OBSERVATIONS
ON
ULCERATION
OF THE
CARTILAGES OF JOINTS,
AND ON
ANCHYLOSIS.

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IN a valuable paper by Mr. Key on the ulcerative process in joints, published in the eighteenth volume of the Medico-Chirurgical Transactions, two opinions are maintained. One is, that ulceration of cartilage is more frequently dependent on inflammation of the synovial membrane than it is commonly supposed; the other is, that the inflamed synovial membrane is the agent by which cartilage is absorbed, or that cartilage is not so organized as to be capable of self-absorption, as the vascular tissues are, but when appearing to ulcerate, is acted on and taken up either by the capsular synovial membrane, or by a false membrane superadded to the latter, with one or other of which the cartilage is in contact. The first of these opinions is borne out by my own experience;

the second is opposed to the authority of Dr. William Hunter and of Mr. Brodie, and is at variance with facts which will be stated in the present paper. My principal object, however, in the present paper, is not to multiply proofs of vital forces being inherent in cartilages, but to establish certain pathological differences, which I believe to have been overlooked by others, in ulcerative diseases of joints. With this purpose, I shall describe several cases and dissections which have fallen under my observation. They tend to shew that articular cartilages are liable to three distinct forms of ulceration, or exhibit three varieties of ulcerative disease, which, although they may be occasionally combined, are oftener met with separately.

The cases which I shall first describe, are instances of rapid absorption of cartilage beginning on its synovial aspect, the new surface, if of cartilage, being smooth and unaltered in structure; if of bone, healthy; the absorption of cartilage being attended with inflammation of the capsular synovial membrane.

The second series will exemplify chronic ulceration of cartilage beginning on its synovial aspect, producing an irregularly excavated surface, with fibrous or brush-like projections of the cartilage and synovial membrane, attended with inflammation of the capsular synovial membrane, and sometimes of the same membrane where it is reflected over the cartilage; the bone and the surface of cartilage towards it being healthy.

The third are instances of ulceration of cartilage beginning on the surface towards the bone, attended with inflammation of the adjacent surface of the bone, with inflammation of the synovial membrane, and in some instances with sensible vascularity of the cartilage itself.

Of these three classes, the second alone appears to me to have been fully treated of by Mr. Brodie, in his well known work upon the joints. The first does not seem to have attracted his attention as a separate form of disease; and the third he has not, I think, sufficiently distinguished from scrofulous affections of the articular ends of bones.

I.

“ Cases of rapid absorption of cartilage beginning on its synovial aspect, the new surface, if cartilaginous, being smooth and unaltered in structure; if of bone, healthy; the absorption of cartilage being attended with inflammation of the capsular synovial membrane.”

A young woman was admitted into the Middlesex Hospital in the summer of 1829, four or five weeks after her confinement, in a state of great emaciation, with a large abscess below the fascia of the thigh, extending from the knee more than half way to the groin. The abscess did not communicate with the joint, which contained no fluid, but was contracted; the tibia was drawn backwards upon the condyles

of the femur. In six weeks this patient sank and died.

Upon examining the knee-joint, the cartilage of the condyles of the femur was found to be entirely absorbed towards the edge, the bone exposed being healthy. The cartilage covering the condyles at other parts was uniformly attenuated, but smooth, and strongly adherent to the bone, which was healthy.

The capsular synovial membrane was inflamed and thickened, and a fine film of false membrane extended over the whole surface of the condyles, being the agent through which, upon Mr. Key's hypothesis, the superficial absorption of the cartilage had taken place. The patella was ankylosed to the femur, a thin layer of cartilage intervening between the two bones.

The preceding instance belongs to a class of cases which I described in the eleventh volume of the *Medico-Chirurgical Transactions*. Of these cases, the only one of which I had then obtained a dissection, was the following.

A boy fourteen years of age died in the Middlesex Hospital of *hernia cerebri*, three weeks after a fracture of the skull. He was perfectly well till the accident. Four days after its occurrence, a joint of one finger and one ankle-joint became swollen and painful. The swellings suppurated, and were opened.

On examination of the parts after death, the abscesses were found to have no communication with the neighbouring joints. The joints contained no fluid. The capsular synovial membrane of each was inflamed and thickened, but neither fringes nor productions of false membrane stretched between the articular surfaces of the bones. The cartilages were, however, partially absorbed, and in each joint with the same character. The cartilage of the under surface of the astragalus had become so thin as to be semi-transparent; the layer which remained was smooth, of the natural texture, and firmly adherent to the bone. The cartilage upon the tibial aspect of the astragalus was nearly wholly absorbed; patches only were left at the extremities of the upper and lateral edges, which were smooth and firmly adherent to the bone. The exposed surface of the astragalus was healthy.

The upper surface of the astragalus is represented in Plate I., fig. 1.

It is certain that in this case the absorption of the cartilage must have taken place through the vessels of the cartilage itself.

In the paper to which I have referred, two other cases are described, which appeared to be of the same nature, and in which the patients recovered with ankylosis of the affected joints. In one the joint diseased was the knee, in the other the elbow. It happened that some years afterwards the second patient

died under circumstances which enabled me to examine the elbow-joint which had been affected. I found in it, as I had anticipated, bony ankylosis between the humerus and ulna. The cartilage having been absorbed, healthy surfaces of bone came into contact, between which union had taken place.

Cases like the preceding are of rare occurrence. The absorption of cartilage takes place rapidly. It is attended with severe pain, with inflammation of the capsular synovial membrane, and generally with suppuration in the cellular tissue adjacent to the joint. The only favourable termination of the disease that I have witnessed, has been ankylosis.

II. .

“ Cases of chronic ulceration of cartilage beginning upon its synovial aspect, producing an irregularly excavated surface, with fibrous or brush-like projections of the cartilage and synovial membrane, attended with inflammation of the capsular synovial membrane, and sometimes of the same membrane where it is reflected over the cartilage ; the bone and the surface of cartilage towards it being healthy.”

To exemplify the connexion between this form of disease and inflammation of the synovial membrane, I shall give two instances, the first of which might be viewed as evidence in favour of Mr. Key's hypothesis. The second, however, contravenes it. The second case likewise presents some peculiar features, and a

character of much acuter suffering than commonly attends the disease.

Mary Cole, ætat. twenty-seven, was admitted into the Middlesex Hospital, January 16, 1834. The left knee was nearly motionless through ankylosis of the patella to the outer condyle; it was swollen, but in a trifling degree. The position of the knee was nearly straight. When the limb was at rest, she was generally free from pain, which, however, was invariably brought on by motion or pressure. The complaint had commenced a year before, and she attributed it to an accident; her foot had slipped through a hole in the floor, and the joint might have been strained. But three months elapsed between the occurrence of this accident and any symptom which she distinctly remembered. The joint at that period became suddenly swollen and painful. Leeches, cupping, fomenting, blisters, and an issue were used, which in four months had nearly removed the pain and swelling, when she accidentally fell and struck the knee. The symptoms immediately returned with aggravation, and the knee was drawn into a semiflexed position. The treatment which had before been of service was again resorted to successfully: after persevering in it for some time, bandaging with mercurial ointment was used. The knee became nearly free from pain, and straight, but the joint was useless.

She now ventured to walk, when the pain, which had never wholly gone, increased. Soon after this

period, she came into the hospital. A few days after her admission she was taken with erysipelas, and died.

Upon examining the diseased joint, bony ankylosis was found to have taken place between the patella and outer condyle. The inner half of the cartilaginous surface of the inner condyle was ulcerated; the ulceration was shallow, the excavated surface was irregular, and uneven rather than rough. It had the appearance of being a surface that, having been ulcerated in the former attack, had subsequently healed. The capsular synovial membrane was inflamed and thickened, especially at the front of the joint, and a layer of false membrane partially covered both condyles.

Jane Dean, ætat. twenty-seven, was admitted into the Middlesex Hospital, June 18, 1833. The preceding April, the lower outer and anterior part of the left knee became full and painful, which she attributed to cold from kneeling upon the stones. Cupping, poultices, and a liniment were used. The slight fulness went away, but a pain, which she had felt from the first, deep in the joint, now increased. The application of a blister mitigated the pain for a time; afterwards, cupping twice repeated, leeches, and the use of a cold embrocation, had nearly removed the pain, when upon using the joint in walking, the symptoms became aggravated.

At her admission, but for a slight fulness towards the

outside of the ligament of the patella, the knee had the appearance of being free from disease; but she was never without throbbing pain under the knee-pan, which was increased by motion or pressure. The position of greatest ease was very slight flexion of the joint. There was no mechanical impediment to complete flexion or extension.

From the 18th of June, the period of her admission, to the 7th of February following, when the limb was amputated, this patient, with one brief intermission, became progressively worse. The pain during the last two months was nearly insupportable, and she obtained very short intervals of broken rest at night through large doses of laudanum alone. The pain in the knee did not alter its place or character, but latterly, in combination with a sense of violent throbbing, the patella felt as if lifted up. The leg wasted; the ankle and instep became œdematous. The slightest touch on the knee aggravated the patient's suffering.

Many remedies, in the mean time, were ineffectually used; leeches, cupping upon the knee and upon the loins, blisters, caustic issues, tartar emetic ointment, hot fomentations, steaming, ice, opium with calomel to touch the gums, belladonna and the acetate of morphia applied to a blistered surface, mercurial ointment and bandaging, bandaging to a light splint to prevent motion, carbonate of iron, arsenic, colchicum, iodine, and an intermission of all remedies, were in

succession tried. Of the means described, the only one which produced a marked effect was constant hot fomentation; there was a week, during the early period of her illness, when the pain was materially lessened by this means. The application of ice, and of pressure with mercurial dressings, were discontinued as soon as tried; they aggravated the symptoms. Of the other remedies, each, when first tried, appeared of service, and afterwards became wholly nugatory. During the last two months, any local treatment invariably produced an aggravation of pain.

Upon examining the knee-joint, which was previously injected, the capsular synovial membrane was found highly vascular, but not thickened. Upon parts of the cartilage of the patella, of the inner condyle of the femur, and of the semilunar cartilages, the vessels of the synovial membrane were filled with the injection. Upon the patellar surface of the inner condyle, the cartilage was superficially absorbed for a small extent, presenting the characteristic excavation and fibrous or brush-like processes. The synovial membrane adjacent to this, and, which is singular, that covering a part of the ulcerated surface, were highly injected. (These appearances are represented in Plate I., fig. 2.) The texture of the cartilages of the joint was otherwise natural, and their adhesion to the bone perfect. But they had a slightly greenish tinge, which contrasted with the clear blueish whiteness of the cartilages of the ankle-joint.

The following case, in which the patient has nearly recovered, bears a great resemblance to the first of the two which have been last narrated.

Elizabeth Higgin, *ætat.* thirty, was admitted into the Middlesex Hospital in August, 1833. The right knee was a little swollen, but the synovial cavity was not distended with fluid; the knee was slightly bent, the tibia was retracted, and the foot everted. The knee was hot and painful; the pain was seated in the front of the knee, and became increased on motion; when the patella was moved upon the condyles, some roughness was indistinctly felt. The tongue was white, the pulse frequent, the skin dry and heated. The complaint had commenced ten weeks before, with fever, and pains in the limbs generally, and pain with swelling in the knee; the pain lay on each side of the patella. The knee continued to swell during the first fortnight; from that time till her admission, it had been getting better. A few leeches were applied, and the joint was fomented at the commencement of the attack, without influencing in any degree its progress. Afterwards, two blisters and the ointment of tartarized antimony had been prescribed, from which sensible relief was experienced.

Upon her admission, leeches and hot fomentations were ordered, the diet regulated, and opening medicine with calomel given. Afterwards, caustic issues were made on each side of the patella; the knee was bandaged to a splint having a joint capable of exten-

sion by means of a screw. The patient is now nearly recovered. The pain and swelling are quite gone; the skin has its natural hue; ankylosis has taken place between the patella and femur; the position of the joint is very slight flexion. The recovery of this patient has been occasionally interrupted by sudden increase of pain and heat, which has in each instance been relieved by local blood-letting.

III.

“ Cases of absorption of cartilage beginning on the surface towards the bone, attended with inflammation of the adjacent surface of the bone, with inflammation of the synovial membrane, and sometimes with sensible vascularity of the cartilage itself.”

Eliza Devonport, ætat. 20, was admitted, November, 1833, into the Middlesex Hospital. Three years previously her left elbow-joint had been attacked with pain and swelling, which, being treated with leeches and embrocations, went away in nine months. Shortly after her recovery, the left knee began to swell at the lower and fore part; the swelling was attended with pain, which, although constant, was severe at times only: she thought it rheumatism, and wore flannel round the joint. A year before her admission the disorder in the knee became more serious; at times it confined her to her bed. The joint was hot, stiff, and painful; several blisters were at this period applied in succession

with some advantage. Leeches, fomentation, cold embrocations, bandaging, were tried, but were of no service.

At the time of her admission into the hospital, and for a month previously, she had been suffering the acutest pain; which the least pressure or motion aggravated to intolerable intensity. The knee was hardly or very slightly swollen; it was a little bent. There was no impediment to further flexion but the pain which it gave. The pain was severest beneath the patella; it extended, however, along the leg and thigh. Having tried local bleeding, fomentation, a large caustic issue, and opium, without any mitigation of her intense suffering, I amputated the limb. This patient recovered, and is well.

Upon opening the knee-joint, which had not been injected, a tea-spoonful of thin yellowish synovia escaped. The capsular synovial membrane was inflamed and thickened, and presented a jelly-like granulated surface, which extended a little way over the cartilages of the condyles. The cartilage was partially ulcerated on its synovial surface, both upon the femur, patella, and tibia. Near the crucial ligaments, for the extent a sixpence would cover, the synovial surface of the cartilage, on the inner part of the tibia, was softened and rendered semi-transparent for two-thirds of its thickness.

More serious disease was found between the

cartilages and the bones. When the cartilages were cut through, either half could be easily torn from the bone. There were parts indeed at which a complete discontinuity of substance appeared to have existed, the surface of the cartilage being irregularly excavated, and the corresponding surface of the bone ulcerated and extremely vascular. Elsewhere the cartilage did not come away clean, but tore off with it numerous granules of bone from the surface. This arose from the surface of the bone, for the depth of a line, having been highly inflamed and softened in its texture, so that it gave way to very slight force. Except upon the surface, the bones were perfectly healthy.

Benjamin Cockerell, ætat. 15, was admitted into the Middlesex Hospital, in January, 1834. Three years and a half before, he had fallen out of a stable-loft, and struck his knee. The knee swelled, and became stiff and painful, but notwithstanding this he continued to walk upon it for three weeks, during which it became worse. Leeches, fomentation, lotions and blisters, were then used; and in six months, being much relieved, he began again to walk. After a short period, a relapse took place, when the same treatment was gone over again with the same advantage. This recurred more than once. The relapses generally happened in the winter. When at the worst, the knee was not greatly swelled; there was pain all over it; its position of ease was moderate flexion. The sensations in the joint were of shooting, pricking, and throbbing.

The last summer, this patient was for a period better than he had been since the first attack, but at Christmas he again became worse. At the time of his admission into the hospital, the knee was more swelled than ever: the form of the bones was lost through effusion into the joint. Leeches, and fomentation, blisters, and caustic issues, and bandaging over strips of mercurial dressing, were used ineffectually. The limb was amputated on the 12th of March. The boy speedily recovered.

On examining the knee, which had been injected, much lymph was found effused into it, part gelatinous, part an organized false membrane. The capsular synovial membrane was highly inflamed, and thickened.

The marginal parts of the cartilages of the femur, patella, and tibia, had wholly disappeared, leaving rough and highly vascular surfaces of bone exposed. The vascularity of the bone was superficial; its structure, except at the surface, was healthy. The roughness arose from a partial, superficial, and irregular absorption of the crust of the bone for about the depth of half a line. The cartilage which remained was in parts ulcerated upon its synovial surface; in parts was attenuated, through ulceration upon its osseous aspect, which was proved by the synovial surface being perfect at those parts. The adhesion of the attenuated cartilage to the bone appeared to be very slight. Most part of it, however,

did not separate cleanly from the bone, but brought away with it particles of the inflamed surface of the bone. At the posterior part of the inner condyle, the vascularity and softening of the bone extended further, but to no great extent, into its substance. The semilunar cartilages were partially ulcerated, softened, and distinctly vascular.

I amputated the leg of a patient, *ætat.* 28, for disease of the *os calcis* and *os cuboïdes*. The cartilages had disappeared from the opposed surfaces of the two bones. The surface of the *os cuboïdes* was covered with lymph; that of the *os calcis* presented in parts its proper hard shell of bone: in parts the shell was ulcerated, and exposed the cancelli, which, to the depth of a third of an inch, were highly vascular.

The surfaces of the astragalus were in an earlier stage of disease, and presented the following remarkable appearances. The tibial and navicular surfaces were not denuded of cartilage; but the synovial membrane covering each was in parts highly injected, and was everywhere easily separable from the cartilage. Upon the middle of the tibial surface, the synovial membrane was so much thickened as to be semi-opaque, and to resemble a thin layer of cartilage. On both of these surfaces, several vascular points were seen; the greatest number were on the tibial aspect. On making sections of the cartilage on this surface, the points were found to be the terminations of nu-

merous vessels, which had pierced the cartilage from the bone. One of these anastomosed with vessels of the inflamed synovial membrane. The bone, with the exception of its surface, was perfectly healthy.

I amputated the leg of a patient, twenty-five years of age, five months after a compound fracture of the tibia and fibula. The bones had united, but the swelling, which had succeeded the fracture, had led to repeated large collections of matter in the calf of the leg, and about the ankle-joint. These had been opened in succession, and the patient had as many times rallied from the hectic fever and debility which they had occasioned. At last there formed above the knee-joint an extensive abscess, which was opened; when profuse discharge, alternately of blood and matter, took place for several days. The limb was amputated too late to save the patient.

The knee and ankle-joints were examined after they had been injected: the appearances were much the same as in the two preceding instances. The bones were sound, all but the surface towards the cartilages, which was highly inflamed. The cartilages were in part entirely absorbed, in parts remarkably attenuated by absorption upon their osseous aspect; at other parts, but to a small extent, ulcerated upon their synovial aspect. The attenuated cartilages appeared to be readily separable from the bone, but when torn off, their under surfaces were found covered with bony particles, shewing that it was the

line of inflamed and softened bone which gave way, not the adhesion of the cartilage to the bone.

The capsular synovial membrane was inflamed, and the cartilage of the patella was partially absorbed on its synovial surface. The appearance of one of the condyles is given in Plate I., fig. 3.

The kind of disease which has been exemplified in the last three cases, is clearly distinguishable from ulceration of cartilage, beginning on the synovial surface. As far as my experience has gone, it is considerably less manageable, but the case of Cockrell shews that it will yield for a time to treatment, though the joint may remain strongly disposed to a relapse. The circumstance which is most against recovery in this affection, is the partial or complete separation of portions of cartilage from the bone, which necessarily prove an additional source of irritation.

These cases again are not less distinguishable from the disease which Mr. Brodie has described under the name of "scrofulous disease of the joints, having its origin in the cancellous structure of the bones." I will give one well-marked case of the scrofulous disease, to throw the class, to which it belongs, into contrast with the preceding.

A child, six years of age, was admitted into the

Middlesex Hospital, for disease of the right ankle-joint. The ankle was swelled to four or five times its natural size. Two indolent ulcers were situated one on each side of the joint, which were filled with pale granulations. A probe, introduced into one of these, passed nearly through the ankle, and grated against osseous tissue. The disease had commenced four months before, and, it was thought, had been occasioned by another boy having trod upon this patient's ankle. The ankle had enlarged slowly, and with little pain. As the boy's health, however, was suffering, the limb was amputated.

The foot was examined immediately after the amputation. On opening the joints about the ankle, the cartilage of the posterior and upper surface of the astragalus was found to have been absorbed, and the cancellous structure within to be soft, and as if rotten, its cells containing a thick, brown fluid. The bony texture of the anterior part of the astragalus was healthy. On making a horizontal section of the os calcis, about a third of the surface appeared healthy: the greater part had the brown and rotten appearance and texture of the diseased os calcis. The lower part of the tibia was in the same state.

Some of the cases which have been referred to throw light upon the process of Anchylosis.

There appear to be three varieties in the mode in

which the ends of bones become united, after partial or complete absorption of their natural articular surfaces.

One is *bony* ankylosis, in which the ends of the bones become united, after the complete absorption of the cartilages and synovial membrane.

A second is *cartilaginous* ankylosis, in which a junction takes place between surfaces, both of which are cartilaginous, but have undergone superficial ulceration.

The third may be called *mixed* ankylosis, in which a surface of cartilage, that has undergone superficial ulceration, is united to a denuded surface of bone.

These distinctions indeed refer to differences, rather in the nature of the surfaces that become united, than in the process of union. In each of the three kinds it may be proved, or rendered very probable, that an exudation of coagulable lymph, adhering to the surfaces which are in apposition, first glues them together mechanically, and afterwards becomes an organized medium of union. The layer of lymph is of very variable thickness.

Complete bony ankylosis had taken place in the elbow-joint of the patient whose case is referred to at the commencement of this paper: the humerus and ulna were united, so as to form one bone, with no

break or line of interruption, or discontinuity of osseous structure.

The commencement of this process was seen in another case. A young man had the leg amputated after a lacerated wound of the ankle. Ten days after the accident, erysipelas had supervened, and matter had formed about the joint: the integument sloughing, an opening could be seen into the fore and outer part of the ankle-joint, the cartilage of which became rapidly absorbed*. The patient suffered severe pain, which he described as gnawing, throbbing pain, with occasional violent shootings through the joint, and a distressing sense of grating when the limb was disturbed. The patient's strength declining rapidly, amputation was thought necessary. The limb was removed two months after the accident. Upon a vertical section being made of the ankle, one common change was found to have taken place in both the joints, which the upper and under surfaces of the astragalus contribute to form. In each of these joints the cartilages had entirely disappeared, and the denuded ends of the bones were joined together by a layer of semi-transparent and organized lymph, from a sixth to a quarter of an inch in thickness. This union by lymph was a step towards union by bone. One circumstance appeared to me of peculiar

* In two other cases which I have witnessed of exposure of the ankle-joint by sloughing after severe injury, the entire absorption of the articular cartilages took place within a month.

interest. The interior of the bones was perfectly healthy, but the surfaces to which the lymph adhered were, for the depth of one or two lines, extremely vascular. They combined with that vascularity the roughness of surface and softness of texture described as found upon the articular aspect of bone in the third kind of ulceration of cartilage specified above. I conclude from hence that bony ankylosis may, under favourable circumstances, take place after that form of ulceration of cartilage, which depends upon inflammation of the adjacent surface of the bone.

To exemplify cartilaginous ankylosis, I may describe a case in which superficial ulceration of the cartilage had taken place upon the opposite surfaces of the femur and patella, and in which ankylosis was in progress, when amputation was rendered necessary by necrosis of one of the condyles.

Mary Logan, ætat. 17, had suffered from childhood with disease of the left knee-joint. It had come on gradually. Three years previously, upon being treated with friction, the joint had become much worse; but it grew better under the use of leeches, fomentation, and blisters. When she was placed under my care, the joint was semiflexed, the tibia retracted upon the femur, the patella ankylosed, the foot everted, the limb wasted: she was suffering severe and constant pain. As her sufferings were

not mitigated by the remedies which I tried, I amputated the limb. She recovered.

The patella was united by cartilaginous ankylosis to the fore and upper part of the condyles. Upon using some force, the union gave way, when it was seen to have taken place between two ulcerated surfaces of cartilage, which were longitudinally, but irregularly and shallowly grooved.

The cartilage of the under part of the outer condyle was entirely removed, and a thick layer of adherent lymph substituted for it; the under part of the outer condyle, from which the cartilage had likewise disappeared, was necrosed to the depth of from half an inch to an inch, and already in process of exfoliation into the joint.

Mixed ankylosis of the patella to the femur had taken place in the first case described in the present paper. This was proved by forcing the patella from the femur, after a longitudinal section had been made of these bones. The patella came away denuded of cartilage, while the layer of cartilage, which was left on the corresponding part of the femur, was not of greater thickness than that on the immediately adjacent surface. The texture of the bones was quite healthy. A thin layer of lymph, or false membrane, which extended over the cartilages of the femur, had the appearance of having spread between the denuded

surface of the patella and the cartilage with which it had been anchylosed.

The preparations, from which the figures are taken, and others which are referred to in this paper, and were shewn when it was read, may be seen in the anatomical museum of King's College.