Spine: bones, roots, vessels, muscles and fasciae

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Spine is a very complex system, including bones, osteo-meningeal canal, joints and ligaments, that contain and protect (but could injure in degenerative conditions) nervous structures (medulla and roots) and vessels. The muscles and fasciae of the back provide a large contribution to the motion and stability. The composite pattern leads to new studied anatomical aspects that can be useful for a better understanding of “back pain”.

Vertebrae

Morphometric studies of the vertebrae may still be useful in order to plan surgical procedures, such as screw implantation or posterior cervical dissection and decompression between others. Two papers devoted to the vertebral pedicles by means of CT scan are presented in this issue. They highlight the important variations that may be encountered according to the vertebral level as well as to the gender and ethnic characteristics of patients and must be taken into account for adequate transpedicular instrumentation. A morphometric analysis of the interlaminar space in the cervical spine using CT scan as well provides important information in order to safely approach the posterior cervical spine.

The basivertebral foramina of the true vertebrae contain the homonymous neuro vascular bundles that may have important clinical implications in various situations such as spinal fractures, vertebral augmentation, and basivertebral nerve radiofrequency ablation. The number, shape, size

and topography of these foramina have been investigated in detail on 1561 dried vertebrae, taking into account vertebral levels, gender and age groups.

On a more general point of view, the relationship of the morphometric characteristics of cervical vertebrae with the shape of the face has been assessed, showing interesting results that may sometimes be useful in surgical practice.

Sacro-iliac joints

At the base of the spine, the sacroiliac joint connects the axial skeleton with the pelvis. Due to its characteristic involvement in various disorders such as spondylarthropathies, their radiologic investigation is part of the routine practice. Their variations (accessory sacroiliac joint, iliosacral complex, bipartite iliac bony plate, crescent iliac bony plate, semicircular defect and ossification centers) that must be well known for a proper interpretation have been investigated by means of CT scan in 400 subjects and discussed in the light of literature.

Clivus

Just above the spine, the clivus, which is formed by the occipital bone (phylogenetically a former vertebra) and the sphenoid bone, may present various anatomical variations such as fossa navicularis magna, canalis basilaris medianus, and craniopharyngeal canal. These variations must be well known in order to avoid misdiagnoses on the one hand and because of their potential implications in various disorders on the other hand. Cone beam computed tomography that has become a routine investigation of the craniofacial region allows the easy diagnosis of such variations in the daily practice.

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Roots

Palsy of the L5 nerve root remains an important complication in lumbosacral spine surgery, the still debated pathophysiology of which involving (between others) iatrogenic traction strain. The potential movements of the L5 nerve during physiological flexion/extension of the hip and lower lumbar spine have been quantified and discussed in this issue.

Most often considered incidental findings, spinal perineural Tarlov's cysts may occasionally exert pressure upon nerve roots. A meta-analysis collecting 13,266 subjects concludes that about 15% of these cysts are symptomatic and globally details their distribution and morphologic features.

Vessels

The vertebral artery is evidently one of the most important anatomical structures during cervical spine surgery, the variations of which may lead to vital complications. These variations may also be associated with some pathologies in the posterior circulatory territory and be of practical interest in various procedures such as stent placement, angiographies, or evaluation of vascular pathology such as arterial dissection.

Along with the cervical sympathetic chain, the inferior roots of the brachial plexus, and the cupula, the vertebral artery is one of the key-component of the vertebral triangle (or scaleno–vertebral triangle), which is of particular interest in cervical sympatectomies, stella ganglion blocks, proximal brachial plexus repair, or scalenotomies. Further information about its dimensional anatomy, the exact location and the possible variations of its actual content, particularly the origin of the vertebral artery and its branches, are provided in this issue.

A systematic analysis of the proximal vertebral artery (V1, V2) (diameter, variant origin, level of entry into the

transverse foramen, tortuosity) carried out in 554 subjects is also presented.

Special attention has been paid on the entrance of the vertebral artery in the transverse foramen, which is the sixth transverse foramen in about 90% of individuals. An exceptional high level in the third transverse foramen may be easily revealed by MR imaging, as reported in this issue. In such a case, the unusual anterior course of the vessel may be of crucial importance during anterior neck surgery.

Muscles and fasciae

Some paravertebral muscles are major actors in various disorders, as is the case with posterior neck muscles and cervical dystonia, the gold standard of the treatment of which being botulinum toxin injection. In this regard, a perfect knowledge of the anatomo-sonographic landmarks of these muscles is required. It was the topic of another paper published in this number.

The role of the thoracolumbar fascia that encapsulates the erector spinae and the quadratus lumborum muscles is considered important as a potential source of lower back pain by numerous physical therapists. The development of this fascia has been investigated in 25 embryos and fetuses. This study underlines the drastic change occurring after birth and the importance of interfascial connections and topographical relation to muscles.

We wish you all, anatomists and clinicians, an interesting reading.

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