Radiography of the Spine*

Abnormalities

Content:

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8. Discospondylitis
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1. VERTEBRAL DEVELOPMENTAL ANOMALIES

Block vertebrae

Incomplete separation of vertebral bodies. Usually not significant. Possible greater risk of disc protrusion at the intervertebral spaces cranial and caudal to the blocked segment.

Hemivertebrae

Incomplete ossification of vertebral body. The affected vertebra is wedge shaped on the LL view, and has a butterfly form on the VD. Rarely causes spinal cord compression. Very common in bulldogs. Spinal curvature deformities are often present.

Transient vertebrae

At the junction of the major junction of the spine a vertebra may assume the characteristics of an the adjacent division, e.g. first lumbar (L1) vertebra with rib(s) (thoracoization), thoracal 13 vertebra without or with only one rib (lumbarization), L7 with bony connection to the pelvis (sacralization) etc. Usually no clinical significance. May cause troubles in vertebral identification.

*Written aid for 4th year Small Animal Radiology lessons
2. INTERVERTEBRAL DISC DISEASE

Common in dogs rare in cats.

Hansen type I:
Affects small breeds (dachshund, toy poodle, Pekinese etc.), typical age: 3-6 year. 
Pathomechanism: calcifying degeneration of the nucleus pulposus - the loss of elasticity - rupture of annulus fibrosus - the nucleus “explodes” into the vertebral canal (extrusion), injuring and compressing the cord. Acut symptoms (back pain - ataxia paralysis)

Hansen type II:
Mostly older, large breed dogs. Slower deterioration, chronic clinical signs. Pathomechanism: fibrotic degeneration of the nucleus. The annulus does not rupture, but bulges into the canal (protrusion), compressing the cord.

In case of a cervical compression four limb symptoms are expected. In case of a thoracolumbar compression hind limb symptoms are expected.
The physical neurological examination helps to determine the affected portion of the spine. To reveal the exact site (the intervertebral space) of the compression radiographic examination (myelography) is required.
The survey radiograph may be helpful:
- collapsed intervertebral space may suggest dislocated disc (but may represent an old process also!!)
- calcified disc in normal position demonstrates calcification in the nucleus (it is not equal with disc herniation!)
- extruded calcified disc material in the vertebral canal can be pathognostic (but very rarely visible!)
Myelography is obligatory to the exact diagnosis.
Discus hernia causes signs of an extradural compression in the radiograph.

3. WOBBLER SYNDROME
(CERVICAL SPONDYLOMYELOPATHY)

Congenital malformation of cervical vertebrae, resulting in either abnormal articulation and/or direct spinal cord compression due to the abnormally shaped vertebra. The abnormal/instable connection produces excessive stress on neighboring structures, causing ligament hypertrophy, disc protrusion, etc.
Dobermans (over 5 years) and Great Danes (under 1 year) are overrepresented.
Typical symptoms: weakness and wobbling movement of the hind limbs.
Radiographic changes:
1. Static changes (the degree of compression does not differ with the flexion/extension of the spine)
   - cervical hemivertebra (wedge vertebra) (B)
   - depressed dorsal lamina (A)

The contrast column stops between T13-L1. The dorsal displacement of the ventral contrast column indicates a ventral epidural compression (arrow).
2. Dynamic changes (the degree of compression varies in different neck positions)
   - disc protrusion (D)
   - hypertrophy of lig. flavum (C)

4. CAUDA EQUINA COMPRESSION SYNDROME
   (LUMBOSACRAL STENOSIS)

Old, large breed dogs (German Shepherd!)
Chronic progressive hind limb weakness, ataxia. Lumbosacral joint is painful on extension or deep palpation.
The spinal cord (dural sac) ends around the LS joint, but the cauda equina nerves can be compressed. The instable connection between the L7 and sacrum may cause:
- disc protrusion (ventral compression) at the LS joint
- dorsal compression by the depleted dorsal arch of the sacrum
- perivertebral osteophytes (spondylosis) formation and resulting “Tunnel syndrome” (nerve surrounded and squeezed by bony tunnel)

Radiography
Survey radiograph
Signs of the instability are often seen:
- spondylosis deformans (see later)
- sclerotic endplates
- narrowed vertebral canal by too steep dorsal lamina
- narrowed intervertebral space (suggesting disc prolapse)
The survey radiograph is generally does not provide enough information to establish the diagnosis.

Myelography
In case the dural sac extends the LS joint (which varies individually) myelography can be a helpful aid in the diagnostics of LS disease.
Flexed and extended stress-radiographs can improve the lesions’ visibility.
In case the dural sack is too short, the myelography can be replaced by epidurography.

5. SPONDYLOSIS DEFORMANS

Ossification of the vertebral ligaments (mostly on the ventral aspect of the vertebral body), which may lead to bridging connection or even “bamboo spine” (common in boxers). Neurological consequences are rarely seen, sometimes painful.

6. SPONDYLARTHROSIS/OSIS


6. DISCOSPONDYLITIS

Septic inflammation of the intervertebral disc. Bacteria can arise from cystitis, prostatitis, dental abscess, sometimes due to wandering foreign bodies. Radiographic signs: osteolysis on the endplates in the affected intervertebral space, sclerotic zone around the lesion.
7. TUMORS (VERTEBRA, MEDULLA)

See lecture notes

8. TRAUMA OF THE SPINE

The degree of dislocation seems always less severe in the radiograph, then was actually in the moment of trauma (muscle contractions try to fix the injured components)
A second projection often reveals dramatic difference in luxation degrees, therefore orthogonal (LL and VD) projections are obligatory (especially in case of a mild subluxation)
More than 30% dislocation at the ThL portion suggests complete cross-lesion of the cord, making the prognosis poor. This ratio is less strict at the end of lumbar spine, where the canal is wider and the cord is thinner.