The first NODi meeting of 2012 addressed the topic of neck pain. We were lucky enough to have two speakers to stimulate our thoughts: Pat Sells discussed a case series (presented at ECVIM) of horses with neck pain as their primary complaint and then Richard Hepburn presented an interesting case series of neck problems with a predominantly neurological bias.

Pat's case series was made up of horses presenting with neck pain at Rossdales Diagnostic Centre from 2004-2008 that underwent radiography of the cervical region. Out of 129 horses osteoarthritis represented 62.8% and was most common at the C6/C7 articular process joints (APJs), with cases mainly presenting with a history of poor performance and with an increased risk with age. Ataxia and decreased sagittal ratios were uncommon. 14.7% suffered cervical soft tissue injury, 8.5% cervical vertebral malformation (CVM) and cervical vertebral fracture represented 3.1% of cases. Cervical vertebral subluxation and a vertebral body abscess were among the other cases described. Please see pages 3–5 of this PDF for further details of the cases.

The case series lead to some interesting discussion points: only around 7% of cases presented with ataxia, which is perhaps very low compared to what we would intuitively think with conditions affecting the neck. With the horses relatively simple nervous system they are able to cope with quite substantial lesions. Currently our knowledge of neck pathology in older horses is limited and we have difficulty in establishing a firm connection between poor performance and neck pain.

Richard followed Pat's talk with ‘Cervical neurological disturbance of gait’. Diagrams of areas of the spinal cord affected and their clinical presentation were discussed (See pages 6–16 of this PDF for Richard’s talk). Richard has mainly seen cases of ‘Acquired Cervical Vertebral Canal Malformation’. Clinical signs commonly lead to the description of ‘AQR’ horses (‘Ain’t Quite Right’) and include ataxia (Grade 1-3 out of 5), poor performance, collapse and neck pain.

Richard reminded us of the need for medics and orthopods to work closely together on these cases and the need for specific diagnostic criteria to successfully treat these cases. These included suitable neurological signs (neuro-anatomically linked to the neck) good plain lat-lat rads and oblique shots (to highlight the facet joints and their margins), normal sagittal ratios (to rule out canal stenosis) and normal intervertebral disc spaces. Scintigraphy was rarely used in his cases and including a ventro-dorsal view of the neck to establish true left to right asymmetry. Asymmetric uptake in the neck on scintigraphy was a significant finding. Myelography was used commonly to rule out canal stenosis and further support an alternative diagnosis. This procedure is not commonly used in Newmarket and Richard urged us to consider this worthwhile procedure in more neurological cases.

Several papers in the literature were cited (see references below) covering neuro-anatomy, standard neurological examination, calculating mean standard ratios and injecting APJs. Several videos of neurological examinations
were presented with how to and how not to carry out certain procedures to allow the most accurate results to be obtained. Richard follows his own neurological worksheet (see below) and reminded us to always complete the full neurological examination even if deficits are established early on. Placement tests were included, but due to the incredible variability and potential for both false positives and negatives interpreted with care. As neurological signs are most obvious at walk; trotting and ridden examination are not considered as significant. The basic provocative tests enable differentiation of those horses that are predominantly ataxic from those that are predominantly lame; with the tail pull, circling and backing up tests being the most useful. An interesting observation was made that during the tail pull ataxic horses rotate their hind feet out, but orthopaedically weak horses don’t. Blocking of the APJs with local anaesthetic was not a standard part of the work up, but can be considered.

Of the 300 cases 80% had a positive response to treatment with a 2-3 grade improvement on neurological examination at 4 months post injection of the APJs with clinical signs. The improvement lasted approximately 2-3 years before recurrence. Richard’s selection criteria included normal sagittal ratios, as those with significant narrowing were considered less likely to respond.

The discussion included support for physiotherapy as part of the treatment of these cases as well as consideration that our APJ injections may be treating soft tissue lesions as well e.g. enlarged synovial cysts/bursi. An interesting observation to consider is that at post mortem 20-50% of non-ataxic horses are noticed to have marked pathology of the APJs. The discussants tended to agree that medication of the cervical spine was rarely successful in treating non-localised lameness. It was reiterated that a neck lesion in a stiff necked/ poorly performing horse should only be considered as a likely cause once other problems have been excluded.

Sarcosystis as a possible aetiology of spinal cord damage, endemic in France, Germany and Spain, was discussed. Although not readily recognised in the UK there is a 40-60% seroprevalence. Currently testing for this disease is limited with only 1 lab in France testing for Isospora. Hopefully there will be a commercially available test in the near future and with this final thought an interesting and informative evening was brought to a close.

**RELEVANT LITERATURE**


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Aims of the study
To address the questions:
1. What diagnoses are made in horses presenting with neck pain?
2. Are signalment and clinical features of horses presenting with neck pain associated with specific diagnoses?

129 Horses Presenting With Neck Pain

Osteoarthritis (OA) of the Articular Process Joints (APJs)
- Prevalence – 81/129 (62.8%)
- Majority had 2 pairs of joints affected
- Most commonly affected site C6/7

Diagnosis of OA of APJ
Radiography alone = 19/81 (23.5%)
Radiography and scintigraphy = 62/81 (76.5%)

Clinical Features of OA-AJP
- Significant factor
  - History of poor performance
  - FL lameness
  - Age group
  - Breed group
  - Status group
  - Concurrent orthopaedic problem
  - Normal Intravertebral sagittal ratios

P Value
- 0.0002
- 0.0013
- 0.0004
- 0.0144
- <0.0001
- <0.0001
- 0.0018
- 0.0072

Acknowledgements
- Cecily Burbidge, Elaine Packer, Kylie Semple, Faye Enefer for assistance with data collection

Methods
Inclusion:
All horses that underwent radiography of the cervical region at Rossdales April 2004 - December 2008 WITH either a history of neck pain or exhibiting neck pain (i.e. restriction of voluntary movement) on clinical examination.

Analysis
1. Descriptive statistics: mean + Standard deviation
2. Horses grouped by final diagnosis, and associations with clinical features examined using:
   a) Univariate: Chi square and Fisher’s Exact
   b) Multivariate: where numbers allowed, forward stepwise logistic regression, all variables with P<0.2
3. Comparison of sagittal ratios between diagnosis groups: one way ANOVA
4. P ≤ 0.05 regarded as significant


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   To address the questions:
   1. What diagnoses are made in horses presenting with neck pain?
   2. Are signalment and clinical features of horses presenting with neck pain associated with specific diagnoses?
Clinical Features of OA-AJP
Multivariate analysis

Increasing risk with increasing age:
OR 1.1; CI 1.1–2; P = 0.04

History of poor performance:
More likely to have OA than other conditions:
OR 49; CI 2.01,12; P=0.001

CVM horses had sagittal ratios that were significantly lower than OA of APJs and all other diseases at multiple sites:

False negatives:
3/11 CVM horses had low normal intervertebral SR (a/b)
1/8 CVM horses had low normal intravertebral SR (c/d)

Cervical vertebral fracture

Incidence: 3.1% (4/129) horses
Fracture sites: C2, C4, C5 & C6
3 presented without neurological dysfunction
2 subjected to euthanasia
2 returned to athletic function (winners)

Cervical vertebral subluxation ???

- 3 cases
- Presentation: all with neck stiffness and hindlimb ataxia
- Nuclear scintigraphy: negative in 2/3
- Apparently traumatic — actually CVM

Radiographic Features of CVM

1. Enlargement of the caudal epiphysis (ski jumps)
2. Caudal extension of dorsal aspect of vertebral arch
3. Intervertebral malalignment
4. Abnormal ossification of the articular processes
5. DJD of the articular processes

Age Distribution

Pneumocephalus

- 14 y.o. TBx gelding
- Neck stiffness, hindlimb ataxia, progressive depression
Cervical vertebral subluxation

- 3 cases
- Presentation: all with neck stiffness and hindlimb ataxia
- Nuclear scintigraphy: negative in 2/3
- Apparently traumatic – actually CVM

Vertebral Body Abscess

- 5 y.o. Arab gelding
- Neck pain
- Weakness & ataxia of all four limbs

Neoplasia

- 8-year-old TB gelding
- Weakness in all four limbs
- Reluctance to flex the neck
- Progressive ataxia and eventually quadriplegia
- Subjected to euthanasia
- Osteosarcoma on histopathology

Pneumocephalus

- 14 y.o. TBx gelding
- Neck stiffness, hindlimb ataxia, progressive depression

Atlanto-occipital joint infection

- 3 month old TB foal
- Neck pain and swelling around right atlas
- No neurological dysfunction
- Synoviocentesis confirmed joint sepsis due to Rhodococcus equi

Conclusions

- Osteoarthritis of the Articular Process Joints is the most common diagnosis in this group
- Increasing risk with age
- A history of poor performance is commonly seen
- Ataxia & ↓ SR were uncommon features
- Wide range of other diagnoses possible
- Neck fractures had a better outcome than might have been expected
- These disease prevalences reflect the local population and may not apply to other hospital populations

Measurements have been shown to be more sensitive than myelography (87% vs 56%) and specific (94% vs 83%)
- Positive predictive value = 95% vs 86%
- Negative predictive value = 84 vs 52%
- Narrowest site does not necessarily correlate with site of most extensive spinal cord compression
Acquired CVCM

- **AETIOLOGY**
  - High degree of caudal cervical vertebral column mobility
  - Higher biomechanical loading forces
  - Changing facet angles caudally
    - More laterally placed
  - Trauma
  - Neck
  - Cervicothoracic intumescence

- **PATHOPHYSIOLOGY**
  - Chronic facet and lig Flavum microtrauma
  - Vertebral column instability
  - Fibrocartilagenous proliferation
  - Joint swelling
  - Proximity of SpC to facets

- **RESULTS IN**
  - Extra-dural spinal cord compression

EBM of Acquired CVCM

- Few studies, small numbers
- WB, TBX, QH, large breed horses
  - 8yo onwards
- Ataxia - 1/5 - 3/5
- Poor performance, collapse, neck pain
- C5-6 and C6-7 articulations most common
- APJ therapy
- Prognosis better with chronic disease

**RH - Acquired CVCM**

- Commonest presentation of neurological gait abnormalities in UK
  - >8-12yo
- WB, TB, large breed sport horses
- **History**
  - Poor balance, refusing, weak behind, ∨-neck flexion
  - Stumble, trip (worst downhill)
  - Stand abnormally
  - Strange multilimb gait changes / lameness

**RH - Radiographic Criteria**

- Normal mean sagittal ratios
- Suitable changes to appearance of APJs
  - Latero-lateral projections
    - 4 changes to look for
    - Grade 3b - 4b (5a)
  - Relatively symmetrical on oblique views
  - Minimal incongruity / malarticulation
- **No evidence of inter-central disease**
  - Normal iv disc space

**Extra-Dural Spinal Cord Compression**

- Continuous or cyclical SpC compression
  - Neuronal fibre swelling, Wallerian degeneration
  - Axonal spheroids, Astrocytic gliosis
  - Perivascular fibrosis, Demyelination
- **Degeneration begins superficially**
  - Dorsal spinocerebellar tracts first affected
  - Spreads deeper with time
    - Rostral spinocerebellar tracts
Cervical Neurological Deficits

- **Gait**
  - Ataxia, dysmetria, paresis
- **Panniculus hypereflexia/hypaesthesia**
  - Cervical, truncal, cervico-auricular
- **Pain** - can referred pain occur?
  - What will Pat say...
- **Muscle spasm**
  - Neck deviation - SO RARE!

This explains it all...

Neurological Examination

- **Observation of behaviour and mentation**
- **Cranial nerve examination**
- **Examination of gait**
  - Placement Tests
  - Observation
  - Provocative testing

Limb Placement Tests

- Initial detection of proprioceptive deficits and muscular weakness
- Insensitive, high variability (inter and intra)
  - Signalment important
  - Older = slower, young TB = forget it!
- **f/l** – crossing and hopping

Provocative Gait Tests

- **Back up, stop abruptly**
- **Spin, stop abruptly**
  - Both directions
- **Tail pull**
  - Standing (LMN) and walking (UMN)
  - +/- Withers push
- **Hill walking**
  - Head neutral, head elevated

Gait Analysis

- **Evaluate horse in motion**
  - Back, front, walking alongside
  - WALK (trot to exclude lameness)
  - Assess basic limb function
    - Range, symmetry, efficiency
- **Evaluate response to provocative tests**
  - Grade deficits

Dysmetria

- Imbalance in extensor vs. flexor tone
- **Hypermetria**
  - Flexion > extension – **f/l** fetlocks + pasterns
- **Spasticity**
  - Extension > flexion – **h/l** hocks + fetlocks
**Mayhew’s Amazing Grades**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description of Gait Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No neurological deficits detected</td>
</tr>
<tr>
<td>1</td>
<td>Neurological deficits just detected at the walk and slightly worsened by backing, turning, loin pressure, or neck extension</td>
</tr>
<tr>
<td>2</td>
<td>Neurological deficits easily detected at the walk, and exaggerated by backing, turning, loin pressure, or neck extension</td>
</tr>
<tr>
<td>3</td>
<td>Neurological deficits prominent at the walk, with a tendency to buckle or fall with backing, turning, loin pressure, or neck extension. Postural deficits noted at rest</td>
</tr>
<tr>
<td>4</td>
<td>Stumbling, tripping and falling spontaneously at walk</td>
</tr>
<tr>
<td>5</td>
<td>Horse recumbent</td>
</tr>
</tbody>
</table>

**Neuroanatonic Localisation**

- Location(s) of dysfunction that best describes the identified deficits

**Panniculus Reflexes**

- **Prick skin** – observe for skin flick response
  - **Cervico-Auricular** – Prick up to C2 = skin flick, ear twitch and smile
  - **Cervical** – prick neck = local skin flick
    - Exaggerated = peripheral neuropathy/SpCC
    - Reduced = SpCC
  - **Truncal** - limited variability

**Further Define Location**

- Spinal inflow/outflow obstruction
- UMN moderation of unit somatic function = cutaneous trunci reflex
dampening = panniculus hyperreflexia

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**Backing Up**

- **Normal**
  - Normal gait in reverse
- **Abnormal**
  - Exacerbates abnormal forward gait
  - Base wide
  - Toe dragging
  - Interference
  - Reluctance

**Hill Walk**

- Lead horse down an incline with head neutral and then head elevated
  - Lead directly down or zigzag
- **Normal**
  - F/l and h/l - normal gait
- **Abnormal**
  - Forelimbs – floating and base wide
  - Hindlimbs – knuckling and tracking under

**Spinning**

- Turn briskly about axis
- **Normal**
  - Forelimbs - up / down, up / down
  - Hindlimbs – cross over / shuffle
  - All limbs inside lateral margins of the trunk
- **Abnormal**
  - Forelimbs – pivot, abduct, interfere
  - Hindlimbs – circumduct, interfere

**Tail Pull**

- **GRADUALLY LOAD THE TAIL**
  - Aim to assess muscular response
  - Assess symmetry of paresis
  - **NOT** surprise horse or arm wrestle it!
  - **AT REST** = LMN response
  - **AT WALK** = UMN response
  - Assess results together

---

**PARESIS**

**ATAXIA**

**REFERRED PAIN**
Further Diagnostics

- **Plain radiography**
  - MSR, APJ (facet) changes
  - Rarely discospondylitis

- **Scintigraphy** - largely useless

- **Myelography** - Don’t ignore it!

- **CSF analysis + Vitamin E analysis**

Vertebral Canal - Mean Sagittal Ratios

- **Intra-vertebral**
  - **Green** / black
  - C2-3 to C5-6
    - >0.52 = normal
  - C5-6 to C7-T1
    - >0.56 = normal
  - Anywhere ≤0.48
    - 89% PPV for Canal stenosis

Grading Cervical APJ (Facet) Changes

- No significant association between clinical signs and grade of radiographic change
  - Numbers small (<100 cases neuro + ortho)
- C5-6 grade increases with age
- C5-6 and C6-7 changes can be normal and abnormal
- **We are grading c.300 neurological cases...**
  - 3b–4b most common
Dorsal osteophytosis

Mild ventral buttressing, reduced iv foramen

More severe ventral buttressing, reduced iv foramen

Mild ventral buttressing + dorsal osteophytosis, reduced iv foramen

Severe ventral buttressing, mild dorsal osteophytosis reduced iv foramen

Dorsal and ventral osteophytosis, dorsal new bone >1.5x vertebral canal width, reduced foramen size

Dorsal and ventral osteophytosis, dorsal new bone >1.5x vertebral canal width, obliterated foramen

Oblique projections should be performed

Young horses where developmental disease is suspected

Older horses where asymmetric deficits or panniculus hyporeflexia present

IV Disc (Inter-Central Joint) Disease

Myelography

- Radiography
  - Neutral views
  - Flexed views
  - Extended views
  Do in this order, stop when compression is identified
  Extension most likely to worsen neurological signs
- Recover with head on a cushion
- Problems
  - Worsened neurological deficits
  - Seizures
  - Recovery injury
  - Delayed contrast hypersensitivity

OBLIQUE PROJECTIONS?

How To: Injecting APJs

EQUIPMENT

- Ultrasound
  - Phased array, sector or micro-convex
    - Put transducer inside sterile glove WITH gel
  - 6-10MHz
    - Scan depth – 6-8-10cm
    - Usual focal point is 4-6cm
    - Image – dorsal to right hand side
- Spinal needle
  - 12.5cm 18G ideal (C7-T1 possibly longer)
**PATIENT PREPARATION**

- **Adequate sedation**
  - 0.01mg/kg detomidine + 0.01mg/kg butorphanol
  - No local anaesthetic (wrong place!)

- **Analgesia**
  - Firocoxib, meloxicam

- **Prepare aseptically ± Clip** (no.40)

- **Position**
  - Neck in a neutral position, head turned slightly away

**What to Inject**

- **Triamcinolone acetate** – 16mg max/horse
  - 2 joints (1 articulation)

- **Methyl prednisolone acetate** – 200mg/horse
  - 4 joints (2 articulations)

- **Inject both sides**
  - L+R do not communicate reliably
  - Fenestrations may exist

**2 Injection Techniques**


- Easy to image and spatially simple
- BUT close to intervertebral space


- Miles away from SpC
- Harder to spatially orientate

**DORSAL INJECTION APPROACH**

**Dorsal Approach Accuracy**

- **Overall C2-C7 = 89%**
  - 72% Intra-articular
  - 17% Intra-capsular
  - 10% Periarticular
  - <1mm of joint capsule

**Injection Technique**

- Get BEST POSSIBLE image
- Keep transducer STILL
- Introduce needle 1-2cm dorsal to probe
- Aim to triangulate needle to cross probe axis at joint
  - Can use biopsy guide

**ORIENTATION**

PROBE REFERENCE DORSAL TO RIGHT NEEDLE WILL COME ACROSS FROM RIGHT
Cervical Facet Injections
- **RH Data** - acquired CVCM cases (*unpublished*)
  - 80% positive response + return to previous function
  - 2-3 grade improvement (**neuro exam @ 1+4m**)
    - 50% over 1st month = resolution of SpC compression and remyelination of damaged axons
    - 50% over next 2-3 months = plastic adaptation of remaining nervous tissue
  - Lasts 2-3+ years, then repeat
  - c.200+ cases with follow up...

Cervical Vertebral Fracture
- Acute onset, variable neurological disease
- Acute onset, variable neck pain
- Variable deformity
- Radiography
  - Lateral + oblique views
  - Can be difficult

VERTEBRAL TRAUMA
- All ages / breeds
- Eventers, NH racehorses, foals
- Bony tissue +/- soft tissue
- Cervical (all 4 limbs) > thoracolumbar (h/l)
  > sacral (caudal signs, h/l)
- **CLINICAL SIGNS**
  - Local pain, structural asymmetry, abnormal neck position, behavioural changes, colic, sweating, panniculus hyperreflexia

Cervical Vertebral Epidural Haematomas

VERTEBRAL TRAUMA
- **DIAGNOSIS**
  - c/s
    - Lowered head carriage
    - Neck pain
  - Radiography
    - Bony and soft tissue trauma – may be negative
  - **CT – can you get there?**
  - CSF sampling
    - Haemorrhage, xanthochromia
  - **PM**

VERTEBRAL TRAUMA
- **TREATMENT**
  - Restraint for radiography
    - Xylazine +/- diazepam, GA
  - Anti-inflammatories
    - Dexamethasone, DMSO, Vitamin E
  - Stabilisation - fracture
    - Cradle, box rest
- **CLINICAL TIMELINE**
  - Injury = acute SpC compression
  - Initial improvement = inflammation resolves
  - Later deterioration may occur = callus formation

Diskospondylitis
- Older>younger horses
- Cervical V Rare
- Thoracolumbar commonest
- Infectious, inflammatory
- CBC, APP, x-rays
- Systemic AB
  - Fluroquinolones
- Grave prognosis
Equine Degenerative Myeloencephalopathy

- **Symmetric, non-compressive demyelination**
  - Symmetric spinal ataxia (h/l = f/l)
  - Abnormal cervical, cervicoauricular and thoracolaryngeal reflexes
- **Younger animals (6-8mo) at onset**
  - Possible familial inheritance pattern
  - Problem with vitamin E utilisation?
  - Oxidative damage – phenol exposure?
- **Has been reported in older animals**

Protozoal Myeloencephalitis

- **Parasitic inflammatory necrosis of brain, brainstem and SPINAL CORD**
- Spinal cord is predilection site
- Stress induced immunosuppression important to experimental infection in horses
  - Role in wild infection?
- **Sarcocystis neurona**
- Neospora hughesii/caninum

Protozoal Myeloencephalitis

- **Neospora hughesii / caninum**
  - 11% normal UK horses sero+ve
  - 20+% normal horses in other USA, France
- **S.neurona antibodies in neuro cases in France**
  - Never travelled
  - Cross reactivity with N.hughesii does occur…

Protozoal Myeloencephalitis

- **Diagnosis**
  - WB or IFAT
  - Less chance of false +ve from blood contamination with IFAT (10,000 vs 10 cells/ul)
- **Treatment**
  - Sulfonamide (20mg/kg) + pyrimethamine (1mg/kg) PO q24h for 150-180d
  - Ponazuril (10mg/kg) PO q24h for 28d
  - + corn oil to incr absorption
  - 75% improvement in function

EHV-1 Myeloencephalopathy

- **Neurotropic EHV-1**
  - T-lymphocyte cell associated viraemia
  - Vascular endothelial cell tropism
  - eEHV-1 likes CNS vascular endothelium
  - Thrombosing vasculitis
- **Clinical signs**
  - Fever, 7-14d later = neurological signs
  - VERY VARIABLE – h/l ataxia and paresis +/- tail flaccidity, perineal hypalgesia, coprostasis, dysuria
  - Can progress to tetra-paresis/-plegia and CN signs
  - Rapid deterioration, stabilise, SLOW improvement

EHV-1 Myeloencephalopathy

- **Diagnosis**
  - Presumptive = c/s
  - Serology – variable – can be v.quick or v.slow
  - CSF – xanthochromia, IgM capture ELISA
- **Treatment + Prognosis**
  - Anti-virals – valcylovir (40mg/kg q8h) > acyclovir
  - Corticosteroids = controversial [www.acvim.org](http://www.acvim.org)
  - Prognosis = ALWAYS guarded, significant deficits can be left. Mortality varies by strain.
Others to think about…

• Equine Motor Neuron Disease
  – LMN weakness, profound muscle loss, fasciculation, lowered head carriage

• Polyneuritis equi
  – CN and caudal signs, P2 Ab serology?
  – Cerebellar abiotrophy
  – Can present <2yo