

cloth, through the white stains which are left on drying from the urine which has splashed over the trousers while micturating against a wall or on the ground. Such stains are very troublesome to remove by brushing; and when found on trousers which may have been put aside and not worn for a few years, as sometimes happens, we are at liberty to assume that the urine at that time contained sugar. I have heard of hotel servants, whose duty it is to brush the clothes, recognising diabetic patients from the difficulty experienced in brushing out these stains. I have noticed that it is especially in elderly people that we find this gradual onset.

I will now refer to instances where the disease has come on suddenly. In December, 1876, I was consulted by a lady, aged 35, in whom diabetes had supervened quite suddenly, four weeks previously. She was, at the time of the attack, nursing an infant of two months old, when her supply of milk ceased all at once, and contemporaneously with the cessation of the lacteal secretion she noticed that she became very thirsty, and passed an abnormal quantity of urine. Four years previously she had sustained a severe nervous shock, with injury to the spine, in a railway collision, which led to her being bedridden for a period of eight months. She was, however, supposed to have recovered perfectly from this accident, and I am, of course, quite unable to say whether it had any bearing on the production of her subsequent illness.

Another instance of the disease coming on suddenly occurred in a lady, who dated her illness from one evening when she had dined out with some friends. Previous to this, her health had been in all respects good. In the course of the evening she became very thirsty, with a thirst that nothing could quench, and she was at once afterwards recognised to be suffering from diabetes. Here the history was very clear, nothing unusual had been remarked during the day, until in the evening the thirst manifested itself.

Then, as to its duration; this varies within very wide limits. It may go on for years without seriously impairing the patient's general health, or it may terminate very speedily in death. Let me first refer to cases where the result is rapidly fatal, such, for example, as that of a gentleman, aged 46, whom I saw in 1870, and in whom the diabetic condition had only been definitely recognised on the previous day. His symptoms were now marked and urgent, and the patient assured me that certainly nothing unusual had existed a month previously. Two days later, I was summoned to Croydon to see him by his medical attendant, and found him dying from diabetic coma.

Again, in July, 1883, I was consulted by a gentleman, aged 39, whose diabetes dated as far, as it was possible to ascertain, from a week previously (he had already lost a sister from the disease); three weeks later, I heard that the patient, who had returned to Liverpool, where he resided, was dead. From the description given me of his illness, I gather that what was in all probability a carbuncle had formed over the parotid gland which had determined the fatal result.

The most acute case I think I have ever known was that of a gentleman aged 55, whom I saw on April 24th, 1884, at Blackheath, in consultation with Mr. Moore and Mr. Roper. The patient had been under the care of my neighbour, Dr. Russell Reynolds, on account of epileptic attacks, to which he had been subject during the last few years. Albumen had been known to be present in his urine for five or six years past. It happened that his urine was examined both for albumen and sugar three weeks previous to my visit, and found free from sugar. It may, therefore, be assumed that no diabetes existed at that time. When I saw the patient, the diabetic symptom were severe in the extreme; the thirst was most urgent, and his tongue, mouth, and fauces were of that bright red colour which is so often present in a severe form of diabetes. Three days later I was again called in, only to find the patient in a state of diabetic coma, which soon terminated fatally.

The cases which go on for years, the patient meanwhile enjoying a fair state of health, are, as I have already stated, most commonly met with in elderly people, although a similar chronicity is occasionally met with in younger people. I remember a lady, whom I saw for the first time in November, 1871; she was then 48 years of age, and had been suffering from diabetes for ten years. In September of last year, she was still in very fair health, which makes upwards of twenty years that she has been the subject of diabetes. I may state that it is by no means out of the way for

elderly people from time to time to tell us that they have been diabetic for twenty or twenty-five years past.

With reference to young people, a gentleman aged 22 fell under my care in June, 1874, having already been diabetic for three years. He continued in quite a satisfactory condition until May 30th, 1876, all the time passing saccharine urine, but the disease otherwise appearing dormant, when suddenly active symptoms declared themselves, and death rapidly supervened.

Another case of long duration occurred in a lad of 17, who was brought to me from Wellington College in April, 1874. I saw him off and on until December, 1879. I have not heard or seen anything of him since, but he was in a fair state of health when I lost sight of him.

Another case is that of a young lady of 19, first seen by me in January, 1881, whose mother had died diabetic, and whose aunt, the wife of a medical practitioner, has come to me with diabetes during the last six months. The patient herself had been suffering from the disease for four years previously, but has been doing exceedingly well up to the present time. Here, then, is a case in a young subject where the disease has been existing for eight years and a half. The patient still passes a large quantity of sugar in her urine; but I saw her only a few days ago, and there is nothing in her appearance which would lead one to suppose that she had anything the matter with her. She is plump, instead of presenting the emaciated appearance of the disease. She married some two years since, and her first pregnancy terminated in a miscarriage; she subsequently gave birth to a child at term, which only lived a short time, though whether the diabetes had anything to do with this I cannot say, as there was a history of syphilis on the father's side, and the infant had a rash soon after birth.

(To be concluded.)

CASES OF SARCOMA OF BONE RAPIDLY FOLLOWING UPON INJURY.¹

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HAVING recently had under my care three cases in which sarcoma has rapidly developed after injury, I have thought it might be useful to briefly narrate their histories and discuss the influence of injury in the genesis of malignant tumours.

CASE 1.—M. B—, a girl sixteen years of age, consulted me at the London Temperance Hospital on March 19th 1885, in reference to a swelling in the left elbow. She stated that in October of the previous year she missed a step and fell with all her weight upon the front of the left arm, striking particularly the elbow. Soon after the accident she noticed that the movements of pronation and supination were somewhat limited, and since Christmas a swelling had appeared and had gradually increased. This swelling I found to be an enlargement of the upper end of the radius, about the size and shape of a hen's egg, hard and unyielding, moderately painful and tender; the skin over it and the movements of the elbow-joint were unaltered; there were no symptoms or other evidence of syphilis or struma. I ordered some iodine to be painted over the swelling, and iodide of potassium in five-grain doses to be taken three times a day. She was next seen on April 9th, and on that day was admitted to hospital. The swelling had considerably increased, and involved the upper third of the radius. It was smooth, rounded, and tense, but fluctuation was to be detected quite across it; the skin over it was reddened and hot. The hand was fully pronated, and could only be supinated a very little; flexion of the elbow was only limited by the swelling. The girl was in other respects healthy, was tall and fairly well nourished. On April 13th I introduced an aspirator needle, and withdrew four ounces of dark blood. This caused a very distinct collapse of the tumour. I then advised that an exploratory incision should be made into the swelling, and if, as I anticipated, it were found to be a sarcoma,

¹ The greater part of this paper was read at the Medical Society of London on Nov. 23rd.

amputation of the arm should be performed. To this consent was readily obtained, and on the 16th I operated. On cutting into the tumour, I found that the upper end of the radius was entirely destroyed; above was felt the cartilaginous cap of the bone, and below sharp spicules of bone. The limb was removed above the condyles of the humerus by the circular method; the nerves were cut as short as possible, the arteries twisted, and the stump dressed with carbolic gauze. The stump was dressed on the 17th, and the drainage-tube removed; again on the 20th and on the 28th, when all the stitches were removed and the wound was healed except at the two extremities; the dressing was changed to boric lint. She left the hospital with a soundly healed stump on May 13th. She was last seen by me on Sept. 17th, when she was in all respects well. Dissection of the limb removed showed that the upper third of the radius was entirely destroyed and replaced by a very soft tumour, presenting the appearance of blood-clot, with a very thin indistinct capsule. The layer of articular cartilage covering the head of the bone was intact, and the tumour had not burst into the elbow-joint. Microscopical examination of the growth showed it to be a myeloid sarcoma into which there had been abundant hæmorrhage.

CASE 2.—On June 27th, 1885, my friend Dr. Wallis Mason brought to my house Mrs. L—, aged twenty-six, with a tumour in her left thigh. She stated that about three months previously she had fallen and struck the left thigh just above the knee against some short steps. About six weeks afterwards she noticed an aching pain in the part, and felt a lump about the size of a walnut. A month ago she showed this lump to Dr. Mason, who prescribed iodide of potassium internally and externally; the swelling, however, had steadily increased, and now formed a considerable enlargement of the femur just above the knee, which was most prominent on the inner side, and reached round both the front and back of the bone. The tumour was very hard, but without any clearly defined edge; it did not present pulsation or any egg-shell crackling. The patient stated that she had constant severe pain in the thigh; the most prominent part of the swelling was tender. The knee-joint was normal. There was no enlargement of the inguinal glands. The circumference of the thigh over the greatest prominence of the tumour was $15\frac{1}{2}$ in.; of the same spot of the right thigh $13\frac{1}{2}$ in. The patient had been married six years, had had one miscarriage, and no children. There was no history of syphilis. She was pale, thin, and weakly. The viscera were healthy. The diagnosis of subperiosteal sarcoma of the femur was made, and amputation at the hip-joint was recommended if an exploratory incision confirmed the diagnosis. This advice was followed, and on June 29th I operated with the assistance of Mr. Mason, Dr. Wallis Mason, and Mr. Wilkins. Mr. Henry Davis gave ether. Having applied Esmarch's bandage up to the groin, and there encircled the limb by the rubber cord and also by a Petit's tourniquet, I made an exploratory incision down to the tumour, and found it to be a sarcoma growing from the outer surface of the bone. I then made a circular amputation through the middle of the thigh, reflecting the skin and fascia for about two inches, and then dividing straight through the muscles and bone. Having twisted all the arteries and removed the tourniquet, I cut down on to the femur along the outer side of the stump as far as the top of the great trochanter, separated the muscles from the bone, and disarticulated it at the hip-joint; in doing this the internal circumflex artery was wounded and a double ligature was placed on it; no other artery bled. The wound was closed by deep and superficial sutures, two large drains being inserted, one across the lower end of the stump and one in the position of the femur. The operation was done with full antiseptic precautions, and a carbolic gauze dressing was applied. The patient bore the operation well; a very small quantity of blood was lost. The stump was dressed on June 30th; on July 1st, when the drain across the stump was removed; on the 3rd and 5th, when two deep stitches were removed, and the large tube was replaced by a smaller one. On the seventh day the patient was lifted on to a couch, and made a good dinner of beef, &c. The dressing was renewed on July 7th, 8th, 9th, 10th, 11th, 13th, and 15th. On the 7th the remaining deep stitches were removed, and on the 8th the drainage-tube was discontinued. On the 15th I left the case entirely in the hands of Dr. Mason, whose skill and care had been of great service; the stump was then firmly healed except at

the upper corner, from which there was a small amount of discharge. Dissection of the parts removed showed a tumour, about the size of an orange, springing from the upper part of the lower third of the femur on its inner and posterior sides; a separate and much smaller nodule sprang from the front of the bone. On sawing the bone longitudinally, the tumour was found to fill the medullary canal for four or five inches. The tumour contained some blood-cysts and was in part ossified, and two considerable ossific masses occupied the medullary canal. A microscopic examination of the softer parts of the tumour showed it to be a spindle-celled sarcoma. In reference to the subsequent history of the case, I may mention that she went to the country, and towards the end of August she noticed a small lump in the groin, which steadily increased. On Sept. 23rd I again saw her in consultation with Dr. Mason; she was fat and strong, and much better than previously to the amputation, but in the groin there was a prominent firm nodular mass as large as a duck's egg, which was not adherent to the skin, but was firmly held on its deep aspect. I removed this tumour next day, when I found it extended through the saphenous opening and surrounded the extremity of the internal saphena vein. I therefore had to place a double ligature upon the femoral vein and cut a piece of it out. The coats of the femoral vein were much thickened, and the vessel gaped like an artery when cut. I then divided Poupert's ligament, and with the finger removed the glands in the iliac fossa. A drain was placed in the iliac fossa, and another in the more superficial part of the wound, which was united by chromic catgut and dressed with a deep dressing of wet carbolic gauze, outside which was placed iodoform wool. The patient made an excellent recovery from this operation; but I learn from Dr. Mason that there is now great œdema of the stump and evidence of recurrence of the tumour in the groin.

CASE 3.—J. C—, aged seventy, was admitted under my care into Middlesex Hospital on July 29th, 1885. He stated that on Oct. 29th, 1884, he fell and struck his right arm and elbow and was admitted into Hackney Infirmary, where he was treated for contusion. On Nov. 18th he was discharged apparently well. He was readmitted on Feb. 26th, 1885, on account of pain and swelling in his arm and inability to move it. It was then found that there was mobility in the shaft of the humerus, and the limb was put up in splints for six weeks. On removing the splints it was found that the swelling had greatly increased, and on that account he was kindly referred to me by Dr. Gordon. The patient was an emaciated old man, with thin grey hair and very rigid arteries. The whole of the right arm was greatly swollen and distorted; it was hot to the touch, but the superficial veins were not enlarged. The humerus was found to be everywhere surrounded by a firm tumour, and just above its middle it was broken, so that the two parts could be moved upon one another. The brachial artery was felt coursing over the tumour. The glands in the axilla and above the clavicle could not be felt enlarged. There was complete paralysis of the flexor muscles of the hand and nearly complete paralysis of the extensors; sensation in the limb was not impaired. Some solid œdema of the back of the forearm was present. The man complained of shooting and burning pain in the hand and arm, and readily consented to amputation. There was no sign of tumour in any internal organ. On July 30th I amputated the limb at the shoulder-joint by the oval method, cutting down first upon the axillary artery and ligaturing it. Afterwards I cut the nerves off as short as possible, and finding the artery very long, I twisted it near the scapula and cut the vessel off below. Soon after being placed in bed I had to remove the dressings on account of some bleeding. I opened up the stump, but could not find any bleeding point. Healing of the wound was slow, suppuration occurred, and a thin superficial slough formed over the greater part of the surface. The man's temperature fell to the normal on August 10th, and it never afterwards rose to 99° . He left the hospital on October 6th, the stump being then firmly healed, except along the line of incision, which was inverted; there was no sinus. I regret to have to say that there is a recurrence of the growth just below the coracoid process.

To these cases I would add brief notes of some others I have met with in surgical literature:—

Paget² mentions the case of a boy who received a blow on his knee, and a few weeks later a medullary sarcoma of the

femur developed; and also the case of a man who received an injury to the fibula—either a strain or a fracture,—and eight weeks later a sarcoma of the bone appeared.

Stanley³ also mentions two cases. The first, a man aged thirty, who fell and injured his knee, and was treated by Lawrence for swelling and pain in the joint; shortly afterwards a painful swelling arose immediately above the knee, which proved to be a subperiosteal sarcoma. The second, a boy ten years of age, who fell and hurt his knee, and the joint was found stiff and painful; a swelling gradually arose, which proved to be a central sarcoma of the femur.

Travers⁴ records the case of a boy ten years of age who fell and hurt his shoulder; ten days afterwards a swelling in the clavicle was noticed, which rapidly developed. Twelve months after the injury the bone was excised, and was found to be the seat of a hæmorrhagic sarcoma.

Dupuytren⁵ mentions three cases bearing on this point. (1) A man aged thirty-six, who received a blow upon the chin, and three months later was found to have a large osteo-sarcoma of the lower jaw. (2) A woman aged forty-three fell on the knee. A few weeks later the part became the seat of a dull pain. In three months a rapid enlargement of the thigh occurred, and an enormous osteo-sarcoma of the femur developed, involving four-fifths of the length of the bone, and attaining a maximum circumference of two feet. (3) A man aged forty-nine received in a fall a severe contusion of the front of the right arm. Eight months later severe pain was experienced in the shoulder, and a firm tumour of the humerus appeared.

Mr. Barwell⁶ has recorded two cases of what he calls "acute traumatic malignancy." (1) A lad seventeen years of age fell violently on his shoulder on April 24th, 1875. When first seen, on May 19th, a tumour of the shoulder was detected, which steadily enlarged until it was excised in the following June. It was found to be a round-cell sarcoma, commencing apparently in the subsynovial tissue. (2) A man aged sixty-three fell down the hold of a ship, severely bruising his left side. Eighteen days afterwards, when first seen, a tumour was found over the tenth and eleventh ribs, with considerable dulness of the chest on the same side. He died on the thirty-first day after the injury, and the "whole left pleura (parietal)" was "one mass of malignant growth, in places $\frac{3}{4}$ in. thick, nodulated on the surface, and white. The lung" was "infiltrated with a like material." The right pleura and lung were in a very similar condition. The growth was a round- and oval-cell sarcoma.

R. W. Parker⁷ records the case of a child, a few months old, who fell and hurt her left knee; a few days later the part began to swell, and the enlargement increased till death, being due to a large subperiosteal sarcoma.

Mr. Butlin⁸ mentions the case of a man, thirty-eight years of age, who strained his knee by a fall; in less than three weeks a tumour appeared just above the joint, for which amputation of the thigh was subsequently performed. He states that he could relate "at least six other instances of subperiosteal and central tumours of bone rapidly arising after injury, and a still greater number attributed, apparently with perfect justice, to injury, but pursuing a chronic course."

Dr. S. W. Gross⁹ mentions a case of lympho-sarcoma of the humerus, noticed six weeks after an injury.

Reclus¹⁰ records the case of a lad who was struck on the thigh with the handle of a cart; in eight days he was disabled from work owing to swelling of the part, and in three months the thigh was amputated for a very large tumour of the femur.

Mr. Walker¹¹ reports the case of a lad who was kicked on the shin, and a sarcoma of the tibia quickly developed at the seat of injury. He mentions also two cases of cancer—one of the liver and one of the prepuce, apparently excited by a single injury.

Cripps¹² records the case of a constable who was kicked in the breast; about two months later he noticed a small lump at the seat of the injury; this quickly increased, and proved to be a sarcoma.

Roger Williams¹³ has recorded the case of a man aged twenty-one who received a severe contusion of the leg. A month later a tumour was noticed, which on examination

was found to be a subperiosteal round-cell sarcoma of the tibia and fibula.

To this list I might add many more if I had the opportunity of searching hospital registers and surgical literature. They suffice to show the kind of evidence on which may be rested a belief in the influence of single injuries in the genesis of tumours, and especially of sarcomata. In this paper I wish to consider only the influence of *single injuries* as opposed to frequently repeated milder lesions or *irritations*, and to view this influence in relation to sarcomata only.

The questions that are suggested by such cases as those I have cited are two: 1st, Does injury play any part in the genesis of sarcoma? and 2ndly, If it does, of what nature is its influence? or, How does an injury lead to the development of a sarcoma?

1. *Does injury play any part in the genesis of sarcoma?* Are the examples of sarcoma quickly following injury mere coincidences, in which the injury may have drawn attention to a tumour already existing, or in which the detection of a swelling led the patient to recall with special vividness some previous injury to the part? The history of many of these cases is difficult to reconcile with either of these theories; but, on the other hand, the extraordinary and undoubted coincidences met with in practice should make us hesitate to accept such evidence as these cases afford without carefully weighing it. We must bear in mind that in a large number of cases of sarcoma of bone the patients are unable to recall any previous injury to the part; and it is unquestionably true that of the vast number of contusions and other injuries only an infinitesimally small proportion are followed by the growth of a sarcoma. On the other hand, we have to put the general experience of surgeons which leads them to regard the relation of single injuries and tumour formations as not accidental, and such specific cases as those above cited afford a marked corroboration of this opinion. Further confirmation of this view is afforded by the facts that sarcoma of bone is most common between the ages of twenty and forty, and occurs with greater frequency in men than in women (in the proportion of 138 to 117, R. Williams) and in those bones which are most exposed to injury. On the whole, the balance of evidence appears to show that *in a certain proportion of cases a single injury does excite the growth of a sarcoma of bone.*

2. Our second question is a far more profound one, and the precise answer to it must wait until we have more exact knowledge of the conditions governing cell growth and development. We may, however, consider some of the theories that have been advanced. Billroth and some others assume that in these cases there has been a tumour diathesis or some special constitutional tendency to the development of sarcoma, which has only needed an injury to call it into activity, just as an injury may bring on a gouty arthritis in a subject of the gouty diathesis. This theory only pushes the difficulty one stage further back, and suggests inquiry into the nature of the constitutional change, which renders an individual liable to the development of a sarcoma on the receipt of an injury. Fascinating as is this view, it yet lacks all positive evidence in its favour; nothing is known of the nature of the diathesis, or of any features by which it can be recognised before the development of the sarcomatous tumour. On the other hand, all the facts alleged in its support are at least capable of another explanation, and it leaves us at a loss to explain why every injury to those who are supposed to be the subjects of this diathesis is not followed by the growth of a sarcoma, and why sarcoma in its primary manifestations is so constantly single, while multiple contusions are so very frequent. Mr. Barwell's second case might be cited as an instance to the contrary, but although I have included it in my list of cases, as it forms an important item in Mr. Barwell's interesting paper, I cannot think that the evidence of the traumatic origin of this tumour is by any means conclusive. It is well known that considerable intra-thoracic growths may exist without giving rise to any morbid symptoms. The theory of "fœtal inclusion" is entirely unsupported by evidence, and it is of such a nature that until some proof can be alleged in its favour it is impossible to discuss it. The same observations apply to the view which regards sarcomata as produced by the growth of parasites or micro-organisms. If this were proved, the influence of injury in exciting the growth of a sarcoma would have a close analogy in the case of acute osteo-

³ Treatise on Diseases of Bones.

⁴ Med.-Chir. Trans., vol. xxi.

⁵ Diseases and Injuries of Bones.

⁶ Brit. Med. Journ., Feb. 11th, 1882.

⁷ Path. Soc. Trans., vol. xxxi.

⁸ Brit. Med. Journ., March 18th, 1882.

⁹ Amer. Journ. Med. Sciences, 1879.

¹⁰ Bull. de la Soc. Anat., 1873.

¹¹ Brit. Med. Journ., April 1st, 1882.

¹² Ibid., May 6th, 1882.

¹³ Path. Soc. Trans., 1883.

myelitis. If now we cast aside these theories, which are advanced to explain the origin of all tumours or of all malignant tumours, and look at the local changes in the repair of injuries, the problem presents itself thus. The repair of all injuries is effected by means of indifferent cells derived from the white blood-cells, which pass through various developmental changes until they have formed a tissue more or less perfectly resembling the original. At a certain early stage of this process the reparative material resembles more or less exactly a sarcoma, and in such cases as those we are considering we may describe the growth of the tumour as due to the arrest of the development of the "lymph" when it has reached only an immature stage. We know that the development of the reparative material is largely influenced by the living tissues immediately adjacent to it, possibly also by the nerves of the part, so that in one place the same "lymph" will grow into fibrous tissue, in another place into bone, and in a third into nerve. I would therefore submit that we find a clue to the cases under discussion by regarding the origin of the sarcoma as depending upon some dynamic influence of the injury upon those tissues which control the development of the reparative material, and which shows itself by arresting the development when the tissue formed is immature, and when the cells are endowed with great powers of growth. I think we have evidence that injury does exert such dynamic influence upon tissues in some cases of inflammation and abscess after injury, in cases of wasting of muscles after contusion, in brittle nails after pinches of the digits, &c. The rarity of this sequel to an injury is probably accounted for by the *real* dissimilarity of injuries which appear exactly alike, and by the different inherent powers of resistance possessed by the tissues of different individuals. At any rate, the different results in other particulars which follow the most closely similar injuries afford an important analogy. In conclusion, I would merely point out such a supposition as this may throw light upon the facts adduced by Verneuil, Kirmisson, and others, which appear to show that malignant tumours in central organs may develop rapidly after an injury to the extremities; and also upon Nicaise's cases of the growth of secondary malignant deposits only in parts exposed to injury.

I should like further to add a word about the method of amputation adopted in the second of my cases, as it is in my opinion the simplest procedure in such cases. It may be considered as a modification of Furneaux Jordan's plan, inasmuch as the soft parts were divided at the middle of the thigh, and the inner part of the thigh was left intact. It differs from the modification of his first method which Mr. Jordan suggested, and which has been largely practised by Dr. Marshall, inasmuch as a complete circular amputation of the thigh was first made, and after the hæmorrhage had been arrested the upper end of the femur was enucleated by means of an incision along its outer side. The advantages of Furneaux Jordan's method of amputation at the hip are now generally admitted. The additional advantage of the plan I followed is that it relieves the surgeon of all difficulty or anxiety on the score of hæmorrhage. A simple tourniquet easily controls the common femoral artery, and the whole question of hæmorrhage and its prevention is reduced to the simple proportions it assumes in amputations of the thigh. The need for Lister's abdominal tourniquet, Davy's lever, or special applications of Esmarch's cord is entirely obviated. It is better to have skin flaps to cover over the mass of muscles divided, and I therefore preferred this plan to a simple straight section through the limb. (At the close of the meeting of the Medical Society at which this paper was read, Mr. J. H. Morgan informed me that he had practised this method of amputating, and was very pleased with it.)

THE NEW LUNATIC ASYLUM.—On the 26th ult., at a general meeting of the magistrates of the county of Middlesex, it was decided that the provisional contract entered into by the committee appointed to provide an additional asylum for pauper lunatics for the Birch Hall Estate, Theydon Bois, in the county of Essex, containing 136 acres, for £12,750, be approved by the Court, subject to the sanction of the Secretary of State for the Home Department, and that, subject to the approval of the contract by the Secretary of State, the sum of £13,200 be raised on mortgage of the county rates for the purchase of the Birch Hall Estate, for the purpose of erecting thereon a fourth lunatic asylum for the county of Middlesex.

TUBERCLE AND THE TUBERCLE BACILLUS:

A REVIEW.

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(Concluded from p. 989.)

WE will now consider the importance of the dose of the virus used for inoculation. Koch says, it is of the greatest significance whether the infection be produced by few bacilli or by a large number. The different results can be most simply studied in the eye of the rabbit. If as few bacilli as possible be introduced into the anterior chamber, there follow at first separate grey nodules, true miliary tubercles, which become yellow in the centre. Their number gradually increases, they become confluent, and lead, only after a somewhat lengthened period, to general caseation and destruction of the eye, and to the production of tubercle in other organs. If, on the contrary, a large number of bacilli be introduced into the anterior chamber, a diffuse caseous infiltration ensues, and the eye speedily becomes disorganised, general tuberculosis taking place early, usually within three weeks. And, further, with regard to the method of infection, the changes found in animals that have died of spontaneous tuberculosis are very different from those that are produced by artificial infection, so that the method of infection can be determined with complete certainty. In spontaneous tuberculosis one or two large tubercular masses in a state of advanced caseation are found in the lungs, and at the same time the bronchial glands are much enlarged and caseous. Occasionally nothing is found in the lungs, but the bronchial glands are enormously enlarged and caseous. The tubercular changes in the other organs are, on the contrary, relatively slightly advanced. In the artificially produced disease the appearances differ according as inoculation or inhalation of bacillus-containing fluids is employed. In inoculation under the skin of the abdomen the nearest lymphatic glands are greatly enlarged and caseous; but the bronchial glands are almost always so small as only to be found with difficulty. The tubercular changes in the liver and spleen are also far advanced, whereas in the lungs they are relatively slight. In animals that have become infected by inhalation and that have received a large quantity of bacilli into the lungs, there are found not one or two large tubercular masses in the lungs, but a very large number of small tubercles. Thus, in all cases, in man and in the lower animals, a local caseous tubercular mass, with infiltration of the neighbouring lymphatic glands, precedes general tuberculosis by a longer or shorter time. In guinea-pigs inoculated with a large dose, the time that elapses before general infection takes place may be very small. In man, on the contrary, who is generally infected by a small dose, though it may be oft-repeated, the time is generally long, and much more frequently than not general infection never takes place at all. In this respect the course of tubercular disease in man resembles that in dogs, cattle, and fowls, tending to produce local changes, and not a general infection.

With regard to the much-disputed question of the hereditary transmission of tubercle, there are no grounds for supposing that tubercle bacilli can exist in the infant body during intra- or extra-uterine life without in a relatively short time producing visible changes. Hitherto signs of tubercular disease have been very seldom found in the foetus or in the new-born infant, and from this we may conclude that the tubercle virus only exceptionally comes to maturity during intra-uterine life. This is in accordance with the fact that the animals used in Koch's experiments—namely, guinea-pigs,—which frequently became pregnant shortly before or after becoming infected with tubercle, never produced young that were already tubercular at birth. The young of mothers with advanced tubercular disease were free from tubercle and remained healthy for months. We are therefore driven to the conclusion that in hereditary tubercle it is not the *materies morbi* itself that is inherited, but certain special conditions which favour the growth of the virus when at a later period it comes into contact with the body, and which we call predisposition. Although a great part of what is comprised under the expression "predisposition" consists in simple and easily explained condi-