of stones, especially if the gall bladder has been removed at the first operation, may be most difficult, particularly if dense adhesions bind the area in a confused mat, and a state of hepatitis, or biliary cirrhosis, makes the liver bleed at a touch.

The importance of removing all stones from the common duct cannot be overestimated. In nearly one-third of the deaths following operation on the common duct for stone in our series, *post-mortem* examination revealed that all stones had not been removed. Since *post-mortem* examinations are made on more than 90 per cent. of patients who die in the hospital, this checking up has been of very great importance in adding to knowledge, although often most humiliating to the surgeon. Perhaps some of the stones which are supposed to have re-formed in the common duct are left-overs.

Next to gall stones in the hepatic and common ducts, operative injuries during cholecystectomy are the most common cause for operations on the common duct. The most serious and difficult operations are those which have for their purpose restoration of totally interrupted biliary connexion between the liver and the intestinal tract. When the common or hepatic duct has been injured, and the fact has been recognized at the time, failure successfully to repair the injured duct has not occurred in a single instance. A study of the operative methods employed in these cases, from the standpoint of ultimate results, indicates that in any case in which a piece of the duct has been accidentally removed, and the injury not discovered and repaired at the time, thus necessitating secondary reconstruction, direct union between the stump of the hepatic duct and the duodenum is the best operation.

Of the causes of death after operation, haemorrhage, hepatic and renal insufficiency, and infections of the bile ducts are the most common. These conditions are directly related to the existing chronic obstructive jaundice, hepatitis, biliary cirrhosis, dehydration, and chronic under-nourishment. Walters reviewed the *post-mortem* records, for a five-year period, of patients who died following operation on the biliary tract, and demonstrated that in 58 per cent. of the patients with jaundice who died within the first week after operation, there was more or less blood in the abdominal cavity, usually the result of oozing from slight injuries to the liver. Of itself the haemorrhage was not always sufficient to cause death, but it was a contributing factor. In jaundiced patients in poor condition, unless there is a definite indication, cholecystectomy is not added to the risk of operation on the common bile duct because of the danger of injury to the liver, which adds to the possibility of slow post-operative oozing.

As these patients are dehydrated and usually unable to take much nourishment, an attempt is made before operation to introduce a quantity of water into the system to aid renal elimination. As a rule it is difficult to accomplish this by mouth; it is best accomplished by proctoclysis, or subcutaneously.

A third factor of importance in these cases is hepatic insufficiency, which runs parallel with renal insufficiency. In the presence of hepatic insufficiency the blood sugar may appear to be at the normal level when it is not truly so, because of the concentrated state of the blood from dehydration. Therefore, in the presence of hepatic insufficiency, 5 per cent. glucose, in plain water by rectum, or 3 per cent. in sodium chloride solution subcutaneously, is given.

In order to check the haemorrhage calcium chloride intravenously has proved effective, and in certain cases blood transfusion is a remedy of remarkable efficiency. Failure of normal blood-clotting in the jaundiced patient is a specific indication of deprivation of blood calcium. It remained for Lee and Vincent to give calcium in a 10 per cent. aqueous solution intravenously, with striking results. When the administration of calcium fails to reduce the clotting time to normal, blood transfusion will usually cause a temporary reduction in the clotting time sufficient for an operation to be performed.

The careful pre-operative management of jaundiced patients has greatly reduced the mortality of operations. In two years in not a single instance in the clinic has a patient so prepared died from haemorrhage following the operation.

CASES ILLUSTRATING METHODS OF DIAGNOSIS IN RENAL SURGERY.*

(With Special Plate.)

BY

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IN spite of its already voluminous literature, the subject of cystoscopy, pyelography, and ureterography is so important that no apology is needed for bringing forward some interesting points in the application of these methods of diagnosis.

Kidney or ureter cases usually present themselves for investigation because of one or other of the symptoms—pain, haematuria, dysuria, or pyuria which does not yield to potassium citrate or the usual urinary antiseptics. On the other hand, some cases which eventually prove to be of urinary origin come under observation because of symptoms not necessarily suggesting the upper urinary tract as the seat of trouble; for example, in one case which I shall quote, asthma was the only symptom of ill health in the first instance.

Assuming that one of the typical urinary symptoms is present, that a pathological and bacteriological examination of the urine, and a clinical and x-ray examination of the renal, ureteric, and bladder regions have been made, an approximate diagnosis will probably have been reached, but many points will still remain to be investigated. Thus, if pyuria is present, the question whether it is of bladder or renal origin remains. The general recognition of the fact that most cases of persistent pyuria are of renal origin must be credited to the wide adoption of cystoscopy. Simple observation of the ureteric orifices or ureteral catheterization will localize infection or haemorrhage to one or other kidney. The ureteric catheter will provide material for estimating the efficiency of each kidney. Catheterization and aspiration may determine the existence of a hydro-nephrosis.

In almost every case pyelography will contribute some fresh details in the investigation. In renal calculus one will learn whether the stone is in the renal pelvis or in a calyx—an important point in planning operation. The shadow of a ureteral stone can be differentiated from other shadows like it by a pyelogram, but sometimes an x-ray photograph of the opaque ureteral bougie *in situ* will suffice. The cases mentioned below will illustrate these among other points.

The method of performing cystoscopy and of obtaining a pyelogram are now standardized. In injecting the ureters one depends on the patient's sensation of fullness or pain to indicate when enough of the opaque solution has been injected. For ordinary cases no special apparatus is necessary, save the cystoscope, ureteral catheters, and access to a radiologist. Dr. Oram has taken all the photographs in the cases mentioned in this paper. In most cases the ordinary x-ray couch serves for the various cystoscopic procedures, and conversely the x-ray tube can be used with the patient resting on the cystoscopy table. The latter arrangement will suit best when a photograph in semi-upright position is desired.

The first case I shall mention is one illustrating how, in certain cases of chronic pyuria, cystoscopy by itself excludes the bladder, and localizes the active septic focus to the kidney.

CASE I.

Some six months before I saw him, the patient, a man of 53, had an acute attack of cystitis with frequent micturition, suprapubic pain, and abundant pus in the urine. The attack came on after six hours' exposure to tropical rain. He was very ill and was admitted to a foreign hospital, where his bladder was washed out several times a day and urinary antiseptics administered. Under treatment his symptoms improved, but albumin and pus, as well as staphylococci and a coliform bacillus, remained constantly in the urine. On examination one saw that the mucous membrane was healthy everywhere save at the orifice of the right ureter,

*A paper read at a clinical meeting of the Lancashire and Cheshire Branch of the British Medical Association.

where the lips of the opening were engorged, and below that orifice there was a fan-shaped inflamed area, marking the track of the shoot of urine from the orifice. The jet of urine from the right orifice was turbid, while that from the left was clear. The condition was either simple or calculous pyelitis. Radiographically a large stone was to be seen in each kidney (Fig. 1). Subsequent catheterization of the ureters after a meal of 15 grams of urea confirmed the infectivity of the right and the non-infectivity of the left kidney, and the differentiated urines showed: on the right side 1.2 per cent. of urea; on the left 1.5 per cent. The stone was removed from the right kidney by pyelotomy, and after six months' treatment with urinary antiseptics and vaccines, and when the pus had disappeared from the urine, the left kidney was similarly treated. When last seen before going abroad, albumin had quite disappeared.

The next two cases I shall mention are cases in which cystoscopic examination, taken in conjunction with clinical signs, facilitated definite diagnosis of tuberculous kidney in spite of the fact that tubercle bacilli could not be found in the urine.

CASE II.

The first case was a woman of 42, who gave a history of having had an abscess in the left loin, which was opened about three years ago. The abscess discharged for some months and then healed, only to break down again after another few months.

The urine was normal and the patient denied that there had ever been any urinary abnormality. The doctor who was last in attendance, however, suspected kidney trouble and sent her for further examination. At this time there was a sinus in the left loin discharging pus containing staphylococci. In the circumstances, and in the presence of normal urine, the suppurating focus might have lain in any of the neighbouring structures, but cystoscopic examination showed that there was only one functioning ureter—the right. There was no trace of the left ureteric orifice even after an intramuscular injection of indigo carmine. In the region where the left ureteric orifice should have lain, however, there were three or four cicatrices of healed ulcers. It was only at this stage that the patient could be induced to remember that

Fig. A.—Case II. Remains of old tuberculous kidney, showing fibro-fatty capsule with trabeculae and caseous debris below.

twenty-five years previously she had had haematuria, and increased frequency of micturition, lasting over a period of six months. With this confirmatory fact it was possible to realize what had occurred—that at the age of 16 to 17 she had suffered from an actively tuberculous kidney. The caseous debris had, later, blocked the left ureter and allowed the secondary ulceration of the bladder to heal.

In this case I removed the kidney, or rather its representative—a large sac of caseous matter contained in the fatty capsule, subdivided by fibrous strands, but containing no trace of kidney tissue (Fig. A). Probably there had been no trace of secreting tissue for over twenty years.

CASE III.

The second case of tuberculous kidney I shall mention was in a girl of 19, who had been wardmaid in a sanatorium for tuberculosis. She suffered from hectic fever, night-sweats, intermittent haematuria, colic on the right side, and a considerable amount of

pus in the urine. Tubercle bacilli were not found. She had very frequent micturition, and her bladder could not be induced to tolerate more than 2 ounces of fluid. It was necessary to give her an anaesthetic for cystoscopy, and then one had an opportunity for a moment of seeing and catheterizing the left ureter and of ascertaining that the right ureteric orifice was situated in the centre of an ulcer in the posterior wall of the bladder. The cystoscope was removed, the catheter being left in position, and the patient allowed to come round from her anaesthetic. She was given 15 grams of urea, and in an hour and a half she was found to have a concentration of 2 per cent. urea in the urine from the left kidney. There were some blood and pus cells in the urine from the left kidney, but in view of its power of concentrating urea, and as the symptoms of colic, haematuria, hectic fever, and night-sweats were pressing, the right kidney was removed. It was found to be tuberculous and secondarily infected (Fig. 3).

She was excreting 45 ounces of urine when she left hospital, but there was still some pyuria.

Fig. B.—Case III. Tuberculous kidney with mixed infection.

The differentiation of the x-ray shadow of a phlebolith or of a mesenteric gland from that of ureteral stone is frequently necessary. I will first show the appearance of a genuine ureteral calculus in relation to the opaque bougie and the opaque injection, and then show cases where the pyelogram or ureterogram excludes the possibility of urinary calculus in favour of phlebolith or calcareous gland.

CASE IV.

A young man of 23 had suffered from one attack of haematuria and from intermittent pain in the right iliac fossa and right inguinal region. The x rays showed a shadow which was probably a stone in his right ureter (Fig. 2). Cystoscopically the bladder and the ureteric orifices were normal. Examination of the urine showed nothing definite once the slight haematuria had passed off. On passing the ureteric catheter, it was stopped at a point short of the renal pelvis. Fig. 3 shows the catheter held up. Fig. 4 shows the sodium bromide injection passing round the stone and partly dilating the renal pelvis. The stone, obviously ureteric, was removed extraperitoneally.

CASE V.

In contrast with the case just mentioned is that of a medical student, aged 20, who had suffered from pains in the right iliac fossa and inguinal region for some months. The pains had recently disappeared, but while they were present they had occasionally been accompanied by haematuria. Later on he passed per urethram a small calculus, which Dr. Duffield analysed and reported as consisting of phosphates. The urine was normal. A radiogram showed a shadow at the brim of the pelvis over the course of the ureter, and the question arose as to whether this shadow was a ureteral calculus or a calcareous gland. Catheterization of the ureter could only be effected to the extent of a couple of inches (Fig. 5), but on injecting the ureter with sodium bromide the shadow, though in contact with that of the ureter, was seen to be independent of the latter (Fig. 6). The ureter is seen to pass the region of the doubtful shadow without dilatation or distortion—this in contrast to the photographs in the previous case, where the injecting solution is seen to surround the stone. The shadow in the present case is evidently that of a mesenteric gland.

CASE VI.

In contrast with Case iv, too, is Case vi, that of an old lady suffering from intermittent haematuria accompanied by colicky pains in the right loin. The x-ray appearances of the renal region were negative. In the ureteral region they showed two circular shadows low in the pelvis, and in the course of the right and left ureters respectively (Fig. 7). An x-ray examination made with the ureteric bougies in position showed that the shadows did not in fact lie in the course of the ureters (Fig. 8). At a later examination when the haemorrhage was actually in progress the blood was seen to be coming from the

left ureter. In the absence of pus or x-ray evidence of stone, the presumption was in favour of a growth of the left kidney. No operation was performed owing to the feeble condition of the patient, but the rapid increase in size of a gland above the left clavicle confirmed the existence of malignant disease in the drainage area of the thoracic duct. The shadows in the pelvis were phleboliths.

CASE VII.

This patient was a seaman aged 36. When homeward bound from Australia he was seized with severe pain in the right iliac fossa and right testicle. He was obliged to lie up for three or four days. He was then transferred to hospital ashore at a Mediterranean port. There he was x-rayed and a diagnosis of calculi in the pelvic ureter on the right side was made. Being anxious to get home he declined treatment and continued his voyage. The severe pain had passed off in two days from its onset, but he suffered from slight abdominal aching for upwards of a fortnight. On reaching Liverpool, two months later, he was referred to me for further investigation and treatment. The urine was normal. Palpation revealed slight tenderness in the right iliac fossa. Radiographically a number of circular shadows were visible in the right lower pelvis (Fig. 9), but a photograph with the opaque bougie in position showed that the shadows lay clear of the ureter (Fig. 10). The renal pelvis was normal.

The original illness was evidently due to appendicitis, of which testicular pain is an occasional symptom. This diagnosis I verified by operation, finding a retrocaecal appendix lying over the course of the ureter, buried in adhesions and acutely kinked.

A ureteral calculus may exist side by side with a phlebolith, and the latter with its associated fibrosis may prevent the passage downward of the former.

CASE VIII.

The patient, a man of 37, suffered from repeated attacks of right loin pain radiating downward to the testicle. A radiogram showed two shadows in the region of the lower right ureter (Fig. 11). The ureteric bougie passed the lower shadow and thrust the upper shadow upwards for a couple of inches before being stopped (Fig. 12). The ureterogram (Fig. 13) showed that the lower shadow lay outside the ureter, and that the injection could not pass backward below the point of the ureter in contact with the phlebolith. The ureteric catheter occupied the entire lumen of the ureter at this point. At operation I found the ureteral calculus lying beside the phlebolith, separated only by the ureteral wall. The phlebolith was surrounded by a mass of fibrous tissue which involved the ureter, and determined the obstruction. The calculus was removed and the obstruction dilated.

The fact that a pyelogram is normal helps one to exclude the possibility of a surgical condition of the kidney in a doubtful case of loin or abdominal pain.

CASE IX.

A woman of 54 complained of a constant aching in the right iliac region. The routine x-ray examination of the urinary tract showed no abnormality. The urine was normal. A pyelogram in the semi-upright position showed a normal renal pelvis (Fig. 14).

The patient is now wearing a visceroprotect belt and has obtained relief.

CASE X.

A young woman complained of severe pain in the left iliac fossa and on the front of the left thigh. An x-ray examination of the urinary tract was negative. The urine was normal. A pyelogram taken as in the last case was normal. The pain was so severe that I explored the abdomen, and found high up at the root of the mesentery a large tuberculous gland. Its removal relieved the symptoms. The pyelogram helped to exclude a renal condition, and limited the exploratory operation to the abdominal cavity.

When an intramural ureteric stone remains in situ for some time the ureteric muscle tires in its efforts to expel it. It is of interest to observe the later changes in the appearances presented at the ureteric orifice.

CASE XI.

Shortly after her confinement, a woman came complaining of severe pain in the right inguinal region, coming on at short intervals. There was pyuria and slight haematuria. X rays showed a stone in the lower part of the right ureter (Fig. 15).

Cystoscopically the left ureteric orifice was of the normal slit-like type; the right was a circular dark hole, and any attempt

to pass the urethral bougie brought one up against the stone. When the orifice was kept in view for a short time, one could see the lower pole of the stone rhythmically presenting at the orifice as the ureteric muscle endeavoured to thrust it through. With each contraction one could see round the presenting stone a circle of jets as the urine was forced out. The presentation of the stone in the orifice was sometimes accompanied by distinct pain, and the whole phenomenon was, in miniature, what is seen during a labour pain when the foetal head is presenting and receding. When I first saw her a few months ago she had just been confined and was nursing her baby. As the pain was not severe, and the stone likely to pass spontaneously, I thought it desirable to postpone operation. In the course of five months the stone failed to pass into the bladder, and I have since removed it through the bladder. In the meantime the cystoscopic appearances had altered completely. The stone no longer presented intermittently at the ureteric orifice, and though the kidney still functioned, the efflux trickled away constantly, and not with a periodic jet. The ureter had evidently become dilated and lost its power of rhythmic ejaculation.

In hydronephrosis it is not always possible to demonstrate the condition by aspiration. The aspirating catheter may not pass the obstruction, and when the syringe is applied nothing may be drawn off. In such a case an opaque injection may be made to pass the obstructing stricture or kink, and the ureterogram or pyelogram to demonstrate the obstruction.

CASE XII.

Mrs. D., aged 54, had for six years been suffering from severe spasmodic asthma. She had had various forms of treatment, including Tucker's asthma cure, morphine injections, and adrenaline injections. The adrenaline had the power of cutting short an attack, but there was no means of preventing it. Her doctor found pus in the urine, and with the aid of x rays demonstrated the presence of a large stone in the left kidney (Fig. 16), and some minute shadows in the right (Fig. 17).

As a preliminary to operation I passed the ureteric catheters for differential examination of the urine. On the left side the ureteric catheter passed up to the renal pelvis, and a pyelogram showed the stone to be situated in a calyx (Fig. 18). In the case of the right side the ureteric catheter failed to advance higher than about 2½ inches from its lower end (Fig. 17), but using a catheter with a terminal opening only, the obstruction proved to be permeable to injection.

The pyelogram (Fig. 19) showed a hydronephrosis and enlargement of the upper ureter; the ureterogram (Fig. 20) showed narrowing of the shadow where the instrument had been stopped. At operation this narrowing was found to be a stricture, not a kink.

Treatment consisted in relieving the stricture in the right ureter and removing the stone from the left kidney. Apart from showing the superiority of the injection over the opaque bougie in certain cases it was of interest to find that the patient was cured of her asthma.

In contrast with the picture of general dilatation of the upper urinary tract seen in the last case, is the pyelogram of a hydronephrosis caused by obstruction at the uretero-pelvic junction.

CASE XIII.

A man of 58 presented typical symptoms of right renal obstruction—pain in the right loin, intermittent haematuria, alkaline urine containing pus. The x-ray photograph showed faint shadows in the right renal region (Fig. 21). A pyelogram showed dilatation confined to the renal pelvis (Fig. 22), and localized the shadows in the dilated pelvis. At operation an artery was found passing from the aorta to the inner aspect of the kidney, half an inch below the renal sinus. With the kidney *in situ*, the ureter lay in front, and the dilated pelvis behind the vessel. The vessel was removed, also half a dozen stones from the renal pelvis by pyelotomy. The stones were probably secondary to the stasis caused by the abnormal vessel. The shadows seen in Fig. 21 were smaller than the stones themselves. This is explained by the radiogram of the calculi taken after removal (Fig. C). Each stone shows a dense core, and less dense periphery. The core consisted of calcium oxalate, magnesium salts, and albuminous material; the periphery of uric acid and magnesium salts.

Under magnification the original of Fig. C showed the lamination of the periphery of the shadows. In such a case a pyelogram is necessary as a means of fixing the level of the obstruction, and of locating the calculi in the pelvis.

FIG. C.—Case XIII. Stones x rayed after removal, showing oxalate core and uric acid and magnesium salts in periphery.

FIG. D.—Case XIV. Pyonephrotic kidney after removal. (Compare Figs. 23 and 24.)

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FIG. 1.—Case I. Stone in right renal pelvis. Radiogram taken after finding pus coming from right ureter.

FIG. 2.—Case IV. Shadow in course of right ureter.

FIG. 3.—Case IV. Ureteric bougie stopped by ureteric calculus.

FIG. 4.—Case IV. Opaque injection surrounding ureteric calculus and partially filling upper ureter and renal pelvis.

FIG. 5.—Case V. Doubtful shadow in ureteric region.

FIG. 6.—Case V. Injected ureter, showing that the doubtful shadow is independent of the ureter.

FIG. 7.—Case VI. Shadows in the course of right and left ureters respectively.

FIG. 8.—Case VI. Opaque ureteric bougie x rayed *in situ*, showing that the shadows in this case lie free of the ureters.

FIG. 9.—Case VII. Shadows in course of right ureter.

FIG. 10.—Case VII. Opaque catheter *in situ*, showing that the stones are extraurethral.

FIG. 11.—Case VIII. Showing two shadows in the region of the right ureter.

FIG. 12.—Case VIII. Shows the ureteral bougie passing one of the shadows and thrusting the other upwards.

FIG. 13.—Case VIII. Opaque injection surrounding upper shadow (ureteral calculus). The reproduction is not deep enough to show the stricture of ureter at level of phlebolith.

FIG. 14.—Normal renal pelvis as seen in Cases VII, IX, and X.

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Fig. 15.—Case xi. Stone in the intramural portion of the right ureter.

Fig. 16.—Case xii. Showing stone in left renal region.

Fig. 17.—Case xii. Showing limit to which ureteral bougie could be passed.

Fig. 18.—Case xii. Left pyelogram, showing that the stone is in a calyx. (Compare Fig. 16.)

Fig. 19.—Case xii. Right pyelogram, showing hydronephrosis and dilatation of upper right ureter. (Compare Fig. 17.)

Fig. 20.—Case xii. Showing lower right ureter with obstruction where the bougie had been held up. (Compare Fig. 17.) The bladder is filled with 25 per cent. sodium bromide.

Fig. 21.—Case xiii. Right renal region, showing various small shadows.

Fig. 22.—Case xiii. Pyelogram showing right hydronephrosis. The ureter is not dilated, the obstruction lying at the ureteropelvic junction.

Fig. 23.—Case xiv. Left renal region, showing small calculus.

Fig. 24.—Case xiv. Left pyelogram, showing hydronephrosis and dilatation of upper right ureter. (Compare Figs. D and 23.)

In pyonephrosis a pyelogram materially assists in prognosis.

CASE XIV.

A woman of 36 suffered pain in the left loin, pyuria, and irregular fever for six months. There was definite enlargement of the left kidney. X rays showed a small calculus (Fig. 23). No urine could be obtained by catheterization of the left kidney. Catheterization of the right kidney after 15 grams of urea gave a urea concentration of 1.8 per cent. A pyelogram showed cavities occupying the greater part of the renal region (Fig. 24). At operation these cavities were found filled with pus, and the kidney shown in Fig. D was removed. It consisted merely of fibrous loculi and contained a small stone.

It was possible to say prior to operation that nothing short of nephrectomy would relieve such extensive suppuration and disorganization.

NOTE ON "DEFATTING" OF THE ACID-FAST BACILLI OF LEPROSY AND TUBERCLE BY INJECTIONS OF CHAULMOOGRADES AND MORRHUATES.

BY

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IN 1916 I recorded favourable effects in leprosy from the subcutaneous and intravenous injection of soluble sodium salts of the unsaturated fatty acids of chaulmoogra oil, sodium gynocardate, and hydnocarpates¹; in 1917 I pointed out² that even small doses given intravenously may produce softening of the nodules, accompanied by breaking up and absorption of the lepra bacilli; these changes were illustrated by coloured plates. In 1919 I recorded similar results from sodium morrhuate, prepared on similar lines from cod-liver oil,³ and a year later with sodium soyate from soya-bean oil (to which Dr. E. Muir has since added ethyl esters of linseed and olive oils), and I showed that prolonged treatment by these methods may produce disappearance of the lepra bacilli from the tissues with apparent cures, which have now lasted in some cases for from five to eight years. I showed also that occasionally severe cases of leprosy cleared up in the course of some months following a prolonged febrile reaction, with great destruction of the bacilli, after a small intravenous dose without any further treatment, indicating that the dissolved bacilli have acted as an antigen in producing active immunity. In 1920 I reported some favourable results in the treatment of tuberculosis, mostly of the surgical form, with sodium morrhuate. In 1921 I summarized the results of my six years' researches,⁴ and discussed the probable mode of action of these preparations, pointing out that the direct action theory of E. L. Walker and Marion Sweeney⁵ (based on their demonstration of a specific action of gynocardates and hydnocarpates on acid-fast bacilli as a class) would not explain the efficacy of sodium morrhuate and soyate nor the prolonged improvement after a single febrile reaction, and I concluded:

"Such cases appear to be best explained on the theory that, during the extensive breaking down of the bacilli, antigens are formed, which bring about the subsequent prolonged improvement. I have for long considered that the action of the soluble salts of the fatty acids of the several oils I have shown to be effective in leprosy must, in some way, be due to a chemical reaction with the fatty acids in the coating of the acid-fast bacilli, so weakening their protective envelopes as to allow the body-cells to deal with them, while the extensive breaking down of the bacilli in the body may lead to immunizing antigen formation in the system. Whatever the precise explanation may be, it is now abundantly clear that my discovery, that injections of soluble preparations of the fatty acids of chaulmoogra, cod-liver, and soya bean oils lead to breaking down of leprosy bacilli in the human body, is of great interest and importance, and one which demands much further research."

The precise manner in which the dissolution of lepra bacilli in the tissues is brought about remained to be elucidated, but in 1920 Dr. J. A. Shaw-Mackenzie⁶ recorded experiments showing that the addition of sodium

gynocardate, sodium morrhuate, and sodium oleate to a pancreatic extract doubled the fat-splitting effect of pancreatic lipase on an emulsion of olive oil *in vitro*, and he suggested "a direct stimulating action of tissue lipolysis in, at any rate, partial explanation of the therapeutic effect of sodium morrhuate and of sodium gynocardate" on acid-fast bacilli. It then occurred to me to investigate the possible effect of these preparations on the blood lipase in both leprosy and tuberculosis, for it is known that this ferment is deficient in many tuberculous cases, and during the past year I have been working at this point in the biochemical laboratory at St. Bartholomew's Hospital, with the kind permission and help of Dr. Mackenzie Wallis, the preliminary results of which appear to be worth mentioning in view of the interest aroused by Professor Dreyer's important researches on "defatting" of tubercle bacilli *in vitro*.

Thanks to the kindness of Dr. E. Muir, Leprosy Research Worker, Calcutta School of Tropical Medicine, in sending home to me in ice a considerable number of serums of treated and untreated lepers, I was able to find that in three untreated nodular lepers the blood lipases averaged only an equivalent of 0.033 decinormal sodium hydrate, while the average of nine treated cases was 0.22, or about the normal figure; one of them, who had just had a severe febrile reaction with extensive destruction of the bacilli, however, showed a low lipase content, as if the ferment had been used up in dissolving the organisms. Dr. Muir has since made a large number of lipase estimations in lepers in Calcutta, and he has recently reported to me that "we are finding almost invariably a very low lipase content in severe reactions, and we are finding a good prognosis justified when there is a high lipase content."

I have also been making lipase estimations in a number of serums from surgical cases of tuberculosis kindly sent to me by Dr. Pugh and Dr. Mawson from the Carshalton Children's Hospital, and Dr. Mawson has recently sent me records which indicate that patients with low lipase content are usually those who are not doing well. I am also testing serums before and after treatment by chaulmoogrades and morrhuates at Carshalton, and also, through the kindness of Dr. Rundle, at the Fazakerley Sanatorium of Liverpool, to see if the lipases are raised by these drugs. It is too early to report the results, but those already obtained in leprosy appear to support the view that this class of preparation acts by increasing the blood lipase, which in turn dissolves the fatty coating of the acid-fast bacilli of leprosy, and probably also of tubercle, setting free the antigens, with resulting production of immunity in the system in leprosy, and possibly also in tuberculosis. In the latter disease, however, it is more difficult to control the process with sufficient accuracy to prevent too great liberation of toxins, in pulmonary affections at any rate. In other words, I appear to have obtained in leprosy, and possibly in surgical tuberculosis, "defatting" of the causative bacteria *in vivo*.

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- ¹ *Lancet*, February 5th, 1916. ² *BRITISH MEDICAL JOURNAL*, October 21st, 1916. ³ *Indian Journ. Med. Research*, vol. v, No. 2, October, 1917. ⁴ *Indian Med. Gaz.*, May, 1919. ⁵ *Practitioner*, August, 1921. ⁶ *Journ. Infect. Dis.*, 1920, 26, p. 238. ⁷ *Medical Press*, August 18th, 1920.

A PAN-RUSSIAN Odontological Congress will be held at Moscow from September 4th to 11th, when the subjects of discussion will include the chemistry and surgery of the buccal cavity, single and compound prosthesis, caries as a social disease, industrial diseases of the teeth and buccal cavity and the means of combating them, provision of dental treatment, statistics of diseases of the teeth and buccal cavity, and post-graduate courses.

THE fifth Italian Congress of Medical Radiology will be held at Palermo, under the presidency of Professor Gioacchino, from October 18th to 21st, when the following subjects will be discussed: X-ray treatment of skin diseases, by Professor Rossi of Parma; pneumo-radiography, by Professor Gortan of Trieste; radio-diagnosis of the urinary system, by Professor Boidi Trotti of Turin. An excursion will be made to Taormina and Syracuse. The subscription, 25 lire, should be sent to Dr. Sgroi Salvatore or Professor G. Scaduto, via Alloro 58, Palermo, before September 1st.