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OSTEOSARCOMA OF THE KNEE-JOINT.

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WITHIN the last few years a number of papers on sarcomata in general have been published, and in them the results of various lines of treatment have been tabulated. The writers of the present paper, however, purpose to deal with a single variety of osteosarcoma, involving a single anatomical structure, namely, the knee-joint, and to give the results of radical operative measures in a series of 15 cases.

The term "osteosarcoma of the knee-joint," as here used, is restricted to the myelogenous type, which primarily involves the epiphysis of the femur or tibia, but which secondarily invades the joint itself and the peri-articular structures, by growth and destruction of the bony shell. By this definition are excluded those subperiosteal sarcomata which originate from the periosteum of the diaphysis of either of these bones at some distance from the joint, and which only encroach upon it after considerable growth along the shaft of the bone. It seems wise to restrict this paper to this limited field for the following reasons: Among the long bones, the lower extremity of the femur and the upper extremity of the tibia are the most frequently affected by myelogenous sarcoma. This prevalence naturally furnishes a larger statistical basis from which to draw conclusions; also, on account of its location and similarity in signs and symptoms to other chronic

diseases of the knee-joint, it presents the greatest difficulties of differential diagnosis among the osteosarcomata.

From an examination of the literature on sarcomata in general, it is evident that there is a wide difference of opinion at the present time as to what is the best method to pursue in eradicating these growths and preventing their recurrence. By some, radical operative measures are advocated, and by others, the use of more conservative surgery, x-ray and toxin treatment. These latter views, as expressed by well-known and experienced operators, carry much weight, and yet the writers of this paper believe and feel that they can substantiate the allegation, that there is still room for debate as to what line of treatment is indicated in a given case from the series to be quoted later. And also, that where a central osteosarcoma of the knee-joint exists, a radical operation will insure to the patient the best chances of cure.

In support of what has been said regarding differences of opinion as to which method of procedure should be adopted, the following extracts from the literature may be quoted: Butlin, after discussing a large number of cases drawn from English and German sources, says: "The only hope of the future is in very early diagnosis and in very high amputation." McCosh, after reviewing 125 cases of sarcoma at the Presbyterian Hospital (New York), decides that amputation, rather than resection, is for the best interest of the patient. Coley, although formerly an advocate of early and high amputation, now advises, as a routine procedure in sarcoma of the long bones, the preliminary use of the mixed toxins of streptococcus and bacillus prodigiosus. If the growth, after two or three weeks, is not seen to be influenced by the use of toxins, he then advises either immediate resection or amputation, followed, after recovery from the operation, by prolonged use of the toxins to prevent recurrences. Babcock and Pfahler come to the conclusion that "radical and early operations have not clearly decreased the tendency to metastasis and recurrence in sarcoma." And "High amputation, usually unnecessary and unjustifiable for the more benign sarcoma, is usually unavailing against the more malignant." They advise subcapsular enucleation, prolonged Roentgenism, topical applications, and the use of toxins. Painter, although he gives no direct conclusions in his recent article, seems, from an analysis of the treatment in his case reports, to advise as a routine procedure either enucleation or amputation. These various statements indicate in a brief way the diversity of opinions held by operators to-day as to whether conservative or radical means should be used in the treatment of sarcomata in general.

It is evident at once that to establish conclusively any one method of treatment as the best, investigations must be conducted along some very definite line. Therefore, logical conclusions can only be drawn in these cases from the results of a single operative procedure, in one particular form

of sarcoma, in a specific location. The comparative frequency of this condition, not only in the knee-joint, but also in other joints, naturally brings the orthopedic surgeon in contact with it, and, indeed, there seems to be no valid reason why this disease should be referred to the general surgeon for treatment, inasmuch as osteosarcoma of the knee-joint simulates several conditions which properly belong to orthopedic surgery. Moreover, pathologically it so closely resembles that most common of all chronic diseases of the knee-joint, namely, tuberculosis, that one must resort to the pathologist for positive diagnosis. For the primary focus of the neoplasm begins in the epiphysis adjacent to the joint, just as tubercular osteitis does, and later invades the joint in a similar manner. Thus the location, symptoms and course of central osteosarcoma of the knee-joint present what would seem to be a purely orthopedic problem.

That the different forms of sarcoma of the long bones, owing to their varying malignancy, cannot all arbitrarily receive the same line of treatment is perfectly apparent. For, although in some instances removal by extensive operation results in a permanent cure, in others, and perhaps a large majority, the most radical procedures are futile, and the victim dies either from recurrence or metastases. This is particularly true of the subperiosteal sarcomata of the long bones, concerning which several leading articles of late have extensively treated. The central type, however, shows a much more favorable prognosis, and although recurrence of the growth may follow the most radical operation, yet there is sufficient proof of permanent cure following such a procedure to warrant its recommendation. A large number of cases, in which the pathological report showed a malignant growth of myelogenous origin, have been reported as cured years after the operation.

The early symptoms of central sarcoma differ entirely from those of periosteal sarcoma for two important reasons, namely, the location of the growth and the rapidity of the development. The central variety is situated in the epiphysis of the bone near the joint, and being confined within the bony cortex in the early stages, it is slow of growth, resembling other chronic disease of the bone with secondary involvement of the joint. The periosteal tumor, however, is located in the diaphysis and is superficial. Moreover, it is much more rapid in its development, and is not unlike other easily recognized malignant growths found in any part of the body.

In order that conclusions may be safely drawn as to what method of treatment is advisable in a given case of osteosarcoma of the knee-joint, one should be conversant with the pathology and development of these growths. For in dealing with malignancy it cannot be too keenly appreciated that what at first may seem a comparatively harmless condition may develop later into a most malignant tumor which resists all treatment. Myelogenous or central sarcomata of the femur or tibia are, practically speaking, of three varieties, the round-celled, the giant-celled and the alveo-

lar, or so-called endothelioma. The round and giant-celled types have their origin in the marrow of the epiphysis. They seldom develop in the diaphysis, though by extension they may involve it later. At first there are no external changes in the contour of the joint, the only alterations taking place in the cancellous tissue of the epiphysis, where the growing tumor absorbs and destroys the bone. Later, it pierces the bony shell, invades the joint cavity, attacks the peri-articular structures and produces enlargement and irregularities. Endothelioma of bones is a rare condition, only 23 cases having been reported to date. In these, the femur was involved eight times, the tibia three, while the tumor made itself manifest in the neighborhood of the knee-joint only twice. The endothelial tumor begins in the central portion of the bone, spreads along the marrow cavity, and, passing through the bone, invades the surrounding tissues. This type of sarcoma takes its origin from endothelium of perivascular lymph spaces. Primary sarcoma of the synovial membrane of the knee-joint, according to the literature on the subject, has been observed but ten times. For practical purposes, therefore, we are dealing in this paper with either a round-celled or giant-celled sarcoma, or, as sometimes happens, a combination of both.

From a clinical study of these cases in the early stage of the disease, there are no points which are diagnostic from other chronic diseases of the knee-joint at a similar period of development. When first noticed, there is some enlargement of one of the bones near the joint, and accompanying symptoms, such as pain, limitation of motion, and tenderness, are present. Subsequently, however, the appearance of the joint changes, due to an enlargement of all the articular structures. Finally, after the disease has broken through the bony shell, and the surrounding tissues have become invaded, the progress is as rapid as in any of the most malignant types. In some instances, notably following a conservative operation or after the tumor pierces the bone by its own growth, this change in malignancy is most marked. It is therefore obvious that sometimes what apparently is in the beginning a semi-malignant growth, becomes fulminating as soon as it appears extra-cortical. This invasion or spread of the tumor may come through extension at the circumference of the growth, through contact with surrounding tissues in operating, or by detached tumor cells which circulate in the blood stream to other parts of the body.

As has been mentioned earlier in this paper, central sarcoma of the knee-joint closely resembles tubercular arthritis. In fact, it may be said, in a general way, that all the symptoms found in one may be present in the other. For instance, as far as the history of the case goes, one is as likely to find a history of previous injury in tuberculosis as in sarcoma. The fallacy of depending on previous or co-existing family tuberculosis in any case of joint disease has been demonstrated too often to need comment in this paper. Moreover, the occurrence of these two

diseases as regards age is very similar. In respect to signs and symptoms there is also a remarkable agreement. Temperature variations are present in both, and although in the early stages only slight impairment of general health may be the rule, later, loss of weight and strength accompanies both diseases, together with limitation of motion and pain of varying degree.

From what has been said thus far, it is perfectly apparent that clinical signs and symptoms do not form a sufficient basis for differential diagnosis between sarcoma and tuberculosis of the knee-joint. The only reliable guide in discriminating between these two conditions is careful, well-directed treatment. For, as is well known, under fixation, traction and protection, the symptoms of tuberculosis in a short time subside, while under the same treatment the symptoms of sarcoma continue to increase in severity. In this way a positive diagnosis can be made within a reasonably short period of time. If, in a given case, the proper treatment fails to relieve the condition, an early exploratory incision is indicated, and a microscopical examination should be made to determine the exact nature of the growth. Against this procedure has been advanced the danger from extension or distribution of the growth, but this risk is far less than that which arises from the usual method of temporizing. It may be said in general that the error is often made of treating these cases conservatively for too long a period, waiting to make a positive diagnosis until it is too late to save the patient's life. For during this delay, metastases may have occurred, and radical measures are then useless.

In reporting certain cases, the term "recurrence" has been used, referring to the reappearance of sarcomatous growth years after operation, but it seems doubtful if these cases could properly be called the results of metastases, since it is not probable that metastatic tumor cells would be carried in the blood stream to some other portion of the body, remain quiescent for years, and then develop. Such cases must be the result of a separate and distinct sarcomatous process arising "*de novo*."

The number of cases here reported of central osteosarcoma of the knee-joint, and from which the following conclusions are drawn, is believed to be the largest number of this class tabulated at one time up to the present date. There are, in all, 15 cases of this type, but no attempt is made to report them all in detail, as they are so similar in their nature and progress that it is not considered necessary. The location of the primary growth, the method of surgical intervention, and the length of time since operation without recurrence, however, are stated. There are two cases which are reported in particular, inasmuch as they present some of the phases mentioned in an earlier part of the paper, and will serve as a practical illustration of the different points in question. The following history of one of these cases shows the danger of too much conservatism in the treatment, the rapid growth of a central sarcoma after the peri-articular structures are

involved, and the benefit derived from an amputation even after extensive involvement of all the parts surrounding the joint.

H. E. M., male, aged twenty-four years, laborer; family history tubercular. In July, 1902, the patient after retiring noticed for the first time slight pain in the right knee-joint. This continued for several nights, but as he did not suffer during the day, he gave it little attention. In September of the same year he wrenched the joint in climbing over a stone wall, and the night pain returned. There was also slight discomfort during the day, and in a few weeks he noticed some stiffness in the morning, which passed away as soon as the limb was used. The condition of the joint gradually became worse and he finally consulted his family physician, who pronounced it rheumatism and applied local treatment, together with large doses of salicin. Under the treatment the stiffness disappeared and the pain lessened so much that he resumed his work. In December next, he injured this joint again by slipping on the ice, and was obliged to use crutches. The knee at this time was somewhat swollen, due to the accumulation of synovial fluid. The treatment consisted of strapping the joint with adhesive plaster, and in a few weeks the swelling subsided. In February of the following year, the pain and stiffness became more marked, and under the family physician's advice, the joint was subjected to "hot-air" treatment, which was continued until the last of April with some abatement of the pain and stiffness. About this time it was noticed that the inner condyle of the femur was enlarged and all local treatment was discontinued for two months, during which the patient was allowed to go about on crutches. In June the condition of the knee was worse and after consultation a plaster-of-Paris cast was applied. This was worn for six weeks with scarcely any improvement, and upon its removal the joint was noticeably increased in size. Pain during this period of treatment by fixation continued, but the sensitiveness of the joint disappeared. The last of July a surgeon from a nearby town was called in consultation, pronounced the case tuberculosis and advised operation. The following week an incision was made into the joint and a gauze wick inserted. Infection followed but cleared up in a few weeks and the wound healed. The patient was first seen by the writer August, 1903, and an excision advised with the privilege of making an amputation, after exploring the joint, if it was thought advisable. The joint when opened showed such changes as those usually found following chronic inflammation. There was also considerable enlargement of the inner condyle. In testing the bone with a blunt instrument, the shell suddenly gave way, disclosing a friable growth which had destroyed all the cancellous tissue of the condyle and a large part of the compact tissue, leaving barely enough bone to separate it from the surrounding soft tissues. Further exploration showed this cavity to be about the size of a hen's egg, and the material filling it looked to be malignant, but as the walls were well defined and as there was apparently no extension of the disease beyond this limit, it was decided to make an excision. This was done and a careful examination of the parts left did not show anything which looked like diseased tissue. The wound was closed in the usual manner and the limb placed in a plaster-of-Paris splint.

Microscopic examination showed the growth to be a round-celled sarcoma. An examination of the tissues removed from several different places around the bone did not show any malignant disease. The dressing was changed in ten days and the patient was reported as doing well. Five weeks later union was very good and the first cast was removed and one applied without any

opening. This was worn for four weeks and the patient was allowed to go about on crutches. At the expiration of this time, he applied to his physician for relief from the cast, which was causing much discomfort over the site of the excision. When the cast was removed it was found that the tissues on the outer side of the lower end of the femur were involved, and that the growth had developed rapidly. Another operation was refused at that time, but some three weeks later a high amputation was done. At this time the growth had assumed a prodigious size, the part measuring more than double that of the other knee. The growth had also broken through the skin in several places and there was considerable bleeding from it. The amputation healed by first intention and in a short time the patient was around on crutches. Some four years have passed since that time and the patient's general health is excellent.

Another case which resembles the above in some respects is reported as follows: J. W. C., female, aged seventeen years, student, seen for the first time in January, 1904, and the following history obtained: About one year previous to this date, the left knee commenced to pain her. She did not give it much attention at that time, but some months later she consulted her family physician, who thought she had torn one of the cartilages of the joint. A brace was produced and worn for several months without any improvement. The joint increased in size and by actual measurement, ten months after she first noticed the trouble, it was one fourth larger than the other knee. About one month before the writer saw it, an incision had been made into the joint by a surgeon to determine the nature of the disease. It was pronounced chronic osteomyelitis, and, as amputation had been refused, a drain was inserted and the usual after-treatment followed. Some two weeks later, the wound not having closed, it was noticed that there was a growth in the tissues around the opening. The tumor rapidly increased in size, and at the time that the writer first saw the case the knee was as large again as its fellow, and there was considerable discharge from it with some odor. Immediate amputation was advised and accepted. Microscopic examination showed round-celled sarcoma. It has now been more than four years since the amputation was done and the patient is in excellent health.

The other 13 cases do not present any striking features, and in the main resemble each other so closely, that they do not need separate mention. The epiphysis of the femur was involved in 11 cases, and the epiphysis of the tibia in 4. More than half of them were seen before the growth was extensive, and in only 2 instances has the growth returned. These 2 cases were well advanced, and the subsequent examination showed that the inguinal structures were undoubtedly affected when the amputations were made. The microscopic examination in every case showed the tumor to be of the round-celled type. Excision of the joint was made in 4 cases, 2 of them on account of a previous diagnosis of extensive tuberculous disease having been made, and two in the hope of saving the limb. In all 4, a later high amputation was necessary as the growth had returned. The time which has elapsed since operation and the present day in these cases varies from two to seven years. In this series of 15 cases there have been 2 deaths from recurrence, which leaves a percentage of 86 for those that have recovered.

CONCLUSIONS.

From the above experience, a radical measure, such as an amputation, for the central variety of sarcoma of the knee-joint is advised for the following reasons:

A. Early and high amputation gives the largest percentage of recoveries without recurrence.

B. Treatment by the use of toxins, which seems to be a useful adjunct, but alone, according to present statistics, gives only 15% of cures in all varieties, cannot be entirely depended upon.

C. Immediate death following operation seldom occurs if the previous condition of the patient is fair.

D. Resection is of doubtful benefit, and, in cases where there is so much at stake, should not be attempted.

THE ABUSE OF ALCOHOL IN THE TREATMENT OF CHILDREN'S DISEASES.*

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AMONG the most frequently used remedies in the diseases of children, alcohol probably ranks first. With its long reputation as a stimulant, it is natural that alcohol should be given both in the acute and in the chronic diseases of children. If the physician does not order it, the parents are apt to suggest its advisability in all exhausting illnesses. The very name pneumonia, for example, suggests to most parents and physicians the use of alcohol to stimulate the infant or child, so as to carry it through the exhausting attack of this dreaded disease. The same may be said of diphtheria, although, fortunately, antitoxin has largely robbed alcohol of its rôle in that affection. In the prolonged summer diarrheas, many of which take on a decided septic character, alcohol is the sheet anchor of many practitioners, and the drug is given in large amounts.

If, however, we are to believe the conclusions drawn by some recent students of the question, that alcohol acts as a narcotic and depressant in small as well as in large doses, a halt should be called to the indiscriminate use of this drug. However this may be, and it is not my intention to discuss the matter here, it would be well for a moment to consider the differences in the effect of alcohol in children and in adults. Most adults have a firm belief in the stimulating action of alcohol, and are probably benefited by their faith in its use in exhausting illness. This belief is, of course, absent in infants and young children. Again, children live in the present. If they are comfortable they do not fret about past sufferings, nor anticipate troubles to come. Adults, on the contrary, no matter how comfortable they may be in the present moment, often worry about past or future suffering, about domestic affairs and financial matters. Alcohol in acting on the higher centers, whether the action be a depressing one or not, appears, at least, to act as a stimulant by making the patient forget his worries for the time being. Whether the general and lasting effect be a good one or not need not be discussed here, but the point I wish to make is that these partially psychotherapeutic actions of alcohol, which may have an immediately good effect in adults, are

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