she had not got malignant disease of the uterus, it would relieve thousands of women of a haunting fear. Conversely, they should be told that if they have a lump in the breast they must at once consult a doctor, and likewise if they have any irregular haemorrhage. When, however, such propaganda is sent out it should also be explained that not every lump in the breast is cancer, and that a great many cases of irregular haemorrhage are not due to this serious condition.

It has been suggested that it is a good thing to tell the public the statistics of people dying from malignant disease. It is often said that cancer is on the increase, a statement which, though probably true, is by no means as true as the figures would seem to suggest. We must allow for the greater age to which people live, and for the better diagnosis owing to the higher average diagnostic ability of the general practitioner compared with that of a past generation. But how is broadcasting these facts going to help the public?

There is, however, one thing that will appeal to the people, and that is their pocket. Few of us are really very frightened of dying; most of us dislike the idea of pain during the process of dying; but all of us fear being put out of action and seeing our relatives suffering because the breadwinner is laid low and additional expenses are being incurred for treatment. Can this expense and worry be avoided, and can any scheme for this object be made to help in the education of the public? I believe it could be if a special insurance policy could be taken out for cancer, and if the premium on such a policy could be reduced on the production of a certificate that the individual had been examined within the last six months and shown to be free from any signs of malignant disease. Such a system would, I venture to suggest, appeal to millions of people. It is true that the insurance companies are not primarily philanthropic societies, and inquiries suggest that they are averse to the principle of frequent medical examinations in connexion with insurance. On the other hand, if a case of cancer is treated early the prospects of a permanent cure are very good, and the patient will go on paying premiums for a great many more years, and the insurance companies will not have to pay the large sums of money which are forfeited on the death of the patient.

There is yet another line in which the public must be educated, and that is concerning the meaning of the word "research." Nine out of ten people, even among the better educated, believe that research means that a person suddenly thinks of an experiment and does something to see what will happen, much in the same way as a little boy will put a match under some gunpowder to see what comes next. Nothing is further from the truth. Research may be considered under two headings: first, laboratory research; secondly, clinical research. Both of these are essential if any advance is to be made in the fight against cancer; but it is about the clinical side of research that the public must learn.

If we labelled any hospital as a "Research Hospital" it would be very difficult to get patients to come and be treated. The patients would imagine that the surgeon, like the little boy with the gunpowder, is going to do an experiment not knowing in the least what will happen. What are the real facts? In clinical research a patient is treated by the most up-to-date methods known to science, but instead of letting that patient go out of the hospital and all the facts concerning him be forgotten, extremely careful notes are taken before the treatment is started, during the treatment, and after the treatment. When some hundreds of similar cases have been treated these notes are collected and carefully compared to see the value of such treatment or the value of any modification that has been made in that treatment. It is true that to a greater or lesser extent all hospitals are research hospitals, because experience is gained by somebody every time a patient is treated, but in a busy general hospital the need to treat thousands of patients as quickly as possible prevents the medical attendant from making as careful records as is desirable. For that reason it is far better to segregate patients suffering from cancer in special hospitals, the staffs of which are specially chosen for their interest in and knowledge of that

disease. Such a hospital must lay itself out for the careful observation and making of records.

It is quite true there are in this country cancer hospitals but are there sufficient? There are in the British Isles over 40,000 deaths from cancer every year, and every one of these cases should have careful records and special investigations if rapid advances are to be made in the treatment of malignant disease. Can the existing hospitals deal with such numbers? It is obviously absurd. Even if there was sufficient accommodation in the existing hospitals I venture to say that there is not one single hospital which at present quite "fills the bill" as a research centre. It is our duty to demand that such centres be created. Every such centre should have an efficient and well-equipped research laboratory attached to it so that clinical research and laboratory research can go hand in hand. It must not be forgotten that it is the patient who is suffering from the disease, and it is the patient who must be cured.

There is yet another difficulty that the public cannot realize—namely, that progress is a matter of evolution. One point gained leads to another, but the final goal is often a long way off, and it must be a really philanthropic person who is prepared to put down money to help a cause the ultimate goal of which may not be reached until after the death of the donor. If one could guarantee to have a solution to the problem within a specified time there would be no difficulty in getting money, but that is not possible. But think of the magnificent gamble! By subscribing a million or even half a million to a hospital the goal may be reached within a comparatively short time.

UNION AND NON-UNION OF FRACTURES.

WITH SPECIAL REFERENCE TO FRACTURES OF THE NECK OF THE FEMUR IN ELDERLY PEOPLE.

BY

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(With Special Plate.)

In most situations in the body fracture of a bone is normally followed by a process of repair which leads eventually to restoration of the continuity, strength, and rigidity of the broken bone. This is bony union. Failure of bony union is non-union, because no other kind of union can give the strength and rigidity which are essential to the normal functioning of a bone.

For the purposes of this inquiry it matters not whether the fibrous tissue between the fragments of an ununited fracture is thin and loose or thick and firm, nor whether the ends of the fragments themselves are atrophied and pointed or enlarged and shaped to the semblance of a joint (pseudarthrosis). It is sufficient that non-union as a rule causes great disability, so that bony union is the ideal to be aimed at in the treatment of nearly all fractures.

The causes of non-union given in textbooks of surgery are many and various, and the following classification is fairly typical of them all.

I. Local causes:

- (a) Imperfect immobilization—said to be the most frequent of all causes.
- (b) Great separation of the fragments.
- (c) Interposition of bone, muscle, or tendon.
- (d) Poor blood supply through injury of the nutrient artery—for example, in fracture of the neck of the femur.
- (e) Tumours—sarcoma in callus or pathological fracture through tumour.
- (f) Infection and excessive suppuration.

II. General causes—for example, acute infectious diseases, scurvy, syphilis, osteomalacia, gout, rickets, rheumatism, chronic nephritis, diabetes, alcoholism, anaemia resulting from prolonged lactation or long-continued fever.

Before commenting on these alleged causes I would suggest that there is really only one common cause of non-union—namely, absence of haemorrhage between and around the fractured surfaces—and that the great majority of the causes given above may be identified with it.

The bones in most situations are vascular, and bleed when they are broken. Usually there is considerable haemorrhage between and around the fractured surfaces, and the extravasated blood, acting as an irritant, provides the first stimulus to repair of the fracture. Absorption of the blood clot and its replacement by connective tissue cells derived largely from the periosteum and marrow of the broken bone is the first step in the formation of the provisional callus which is essential for bony union.

When for any reason sufficient haemorrhage does not occur at the site of a fracture, the natural stimulus for repair is lacking, and the fracture may fail to unite. This event is especially common in the case of fracture of the neck of the femur in an elderly person, not, as usually stated, on account of malnutrition of the fragments, but simply on account of the absence of haemorrhage, for these fractures are practically dry.

Many surgeons, and particularly those who are familiar with cranial surgery, are aware of the remarkable haemostatic effect of fresh muscle tissue when it is applied directly to a bleeding point or surface. In some cases, when a bone is broken, the jagged broken surfaces are immediately thrust into the mass of muscle surrounding them. Haemorrhage is thus arrested, and when eventually the fragments are reduced and brought into apposition there may be little, if any, blood clot around them to provide the stimulus for repair. It has occurred to me that this may be the explanation of some cases of non-union—for example, of fractures of the shaft of the humerus.

When a fracture is compound and infected, even mildly, the first effect of the suppuration is to break down and remove the surrounding blood clot, which is discharged as pus. The infective process, if mild, may itself provide the stimulus for repair; but, on the other hand, it may not, and this is a not uncommon cause of non-union.

Of other causes of non-union, imperfect immobilization is said to be the most frequent of all. This is absolutely untrue. The treatment of fractures by active movements from the first results in sound bony union. Deliberate attempts to prevent bony union by active or passive movements are frequently unsuccessful. Fractures of the ribs and other bones, both in man and in other animals, unite readily in spite of constant movement. Great separation of the fragments, as well as the interposition of soft parts, may make it mechanically impossible to restore the continuity of the bone.

Poor blood supply through injury of the nutrient artery suggests that the reparative power of the bone is interfered with. But I would again suggest that the real cause of non-union is absence of stimulus, due to insufficient haemorrhage. Tumours, in so far as they are purely destructive, are an obvious cause of non-union.

Turning now to the general causes of non-union, many of these—for example, syphilis, gout, chronic nephritis, diabetes, and chronic alcoholism—are conditions which are or may be associated with arterial disease (endarteritis, arterio-sclerosis), and it is possible that this may account for very slight bleeding from the ends of a fractured bone, and in exceptional cases lead to non-union. It is difficult to see any other connexion between these common conditions and the comparatively rare occurrence of ununited fracture.

No orthopaedic surgeon would accept rickets as a cause of non-union. Deliberate fracture of rachitic bones for the correction of deformity is one of the commonest orthopaedic operations, and non-union is practically unknown. On the other hand, so-called renal rickets, which has nothing to do with rickets proper, but is definitely associated with chronic nephritis and arterial disease, may be included in the causes of non-union. Osteomalacia is not a cause of non-union, and I know nothing of non-union due to rheumatism, scurvy, or acute infectious diseases.

I would submit that there is only one common cause of non-union of fractures, and that is insufficient haemorrhage between and around the fractured surfaces. Two practical deductions obviously follow this conclusion: (1) that in order to promote union there must be blood clot at the site of a fracture; and (2) that in order to prevent union haemorrhage must be prevented, and blood clot, if present, must be removed.

Intracapsular Fracture of the Neck of the Femur.

Until comparatively recent times non-union was thought to be the almost inevitable result of an unimpacted intracapsular fracture of the neck of the femur. Non-union in this case has been attributed to malnutrition of the head of the bone, or to lack of apposition of the fractured surfaces (Whitman). More recently numerous attempts have been made to secure bony union in this fracture (a) by operative fixation of the fragments, (b) by the abduction treatment of Royal Whitman, and it is now pretty well established that bony union may be obtained in a fair proportion of cases by either of these methods.

But, while each has its enthusiastic advocates, neither method is suitable for general application among elderly patients. Intracapsular fracture of the neck of the femur is one of the common fractures of old people, and though it is true that it occurs also in the comparatively young, and sometimes even in the very young, this does not alter the fact that the majority of cases met with in practice are at least middle-aged or elderly. Many of these are entirely unsuited for direct operative intervention on the hip-joint, and the same objection applies to some extent also to the abduction treatment of Whitman.

The abduction treatment is by no means a trivial affair. For an elderly patient the administration of an anaesthetic, the forcible manipulation of the already injured hip, the application of the plaster, which takes time, and the prolonged fixation of the patient in plaster afterwards, constitute an ordeal which is not likely to become standard or routine unless we can confidently predict bony union as the ultimate reward. This we cannot do. The only statistics available show failure of bony union in from 30 to 40 per cent. of cases, and this is the experience of most surgeons.

The outstanding criticism of the abduction treatment, however, is that it is purely mechanical and takes no account of the physiology of repair in fractures. In other words, Whitman places the fragments in apposition and hopes that they will unite. Sometimes they do, and sometimes they do not. He does nothing further to promote their union, and it may be remarked in passing that prolonged fixation in plaster generally conduces to atrophy of bone, which is not encouraging to union of a fracture.

In the first part of this paper I have put forward the view that absence of haemorrhage between and around the fractured surfaces is the one common cause of non-union. In fracture of the neck of the femur, especially in old people, there is very little bleeding from the bone, and therefore the natural stimulus to repair of the fracture is wanting. Intracapsular fractures fail to unite because they are dry; turn them into wet ones, and they will unite like other fractures. Acting upon this hypothesis we have injected fresh blood directly into the hip-joint as soon as possible after the receipt of the fracture, with the result that sound bony union has been obtained without operation or prolonged fixation of the patient in plaster.

Needless to say, length and alignment are important mechanical considerations, and we have considered the best means of securing proper reduction of these fractures in the circumstances of elderly patients. We do not doubt that manipulation under an anaesthetic is most effective, but we have found that perfect reduction may also be obtained by weight extension, which is far more generally applicable to elderly patients. Weight extension is, of course, one of the oldest methods of treating fractures, but until the introduction of skeletal traction I believe it was not possible to apply really efficient traction to a fracture at the hip-joint. With skeletal traction perfect length and alignment can be obtained. Up to the present time only one case has been treated to a termination.

A woman, aged 57, fell and was admitted to the Middlesex Hospital on March 20th, 1929. On examination she was found to have a typical intracapsular fracture of the neck of the left femur (Fig. 1). Within an hour of her admission 14 c.cm. of blood were injected into the hip-joint. The blood was drawn directly from the median basilic vein with a Record syringe, and injected straight into the joint above the great trochanter. After the injection ice-long callipers were applied under local anaesthesia to the lower end of the femur, and a weight of 15 lb. was applied at once. The weight was rapidly increased

up to 30 lb., and later reduced to 21 lb. This gave perfect reduction of the fracture with restoration of the normal length and alignment of the neck of the femur (Fig. 2), and it was maintained continuously for thirty days. The weight was then reduced to 11 lb., which was kept on for a further period of fifteen days, and then removed. During extension the limb was slung in a bent calliper splint for convenience in nursing and to reduce friction, but no attempt was made to immobilize the hip—in fact, massage was started at once on all accessible parts of the limb and movements were encouraged as far as possible without disturbing the extension. At the end of nine weeks the patient was got up in a walking calliper splint. For the last two months she has borne weight upon the joint, and she has now discarded the splint. The radiogram (Fig. 3) shows that the length and alignment of the neck of the femur have been maintained and that there is unmistakable bony union.

I am greatly indebted to my Registrar, Mr. E. W. Riches, F.R.C.S., for his invaluable assistance in carrying out the practical details of this case.

Commentary.

All our experience of fractures in general points to the conclusion that mere apposition and immobilization are not

the vital factors in the repair of bone, but that a physiological process is involved, and it should be the aim of treatment to stimulate and promote physiological union when this is likely to be deficient. The case here cited was a typical intracapsular fracture of the neck of the femur in a middle-aged woman, which would almost certainly have failed to unite under ordinary treatment by weight extension alone. The injection of fresh blood provided the stimulus to repair, which is present in most fractures, even in old people, but which is lacking in intracapsular fractures of the neck of the femur. Perfect reduction of the fracture was obtained by efficient traction without serious disturbance of the patient, no general anaesthetic or direct manipulation of the fracture being required at any stage of the treatment.

If the experience gained in this case is borne out by others, it seems likely that this treatment by injection and traction will become the method of choice in the future, for it is applicable to any patient who can be kept in bed at all, and, provided that skilled nursing is available, the technical difficulties are not great.

RENAL CALCULUS ASSOCIATED WITH A SOLITARY CYST OF LEFT KIDNEY.

BY

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With Operation Note by

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(With Special Plate.)

THE following case is published for three reasons: (1) To place on record a case of solitary cyst of the kidney (itself a rare condition) associated with a renal calculus, a combination believed to be unique. (2) To describe how a case of renal colic should be relieved, investigated, and treated. (3) To show that, in spite of modern methods of urological diagnosis, the cause of a patient's symptoms may sometimes be only discoverable at the time of operation.

S. T., male, aged 54, married, was seen for the first time on June 8th, 1929, two hours after the beginning of a typical attack of left renal and ureteric colic.

Past History.—Six to four years ago he had attacks of pain in the left side of the lower abdomen which had a sudden onset, a duration of six to seven hours, and an abrupt termination. Four to two years ago there was a period of freedom from attacks. During the last two years there had been several attacks of a similar nature, but not so severe; during one of these a little blood was passed per urethram. A course of waters at Carlsbad made no difference to the symptoms. His last attack occurred about a month previous to the present one, and lasted for four hours. The pain, of a dull aching character, began in the left renal region, with intermittent acute pains shooting to the left testis and tip of the penis. The patient had never noticed any grit in his water. X-ray examination a year ago was said to be normal.

Examination showed the patient to be a healthy well-covered man, but in considerable pain. He micturated four or five times during the day, but not at all in the night; the stream was good and there was no difficulty, urgency, or haematuria. The pain was that of left renal and ureteric colic. The bowels were regular, and there was never any blood or mucus in the stools. Per rectum, the prostate seemed normal; no abnormality was felt. Examination by the abdomen showed neither kidney to be palpable. There was tenderness on deep pressure in the left loin.

Cystoscopy (under local anaesthesia).—The bladder mucous membrane showed mild cystitis with very slight swelling of the left ureteric orifice. A No. 4 Charrière ureteric catheter was passed up to the pelvis of the left kidney. Some resistance was felt at

two points: (1) at the uretero-pelvic junction, and (2) about 3 inches lower than this. Some 15 c.cm. of urine, indicating a slight degree of hydronephrosis, were collected and preserved for examination. Immediately the catheter reached the pelvis of the kidney and the flow of urine was established, the renal colic subsided, and after withdrawal of the cystoscope and catheter the patient said he was absolutely free from all pain or discomfort.

A report on the catheter specimen from the left kidney stated it to be of normal colour, acid, slight haze of albumin present, no sugar, no phosphates, and a small deposit of mucus.

Subsequent Progress and Further Investigations.—On radiography of the urinary tract by Drs. Coldwell and Allchin the right urinary tract was found to be normal. The left urinary tract, with opaque catheter passed to the left kidney, showed: (1) no shadow indicating stone in left kidney or ureter; (2) displacement of kidney shadow upwards by a spherical body some 4 inches in diameter which is probably attached to the lower pole of the kidney and moves with it on respiration (Figs. 1 and 2); (3) this body displaces the lower ureter inwards and forwards, causing marked kinking of the catheter on full inspiration (Fig. 3), its opacity to x rays being rather less than that of the kidney itself.

Left Pyelogram (with 20 per cent. solution of sodium iodide).—Pelvis and calyces normal. No demonstrable communication with any possible cavity in the spherical body. Sodium iodide withdrawn and a further skiagram taken in the hope that if a stone were present some of the fluid would adhere to its surface and thus throw a faint shadow. No shadow was seen.

Renal Function Tests.—10 c.cm. of a 1 per cent. solution of indigo-carmin were injected into the median cephalic vein, an observation cystoscope being in position. This appeared at the right ureteric orifice in two and three-quarter minutes, the efflux being well stained. There was no appearance of the dye at the left ureteric orifice in twelve minutes.

On June 26th the patient had a second attack of left renal colic, accompanied by some intestinal obstruction and followed by the passage of large quantities of flatus. A catheter was passed to the pelvis of the left kidney and the colic was relieved. The

following day, at 9 p.m., he had a third attack of colic. A catheter was passed at the patient's residence, with immediate relief after withdrawal of 15 c.cm. of urine. During this attack it was possible to palpate a tumour in the left upper abdomen.

On June 29th the patient was seen in consultation with Mr. T. P. Dunhill, and the past history and investigations were explained. At this time no tumour could be palpated. Exploratory operation, with differential diagnosis of (a) a solitary cyst springing from the lower pole of the left kidney, and (b) hypernephroma, was advised, and permission obtained to remove the left kidney if necessary. The renal colic was thought to be due to kinking of the ureter by pressure of the tumour.

OPERATION NOTE BY MR. T. P. DUNHILL.

On June 31st the left kidney was explored through a curved incision in the loin, and on palpation the upper half appeared

FIG. 3.

A. S. BLUNDELL BANKART: UNION AND NON-UNION OF FRACTURES.

FIG. 1.—Intracapsular fracture of neck of left femur, before treatment.

FIG. 2.—The same case—showing reduction by skeletal traction.

FIG. 3.—The same case six months later—showing bony union.

J. C. AINSWORTH-DAVIS RENAL CALCULUS WITH SOLITARY CYST OF LEFT KIDNEY.

FIG. 1.—Skiagram at full inspiration. Lower margin of cyst below iliac crest. No calculus visible.

FIG. 2.—Skiagram at full expiration. Lower margin of cyst well above iliac crest. No calculus visible.

FIG. 4.—Skiagram of kidney, cyst, and calculus after removal. The last is well shown.