"rheumatic" condition of the system acts as a direct etiological factor, and also where its influence is only of a secondary nature.

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SEPTIC AND GONORRHEA JOINTS.¹

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THERE is probably no medical term which is made to cover so many sins and errors in diagnosis as the oft-used words "joint rheumatism." By dint of careful clinical study, and especially through the aid of bacteriology, certain types of joint disease have been gradually differentiated from this ancient chaos. Last to endure—it is to be hoped soon to go—is the rather indefinite phrase "gonorrheal rheumatism." This paper deals with joint infections, septic and gonorrheal, which may be confused with articular rheumatism. As this disease is probably also an infection manifesting itself chiefly in the joints, it is evident that we are dealing with more or less similar processes, which, though varying in etiology, must still have many symptoms in common.

No mention will be made of the septic infections which follow immediately upon operations or open wounds of joints, or of joint tuberculosis. There remain the infections which occur secondary to a suppurative process in other parts of the body, or following general infection through undiscoverable local lesions. The more carefully this question is investigated the more we recognize that pathogenic organisms may enter the circulation even in conditions of apparent health. These organisms either die in the blood, are eliminated by the kidneys, etc., or localize

themselves in various organs or tissues where they may be destroyed by the phagocytic cells or germicidal body fluids. If, through a general or local diminished resistance, the germs continue to grow, there results a general or local infection of varying intensity. A favorite site for such manifestations is the joints or the adjacent epiphyseal ends of bones. Where a suppurative or septic process is known to coexist, errors of diagnosis are infrequent. In the infective diseases like scarlet fever, dysentery, pneumonia, meningitis, the attendant joint complications are usually recognized. Most difficulties occur in the cases of so-called idiopathic arthritis, where the mode of entrance of the organisms is undiscoverable, through the tonsils, pharynx, intestinal tract, a boil or pustule, a small healed wound. The germs which most commonly are found in such joints are the ordinary pyogenic staphylococcus, the streptococcus, the pneumococcus. Unusual infections occur from the typhoid bacillus, glanders bacillus, etc. Cases of gonorrheal infection and the arthritis accompanying osteomyelitis or epiphysitis, are most frequently mistaken for rheumatism. In infants or young children often no existing cause can be found. In older children or young adults exposure to wet or cold not infrequently precedes the joint inflammation, or so-called "rheumatism" sets in after an injury. There may have been a sore throat. The constitutional symptoms are in general more severe, the fever higher and less irregular, with a more rapid pulse. Sweats are uncommon, chills relatively frequent, the leucocytosis more marked. The pain is extreme and boring, limited in the earlier stages to the epiphyseal end of the adjacent bone; this sign soon giving place to general tenderness about the joint as it becomes involved. Of value for diagnosis is the definite interval by which the general symptoms and great pain precede the signs of local infection, thus differing from rheumatism. In superficial joints edema soon appears and rapidly extends; redness appears later than in acute rheumatism; the joint capsule or periosteum may be perforated, when fluctuation becomes evident. Though more than one joint may be involved, such septic processes are usually monarticular. Salicylates have little effect on the pain. As early diagnosis is all important to save the joint from disorganization, puncture, in doubtful cases, should be resorted to without hesitation. Not all septic joints have such an acute onset. For example, a boy eight years of age entered the Massachusetts General Hospital with the diagnosis of articular rheumatism of the right knee, duration five days. Salicylates had caused no improvement. Temperature 100°, pulse 80; only moderate pain and tenderness. The effusion was slight; leucocytosis 11,000. The condition remained relatively the same for days, when it was learned that he had fallen on a needle which had entered to one side of the patella. The joint was opened and found much disorganized. Cultures showed pure streptococcus infection.

Another boy of ten, without preceding illness, fell and struck his left knee. He was brought into the hospital three days afterwards with the diagnosis of acute rheumatism. There were high temperature and rapid pulse and several general symptoms. The joint was very tense and held immovably fixed. The skin was much reddened; pain and tenderness extreme. Under ether, 3 ounces of creamy, yellow pus were evacuated, which showed a pure culture of the pneu-

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nococcus. The subsequent course of this case illustrates the frequent burrowing of pus even after apparently thorough drainage. Several successive abscesses formed which extended between the muscle planes and fasciæ, and up and down the leg. From all of these pure cultures of the original organisms were obtained. Although in both of these cases at the time of operation it appeared as if permanent ankylosis would follow, at the end of three months the knees could be flexed to a right angle. With early operation in such cases the prognosis is probably not as bad as would be expected, especially in children and young adults. As gauze stimulates the formation of granulation tissue, protective seems to be the ideal drainage material. Under it the synovial membrane is more quickly restored, adhesions are prevented rather than excited, irrigation and changing of dressings is almost painless, and the danger of pus backing up behind gauze wicks is not present.

To illustrate a joint infection with one of the rarer organisms, a case of Dr. C. B. Porter is of interest. A man of thirty-five entered the hospital with severe general symptoms and an arthritis of the great toe and knee. Cultures from the pus were sterile on ordinary media. Inoculation into guinea pigs, however, proved that the infecting organism was the glanders bacillus. There was nothing characteristic in the joint lesions.

When once the diagnosis of a septic joint has been made, the surgical indications for drainage and disinfection are so clear that there is no need to speak of their treatment.

The pathological processes in these septic joints are well recognized and need not be alluded to.

Of late several cases of joint infection with the typhoid bacillus in pure culture have been reported, and attention has been called to these typhoid joints, especially by Keen in his monograph.

Owing to the general condition of the patient the joint lesions are often overlooked. It appears to be characteristic that an insidious disorganization occurs in the articular structures which relatively early leads to dislocation. Indeed, it is this dislocation which in several cases has first attracted attention. Later, joint lesions may occur in typhoid fever, after apparent recovery, due either to the typhoid bacillus itself, or mixed infection with the ordinary pathogenic organisms which have entered through the healing ulcers. In such cases a subacute rheumatism may be simulated.

Though any of the above septic joints may occasionally be mistaken for rheumatism, gonorrheal arthritis is a disease which has hitherto not been sufficiently recognized as quite different from ordinary rheumatism. Although continual advance has been made of late, particularly by the Germans, I do not believe that the majority of the profession yet realize how often a careful analysis of so-called "rheumatic cases" will lead to the discovery that the real nature of the arthritis is gonorrheal. For many reasons the relative frequency of joint complications is hard to determine. Statistics from in- or out-patient departments of hospitals and from private practice vary much, according to their source. The well-known unreliability of venereal statistics, the great difficulty in diagnosing chronic or latent gonorrhea in men, and especially in women; the comparative rareness of thorough bacteriological examination, with the fre-

quent negative findings, even in undoubted cases, — all combine to make accurate statistics hard to obtain. One is often struck on carefully questioning gonorrheal patients with the frequency with which mild or severe rheumatic symptoms have coexisted, and the more the physician's attention is directed to this subject, the more cases of gonorrheal arthritis does he find. If, as seems probable, between 2 and 5% of the cases of gonorrhea are complicated by arthritis, it is certainly not a rare disease. From another standpoint, although arthritis in connection with a gonorrheal infection has been recognized for a long time, the causative relation of the gonococcus to it has only recently been demonstrated. The old idea, that the patient, run down by the disease, developed articular rheumatism, has been and is still advocated by some. While articular rheumatism may occur in such a patient, the nature of the arthritis, unless absolutely typical of rheumatism, should be regarded with much suspicion.

It has been demonstrated, also, that certain joint lesions occurring in connection with gonorrhea have been due to the ordinary pyogenic organisms, though classed under the general heading "gonorrheal rheumatism." In such cases, where the bacteria have entered the blood from the urethra or elsewhere, the pyogenic organisms dominate the symptoms, and it is essentially a septic joint disease and not gonorrheal arthritis. The gonococcus undoubtedly forms a powerful toxin, and certain writers have put forward the view that the joint manifestations may be due to this toxin, without actual localization of the organisms. Careful examination of the contents of undoubted gonorrheal joints have so frequently proved sterile by smear and culture that there is some plausibility in favor of this toxic origin of the milder forms of arthritis. This subject will be spoken of later under bacteriology. Until recently, gonorrhea had been regarded as essentially a local disease, spreading by continuity. There are, however, a sufficient number of reliable reports which definitely establish that this organism may cause metastases in various distant parts of the body. Such localizations are numerous; in the joints, tendon sheaths and bursæ, pleura, peritoneum, meninges, sheaths of nerves, heart wall and valves, spleen, lungs, kidneys, periosteum, lymphatic glands, subcutaneous tissue, skin and parotid gland. From the circulating blood gonococci have been recovered several times, so that we have absolute proof that this organism may cause a general septicemia, or pyemia, and may produce pus wherever localized.

As "grippe," with rheumatic pains in various parts of the body, not infrequently complicates an acute gonorrhea, or exacerbation of a chronic process, it is probable that mild systemic infection occurs, which never goes on to a definite arthritis. The rôle which gonotoxin absorption plays in producing these symptoms has not yet been determined.

TIME OF OCCURRENCE OF METASTASES.

Though a period of from two to six weeks usually elapses before metastasis occurs, the joint complications may first appear months or years after the original infection. Fingers's statistics seem to show that the joint lesions occur more frequently in chronic or relapsing gonorrhea than during the acute stage; certainly in the older cases, where few or no local signs exist, far more errors are made in diagnosis. Very

rapid dissemination may occur within a few days of infection. For example, a case of Resniko's, a girl of twenty, four days after marriage, acquired an acute infection from her husband, who had purulent discharge at the time. She developed with the symptoms of general infection a severe polyarthritis. The ruptured hymen was regarded by him as the infection atrium. In chronic gonorrhea the connection between an increase of local symptoms and a recrudescence in the joint is most striking and characteristic in many cases. The opposite may be true, and as in epididymitis, local symptoms may cease with the complication, or may show no change from the previous condition. Recent medical literature is full of articles emphasizing the long duration of gonorrhea and demonstrating the difficulties of determining when infection has actually ceased. Particularly is this true in women, where the disease may appear to be chronic and mild from the start, and unknown to the patient. Owing to the numerous bacteria which exist in the vagina, culture methods and even staining are often most unsatisfactory. Negative findings after careful search are so commonly proved erroneous by the subsequent infection of another party that their value for exclusion is slight. In 226 cases of chronic cervical catarrh in prostitutes without symptoms, gonococci were found 117 times. In many of these cases the organisms could be found only during or after menstruation.

Kopp reports 52 cases of chronic urethritis where repeated search was made for gonococci in vain; yet without renewed infection, recidives occurred in which the organisms could be demonstrated. Therefore, in males also the latent period is often as impossible to diagnose, and is certainly far longer than is usually thought.

In a patient of mine who was positive that no new infection had occurred, gonococci were found in the seminal vesicles five years after the original disease. I dwelt on this part of the subject simply to emphasize that, apart from the mere misstatements or ignorance of patients in regard to gonorrheal infection, there are many cases where the physician can find no reason to suspect a connection between the present "rheumatism" and past venereal disease, and to show that the danger of gonorrheal metastases endures for a long time. Though there is a general belief among genito-urinary surgeons that the metastases in males occur most frequently after posterior urethritis, it would appear that the depth to which the gonococci have penetrated into the mucous membrane is of more importance than the part of the urethra involved. A few days after infection the gonococci proliferate deep in the mucous membrane and are carried about within the migrating leucocytes. The not infrequent edema of the prepuce and swelling of the inguinal glands are usually due to toxin absorption, though the presence of gonococci has been occasionally demonstrated. Though infection may thus occur through the lymphatic apparatus, it is believed that the organisms enter through the blood vessels.

Wertheim was able to show the gonococci in a thrombus of the bladder wall. The chain was thus made complete, and found to be similar to ordinary pyemic infection.

Though males are probably more frequently afflicted with joint complications than females, the disproportion is not as great as was once thought.

In babies, subsequent to gonorrheal ophthalmia, there is naturally no disproportion between the sexes. In childhood cases occur in young girls from vulvovaginitis more frequently than in boys of the same age. In adults, Nasse reports in one year 43 cases, 24 in males and 19 in females; Northrop, 117 in men and 76 in women. As attention has not been called sufficiently to gonorrheal arthritis in women — and venereal disease is by them denied or unknown more commonly than by men — more cases have undoubtedly been overlooked.

Bedouin reports 42 cases of arthritis in connection with the puerperium. While some of these were ordinary pyemic joints, many of them showed the presence of gonococci. The lacerations attendant upon childbirth were considered as the source of entrance. The well-known tendency of puerperal non-suppurative arthritis to prolonged stiffness or ankylosis is regarded by him as characteristic of a gonorrheal joint. One case now in hospital illustrates this disease. Coincident with her confinement she had acute swelling of the metacarpophalangeal joint, ankle and knee on the right side. There was no evidence of uterine sepsis. The baby had gonorrheal ophthalmia. Salicylates gave no relief to the pain; the local lesions, which will be spoken of later, were quite characteristic of gonorrhea. The organisms were recovered from the joint contents in pure culture, as well as from the urethra.

In addition to the error of believing that women rarely suffer from gonorrheal arthritis is the mistaken idea that such arthritis is essentially a monarticular affection, and different in that respect from acute articular rheumatism. Recent statistics have shown that more than one joint is involved in 60% of cases; yet, though several joints are involved, it is true that *one usually* bears the brunt of the infection.

The larger joints — the knee, ankle and elbow — suffer most frequently. The small joints of the hand, foot and fingers are more commonly attacked than in acute articular rheumatism, though usually in connection with other joints. The jaw, spine and sternoclavicular articulation are affected more often than in rheumatism. The sheaths of tendons, the bursæ, especially the bursa under the Achilles tendon, are favorite seats for gonorrheal metastases. The tendons about a joint may be involved with it or independently. Trauma and overexertion are predisposing causes. Curettage, the passage of sounds, too vigorous local treatment, may precipitate a metastasis or make an existing joint lesion worse. Exposure to cold or wet exercises no influence.

SYMPTOMATOLOGY AND COURSE.

In a disease like this, which varies in its manifestations from a slight effusion with little pain to disorganization of a joint with formation of pus, accompanied by severe general and local symptoms, it is naturally difficult to classify the various forms and hard to describe any definite type.

Though at any given time the joint lesion may closely simulate acute or subacute articular rheumatism, it is, I think, possible in a great majority of cases to make a clinical diagnosis of gonorrheal arthritis. In cases of acute joint disease, not conforming typically to articular rheumatism, a careful history will often make the physician at least suspicious of a past gonorrheal infection. Thorough local examina-

tion may show the presence of an old urethritis or signs of an old gonorrhea in women. Bacteriological examination of urethral shreds, discharges from the cervix, urethra, Bartholin's ducts or adjacent crypts, may show the presence of gonococci. When such evidence is wanting the course of the disease and the general local symptoms can alone be relied upon. The mode of onset varies. The majority of joint lesions are mild; particularly in connection with chronic gonorrhea an acute or subacute synovitis develops most frequently in the knee. There is little pain, moderate stiffness, a varying amount of effusion, which may rapidly disappear, or may persist with thickening of the capsule as a painless chronic relapsing synovitis. In such cases there is nothing characteristic, and unless in the acute stage the gonococcus can be demonstrated by puncture, diagnosis is extremely difficult. If one or more times this synovitis recurs with increase in the urethral signs, the diagnosis is probable. The cases which are most frequently confounded with articular rheumatism are more severe, beginning usually in the morning without preceding exposure to wet and cold, or tonsillitis. One of the larger joints begins to swell, with fleeting pain in several others. The amount of pain is so variable that from it little help can be obtained in diagnosis. It may be extreme, but is generally less than in articular rheumatism. The pain is usually worse at night. Several joints may be involved, or one joint may follow another in fairly rapid succession; but the tendency to improve in one as another becomes involved, so characteristic of articular rheumatism, rarely occurs in gonorrheal arthritis. The joint most affected shows little tendency to improve, and remains swollen and tender for a long time, entirely out of proportion to the general symptoms. The amount of fever varies; rarely absent at the onset, it may disappear at the end of a few days, though the joint symptoms remain active. In severer cases it may last for a number of weeks, and soon assume the suppurative type with morning remissions. This is true in cases which have been proved to be uncontaminated by ordinary pyogenic organisms. Almost never does the fever curve show the markedly irregular remissions characteristic of real rheumatism. The acid sweats are wanting; endocarditis is very rare. The amount of effusion varies. On the whole it is rather slight, and the chief changes occur in the synovial membranes and periarticular tissues. In some cases the joint capsule becomes rapidly thickened without much edema, but as a rule the subcutaneous infiltration is well marked, extending above and below the joint, and giving a doughy, boggy feeling. The skin is not reddened, the papillæ are apparent, and the glossy, mottled blush characteristic of articular rheumatism is absent. The local heat and superficial sensitiveness are slight. In short, except for the tenderness and the acute onset, the gonorrheal joint strongly suggests a tumor albus. For weeks the local signs are out of proportion to the general symptoms. Often the pain disappears within two weeks; yet for a long time tender points on deep pressure are found over the sides of the joint at the insertion of the ligaments or tendons. In acute cases, the joint is fixed. In the knee flexion occurs relatively early. The great sensitiveness to deep pressure, the early tendency to stiffness and ankylosis, are most characteristic. In the wrist, more than in any other joint, softened tender areas appear among

the tendons, which suggest the formation of an abscess. Pus, however, is infrequent, and one finds only softened hemorrhagic granulation tissue. The contents of the joint may perforate the capsule, or infection by continuity occur. Residual abscesses, often unaccompanied by fever, may extend along the tendon sheaths or into the subcutaneous tissue.

The edema and exudate about the joints and tendon sheaths persist longer than the serous infiltration of acute articular rheumatism, and after their disappearance the boggy thickening of the capsule and sub-synovial tissue, with little effusion, is apparent; whereas, in rheumatism the joints usually recover in six weeks, gonorrheal joints often remain stiff and swollen for two to six months. A non-traumatic arthritis which persists for weeks in one joint should always arouse suspicion.

In several cases I have seen at the hospital, especially in the wrist, acute tuberculosis was closely simulated. In such cases tuberculin may aid in the differential diagnosis.

Periarthritis of the shoulder, not infrequent in young adults, without the history of trauma, may be due to gonorrheal infection.

BACTERIOLOGY AND PATHOLOGY.

A great deal of work has been done on gonorrheal joints in the past two years, especially by the Germans, as a result of which the behavior of the gonococcus in the joint and the resulting lesions are fairly well understood. Rindfleisch has published the results in 30 cases very carefully investigated by him. In 19, gonococci were demonstrated. In 2, the staphylococcus aureus alone; in 1, mixed with gonococci was found. In 1, the staphylococcus albus alone, in another with the gonococcus. In 9 cases no organisms could be found. Weiss has collected 121 cases of undoubted gonorrheal arthritis, from 92 of which the gonococcus was isolated. Young, of Johns Hopkins Hospital, recently reports 13 cases of joint and tendon sheath infection, in which the gonococcus alone was present. The gonococcus apparently first localizes itself in the subendothelial tissue, there proliferates, and is carried into the joint cavity by the migrating leucocytes, or the desquamated endothelium. In the first few days the organisms are infrequent in the joint fluid. At the end of three days the leucocytes and endothelial cells appear in about equal numbers, and the gonococci are most abundant, yet are conspicuous for their relative scarcity, occurring in twos and fours within and without the cells. The joint fluid is not a favorable medium for their growth. Degenerate forms soon appear, shown by their refusal to grow on culture, and the crowding of the leucocytes with more organisms. Subsequent proliferation occurs not in the joint fluid, but in the synovial membrane, as Rindfleisch and others have demonstrated. In 1 case, numerous organisms were present in the fluid on the third day, had disappeared by the thirteenth, yet could be demonstrated by culture and smears, in curettings from the synovial membranes.

In reviewing the cases reported of positive findings, it is striking that in all of them the joint infection was relatively fresh, or a recurrence had taken place. I can discover no mention of gonococci found in chronic synovitis. When we consider this early disappearance from the joint cavity, the relative scarcity of the organisms, and the well-known difficulties in

their successful cultivation, we can understand why so many aspirations may be sterile, and the necessity for early puncture of the joint for diagnostic purposes is evident. Both culture and staining methods should be used, for in many instances cultures have proved positive where no organisms could be found by staining, and vice versa. Though exudation, and even suppuration, has been produced by injection into joints of sterile products, gonotoxins, in view of the above-mentioned facts it seems more likely that the gonococci have early disappeared from the joint, or failed of demonstration than that local joint disease is caused by toxins absorbed from the urethra. In the effusion there is nothing characteristic. It is more apt to be blood stained and purulent than in acute articular rheumatism. König regards a reddish, gummy, seropurulent fluid as insignificant.

The gonorrheal process in joints is characterized chiefly by proliferative rather than destructive changes. The synovial membrane and periarticular tissues are much thickened and infiltrated, even at a distance from the joint; the granulation tissue formed is very richly vascularized. The capillary walls are thin, areas of hemorrhage are frequent, and blood usually escaped into the joint. In more chronic processes in the joint and about the tendon sheaths, the dark red, easily bleeding granulation tissue, giving to the joint or sheath a velvety appearance, is suggestive of a gonorrheal process. It is the rapid organization of this granulation tissue and surrounding exudate which causes the early tendency to stiffness and ankylosis.

CASES.

A few cases which I have seen at the hospital will illustrate typical gonorrheal joints.

A girl of thirty, who denied venereal history, entered the hospital suffering from debility. Three days after entrance she suddenly developed, with moderate fever, an acute swelling of the right metacarpophalangeal joint and right knee. The thumb was swollen, tender, not red; moderate effusion in the joint. In the knee the synovitis was slight. The capsule was evidently thickened; periarticular edema lacking. Pain severe, worse at night; leg moderately flexed. The inflammation in the thumb quickly subsided, but the local tenderness in the knee steadily increased. Three weeks after the onset the joint was tapped, and a small amount of seropurulent fluid obtained, tinged with blood. This relieved the pain. Cultures were sterile on ordinary media. No organisms could be found by the microscope. As the fever continued, varying from 99° to 101½°, and the joint had not improved, operation was decided upon. The knee was held moderately flexed, very tender on deep pressure over the external lateral ligaments, and presented the appearance of a chronic white swelling. At operation a small amount of turbid blood-tinged seropus escaped. The cavity of the joint was small, limited by the greatly swollen synovial membrane, which in places was an inch thick. Fibrin was small in amount. Already adhesions had formed between the patella, femur, and several parts of the capsule; the alar ligaments were greatly thickened. Cultures and smears were again negative. No organisms could be found in the sections from the synovial membrane. At operation a purulent vaginitis was found, but no gonococci could be demonstrated. A history of cystitis was finally obtained four months before the

present illness. The fever gradually subsided, but the joint swelling and tenderness persisted for several weeks with great stiffness, and ultimately ankylosis was absolute. Large doses of mercury and iodide had no effect.

Another case previously alluded to showed, coincident with confinement, a swelling of the thumb, ankle and knee. The symptoms in the hand and foot rapidly subsided, but in spite of salicylates the knee joint remained very painful, flexed to a right angle, not red, very tender at several points, with moderate effusion and moderate thickening of the capsule. This joint was opened by Dr. Harrington. The fluid was turbid, blood stained, seropurulent. Examined under the microscope, the leucocytes were numerous. In a few of them diplococci which decolorized by Gram's stain were found; in two days pure cultures of the gonococcus were obtained by Dr. Wright.

A man of forty-two, who had contracted a gonorrhea eight weeks before, entered the Out-Patient Department with the following history: Two weeks ago, with moderate fever and much pain, he had swelling of the ankle, shoulder and wrist. In a few days the inflammation in the other joints subsided, but the wrist continued swollen. The hand and forearm were much swollen, the exudation firm and boggy; there was no redness, little heat. Motion at the wrist was impossible without great pain. In the anatomical snuff box and over the extensor tendons at the wrist, two apparently fluctuating areas existed. Gonococci were demonstrated in the urethra. On incision, the subcutaneous tissue was porky, the sheaths of the tendons were filled with a gummy, slightly hemorrhagic exudate. Communication with the joint could be made out. Gonococci were recovered from the pus and granulation tissue by Dr. Wright in smear and culture. The temperature was 100°, the leucocytosis 26,000. Recovery followed very slowly, with marked tendency to ankylosis.

Another case represented the appearance of an ordinary palmar abscess over the head of the fifth metacarpal bone. Duration six days, with superficial redness of the skin and great tenderness at operation. No pus was found, but the adjacent joint was filled with seropurulent material in which were diplococci decolorizing by Gram's stain. No growth on ordinary media. The girl had contracted gonorrhea four months before, and the organisms were still present in the urethra.

TREATMENT.

Of the many drugs which have been advocated as beneficial in gonorrheal arthritis, none in my experience has exerted much influence on the joint lesion. The pain is rarely relieved by the salicyl or coal-tar products, thus giving some aid in discriminating between a gonococcus infection and articular rheumatism. Morphia is often required in the acute stages. The treatment of the urethra should be begun at once, with mild, hot permanganate, or citrate of silver irrigation. No sounds should be passed during the acute joint disease. Laudanum fomentations, turpentine stupes, guaiacol, or ichthyol ointment, so often used, have appeared to me to be of little benefit. Most relief has been obtained from the continual use of ice bags, or dry heat, preferably with a hot oven, at a temperature of 250° to 400°. The circulation is stimulated, pain relieved, and absorption of the exudate

favored. It was hoped at one time that the temperature of the joint could be raised sufficiently to inhibit the growth of the gonococcus, which is very susceptible to heat. This seems not to be the case. Flaming with the actual cautery is the best counterirritant and often relieves the pain.

Absolute immobilization by appropriate splints is the best treatment in the acute stage. As in other forms of arthritis, flexion of the knee may occur early. If gradual extension is too painful, an anesthetic should be given at once, and the joint straightened and immobilized, for if ankylosis results adhesions can be more safely broken by flexion than by extension. In the elbow the opposite is true, and this joint should be flexed to a right angle.

While the acute process usually subsides within two or three weeks, in many cases great pain follows attempts at motion, probably due to the rapid formation of adhesions within and about the joint. Here the physician is at a loss to decide upon the proper treatment. The joint grows stiffer day by day, yet movement is bitterly complained of by the patient. In such cases, advantage should be taken of the period of diminished sensitiveness to pain which usually follows the hot-air bath. Massage should precede movement. Unless the signs in the joint become worse, treatment should be firmly persisted in. At intervals, under an anesthetic, the joint may be *once* fully flexed and extended, allowed to rest for a couple of days, when active and passive movements should be continued. In the acute stages, when the capsule is much distended, aspiration should be done for the purposes of diagnosis, and irrigation of the joint. In the subacute period the usually small amount of fluid is probably beneficial, separates the inflamed joint surfaces and prevents their adhesion. Pressure with immobilization should not be used at this time. The question of operation in gonorrheal arthritis is coming more and more to the fore, and is advocated even in relatively mild cases by good surgeons, who report numerous cases where the fever, general symptoms and pain have been quickly relieved by operation, and earlier use of the joint followed.

By operation the toxins and gonococci in the joint fluid may be rapidly evacuated, and such treatment is indicated in all severe gonorrheal joints, as in any septic arthritis. With proper precautions the danger from sepsis is probably slight in comparison with the advantage to be gained; good temporary results may follow operation in the knee, where the surfaces can be seen, thoroughly cleaned, and superficially disinfected; but, as the gonococci will continue to proliferate in the synovial membrane beyond reach, the process, though checked, will often continue. As relatively few pure gonorrheal infections lead to suppuration, the treatment by immobilization and early passive motion is safer for general adoption. Particularly is this true in the more complicated joints, as the elbow, ankle or wrist, where thorough irrigation and drainage are usually impossible, and where incisions among the adjacent tendons would not infrequently lead to the ankylosis which operation is intended to prevent. When pus can be demonstrated by fluctuation, edema and redness, or aspiration of the joint or tendon sheaths, then only should operation be resorted to. Incision, irrigation, immediate suture, without drainage, should be attempted.

The passive hyperemia method, advocated by Behr,

in the treatment of joint tuberculosis, has been used with good results in gonorrheal arthritis. The limb is bandaged up to the joint; above it a flat tourniquet is applied, sufficiently tight to impede the venous circulation. The joint swells, the pain is relieved, and earlier motion is reported. This was true in 2 of my cases. In 3 others no benefit followed.

SUMMARY.

In this paper I have endeavored to show: (1) That the gonococcus alone can cause arthritis, which, without the presence of other organisms, may be purulent.

(2) Gonorrheal arthritis occurs not only in acute gonorrhea, but in the chronic or latent stages, which persist much longer than is commonly believed.

(3) The signs of such chronic infection in the male and female are often slight, and disregarded or overlooked by the patient and physician.

(4) In consequence, not a small proportion of cases are diagnosed as articular rheumatism which are really of gonorrheal origin.

NEUROPATHIC JOINTS.*

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It is obvious that the term "neuropathic joint" might reasonably be of very wide or extremely limited application, according to whether we had most in mind the fundamental rôle played by the nervous system in all vital processes on the one hand, or on the other the smallness of the number of joint affections generally regarded as essentially trophic in nature.

I shall apply the term in this paper to all those affections which seem, from the evidence at present available, to owe their characteristics to the direct influence of the nervous system, whether strictly trophic or not. The limitations of time will prevent any more than passing mention of the neuromimetic and so-called hysterical joints, which indeed do not fall within my province, for they depend upon disorder of ideas, are psychopathic in origin, not resulting from physical lesion. They have moreover but slight bearing on the differential diagnosis of the profoundly altered joints with which this paper principally deals.

Taking up first the classic examples of true nervous arthropathies as they are called—those of tabes dorsalis and syringomyelia—we find that the anatomical characters are almost identical in the joints, notwithstanding the great and essential differences shown by the diseases as a whole, so that much of what can be said of one applies to both.

It is of primary importance to recognize the facts that the joint lesions of these two cord diseases are in typical form almost absolutely limited to them, that they occur with frequency, 5% to 10% of all tabetics and about 10% of syringomyelics being thus affected, and that conspicuous among the symptoms in both troubles are extensive losses of sensation. The course of these arthropathies need not be here described in great detail.

The following mode of onset is not at all uncommon. Entirely without warning, entirely without pain, entirely without evident cause, during some mild

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