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

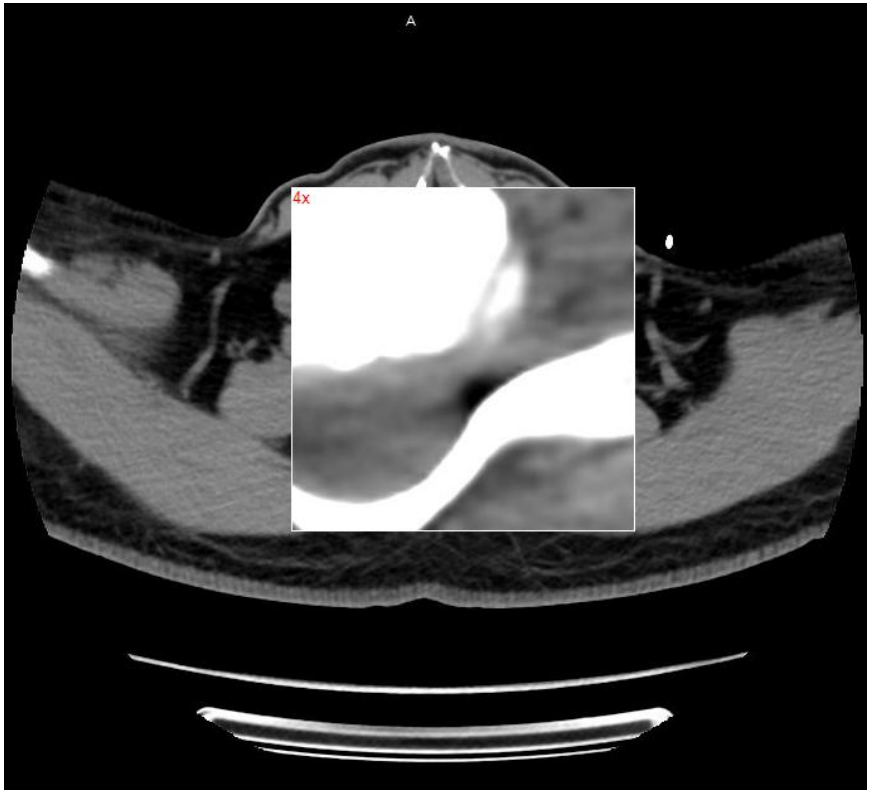
Investigations

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

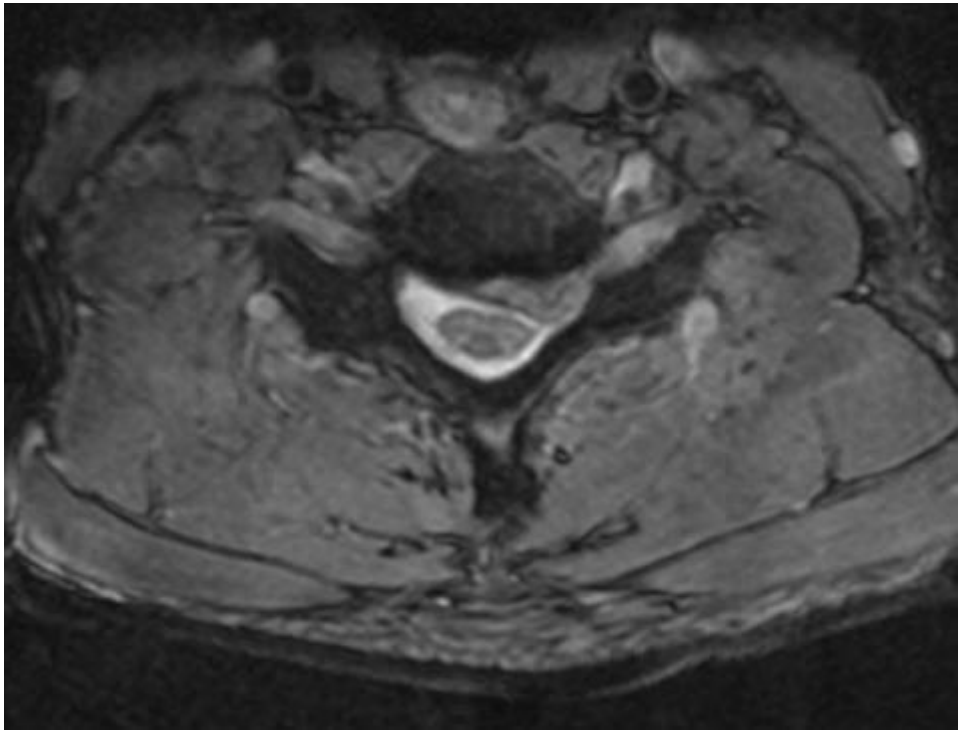
X-ray Cervical spine

CT Cervical spine

CT Cervical spine C6-7



MRI



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: 4th 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

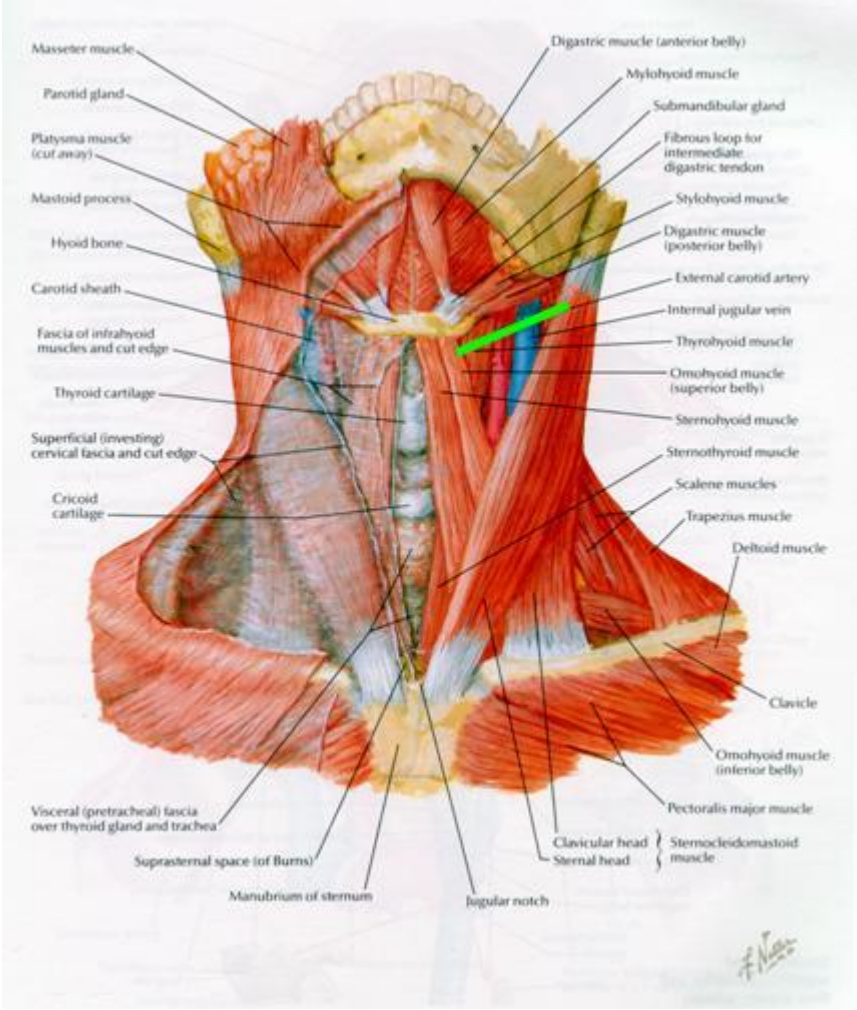
- Neural Decompression
  - Direct
  - Indirect (restore foraminal height)
- Stabilization
  - Fusion
- OR
- Motion preservation
  - Artificial disc

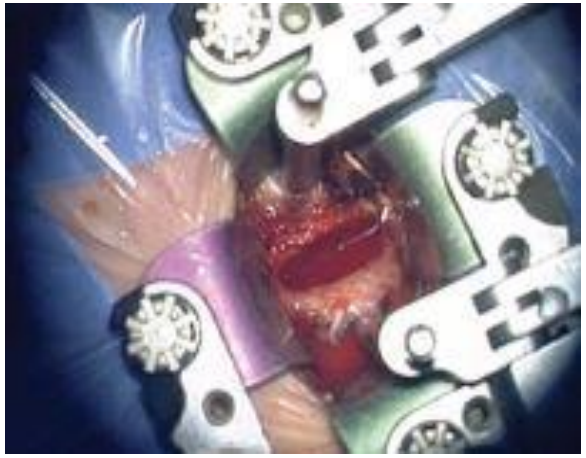
Anterior Cervical Surgery

Positioning

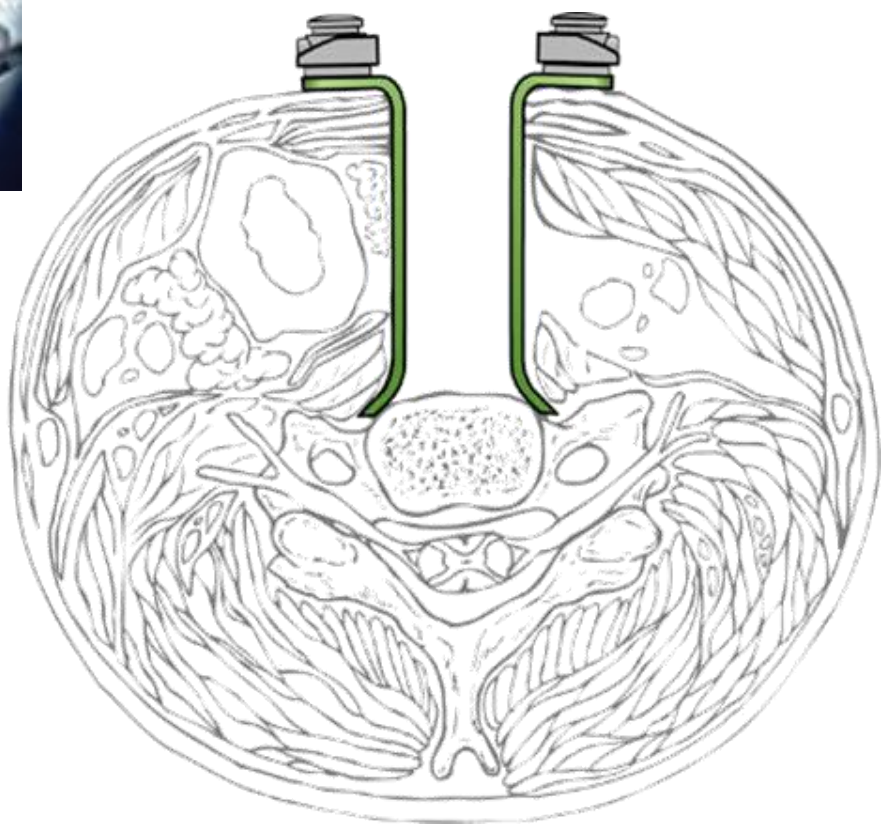
Incision

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



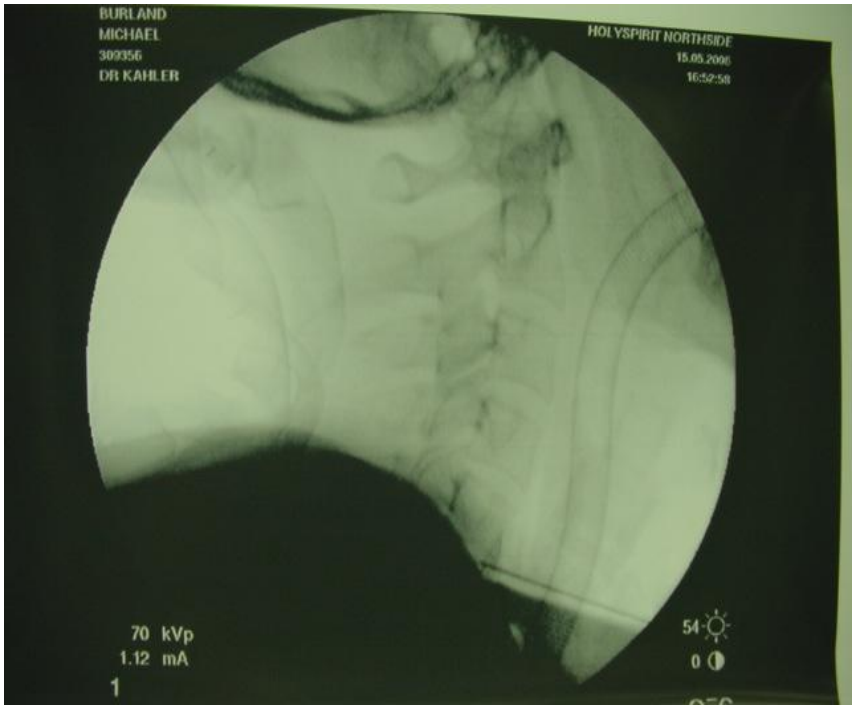


Dissection

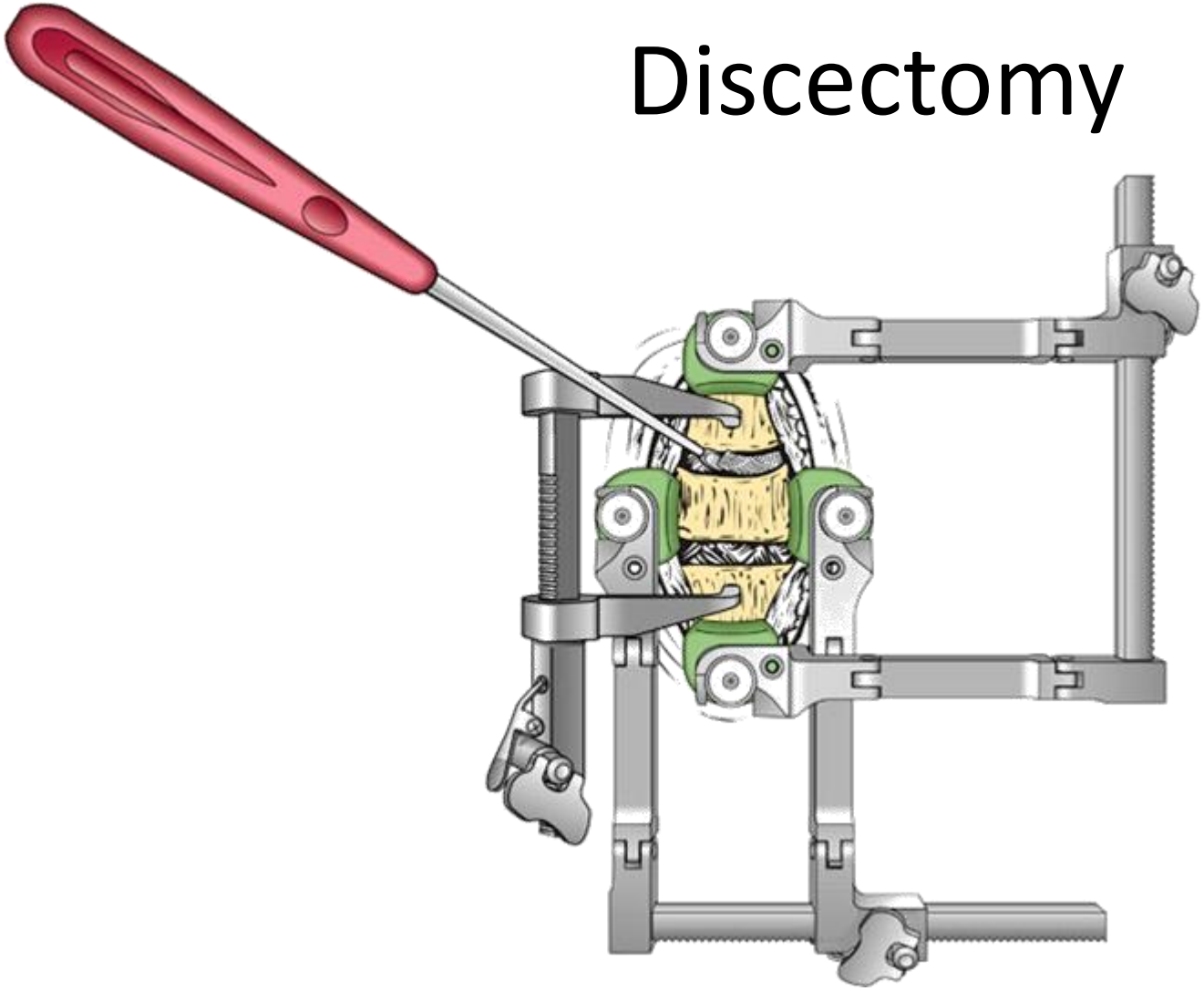


- Lateral retraction of the carotid sheath
- Medial retraction of the tracheo-oesophageal bundle

Check level/ Retractors placed

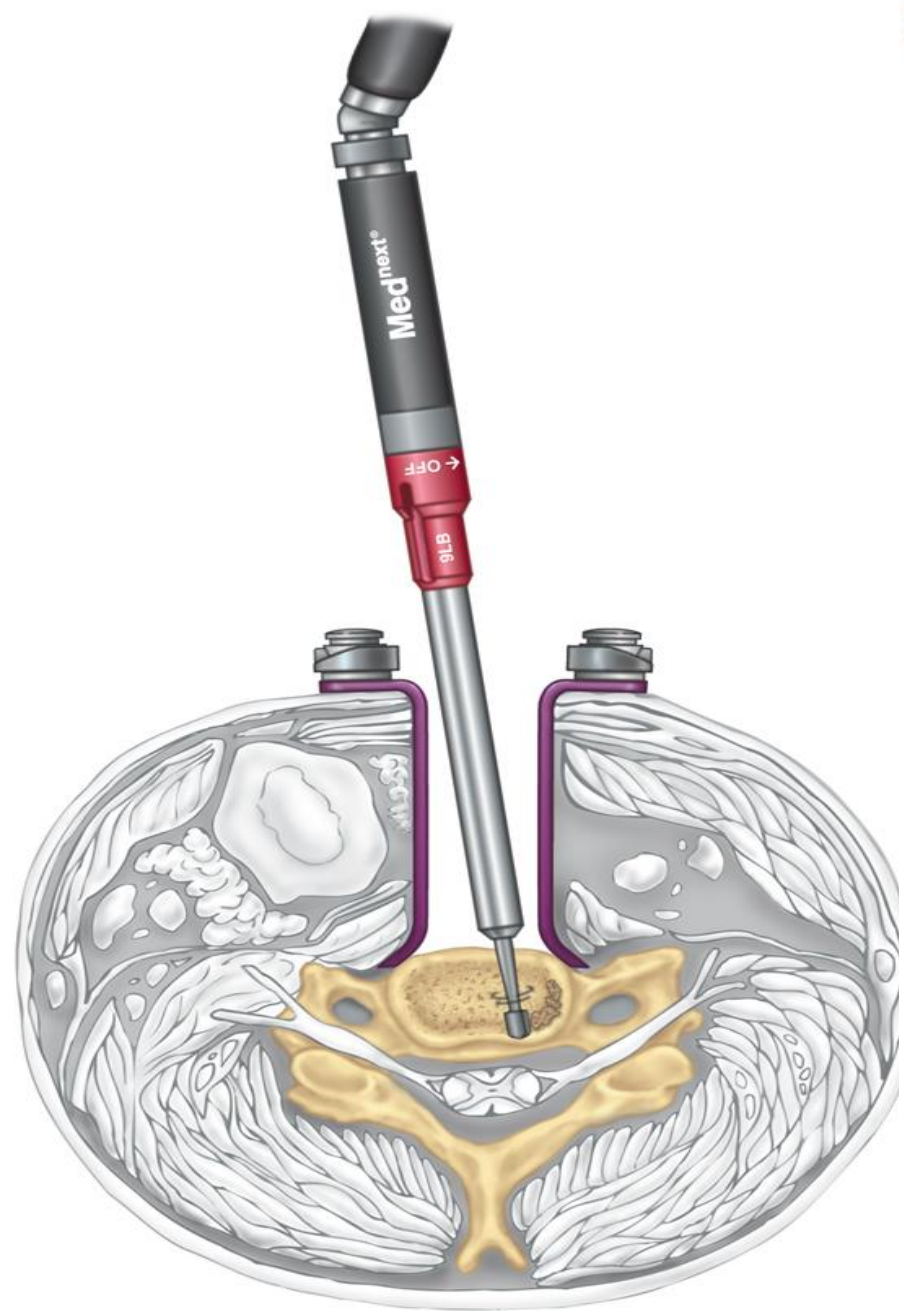


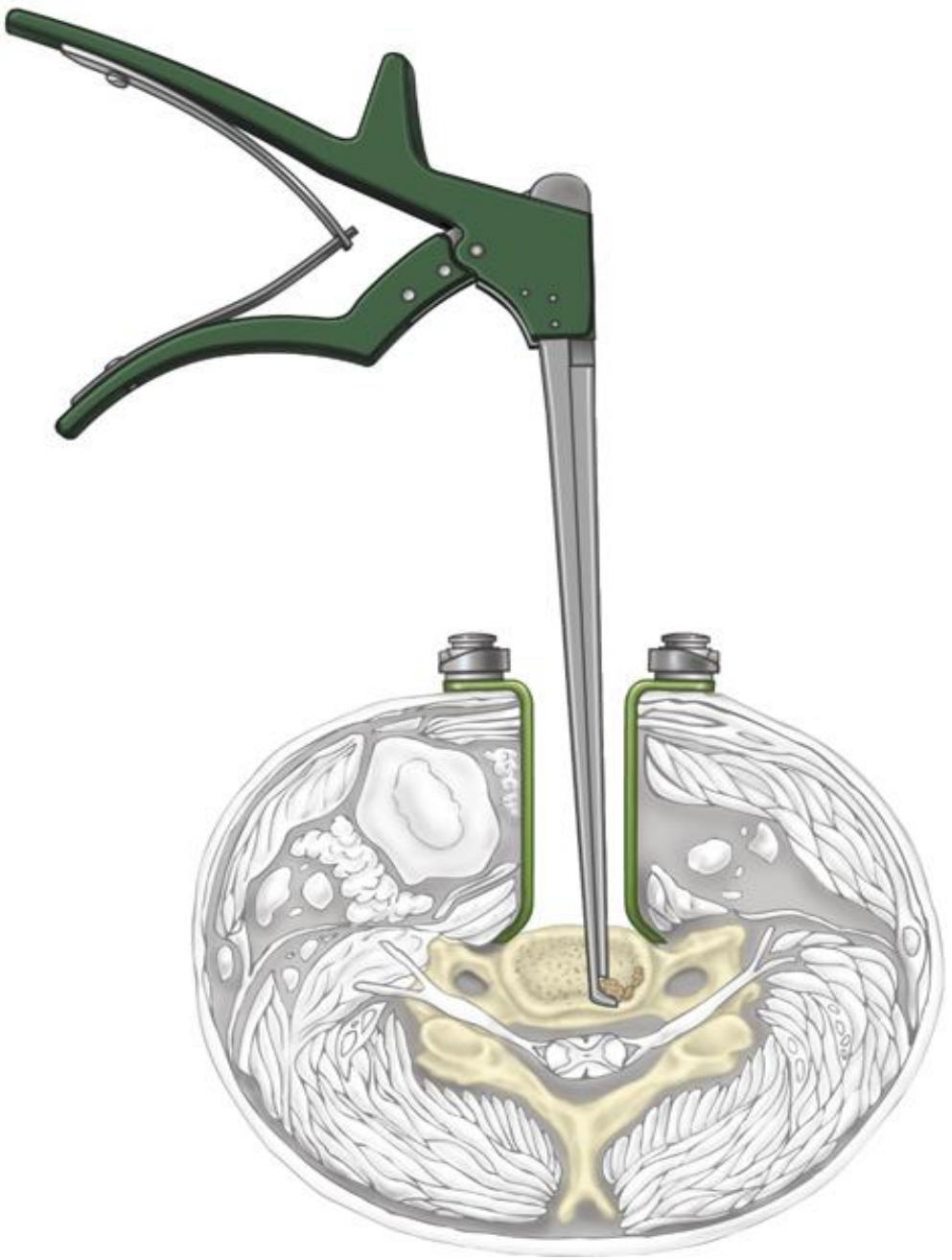
Discectomy



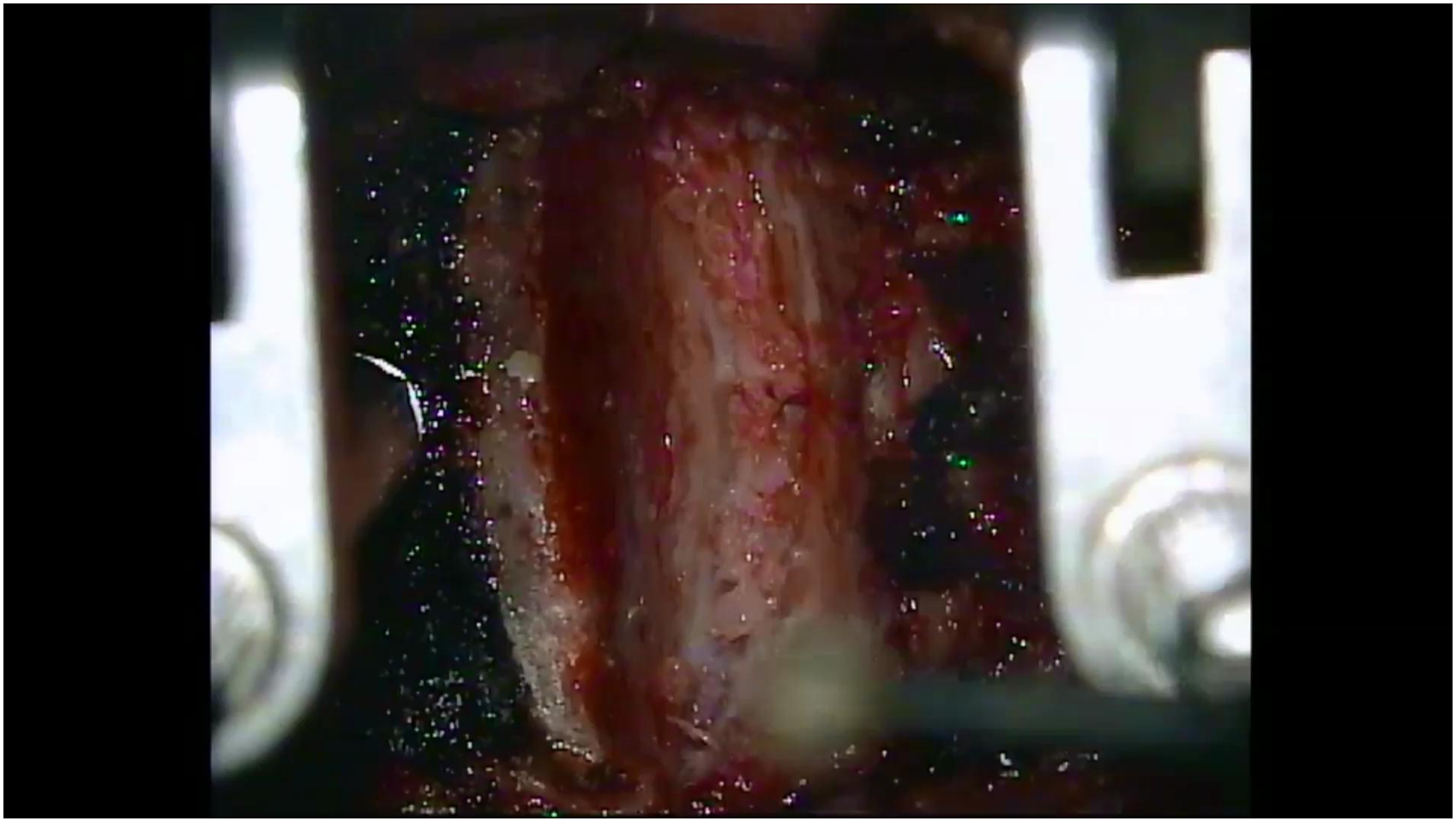
- Straight and angled curettes. Disc forceps

DISCECTOMY/DECOMPRESSION



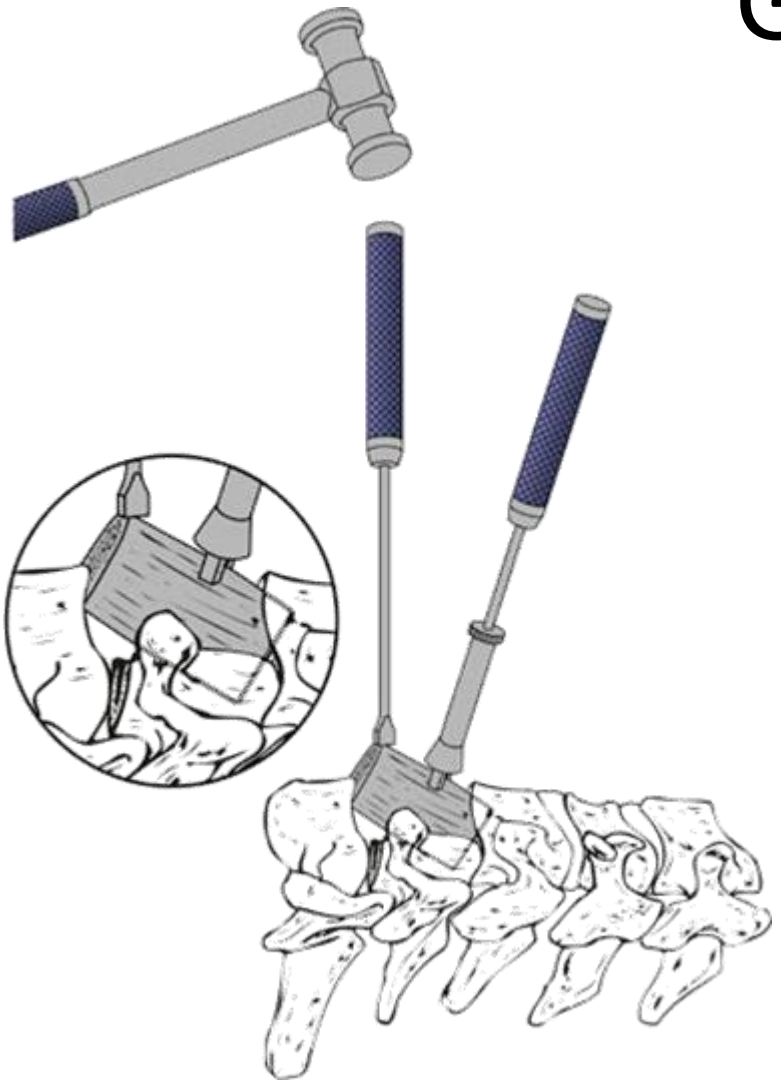


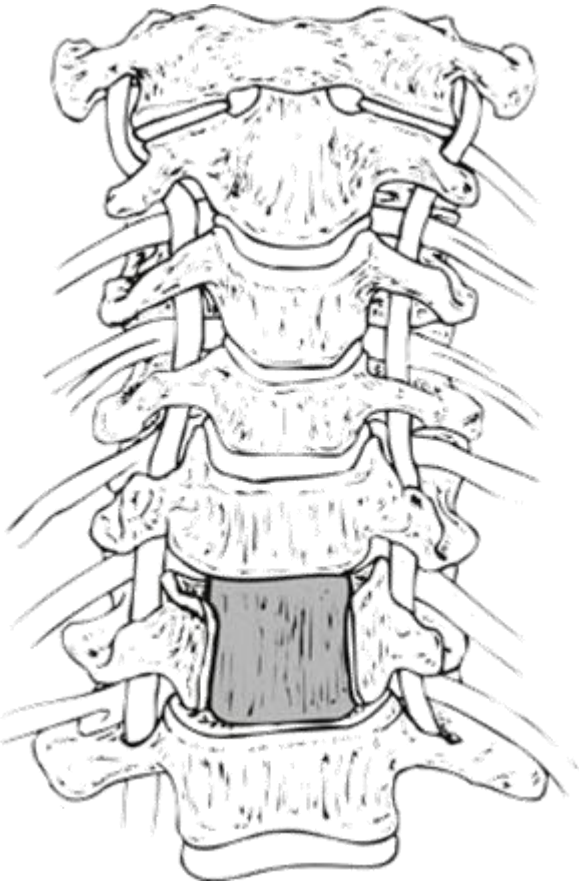
Intra-operative video



Filling the hole

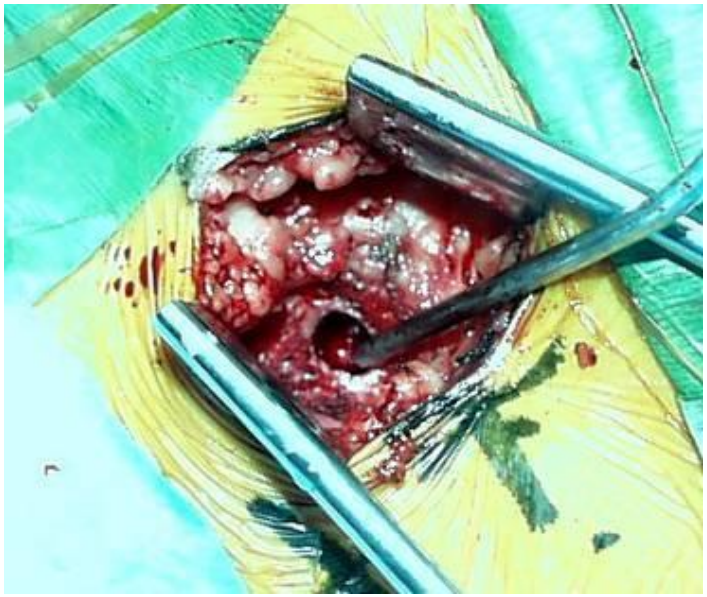
Grafting

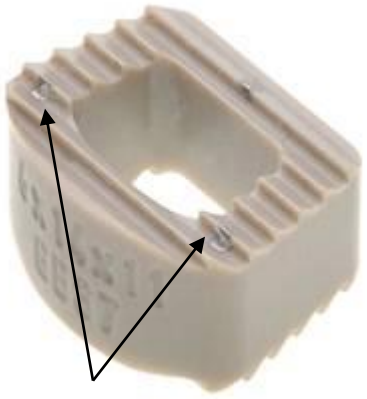




- Tricortical graft or Cage autologous bone

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

Years of Evolution

Bristol/Cummins

1991

Prestige I

1998

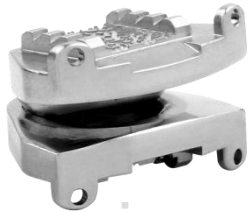
Prestige II

2000

Prestige ST

2002

Prestige STLP



2003

Prestige LP

2004

Bristol Disc

6 Week Postoperative Flexion/Extension

Prestige Disc

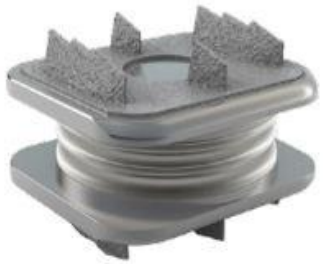
M6 Cervical Disc

M6-C artificial cervical disc

ADVANCED GENERATION TECHNOLOGY NATURALLY

6 degrees of natural freedom

M6-C Artificial Cervical Disc

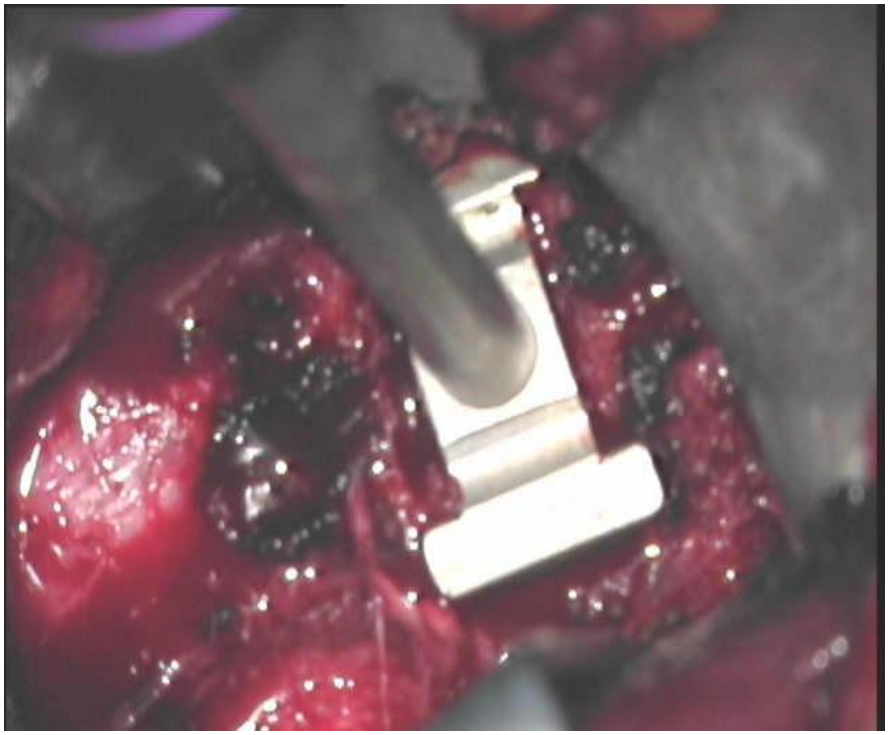


Artificial Annulus

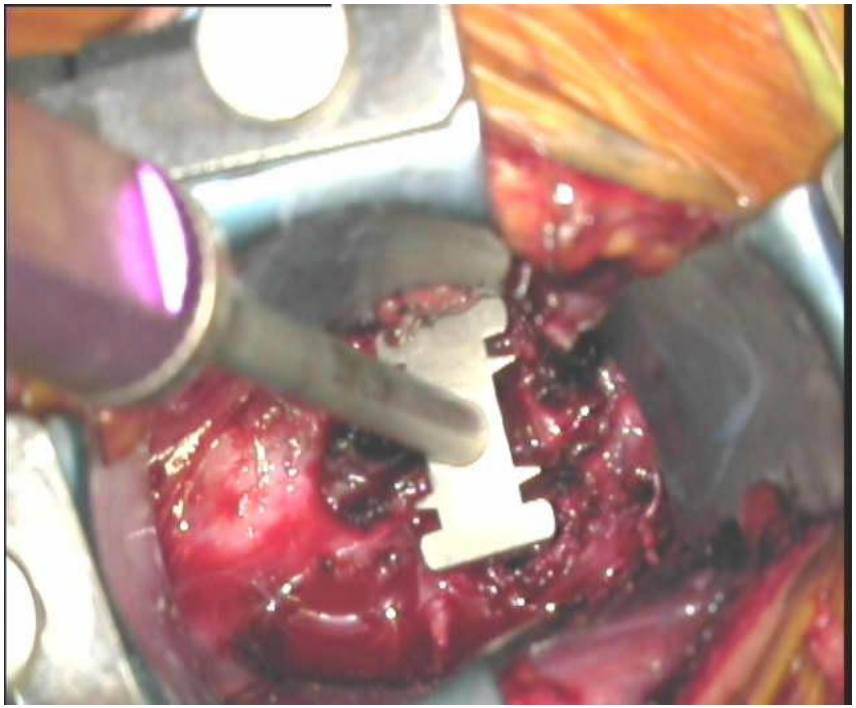
Artificial Nucleus

6 Degrees of Natural Freedom

Trial Sizing and X-ray

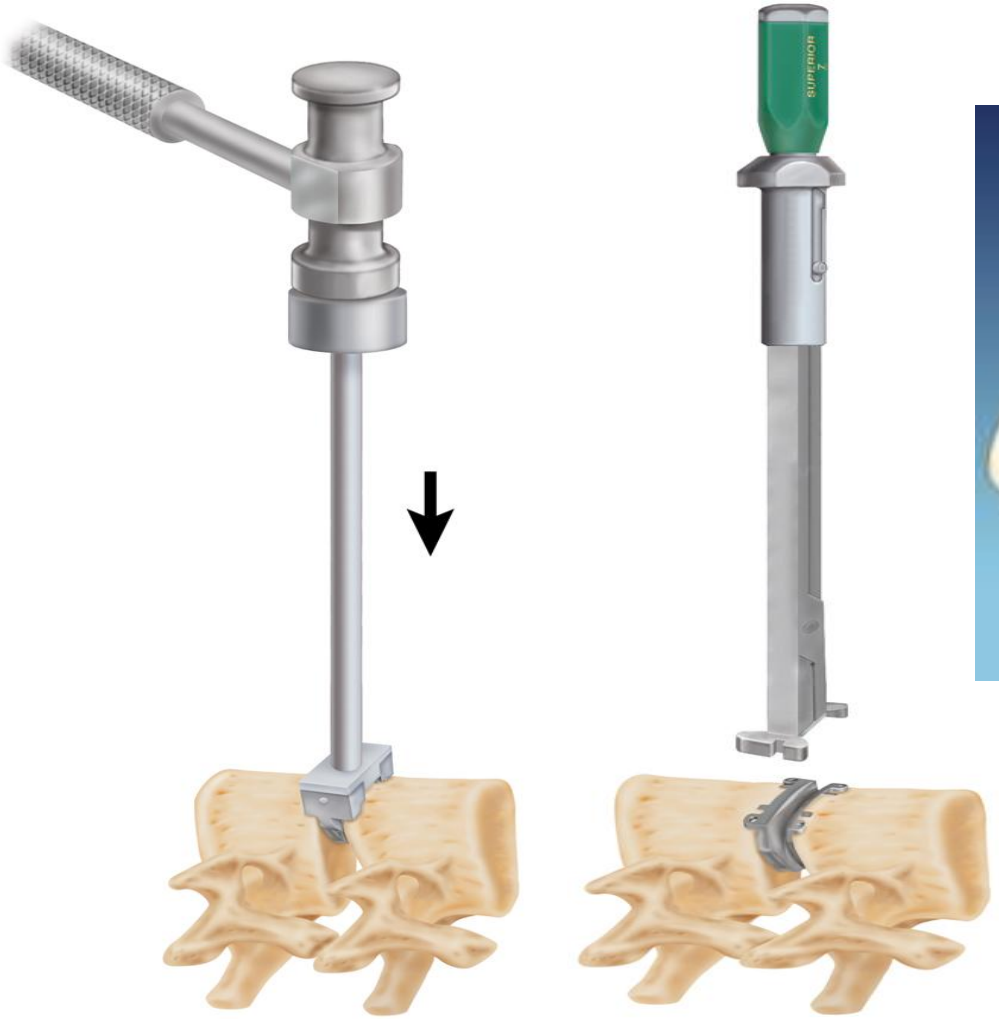


Rail Cutter

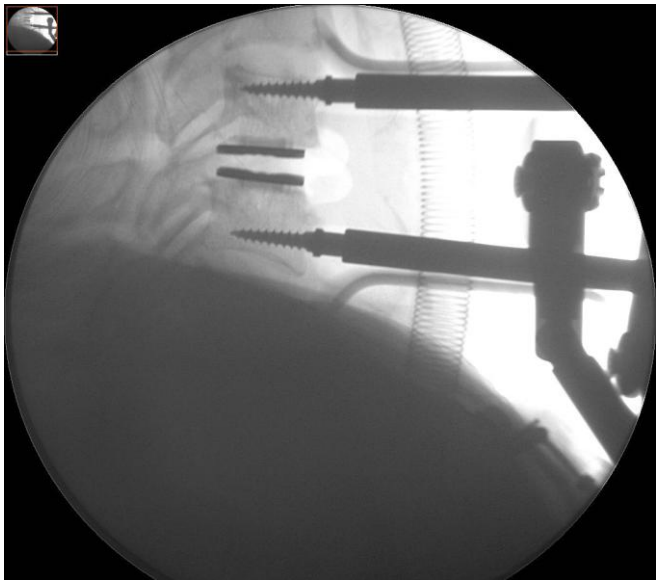


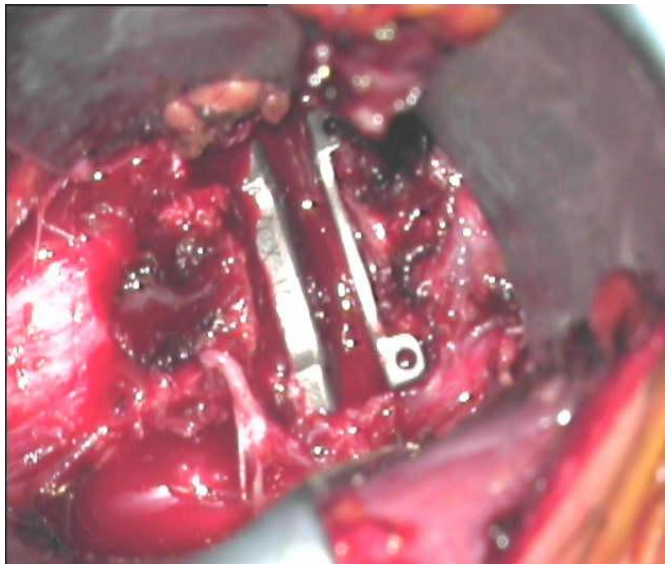
DISC IMPLANTATION

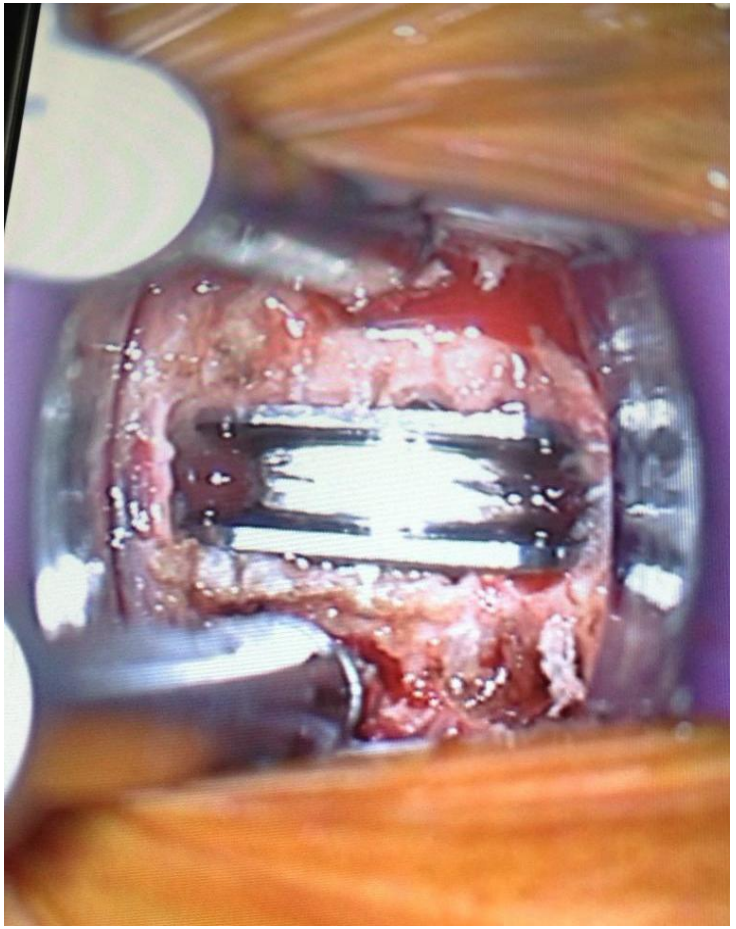
Implant
Inserter



Disc Placement







Surgery - Hybrid

- 10th 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 12th June 2015

Post-op images

Neck and arm pain

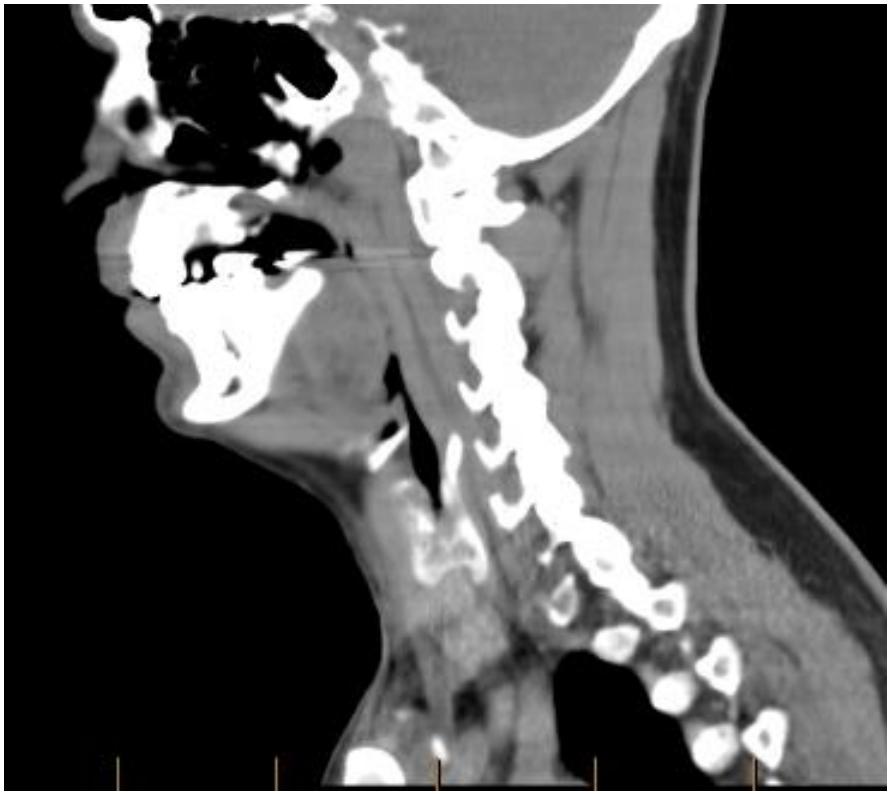
- Neck pain – Axial pain
  - Acute
  - Chronic
- Brachialgia – Upper limb nerve pain
  - Acute
  - Chronic

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.

http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/cp94c.pdf

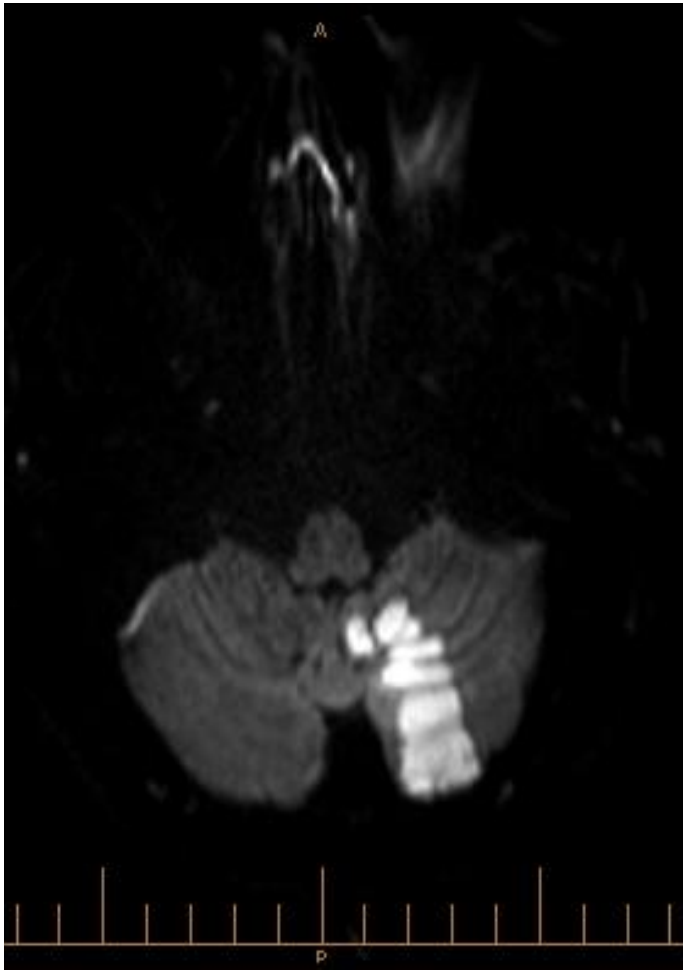
Acute calcific prevertebral tendonitis



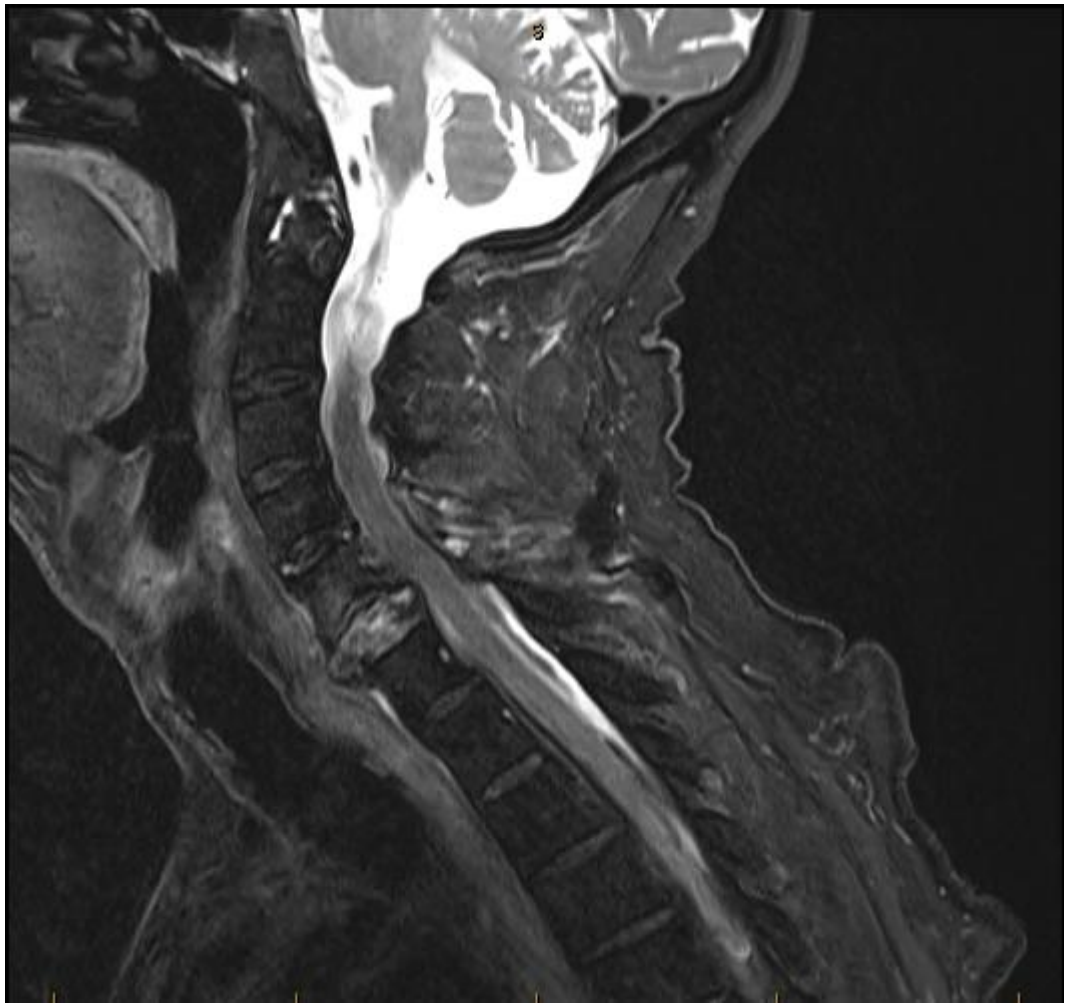
Red Flags

- 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.

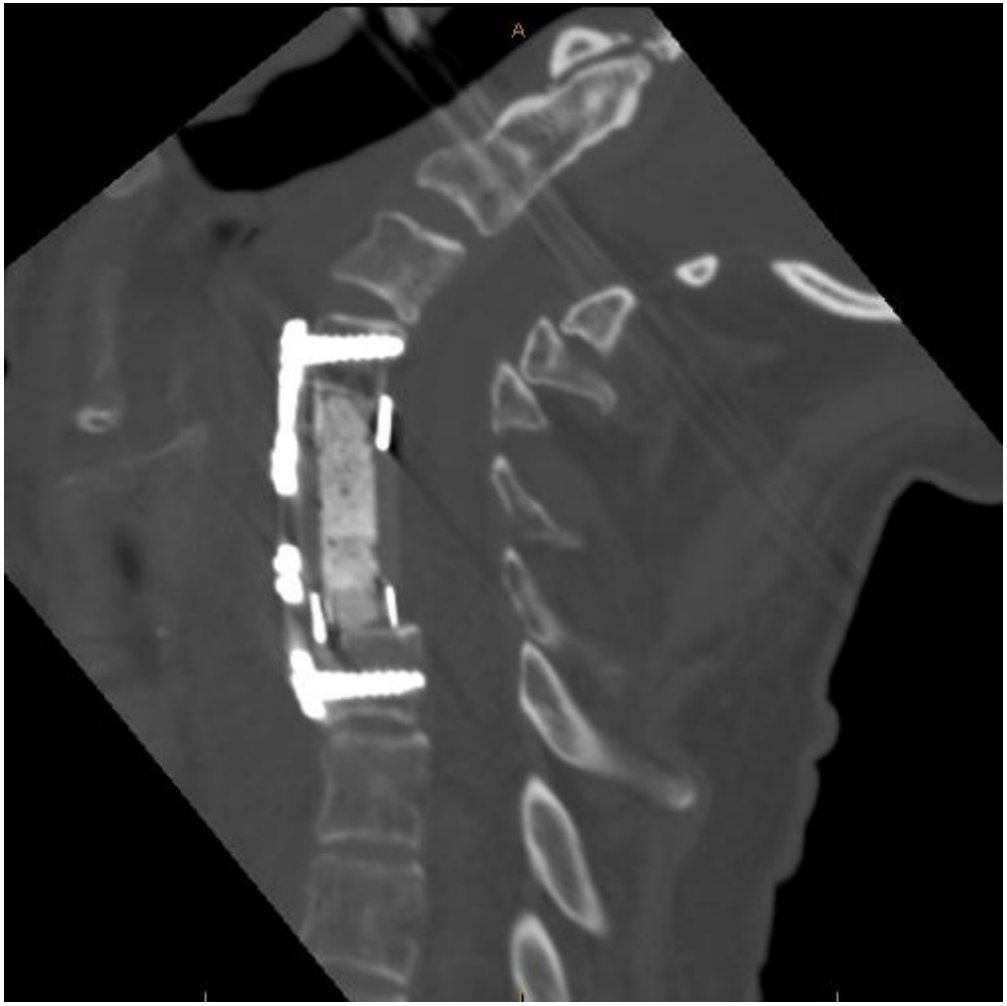
Vascular – vertebral artery dissection



Malignancy



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 excercises, or
  - excercises 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).

  » Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Duranceau J, Suissa S, et al. Scientific Monograph of the Quebec Task Force on Whiplash-Associated Disorders, Redefining Whiplash and its Management. Spine 1995;20(8 Suppl):1S-73S.

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

  – https://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/cp112.pdf

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)*

* With or without radiculopathy

- 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

https://www.inkling.com/read/essentials-family-medicine-philip-sloane-6th/chapter-37/table-37-1

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.

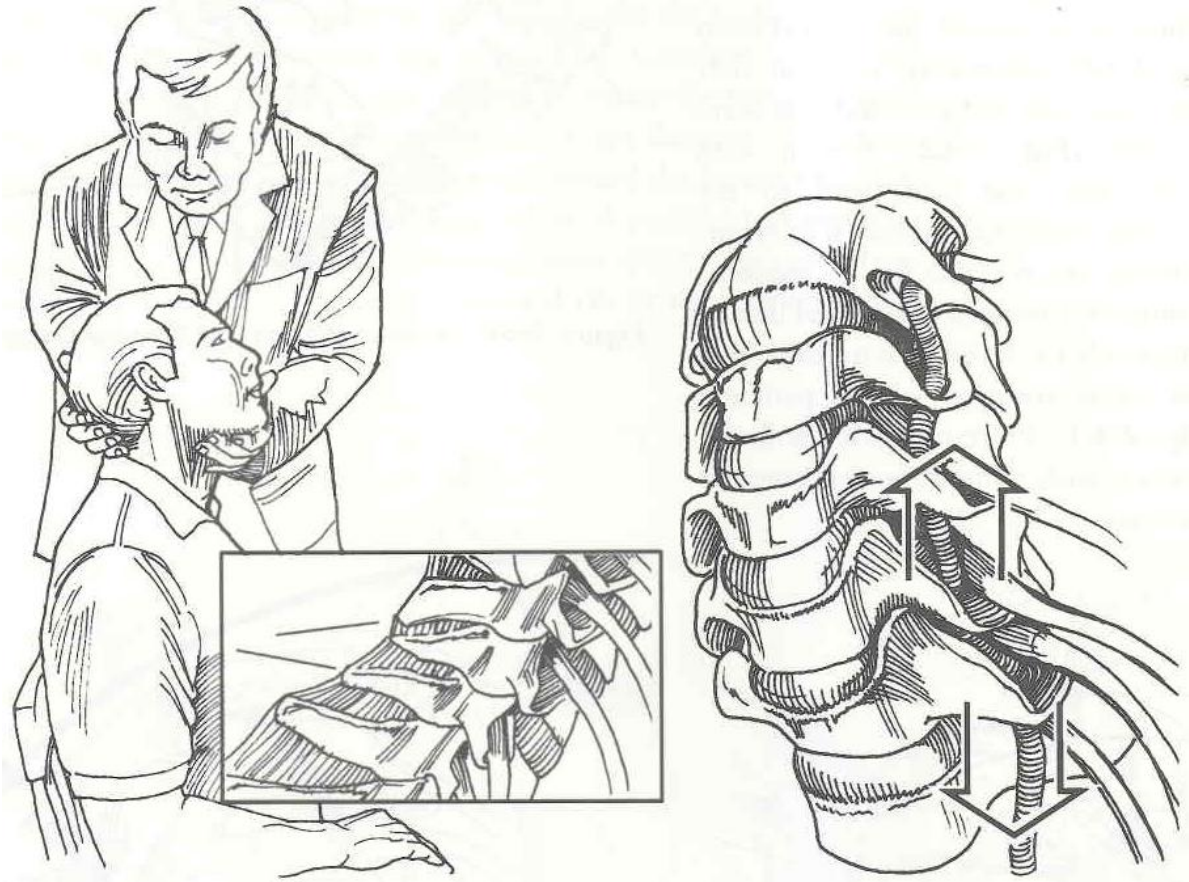
- Examination
  - Appearance/ posture/ stance/ gait
  - Range of movement
  - Neurological examination
  - Specific tests
    - Spurling test
    - Axial cervical distraction test
    - Arm abduction test

- **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**



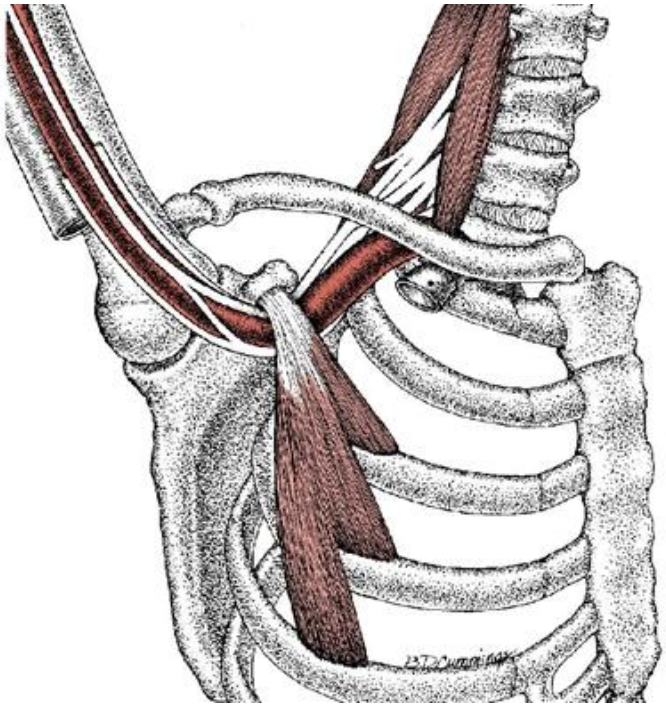
Arm abduction test

- Full abduction of the affected arm over the head of the seated patient
- Decreases traction on the nerve root

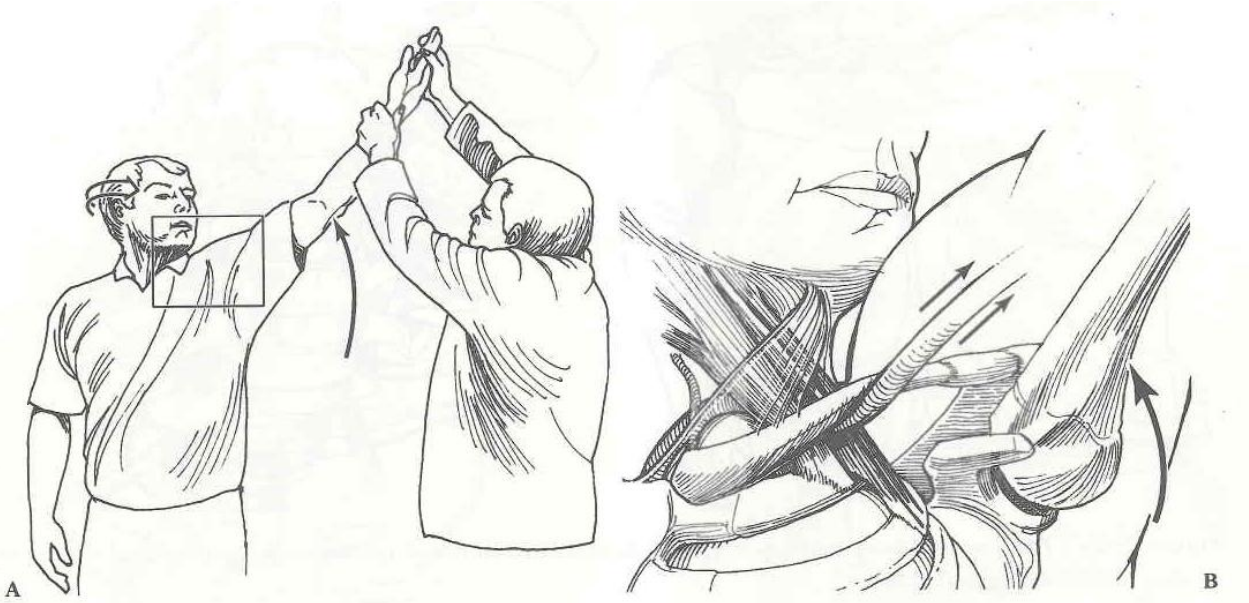
Shoulder / Upper limb examination

- 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



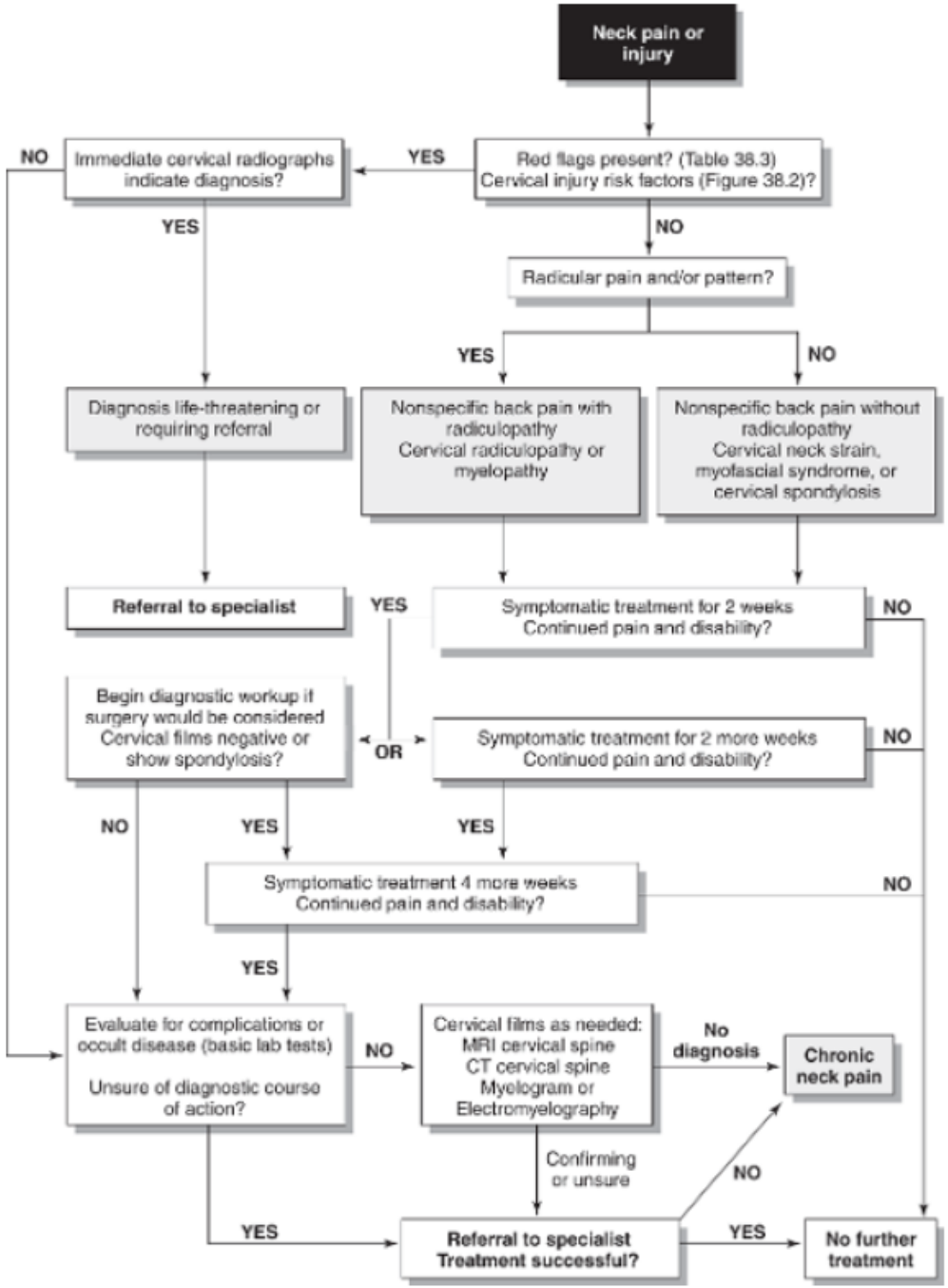
Investigation

- 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


Neck pain or injury
Red flags present? (Table 38.3) Cervical injury risk factors (Figure 38.2)?
YES
Immediate cervical radiographs indicate diagnosis?
NO
YES
NO
Radicular pain and/or pattern?
YES
NO
Diagnosis life-threatening or requiring referral
Nonspecific back pain with radiculopathy Cervical radiculopathy or myelopathy
Nonspecific back pain without radiculopathy Cervical neck strain, myofascial syndrome, or cervical spondylosis
Referral to specialist
YES
Symptomatic treatment for 2 weeks Continued pain and disability?
NO
Begin diagnostic workup if surgery would be considered Cervical films negative or show spondylosis?
OR
Symptomatic treatment for 2 more weeks Continued pain and disability?
NO
NO
YES
YES
Symptomatic treatment 4 more weeks Continued pain and disability?
NO
YES
Evaluate for complications or occult disease (basic lab tests)
Unsure of diagnostic course of action?
NO
Cervical films as needed: MRI cervical spine CT cervical spine Myelogram or Electromyelography
No diagnosis
Chronic neck pain
Confirming or unsure
NO
YES
Referral to specialist Treatment successful?
YES
No further treatment

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
  - Gore DR, Sepic SB, Garner G, Marray M. Neck pain. A long term follow-up of 205 patients. Spine 1987; 12:1-5.

- 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
  - Lees F, Turner JW. Natural history and progression of cervical spondylosis. BMJ 1963:5:1607

Outcomes

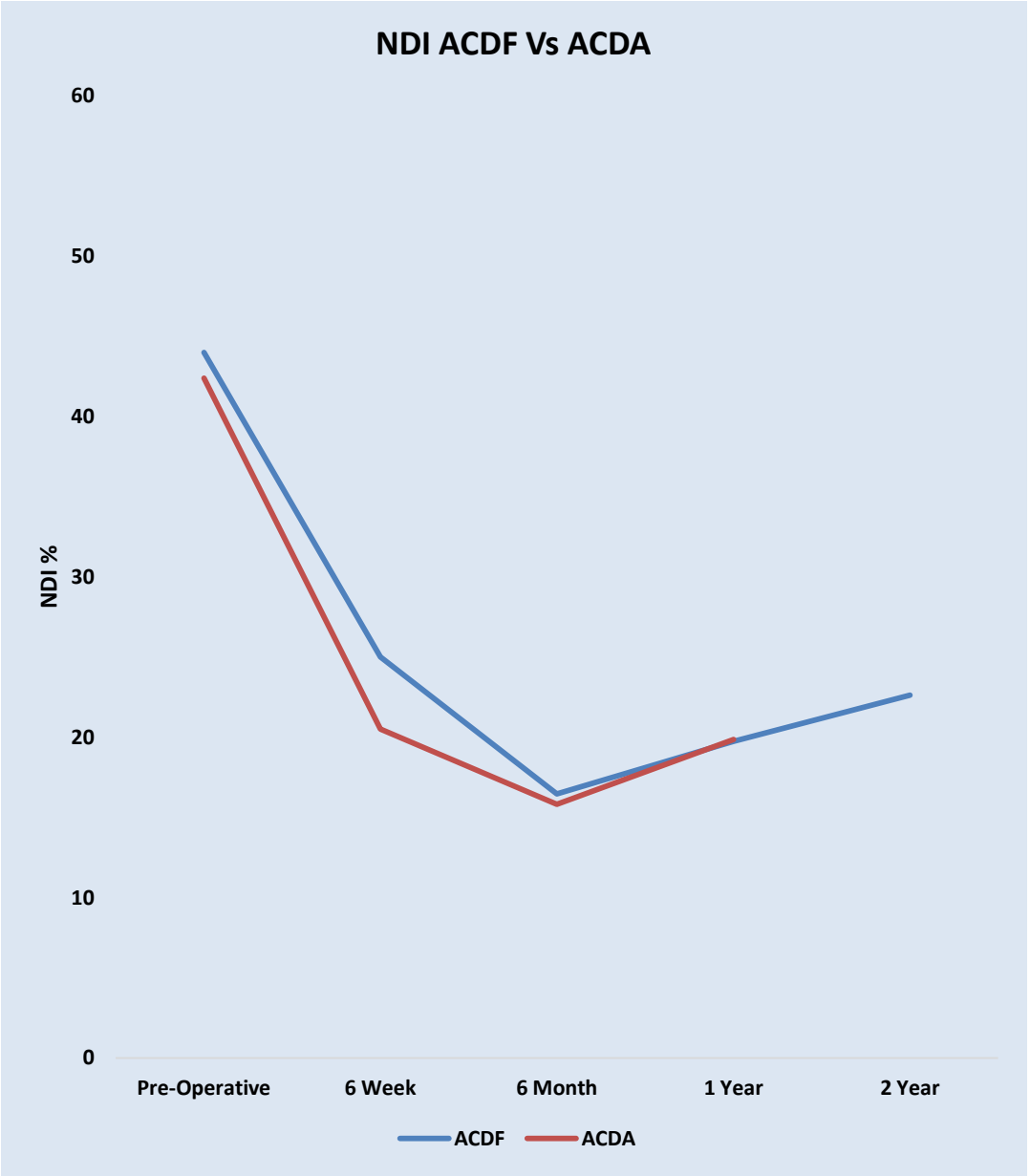
- SOS
- Surgical Outcome Surveys
- Neck disability index
- Pain Scores
  - Neck pain
  - Arm pain
- SF-12 scores
  - QOL

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.
  - (Vernon H, Mior S. "The Neck Disability Index: a study of reliability and validity." J Manipulative Physiol Ther. 1991 Sep;14(7):409-15.)

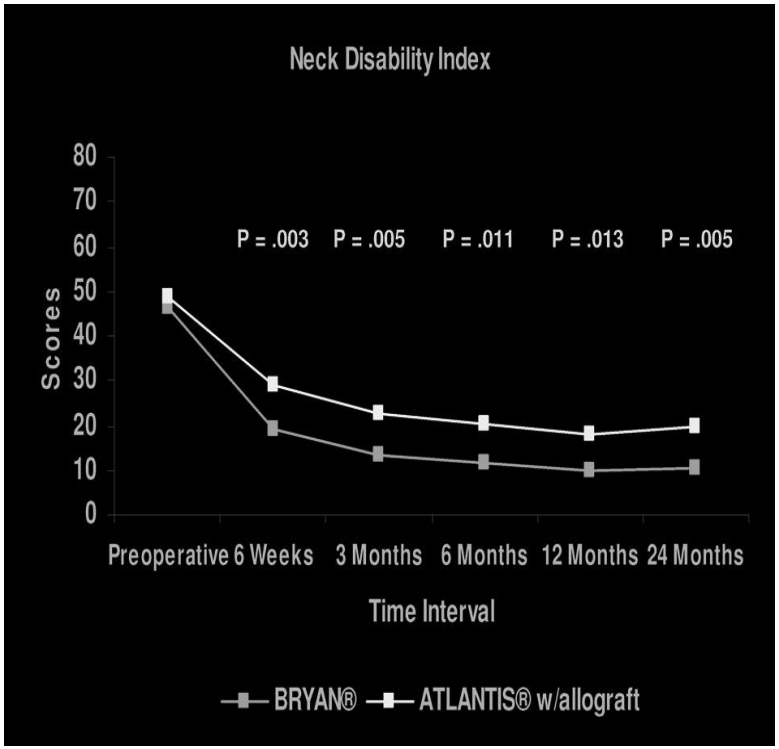
- **Raw Score**
- **Level of Disability**
  - **0 - 20%** minimal disability
  - **21 - 40%**moderate disability
  - **41 - 60%** severe disability
  - **61 - 80%** crippled
  - **81 - 100%** bed bound

NDI % Surgical Patients ACDF Vs ACDA

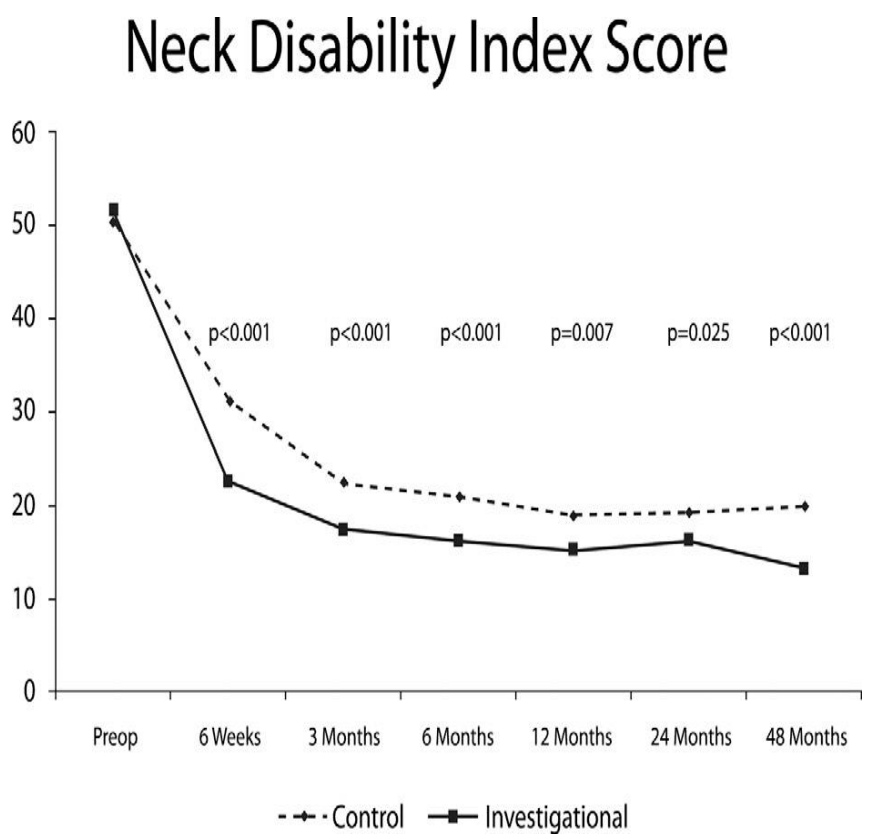


NDI

2007 Sasso, RC., et al



2011 Sasso, RC., Anderson PA et al



Thank you!

Cases

Case – Adjacent segment deterioration

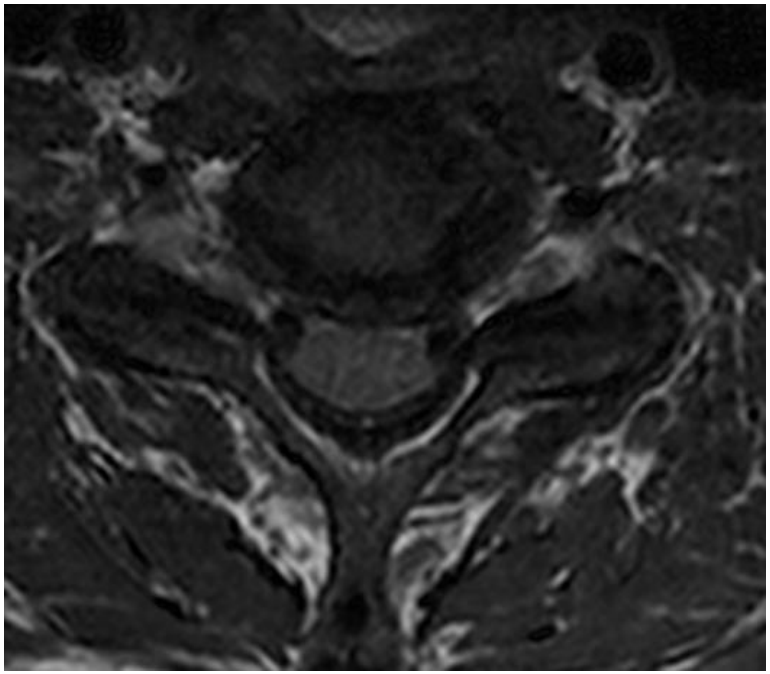
- 52-year-old male
- Left brachialgia – refractory
- Congenital fusion 5-6
- Foraminal stenosis
- Unable to continue work – welder
- Went on to surgery 2009
- C3-4 C4-5 ACDF with cages plate and screws

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

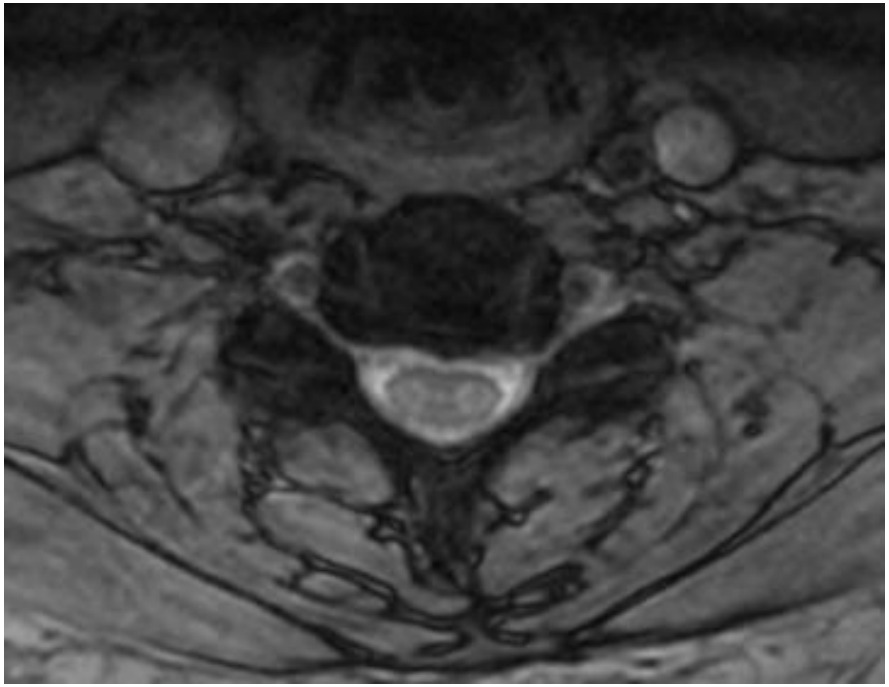


Motion preservation – too little too late?

Case 3 – Motion Preservation

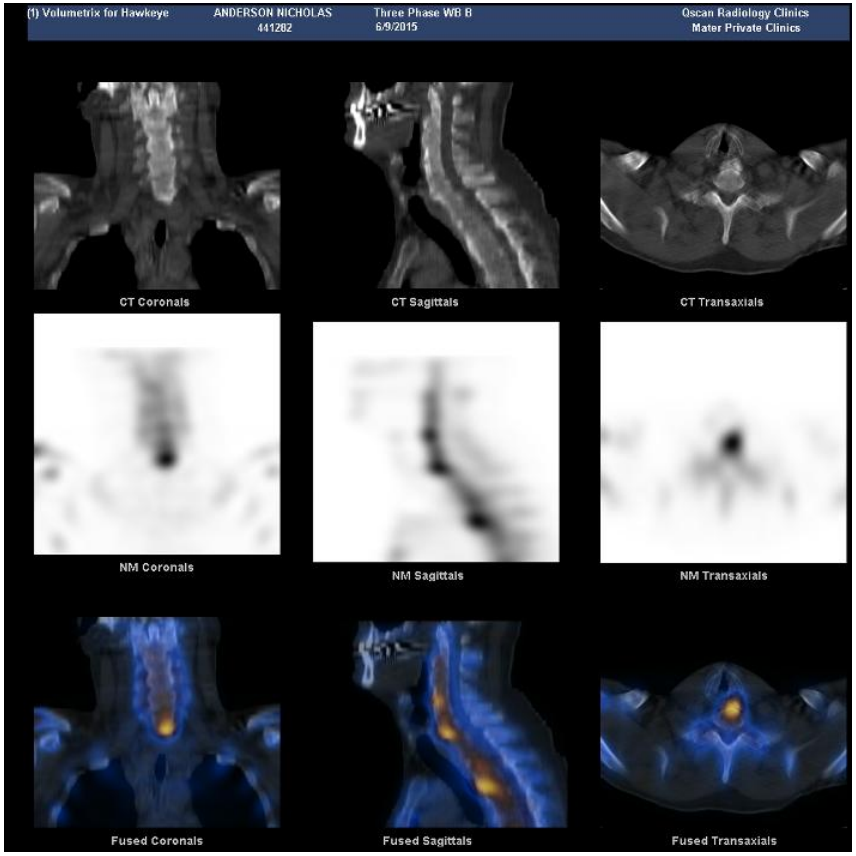
- 32-year-old RN
- Left neck and arm pain
- Not settling with conservative treatment
- Left triceps weakness

Multi-level pathology – 3 level



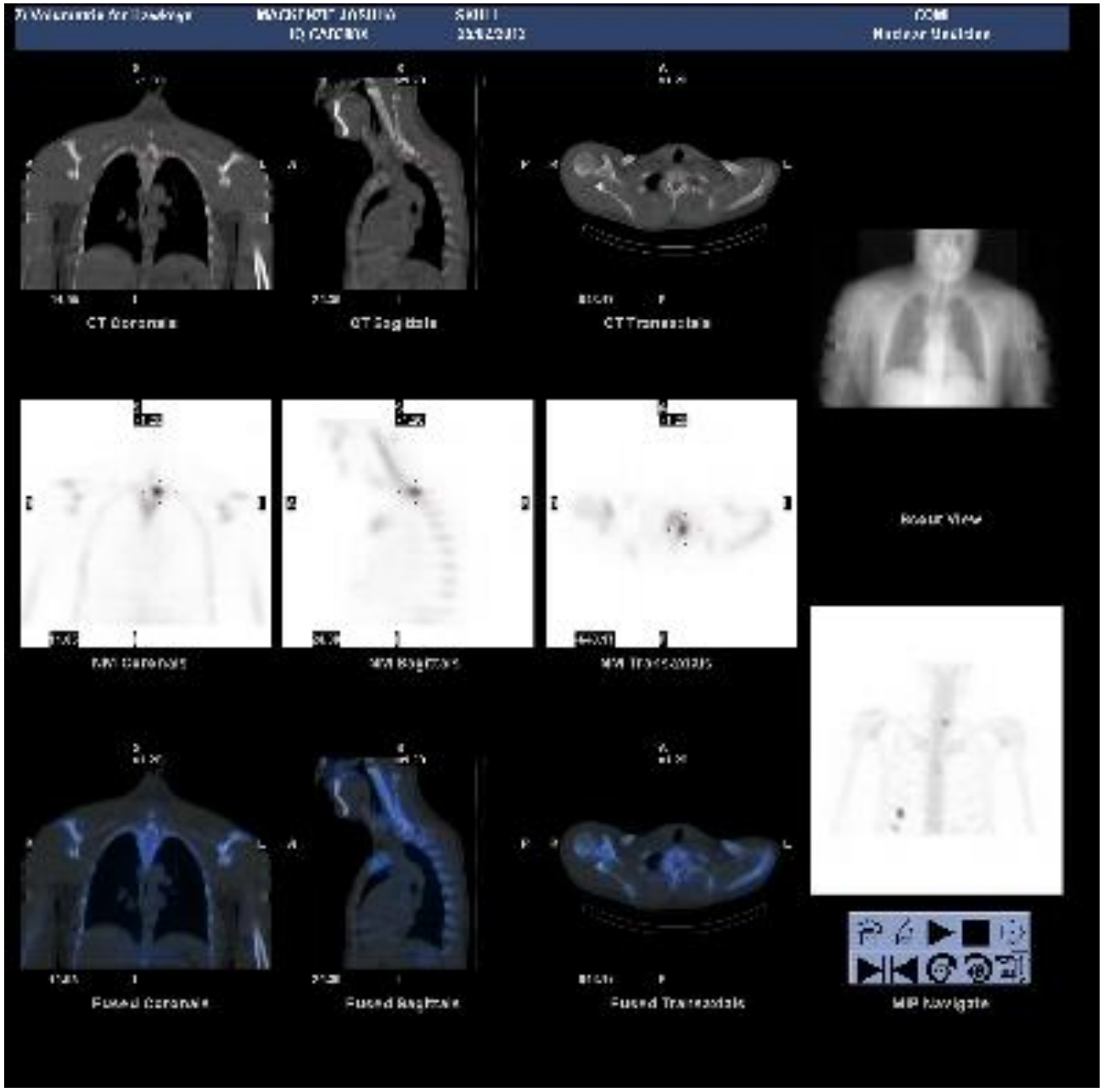
Post-op

Ankylosing spondylitis

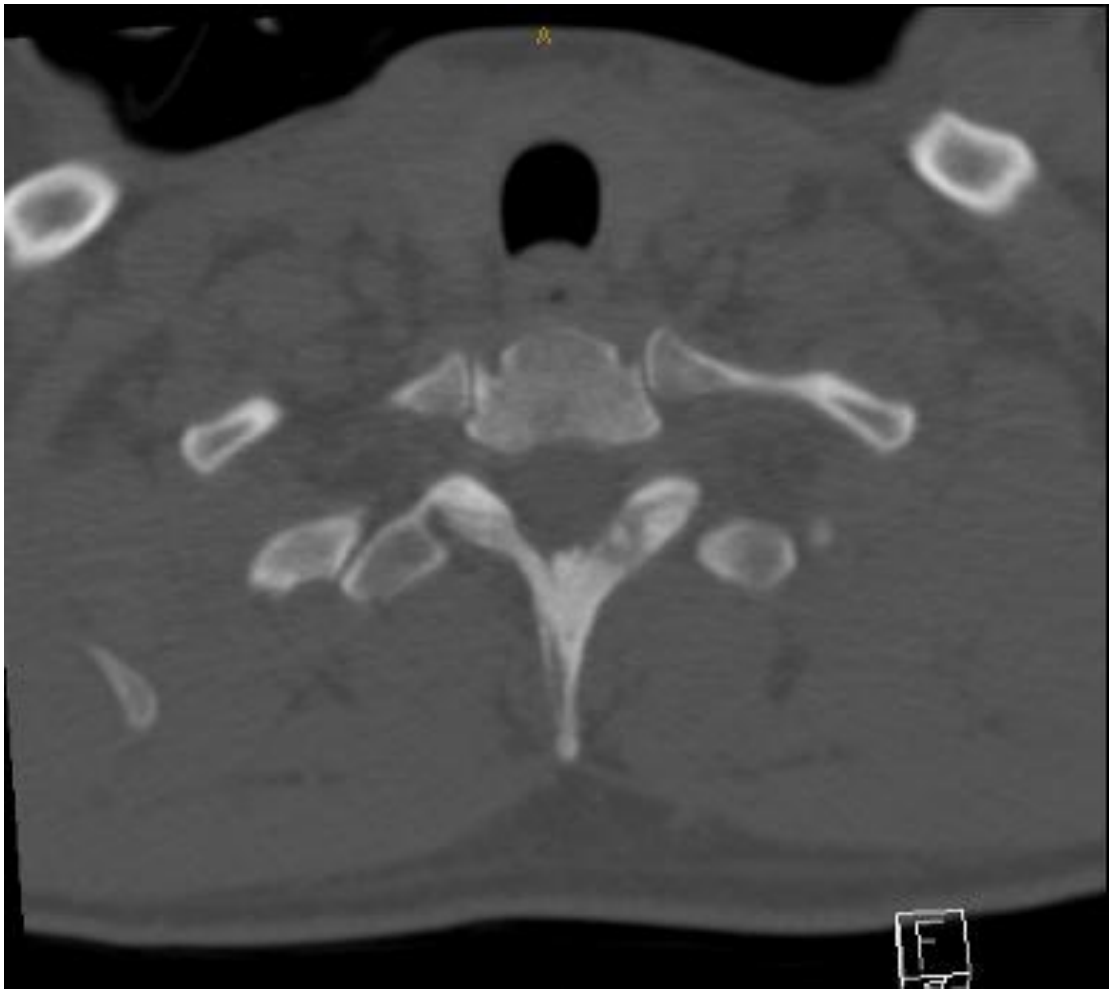


Incidental Neurofibroma

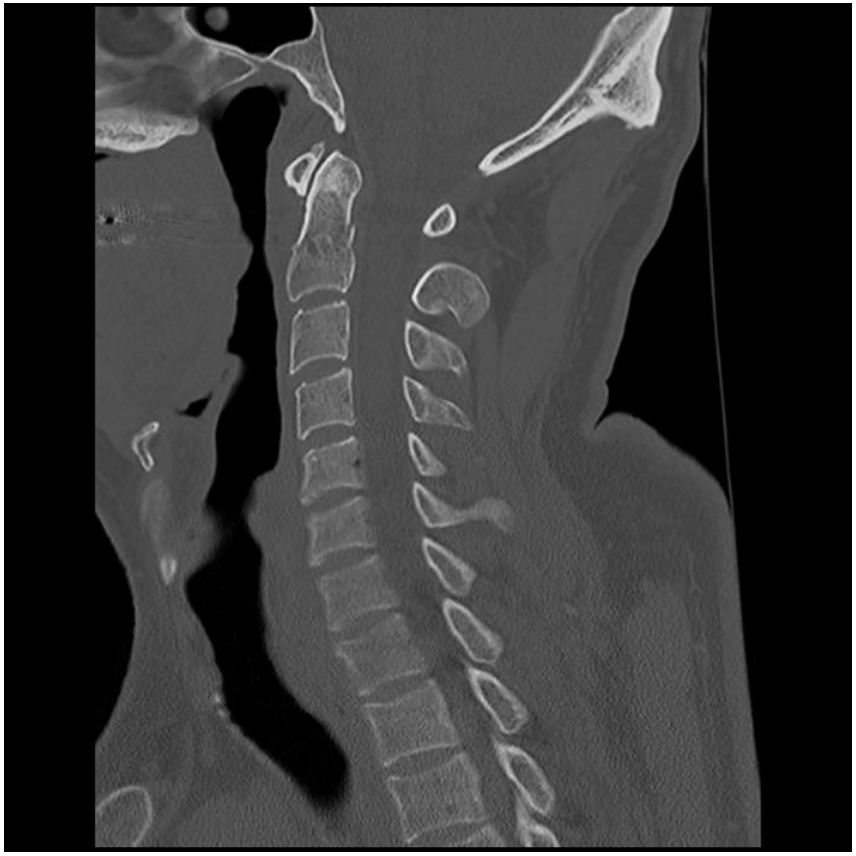
Neoplastic

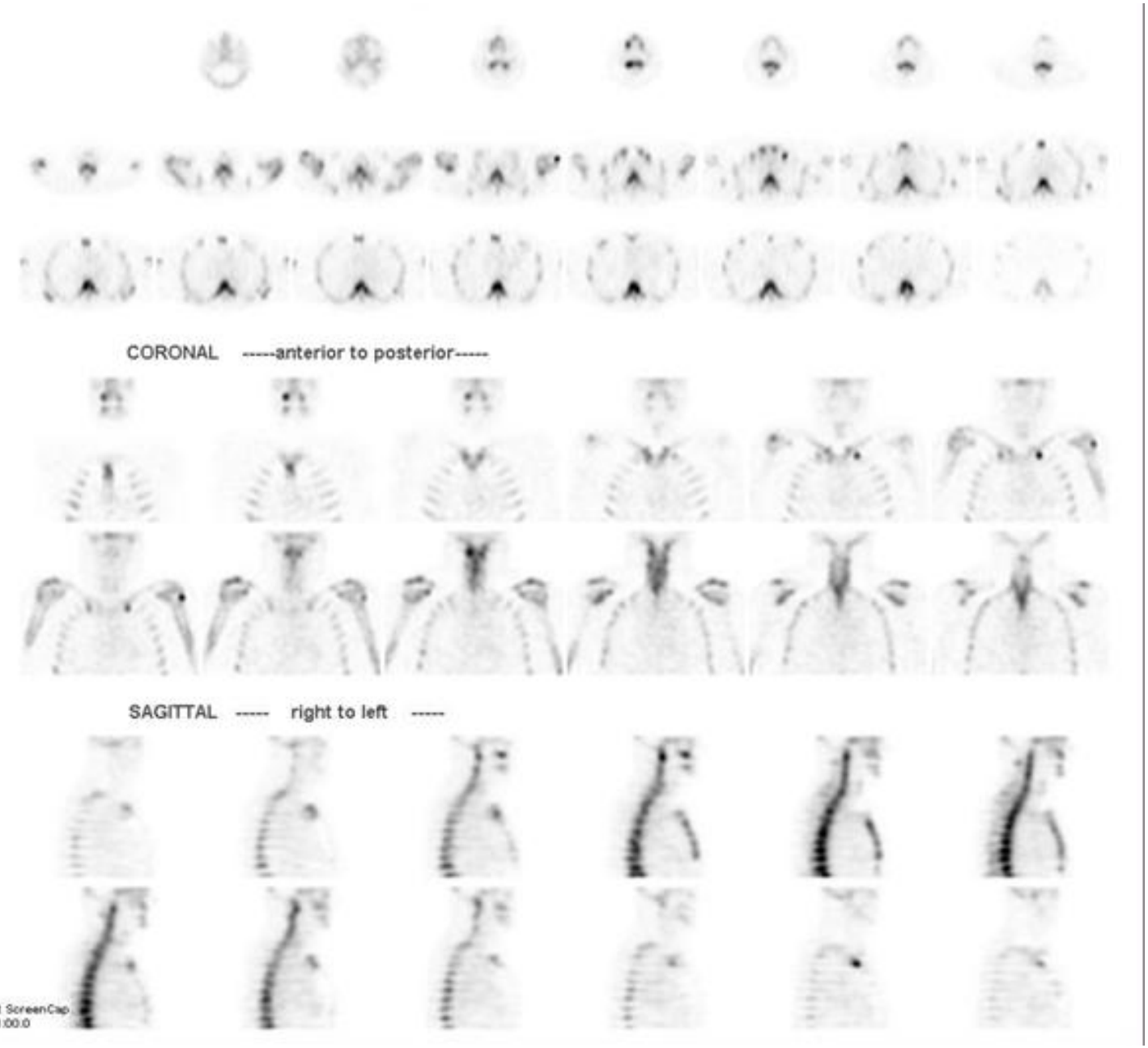

CT Coronal
CT Sagittal
CT Transaxial
Fused Coronal
Fused Sagittal
Fused Transaxial
MIP Navigate

Osteoid Osteoma



Post-traumatic




CORONAL -----anterior to posterior-----
SAGITTAL ----- right to left -----
spect ScreenCap
11:31:00.0

Questions?