# PERSISTENCE OF THE NOTOCHORD IN THE HUMAN SUBJECT.

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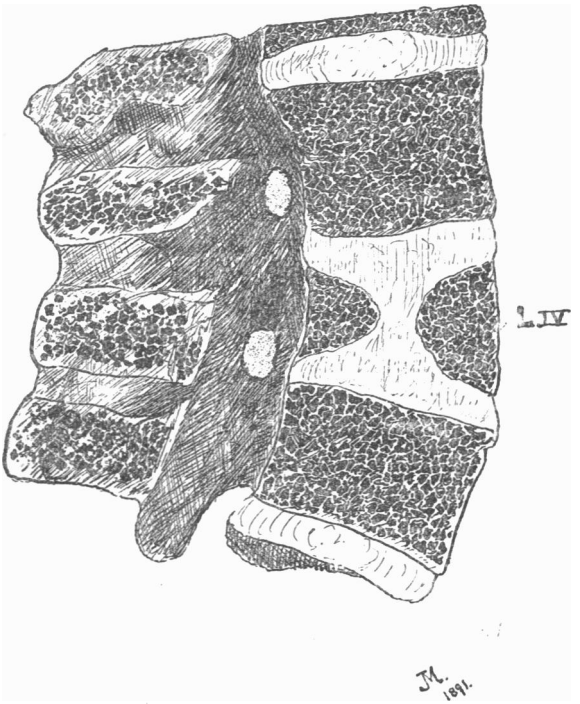
WHATEVER difference of opinion may exist among histologists concerning the origin and function of the notochord, there can be little doubt that, after the development of the bodies of the vertebræ around this central axis, its remains may still be found at birth, and even in the adult subject. Not only does this column of cells tend to persist, but an actual increase in its size may take place—in one animal, opposite the body of the vertebra; in another, corresponding to the intervertebral disc. We may recognise, indeed, three modes in which the notochord may persist. In the first, as found in reptiles, birds, and amphibia, the notochord disappears from the intervertebral spaces, owing probably to the development of synovial cavities; whilst in the bodies of the vertebræ its remains may be recognised. In some mammals, on the other hand, which illustrate the second mode of persistence, the notochord shows a dilatation in the intervertebral disc, and is continued through the body of the vertebra as a slender rod, with two smaller dilatations, one between each epiphyseal plate and the centrum. In the third form, found in osseous fishes, the intervertebral dilatations of the notochord take place to such an extent that the bodies of the vertebræ are markedly amphicœlous in character, the concavities being joined by a short canal filled by the constricted part of the notochord. In the human subject the arrangement is similar to that found in other mammals, the persistence being most evident in the intervertebral disc, although it has also been recognised as a slender rod through the body of the vertebra. This is the usual arrangement.

In a subject which I recently examined in the dissecting-room at the University of Edinburgh, I found in one of the lumbar vertebræ a condition reproducing the characters of the osseous fishes. On making a transverse section through the

middle of the body of the fourth lumbar vertebra, there was seen in the centre of the bone a core of unossified tissue, resembling in appearance the tissue of an intervertebral disc. The section bore a striking resemblance to the vertebra of a human fœtus at the eighth week,[1] figured by Kölliker, where the notochord is seen in the centre of the body of the vertebra, surrounded on all sides by cartilage. This core of unossified tissue had a diameter of 15 millimetres from side to side, and 12 millimetres




from before backwards. Immediately surrounding the central core was an ill-defined cartilaginous-looking layer 2 millimetres in thickness, and surrounding this again the cancellous tissue of the vetebral body. The cancellous tissue in the greater part of the section resembled that of a normal vertebra, but the bone at the hinder part, between the core and the posterior common ligament, was more fibrous, and less perfectly

[1] Reproduced in Schäfer's "Embryology," part 1, vol. i. of *Quain's Anatomy*, 1890.

ossified than usual. The whole body of the vertebra measured in its antero-posterior diameter 3·5 centimetres, and transversely 6·7 centimetres. Its depth in front was 2·1 centimetres, and behind, 1·4 centimetres. In comparison with this, the third lumbar vertebra measured 2·8 in front and behind, while the fifth was 3 centimetres in front and 2·7 behind. After placing the cut surfaces together, I made a vertical antero-posterior section in the mesial plane through this and the adjoining vertebræ, and found that the central core expanded above and below to become continuous with the adjoining intervertebral discs, giving the body of the fourth lumbar vertebra an amphicœlous character, like the bones in the osseous fishes. The disc between the third and fourth lumbar vertebræ was prolonged downwards in the funnel-shaped concavity on the upper surface of the subjacent centrum, to expand again in a similar hollow on the lower aspect of the bone, and there become continuous with the disc between the fourth and fifth lumbar vertebræ (see figure). Great as the peculiarity was in the shape of the body of this vertebra, there was nothing to suggest it in the external appearance of the spinal column before the cut was made. It was only on sawing across the spine to detach the pelvis that my attention was directed to it. The subject in whom it occurred was an exceptionally well-developed male, and the rest of the vertebræ, including the adjacent third and fifth lumbar, were normal.

Unfortunately, the circumstances under which the specimen was obtained—after lying many weeks on the dissecting-table—rendered microscopic examination very difficult. Yet, in a fragment removed from the centre of the core, it was possible, after staining with hæmatoxylon, to recognise cells and fibres, such as are found in the intervertebral disc. Whether the tissue of the notochord was represented by patches of *débris* seen in the fragment could not be decided.

In a recent number of this *Journal* (vol. xxiv.), Dr Carlier directed attention to the eccentric position of the notochord in the intervertebral disc of the sheep, and in this connection it is interesting to observe that, although the core is placed centrally in this vertebra, there is imperfect ossification of the bone at the posterior part.

How far this unossified core of tissue can be looked upon as the remains of the notochord, it is difficult to say. But the condition is interesting, as showing the resemblance to the osseous fishes, where the central core is undoubtedly formed by the chorda dorsalis.