Integrated analysis of C3AR1 and CD163 associated with immune infiltration in intracranial aneurysms pathogenesis

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Background: To identify potential immune-related biomarkers, molecular mechanism, and therapeutic agents of intracranial aneurysms (IAs).
Methods: We identified the differentially expressed genes (DEGs) between IAs and control samples from GSE75436, GSE26969, GSE6551, and GSE13353 datasets. We used weighted gene coexpression network analysis (WGCNA) and protein–protein interaction (PPI) analysis to identify immune-related hub genes. We evaluated the expression of hub genes by using qRT-PCR analysis. Using miRNet, NetworkAnalyst, and DGIdb databases, we analyzed the regulatory networks and potential therapeutic agents targeting hub genes. Least absolute shrinkage and selection operator (LASSO) logistic regression was performed to identify optimal biomarkers among hub genes. The diagnostic value was validated by external GSE15629 dataset.
Results: We identified 227 DEGs and 22 differentially infiltrating immune cells between IAs and control samples from GSE75436, GSE26969, GSE6551, and GSE13353 datasets. We further identified 41 differentially expressed immune-related genes (DEIRGs), which were primarily enriched in the chemokine-mediated signaling pathway, myeloid leukocyte migration, endocytic vesicle membrane, chemokine receptor binding, chemokine activity, and viral protein interactions with cytokines and their receptors. Among 41 DEIRGs, 10 hub genes including C3AR1, CD163, CCL4, CXCL8, CCL3, TLR2, TYROBP, C1QB, FCGR3A, and FCGR1A were identified with good diagnostic values (AUC >0.7). Hsa-mir-27a-3p and transcription factors, including YY1 and GATA2, were identified the primary regulators of hub genes. 92 potential therapeutic agents targeting hub genes were predicted. C3AR1 and CD163 were finally identified as the best diagnostic biomarkers using LASSO logistic regression (AUC = 0.994). The diagnostic value of C3AR1 and CD163 was validated by the external GSE15629 dataset (AUC = 0.914).
Conclusions: This study revealed the importance of C3AR1 and CD163 in immune infiltration in IAs pathogenesis. Our finding provided a valuable reference for subsequent research on the potential targets for molecular mechanisms and intervention of IAs.