The anterior radicular veins typically originate at and drain each of the ventral nerve roots and the pial plexus of the spinal cord. They exit the vertebral canal with the ventral nerve roots through the corresponding intervertebral foramen.

At the levels of the lower cervical, lower thoracic and upper lumbar regions, some anterior radicular veins originate before their ventral nerve roots, from ascending and descending tributaries from the anterior spinal veins.