

RHEUMATOID ARTHRITIS*

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THERE were over 12,500 hospital days for rheumatoid arthritis in our service in Banff in 1942. Some of the patients were admitted twice or more. According to Comroe, the disease "is more common than the total number of cases of tuberculosis, diabetes, cancer and heart disease combined". The etiology of rheumatoid arthritis is unknown. The causes may be many. Comroe says,

"It is probable some as yet unidentified microbe plays a rôle in its etiology. Many other factors may contribute, or prepare the soil for such infection: these include heredity, poor environment, trauma (whether accidental, occupational, recreational, etc.), dietary or vitamin deficiency, associated diseases, psychic shock, worry, etc. This is purely theoretical as there is no definite proof that any bacteria cause this disease."

Steinbrocker defines rheumatoid arthritis as

"A systemic disease of undetermined origin, characterized by inflammation of articular and periarticular tissues which may lead to deformity and ankylosis. The cause of these changes has not been definitely established, although impressive evidence of the infectious nature of the disease has been advanced. The condition has sometimes been called 'atrophic arthritis' because of the atrophy of muscles so frequently seen in severe or advanced cases. It has also been termed 'arthritis deformans', owing to the characteristic deformities developing in the terminal stages. Often however, rheumatoid disease is arrested before these later stages appear in any marked degree."

In taking a history of a rheumatoid case, one usually discovers that the patient was never in her life very robust, while having no special complaint. She will tell you that the first sign she noticed was when one or more joints in her hand or foot or elsewhere became swollen and tender. If in the hand, the offending joint was usually one of the proximal interphalangeal joints and the swelling was fusiform in shape. This is the usual history though really any joint may be the first one affected. The swelling and

soreness stay for a while and then gradually go away, leaving maybe a thickening about the joint along with some stiffness. The next attack may affect multiple joints, fingers, wrist, ankles, feet: then knees, elbows, shoulders, hips and even the spine may be involved. Any or all of these joints may be affected at one time. The patient wakes up one morning with a real attack of arthritis which may simulate acute rheumatic fever. All of these attacks seemed to be separate entities but in reality the disease process was continuous since the involvement of the first joint.

Now we have a well established disease and as it progresses we find more definite signs and symptoms. The patient becomes mentally and physically ill. There develops a sort of transparency of the skin, moist, cold, clammy palms and soles, or sometimes hot, moist palms, numbness of the hands and feet, general weakness, atrophy of the extensor muscles and of the intrinsic muscles of the hands, subluxation of the joints of the fingers with ulnar deviation

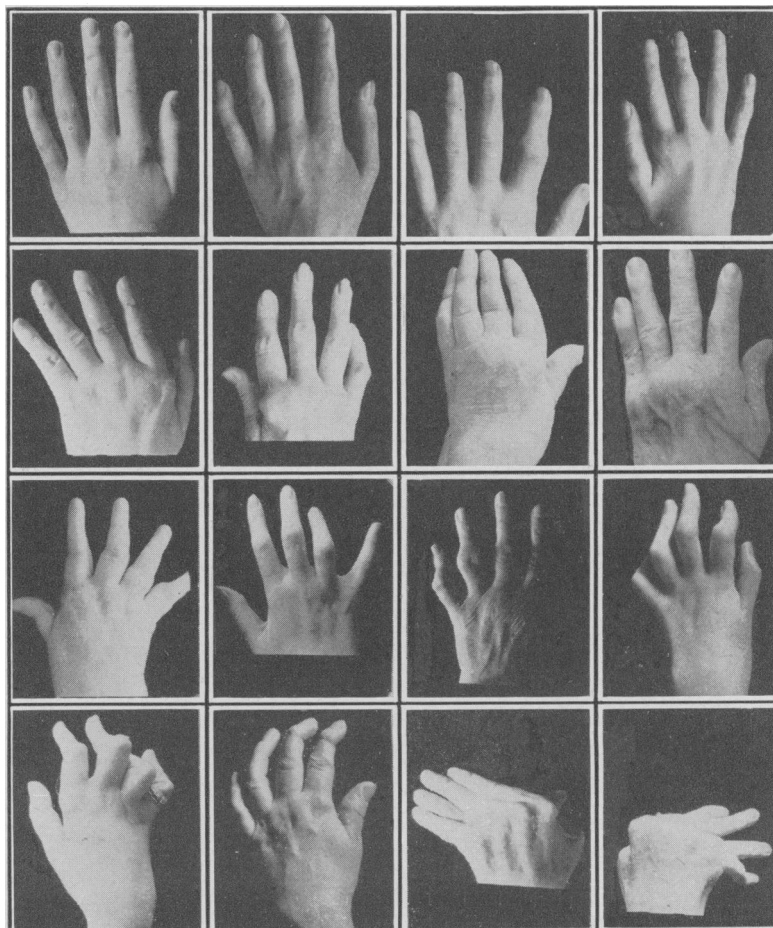


Plate I.

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and limitation of the movements. It is not only in the small joints one notices these changes. The shoulders, hips, knees and spine may be affected. During the acute exacerbation, all the sore joints may be kept flexed for comfort and it is then that the extensors atrophy and the joints in time may become more or less fixed in these new positions. The position of the joints should be changed often and splinted in the best position if necessary to prevent deformity. Weight-bearing should never be allowed on joints during an exacerbation. Patients should be kept in bed. Rhythmic exercises should not be allowed at this time nor should the patient be allowed to knit or crochet. It is dangerous advice to give a patient with sore joints to keep going on them as long as she can, "so that the joints will not get stiff".

In the terminal type there is ankylosis of some joints in good or bad position, (depending on what sort of care and treatment the patient has had) with marked muscle atrophy. The patient is more or less resigned to her fate and lies in bed or is carried for a change to a chair. She is often not able to do anything for herself as her wrists and hands may be ankylosed and deformed, with ulnar deviation and subluxation of the fingers. The skin of the extremities becomes glossy and smooth, the thenar and hypothenar eminences reddened and there is atrophy of the intrinsic muscles of the hands and feet. Later on there is so much atrophy of the muscles of the arms and legs that even if the joints have retained some mobility, the muscles are not strong enough to move them and they lie constantly in the easiest position until they become ankylosed. Reference to treatment will be made later.

Differential diagnosis from osteoarthritis.—Most rheumatoid cases are sick looking and worried. When once the disease has been diagnosed it worries them to think of the future when they come in contact with many advanced cases. Osteoarthritic cases generally are healthy and robust looking. They are not particularly worried but they have pain which they think of as "rheumatics". They believe if their one or two sore joints are attended to they will be all right again.

Rheumatoid cases are more susceptible to windy weather and osteoarthritis cases dread cold, damp, changeable weather. Osteoporosis is noted early in rheumatoid films and there is

absence of other bone damage. The disease commences in the peripheral soft tissues and works inward. In osteoarthritis the disease commences in the centre of the joint and works outward. X-ray changes are seen early when nature tries to preserve the surface area of the joint by widening the joint at the edges with bony growth. Decalcification is only noted in osteoarthritis after a long period of non-use due to pain. Small joints are usually affected first in rheumatoid, though any joint may be affected. Knees and hips are commonly involved.

In osteoarthritis weight-bearing joints are generally attacked, namely, hips, knees, spine and shoulders. Heberden's nodes are commonly seen on the terminal phalangeal joints though these are not weight-bearing joints.

In rheumatoid, the proximal interphalangeal joints are most commonly affected. In osteoarthritis the terminal joints of the fingers are attacked. Rheumatoid deforms and cripples early: osteoarthritis late. The erythrocytic sedimentation rate is usually high in rheumatoid arthritis and normal or slightly increased in osteoarthritis. During a resting period in rheumatoid the rate may be much lower than during an exacerbation. Rheumatoid advances by a series of exacerbations and recessions, progressing further with each exacerbation.

At times it is almost impossible to distinguish between an acute exacerbation of rheumatoid arthritis and an attack of acute rheumatic fever. Certainly in taking a history of a rheumatoid case one cannot be sure whether a previous attack was acute rheumatic fever or an acute stage of rheumatoid arthritis.

True rheumatoid cases will usually tell you that they were never very robust but were fairly well until this disease started. Osteoarthritic cases will tell you they were never ill a day in their lives until this struck them.

Climacteric cases also have usually been very healthy until the arthritis started. They resemble rheumatoid cases otherwise and respond to the same treatment in about the same way.

TREATMENT

All cases on arrival at this clinic and after diagnosis, are started on mixed staphylococcus and polyvalent streptococcus vaccine (Crowe). The most satisfactory dosage is arrived at after several doses have been given and the response or reaction noted. A relatively large dose is

given at first and then each time if there is reaction the dose is reduced until maximum response is secured.

Rest.—This is probably the most important basic therapy in rheumatoid arthritis. Weight-bearing should not be countenanced on inflamed joints. Many patients arrive here physically and mentally ill. They are weak and hectic, and act and feel as though they had an elevated temperature. Usually there is no rise in temperature when judged by the thermometer but there is a rapid sedimentation rate. Hands and feet are cold and clammy, skin transparent, extremities smooth and glossy and there is numbness (pins and needles) in feet and hands. There is atrophy of muscles and probably flexion deformities of legs and arms. Joints are sore and muscles are kept tense to prevent movement of the joint, which causes pain. Splinting of joints allows the muscles to relax and thus lessens the inflammation. Rest in bed does the same thing for the weight-bearing joints. Inflamed joints are very similar to hot bearings in machinery. Bearings are lined with babbit which is the counterpart of the cartilage in the joint. When the bearing becomes hot the babbit liquefies and runs out and the bearing knocks and is destroyed. When the joint becomes hot the cartilage does almost the same thing and may disappear from the joint in a short time. The problem in both cases is how to prevent the damage to the bearing or joint, and how to prevent the lining from liquefying and "running out". The motto is, "Don't run a bearing when it is hot and don't exercise or bear weight on a hot joint".

If splints are used they should be removed daily for movements of the joints which may be accomplished by gently lifting the limb from the cast or splint and moving it throughout its course. It is then replaced in the splint until the next day. These movements are not done until the patient has been under treatment for a time and the joint pain is subsiding.

Diet.—Patients are fed on a nutritious diet supplemented by a multiple vitamin capsule. If there are signs of specific vitamin deficiency that particular vitamin in concentration is added to the list. Nicotinic acid and cevitamic acid are two that are frequently added, especially during gold therapy. Iron is required in most cases and is given in full doses. We eliminate sweets, condiments and fried foods

from the diet. Otherwise almost anything is allowed within reason. If a patient is underfed we try to build her up. If overfed we try to reduce her weight.

Infections.—It is our custom to wait for the removal of foci of infection until the disease has quieted down under regular treatment: suspected foci should always be attended to at that time. The disease should be as nearly quiescent as possible.

Physiotherapy.—At the Banff Springs Hospital there is a hot mineral pool kept at the temperature of about 101° F. As patients improve and are allowed on their feet, they may go to the pool in place of the mineral bath tub. They do this daily. It is found that the heavier water supports the body, relaxes the muscles and makes movements, including walking, much easier. Thus, the baths apart from any medicinal value they may possess, are very useful for allowing increased movements without pain. Patients comment on the increased movement without pain they get in the pool.

Psychological therapy.—This brings us to an important angle of treatment. Most arthritic patients are not the very depressed individuals some would have us think. True, they do have spells of depression (as do other people) but we have found them to be on the whole optimistic and happy to a surprising degree. It is most important that we who look after them do our best to keep them happy. If, on admission, we can impress them that we are interested in them and that we are going to do our best to help them get well again, they are very grateful. Hope revives when they find someone willing to give them a helping hand. The fortitude of these patients is amazing to me. At the Banff Mineral Springs Hospital there is a bright young sister who goes about among the patients spreading cheer and happiness. This helps to keep the patients interested and satisfied during their long stay in hospital. Once a month or so there is a "bingo" game for the patients. Those who are well enough to play come to the game walking or on crutches or on a wheel chair. At Xmas and Easter a Banff choir brings its special music for the benefit of the patients. Also there is the odd showing of movies or stills of the Rockies.

The rôle of these things in the building of morale cannot be overestimated. Patients hear of Banff from former patients who have been benefited here and also through their doctors

who have information on the treatment at Banff. It is a place where rheumatism sufferers came long before there was any special medical attention here. They leave all home responsibilities behind them and we try to bolster their determination to get well. They are told that there is no short cut to health: that their disease in most instances is one of long standing: that there may be a great deal of irreparable damage done. They are told that when the disease becomes quiescent, the joints in which the cartilage has gone may be covered with a tough connective tissue which may act in place of the cartilage and give them some use of the joint again. We explain to the early case that she may get entirely well; to the later case that she may be free of pain and have more freedom of movement and be able to carry on again in comfort; to the advanced case that she may be freed of pain and might even get the use of her legs again, though the cartilages will not return and the use will be limited. We make no promises but tell them that we will help them and that they must cooperate with us fully. Between us we will see how much improvement we can get.

Gold.—All cases on arrival at Banff are given a thorough physical examination, also full blood count and the erythrocytic sedimentation rate is done along with x-ray and urinalysis. The erythrocytic sedimentation rate is repeated every three weeks and the urinalysis every week prior to the gold injection. If possible every case with an increased sedimentation rate is started on myochrysin. The first dose is ten milligrams, the second fifty milligrams and the third and all succeeding doses one hundred milligrams, given at weekly intervals until a maximum of one and one-half grams have been given. After this the patient is given a month or six weeks at home to attain the full benefit of the series.

Gold is present in the system in quantities until a month or more after a series is given. It is stated that traces may be found in the urine six months afterwards. One series of myochrysin injections is often not enough to complete treatment and it is wise even in early cases to have two series. Certainly if the sedimentation rate is still up after the first series, two series or more are absolutely essential. This brings up the economic problem. It will be well to remember first, that gold treatment should be given with the patient at rest in an

institution and in bed most of the time. Urine tests have to be made weekly and sedimentation rates monthly. Second, gold is given over long periods of time. The average case should in the first series get one and one-half grams and this requires four months. Many cases here are not able, because of the cost, to stay for one complete series when in reality they need several series to get the maximum benefit. The cost of hospitalization is prohibitive for the average person, the lowest rate requiring \$150 per month and many people cannot afford that amount over an extended period.

Under these circumstances no list of statistics will give a true idea of the value of myochrysin. Most of the early cases get entirely well after regular treatment supplemented with chrysotherapy. This does not mean that they just get a temporary recession between exacerbations of the disease. It means that they become free from all signs and symptoms and the sedimentation rate becomes normal. One series may be enough to do this in some cases, though in most cases and certainly in later cases, more than one series is needed. If there are no complications and the urine is normal the doses are given regularly each week at one hundred milligrams after the first two weeks. Contraindications are nausea, dermatitis, diarrhoea, stomatitis or swelling and irritation of the face. It is impossible in most cases to anticipate toxic reactions. They may appear after only one or two doses or may appear for the first time after the patient has gone home following an extended treatment. The commonest forms of toxic reactions are dermatitis and stomatitis. Some form of skin irritation is very common during the course of injections. Only the odd case develops into a true dermatitis which may become very serious.

One case of serious dermatitis exfoliativa came on shortly after receiving one hundred and sixty milligrams of gold. She became ill and developed a high temperature which remained for days. Her face was swollen and eyes inflamed and almost closed. Lips were swollen and sore and mouth was affected throughout. All the mucous membranes and skin on her body seemed to be thickened and inflamed. The skin was covered with scales which shed over everything. She was most depressed. Calamine liniment was used generously and she was given large doses of nicotinic and cevitamic acid. She recovered after three weeks. Of course her gold injections were stopped as soon as she began to show signs of general dermatitis.

We have had six cases of dermatitis exfoliativa with no serious end results.

This serious case of exfoliativa developing after three doses of gold shows that the amount

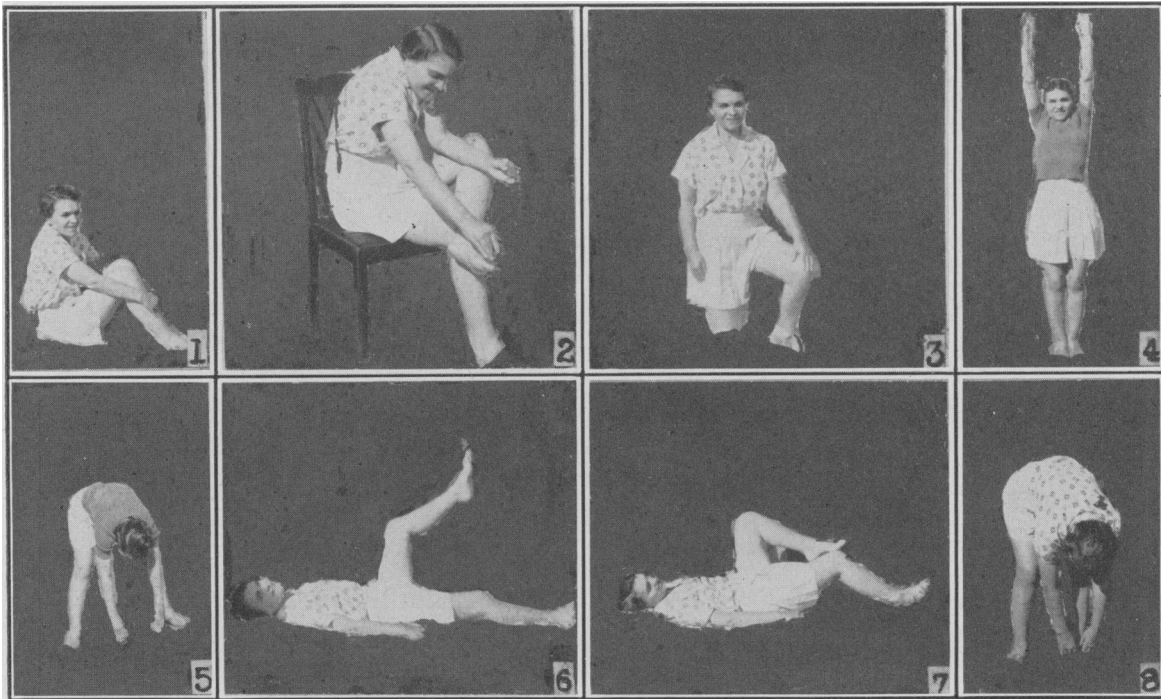


Plate II.—September 20, 1940. (1) Jack-knifing. From July 23, 1933 to November 6, 1937 (breaking down of adhesions) could not touch knees. (2) Right fingers on left foot but not both hands. Could not cross ankles before. (3) Full weight on one knee. Movement in hips. (4) Knees locked, shoulders free. (5) Twenty-three inches between heels. (6) Separate hip movement and muscle control. (7) Hip and knee freedom. (8) Reaching down to feet.

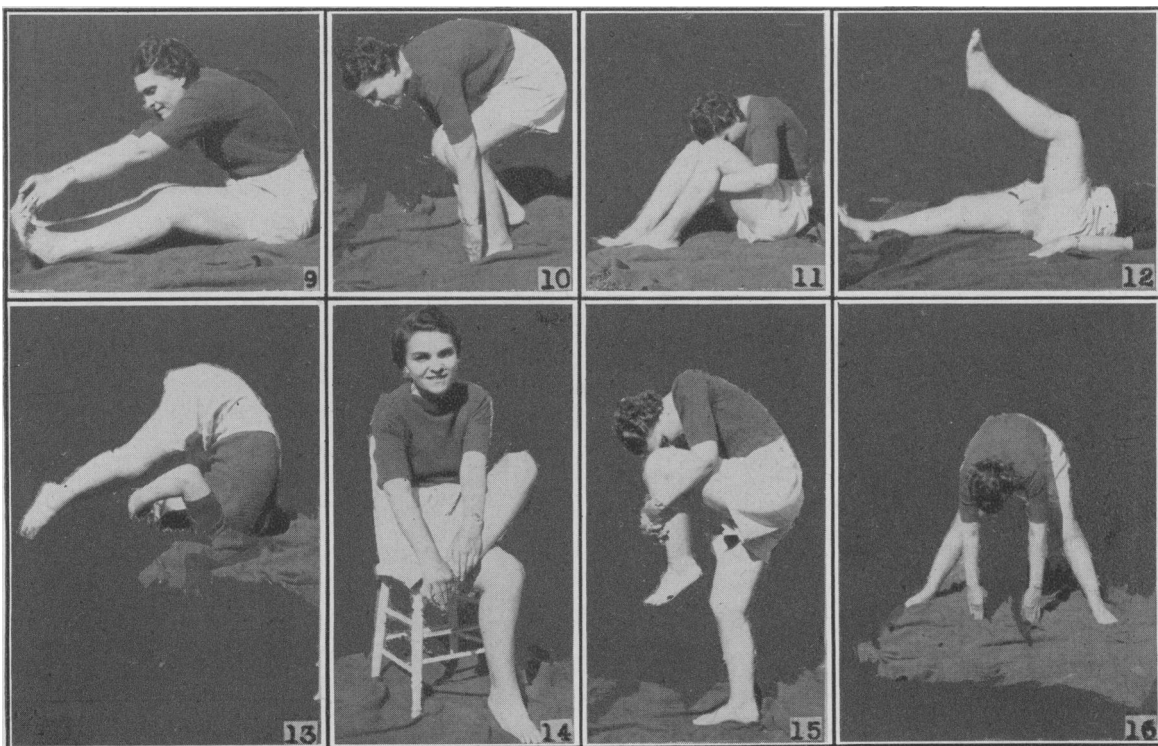


Plate III.—April 16, 1941. (9) A good stretch. (10) Balance and muscle control. (11) Jack-knifing, marked improvement in 7 months. (12) Separate hip movement and muscle control. (13) Strength of muscles, specially abdominal and nape. (14) Both hands on foot, greater knee and hip action. (15) Balancing on one leg. Muscle co-ordination. (16) Thirty-four inches between heels. Eleven inches in seven months.

of gold given is not in direct relationship to the severity of the reaction. Gold is apparently toxic to some people just as is arsenic or sulfanilamide. The patient above mentioned left here and went home. Several months later she died from a cerebral hæmorrhage. Sending the history sheet down to the doctor who did the post-mortem examination, we enquired as to whether there might have been some connection between the death and the previous attack of exfoliativa. The doctor stated that he did not think the hæmorrhage had anything to do with the dermatitis as she had completely recovered from that. This is the only case in our history in which there seemed to be any question of a serious ending to a case of exfoliativa.

Chrysotherapy has improved our treatment of rheumatoid arthritis more than any other single remedy. Nevertheless our treatment would fall far short if gold were the only form of therapy used. All cases are not suitable for gold. For instance some have major kidney trouble or a history of serious skin eruption. Some are terribly anæmic and have to be built up before they can take gold. After the first dose of ten milligrams there may be a toxic reaction and it may have to be stopped. This reaction may be pain in the stomach, nausea, headache or may be vomiting and diarrhœa. These cases are limited to general treatment including vaccine. It is stated in many quarters that chrysotherapy should not be exhibited in cases of pregnancy. I have yet to find any logical reason for this. Of course there is an extra load on the kidneys during pregnancy but if the same precautions were taken as in all cases I do not see why one should not carry on. As a matter of fact I have given it in pregnancy for fairly long periods, not knowing the patient was pregnant, without any untoward result. However, one would like to hear of other experiences regarding this.

Manipulation.—When joints are already deformed one has to wait until the disease is more or less quiescent, or under control, before using methods to improve the deformities. Where there is no ankylosis, movement may be increased by moving the joint through its full possible course and slightly increasing this possible movement daily. If this fails then it may be manipulated under general anæsthesia. It is always wise to do too little rather than too much while manipulating a joint. After mani-

pulating the joint and increasing the movement a cast or half cast should be applied to hold the leg in the improved position. This manipulation may have to be repeated several times to get the greatest amount of movement and the best position. After manipulations new casts are required each time. Casts are left on for forty-eight hours and then removed for easy exercise and replaced daily. If the joints are already ankylosed then it must be decided by the surgeon what action if any should be taken to correct them.

We wish to report a case of rheumatoid arthritis in a woman in her thirties. On coming here she brought an x-ray report which read as follows: "Osteoarthritis of both hip joints, right worse than left. Would judge there is complete destruction of articular cartilages with fixation of both joints."

This case demonstrates how easily one may mistake rheumatoid arthritis for osteoarthritis if one is judging by the x-ray film alone. Physician and x-ray expert must work together. Clinically this was a case of rheumatoid arthritis. Fingers of both hands were subluxated, with fixed joints of hand and wrist. Hands and feet were cold and clammy. Knees extended fully would flex 40 degrees: adductors of the thighs were contracted and drew the legs close together so that the heels could be separated only eight and a half inches. Both hips moved together: that is if one thigh were raised up the whole body along with the other thigh came up with it and there was only the slightest movement at the hips. She had not been able to touch her knees with her hands for seven years. If she were stood on her feet she could walk a little but could not sit down at all. She could not cross her ankles.

We present two sets of pictures taken in 1940 and 1941 to show the amount of improvement gained since she started treatment here in 1937.

Her treatment in 1937 started with general treatment fortified with Crowe's vaccine. This included hot mineral baths, rest, movements, etc. In 1939 gold was added to the armament.

As her condition became more or less quiescent, joints were loosened up under anæsthesia and a number of manipulations done. To hold what we had gained by manipulation her legs were put up with a sling under the knee and one under the ankle and foot. Pulleys were arranged so that when she drew up her knee,

her hip would flex and her foot would drop down, causing flexion of the knee. This gave the same action as riding a bicycle upside down. In this way, without weight on the joints she was able to exercise slowly and easily as everything was balanced. Later on she made the same movements in the hot mineral pool and later still on a bicycle in the physiotherapy department. She developed a great deal of movement in this way and still gave the joints a chance to heal. In 1940 according to the pictures she was able to separate her feet 28 inches and in 1941 30 inches had been gained.

SERIES OF CASES

We now submit a report on two hundred cases of rheumatoid arthritis treated with chrysotherapy at the Banff Mineral Springs Hospital during the past several years. All the cases were typical rheumatoid or atypical cases which were diagnosed as rheumatoid arthritis, along with several cases of spondylitis ankylopoietica and other cases of mixed arthritis-rheumatoid and osteoarthritis combined.

Early cases of rheumatoid arthritis often become free of symptoms and signs after one series of gold therapy. Others need two or more courses. Some cases with fixed joints arrived here with very little pain and apparently quiescent. However on taking the erythrocytic sedimentation rate it was found that the disease was still active. Gold helped them. If the disease has run its course and is burnt out, gold therapy would not be indicated.

Early cases are those with fusiform swelling of one or more proximal interphalangeal joints. They are able to work and carry on and have very little disability. While under treatment in hospital they were mostly in bed.

Medium cases are those in whom the disease is well established, with several or many joints involved and painful: may have contractures. They are able to work at times and get around with or without crutches. They stay in bed while under treatment.

Late cases are crippled and helpless. They are in bed most of the time. They may be carried to a chair but can do very little for themselves. They remain in bed while under treatment.

In 1939 16 cases received gold therapy averaging 500 mgm.

In 1940 23 cases received gold therapy averaging 1,210 mgm.

In 1941 46 cases received gold therapy averaging up to 2,940 mgm.

In 1942 71 cases received gold therapy averaging 1,000 to 1,500 mgm.

In 1943 44 cases received up to May gold therapy averaging 1,000 to 1,500 mgm.

Of the cases reported approximately 25% are considered cured. In this 25% are patients from all three stages of arthritis. Cured in this sense means free of pain and discomfort for those in the advanced class: freedom from pain and freedom of movement of joints in the medium class and ability to resume a more or less normal life. In the early class it means freedom from all signs and symptoms. In all classes it means a normal sedimentation rate and no further progress of the disease at this time. Many in the late class are able to walk again after many years. Most in this series have required two or more series.

Approximately another 25% were greatly improved, and if they could have had other series of gold they would be very likely in the cured class. They also come from the three classes of patients. They are not entirely free from pain and the progress of the disease is not entirely arrested. The economic factor enters here.

Approximately another 25% of all cases reported show some improvement but have gone away before the condition was satisfactory. Some of these have suffered for years and came here prepared to stay a month and hoped that they would then be well, whereas they should probably have been here off and on for several years.

Twenty-five per cent were not helped for various reasons. Wrong diagnosis in some, lack of co-operation, limitation of gold therapy because of other disease or toxic reactions may all have had something to do with the result. However, we do think that some cases of rheumatoid arthritis are not helped no matter what therapy is used.

Many cases of apparent rheumatoid arthritis are climacteric or arthritis commencing at the climacteric. They might be true rheumatoid and then again probably some of those which do not respond to gold therapy might be helped by gland therapy. The true rheumatoid cases seem to respond to gold therapy better than any of the doubtful ones. We use gold in all cases having a high sedimentation rate. Twenty-three of all the cases reported have had two or more series of gold. This appears to be a small percentage, but hospitalization is ex-

pensive and it is very difficult for most people to find the money for return visits of several months. This is where the government should step in. Arthritis and rheumatic diseases are so prevalent and yet there is no legislation passed to help in the diagnosis and treatment of these cases.

SUMMARY

1. Most cases of early rheumatoid arthritis, under one year's duration can be arrested and apparently cured by proper treatment.

2. In later cases, both moderate and severe, the disease may in many instances be brought to rest: further pain and crippling was stopped and some improvement in deformity noted.

3. Rheumatoid hips are sometimes mistaken for osteoarthritic hips, especially when the diagnosis is made by x-ray film alone.

4. Gold is a useful addition to our equipment for fighting rheumatoid arthritis. Good judgment must be used in its employment because of its toxicity.

5. Gold should be given only while the patient is in bed, preferably in an institution where she can be kept under daily, regular supervision.

6. The outlook for chronic arthritis cases is brighter than for almost any other chronic disease.

7. Legislation should be brought in to assist in the hospitalization of these cases. Rheumatoid arthritis is probably the greatest disabling condition with which we have to contend.

How rapidly flies will multiply when conditions are favourable is shown in a report by Dr. J. A. Charles, medical officer of health, Newcastle-upon-Tyne. Following an air raid on a railway goods yard, water used to extinguish the fire made a compost of flour, sugar, and fat which became widely dispersed in the nooks, crannies, and crevices of the buildings and provided an excellent breeding place for flies. "Within 14 days of the fire the whole of the centre of Newcastle was invaded by hordes of *musca domestica*, which were found at distances of as much as half a mile from the central breeding ground. In some houses the plague was so great and the importunity of the insects so persistent that to drink a cup of tea under reasonably hygienic conditions it was necessary to use a straw under cover, or a saucer as an umbrella."—*J. Roy. Inst. Pub. Health & Hyg.*, November, 1943, 7.

HEREDITARY ACHOLURIC JAUNDICE IN THE RAT

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THERE appears to be no record of hereditary jaundice among animals other than man, except in a new mutant strain of albino rats in which jaundice is evident at birth or shortly afterwards and persists throughout the life of the animal (Gunn³). This mutation was observed for the first time in the breeding stock of the rat colony of the Connaught Laboratories in 1934. Three young of a litter of thirteen rats, whose parents were apparently normal albino rats, were found to have a definite yellow tinge. The proportion of the litter affected, together with the normal appearance of the parents, suggested the possibility of this being a recessive mutation from two hybrid parents. This stock of rats is of Wistar origin among which Dr. Helen King has no record of such a mutation (King and Castle⁴).

The chief causes of yellow coloration of mammalian skin are those grouped under blood pigments, bile pigments, carotene, melanin, and lipids.

The yellow pigmentation in mutant rats was found to be inherited as a recessive character similar to carotinæmia in rabbits, and as the body fat of both mutant forms was found to be yellow in colour, specific tests were carried out to differentiate the two mutations. Tests for carotinoid pigment in the rats were entirely negative (Palmer⁵), while the van den Bergh test, which is specific for bilirubin, was found to be consistently positive.

Jaundiced rat serum is golden yellow in colour in contrast with the pale, straw-coloured blood serum of normal rats. Differential tests were carried out to determine whether the jaundice was obstructive, toxic, or hæmolytic in origin.

MANIFESTATIONS OF ACHOLURIC JAUNDICE

1. *Absence of bile in the rat urine* (Table I).—Urine was collected from jaundiced and normal adult male rats which were maintained under identical conditions with respect to housing and diet. Tests for the presence of bile were negative in both control and jaundiced animals. Similarly, the urine of hybrid rats,