

The local character of yellow fever is strongly shown by the numerous instances in which numbers of persons, many of them suffering from the disease, have left an infected locality and settled down at a short distance from it, with the result of very speedily checking the progress of the epidemic amongst them. During the Gibraltar epidemic of 1828 four thousand persons left the town, and were encamped in the neutral ground, taking with them their furniture, &c. The disease was checked at once.⁷ At Leghorn, in 1804, six thousand persons left that city for Pisa; at the same time the French army removed to the same place, taking with them 180 men suffering from the disease; yet it was not propagated in Pisa. A good instance of the same kind also occurred at Bermuda in 1864.⁸ The 2nd Batt. 2nd Regt. arrived at St. George on July 15th, five days after the occurrence of the first case of yellow fever in the town, and remained there until August 1st. During this time seventeen cases had occurred, with two deaths. The battalion was then sent to the camp at Ferry-point on the same island. Up to September 3rd men were being constantly sent into St. George on duty, and cases occurred amongst them. After this date, however, coloured men were employed in the work, and the disease soon disappeared. At the conclusion of the epidemic the convalescents were paraded and questioned, when it appeared that out of sixty-one cases only seven had, in all probability, originated at Ferry-point. It is interesting to note that at Ferry-point there were thirty-four orderlies attending on the sick, of whom four were attacked; while at the hospital at St. George, out of the thirty-four so employed, thirty were attacked and eighteen died.

It is needless to point out that the characteristics of yellow fever are not those of an ordinary infectious disease. Several theories have been brought forward to account for the contradictory facts observed. I myself am disposed to hold provisionally the view that yellow fever is a miasmatico-contagious disease (to borrow a German expression) analogous to cholera and to enteric fever. It would seem—to speak in terms of the germ theory—that the germs in the blood of a patient cannot reproduce themselves in the blood of another person, but that they require to undergo further development, or to produce a second generation, in a suitable nidus, before they, or the new generation, can multiply in the human body and produce yellow fever. This nidus is chiefly found on board ship, or in seaport towns; and yellow fever may be propagated by its being conveyed, with the disease-germs in it, by ships, persons, or articles. The germs in this nidus at the time of its conveyance may be in an advanced state of development, and ready at once to seize upon the human frame. Under favourable circumstances fresh foci of disease may thus be formed, or persons may be directly infected. The disease seems at times to spread with greater facility than at other times, especially when the temperature is unusually high. This may be due to the rapid development and great activity of the germs.

CASE OF CONSECUTIVE EXCISION OF BOTH KNEE-JOINTS FOR DISEASE,

TERMINATING IN RECOVERY.

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STEPHEN H—, aged forty-five years, married, was admitted into the Sunderland Infirmary on May 29th, 1877. Eight years ago, whilst at sea as a ship-carpenter, and sleeping frequently in wet clothes, his knees began to be painful and swollen, with nocturnal exacerbations of pain. Returning from this voyage, he did not feel able again to go to sea, but commenced work as a shipwright on shore, and so continued until the summer of 1875. In this interval he seems to have been regularly at work, but the knees were gradually becoming more swollen and the pain more severe. About this time he was recommended to go to Croft Spa, and was there some weeks taking the sulphur baths; but not experiencing the benefit anticipated, he was removed

thence, and admitted into the Durham County Hospital, where he remained seven weeks. He came home, however, unrelieved, and resumed work, though the swelling was still increasing and the knees were now becoming somewhat flexed. On the 12th October, 1876, he was admitted into the Edinburgh Infirmary, where he was first, for three weeks, placed in the surgical wards. After that time he was transferred to the medical wards, and the knees were painted and blistered. After eleven weeks, receiving no benefit, he was discharged, and he returned home in the last week of December, 1876. When he left the Edinburgh Infirmary the contraction of the knees had so much increased that he was unable to walk about.

Five months after leaving Edinburgh he was admitted into the Sunderland Infirmary under my care. On admission he was in a somewhat debilitated condition, but, except in the knees, there were no physical signs of disease. Examining his knees I found them fixed at a right angle, the thighs flexed and abducted, and the feet approximated, so that his position in bed was much like that of a tailor at his board. The right knee-joint was much swollen and hot; surface glossy, pink, and marked with a network of distended veins. The left knee was less swollen; skin nearly natural in appearance and temperature. The muscles of both legs were much wasted. His previous health had always been good; had never had any illness; had been a steady man, but seven years ago had a slight attack of gonorrhœa, which lasted only a few days, and was not succeeded by any secondary symptoms. Married fifteen years; no family living, but his wife had borne him four children, the first of whom died a few hours after birth, and the others at six, eight, and twelve months respectively, as he said, of inflammation of the lungs. His wife had had no miscarriages. His family history was entirely negative: no rheumatism; no joint affection; no chorea; and no consumption.

For about three weeks after admission iodine was painted on both knees, and a blister was applied, but without any apparent advantage. After much consideration, and consultation with my colleagues, I decided to perform excision of the joints, as the most likely means of relieving my patient from his unfortunate position, and procuring for him, as I hoped, good and useful limbs. He and his family were duly informed of all the possible evil consequences that might result from a failure in the operation, but he quickly decided in favour of my recommendation, desiring me, if possible, to save his leg.

First operation.—On June 20th, 1877, with the kind help of my colleagues, the patient being placed under the influence of chloroform, I proceeded to excise the right knee-joint. The operation was performed in the usual way, by a curved incision, and under complete antiseptic precautions. On opening the joint, the synovial membrane was found in an advanced stage of gelatinous degeneration; the cartilage on the inner condyle of the femur was ulcerated, as was that on the corresponding surface of the tibia; and there was partial dislocation of the tibia backwards. Before closing the wound, as much as possible of the diseased synovial membrane was removed. A drainage-tube was inserted along the floor of the wound from side to side, and the limb put up straight on an ordinary Macintyre splint.

There was nothing particular to record in the progress of the case. The drainage-tube was removed on the 29th of August (the 70th day of treatment); and on September 15th (the 87th day) bony union was complete, and the splint was discarded. During this time, the swelling and heat of the left knee had subsided, and there was partial bony ankylosis.

Second operation.—The first operation having been so successful, I was encouraged to proceed with the excision of the left knee, and accordingly on October 10th, I performed the second operation. This was done, as before, under complete antiseptic precautions. On opening the joint, there was found bony ankylosis between the tibia and posterior portion of the articular surface of the femur, the tibia being dislocated backwards. In the first operation, adaptation of the bones was easily accomplished; but in the second perfect adjustment was not effected until a second piece was removed from the tibia, and two or three of the flexor tendons divided. The patella was removed in both operations. The case progressed even more favourably than on the first occasion. The drainage-tube was removed on Dec. 10th (the 61st day of the treatment), and bony union being complete on Jan. 18th, 1878 (the 100th day), he was allowed to be up for the first time, the two operations having been brought to a successful termination within a

⁷ Board of Health's Second Report on Quarantine.

⁸ Army Medical Report for 1863, p. 307.

period of seven months, or 212 days. The difference in the length of the two legs scarcely amounts to the eighth of an inch.

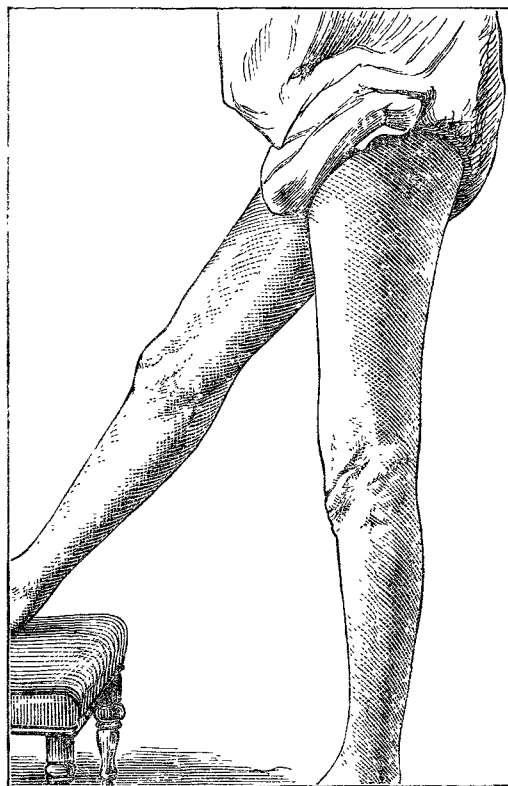
Remarks.—In concluding the history of this case I would make a few observations on one or two points which appear to me to be of interest.

First, with regard to age:—Stephen H— was forty-five years old in April, 1877. He had reached the extreme limit beyond which surgeons are agreed that excision should never be undertaken. Mr. Swain, in his work on "Injuries and Diseases of the Knee-joint," at page 151, says: "I would rather excise a knee-joint in a patient before the age of forty than after. The powers of reparation in advanced life are not sufficiently strong to give the patient much chance of a useful limb or to support him through the long after-treatment." In the list of 104 cases given by Mr. Swain, five only are above the age of forty. They are as follows:—Case 27, female, aged forty-three years, after firm osseous union, died from embolism on the 80th day. Case 75, male, aged forty-five, good union, with recovery; no other details are given. Case 77, female, aged forty-six; no union on the 143rd day; died of phthisis. Case 80, female, aged forty-one; no union in 17 weeks, or 119 days; amputation with recovery. Case 92, female, aged forty-two; on the 205th day, there was still slight movement in the antero-posterior direction. Thus, of the five cases said to be over forty years of age, two died; one underwent subsequent amputation with recovery, and two recovered, one with firm union, the other doubtful. That is, only one recovered with good union, and nothing is said as to the nature of the union, whether bony or otherwise, and nothing stated with regard to the duration of the treatment.

In my patient bony union was complete in both legs in a period of seven months, or 212 days. In the first operation bony union was complete on the 87th day, then an interval of 25 days elapsed, after which the second operation took place, and on the 100th day thereafter bony union was complete, and the patient allowed to get up for the first time. If we exclude this period of 25 days intervening between the date of the recovery from the first operation and the date of the second operation, then the duration of the treatment in the two cases extended over a period of only 187 days. Mr. Holmes, in his "Treatise on Surgery," quotes some tables compiled by Dr. Hodge, in which he gives eighty-six cases where the average duration of the treatment is stated to have been 240 days, forty-eight cases in which the patella was removed occupying an average period of 225 days, and thirty-eight cases where the patella was believed to have been left occupying an average period of 225 days, or, roughly speaking, about eight months. In examining the cases given in Mr. Swain's list, I have selected twenty-eight cases from it which seem to afford something like precise information with regard to the duration of treatment. Six cases are given at the age of ten years and under, and the average duration was a little more than 81 days; above ten and under twenty, ten cases are given with an average of 101 days; above twenty and under thirty, nine cases are given, averaging rather over 97 days; above thirty, two cases, average 73 days; one aged forty-two, a duration of 205 days. There cannot be a doubt, however, that in the more recent cases of excision of the knee-joint, statistics of a much more favourable character could be given as to the duration of the treatment than in former reports. And this is not more than what might reasonably be expected, owing to the greater skill and experience more lately acquired in the dressing and general treatment of the cases, and especially to the comparatively recent adoption of the anti-septic treatment.

As regards the adoption of amputation or excision in cases of knee-joint disease, Sir Wm. Fergusson has expressed his deliberate opinion "that in eight persons out of ten, under the age of twenty or thirty, in whom disease of the articular surfaces of the bones of the knee-joint seems incurable, the operation of excision should be preferred to that of amputation." And he gives his reasons: "The wound is less, the bleeding less, the loss of substance is less, the shock is consequently less, and the chances of secondary hæmorrhage scarcely worth notice, as the main artery is left untouched, whilst there is the encouraging prospect of retaining a useful and substantial limb." The difference in the duration of the treatment in cases of amputation and excision has been urged against the latter operation; but this, I think, is a matter of little importance in comparison with the object to be attained; and so long as a good and serviceable limb be

secured, it is scarcely open to adverse criticism that the patient should be made to lie for a period of six or even more months. But, further, I believe that, as greater experience is gained in matters of detail in the care and management of the cases, this difference will be reduced to a minimum. My own personal experience has been extremely limited, having only performed excision once before, resulting, however, in a rapid recovery, with a good, strong, and useful limb.



The two woodcuts represent, the one a front, and the other a side view of both legs. In the front view the right leg is observed to be somewhat bowed outwards; but this is not dependent upon the operation, as the patient explains that both his legs were bowed before they were operated upon. The cuts are from drawings by Dr. T. W. Barron, taken from photographs.

Then, in the way of warning, I would say that in reading the details of a great many cases I have been particularly struck with the frequent occurrence of deformity after excision recorded in subsequent months or years, and I am

forced to the conclusion that many of the patients who have undergone this operation have been allowed to bear their weight upon the leg much too soon, and at a time when perfect consolidation of the new bone cannot yet have taken place, thus leading to partial dislocation of the tibia in different directions, generally outwards and backwards.

I would add that I am not aware that there is any case on record where excision of both knee-joints has been performed on the same person. I believe this case to be unique in the history of excision of the knee-joint.

In closing my remarks on this case, I would for a moment gratefully take this opportunity of expressing my deep sense of the obligation I feel I am under to my kind and able friend, Dr. Ransom, the senior house-surgeon to the Sunderland Infirmary; for it is to his patient, unwearied, and skilful management of the case that I am chiefly indebted for the happy and fortunate result that has been obtained.

Sunderland.

A CONTRIBUTION TO THE PATHOLOGY OF TETANUS OR LOCKJAW.

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A FEW months ago a patient, a boy aged fourteen years, was under my care at the infirmary suffering from tetanus, which supervened upon partial amputation of the foot, the result of a railway accident. A week after the operation symptoms of tetanus set in, which, in spite of remedies employed—viz., chloroform, chloral, ice to spine—proved fatal in four days.

The house-surgeon, Dr. Murray, kindly obtained possession for me of the whole length of the spinal cord, medulla, and pons Varolii. Some of the nervous tissue I sectionised whilst in a fresh state, having frozen it in the glaciarium, the other portions of nervous tissue were hardened in one per cent. of chromic acid, care being taken to change the solution every day for the first week, and keep in a cool place. Previous to the cord being placed in the chromic-acid solution, it was cut into pieces about an inch long; the cut did not extend through the entire portion of the cord, so that the relations of the cord were not altered. Sections were made at the end of six weeks. To the naked eye the spinal cord, with the exception of congestion, which was most noticeable in the lumbar region, appeared healthy. The cord, however, when cut into, seemed to "well up," as if it had been constricted at points. The cord seemed heavier than natural; the specific gravity was not taken.

Microscopical examination of the cord.—There was no difference between the freshly frozen and the chemically hardened tissue, so that the changes observed could not have been produced by reagent action. In both series of slides an enormous capillary dilatation is observed, some of the smallest arteries in the neighbourhood of the grey matter (usually about $\frac{1}{180000}$ to $\frac{1}{200000}$ mm.), being almost as large as those to be described by me near the central canal (about $\frac{1}{433}$ mm.) Numerous round and oval-shaped bodies can be seen, the round being by far the most numerous. These occupy the central grey matter, especially round and about the central canal. On either side of the central canal the vascular spaces are greatly distended, and in the transverse sections no trace of arterial coat can be discovered, but in many instances these enormously distended vascular spaces contain round bodies (?leucocytes). This vascular distension causes gaps and canals, as if the nerve-structure had become to a certain extent displaced by the blood-pressure and dilatation. The posterior cornua exhibit traces of granular disintegration. I did not notice any swelling in the cervical region or in the neighbourhood of the first lumbar vertebrae, which was noticed by Dickinson,¹ and which has been thought by Schultze to be artificially produced by removal of the cord.² In the posterior columns gaps can be seen showing where dilated vessels have coursed. In the cervical portion, owing to the blood-

pressure, the posterior fissure is greatly displaced, thrust on one side instead of occupying the median line; it is also greatly distended. The ganglionic cells in the anterior cornua did not present any structural or other change. In some tetanic cords I have noticed a very limited portion in which colloid bodies were numerous, and made especially noticeable by staining in logwood. I should advise, in the preparation of staining sections of spinal cords, that more than one medium be used, as I feel certain otherwise many structural changes may pass unobserved. The portion of cord in which I have noticed these colloid bodies is usually that portion nearest the seat of injury. Blood-supply in spinal cord of rabbit injected $\times 60$ (normal). The blood-vessels in the cervical are much more numerous than in the dorsal region; usually several vessels of large size can be observed in the neighbourhood (mostly on either side) of the central canal; one vessel larger than the rest is seen at the side of the central canal to pass along the anterior longitudinal fissure, and anastomose with a vessel at the most anterior portion of the fissure. Near the central canal this vessel gives off several branches, which, meeting with other branches, form a dense capillary network in the neighbourhood of the grey matter. Several vessels anastomose in the medullary portion, but the great anastomosis takes place around the grey matter and between the minute ganglionic cells. The vessels seem to be derived from the same source as those supplying the membranes; they enter the medullary substance by minute fissures; some pass in a straight, others in a wavy direction, and at the junction of the grey matter with the medullary substance unite and form a dense capillary network. So minute are the arterial branches of this anastomosis that in many instances the smallest ganglionic nerve-cells can be seen to be almost surrounded by them. The arterial supply is greater in the cervical than in the dorsal region; in the lumbar enlargement the blood supply is again increased, and the anastomosis as fine as in the cervical region. It seems to be the rule, after examining many hundreds of slides, that where the grey matter is more abundant there is the anastomotic network more dense. The veins form a plexus in the posterior columns. The largest bloodvessels are, as before stated, in the neighbourhood of the central canal, and are about $\frac{1}{433}$ mm., the smallest are about the centre of the grey matter in the posterior columns, and about $\frac{1}{180000}$ to $\frac{1}{200000}$ mm. In man they are considerably larger.

Various pathological changes observed.

In the *brain*, the following changes have been met with in a selection of eighty-one cases from Reeves³ and other sources. Brain injected in fifteen cases. In one case pus existed on the cerebral dura mater (the patient had had his skull fractured); in two other cases blood was observed external to the dura mater; in another the medulla was softened; arachnoid in three cases opaque; lateral ventricles in three cases contained a large amount of serum.

In the *spinal cord* the various changes have been met with and described.

1. Proliferation of connective tissue in chronic cases (Rokitansky).
2. Proliferation of the neuroglia, amounting to sclerosis; granular disintegration of the cells (Lockhart Clarke).
3. Inflammation of the neurilemma (Lepelletier and Frieriep).
4. Collection of fat between the membranes and cord; softened patch in the cord just above the cauda equina.
5. Effusion of blood outside the dura mater, about the seventh or eighth dorsal vertebra.
6. Effusion of serum into the spinal membrane.
7. Hæmorrhage into the spinal membrane; proliferation of connective tissue of cord, medulla, cornua cerebri et cerebelli (Wunderlich).
8. Nerve-twig in the wound diseased (Erichsen, Poland, Trousseau).
9. Congestion, inflammation, exudation, softening, induration (Romberg).
10. In many cases no lesion whatever (Wilks).
11. Some lesions of the spinal membrane, or a little more liquid than usual in the membranes, and softening of the anterior columns of the cord (Sandras and Bourguignon).
12. Areas of disintegration and extravasations of blood in different parts of the cord (Clarke, Dickinson, Allbutt, E. L. Fox).

¹ Med.-Chir. Trans., vol. li., p. 265.

² Deutsches Archiv, Band xx., p. 390.

³ Reeves' Diseases of Spinal Cord and Membranes, p. 368.