Intercavernous connections of the cavernous sinuses

The superior and inferior circular sinuses

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Morphological features of the intercavernous connections of the cavernous sinuses are described and illustrated by photographs of vinylite casts. Surgeons should be aware of the course, potential size, and arrangement of the channels in the dura of the hypophyseal fossa. This is particularly important in exposure of the pituitary gland by the transsphenoidal route.

KEY WORDS - cavernous sinuses - intercavernous connections - circular sinus - inferior circular sinus - hypophyseal fossa

In our study of the cerebral dural sinuses and their tributaries, we have found details of the cavernous sinuses and their intercavernous connections that have not heretofore received specific attention. Two centuries ago, Winslow reported that there were “two circular sinuses of the sella sphenoidalis, one superior and one inferior.” A century later, Knott discussed the connections between the cavernous sinuses; in his series of 44 specimens carefully studied, there were six multiple and 12 other single intercavernous connections beneath the pituitary body. It appears that this anatomical information has not been disseminated. Neither Goss, nor Warwick and Williams in their anatomical textbook mention the venous channels in the dura mater in the base of the hypophyseal fossa. The textbook by Romanes includes an illustration of a midline cut of the pituitary and its adjacent structures, in which the artist depicts channels in the dura mater lining the hypophyseal fossa; however, there is no accompanying narrative concerning them.

Neurosurgeons in particular should be aware of the anatomical position of these venous channels as displayed in the vinylite casts presented in this paper.

Materials and Methods

After removal of the brain at autopsy, we unroofed the posterior orbital fossae and ligated the superior ophthalmic veins or the trunk of the united superior ophthalmic and a
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Fig. 1. Dorsal view of a vinylite cast of the cavernous sinuses and their intersinus connections, showing the stubs of the ophthalmic veins (A and B), and the stubs of the superior petrosal sinuses (C and D); E (arrow) indicates the rostral component of the superior circular sinus. The caudal arm of this sinus is the crescent-shaped channel crossing at the upper limits of the vacant or avascular area. This area, free of vascular channels, represents the dorsum sellae. The inferior part of the cast crossing between C and D is a part of the basilar plexus. The cast of the network in the hypophyseal fossa (center) is the inferior circular sinus of Winslow. This specimen shows the venous pattern most commonly found in the dura mater of the pituitary fossa.

Fig. 2. Dorsal view of a vinylite cast of the cavernous sinuses and their intersinus connections, showing the stubs of the ophthalmic veins (A and B), and the stubs of the superior petrosal sinuses (C and D); E (arrow) is the rostral border of the broad and relatively large complex of channels crossing the base of the hypophyseal fossa. Both the rostral and caudal crescents of the superior circular sinus have connections with the channels along the walls of the hypophyseal fossa. The avascular area representing the site of the dorsum sellae was present in this specimen but not shown in this view. Eight of the 27 casts used in this study had a large complex of venous channels crossing the base of the hypophyseal fossa, comparable to the pattern shown in this illustration.

Anatomical Observations

Each of the 27 casts of the cavernous sinuses and their connections demonstrated channels in the location of the dura mater that covered the hypophyseal fossa. The casts of these channels showed them to be variable in size and to course for the most part transversely along the base and walls of the pituitary fossa. Their junction with the medial aspect of each cavernous sinus was frequently flared. In most instances, interconnections of these venous pathways produced a network that crossed the base of the fossa (Fig. 1). In approximately one-third of the specimens, the interlacing channels were relatively large, thus serving as a major component of the sinus intercavernosi (Fig. 2).

Knott reported a series of 44 specimens. He described the difference in size of the two crescent-shaped channels in the diaphragm of the sella turcica that constitute the circular sinus as follows: the limb rostral to the hypophyseal stalk is the larger. He recorded that the channels caudal to the stalk were in some specimens not only smaller but in 20 instances...
were absent altogether. Our findings were comparable in regard to relative size, but a complete circular sinus could be identified in each specimen of our series. In two casts, the rostral segment of the sinus was represented by a coarse venous network within the dura covering the tuberculum sellae; in no specimen, however, were channels demonstrated in the thin layer of dura mater covering the anterior clinoid processes.

Discussion

The neurosurgeon rarely encounters inordinate venous bleeding when exposing the pituitary gland through a midline incision in the dural lining of the hypophyseal fossa. In the past, this was interpreted by one of the authors (JB), who employed the transsphenoidal operation for pituitary tumors, as being due to an "off center" incision. It is evident that this explanation for excessive bleeding following incision of the dura at this site is incorrect in some cases. The intercavernous connections at the base of the hypophyseal fossa (the inferior circular sinus of Winslow) may consist of sizable channels that commonly extend transversely from one cavernous sinus to the other. Therefore, the description of the transverse channels as an inferior circular sinus is incorrect. In any event, the neurosurgeon should be aware of the possible presence of sizable intercavernous venous connections within the dural lining of the hypophyseal fossa.

References


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