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ORIGINAL COMMUNICATIONS.

ON THE STRUCTURE OF THE SYNOVIAL MEMBRANE COVERING THE SURFACE OF ADULT ARTICULAR CARTILAGE.[1]

By JOSEPH TOYNBEE, Esq., F.R.S., Fellow of the Royal College of Surgeons in England; and Surgeon to the St. George's and St. James' Dispensary, London.

FROM the period when the structure and relations of the animal tissues first attracted the attention of anatomists, great diversity of opinion has continued to exist on the subject of the organization of the joints.

For a long time, the most opposite views were entertained respecting the essential nature of Articular Cartilage. Some anatomists held that it was vascular; others, while allowing it to possess vessels, restricted them to those conveying white fluids; a third party contended that it contained no vessels whatever; and a fourth, that it presented no one trace of organization. Several years ago, in a paper published in the Philosophical Transactions,[2] I endeavoured to prove that articular cartilage should be classed with those animal tissues which are nourished, grow, and are liable to certain diseases, though deprived of the presence of blood-vessels. It is a source of great satisfaction to me, that since the publication of the paper alluded to, other investigators have found their researches tend to the same conclusion, and that there is a general recognition of the fact, that articular cartilage and the non-vascular organs differ from all others by drawing their nourishment from vessels ramifying in their immediate vicinity, but not permeating through them. One subject, however, of great interest to the surgeon and the pathologist, still remains to be investigated, and that is, the causes of the introduction of blood-vessels, during disease, into the articular cartilage and non-vascular tissues, and the explanation of various phenomena connected with the peculiarities of their organization. Little progress, however, in this department of pathological investigation can be

[1] An abstract of this paper was read, and the illustrative preparations exhibited, at the meeting of the Pathological Society of London, on the 16th of January, 1849.

[2] Researches tending to prove the Non-vascularity and the peculiar uniform mode of Organization and Nutrition of certain Animal Tissues. Part II. 1841.

expected, until another question, concerning the anatomy of the articulations, has been satisfactorily settled. I allude to the relations which subsist between the synovial membrane and articular cartilage; a point which has given rise to much diversity of opinion. Bichat affirmed that synovial membrane did cover the surface of articular cartilage; but he appears to have arrived at this conclusion rather by analogical reasoning than by actual demonstration. Sir Benjamin Brodie agrees with the view of Bichat, which his pathological researches tend to corroborate. He says: "where it (the synovial membrane) is reflected over the cartilage, it is thin and readily torn; its existence, however, even here, may be always distinctly demonstrated by a careful dissection."[1] It might be supposed, that by the aid of the microscope, this question would have been decided ere now; this, however, is not the case, for difference of observation has given rise to difference of opinion among microscopical observers. Thus, Henle, writing in Müller's *Archives*, in 1838, says: "the epithelium is continued in a thinner layer over the articular surfaces of the cartilage, on which it is separated from the cartilage corpuscles by a thin layer of cellular tissue." Professors Todd and Bowman, in their recent valuable work on physiology, make the following statement in opposition to that which has just been quoted:—"It (the synovial membrane) may be traced to the edge of the cartilage; to this, it is very intimately adherent for some little distance, beyond which, it cannot be followed where the cartilage has been exposed to pressure during the motions of the joint."[2] In the paper, in the Philosophical Transactions, to which reference has been made, I gave the particulars of a dissection of the knee-joint of a fœtal calf, where I removed the synovial membrane from very nearly the entire surface of the articular cartilage, covering one condyle; to which it was attached by a considerable layer of cellular tissue, containing the ramifications of blood-vessels.

Professors Todd and Bowman do not dispute, that in the fœtus the synovial membrane is continued over the whole of the free surface of the cartilage. It requires, indeed, but a superficial examination to convince any competent observer of the correctness of that view. The question alone, to which any interest can therefore attach, is what becomes, in adult life, of the synovial membrane which is acknowledged to have covered the cartilage in the fœtal period. Is it absorbed, or is it, as some writers have conjectured, worn away by attrition; or does it become incorporated and perfectly blended with the cartilage? It appears to me, that not one of these views is correct, and that there is no difficulty in demonstrating, fully and satisfactorily, the persistence of the synovial membrane during every period of life, and its complete envelopement of the free surface of articular cartilage, so long as the latter continues in a healthy condition.

If the synovial membrane, which surrounds the border of adult articular cartilage, be traced to the margin of the latter, it will be found to adhere very firmly; and, should an attempt be made to tear it from the surface of the cartilage, it will often give way; in some parts, how-

[1] Pathological and Surgical Observations on the Diseases of the Joints, p. 7. 1836.
[2] The Physiological Anatomy and Physiology of Man, p. 127.

ever, and that not unfrequently, a continuation of this synovial membrane will be separated by laceration, in the form of a thin transparent layer, from the surface of the cartilage to the extent of several lines. In some specimens, I have retained this transparent membrane continuous with the thicker and opaque synovial membrane surrounding the cartilage. Another mode of showing the presence of this delicate tissue on the surface of articular cartilage, is to make a very thin flap of the latter, parallel with its surface, and then, by means of a pair of broad-pointed forceps, to draw it gently, but firmly, in the same direction as that of the section. As a general result of this process, it will be found, that a layer of transparent membrane, varying from two lines to half an inch in length, will peel from the cartilage. A third way of demonstrating the existence of this membrane, is to place a portion of articular cartilage under water, and to scratch its surface with the sharp point of a firm needle till a fine membrane is observed to be lacerated, under which, the needle may be introduced, and by careful manipulation, the adhesions between it and the cartilage may be broken, and considerable portions detached.

The question now to be considered is, whether this fine tissue, so detached, is the synovial membrane? When examined by a magnifying power of 500 diameters, portions of it which have been removed from the circumference of the cartilage, or parts which have not been subjected to much pressure, appear to be translucent, and interspersed throughout with fine filamentous lines, resembling in character areolar tissue. This appearance may be seen in Figure 1. If a portion of the membrane, taken from the central part of the cartilage, be examined with the same magnifying power, scarcely any appearance of this areolar tissue will be detected, and it will be found translucent, with a nearly homogeneous structure.

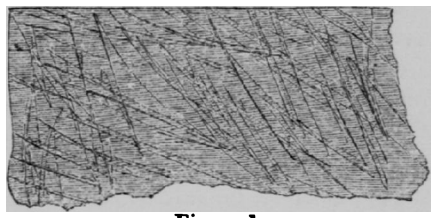

Figure 1.

Figure 2.

Adherent to its inner or cartilage-surface, however, numerous fine points may be observed, as seen in Figure 2, which appear to be particles of cellular tissue that have been lacerated in the process of separating it from the cartilage. Sometimes a portion of the membrane, taken from the central part of the cartilage, will present but few of the above-described points; but upon its inner surface very shallow depressions will be observed, corresponding exactly in size and shape with the corpuscles of articular cartilage over which they have been placed, and against which they have been firmly compressed in Fig. 3. In other instances, one or more of the cartilage-corpuscles are torn away, one may be seen to adhere to the inner surface of the membrane in Fig. 3.

Figure 3.

The free surface of this membrane is smooth, and presents a very fine polish, to which is owing the glistening

appearance of cartilage, which it loses the instant it is denuded of this membrane.

That the tissue just described is not a layer of cartilage, seems to be clear, from the fact of no corpuscles being found in it; from its extreme and yet uniform softness and tenuity, the latter being so great that the membrane folds upon itself when floating in a few drops of water; from the facility with which it is separated from the surface of the cartilage itself, without the necessity of using any cutting instrument; and, lastly, from the circumstance that it is visibly continuous with the synovial membrane around the joint. The only fact which seems to militate against its being considered as synovial membrane, is the absence from its surface of epithelial cells. The absence of the epithelial layer may, however, be accounted for, perhaps, from the facts that it is not, like the reflex synovial membrane, a secreting organ, and from its being subjected to great pressure; nor can the absence of it be deemed a sufficient reason for denying that the tissue described is synovial membrane, in the face of so many cogent reasons for identifying it with that membrane.

The conclusion to which I have been led is, that all healthy articular cartilage is invested with synovial membrane, which membrane, however, differs from the condition in which it is ordinarily met with, in being deprived of an epithelial layer.

If this conclusion be correct, it will, I think, appear, to those who have studied the diseases of articular cartilage, that it may lead to more precise views than heretofore of the process of ulceration, and the *modus operandi* of that change.

Postscript.—In confirmation of the view advanced in the above paper, it may be added, that at the meeting of the Pathological Society, when an abstract of this communication was laid before its members, Dr. Garrod stated, that upon a careful examination of some specimens, where gouty deposit existed on the surface of articular cartilage, he found this deposit covered by a fine membrane. Dr. Garrod has been so kind as to furnish me with one of his specimens, and having submitted it to microscopic observation, I find that it quite agrees in its structure with the membrane of which the description is given above.

12, Argyle Place, St. James', January 1849.

CASE OF MELANOTIC CANCER OF THE SCROTUM.

By T. B. CURLING, Esq., Lecturer on Surgery at the London Hospital.

EXCISION OF THE MORBID PART—RETURN OF THE DISEASE—DEATH IN SIX YEARS AFTER THE OPERATION.

Mr. G., a cabinet-maker, aged 32, enjoying tolerable health, consulted me in November 1842, on account of a fungous growth on the Scrotum. The tumour was about the size of a small walnut and of a dark colour: it had an irregular granular surface, and was attached to the left side of the scrotum by a narrow peduncle or neck. About an inch on one side of this tumour, I observed a small dark spot, apparently produced by some black deposit beneath the epidermis, raising it a little above the