement. Further, it enables us to form an approximate idea of the type of malignant disease that is present. A malignant tumour of the kidney may arise from an adrenal rest or from the secreting or drainage element of the kidney.

Hypernephroma.—The tumour that arises from the adrenal rest is called a hypernephroma. So popular was it that at one time almost every renal tumour was called by this name, so that the inevitable reaction followed, and some even were so severe as to suggest that, like Mrs. Harris, it did not exist. It is occasionally met with. It is a slow-growing circumscribed tumour. The cells are identical with those of the stratum glomerulosum of the adrenal cortex, which are superimposed on a highly vascular stroma, and which, developing in the cortex, destroy the drainage system of that part of the kidney, so that on pyelography certain calyces are observed to be obliterated, and those adjacent are pressed on by the tumour, drawn out, and flattened—an appearance diagnostic of the disease. The functional activity of the kidney, as estimated by excretion urography in these cases, is good.

Tubular Adenocarcinoma.—The tumour of the secreting element is the tubular adenocarcinoma. It is much more malignant, rapidly infiltrating the parenchyma in which it arises. It involves the perinephric tissue early, and produced metastases in the adjacent lymphatic glands. It thus comes about that the kidney, although increased in size, may have a normal contour and the drainage system be only slightly damaged, so that pyelography reveals little deformity, the cavity appearing probably dilated and at one part slightly deformed. When examined by excretion urography, however, it is demonstrated to be a functionless organ by the absence of any shadow. A rare tumour of the renal parenchyma is a haemangioblastoma.

Papillary Adenocarcinoma.—The commonest malignant tumour arising from the collecting element is the papillary adenocarcinoma. Many of these were formerly mistaken for hypernephromata, and, like the latter, they formed a tumour mass, usually palpable and demonstrable. The characteristic local destruction of the drainage system, with the neighbouring calyces elongated and flattened, is observed on pyelographic examination. Functional activity as estimated by excretion urography, however, is poor. From the pelvis or calyces an epidermoid carcinoma may arise.

Villous Papilloma.—The innocent tumour of the kidney that is met with clinically is a villous papilloma. It is similar to that which occurs in the bladder. Its presence can be recognized by pyelography. At first sight, when the film is inspected, the pelvis and calyces appear normal, but on more careful examination the density of the media within the cavity is seen at one part to be diminished—namely, where the villous growth is occupying the cavity. In some cases a definite filling defect is observed, and when this is combined with an interference with the entrance of the pyelographic media to one of the calyces it may be suspected that the villous growth has overstepped the borderline and become a malignant papilloma. Functional activity as estimated by excretion urography in these cases is good.

Tuberculous disease of the kidney produces various appearances on pyelographic examination, which are characteristic and diagnostic.

Renal Calculus.—If the shadow of a stone is seen in the renal region at the preliminary x-ray examination, its accurate localization can be simply achieved by taking another photograph with the patient lying on his side. If the concretion be situated within the renal pelvis, this lateral view will show it lying opposite the anterior third of the body of the corresponding lumbar vertebra. If the shadow be intra-abdominal, it will be seen in front of the bodies of the lumbar vertebrae. The exact situation of the stone within the pelvis or calyces can be demonstrated by pyelographic examination.

IDIOPATHIC HAEMATURIA

Essential or idiopathic haematuria is the one renal disease producing haematuria whose diagnosis is arrived at by a process of exclusion. The source of the bleeding having been localized to one kidney, no further abnormality of this organ can be revealed by any of the various methods that are employed; the urine collected is found to be sterile and free from pus cells, such as would be met with if the bleeding was from an inflamed pelvis; the pyelographic contour is normal. In some cases of essential haematuria the bleeding may be most persistent. Eight years ago I operated on a man who had suffered from haematuria from this cause for twenty out of twenty-one years since it originally appeared. Nephrectomy was performed, and he has had no recurrence of the bleeding since then. Anatomically, after the kidney

was removed it appeared normal, and on histological examination all that was revealed was a certain increase of the intrarenal pelvic fat, and a varicosity of the venules within it.

CONCLUSION

When a case of haematuria comes under our observation it is our duty to demand that the cause of the bleeding be forthwith determined. This may necessitate a somewhat tedious examination, but the ultimate result is certain. Fortunately, in most cases, when the cause of the bleeding has been determined, a speedy and certain cure can be obtained. In others, especially where malignant disease is present, the outlook is graver. In all of them, however, the earlier the diagnosis is arrived at the better will be the result of treatment, and in all of them, whether they are innocent or malignant, the progress of the case afterwards should be followed up by re-examination at regular intervals of three months, six months, and a year. It is difficult to persuade patients who have been pronounced cured after operative treatment of the necessity of this, and the temptation sometimes is to dismiss them with a reassurance that all is well for all time. Fortunately, in many this will prove to be correct, but in others, slight recurrence may take place, and, if so, by an accurate follow-up system such recurrence can be observed at its earliest stage and dealt with simply and promptly.

THE STROKE IN HIGH ARTERIAL PRESSURE*

A STUDY OF 150 CASES

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The prominence given to the study of high arterial blood pressure seems to be ever increasing, both in the recognized textbooks and in the medical journals. Since Clifford Allbutt's lucid exposition of the condition called by him "hyperpiesis," Batty Shaw, Geoffrey Evans, Lord Dawson, and others have contributed to the elucidation of some of the clinical and pathological aspects of this type of high arterial pressure and of that associated with renal disease. But much remains still hazy, unknown, and unexplained. Etiology is but vaguely understood; some of the clinical manifestations have received no uniform explanation, physiologically or pathologically; and the lines of treatment indicated touch no specific methods which can be relied on to help the practitioner, who is left to turn for relief to general measures adopted in the treatment of other diseases—for example, rest, restricted diet, hydrotherapy, and the removal of septic foci.

On the whole, one feels that there is some justification for striking a note of disappointment, and that, in spite of the valuable contributions hitherto made, very little substantial advance has taken place in our knowledge by which the disease can be arrested or relief be given to those in danger of being afflicted with its unpleasant sequels. One reason for this slow progress seems to be clear—namely, that the malady has not been thoroughly investigated or its early stages closely followed. Cerebral haemorrhage and heart failure as terminal events in high blood pressure may be encountered commonly enough in hospital practice, but the earlier phases and the less serious and striking manifestations are very seldom seen. Indeed, it is true to say that, by the time the grosser

* Awarded Sir Charles Hastings Clinical Prize, 1930.