

## Chapter 3

# Neurovascular anatomy: Spine

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### Abstract

The arterial supply of the spinal cord is provided by the spinal branch of the cervical, thoracic, and lumbar intersegmental arteries. While supply is initially provided at each embryonic segment, only a few prominent anterior radiculomedullary arteries remain at the adult stage, including the arteries of the cervical and lumbosacral enlargements as well as a constant upper thoracic contributor.

The spinal cord is surrounded by the vasocorona, an arterial network that includes several longitudinal anastomotic chains, notably the anterior and posterior spinal arteries, which respectively supply the central and peripheral components of the intrinsic vascularization. The intrinsic venous circulation is also divided into central and peripheral components. The perimedullary venous system includes several longitudinal anastomotic chains interconnected by the coronary plexus. The radiculomedullary veins loosely follow the spinal nerve roots on their way to the epidural plexus. Their point of passage through the thecal sac forms an important valve-like structure, the antireflux mechanism.

### INTRODUCTION<sup>1</sup>

Safe and efficient spinovascular procedures require a thorough understanding of spinal vascular anatomy. Spinal digital subtraction angiography (SpDSA) remains the gold standard imaging modality for the evaluation of the spinal vasculature. In addition, endovascular techniques have become a valid minimally invasive option, either as a complement or as an alternative to open surgery. This chapter provides an overview of the vascular anatomy relevant to the performance of diagnostic and therapeutic SpDSA.

### DEVELOPMENTAL ANATOMY

The primitive human spinal cord is supplied by paired embryonic dorsal aortae appearing at the six-somite stage (Evans, 1912). Each dorsal aorta provides medial, lateral,

and dorsal branches; the latter pass in-between adjacent somites, following an intersegmental rather than segmental distribution (Fig. 3.1) (Evans, 1912).

Each dorsal branch forms a capillary loop with the ipsilateral posterior cardinal vein. This loop reaches the ventrolateral surface of the developing neural tube and anastomoses with adjacent loops to create a network extending to the posterolateral surface of the cord (Evans, 1912). The arterial and venous limbs of the capillary loops become the intersegmental arteries (ISA) and intersegmental veins. The anterior and posterior radicular arteries are early branches of the ISAs (Evans, 1912); they participate in the formation of a plexus on the ventral surface of the cord, from which emerge bilateral longitudinal channels when the embryo is 9 to 11 mm in length (Evans, 1912). These spinal longitudinal channels are continuous with the cranial longitudinal neural arteries (Sabin, 1917). They merge over

<sup>1</sup>Abbreviations used in the chapter are listed at the end of the chapter before References section.

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