Spinal dura mater

The spinal dura mater is an extension of the dura mater from the posterior cranial fossa. It forms a spinal dural sac, which spans from the foramen magnum to the level of S2, where it attaches to the coccyx by the filum terminale.

The dura lies free apart from attachments to the tectorial membrane and posterior longitudinal ligament on the body of the axis vertebra. The dura mater is also stabilised by anterior and posterior spinal nerve roots, which pierce it segmentally and give lateral projections after they exit.

It sits within the spinal canal within a layer of fat containing the internal vertebral venous plexuses.

Innervation

Innervation is from the recurrent meningeal nerves.

The nerves supplying the spinal dura mater were studied in four human foetuses (16-22 weeks) with the acetylcholinesterase in toto staining method. The ventral spinal dura contains a dense, longitudinally oriented, nerve plexus, which receives its contributions from: (I) the sinuvertebral nerves, (II) the nerve plexus of the posterior longitudinal ligament, (III) the nerve plexus of radicular branches of segmental arteries. Dorsal dural nerves are much smaller in number, do not form an evident plexus and do not reach the medial region of the dorsal dura. The dorsal nerves are derived from the ventral dural plexus at the level of the “intersleeval” parts of the dura mater. The ventral dural nerves may extend up to eight segments, with a great amount of overlap between adjacent nerves. This may provide an anatomical substrate for the understanding of extrasegmentally referred dural pain. The curled bundles of nerve fibres of pathways (I) and (II) provide an adequate adaptation to displacements of the spinal dura mater during flexion and extension. Pathway (III) has not been described before. The described nerve plexuses may be of importance in elucidating the mechanisms of epidural therapies in back pain and peripheral vascular disease [1)].

Pathology

Among 1519 patients with spinal space-occupying lesions, 66 patients demonstrated spinal dura mater pathologies. Neuroradiological and surgical features were reviewed and clinical data analyzed.

Saccular dural diverticula (type I, n = 28) caused by defects of both dural layers, dissections between dural layers (type II, n = 29) due to defects of the inner layer, and dural ectasias (type III, n = 9) related to structural changes of the dura were distinguished. For all types, symptoms consisted of local pain followed by signs of radiculopathy or myelopathy, while one patient with dural ectasia presented a low-pressure syndrome and 10 patients with dural dissections additional spinal cord herniation. Type I and type II pathologies required occlusion of their dural defects via extradural (type I) or intradural (type II) approaches. For type III pathologies of the dural sac no surgery was recommended. Favorable results were obtained in all 14 patients with type I and 13 of 15 patients with type II pathologies undergoing surgery.

The majority of dural pathologies involving nerve root sleeves remain asymptomatic, while those of the dural sac commonly lead to pain and neurological symptoms. Saccular dural diverticula (type I) and dissections between dural layers (type II) pathologies were treated with good long-term results

occluding their dural defects, while dural ectasias (type III) were managed conservatively [2].

1)
Groen GJ, Baljet B, Drukker J. The innervation of the spinal dura mater: anatomy and clinical implications. Acta Neurochir (Wien). 1988;92(1-4):39-46. PubMed PMID: 3407473.
2)
Klekamp J. A New Classification for Pathologies of Spinal Meninges, Part 1: Dural Cysts, Dissections, and Ectasias. Neurosurgery. 2017 Mar 17. doi: 10.1093/neuros/nyx049. [Epub ahead of print] PubMed PMID: 28327939.