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CLINICAL ASSUMPTION

The venous circle of trolard

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Abstract: A venous anastomotic network is occasionally found at the base of the brain, which closely resembles the vicinal arterial circle of Willis. When present, this venous polygon is composed of the anterior cerebral and communicating veins, the basal vein of Rosenthal and the posterior communicating and lateral mesencephalic veins.
We propose that this anastomotic ring be termed the venous circle of Trolard. This venous circle might cause bleeding with such procedures as an endoscopic third ventriculostomy. We believe that information regarding this venous circle may be useful to neuroradiologists or neurosurgeons operating at the base of the brain *(Fig. 1, Ref. 10).* Full Text (Free, PDF) www.bmj.sk.
Key words: anastomosis, communicating vein, brain, intracranial, venous circle.

The arterial Circle of Willis is well known arterial ring at the base of the skull which is important in collateral blood flow in case of internal carotid artery stenosis or occlusion. Regionally, the basal vein of Rosenthal (BV) begins anterior to the midbrain near the anterior perforated substance, travels lateral to this structure and terminates posteriorly into the great vein of Galen although it may drain into the straight sinus or internal cerebral veins (3—6, 8). This vessel arises from four main tributaries. These are the anterior cerebral formed by the anterior limbic and pericallosal veins, the medial and inferior frontal veins, one of which is the olfactory vein, the deep Sylvian vein (deep middle cerebral), and the inferior striate veins (5, 9). Trolard (1) and Duvernoy (2) described midline anastomoses between the right and left hemispheres' venous network. The functional significance of this venous anastomosis referred as the venous circle of Trolard is not clear. As the venous drainage of the brain shows a high individual variability, a particular venous tract may become important only in such pathologic conditions as brain tumors or vascular malformations. We present our observations of the venous circle of Trolard and review of the literature. A thorough description of this venous circle is lacking in the anatomical and surgical literature.

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A case review

Within another research project, an adult male cadaver that had undergone blue latex injection of the left and right internal jugular veins was found to posses a complete venous circle at the base of the brain (Fig. 1). There was no gross intracranial pathology in this 89-year-old male who died due to pneumonia. This venous circle gave rise to the anterior cerebral veins with the contribution of the left and right BV, laterally. Two communications were noted across the midline: one between the anterior cerebral veins and the other between the left and right BV. These anterior and posterior communicating veins traveled transversely within the prechiasmatic and the interpeduncular spaces, respectively. The posterior communicating vein passed just posterior to the mamillary bodies thus the venous circle was comprised of this and the anterior cerebral veins united by the anterior communicating vein. Primary, BV was formed from the deep Sylvian vein. The anterior communicating vein was found to be shorter than its posterior counterpart. The venous circle was thus formed at the level of the optic chiasm and tracts (i.e. at the floor of the third ventricle).

Discussion

The anterior cerebral veins are united by the anterior communicating vein superior to the optic chiasm (5, 10). These vessels continue posteriorly and laterally to reach the anterior perforated substance. The anterior cerebral veins receive the paraterminal veins from the paraterminal and parolfactory gyri and the anterior pericallosal veins from the rostrum and genu of the corpus callosum (6, 8). Because of the anterior communicating vein either anterior cerebral vein may be hypoplastic. The anterior communicating vein is located in close contact with the

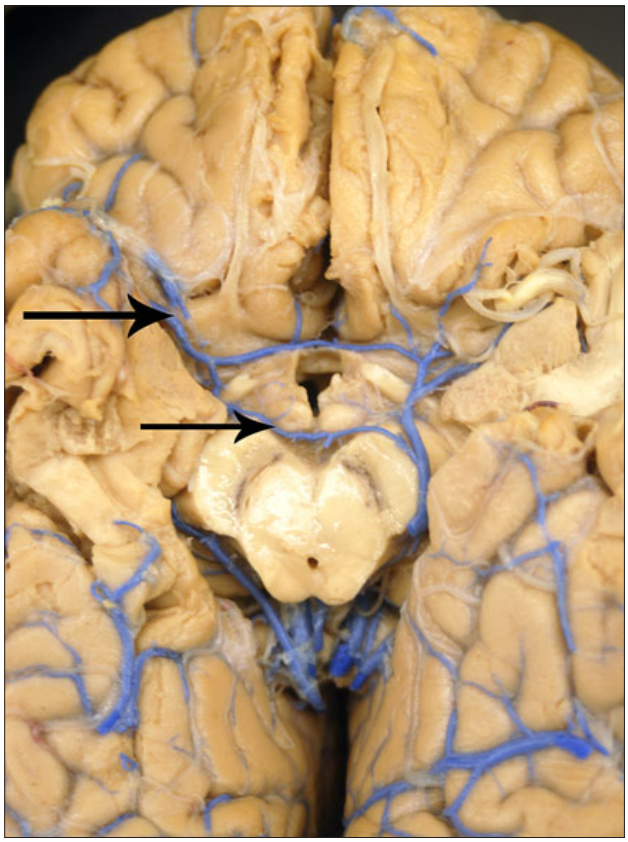

Fig. 1. Cadaveric photo of the base of the brain. For reference, note the olfactory tracts and midbrain in cross section. Note the venous ring encircling the mamillary bodies and floor of the third ventricle. The anterior cerebral veins are seen leaving the longitudinal fissure. Note the anterior communicating vein between the two anterior cerebral veins and the deep Sylvian vein (upper arrow). An anastomotic vein (lower arrow) is seen linking the basal vein of Rosenthal just posterior to the mamillary bodies. The floor of the third ventricle has been perforated as would be done in a third ventriculostomy.

lamina terminalis opposite the roof of the prechiasmatic cistern (1, 2). This vein is seen in approximately 50 % of the population and usually has a smaller diameter than the anterior cerebral veins (1). Huang and Wolf (5) have stated that the anterior cerebral veins are much smaller than their corresponding arteries. Padget (7) has shown that the deep middle cerebral vein (deep Sylvian vein) and the anterior cerebral veins develop from the deep telencephalic vein, and the ventral diencephalic vein drains from the primitive tentorial sinus into the transverse sinus in approximately the 40 mm embryonic stage. The posterior communicating vein joins the middle segment of the lateral mesencephalic vein or the posterior segment of the BV (2). This vein passes within the interpeduncular space behind the mammillary bodies and on the cerebral peduncles where it is in proximity to the longitudinal veins of the pons (1, 2). Occasionally, it may travel on the lateral wall of the posterior perforating substance. The posterior communicating vein is found in approximately 75 % of individuals (1). This vein is also longer and larger than the anterior communicating vein. The posterior communicating vein drains the premammillary and retrochiasmatic veins from the floor of diencephalon and the interpeduncular vein from the brain stem (1).

As first described by Trolard in the late 1800‘s, we believe an appropriate term for this midline venous anastomoses at the base of the brain would be the Venous Circle of Trolard. The clinical significance of such a venous circle would only be speculative but this anastomosis could potentially compensate the deep drainage of the anterior tributaries of the BV with contralateral BV occlusion either due to mass effect (e.g. tumor) or from iatrogenic injury during neurosurgical procedures. This information will be useful for neuroradiologists or neurosurgeons operating at the base of the brain.

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