

Imaging the Spine

The spine is a complex bony structure with key functions of protecting the spinal cord, and containing about 50% of active red bone marrow in adult age. The anatomic configuration of the spine differs significantly in the different spinal segments. This variable anatomy, the different types, and ranges of movements along with other complex variables, result in a wide range of possible pathologies.

Spinal diseases have an enormous impact on radiological activity, and consequently on the whole health system. In the ranking list of imaging examinations, in terms of total charges per year in the United States, MRI of the lumbar spine is nowadays at the second place (686 million dollars per year), after mammography (718 million dollars per year). Spinal diseases such as vertebral fractures are potentially invalidating, and their prevalence is extremely high, ranging from 26% to 18% of the female population in Europe, 20-24% in white women in North America (>50 years old - white/black ratio=1.6/1), 11-19% in Latin and Native Americans (>50 years old), and 24-9% in Asia (>65 years old – maximum in Japan and minimum in Indonesia) [1]. With regards to oncology, bone metastases from solid tumors are located in the spine in 30-70% of cases, and about 50% of multiple myeloma bone lesions are located in the vertebral column [2]. Moreover, spondylodiscitis registered a slowly increasing trend all over the world, with an annual incidence of 2.4-7.2 cases / 100,000 people; MRI represents a key element in the clinical assessment of the disease, and their results should be taken into account also for the microbiological aetiology recognition [3].

Spine radiographs came into use shortly after Roentgen’s discovery (1895), even though there was not much in medical literature regarding this topic until the 1920s [4]. In the subsequent years, myelography was developed, starting with air and then with different kinds of positive contrast agents [4]. Cross-sectional imaging techniques changed dramatically the imaging of the vertebral column. Particularly MRI, applied in clinical practice on the spine firstly in 1983, revolutionized the power of diagnostic imaging for spinal pathologies [4].

Nowadays, we are observing another major transformation in diagnostic imaging of all body districts, including the spine. A transition from qualitative to quantitative imaging evaluation started several decades ago, and it is accelerating now with the introduction of radiomics imaging analyses. Texture analyses have been applied to different spinal conditions, including oncology, metabolic diseases, and more others [5, 6]. As a matter of fact, our future work will benefit from these quantitative tools.

The current diagnostic imaging of the spine takes advantage of all the imaging tools. A radiologist reporting spinal examinations should deeply understand skeletal and neuro-radiology. Moreover, particular attention should be given to incidental extraspinal findings [7, 8].

Moreover, our knowledge should be vast regarding pathologies involving the spine and, we should know that they vary significantly according to age and spinal level. Special attention needs to be paid to craniovertebral junction assessment where the anatomy significantly differs from other spinal levels, and peculiar conditions such as atlantoaxial subluxation/fxation and Griesel’s syndrome may occur [9].

Interventional radiology of the spine is increasing in importance due to technological advancements and improved skills among physicians. Among all the well-consolidated image-guided spinal procedures (e.g., CT-guided biopsy, CT-guided thermal ablation for osteoid osteoma), cryotherapy should be specifically mentioned offering several advantages compared to classic thermal ablation, especially for the real-time evaluation of ablated areas (‘ice-ball’) and the reduced need of anesthesia [10].

Finally, I would like to underline the importance of an underestimated condition among radiologists and clinicians: spinal epidural lipomatosis. This condition has a considerable prevalence in the populations (ranging from 2.5% to 20%), with recently well-established linkage with systemic diseases (e.g., metabolic syndrome, obesity) [11, 12]. MRI is the ‘gold standard’ for its assessment, and radiologists should accurately evaluate the amount of fat in the spinal canal [13].

In this issue of ‘Current Medical Imaging’, expert authors in the field will analyse several ‘hot topics’ on different arguments with regard to spinal imaging.

I hope that all these contents will help radiologists and clinicians in their practice, and also offer some starting points for future researches.

Thanks to all the readers and scientific contributors of ‘Current Medical Imaging’.

REFERENCES


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