ON THE
FORMATION
OF
NEW JOINTS,

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HAVING in a former communication pointed out the appearances of the superficial deposit, or ossific node, and also adverted to those of the more considerable accumulations of ossific matter which constitute exostoses, I now purpose making some observations upon the production and structure of new joints, as they occur consequent to dislocation.

Upon this particular subject the writers on surgery have been generally silent. Ambrose Paré mentions it, and speaking of dislocations, says that “sometimes a reduction cannot be effected, from the flesh having grown into the cavity, and from the head of the bone having made itself another cavity in the place whereinto it is fallen, forming

to itself a new hollowed cavity, which serves it instead of its natural socket ;” but neither Wiseman, Du Verney, Petit, Heister, Boyer, or Desault, make any mention of this process. Mr. Hunter adverts to it in his lectures, and says that “where joints are not reduced, we have sometimes a new joint formed. An absorption of one or both bones takes place where they are in contact. The adhesive inflammation also takes place, by which means a new socket is formed, which is also covered with cartilage, and is farther covered with a fluid.” From this statement it appears that Mr. Hunter had examined such joints while in their recent state, an advantage which has fallen to the lot of very few.

Having already taken a cursory, although I trust a correct and practical view of this subject in another place *, the following inquiry will be principally directed to the appearances and texture of the newly organized bone, contrasted with the original structure upon which it is deposited.

From the frequent contemplation of a very extensive series of preparations in Mr. Heaviside’s Museum, from some of which I had plates engraved in the year 1812, and from subsequent observations to which these give rise, I have since stated what I believe to be very true, that the

* See Practical Observations in Surgery and Morbid Anatomy.

formation of a new articulation principally depends on the state of the capsule of the joint; and that although the constitutional powers must be favorable to such an effort, whenever it is attended with success, it can seldom if ever take place where dislocation has been connected with rupture of the capsular ligament.

From the statement lately brought forward of a dissection by Sandifort, in connection with various other observations upon the same subject, I have been led to believe that in the formation of new joints the ossific matter is deposited in the interstices of the cellular structure of the capsular ligament, although as to the surface of such new structure ultimately becoming cartilaginous, I know nothing more than that in one case of preternatural joint, formed in consequence of an ununited fracture of the humerus, I examined the limb after death, and certainly found cartilage upon several points of the opposed surfaces, where the light cancellated parts of the bone had been previously rendered compact by a new deposit of ossific matter*.

* Since writing the above, I have had a favorable opportunity for examining the appearance and structure of an artificial joint, in the thigh-bone of a rabbit.

The bone had been fractured, and put up in splints, with a view to its union. The limb became tolerably firm; and on the 23d day the animal was killed, and the limb injected. On dissection an oblique fracture was found, which instead of unit-

In demonstrating the structure of the superficial deposit or ossific node, I observed that the peculiar

ing had formed an artificial joint. The periosteum was not lacerated, but had become very much thickened, and elongated; enveloping the new joint, and forming a strong and moderately vascular capsule.

Several membranous filaments were found connected to correspondent points upon the two surfaces of articulation; these filaments exhibited some few injected vessels, and were considered to be elongations of the membranous expansions within the medullary cavity, which had been partially divided in the experiment.

The most particular attention, however, was bestowed upon the examination of the surfaces of articulation, that I might be enabled to determine clearly and accurately the exact structure.

Those parts of each surface which by the manner of the fracture were at first uneven, still remained so; although I apprehend that the friction of the surfaces of contact would in the course of time have become the exciting cause of the removal of the projecting points.

Fortunately the injection had run particularly well, so that when examined under the microscope, those points where the circulation was actively employed afforded a striking contrast with other parts, that were less vascular.

Both the articulating surfaces were covered with a fine smooth transparent membrane, apparently extended immediately over the surface of the cancelli of the medullary cavity, the texture of which was rendered more compact than natural, by newly deposited ossific matter.

It was either into, or behind this membrane, that the cartilage had been secreted. The appearance in the microscope was that of numerous small opake pearly spots, with a gentle elevation of the surface of the membrane. The innumerable terminations of the injected capillary arteries seen shooting in all directions were only perceptible in the intermediate spaces of the membrane, for at the margin of each of these pearly spots, the surface became

disposition of the spaces between the recent deposit and the bone, is such as to lead me to believe that the ossific matter is not laid down immediately upon the surface of the original bone, but that it is secreted into the texture of the periosteum, but so near the surface of the bone as to leave only the thinnest lamina of the membrane for a separation; and that it is also pretty evident that while some parts of this intermediate membranous texture are progressively removed so as to allow of the new and old ossific matter being brought into contact, other parts assume to themselves new functions, and furnish secretions in effect equivalent to the ordinary medullary contents of the longitudinal canals.

We have already seen in the examinations of bone during its growth, that the vascular secreting membranes within the smallest interstices of the ossific structure, exert, during that period particularly, the power of producing a slow and progressive change in the whole internal structure of bone, in consequence of which the minute tubular spaces of the new deposit are made larger, and the gradually opaque, and was elevated into an elastic cartilaginous convexity; but in no instance could a single vessel be discerned passing into these spots, although they were examined in every kind of light, with various degrees of magnifying power; I therefore concluded that cartilage is in these cases (as in those of natural formation) a true secretion into the fine cellular or reticular texture of membrane, and that it is here, as elsewhere, one of those secreted substances which is not necessarily vascular.

ossific masses being pressed together and united, assume an appearance of greater solidity; which changes although distinctly enough perceptible in the bones of the mammalia, are most clearly demonstrable in those of birds.

Upon the same principle the minute structure of bone appears to be regulated and altered, under circumstances of preternatural action, or disease; and making due allowance for the various states of excitement in the soft parts, and the various turns of constitutional predisposition, we have in this principle the means of affording a rational and satisfactory solution of most of the appearances of disease.

The formation of a new joint may be considered one of the most difficult, as well as most curious and interesting of all those processes of restitution occasionally set up in the animal machine. That it is a difficult process may be argued not only from the great length of time required for its completion, but also from the evidence afforded by the series of specimens brought forward in my surgical observations; for these demonstrate that in some cases the ossific deposit takes place only to a very inadequate extent, and in others not at all; while in very few does it produce that efficient support to the head of the dislocated bone, which is essential to perfect ease and freedom of motion in the limb.

Having elsewhere given the principal results of my observations upon this subject, deducing the series of changes in the order in which they necessarily arise out of each other, it now remains to demonstrate those appearances that I have found on examination of the ossific structure in new joints; for which purpose the most interesting specimens have been selected from among those, the external appearances of which are already laid before the public. By the adoption of this plan I shall, on the one hand, be enabled to avoid trespassing unnecessarily on the time of the Society, while on the other I shall perhaps render the account formerly given of these valuable preparations more complete.

With a view to unfold as perfectly as possible the exact nature of the communication both of structure and function, established between the original surface of the bone and the newly deposited ossific matter, Mr. Heaviside very kindly allowed me to remove a thin section including the new and the old bone from each of two specimens; one of these being taken from the preparation that forms the 5th fig. upon the 6th plate of my surgical observations, and the other from the preparation shewn in the 1st fig. of the 8th plate in the same work. The first exhibiting a newly formed surface of articulation upon the anterior part of the neck of the scapula; the second shewing the

same thing upon the ilium, in a case of dislocated hip.

The specimens were prepared for examination in the microscope by calcination; being subsequently fixed with glue upon a slip of wood, and lastly reduced to a smooth face, and very assiduously cleared out with a fine camel's hair pencil. The views afforded of these preparations by the solar microscope appear to me peculiarly interesting.