as its center, such hospitals to be under the management of trustees, who, it is to be hoped, will take their duties much more seriously than do most trustees of today.

It will probably be objected that this will involve the treatment of all patients in institutions but this will not of necessity result unless it be thought desirable. There is no substantial objection to the hospitals' staff making visits at any reasonable distance without loss of the important advantages of medical grouping. It does not even seem to me impracticable to conduct country practice in sparsely settled districts upon a hospital basis. It would seem to me entirely feasible to use the towns and smaller cities as centers from which medicine should radiate. The younger members of the organization would do the work in the outlying districts, living there if necessary, but always keeping in close touch with their hospital center, and being promoted as experience and opportunity should dictate. It would thus come about that the younger practitioners would have thrown upon them the more laborious work, while the older members of the group would occupy the positions requiring rounder judgment and fuller development but neither the activity nor the enthusiasm of youth. We might in this way preserve all that is best in competition for that scientific achievement. We could undoubtedly permit the development of individuals along the lines best suited to their peculiar capacity, and get from each what he was best able to give. We should avoid the scandals of inhuman charges and of indecent exploitation of suffering humanity by the sharks of the profession, and we might well avoid the tragedy by which the impecunious young doctor must select general practice, for which he is ill equipped, because he cannot afford to devote himself to the pursuit of pure science, for which he is best fitted.

I cannot leave this subject without admitting that I am not unmindful of the undoubted defects of the system which I have just described. I do not for a moment overlook the danger that we may come to regard efficiency as a god, that we forget that the individual is a patient and think of him only as an instance of disease. I am not unmindful of the danger of losing that broad culture which was developed in the physicians of the last generation. But these dangers seem to me largely avoidable if clearly appreciated. I cannot doubt that the pursuit of science will always bring out inherent qualities of greatness. I cannot doubt that the care of the sick will always develop the humanities and I cannot doubt that a profession which has for its sole aim and object the mitigation of the sufferings of mankind will attract to itself men with the same inherent possibilities for greatness that have always characterized the followers of Aesculapius.

¹ Cheever, BOSTON MEDICAL AND SURGICAL JOURNAL, December 17 and 24, 1896.

Original Articles.

LATE RESULTS OF OPERATIONS UPON HIP JOINTS FOR HYPERTROPHIC ARTHRITIS.

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AND

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TWENTY patients from the orthopedic service of the Massachusetts General Hospital were asked to return for observation upon the late results of operations on their hips. A few could not be found, some lived at too great distances to return, one had died, and only nine finally were seen.

This small number, nine cases, however, is convenient for indicating some of the possibilities of surgery in these social conditions, and the cases will be reported individually as well as in a group. The various circumstances associated with the cases also will be discussed, for benefits of operative interference can be judged most correctly by taking into account the different elements that enter into the background of each surgical picture.

These patients can be described as presenting either (a) monarticular defects or (b) polyarticular ones with marked hip involvements.

(a) Monarticular processes very frequently appear to be excited by definite traumata.

(b) Polyarticular lesions occur after numerous infections and chronic metabolic defects, but in this paper only the residual joint changes that remain after all active processes have entirely subsided will be considered. Exact natures of these residual effects are obscure as they usually represent combined results of a number of factors. All, however, are characterized by more or less overgrowth of bone around the joints, and local hip conditions with their surgical treatments therefore will be given greatest prominence in this paper.

Ages of patients range from young adult life to old age, the majority having reached or having passed middle age. They all present painful, stiffened, damaged joints with marked degrees of disability; and crippling disability is the deciding factor in every case that determines the time for surgical interference.

Two important varieties of operations have been performed: Firstly, removal of small bony prominences around acetabula and heads of femori in hip joints still fairly normal apart from these protuberances; and secondly, more extensive operations in disabled hips. There are two subdivisions of extensive operations, namely (a) arthrodeses intended to secure firm union and complete stiffness of the joints in most desirable

positions; and (b) decapitations of femoral heads in order to allow increased, though limited motion at the sacrifice of some stability.

Cases in which removal of small, isolated osteoarthritic prominences is possible with very distinct benefit are not numerous. The ordinary bony overgrowth, even though extensive, as a rule does not interfere materially with the amount of motion of the joint, as it usually permits as much motion as damage within the joint and in the more or less affected capsule will of itself allow independently. In a few instances, however, overgrowths are so located, under the Y ligament for instance, as to mechanically limit certain motions. Removal of these sharply localized exostoses under these conditions leave affected joints in greatly improved functional states.

The choice of extensive operations often is quite difficult and they should never be thought of until practical disability is nearly complete. In making decisions the following points have to be kept in mind:

(a) The nature of the arthritic process, whether it is a part of a general systemic disease or the residuum of a toxic state that has entirely disappeared.

(b) The involvement of other joints, particularly in the opposite leg.

(c) The degree of disability in its relation to the patient's occupation, social standing and habits of life.

(d) Age of patient.

It is natural that judgments should vary according to social conditions of patients. The working poor will frequently arrive at disabled stages much earlier than sedentary well-to-do people. In the former, relief by operation often becomes a necessity, which in the latter will always remain a choice of expediency.

In multiple arthritis extensive operations are reserved particularly for residual disabilities in which there are reasons for feeling that further progress will not be probable. The existence of multiple joint involvements seriously complicates operations when the processes involve both hips or both knees, or one hip and the opposite knee. In the end, however, in all cases degrees of disability are the deciding factors, and the most important element in disability is that of pain, particularly pain following use. Extensive operations are not to be considered in active nor even in doubtful stages of infections, nor in any steadily progressive lesions.

There are two operations of choice in severe cases, as already stated. Excision of the head of the femur leaving the acetabulum with its lining cartilage intact is designed to retain motion in the hip, although resulting in a somewhat less stable joint for standing or walking. Arthrodesis of the hip joint with removal of the cartilage from acetabulum, and femoral head, gives increased stabil-

ity in standing and walking as a result of the complete stiffness which follows, but with greater inconvenience in sitting. Arthrodesis must be considered a final operation, whereas excision of the head of the femur may be followed later if necessary by an arthrodesis.

In the choice between the two, the social status of the patient again is a matter of very great importance, and before decision is made there also must be thought of: (a) the integrity of the acetabulum; (b) the amount of capsular contraction and thickening which diminishes the intracapsular cavity of the joint; (c) the amount of osteal change of the neck of the femur; and (d) the age of the patient.

Limited degrees of motion always are desired after decapitations of heads of femori; and it is doubtful if more than 35° is desirable in any case, for the reason that greater excursion produces greater mechanical irritation with resultant greater tendency toward further bony changes. Finally, it should be distinctly recognized that removal of offending bony overgrowths and surgical treatments do not terminate always underlying pathological processes which have produced the hypertrophic defects. The latter may continue at times and very gradually limit again motions in operated joints.

GROUP STATISTICS.

The ages in the nine observed cases have ranged from 29 to 57, with an average of 35 years. Three are women and six are men. Five of the persons are at work at present, on an average time of three years and three months after operation, varying within the limits of two years and two months to four years and nine months. Four are fairly comfortable and able to get around with canes or crutches, and none are completely helpless. Among the four who are not at work two were favorably enough impressed by their surgical experiences to come back for a second operation upon the other hip joint, having been as much pleased with the first results, as the five active ones now are with their respective treatments. One chronic hip in the series proved to be tubercular and required two trials for immobilization. It is firmly ankylosed now and the patient walks with a cane.

It is difficult to obtain a clear idea easily of the actual benefit derived from operations in these cases as the patients never can be extremely active, vigorous individuals again, although perfect surgery is practiced. They show before operation already the effects of serious wear and tear of life and these effects cannot be entirely removed. An illustration is given in Case 1, a man of 57 who now has a hip with 30° of flexion, complete extension and 15° each of adduction and rotation seven years after surgical interference. He has very little pain now, and this late result though far from perfect, represents nevertheless, a more useful joint than the painful one with which he came for treat-

ment. Seven years of relief from pain alone is a considerable benefit.

All nine patients who returned for observation had suffered severe pain before their admission to the hospital and all were more or less relieved from this symptom after surgical care. This fact alone should possess considerable weight favoring surgery, apart from any relief of existing anatomical defects.

NON-OPERATIVE MEASURES.

The present paper deals mainly with late results of operations but the pre-operative histories indicate in a general way what human natures will endure before patience is lost, and relief from suffering and disability is demanded through radical surgical measures. On an average in the nine cases reported, surgical interference occurred four years after onset of symptoms, ranging from eight months to eleven years, depending on severity of pain and degrees of disability. During the periods before operations patients received hydrotherapy, medico-mechanical treatments, immobilizations in plaster casts, foot plates, crutches, diets and internal medications. Four received hydrotherapy, one having 39; one, 10; one, 13, and the other person 12 treatments. Four received mechano-therapeutic measures. Special diets were prescribed frequently, once with obvious success; and medicines were given rather sparingly.

The minute details of these various non-operative therapeutic procedures are too tedious to be reported, yet upon their correct prescription depend results to important degrees. For example, when patients are given massage and local stimulating exercises which produce too great local irritation, these individuals then come more quickly to operative stages than they would otherwise; but it is to be remembered that many persons who have mild hypertrophic conditions never come to operation because some of them find relief in the same mechanical measures and immobilizations that aggravate others. Diet regulations undoubtedly have important influences upon articular conditions, but it must be admitted that we prescribe our non-operative treatments unskilfully quite frequently in the absence of reliable delicate indicators of their actions. When physicians are unsuccessful or when diseases are unusually obstinate, sooner or later, patients become weary of all measures which do not afford relief in a reasonable length of time, and they turn then to orthopedic surgeons.

After-care of surgical cases belongs in a class similar to pre-operative treatments, being very important yet frequently very difficult to regulate. An illustration is furnished by Case 1 of this series. One leg of this individual is in good position and is a useful member after prolonged care, while his other leg is comparatively useless following equally good surgery

under identically the same variations in health. The second result seems due, in part at least, to the patient's neglect in after treatment. Apparently he exhausted his patience in the long physical therapeutic courses following the first operation, because he did not return for several years to the hospital after his second surgical experience. It is an injustice to attribute the poorer results of the second operation to surgical causes when they more properly represent the limitations of human perseverance.

SUMMARY.

The nine reported cases represent four arthrodeses, one decapitation of the femoral head, three cheilotomies, and one arthrotomy for a loose body.

Results of the four arthrodeses are as follows: Three patients were actively at work at the time the last observation was made on them, and the fourth person was improved in health. One, a sea captain, returned to work in six months after operation and was still occupied in this way three years afterwards. The second, a laborer, returned to work in five months and was employed thus after four years and nine months. The third, a woman, was working in a lodging house three years and eleven months after surgical interference, having been able to return to an active life in six months. The fourth patient, also a woman, was much improved in general health when last seen four years after her first surgical experience; but although she could walk without a cane she had not recovered enough from her long difficult convalescence to handle her stiffened hip perfectly.

The result of the decapitation of the femoral head represented some improvement. The patient, a laborer, was in good health after two years and two months, and could walk about his home as much as he wished without pain with the aid of a cane, but he was not engaged in regular work. The three cases in which diffuse exostoses and bony lips were removed from hip joints (cheilotomies) varied considerably in their success. One, a teamster, was at work two years and ten months after operation, having begun again seven or eight months after leaving the hospital. The other two patients had both hips operated on, and neither had resumed his former occupation. One of the two could chore around home and did not need a cane except in the street. It is a question whether he would not have received greater benefit by an arthrodesis on one hip. The last observation was three years and five months after he left the hospital. The third cheilotomy case was operated on twice and walked with a crutch and a cane seven years after his first operation. At this last observation which was made he was in fairly good general health with much less hip pain. The first joint of his which was treated was still quite serviceable, while the second one was neglected by

him in its after care so that it was badly rotated outwards at the last examination. This case, the oldest of the series, originally had marked changes in both hips and had been disabled for two years. His efficiency was increased by surgery but not to the point of work, and the main benefit has been in relief from pain.

The one case of arthrotomy for removal of a loose body in the joint probably had a traumatic origin, and at operation the joint did not show many other pathological changes. Complete relief followed removal of this body and the patient could walk easily and painlessly when seen after two years and one month. She then was looking for work.

In conclusion it can be said that the choice of operation should be made with great care, dependent on the amount of destruction, the number of joints involved, the social position of the patient and the kind of work which afterward will be demanded of the joint. Efficiencies of patients may be expected to be increased and the pain relieved by surgery. None of the patients have been made worse by surgical interference and it accomplishes enough to justify itself in those cases which have become seriously disabled, by simply relieving continuous pain, or in quickly stiffening some joints to useful positions, or in prolonging their functions and activity. Surgery does not remove the tendency to continued overgrowth if the source of infection in the multiple arthritis cases is not removed, but there is much less tendency toward recurrence in monarticular traumatic cases.

INDIVIDUAL CASES IN DETAIL.

CASE 1. E. W. Well-developed man of fifty years. Stevedore. Both hips operated on, the second one five years after the first, at the age of fifty-five.

In the left hip at operation a small piece of bone was found on the acetabular margin that interfered with motion and this was trimmed away. There was a small amount of clear fluid in the joint cavity, and the head of the femur was dotted with small rough granules on its articular surface. After recovery much improvement in range of hip motions was noticed immediately, then progressive hypertrophic processes very slowly limited these motions again. Before operation flexion was slightly limited, complete extension was possible with no hyperextension. Abduction and adduction were one-third normal. Pain and crepitus were noticed on motion. Seven years after surgical interference, flexion through 30 degrees was possible with complete extension and with abduction, adduction and rotation each of 15 degrees. At this last observation there was very little pain that previously had been complained of, although joint crepitus persisted.

In the right hip at operation the capsule of the joint was found thickened and hypertrophic processes distributed on the femoral head. The articular edges of acetabulum and head were curetted and smoothly trimmed. Before operation the right hip was permanently flexed 10 degrees, with passive flexion of 55 degrees, and with no inward rotation. It was held in outward rotation and there was pain on motion. Shortly after operation complete ex-

tension was possible, flexion of 40 degrees, abduction of 10 degrees.

Pain on motion disappeared quickly but inward rotation still was impossible. Two years after operation there were a few degrees of permanent flexion and 25 degrees of passive flexion but this was also necessarily accompanied by abduction of the thigh. Rotation was possible then between limits of outward rotation of 35 degrees and 80 degrees; and there were slight hip pains on motion.

The patient came to the Massachusetts General Hospital first complaining of nipping pain and creaking in both legs of two years' duration and gradual onset. He had never had any serious illness, had eaten heartily and drank alcoholic stimulants freely for years but not to great excess at any one time. Hypertherapy first was tried for two months then the first operation was advised. Following it, but previous to the second one, prolonged courses in hydrotherapy and mechano-therapy were received. Pains in the operated hip subsided during this interval while simultaneously symptoms in the right hip gradually increased up to the time of the second operation. After the second surgical interference he was not heard from for two years, having become tired of the frequent visits to the hospital necessary for physical therapy.

When last observed he was walking with crutches, the right leg too much averted to be useful. His general health and muscular strength, however, were still good although he had been unable to perform the active duties of stevedore since the onset of his trouble.

CASE 2. L. W. Well developed man of fifty-three years. Sea captain.

The right hip was found at operation to have the joint capsule bound down obliterating the joint cavity; also the muscles about the joint showed evidences of chronic inflammatory process. A wedge-shaped piece of bone was removed from the head of the femur; and the acetabulum after curettage was allowed to unite firmly with the head of the femur.

Before operation the thigh was flexed at ninety degrees and adducted forty-five degrees. Muscle spasm held the hip nearly rigid, but under ether there was a relaxation to forty-five degrees of flexion and ten degrees of permanent adduction.

Three years after operation at the final observation the thigh was firmly ankylosed in fifteen degrees of flexion, ten degrees adduction, with the foot pointing nearly straight to the front. He then continued to work as captain of a steamer, had no pain, used no cane, walked with a slight limp and was in good health.

The original trouble came from septicemia which developed after an injury to the thumb. During convalescence from this poisoning the hip became involved and continued to become inflamed at intervals for a year's time until he finally came to the Massachusetts General Hospital. Six months before the hip joint was opened the adductor muscles were tenotomized and the leg held straightened in a spica, and during this period the patient gained twenty-five pounds, recovering nearly completely his healthy vigor.

CASE 3. A. J. Well developed man of fifty-one years. Laborer.

The capsule of the right hip joint was found thickened at operation, and nodules were cut away from the neck of the femur. An exostosis, size of a

marble, was removed from the trochanter. Cartilages of the hip joint were normal.

Before operation the patient had a limp, showed marked lumbar lordosis and walked without crutches. His leg was held in a position of permanent flexion of 15 degrees with considerable permanent outward rotation, also there were 45 degrees of flexion without adduction or abduction. The thigh and calf muscles were much atrophied.

Two years and ten months after operation the thigh was held normally extended, and there were 10-15 degrees of flexion but without rotation or adduction. He had gained in weight, thought his operation a benefit, and was able to work driving a water cart. He used a slender cane part of the time to favor the leg, and found that a laborer's work of continuous shovelling of dirt tired the hip.

The onset of hip symptoms originally began suddenly eight months before surgical interference, and there had been no severe trauma. For four or five months at first he was treated with rheumatic remedies, but steadily grew worse and then came to the Massachusetts General Hospital. X-rays taken there showed very definite hypertrophic overgrowths and an operation was soon advised. For five months after dismissal from the hospital ward, following operation, he returned at intervals for baths and medico-mechanical exercises. These he considered helped him considerably in regaining strength and motion in the leg.

CASE 4. S. P. Small woman of twenty-nine years. X-rays showed considerable destruction of the head and neck of the femur and the joint was opened. Several pieces of loose bone were removed, and the acetabulum was curetted and chiselled to fit the upper end of the femur. The wound was closed and a plaster spica applied. A second operation became necessary on account of mobility and pain, two years later. Then an old sinus below the trochanter was curetted and fresh surfaces were made in the joint, so that solid union was obtained ten or eleven months after this second attempt.

Before operation the hip was held in 30 degrees permanent flexion, 20 degrees adduction and 10 degrees outward rotation. Motion of 10 degrees was possible with pain.

Four years and three months after the first surgical interference the patient walked with the leg solidly fixed in permanent flexion of 25 degrees, adduction of 10 degrees, and with very little discomfort aside from a slight stiffness at first on attempting to walk.

She originally had had hip trouble as a child and had worn a high heel. Two years before coming to the Massachusetts General Hospital she slipped and strained the joint, and then developed increasing pain and local tenderness up to the time of surgical interference. Examinations of the pathological tissue later showed this case to be a very chronic tubercular hip.

CASE 5. P. D. Healthy-looking man of fifty-seven years. Laborer.

At operation the rim of the acetabulum and the edges of the articulating surface of the femoral head presented abnormal bony overgrowths and these were removed. The articulating portion of the head was cut away considerably.

Before operation the thighs could be separated only eleven inches between the femoral condyles. The left hip, which was treated surgically, was nearly

completely extended but hyperextension was impossible. There were 45 degrees of flexion which was painful as the limit was reached. Internal and external rotation were both limited.

Two years and two months after operation the leg was held completely extended, and exhibited 5-10 degrees of flexion. There were 5 degrees of permanent adduction and 55 degrees of eversion. Adduction, abduction and rotation were absent. Shortening of 1½ inches. No pain was noticed.

The patient had been troubled five or six years before coming to the Massachusetts General Hospital. X-rays showed marked hypertrophies of both hip joints and operation was soon advised. He received nineteen physical therapeutic treatments during the three months following his dismissal until the last observation was made. At the last observation he was in good health, used a cane, and walked about his home as much as he wished.

CASE 6. J. L. Small man of fifty-three years. Salesman.

X-rays showed many pathological changes in both hips, and both hips were opened, an interval of four months occurring between the two operations.

The left hip at operation showed a thickened capsule and small amount of joint fluid. The femoral head was flattened and mushroomed. There were large exostoses on the rim of the acetabulum. These abnormal overgrowths were all removed. Before operation the joint could be flexed 85 degrees with pain, and adduction and abduction were somewhat limited. Three years and nine months after operation full extension was possible with 30 degrees of painless flexion. The foot pointed straight ahead and a few degrees of rotary motion were possible. Abduction of 15 degrees and adduction of 5 degrees.

The right hip at operation showed a thickened calcified capsule. The head of the femur was flattened and mushroomed, and exostoses were found around the edge of the acetabulum. All rough nodules were removed. Before operation there was complete extension and 75 degrees of flexion. Outward rotation was difficult and limited to 15 degrees. No hyperextension nor inward rotation. Adduction one-third normal. Grinding pain on motion. Three years and five months after operation there were 55 degrees of flexion, complete extension, outward rotation of 25 degrees, no inward rotation, adduction of 10 degrees and abduction of 15 degrees. Less pain on motion.

The patient had had pain in the right hip for eleven years, and for several years in the left one before operation. Finally the left side became so painful that he could not work and he came to the hospital. Hydrotherapy was tried first for two months, but good effects seemed to be neutralized by exposure to cold after the baths. He carried crutches or a cane for four months after the first operation until the second one; but he wanted the second surgical treatment because the operated hip felt so much stronger and because it had a good range of painless motion. When last seen he considered his operation a benefit, although he had not worked except around home. He did not use a cane except in the street and he enjoyed good health, and had less hip pain.

CASE 7. M. O. Poorly nourished, fairly well developed woman of forty-three years.

At operation the joint cavity was found entirely obliterated. A layer of cartilage and bone was re-

moved from the femoral head, and the acetabulum was curetted and deepened for the denuded head to fit into firmly.

Before operation there were 30 degrees of permanent flexion and 20 degrees of permanent adduction with practically no hip motion and no tenderness in the hip. Three years and eleven months after operation there was solid ankylosis with permanent flexion of 15 degrees and permanent adduction of 15 degrees. The foot pointed straight front. Actual shortening of one-half inch. Apparent shortening $1\frac{3}{4}$ inches. No pain. Walked without crutches. Health improved.

The origin of this arthritis was obscure, having come on gradually three years before operation, and increasing until she became incapacitated one year before surgical interference. She thought her operation a great benefit.

CASE 8. D. H. Small woman of thirty-seven years.

At operation a small almond-shaped mass, the size of a bean, could be felt inside the capsule just before it was opened over the femoral head near the cotyloid ligament. When the capsule was cut this was removed, and a sharp ridge on the edge of the femoral head was smoothed away.

Before operation there were irregular snappings and catches in the inguinal region on rising from sitting or kneeling postures, but there was no difficulty in ordinary walking or standing. The hip joint seemed to lock for a moment, and by slowly twisting it the patient was able to restore normal motion again. Flexion was possible to 90 degrees if done slowly. Complete extension was permitted. There was marked limitation in inward rotation and abduction while external rotation was more free. Two years and twenty-three days after operation she walked easily and painlessly with a slight limp. Flexion over 90 degrees was possible with fairly good inward and outward rotation and abduction. General health good.

The hip bothered her for nine years more or less before operation. For a year she tried hydrotherapy and a flannel spica, and finally came for surgical treatment after having become tired of the slow progress, the incapacity, and after x-rays had demonstrated marked lipping of the upper margin of the acetabulum.

CASE 9. J. S. Well developed man of thirty-one years. Laborer.

At operation the capsule of the right hip was found thickened, and the neck and head of the femur were covered with exostoses which were removed. The head of the femur was denuded of cartilage and squared to fit a shelf made in the acetabulum and solid ankylosis secured in twelve weeks.

Before operation all hip motions were painful and rotation limited very much. Four years and nine months after operation there was solid union in a position of 25 degrees flexion, 10 degrees adduction, and the foot was pointed straight front. He carried no cane and had no pain in the joint.

He came to the hospital with a history of rheumatism, tonsillitis and frequent colds, and x-rays showed hypertrophic changes about the hip joint.

THERAPEUTIC VALUE OF INJECTIONS OF WHOLE BLOOD.

BY J. SPENCER DAVIS, M.D., DALLAS, TEXAS.

NUMEROUS articles have appeared in medical literature recommending the use of blood serum in the treatment of various skin diseases, such as psoriasis, pemphigus and the dermatoses of pregnancy.

In some cases the patient's own serum was used while in others it was secured from a second person. In these cases only the serum was used, after being inactivated by heat, but the results of this method of treatment seems to vary greatly in the hands of different observers.

In 1908, Hiss pointed out that the injection of an extract made from leucocytes is capable of producing a leucocytosis. The leucocytic extract was obtained by injecting a mixture of meat broth, starch and aleuronat into the pleural cavity of an animal which is followed by a copious cellular exudate. The leucocytes accumulating in the pleural cavity are removed, mixed with water and kept at incubator temperature until auto-digestion occurs when the extract is put on ice until used. He found that many infections were greatly modified by injections of this extract.

The technic is not so very complicated, but has to be carried out in a laboratory, and besides the yield of leucocytic extract is not very great. Some observers think that the extract thus obtained is not so potential as it might be owing to the fact that the leucocytes are inflammatory leucocytes.

Archibald and Moore attempted to simplify the technic by withdrawing blood from an animal, mixing with a solution of sodium citrate, and separating the white corpuscles by centrifugalization. Further steps for making the extract were similar to that described by Hiss. Leucocytosis produced by this extract occurs very promptly reaching its height in a very few hours, to subside to normal in about 24 hours. The greatest increase is in the polynuclears, while the eosinophile increase ranges from 14 to 45 per cent.

Gay and Clappole under the title of "Specific Hyperleucocytosis," point out that injection of immunized rabbits with typhoid organisms is followed by a marked increase of the leucocytes. They point out that this leucocytosis is specific and only occurs when the animal is vaccinated with the same organism to which it is immune.

In tuberculosis the injection of tuberculin is followed by a similar response on the part of the leucocytes, but the eosinophile increase is, as a rule, relatively greater and more constant than that of any other cells. The leucocytosis produced by tuberculin is specific and does not occur in normal individuals. The repeated injection of any foreign protein produces a leucocytosis.

There seems to be some difference in the leu-