ON THE ORIGIN AND STRUCTURE OF CERTAIN LOOSE BODIES IN THE KNEE-JOINT.

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In a letter from Professor Humphry in the JOURNAL of March 17th (at page 613), on "Loose Bodies in the Knee-Joint," the following sentences occur: "I am correctly stated to have expressed my scepticism in regard to the possibility of the formation of these loose bodies by the detachment of portions of the articular cartilages." "It must be a very extraordinary and violent accident that would break off into the joint a piece of the articular cartilage, with or without bone, of the femur or the tibia. One can scarcely imagine the occurrence of such an accident, or conceive how it could take place." "We have a ready and sufficient explanation of the formation of loose bodies in the growth.....of tufts or processes of synovial membrane, which.....naturally containing cartilage cells, may become the seat of cartilage-growth and ossification, and by rupture of the pedicle become loose in the joint.....We need not therefore search for other and highly improbable modes of origin." "I can scarcely suppose that anyone really believes that a portion of bone detached by the process of necrosis can be converted into one of these bodies, though such a suggestion is actually made in a recent and important work on surgery."

But for the adjective "important," I should conclude that the work alluded to is one for which I am responsible (*Diseases of the Joints*, Cassell and Co. 1886), for I have stated, at page 181, (1) that "pieces of cartilage, with or without portions of the underlying bone may, after injury, as pointed out by Teale, Sir James Paget, and others, exfoliate and drop loose into the joint, without the symptoms of inflammation usually observed in cases that end in necrosis; or (2) a piece of cartilage, or of cartilage and some of the adjacent bone may be chipped off and fall into the joint." Thus—though perhaps Professor Humphry refers to some other work—I have certainly written in a manual intended for students, as well as surgeons in practice, that which Professor Humphry "can scarcely suppose that anyone really believes." I shall therefore be glad, if space can be afforded me, to say what grounds there are for stating that which Professor Humphry regards as so extremely improbable.

1. As to the formation of a loose body by the breaking off into the knee-joint of a piece of the articular cartilage, with or without bone, of the femur or tibia.

In the museum of St. Thomas's Hospital, Specimen D. 110¹ is thus described in the Catalogue (vol. 1, page 140): "Loose body from the knee-joint, removed by Mr. Simon, in 1864. It is a fragment of articular cartilage and bone, apparently chipped off from one of the condyles of the femur." The specimen was shown by Mr. Simon, at the Pathological Society on May 17th, 1864, and is described by him in the following terms (*Pathological Society's Transactions*, vol. xv, page 206).

"Broken-off bit of Condyle loose in the Knee-joint.—A young man who, in falling, had wrenched his knee, came into St. Thomas's Hospital to be treated for some inconsiderable synovitis which followed the accident, and, while under treatment, was found to have a loose body in the joint. As soon as all acute symptoms had subsided (about three weeks after the injury), Mr. Simon operated for the removal of this loose body, and, having removed it, found that it was a broken-off bit of the articular end of the femur, covered on one side with its natural cartilage, and being about the size of a bean. The patient recovered without interruption."

I am indebted to Mr. Shattock, whose opinion on such a question few, I think, will dispute, for the following report:

"The cartilage in Mr. Simon's specimen has every character of healthy articular cartilage, in arrangement of cell-groups and homogeneity of the matrix. There can be no doubt whatever that the loose body is a portion detached from an articular surface."

Fig. 1 represents this body enlarged, for the sake of clearness, to about five times its real size. The bone and the cartilage can be plainly seen. Considering the very definite history which we have direct from Mr. Simon himself, and considering Mr. Shattock's report, I think there can be no reasonable doubt that, in

this instance, a piece of the articular cartilage, with some adjacent bone, was broken off into the joint.

A noteworthy point in this case, in reference to Professor Humphry's opinion, that it must be a very extraordinary and violent accident that could break off a piece of articular cartilage, with or without bone (see above), is that, according to so cautious an observer as Mr. Simon, this injury was produced by a mere wrench of the knee occurring during a fall, and that it was followed only by "some inconsiderable synovitis."

Fig. 1.

2. As to the question whether "a portion of bone, detached by the process of necrosis, can be converted into one of these bodies." In the museum of St. Bartholomew's Hospital (Cat., vol. i, No. 721) are "two portions of cartilage removed from the knee-joint of a lad, aged 18. They are almost exactly alike in form and size, each resembling such a piece of cartilage as might be obtained by removing that which covers the posterior surface of one of the condyles of a femur, and each, as such a piece would be, is smooth and polished on its convex and rough on its concave surface (Figs. 2 and 3). There was an interval of about a year between the operations by which these bodies were removed." In a report on this specimen in the *St. Bartholomew's Hospital Reports*, vol. iv, 1868, p. 257, I said, "On close examination both these cartilages are found to have a thin layer of bone on their concave surface; this presents, under the microscope, the characters of true bone, and is covered with a scanty layer of irregularly disposed fibrous tissue. The arrangement of the cells in the cartilage of both specimens is precisely similar to that of articular cartilage."

Fig. 2.

Fig. 3.

The next specimen (722) in the same museum I have described in the Reports (vol. iv, p. 256) as follows:—"It consists of a layer of cartilage and a layer of bone intimately connected with each other. The cartilage is smooth and glistening on its free surface, like ordinary articular cartilage (Fig. 4). In profile it is seen to have the thickness of the layer that encrusts the condyle of the femur in a healthy adult. Its margins are irregular, as if defined by fracture, and recede towards the bony layer. This latter is of less superficial extent than the cartilage, which exceeds it in every direction. At its central, which is also its thickest, part, it measures about two lines. Its surface is irregular and cancellous (Fig. 5). Examined with a microscope the carti-

Fig. 4.

Fig. 5.

lage is found precisely like articular cartilage. In its deeper layer the cells lie with their long axis at right angles to the subjacent bone, while, towards the free surface, they are small, numerous, elongated, and with their long axes parallel with the surface. The bone presents the characters of true osseous tissue."

Dr. Vincent Harris, Demonstrator of Physiology at St. Bartholomew's Hospital, in the course of last week kindly examined these specimens (Nos. 721, 722). He writes: "I have no hesitation in

saying that they consist of spongy bone covered with articular cartilage, and have also submitted them to another competent authority who confirms my opinion."

In the *St. Bartholomew's Hospital Reports* (vol. vi, 1870, p. 1) Sir James Paget, after referring to a paper on "Quiet Necrosis" which he had contributed to the *Clinical Society's Transactions* (vol. iii, p. 183), writes:—"Not long after this case I had occasion to remove a loose cartilage from a knee-joint. The patient was 16, active, athletic, and, except at his knee, thoroughly healthy. At Harrow he had had many blows and strains of the knee, but he could not refer to any one of them as a cause of special injury. He had had for nearly a year all the usual signs of a loose body in the right knee."

After removal "this body looked exactly like a piece of the articular cartilage of one of the condyles of the femur. It was irregularly oval in outline, about an inch long, half-an-inch wide, and a line in thickness. On one surface it was convex and smooth, on the other concave and rough; and on this surface was a small prominent piece of bone, as if, with the cartilage, a piece of the articular surface of the femur had separated. The borders of the loose body were smoothly rounded off. In agreement with this general likeness to a piece of articular cartilage from a condyle was the microscopic structure of this loose body. In sections through its thickness was found a nearly homogeneous basis-substance, with cartilage-corpuscles, which, in arrangement and all their other characters, were exactly like those of articular cartilage.....Thus no character was wanting to make it certain that this loose body was a piece of the cartilage, together with a very small portion of the bone, of one of the condyles of the femur."

"I believe that the explanation of the formation (of such bodies) is to be found in the case of quiet necrosis referred to at the beginning of this paper. These loose bodies are sequestra, exfoliated after necrosis of injured portions of cartilage, exfoliated without acute inflammation, just as the piece of bone was, or as a tooth after a blow may be slowly detached from its alveolus and cast out....."

"The view that certain loose bodies in joints are pieces of articular cartilage, exfoliated after necrosis due to violence, is supported by the fact that they are frequently consequent on injury in perfectly healthy young persons, and that, when a particular injury can be assigned, it is always at some weeks previous to the first finding of the loose body."

When these descriptions were given, neither Sir James Paget nor myself knew of Mr. Teale's paper (*Medico-Chirurgical Transactions*, vol. xxxix, 1885, p. 31) in which he describes a "case of detached piece of articular cartilage existing as a loose substance in the knee-joint." In this case a brewer, aged 37, had, a year before, accidentally let a cask fall against his right knee. "Severe pain followed, and he was unable to work for three weeks, after which he followed his employment as usual for nearly twelve months until a few days ago, when he became suddenly lame, and was unable to bear his weight upon the leg. He then for the first time felt a flat substance moving about in his knee-joint." Mr. Teale removed the body, and, unfortunately, the patient, who had been a free drinker, died. "The substance, on being examined, was found to be flattened, circular in form, and irregular or ragged at its border. One of its surfaces had the appearance of cartilage, and was smooth, and slightly convex; the other was concave and rough, from a layer of bone." On opening the joint, "at the under surface of the inner condyle the articular cartilage showed a circular depression, about the eighth of an inch in depth, having a rough surface of bone at its base. On comparing this breach in the articular cartilage with the substance which had been removed, they were found to correspond accurately with each other, and, on placing the detached substance in the cavity in the condyle, the continuity of the articular surface was perfectly restored. It is, therefore, evident that the loose body was a portion of the articular cartilage along with a thin layer of bony substance." Mr. Teale believed that the injured piece of cartilage was cast off into the joint "by a slow process of exfoliation extending through a period of about twelve months" (Figs. 6 and 7).

Here, then, are six loose bodies from knee-joints. One, we are told by Mr. Simon, is "a broken-off bit of condyle," and Mr. Shattock has no doubt that it consists of a piece detached from an articular surface. A second was found by Mr. Teale to exactly fit into and make good a breach in the inner condyle of a femur. A third is minutely described by Sir James Paget, who states:

"Thus no character was wanting to make it certain that this loose body was a piece of cartilage, with a very small portion of bone of one of the condyles of a femur." The remaining three are in the St. Bartholomew's Hospital Museum, and are pronounced by Dr. Vincent Harris to have the structure of true bone and articular cartilage. All but the first are, I believe, sequestra detached by the process which Sir James Paget has termed "quiet necrosis."

Fig. 6.

Fig. 7.

In this communication I have kept exclusively to the two chief points raised by Professor Humphry, though there are many others connected with the interesting subject referred to in his letter that would well bear discussion. I will only add that I entirely agree with his view, which no one, so far as I know, would question, that the great majority of "loose bodies" in joints are derived from the synovial membrane in the manner which he has described.

Since the above was written Sir James Paget has directed my attention to No. 647 in the College museum, which is thus described (Catalogue, p. 35): "A large piece of cartilage and bone, of the shape and about half the average size of a patella, removed from a knee-joint. It may be regarded as a portion of one of the condyles of the femur, which, probably after injury, was separated by a process similar to necrosis, but without acute inflammation. The articular cartilage is thinly extended over the edge of the bone. Presented by Sir Everard Home." Mr. F. S. Eve, Pathological Curator of the College, who has kindly examined the specimen microscopically, states: "I believe that in No. 647 the loose body was derived from the articular cartilage."

ON THE RELATION OF SCROFULOUS GLAND DISEASE TO OTHER FORMS OF TUBERCULOSIS: AN EXPERIMENTAL INQUIRY.¹

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SOME two years ago, while writing a brief article on scrofula and tuberculosis for a student's Manual of Surgery,² my attention was drawn to the differences of opinion existing on the precise relation of scrofulous gland disease and affections described as tuberculous. I found that some clinical teachers with large experience in diseases of childhood still maintained that the two affections were practically distinct, while among pathologists some taught that scrofula and tuberculosis were synonyms for the same disease; others that in scrofula the tuberculous virus was so profoundly modified as to constitute a special variety. The latter view was strongly supported by some experiments of M. S. Arloing,³ which appeared to prove that inoculation with material from scrofulous

¹ Read before the Pathological Society of London, November, 1887.

² Treves's *Manual of Surgery*, vol. i, p. 216.

³ *Comptes Rendus*, tome xcix, 1884, p. 661.