RESEARCHES INTO THE HISTOLOGY OF THE CENTRAL GREY SUBSTANCE OF THE SPINAL CORD AND MEDULLA OBLONGATA.

By W. AINSLIE HOLLIS, M.D. Cantab., *Brighton.* Part II. (PLATE IV.)

IN a former paper (*Jour. of Anat.* xvii., 517, *et seq.*) I have traced the relationship which exists between the subepithelial tissue surrounding the spinal canal and the polio-synectic tissue of the central nervous system,[1] I shall now briefly mention a physical peculiarity of this tissue heretofore I believe overlooked. When a deeply-stained section of the cord is mounted in balsam solution, after immersion in oil of cloves, its surface appears to the naked eye to be nearly uniform in colour and texture. When, however, we allow transmitted light to pass through the object, we perceive the central grey nucleus and its appendages to be distinctly darker than the rest of the section. The deeper hue is due to the great transparency of that portion of the section, as may be readily shown by looking at distant objects through the specimen. It is doubtful what causes the great transparency of this portion of the cord. It may be that there exists a close similarity between the refractive indices of the synectic tissue and those of the menstrua used in mounting the specimen, and that the homogeneity or closeness of texture of the grey matter is greater than that of the surrounding white material. The peculiarity is observable in both longitudinal and transverse sections. Gerlach states that synectic tissue[2] (neurolgia) is not stained by carmine solutions. This statement must be modified. In well-stained specimens the synectic tissue is visibly tinted, although less deeply than the nuclei, ganglia-cells, and grey nerve fibres (axis cylinders). Gerlach[3] unwittingly contradicts himself on this subject of tissue-staining. He had elsewhere stated that portions of the posterior columns of the cord are richer in this tissue, and hence stain a deeper red with carmine than the rest of the white

[1] I have elsewhere given the derivation of *polio-synectic.*

[2] Excluding the connective-tissue cells.

[3] *Cf.* pp. 340 and 345, *Stricker's Hand-book of Comparative Histology,* N.S.S., vol. ii.

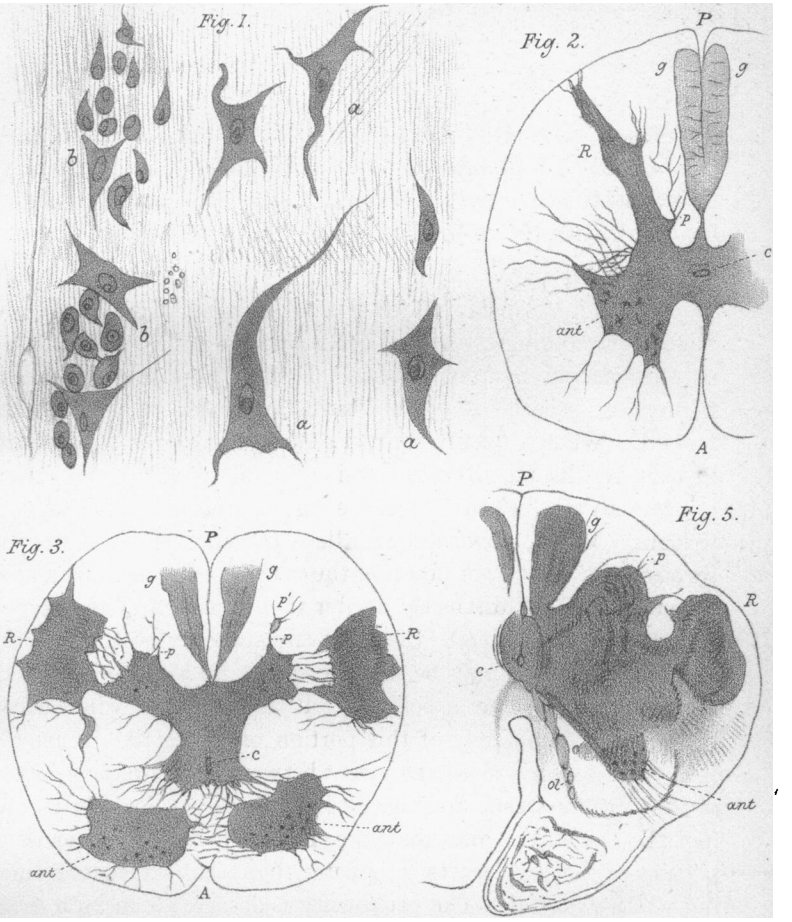
Fig. 1.
a
b
Fig. 2.
P
g
R
p
c
ant
A
Fig. 3.
P
g
p'
p
R
c
ant
A
Fig. 5.
P
g
p
R
c
ol
ant
Fig. 4.
P
g
p'
p
R
c
ant
A
Fig. 6.
P
g
p'
p
R
ant
ra
ol
A

substance. If we attempt to differentiate the grey substance of the cord and medulla by the transmitted light test I have mentioned, we shall find in the cord the cornua and commissure are most translucent, whilst Goll's columns occupy an intermediate position between the grey and white substance, corresponding to the greater amount of synectic tissue observed therein by Gerlach. The grey substance of the medulla is mapped out with similar distinctness by this method. I shall, however, reserve a description of the latter organ for another occasion.

The Intermediate Lateral Tract.—A successful longitudinal section of this tract and the corresponding anterior cornu in the cervical region shows in a marked manner the difference which exists in the shape and the arrangement of the cells in these adjacent regions (fig. 1; *cf. Jour. of Anat., op. cit.*, p. 520). The tract consists of clusters of small (mostly pyriform) cells arranged linearly, and dissociated from each other and from the column of sparsely scattered giant cells, to which they are contiguous by a delicate fibrillar stroma of synectic tissue. In the mid-dorsal region of the cord I have observed two adjacent columns of these cell-clusters.

The Vesicular Columns of Clarke.—The cellular elements of these columns occupy, as regards their size, an intermediate position between the giant cells of the anterior horns and those of the tract I have just described. These columns, as I have before stated, offer many examples of the pyriform cell, and they extend occasionally (contrary to what is usually stated in text-books) as low as the commencement of the *filum terminale.* The cell clusters are larger and more numerous in the lower dorsal region than elsewhere. In the cervical region of the cord these vesicular columns disappear. Only an occasional cell imbedded in a nucleus of synectic tissue marks their upward extension towards the medulla. At the cephalic extremity of the cord a slight well-defined protuberance of synectic tissue at the base and inner side of the posterior cornu (fig. 2, "*p*"), that is in the situation of the upward extension of Clarke's column, becomes again observable, and denotes the point of separation of the *caput* (*substantia gelatinosa Rolando*) from the rest of the grey substance of the posterior cornu in the medulla (fig. 3, "*p*"). The columnar prolongation above described contains very few cellular elements

at the union of the medulla and cord, and it is not until it has passed upwards on a level with the decussation of the anterior pyramids that numerous cellular elements are again visible within it (fig. 4, "*pp*"). In a transverse section of the medulla made on a level with the lowest portion of the olivary body, this protuberance of grey substance which I have ventured to identify as an upward prolongation of Clarke's column, becomes much enlarged, expanding backwards and outwards, and forms the *nucleus cuneatus* of anatomists (fig. 5, "*p*"). The many cellular elements within this grey columnar extension[1] lend support to this view, as they closely resemble, both in their form and size, the pyriform cells observable in Clarke's vesicular columns of the dorsal cord.

Goll's Tract in the Medulla.—The posterior median columns of the cord (fig. 2, *gg*), when traced upwards from the cervical region, are found to shorten and widen as they enter the medulla. This widening is due to the interposition of numerous radiating strands of synectic tissue between the white fibres of the tracts. The radiating strands of grey tissue are not confined to Goll's columns, but are observable in a variable degree throughout the whole of the white substance between the tubercle of Rolondo and the posterior fissure at this part of the medulla. One of these strands is very constant in its appearance on either side at the extremity of the cuneate nucleus, and is named sometimes the external cuneate nucleus (figs. 3 and 4, *p'*, *p'*). At the lower part of the medulla the grey strands of synectic tissue contain a considerable number of cellular elements, mostly pyriform in shape, and closely resembling those in the cuneate nucleus above described. At a level with the calamus the tracts I am describing expand laterally (fig. 6, *g*), becoming, at the same time, an elaborate network of synectic tissue surrounding white medullary fibres, and pushing outwards, as it were, the heads of the cuneate nuclei with their appendages (*p*, *p'*), the external nuclei.

[1] Especially on a level with the pyramidal decussation.

DESCRIPTION OF PLATE IV.

Fig. 1. Longitudinal section of the intermediate lateral tract and adjacent portion of the anterior cornu. Human adult. "*aa*," large multipolar cells of the anterior cornu; "*bb*," clusters of cells (mostly small pyriform) forming the lateral tract.

Fig. 2. Transverse section of the cord on a level with the third cervical vertebra. Youth aged 19 years. *Ant*, anterior cornu; *R*, substantia gelatinosa of Rolando; *c*, canal; "*gg*," Goll's columns; "*p*," prominence at base of posterior cornu.

Fig. 3. Transverse section of medulla at union with cord. The letters refer to similar parts in previous figure.

Fig. 4. Transverse section of medulla at the decussation of the pyramids. *p'*, external cuneate nucleus; *p*, cuneate nucleus.

Fig. 5. Transverse section of the medulla at the lowest portion of the olivary bodies. *ol*, accessory olivary nucleus.

Fig. 6. Transverse section of the medulla just below the calamus scriptorius. *ra*, raphé; *ol*, olivary nucleus.