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VARIATIONS OF VORTICOSE VEINS AND THEIR DISORDERS

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Knowledge of variations in the structure of vorticose veins is relevant for planning and performing surgical interventions on the eyeball. The vorticose (vortex) veins drain the ocular choroid. The intrascleral portions of them are thought to be an important site of choroidal blood flow regulation that influences various retinal pathologies. Also its importance for the development of suprachoroidal delivery of therapies to the posterior segment of the eye, when manipulating extra-ocular muscles, as vortex veins can be inadvertently damaged during surgical manipulation.

There is conflicting information about variations in the structure of vorticose veins: their number, topography (location of the exit of the vorticose veins in relation to the limbus or to the choroid); direction of blood drainage (superior, inferior ophthalmic veins); presence of anastomoses and their course. From the point of view of different authors, the number of vortex veins varies from 4 to 8, with the majority of the normal population having 4 (35%) or 5 (30%). In most cases, there is at least one vortex vein in each quadrant, between the rectus muscles, but the point of exit for them is different, from 14 to 25 mm from the limbus. Typically, the entrances of the vortex veins are in the outer layer of the choroid and can be observed to provide clinical landmarks identifying the ocular equator. Some vortex veins drain into the superior orbital veins and then to the cavernous sinus whilst some drain into the inferior orbital vein which then drains into the pterygoid plexus. There is usually collateral circulation between the superior and inferior orbital veins. The course of the veins is variable. The superior medial vortex vein has a short course and drains directly into the first part of the superior ophthalmic vein. The superior lateral vortex vein follows a longer route, it drains into either the lacrimal vein or sometimes the second part of the superior ophthalmic vein. The vortex veins have a unique characteristic among orbital veins—a comparatively tortuous course, especially the inferior medial and lateral vortex veins. The absence of vortex veins or increased resistance at the level of them can result in uveal effusion syndrome when surgical decompression or unroofing of the vortex veins may be a potential therapeutic option. The assessment of the vortex veins may also be relevant to understanding the pathophysiology of the pachychoroid disease spectrum. The exact causes of choroidal venous congestion producing these alterations are still poorly understood and the regulatory mechanisms of choroidal blood flow, possibly implicated in the pathogenesis of pachychoroid disease, are currently being investigated. Overall, this report will highlight the importance of evaluating the sites of choroidal blood outflow and visualising the entire choroidal drainage pathways, including the vortex vein ampullae, in order to better understand the pathophysiology of the pachychoroid disease spectrum. Known complications of the disorder of vortex veins is a spaceflight-associated neuro-ocular syndrome with associated clinical sequelae such as choroidal detachment, vitreous opacities, vitreous haemorrhage and elevated intra-ocular pressure. Vortex vein injury can be associated with peri-operative and post-operative complications. A possible complication due to direct damage to the vortex vein during suprachoroidal buckling technique for repairing rhegmatogenous retinal detachment is suprachoroidal hemorrhage, which is caused by injury to this highly vascular region of the choroid. A better understanding of vortex vein anatomy and its variations in healthy and diseased states may curb unnecessary investigations by retinal surgeons dealing with such eyes.