Radiography of the Spine

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• Complex anatomy
• Vertebrae: 7 cervical, 13 thoracic, 7 lumbar, 3 sacral, n caudal
• Thorough neurological examination - localization !!!
• Restraining tools – Anesthesia
• High quality equipment (screen/film/grid)

Radiography of the Spine

PLAIN:
• Standard positions:
  – laterolateral
  – ventrodorsal
• Other projections:
  – oblique
  – stress (flex., ext.)

The effect of positioning
Radiography of the Spine

**Radiographic Anatomy**
- Endplate
- Transverse proc.
- Cran. articular
- Caud. articular
- Spinous proc.
- Endplate
- Spinal canal
- Vertebral body
- Intervertebral foramen
- Intervertebral space

**Radiographic evaluation of the Vertebral Column**
1. **Entire vertebral column**
   - deformities
   - traumatic injuries (fract., lux.)
2. **Vertebrae**
   - shape
   - density
   - number
   - articular proc.
3. **Intervertebral space**
   - width
   - change in density

**Diagnosis:** in conjunction with clinical signs!!!

**Anatomy**

**Radiography of the Spine**
1. **Survey radiograph**
2. **Contrast studies:**
   - Myelography
   - Epidurography
   - (Discography)

**Myelography**
- Contrast study of the subarachnoid space
- Aim: to reveal compressive processes in the spinal canal
Radiography of the Spine

**Myelography**

- Contrast study of the subarachnoid space
- Aim: to reveal compressive processes in the vertebral canal

**Myelography**

- **Technique No. 1.**
  - "Cisternal Myelography"
    - general anesthesia
    - occipital puncture (spatium atlanto-occipitale)
    - contrast: nonionic, water soluble iodine: Omnipaque (iohexol), Iopamiro (iopamidol) etc.
    - dose: 0.3 ml/kg (cervical lesion), 0.5 ml/kg (thoracolumbar lesion)

**Myelography**

- **Technique No. 2.**
  - "Lumbar Myelography"
    - lumbar puncture (L4-5, L5-6)
    - in case of unsuccessful cisternal puncture (technical problems, swollen spinal cord (oedema, haematoma)
    - sometimes the first method of choice

**Myelography**

- invasive method
- possible complications:
  - convulsive seizures
  - herniation of the cerebellum
  - medullar puncture: apnoea, exitus
- cisternal puncture: enables CSF examination

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Radiography of the Vertebral Column

CONTRAST STUDIES:
- Myelography
- Epidurography
- Discography

Epidurography
- Contrast study of the epidural space
- Puncture: sacro-coccygeal junction or C1-2
- Indication: lumbosacral compression
- Disadvantage: epidural fat → irregular filling

Compressions in the spinal canal

Golf-tee sign
Radiography of the Spine

**Compressions in the spinal canal**

- Intramedullary swelling

**Abnormalities**

**Developmental anomalies**

1. Spina bifida (spinal cleft)
2. Block vertebrae
3. Hemivertebrae ("wedge-vertebrae")
4. Transient vertebrae
5. Sacralization
6. Lumbalization

- Incomplete ossification
- "Butterfly shape"
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**Abnormalities**

**Formal deviations of the vertebral column**

1. Lateral: Scoliosis
2. Dorsal: Kyphosis
3. Ventral: Lordosis

**Causes:**
- developmental
- metabolic
- spasm, pain

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**Abnormalities**

**Degenerative disease of the intervertebral disc**

1. **Types**
   - “Hansen I.”:
     - chondrodystrophic breeds
     - nucl. pulp.: calcification
     - anulus fibr.: rupture
     - „extrusion”
     - rapid deterioration

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**Abnormalities**

**Degenerative disease of the intervertebral disc**

1. **Types**
   - “Hansen II.”:
     - other (large) breeds
     - nucl. pulp.: fibrotisation
     - anulus fibr.: intact
     - „protrusion”
     - chronic process

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**Degenerative disease of the intervertebral disc**

2. **Consequences:** spinal cord compression, pain, loss of neural function

3. **Localisation:**
   - cervical → four limb symptoms
   - thoracolumbar → hind limb symptoms

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**Degenerative disease of the intervertebral disc**

4. **Radiographic signs:**
   - calcified disc is not pathognostic

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4. **Radiographic signs:**
- calcified disc is not pathognomistic
- narrowed intervertebral space (!)
  (phys: C2-3, C7-Th1,Th10-11)

• Deformity, instability of cervical vertebrae (C4-7), malarticulation, narrowed spinal canal
  • spinal cord compression
  • ataxia, paresis
  Predisposition: dobermann

• Types of the compression:
  - dynamic: worsening by extension of the neck (lig. flavum hypertrophy)
  - static: the same degree in every position (deformed vertebrae)

- calcified disc in the canal (deformed „horse-head”)

- myelography:
  • extradural compression
**Radiography of the Spine**

**Abnormalities**

**Cervical Spondylopathy - Wobbler Syndrome**

- Radiography:
  - myelography: compression of the spinal cord due to
    1. deformed vertebra
    2. disc protrusion
  3. hypertrophy of lig. flavum (multiple location !!, extended view)

**Abnormalities**

**Lumbosacral Stenosis - Cauda Equina Compression Syndrome**

- Lumbosacral instability - stenosis
- German shepherd, large breeds
- Hindlimb weakness, painful palpation of LS region

- Myelography:
  - sometimes not informative (too short dural sack)
  - stress projections (flex., ext.)
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Abnormalities
Lumbosacral Stenosis - Cauda Equina Compression Syndrome

Epidurography

Abnormalities
Spondylosis (Deformans)

- Osteophyte formation on the vertebral body
- It may fuse ("bamboo spine" → boxers!!)
- Generally no clinical relevance !!!

Abnormalities
Spondylarthritis

- Inflammation of the intervertebral joints
- May cause pain without neurological signs
- Radiologic sign: DJD signs in the small joint

Abnormalities
Discospondylitis

- Septic inflammation of the intervertebral disc
- Pyrexia, painful palpation of the affected area
- Neurological deficiencies
- Radiology: osteolytic end plates rounded by sclerotic zone

Abnormalities
Discospondylitis

- Primary (osteosarcoma, chondrosarcoma) or metastatic
- Osteolytic - osteogenetic signs
- Ventral aspect of vertebral body, spinous proc. (end plates are usually not affected)

Abnormalities
Neoplasia of the Vertebrae

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Abnormalities
Neoplasia of the Spinal Cord

- Painful spine, neurological deficiencies
- Survey radiograph is usually negative
- Myelography: intramedullary lesion

Abnormalities
Traumatic injuries of the Vertebral Column

1. Vertebral luxation / subluxation (30%!)

Abnormalities
Traumatic injuries of the Vertebral Column

1. Vertebral luxation
2. Fractures