A VASCULAR MECHANISM RELATED TO THE GREAT VEIN OF GALEN

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In the course of a study of the nervous and vascular relations of the pineal gland (the results of which will be published elsewhere) attention was drawn to a curious formation of the arachnoid membrane of the human brain which may play an important part in regulating the venous flow through the great vein of Galen (*vena cerebri magna*). This formation bears a close resemblance to a much enlarged arachnoid granulation (Pacchionian body), such as is found in great numbers in relation to the sagittal and other venous sinuses of the dura mater. Its base is attached to the superior vermis of the cerebellum, and it projects upwards into the floor of the straight sinus where this is joined by the vein of Galen (see Fig). In one specimen it measured 4 mm. in height and 2.5 mm. in width at its attached base. At its summit the granulation is adherent to the dura mater; elsewhere it is surrounded by the subdural space.

The structure of the granulation is quite peculiar: it contains a stroma of unusually dense pial tissue forming a reticulum of well-defined trabeculae, and the meshes of the latter contain a rich plexus of sinusoidal blood vessels and several large interconnecting blood sinuses. In microscopical appearance, indeed, the whole structure bears

a very close resemblance to typical erectile tissue, though it contains no muscle or elastic fibres. In the accompanying photomicrograph the blood sinuses in the granulation are seen to be partly collapsed and empty, though even in this condition the granulation appears at its summit quite definitely to narrow the entrance of the vein of Galen into the straight sinus. When it is remembered that the sinus is held firmly in the rigid tentorium cerebelli it will be apparent that in a distended state the granulation will bulge upwards conspicuously into the floor of the anterior end of the sinus. In this case (as the photomicrograph also shows) the thin lower lip of the opening of the sinus will be pressed in contact with the upper lip where the latter forms a sharp angle with the

dorsal wall of the vein of Galen. In other words, the structure seems to provide a ball-valve mechanism whereby the venous return from the third and lateral ventricles may be impeded.

The pial arteries in the immediate neighbourhood are accompanied by abundant nerve fibres, allowing for a vasomotor control of the sinusoidal plexus of blood vessels within the granulation. In another specimen of human material, from which serial sections stained by Bodian's protargol technique were prepared, these nerve fibres are very evident. In this specimen, also, the sinusoidal plexus is rather more conspicuous, since the channels are filled with blood. Further, the whole granulation is traversed by a slender nerve (similar in structure to a peripheral nerve and containing about 150 nerve fibres) which can be traced in an uninterrupted course from the tip of the pineal gland into the dural floor of the straight sinus. In its course it actually passes through the cavity of one of the blood sinuses, ensheathed here in a fine investment of pial tissue. In the floor of the straight sinus it runs directly backwards, but its ultimate destination has not yet been determined.

Clearly the inference that this vascular arachnoidal structure functions as a valvular mechanism must be accepted as tentative only. Further study by clinical and experimental methods will be required for its confirmation. Nevertheless, the anatomical appearance is very suggestive of this interpretation. The functional importance of such a neuro-vascular mechanism need hardly be emphasized. The capillary pressure within the choroidal plexuses of the third and lateral

Photomicrograph of a sagittal section of the pineal gland in a human brain ($\times 9$). P: Tip of pineal gland. G: Great vein of Galen. S: Beginning of straight sinus. T: Tentorium cerebelli. C: Superior vermis of cerebellum. SP: Suprapineal body—a large arachnoid granulation filled with a sinusoidal plexus of blood vessels. (In this particular section the granulation is everywhere separated from the dura mater by the subdural space. In adjacent sections, however, the summit of the granulation is directly attached to the dural floor of the straight sinus.) nn: A fine nerve (*nervus conarii*) on its way from the pineal gland to the floor of the straight sinus, which it reaches after passing through the suprapineal body.

ventricles will respond to a regulation of the venous return through the vein of Galen, and this again will exert a direct effect on the secretion of the cerebrospinal fluid.

Lastly, it may be noted that recent clinico-pathological studies have suggested that certain sclerotic conditions of the brain associated with hypermyelinization and demyelination of the white matter may be related to a venous stasis and congestion in the Galenic system of veins.

For descriptive convenience the vascular granulation which is here described may be termed the "suprapineal arachnoid body" from its topographical position above and behind the pineal gland.