Remarks

ON
RADIUM THERAPY IN UTERINE CANCER.

BY

A. E. HAYWARD PINCH, F.R.C.S.,

MEDICAL SUPERINTENDENT, THE RADIUM INSTITUTE.

Of all diseases to which the female sex is subject carcinoma of the uterus is probably that most productive of constant discomfort, incessant pain, and ever-present mental anguish. To a woman the dreaded diagnosis "cancer of the womb" often appears as the equivalent of a death sentence.

The expectation of life of untreated cases rarely exceeds two years, and in the majority of instances fifteen or eighteen months sees a fatal termination.

Until the introduction of Wertheim's abdominal hysterectomy, surgical measures, if adopted, consisted either of local excision of the diseased cervix, or the performance of vaginal hysterectomy, operations which, in the majority of instances, were followed by speedy recurrence. Wertheim's hysterectomy in skilful hands offers, however, a much better prospect of complete recovery from the disease, but the mortality attendant thereon cannot be lightly regarded, and in many cases when the preliminary laparotomy has been performed an inspection of the pelvic cavity shows that the disease is already too widely disseminated to permit of complete eradication. Other methods tried from time to time, consisting chiefly of the local application of caustic pastes of one kind or another, have little more than a transient palliative effect, the disease returning with renewed vigour so soon as the local reaction has subsided.

Radium has been widely used for the treatment of carcinoma of the uterus, but the results obtained by different workers have varied very greatly. Some claim that radium treatment should be used in all cases in preference to operative measures, whilst others content themselves with saying that whilst it produces very great and definite symptomatic improvement, it never effects a cure of the disease. The truth probably lies somewhere between these two views.

CARCINOMA OF THE CERVIX.

Classification of Cases.

It would serve no useful purpose in a paper of this character to discuss the vexed question as to the microscopical pathology of carcinoma of the cervix uteri, and from the point of view of radium treatment it appears to matter little whether the growth originates in the columnar cells of the mucous membrane of the upper two-thirds of the cervical canal or from the squamous epithelium of the mucosa covering the cervix and the lower third of the cervical canal. In many instances microscopical sections show so much metaplasia of the malignant cells that it is impossible to say from which class of epithelium the growth originated. From the macroscopical appearances, however, it is justifiable to divide these growths clinically into three classes:

1. *The Endocervical or Medullary Type.*—These tumours originate in the mucosa of the cervical canal and form circumscribed nodular growths, unaccompanied by any external ulceration; the predominant early symptoms are an occasional slight uterine haemorrhage and a scanty vaginal discharge. Vaginal examination reveals little more than an enlarged and somewhat nodular indurated cervix. These growths sooner or later break down, ulceration and disintegration rapidly occur, and the cervix is speedily transformed into a crateriform ulcer, with its apex at the internal os; its walls are thin, hard, and extremely friable. This is by far the most malignant type of the disease; lymphatic infection takes place at an early date, and involvement of the base of the bladder, leading to the formation of a vesico-vaginal fistula, is commonly observed.

2. *The Flattened Ulcerated Type.*—This condition in its early stages is often mistaken for a simple erosion, although it is probable that not infrequently a chronic erosion forms a starting point of the malignant process. These growths occur as flattened superficial ulcers, with hard edges, and granular vascular base. They tend to spread widely over the surface of the cervix, and to invade the anterior and posterior fornices. The rate of growth is relatively slow,

and infection of the lymphatics and parametric tissues is not so rapid or extensive as in the case of Group 1.

3. *The Proliferative Fungating Type.*—This class is characterized by the so-called "cauliflower" growth, which springs from the extremity of the cervix, forming an irregular, fungating, friable mass which sometimes almost fills the vaginal cavity. This class of growth shows comparatively little tendency to invade the substance of the cervix proper, and is perhaps the least malignant of the three types.

Mode of Spread.

The method of spread of the disease has been clearly established, and follows very definite lines. Direct extension occurs by permeation of the lymphatics covering the uterus, of those running through the utero-sacral ligaments, and also, though to a lesser degree, of the lymphatics of the broad ligaments. With this permeation some degree of cellulitis is often associated, so that the peri-uterine induration is generally of a composite character, inflammatory and carcinomatous.

Glandular infection takes place but slowly. As a general rule the iliac groups are the first to be affected, followed later by the sacral glands; as the disease progresses, the lateral lumbar and superficial inguinal glands are attacked. With the associated inflammatory infiltration fixation of the uterus occurs, and there is persistent pain, referred to the lower part of the pelvic cavity; it often radiates into the thighs, and this may be regarded as due to infection of the deeper glands; it is to be looked upon as a strong contraindication to operation.

The symptom which usually first attracts the patient's attention is intermittent uterine haemorrhage, and since the age incidence of the disease corresponds very nearly with that of the menopause, many patients regard the intermittent haemorrhages as being associated with the establishment of the climacteric, and for that reason do not seek advice until the symptoms of a persistent, copious, offensive vaginal discharge and severe pelvic pain are superadded; thus it happens that too frequently, when a patient submits to examination for the first time, the disease is found to have progressed beyond the reach of surgical measures.

Selection of Cases.

When considering the question of radium therapy, cases should be classified into three groups as follows:

1. *Operable Cases.*—The procedure invariably adopted at the London Radium Institute when a case of early operable carcinoma of the uterus presents itself for examination is strongly to urge immediate operation, followed, when the patient has recovered, by a course of prophylactic irradiation. It is not justifiable to advocate radium treatment in lieu of surgical measures, and for that reason no patient is taken for treatment unless she has positively declined to submit to operation.

2. *Border-line Cases.*—This term is used in reference to that class of case in which the extent of the disease and the amount of infiltration and degree of fixity of the uterus are of such a character that the surgeon is unable to declare positively that the condition is operable; and here it is that radium is often of the greatest use, as by its means much of the existing ulceration is healed, the inflammatory infiltration reduced, and the haemorrhage arrested, so that the removal of the uterus can be more satisfactorily accomplished.

3. *Inoperable Cases.*—In these conditions radium will frequently, almost invariably, produce a degree of symptomatic improvement which is unobtainable by any other methods. Haemorrhage is arrested, discharge diminished, ulceration healed, pain ameliorated, and the progress of the disease checked, sometimes almost completely arrested, the patient's general health being improved in every way.

METHODS OF TREATMENT.

Each case must be judged on its merits, and the procedure varied according to the condition present.

1. *Endocervical Type.*

When dealing with cases of the endocervical type, before much breaking down of the substance of the cervix is apparent, vigorous treatment should be adopted. A tube of 100 to 150 mg. activity, screened with 1 mm. of silver, should be introduced into the cervical canal for twenty-four hours, and this may advantageously be supplemented

by the insertion of tiny emanation tubes of about 25 or 30 mg. activity, screened with 0.3 mm. of platinum, into the nodular infiltration of the cervical walls. Three or four such tubes may be used, according to the amount of infiltration present, and should be allowed to remain in position for periods of twelve hours. A definite reaction ensues, and in favourable cases the resultant fibrosis causes shrinking and hardening of the cervical tissue, compressing the invading acini, and inducing disintegration of the contained cells.

It is advisable, at the same time, to supplement this local treatment by radiation of the whole body of the uterus, and the pelvic cavity generally, and for this purpose powerful applicators, screened with 2 mm. of lead, should be applied externally immediately above the pubes and in both iliac fossae, an exposure of twenty-four hours' duration being given. This radiation serves to arrest or retard the lymphatic permeation and general spread of the disease by direct extension from the cervix to the immediately surrounding parts.

2. Flattened Ulcerated Type.

Where the disease is of a superficial ulcerative character better results are obtained by placing the radium applicators in direct contact with the diseased portions of the cervix; it is in these cases that the use of emanation applicators is to be commended, as it is possible with them to concentrate the activity to a very great degree, and to make the applicator of a size and shape exactly fitted to the area treated.

The tubes may be kept in contact by careful packing with gauze, or still better by the use of dental modelling compound. A mould of the diseased cervix is made, and withdrawn, screened emanation tubes are then embedded in it at those parts which will come into contact with the diseased surfaces, and the mould reinserted. The exposure to be given varies with the strength of the tube and the screening employed, though, as a general rule, with screening of 2 mm. of lead, or its equivalent in some other heavy metal, an exposure of twenty-four hours' duration should suffice.

The same procedure with regard to radiation of the pelvic cavity as indicated in the preceding type should be adopted.

3. The Proliferative Fungating Type.

Here it is advisable, before undertaking treatment, to remove as much of the growth as possible by excision or curetting, and then to treat the remains of the cervical stump. This should be accomplished by the insertion of a 100 mg. tube, screened with 1 mm. of silver, into the cervical canal for twenty-four hours, and the use of tiny platinum screened emanation tubes inserted into any remaining outgrowths that may be present. Here, too, the general radiation of the body of the uterus and pelvic cavity should invariably be adopted.

All patients should afterwards be examined at frequent intervals, and the exposures repeated as and when necessary, though it is advisable not to repeat the treatment at intervals of less than five or six weeks. The vaginal mucosa appears to be much more susceptible than the uterine to radium irradiation, and for this reason it is advisable as far as possible to protect the non-infected vaginal mucous membrane by packing, or the interposition of lead and rubber sheeting. Special attention should be paid to the recto-vaginal septum, as unless this protection be given definite proctitis is sometimes produced in very susceptible subjects. The inflammatory reaction resulting from the treatment described is rarely great, but some degree of vaginitis usually appears about a week or ten days after the exposure, and on this account patients should receive a vaginal douche regularly night and morning for four or five weeks after each exposure, in order to prevent the possible occurrence of adhesive vaginitis.

The amount of symptomatic benefit which the majority of patients experience after the treatment is very striking. Haemorrhage is usually arrested more or less completely within a fortnight of the exposure, the discharge is also greatly diminished, the surrounding infiltration lessened, and the pressure symptoms, such as obstructive constipation, and difficulty or frequency of micturition, much ameliorated. In many cases the pain too is greatly relieved, though when due to pressure of enlarged glands on

nerves of the sacral plexus it is not nearly so frequently benefited.

Ultimate Prognosis.

Many instances are on record amongst the case sheets of the Radium Institute in which patients who have come for treatment at a time when the disease was manifestly inoperable and very extensive, have lived for three, four, or five years from the date of their first treatment, and for the greater part of that period have been free, or almost free, from the more distressing symptoms of their complaint. In some cases the improvement, both local and general, has been so great as to induce the hope that the disease had been completely arrested and the patient apparently cured, but unfortunately sooner or later symptoms have appeared indicative of the infection of parts beyond the effective range of radium, and the disease has slowly progressed to a fatal termination.

Recurrence after Hysterectomy.

Patients suffering from recurrence after hysterectomy often do exceedingly well, more especially if treated within a short time of the appearance of the recurrence. The technique adopted is governed almost entirely by its position and shape. If nodular, and situate at the vaginal vault or on the recto-vaginal septum, the actual insertion of an emanation tube, screened with 1 mm. of silver, for twenty-four hours will often bring about disappearance, and recurrence is not very frequent. When the recurrence is situate on the anterior vaginal wall the proximity of the urethra renders the insertion of a tube into the mass a somewhat hazardous procedure, as it might be followed by the production of a fistula, and for this reason the treatment has to be carried out by means of a leaden screened applicator applied in contact with the vaginal surface of the nodule, supplemented by a smaller silver-screened tube applied within the urethra for two or three hours on four or five successive days. In this way fibrosis of the nodule with encapsulation of the enclosed cells is often obtained, and the risk of a vesico-vaginal fistula obviated.

CARCINOMA OF THE BODY OF THE UTERUS.

This condition is much rarer than carcinoma of the cervix, and comparatively few cases have occurred in the practice of the Radium Institute; the total number has not exceeded 2 per cent. of all the cases of uterine cancer treated. In etiology it differs from that of carcinoma of the cervix in two chief particulars—it is more prone to occur after the establishment of the menopause, and is most generally met with in nulliparae.

Carcinoma of the body of the uterus originates in the cells lining the uterine glands, which proliferate, invade, and destroy the submucous and muscular tissues, and at a late stage of the disease may even perforate the peritoneal covering and infect the abdominal cavity. The onset is very insidious, and diagnosis frequently presents considerable difficulty; but the occurrence of slight persistent uterine haemorrhages, with a more or less uniform enlargement of the body of the uterus in an elderly woman, is always strongly suggestive of malignant disease of the body. The exact diagnosis can, however, often only be established by dilating the cervical canal and removing a portion of the uterine mucosa with a curette for microscopic examination.

Hysterectomy for cancer of the body of the uterus gives more encouraging results than in cancer of the cervix. Dissemination does not take place so rapidly, and is rarely very extensive; fixation of the uterus is a very late feature, and its removal is usually easy; for these reasons the prompt performance of a complete hysterectomy should be urged upon all patients directly the presence of the disease has been clearly established. If, however, the patient positively refuses operation, or has not sought advice until a time when the condition is so far advanced as to be inoperable, then radium treatment should be resorted to.

The routine treatment consists of the introduction of a tube of 150 or 200 mg., screened with 1 mm. of silver, into the uterine cavity, the cervical canal having been previously dilated to a degree sufficient to permit of the passage of a tube with ease. The invasion of the uterine walls by the carcinomatous cells renders them extremely friable, and unless great care is taken in introducing the tube, perforation of the wall may quite easily be produced.

The tube should be maintained in position by light gauze packing, and an exposure of twenty-four hours' duration given, the treatment being repeated after an interval of at least two months.

It is advisable in these cases also to give a general external irradiation to the whole pelvic cavity, with powerful applicators screened with 2 mm. of lead applied above the fundus of the uterus and in both iliac fossae.

Recurrences after hysterectomy for carcinoma of the body of the uterus are extremely susceptible to radium therapy, and their disappearance under appropriate dosage may be confidently anticipated.

Prophylactic Irradiation.

Though all workers are in agreement in saying that this procedure is often of great value, great diversity of opinion prevails as to the best method to be adopted.

There are three periods at which prophylactic irradiation may be administered—namely: (1) Five or six weeks before the operation; (2) two or three days before the operation; (3) three or four months after the operation.

(1) *Radiation some five or six weeks before the operation* is of particular use in "border-line" cases with much peri-uterine infiltration of a doubtful character. If properly carried out radiation will often reduce the amount of infiltration very considerably, circumscribing its limits, so rendering them more definitely appreciable, and thus enabling the actual extent of the infection to be more easily estimated. On the other hand, the reduction of the inflammatory infiltration is associated with a certain degree of fibrosis, and this, whilst limiting the spread of the disease, at the same time renders the removal of the uterus a little more difficult, and so lengthens the operation. It is unwise to allow a period exceeding six weeks to elapse between the preliminary irradiation and the operation, for if this time limit be passed the fibrosis becomes very pronounced, and of an almost scirrhotic character.

(2) *Prophylactic Irradiation immediately before the Operation.*—This is of great service in cases of the fungating type. As a preliminary to the main operation as much of the cauliflower growth as possible should be removed by curetting or excision, and a tube of not less than 150 mg. activity, screened with 1 mm. of silver, introduced into the cervical canal two or three days before the operation; an exposure of twenty-four hours' duration should be given. The irradiation obtained in this fashion will suffice to exert a lethal effect on any disseminated cells in the immediately surrounding tissues or lymphatics, but there will not be time for the development of fibrotic changes, which would serve to impede the performance of the major operation. As most of the radiated tissue will be removed by the surgical procedure, only small isolated foci of the disease will remain, and these the radiation will probably have affected so powerfully as to produce their ultimate degeneration.

(3) *Irradiation Three or Four Months after the Operation.*—This should be done as a routine procedure after all cases of Wertheim's hysterectomy for malignant disease, but considerable caution must be observed in its performance. The elaborate and extensive dissection which is associated with Wertheim's operation appears seriously to impair the functions of the trophic nerves of the pelvis, and it is some time before they return to the normal. Too heavy a dose given at too early a date may result in an excessive reaction, with the production of vesico-vaginal or recto-vaginal fistulae. For these reasons, therefore, it is advisable to limit the intravaginal treatment very considerably, not to treat the case until at least three months have elapsed, and then to use a tube of not more than 50 to 70 mg. activity, screened with 2 mm. of lead and rubber, an exposure not exceeding twenty-four hours' duration being given, preferably in two or three periods of twelve or eight hours each. In this way any intense local reaction is avoided, and the possibilities of fistulous formation abolished. A powerful external irradiation may, however, be given with safety, applicators containing 200 or 300 mg., screened with 2 mm. of lead, being applied externally above the pubes and in both iliac fossae, so as thoroughly to irradiate the whole area. The total exposure in this situation may be of from twenty to thirty hours' duration.

REACTION.

The reaction following on treatment carried out in the manner above indicated is not, as a rule, great or severe. There is a considerable difference in the resisting power of the vaginal and of the uterine tissues; the former are much more susceptible; for this reason it is inadvisable to use silver screening if the apparatus is likely to be in contact with the vaginal mucosa for a period of twenty-four hours, as it is possible that, if the tissues have been infiltrated by carcinomatous cells, considerable destruction, perhaps leading to perforation, may occur; lead screening of at least 2 mm. thickness, with a rubber sheath of 3 mm., should therefore be used whenever the exposure is mainly vaginal in character.

If, on the other hand, the tube is to be completely embedded in the cervical canal, this contingency does not arise, and a screening of 1 mm. of silver only may be employed with impunity.

SEQUELAE.

As a general rule patients suffer little pain or discomfort after the exposure. In most subjects some slight degree of congestive vaginitis appears in about a week or ten days, and for this reason patients are advised to douche freely night and morning for four or five weeks after the treatment is finished. If this precaution be not observed some degree of adhesive vaginitis may ensue, and the resulting adhesions may have to be forcibly broken down at a later date, causing the patient considerable pain and annoyance.

In extremely susceptible subjects a slight transient proctitis has been noted, but this is very infrequent, and when it does occur it is always of a mild degree, and speedily yields to routine treatment.

In patients who have received repeated exposures at intervals of two or three months for periods of one, two, three, or more years much fibrosis is induced in the vaginal wall, and the associated contraction narrows the canal very greatly, its diameter being reduced to that of a lead pencil, or even less.

In inoperable cases occurring in women who have not passed the menopause external irradiation applied with the object of retarding the general extension of the disease usually suppresses the ovarian functions, leading to amenorrhoea or the premature induction of the climacteric.

In untreated inoperable cases the formation of vesico-vaginal or recto-vaginal fistulae is an almost invariable phenomenon in the later stages of the disease; radium treatment properly administered serves rather to retard the appearance of these fistulae than to hasten their development. An excessive prophylactic dose administered too soon after the performance of Wertheim's hysterectomy may, however, induce a reaction of such degree that much breaking down of the recto-vaginal and vesico-vaginal walls may be induced, and fistulae established; it is for this reason that the precautions previously alluded to when speaking of post-operative prophylactic irradiation should be strictly observed.

GENERAL TREATMENT.

Douching after radium treatment should be carried out as a matter of routine, and is best performed by means of the ordinary douche-can with a soft rubber nozzle; the use of a ball enema syringe should be strictly interdicted. Glycothymoline—one part in twenty of warm water—is soothing and cleansing; lysol, tincture of iodine, and sanitas are also of great value when there is much offensive vaginal discharge; in some cases a weak boracic lotion or solution of potassium permanganate will suffice.

In cases of long standing, where there is pronounced infection of the parametric tissues and the pelvic glands, pain is generally a constant and distressing feature, and it is often difficult to find a means of combating this symptom. Aspirin, phenacetin, pyramidon, and other analgesic synthetic compounds should be freely tried before resorting to the use of opiates, but in many cases a cachet containing 4 grains each of aspirin, phenacetin, and pulv. ipecac. co., administered in a glass of hot milk at bedtime, gives great and immediate relief, and ensures the patient a comfortable night's rest.

As an adjunct to radium treatment, injections of colloidal selenium often prove of considerable use, as they serve to diminish the pain and tenderness, cleanse the ulcerated

surfaces, and cause a decrease in the amount of discharge. The procedure usually adopted is to give a dose of 5 c.cm. intramuscularly every fourth day until six such injections have been given. A further series of six at seven-day intervals is then administered, and a period of one week permitted to elapse, during which the patient receives the radium treatment. The majority of patients tolerate these injections very well, but in a small percentage of cases a definite systemic reaction is observed, patients complaining of pain at the site of injection, with sickness, headache, and a slight rise of temperature; if these symptoms are at all pronounced they must be regarded as a contraindication to the continuance of the treatment.

THE TREATMENT OF ACUTE PYOGENIC INFECTION OF THE KNEE-JOINT.

BY

A. H. SOUTHAM, M.A., M.Ch.Oxon., F.R.C.S.Eng.,
RESIDENT SURGICAL OFFICER, MANCHESTER ROYAL INFIRMARY.

ACUTE pyogenic infection of the knee-joint may arise as the result of a wound of the joint, by extension of inflammation from a neighbouring focus, or in conditions such as septicaemia and pyaemia where the organisms gain access to the joint from the blood stream.

The treatment recommended in the older textbooks was by making vertical incisions on either side of the patella and inserting drainage tubes into the joint. This was often followed by disastrous results, the infection tracked along the fascial planes up into the thigh and down the calf, where, later, secondary abscesses had to be incised, whilst the patient's general condition steadily deteriorated and amputation had finally to be performed as a life-saving measure.

It is not going too far to say that the presence of a drainage tube in the knee-joint almost inevitably ends in disaster. It acts as an open drain for the entrance of secondary organisms from without, and as a foreign body in the joint which serves to keep the inflammatory process active. Further, from a study of the anatomy of the knee-joint, it will be apparent that attempts to drain the joint must be inefficient.

The synovial membrane lining the knee-joint has, like the peritoneum, considerable power for overcoming septic infection when placed under suitable conditions. But it must be remembered that the virulence of organisms is much greater when they are contained, under pressure, in a closed cavity such as the acutely inflamed and swollen knee-joint. For the successful treatment of acute arthritis, therefore, it is necessary to place the synovial membrane under the most favourable conditions, and to lower the intra-articular tension and keep it so reduced without the use of drainage tubes. In mild types of infection this can sometimes be accomplished by aspiration or by incision and lavage, followed by suture of the joint, but in acute pyogenic infection this often fails, the joint fills up again and again, and it becomes obvious from the patient's general condition that something radical must be done.

During the war the treatment of acute suppurative arthritis of the knee furnished one of the most difficult problems of surgery. In the early days it was said¹ that surgeons were impotent to prevent the loss of life or limb in these cases. Later, with improved methods and greater knowledge, better results were obtained, though, in many cases, it was impossible to overcome the infection, and amputation had to be resorted to.

Willems, the Belgian surgeon, suggested treatment² of these cases by active movements on the part of the patient to provide free drainage after incision of the joint. But it is difficult to persuade patients to move an acutely inflamed joint, and I have had little success with this procedure. It is, I think, open to question whether it is advisable to start immediate movement of a joint infected by streptococci in a patient who is already in an acutely toxic condition. As a result of experience gained in the war I have adopted the treatment here described in cases of acute pyogenic infection of the knee-joint, arising from general causes, with satisfactory results. The patients have been left with a useful limb and a movable joint. The number of cases is so limited that I would not presume to draw definite conclusions, yet the method seems worthy of

further trial; it is simple, and the after-treatment and dressings are reduced to a minimum; it has, in my hands, given more satisfactory results than can be obtained by other methods of treatment.

In 7 cases it was successful, the patients having left hospital with movement in the joint which was steadily improving. The last case, one of acute osteomyelitis of the tibia and pyaemic infection of the knee-joint, proved fatal from generalized pyaemic abscesses and pericarditis. *Post-mortem* examination of the knee-joint, two weeks after the operation, showed the joint structures to be healthy, and no pus was present in the joint, the acute condition having completely subsided.

Method of Procedure.

Operation should be immediately carried out when pathological examination of the fluid withdrawn from the joint shows that pus cells and pyogenic organisms are present.

Under general anaesthesia the knee-joint is opened by two lateral incisions, on either side of the patella. These extend from the head of the tibia to the upper limit of the subcrural pouch. A tourniquet may be used, or the bleeding points, which are numerous, may be caught in artery forceps; these forceps can be removed later, no ligatures being necessary.

The joint is then thoroughly irrigated with hot saline solution, by means of a Higginson's syringe. Every corner of the joint is explored with the nozzle of the syringe and the knee is flexed and extended to ensure thorough lavage. The irrigation should be continued for ten minutes. The synovial cavity is then dried with lint swabs soaked in ether and held in artery forceps. When this has been completed a small quantity of bipp is applied systematically to the articular surfaces and synovial membrane lining the joint. No sutures are used, the lateral incisions being left open for drainage.

About a dozen turns of broad gauze are then wrapped round the joint, plenty of wool and a firm bandage being applied over this. A strapping extension is fixed to the leg and the limb placed in a Thomas splint, with the knee slightly flexed. The patient is then returned to bed and a light weight applied to the extension.

The temperature usually falls about the third day and the patient's general condition rapidly improves. The dressing is not changed till the fourteenth day, when a fresh one is applied, a little bipp being at the same time rubbed over the lateral incisions. The acute symptoms have usually completely subsided by this time; the splint is now removed and the patient encouraged to move the joint. Massage accompanied by active and passive movements is carried out, and the patient should start walking, when the conditions permit, as early as possible. The dressing is changed about every seven days or as required.

The lateral incisions remain healthy and clean throughout, though it is usually several weeks before they are healed. Probably if secondary suture was adopted this stage might be considerably shortened.

CASE I.

C. D., a miner aged 21 years, was admitted to the Manchester Royal Infirmary on November 3rd, 1920. He stated that whilst working in the mine on October 27th he knocked his right knee against a sharp stone; the knee swelled up and he had been treating it at home. He was found to have a dirty ragged wound on the inner side of the knee, which opened into the joint, from which pus could be expressed. Bacteriological examination showed that streptococci were present. The temperature was 103° F. and the pulse 130.

The knee was treated on the lines described. The temperature fell to normal on the fourth day. When the wounds were dressed on the fourteenth day a small abscess was found in the calf; this was incised. The temperature remained normal throughout, and he was discharged from hospital on January 15th, 1921. The knee could then be flexed to a right angle, the joint was normal in size, and the wounds nearly healed. I have seen the man constantly since; he walks well and has a good range of movement in the knee-joint.

CASE II.

P. A., a butcher, aged 32 years, was admitted to the Royal Infirmary on September 27th, 1920, with a compound comminuted fracture of the right tibia and fibula, the result of a street accident. The wounds became badly infected, and several operations were performed on the leg. His progress was satisfactory till January 8th, when he suddenly had a rigor and the temperature reached 104° F. The rigors continued,