

Radiology Review of Neuromusculoskeletal Conditions Spine

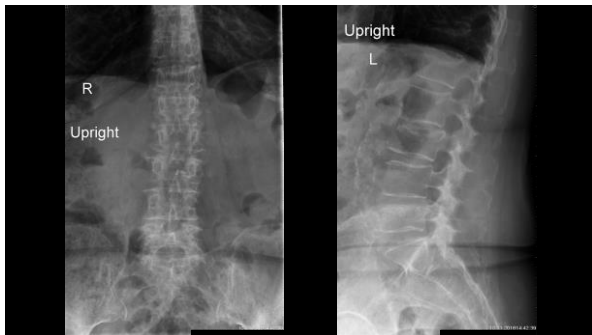
Dr. Robert Coté, DACBR
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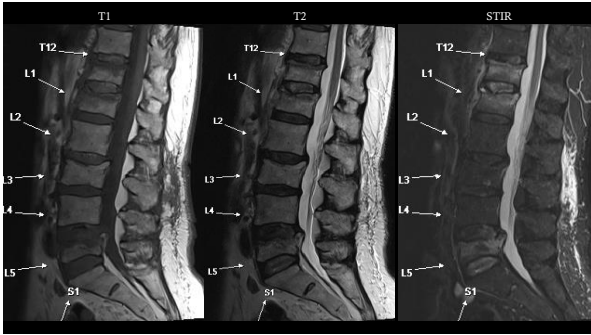
Case 1 – 74F, New onset back pain

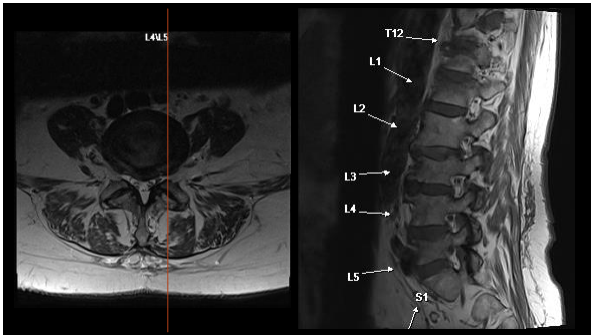
A 74 year old female patient presents complaining of new onset back and leg pain after a fall. She is a longstanding, wellness care chiropractic patient.

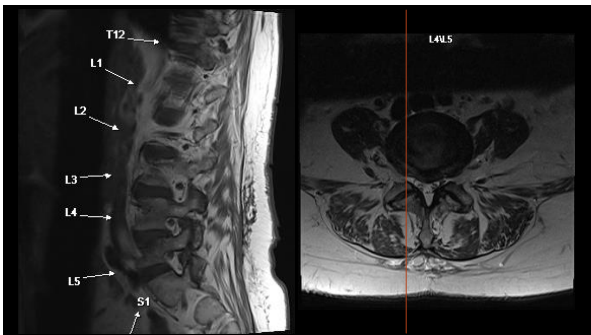
Neurologic examination revealed left-sided weakness of the tibialis anterior and extensor halluc muscles (4/5) and slightly less robust quadriceps reflex (1+J) when compared to the right side.

Light palpation of the lumbar spine elicited severe pain with mild exacerbation of the leg pain.









Osteoporosis and Compression Fractures

- ◊ Metabolic bone disorder characterized by decreased amount of histologically normal bone
 - ◊ Often age-related (post-menopausal females and senile individuals)
- ◊ 50% of women and 20% of men over 50-years-old will suffer an insufficiency fracture
 - ◊ Hip and spine fractures are associated with significant loss of function and increased mortality
- ◊ Diagnosis is common made with DXA (dual energy absorptiometry)
 - ◊ Quantitative US, Quantitative CT

Osteoporosis and Compression Fractures

- ◊ DXA Score
 - ◊ Z-score (age and population based match)
 - ◊ T-score (population match to young adult reference)
 - ◊ +1.0 to -1.0 normal range
 - ◊ -1.0 to -2.5 osteopenia
 - ◊ -2.5 and lower osteoporosis
- ◊ Associated T-score fracture risk
 - ◊ -2 → 4x more likely to suffer a fracture
 - ◊ -3 → 6x more likely to suffer a fracture
 - ◊ -4 → 16x more likely to suffer a fracture

Osteoporosis and Compression Fractures

- ◊ Radiographic findings
 - ◊ Morphologic and morphometric (qualitative and quantitative) assessments
 - ◊ Loss of vertebral body heights (anterior vs. middle vs. posterior)
 - ◊ Often anterior body loss, though loss of middle and posterior may occur with fragment retropulsion
- ◊ MRI of benign osteoporotic fractures
 - ◊ Multiple compression fractures
 - ◊ Incomplete abnormality of bone marrow signal (some normal marrow)
 - ◊ Spared posterior elements

Osteoporosis and Compression Fractures

- ◆ Radiographic predictors relating to delayed neurologic compromise
 - ◆ Thoracolumbar junction
 - ◆ Involvement of the midportion of the vertebral body
 - ◆ Involvement of the posterior vertebral body wall
 - ◆ Pre-existing stenotic lesions
- ◆ Delayed neurologic compromise may add significant socioeconomic burden and additional health problems

Park HY, et al. Clinical and radiologic features of osteoporotic spine fractures with delayed neurologic compromises. *World Neurosurg*. 2018 Dec; Vol 120: e1295-e1300.

Osteoporosis and Compression Fractures

- ◆ Treatment for osteoporosis
 - ◆ Exercise
 - ◆ Diet (including calcium and vitamin-D)
 - ◆ Pharmacologic (often in high fracture risk individuals)
 - ◆ Antiresorptive agents and anabolic agents
- ◆ Treatment for fractures
 - ◆ Activity modification
 - ◆ Braces
 - ◆ Symptomatic management
 - ◆ Surgical (kypho- and vertebroplasty)

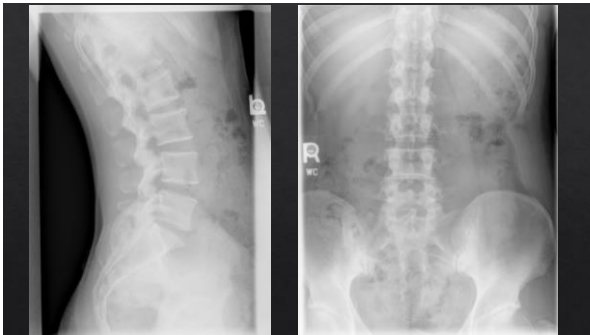
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Case 2 – 26M, Chronic low back pain

A 26 year old male chiropractic student presents to the clinic with low back pain of insidious onset and 1 year duration. He states that he has good days with almost no pain (1/10) and back days that debilitate time (10/10 pain).

Neurologic examination was unremarkable. Lumbar ROM exacerbates his pain. Kemp's test produced local pain in the lumbosacral junction/SI joints. SI joint provocation tests were positive.





Osteitis Condensans Ilii

- ◊ Sclerotic response to mechanical stress
 - ◊ Exacerbated during and after activity
 - ◊ May mimic other arthritic conditions with back stiffness
- ◊ Commonly occurs in post-partum females
 - ◊ May still occur in males and nulliparous females
- ◊ Laboratory analysis is negative for inflammatory markers and HLA-B27

Osteitis Condensans Ilii – Radiographic Features

- ◊ Triangular shaped sclerosis on the iliac side of the sacroiliac joint, bilaterally
 - ◊ Normal joint margins – no erosions, widening, or loss of joint space
- ◊ MRI may show bone marrow edema of the ileum adjacent to the area of sclerosis
 - ◊ At the level of the anterior (cartilaginous) portion of the sacroiliac joint

Osteitis Condensans Ilii

- ◊ Differential possibilities
 - ◊ Spondyloarthropathies (AS)
 - ◊ Septic arthritis
 - ◊ Degenerative arthrosis

Osteitis Condensans Ilii

- ◊ Prognosis is good as this condition is commonly self-limiting
 - ◊ Conservative management to help deal with symptomatology
- ◊ Intractable pain may be treated with
 - ◊ NSAIDs
 - ◊ Sacroiliac joint injections
 - ◊ Surgical resection and arthrodesis
 - ◊ Many complications and poor long-term outcomes
- ◊ Ayoub investigated a minimally invasive decompression surgery with good results

References

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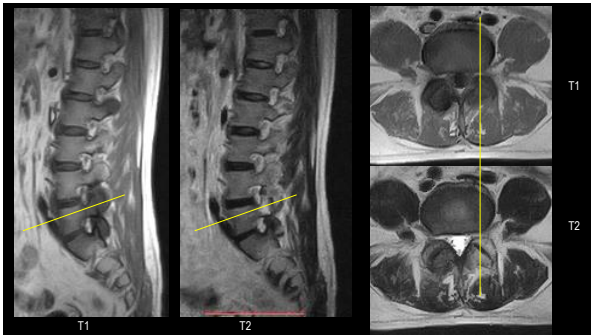
Case 3 – 30M, Back pain post-MVC

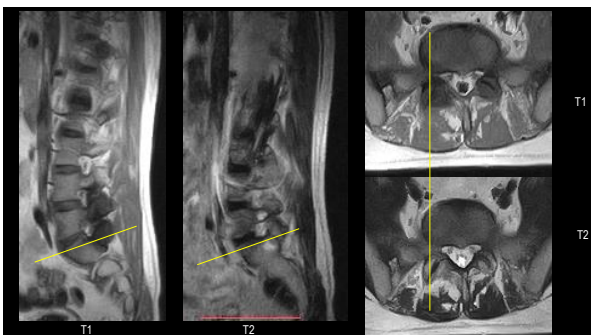
A 30 year old male presents to the chiropractor with moderate back pain and stiffness 2 weeks post motor vehicle collision. Radiographs were taken at the ER and were read as negative. He did not bring have access to them at the time of the visit.

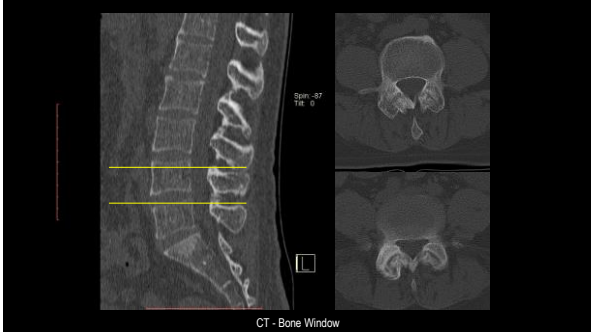
Neurologic examination was unremarkable. Physical examination revealed moderate decrease in range of motion with lumbar musculature tenderness to palpation and radiation of pain into the posterior thigh.

The patient was treated for an additional 2 weeks with little to no symptom resolution. An MRI was ordered.













Ankylosing Spondylitis

- ◊ A spondyloarthropathy involving inflammatory bony erosion and overgrowth
 - ◊ Culminates in bony ankylosis of involved joints
- ◊ Commonly begins before 40 years of age, with a male predominance
- ◊ Back pain and/or lasting morning stiffness, activity tends to reduce pain or stiffness
- ◊ Laboratory analysis – elevated ESR/CRP, HLA-B27, multiple genetic pathways are affected

Ankylosing Spondylitis – Radiographic Features

- ◊ Axial changes
 - ◊ Sacroiliitis – often bilateral and symmetric (may progress to ankylosis)
 - ◊ Erosions of the endplate (Romanus lesion, shiny corner sign)
 - ◊ Syndesmophyte formation (bamboo spine)
 - ◊ Ankylosis and ossification of facets and spinous ligaments (dagger and trolley track appearance)
- ◊ Magnetic Resonance
 - ◊ Helpful for early changes
 - ◊ Inflammatory findings in the affected joints (SI joints, facet joints, vertebral bodies, etc.)
 - ◊ Marrow edema - \uparrow T1 \uparrow T2/STIR signal

Ankylosing Spondylitis – Radiographic Features

- ◊ Extra-axial (50%)
 - ◊ Asymmetric oligoarthritis (often the hip or knee joints)
- ◊ Extraskeletal changes
 - ◊ Uveitis (40%)
 - ◊ Pulmonary fibrosis (15%)
 - ◊ Aortic valve incompetence (10%)

Ankylosing Spondylitis

- ◊ Treatment
 - ◊ Activity and patient education
 - ◊ Exercise and stretching
 - ◊ Support groups
 - ◊ Nutritional support
 - ◊ Pharmacologic treatment
 - ◊ NSAIDs
 - ◊ Disease-Modifying Anti-Rheumatic Drugs (DMARDs) and Biologic agents (including TNF-a)

References

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Case 4 – 15M, insidious onset low back pain

15-year-old male wrestler presents with insidious onset of low back pain of 3 weeks duration. It has steadily increased in intensity (from a 2 to a 4). He thought he was just “overdoing it at practice” and stayed out for a couple days but it didn’t help it.

Neurologic exam was unremarkable. Physical exam revealed local pain upon palpation of the L5 segment, extension ROM increasing his pain, and Kemp’s test producing local pain. There was no radiation with any of the tests.

A radiograph was ordered and was unremarkable. The chiropractor was concerned for spondylolysis and an MRI was ordered.







Active Spondylolysis

- ◊ Damage to the pars interarticularis (uni- or bilateral) that resulting in a stress response
 - ◊ The stressed area then may separate and create a defect or gap
 - ◊ May result in spondylolisthesis (anterolisthesis), often in younger individuals
- ◊ Often as a result of repeated mechanical stress
 - ◊ May also be congenital in nature or caused by acute trauma
 - ◊ Some studies have hypothesized a familial link
- ◊ Extension-type activities have a higher risk
 - ◊ Gymnastics, wrestling, diving, weightlifting, soccer, baseball, oarsmen

Active Spondylolysis – Radiographic Findings

- ◊ With a pars defect - radiolucent gap in the pars interarticularis
- ◊ Early stress reactions will likely not be visible on radiographs
 - ◊ CT may show an incomplete fracture
- ◊ Early MRI will show bone marrow edema (↓T1 ↑T2/STIR) or incomplete fracture
 - ◊ Marrow edema indicate active stress reaction which may progress to frank defect

Active Spondylolysis

- ◊ Conservative management for early changes (stress or acute fracture) has a good prognosis
 - ◊ Lumbosacral orthosis or bracing until the patient is asymptomatic as well as limitation of inciting activity
- ◊ Bouras found that 80-90% of athletes returned to their sport and activity level
 - ◊ Even those with non-union
- ◊ Surgical management is indicated for that that failed conservative management
 - ◊ Fusion (graft, screw fixation, wire fixation)
 - ◊ 80-100% returned to their sport though some surgeons forbade return to extreme weight or heavy contact activities

References

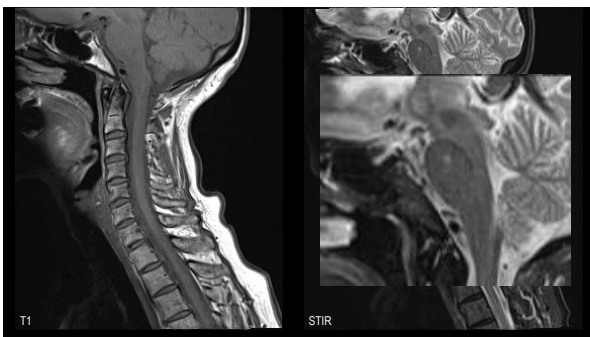
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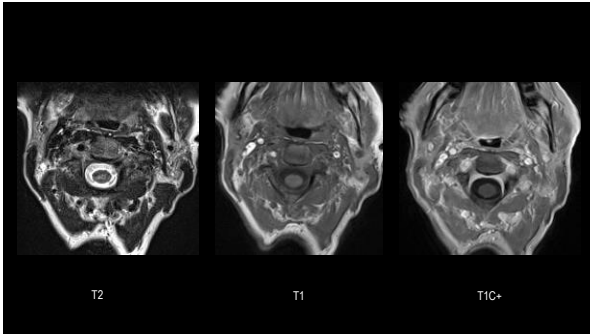
Case 5 – 68F, neck pain and radiculopathy

A 68-year-old female presents with neck pain and radicular symptoms into the upper extremity. She can think of no inciting factor but she can recall that the pain sometimes comes and goes in both intensity and location (LE too).

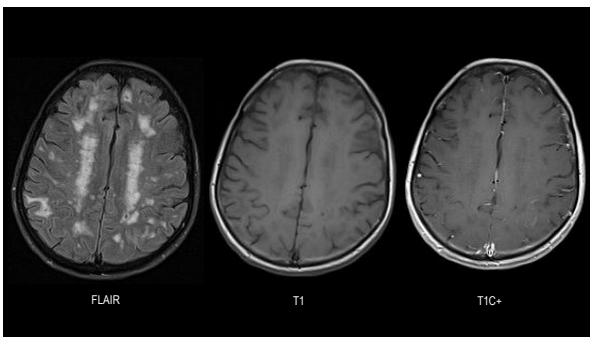
Neurologic examination was unremarkable.

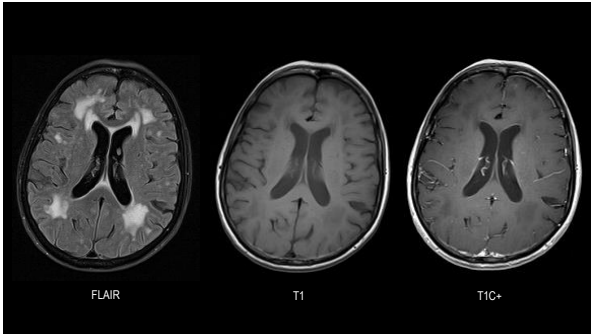
Magnetic resonance of the cervical spine was ordered.

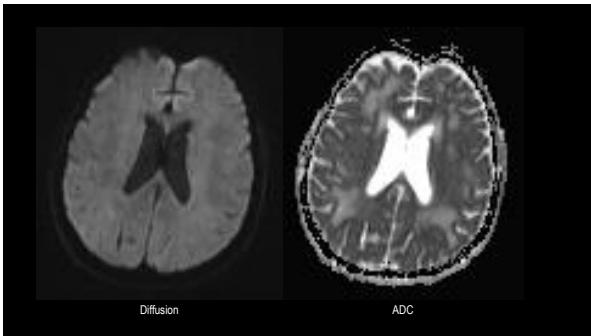


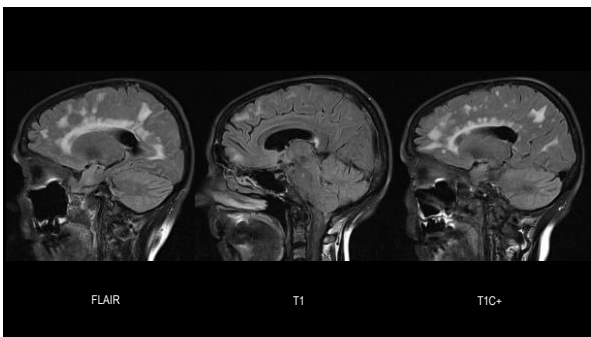


◊ A follow-up brain MRI was ordered to assess the pontine lesion as well as evaluate the remainder of the brain.









Multiple Sclerosis

- ◊ Acquired inflammatory neurologic condition resulting in progressive neurologic deficits
- ◊ Onset around 30y, F>M
- ◊ Etiology is unknown
 - ◊ Genetic factors – HLA-DRB1 in major histocompatibility complex, 6p21.3
 - ◊ Environmental factors – Epstein-Barr virus, distance from the equator, smoking
- ◊ Diagnosis is done using the McDonald criteria
 - ◊ Based on dissemination in time (of attacks) and space (number of lesions)
 - ◊ CSF commonly shows IgG oligoclonal bands

Multiple Sclerosis

- ◊ Subtypes
 - ◊ Clinically isolated syndrome (CIS) – initial, acute presentation in 80%
 - ◊ Relapsing Remitting MS (RRMS) – acute neurologic symptomology with periods of full remission
 - ◊ Secondary Progressive MS (SPMS) – symptomatology with incomplete recovery between acute attacks
 - ◊ Primary Progressive MS (PPMS) – progressive disability without remission
 - ◊ Onset around 40y, F=M

Multiple Sclerosis – Radiographic Findings

- ◊ Negative on radiography
- ◊ MRI demonstrates inflammatory lesions ↑T2,
 - ◊ Lesions tend to be periventricular, juxtacortical, infratentorial, and within the spinal cord
 - ◊ Often ovoid, may be confluent
 - ◊ During periods of active inflammation, lesions will enhance post-contrast

Multiple Sclerosis

- ◊ Differential Possibilities
 - ◊ Acute disseminated encephalomyelitis
 - ◊ Infection
 - ◊ Small vessel cerebral ischemia
 - ◊ Neurosarcoidosis

Multiple Sclerosis

- ◊ Treatment
 - ◊ Symptomatic relief
 - ◊ Physiotherapy, occupational therapy, cognitive behavioral therapy
 - ◊ Acute relapse management
 - ◊ Steroid therapy to reduce inflammation
 - ◊ Disease-modifying treatments
 - ◊ Interferons, Teriflunamide, Dimethylfumarate, Fingolimod, Natalizumab, Alemtuzumab

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