Neck and Arm Pain
Surgical
Case Study

- Presentation:
  - 13th May 2014-
  - 56-year-old male; Right handed; Insurance worker
- Brachialgia
  - 6-8 weeks
  - No trauma; possible onset after pulling weeds
  - Neck pain radiating into shoulder/ scapula and arm and forearm
  - Left chest wall pain
  - Paraesthesiae into left index, middle and ring fingers

- No right side symptoms
- Exacerbation
  - Nocturnal exacerbation
  - Golf/ Lawn bowls
  - Lifting/ driving/ working at PC
- Relief
  - Hand on head
  - Movement
- No other significant medical history
Examination

• Full range of neck movement
• Upper limb neurological examination normal
• Spurling’s test negative
Investigations

- X-ray cervical spine
- CT scan Cervical spine
- Metal implant in ear – no MRI scan
X-ray Cervical spine
CT Cervical spine C6-7
Management

• Short duration of symptoms
  – Explained often initial acute attacks settle with conservative treatment
  – Lyrica 75 mg bd
  – C7 nerve block if not settling on medication
    • Later proceeded
  – Explained surgical options if not settling
Progress

• 3rd July 2014
  – Confusion re nerve block – told not to expect relief for 48 hours! Explained purpose of nerve block
  – Pain much improved on Lyrica
  – Paraesthesiae persisted
  – Plan to slowly wean Lyrica dependent on symptoms
Return for review

• Just under one year later: 4\textsuperscript{th} June 2015
• Increasing pain – “unbearable”
• Cannot drive, sleep, shave, work ...
• Wife has to dress
• Lyrica 150 bd and Nurofen Plus
• Repeat nerve block no help
• Wanted surgery!! ASAP!!
Repeat CT Scan

- No obvious radiological change
- Marked progression in symptoms
Surgical Options Explained

- Posterior decompression – C6-7
- Anterior discectomy and rhizolysis – C6-7 anterior foraminotomy
- C6-7 Anterior discectomy, rhizolysis and fusion (ACDF)
- C6-7 Anterior discectomy, rhizolysis and arthroplasty
- Treat symptomatic level only! OR
- Treat dual pathology – C5-6, C6-7
  - Double level fusion OR
  - Hybrid construct (Fusion and arthroplasty).
Objectives of Surgery

• Neural Decompression
  – Direct
  – Indirect (restore foraminal height)

• Stabilization
  – Fusion

• OR

• Motion preservation
  – Artificial disc
Anterior Cervical Surgery
Positioning
Incision

- Approach may be made:
  - Right side (Bailey-Badgley)
  - Left side (Southwick-Robinson).
- Transverse incision provides a superior cosmetic result.
Dissection

- Lateral retraction of the carotid sheath
- Medial retraction of the tracheo-oesophageal bundle
Check level/ Retractors placed
• Straight and angled curettes. Disc forceps
Intra-operative video
Filling the hole
Grafting

- Tricortical graft or Cage autologous bone
Anterior Cervical Cage + iliac crest bone

Titanium markers verify placement on X-Ray
Non-instrumented fusion
Anterior cervical fusion with cage, TCP synthetic bone, plate and screws
Cervical Artificial Disc

• **Technique**
  – First stage Decompression
  – Second stage Arthroplasty

• **Indications**
  – As for ACDF
  – Single or multilevel pathology
  – Younger age (<50)
Cervical Artificial Disc Benefits

• Reduce Incidence of Adjacent Segment Disease
• Maintain normal neck mobility
• Provide stability
• Eliminate graft site morbidity
• Decreased recuperation period
• Shorter hospital stay
• Preclude need for bracing requirements
Bristol Disc

6 Week Postoperative Flexion/Extension
Prestige Disc
M6 Cervical Disc

M6-C Artificial Cervical Disc

Artificial Annulus

Artificial Nucleus

6 Degrees of Natural Freedom
Trial Sizing and X-ray
Rail Cutter
DISC IMPLANTATION

Implant Inserter
Disc Placement
Surgery - Hybrid

• 10\textsuperscript{th} June 2015
• C5-C6, C6-C7 anterior cervical discectomy, rhizolysis with C6-C7 arthroplasty and C5-C6 anterior fusion with cage, plate and screws.
• Discharged 12\textsuperscript{th} June 2015
Post-op images
Neck and arm pain

- Neck pain – Axial pain
  - Acute
  - Chronic
- Brachialgia – Upper limb nerve pain
  - Acute
  - Chronic
Acute neck pain

- **What Causes Acute Neck Pain?**
  - In most cases it is not possible to pinpoint the cause of the neck pain, or it may be the result of an injury.
  - In either case, it is not necessary to have a specific diagnosis of the cause in order to manage the pain effectively.
  - There is a less than 1% chance that the pain is due to a serious medical condition.

Acute calcific prevertebral tendonitis
Red Flags

• Extremes of age < 20 yrs vs elderly
• Recent history of trauma
• Constant progressive pain – this includes pain that is not associated with movement and not relieved by lying down
• Past history of malignancy
• Recurrent or prolonged use of steroids
• Immunosuppression/ HIV
• Substance misuse
• Being systemically unwell including fevers/ PUO
• Unexplained weight loss
• Neurological symptoms/ signs such as weakness of the limbs
• Structural deformity of the spine.
Vascular – vertebral artery dissection
Post-op
EBM of Acute Musculoskeletal Pain

- There is both a lack of evidence (i.e. few or no scientific studies conducted) and a lack of high quality studies on pain-relieving treatments in this area

- Not effective
  - There is scientific evidence that collars are not effective for acute neck pain

- Effective Measures
- Measures that are effective for relieving acute neck pain are:
  - Staying active and keeping the neck moving;
  - gentle neck exercises (these can be started soon after the pain starts);
  - combined (or ‘multi-modal’) treatments involving cervical passive mobilisation with exercises, or
  - exercises with other types of treatments;
  - and pulsed electromagnetic therapy (reduces pain in the short term).

www.nhmrc.gov.au
EBM of Acute Musculoskeletal Pain

- Inconclusive Studies on
  - TENS,
  - electrotherapy and
  - micro-breaks (small breaks from computer work) for acute neck pain
    - have not tested these treatments against placebo.

- No studies done to prove it works or not
- There are no studies that have looked at:
  - acupuncture,
  - pain-relieving medication (analgesics), anti-inflammatory drugs (NSAIDs),
  - Cervical manipulation, cervical passive mobilisation,
  - multi-disciplinary treatment in the workplace,
  - Muscle relaxants,
  - neck school,
  - patient education,
  - spray and stretch therapy and
  - traction for the treatment of acute neck pain.
Whiplash Associated Disorder

- Whiplash is an acceleration-deceleration mechanism of energy transfer to the neck. It may result from “...motor vehicle collisions...”. The impact may result in bony or soft tissue injuries which in turn may lead to a variety of clinical manifestations (Whiplash-associated disorders).


- Clinical guidelines for best practice management of acute and chronic whiplash-associated disorders

Differential Diagnosis for Neck pain

• Mechanical
  – Non-Traumatic
    • Neck strain
    • Spondylosis*
    • Myelopathy*
    • Cervical fracture* (see neoplasm)
  – Traumatic
    • Whiplash syndromes*
    • Disc herniation*
    • Cervical fracture*
    • Neck sprain
    • Sports (stinger)*

• Non-mechanical
  – Rheumatological/ inflammatory
    • Rheumatoid arthritis
    • Ankylosing spondylitis/ Reiter’s syndrome/ Psoriatic arthritis.
    • Fibromyalgia/ PMR
  – Neoplastic
    • Metastasis
    • Osteoblastoma/ osteochondroma/ giant cell tumour
  – Infectious
    • Osteomyelitis/ discitis
    • Meningitis/ Herpes Zoster/ Lyme disease
  – Neurological
    • Peripheral entrapment/ Brachial plexitis/ Neuropathies/ CRPS
  – Referred
    • Thoracic outlet syndrome/ Pancoast tumour/ Oesophagitis/ Angina/ Vascular dissection/ carotidynia

• Miscellaneous
  – Sarcoidosis/ Paget’s disease

* With or without radiculopathy

Chronic axial neck pain - Degenerative

- Discogenic
- Facet joint
- Neural
- Musculoligamentous
- Postural/ sagittal balance issues
Psychosocial Red Flags

• Psychosocial red flags:
  – Non-physiological pain distribution,
  – non-organic physical signs,
  – repetitive neck injuries,
  – multiple failed treatment,
  – litigation and or disability claims,
  – apparent secondary pain,
  – substance abuse,
  – depression or other psychiatric diagnosis.
Brachialgia – including cervical radiculopathy

- Spondylogenic pain
  - Spondylosis
  - osteophyte
  - Disc herniation
- Non-spondylogenic pain
  - Tumour
  - Infective

- Brachial plexus lesions
  - Tumour
  - Radiation injury
  - Thoracic outlet syndrome
  - Post-traumatic
  - Hyper-abduction syndrome

- Peripheral nerve lesions
  - Radial nerve
  - Median nerve
  - Ulnar nerve
  - Cutaneous sensory branches
Clinical Evaluation

• History
• Pain
  – Character/ location/ mechanism and timing of onset/ duration/ clinical course
• Associated symptoms
  – Radiation/ neurological symptoms/ functional limitations/ psychosocial stresses etc.

• Examination
  – Appearance/ posture/ stance/ gait
  – Range of movement
  – Neurological examination
  – Specific tests
    • Spurling test
    • Axial cervical distraction test
    • Arm abduction test
• Bend to the side of radicular pain and extend neck
• A positive test if pressure exerted downward on the patient’s head will create or intensify radicular symptoms
• LR+ of 4.3/ LR- of 0.75
• Useful when positive/ not so helpful when negative
• LR = likelihood ratio

Spurling test
Axial cervical distraction test

- Examiner **pulls up on the head** to theoretically decrease the pressure on the cervical root
- Performed in **neutral and slight flexion and extension**
Arm abduction test

- Full abduction of the affected arm over the head of the seated patient
- Decreases traction on the nerve root
Shoulder / Upper limb examination

- There is significant overlap between the physical examination of the neck and shoulder
- Shoulder pathology
  - Reduced ROM active and passive
  - Local tenderness
  - Pain increases on abduction
- Peripheral nerve tests
  - Tinel’s test
  - Phalen’s test
  - Compression cubital tunnel
  - Adson’s test
Adson’s test

- Use the Adson’s test to determine compression of the subclavian artery
- Locate the **radial pulse** with patient sitting or standing
- Feel pulse as you **abduct, extend and externally rotate** the patient’s arm
- Once in position, instruct **patient to take a deep breath and hold it and rotate the head toward the tested arm**
- **Test is positive if the pulse is reduced or lost**
- Positive test indicates compromise or compression of the subclavian artery/ neurovascular bundle
Investigation

- Short lived neck pain and no red flags – no tests needed
- Systemic disease
  - Rheumatology screen
  - Metabolic screen
    - Ca/ Phosphate/ ALP
  - Infection/ inflammatory screen
    - ESR/ CRP/ FBC/ cultures
- Neurological symptoms/ signs
  - NCS/ EMG

- Radiological
  - X-ray; dynamic views (as long as stable)
  - CT scan;
  - MRI scan;
  - Bone scan/ CT-SPECT scan
  - Percutaneous tests
- Nerve blocks/ facet blocks
  - Shoulder and upper limb investigations
- X-ray/ Ultrasound/ MRI/ injection
  - TOS investigations
- Doppler studies
Management

- Non-operative
  - Many options
  - Little evidence to support

- Operative
  - Many options
  - Little evidence to support
Neck pain with radiculopathy

• There is little credible evidence to support one best course of treatment for neck pain with radiculopathy

• One non-blinded randomized trial of patients with more than 3 months of radicular pain compared surgery with physical therapy or immobilization in a collar.

  The long-term result was no difference in pain, although the surgery group had a greater short-term reduction in pain, and a large proportion of patients in all groups eventually had surgery

• One very real problem in the study of the treatment of radicular symptoms is that the natural history of symptomatic radiculopathy is not known.

  The belief that untreated patients will develop progressive disability is not supported by reliable evidence. The reported death rates from surgical procedures are 0% to 1.8%, and the rate of non-fatal complications is reported as 1% to 8%.

  Therefore, there are no clear indications for which patients with neck pain and radiculopathy should be referred for surgery and the choice of surgical procedure has not been established by appropriately designed studies.
Cervical spondylosis/ disc herniation

• Gore and colleagues (1987)
• 50% of patients with unilateral arm pain had persistent radicular pain at 15 year follow-up after receiving non-surgical care


• Lees and Turner (1963)
• Followed 51 patients with cervical spondylosis for 2-19 years and found 45% had a single episode of pain, 30% had intermittent episodes and 25% had persistent pain

Outcomes

- SOS
- Surgical Outcome Surveys
- Neck disability index
- Pain Scores
  - Neck pain
  - Arm pain
- SF-12 scores
  - QOL
Interpretation of NDI

- **Interpretation of Score:** Each section is scored on a 0–5 scale, 5 representing the greatest disability. The index is calculated to be expressed as a percentage. Clinical significance is described as a 5 point or 10% change over time.
  

- **Raw Score**

- **Level of Disability**
  - 0 - 20% minimal disability
  - 21 - 40% moderate disability
  - 41 - 60% severe disability
  - 61 - 80% crippled
  - 81 - 100% bed bound
NDI % Surgical Patients
ACDF Vs ACDA
NDI

2007 Sasso, RC., et al

[Graph showing Neck Disability Index scores over time with different markers and p-values for BRYAN® and ATLANTIS® with allograft.]

2011 Sasso, RC., Anderson PA et al

[Graph showing Neck Disability Index Score over time with different markers for Control and Investigational groups.]

P = .003  P = .005  P = .011  P = .013  P = .005
p<0.001  p<0.001  p<0.001  p=0.007  p=0.025  p<0.001
Thank you!
Cases
Case – Adjacent segment deterioration

- 52-year-old male
- Left brachialgia – refractory
- Congenital fusion 5-6
- Foraminal stenosis
- Unable to continue work – welder
- Went on to surgery 2009
- C3-4 C4-5 ACDF with cages plate and screws
Adjacent segment change

- 2011
- Left neck and shoulder pain
- C2-3 foraminal stenosis
- Unable to work
- Failed conservative treatment
- Surgery – C2-3 left hemilaminectomy discectomy facetectomy rhizolysis and fusion
2014 – 57-years-old

Left C7 brachialgia
Motion preservation – too little too late?
Case 3 – Motion Preservation

- 32-year-old RN
- Left neck and arm pain
- Not settling with conservative treatment
- Left triceps weakness
Multi-level pathology – 3 level
Post-op
Ankylosing spondylitis
Incidental Neurofibroma
Neoplastic
Osteoid Osteoma
Post-traumatic
Questions?