Intradural Spinal Tumours

Mr. Nigel Mendoza
Consultant Neurosurgeon
Charing Cross Hospital

Epidemiology of Intradural tumours

20 % of all CNS tumours are in the spinal canal

- Incidence : 2 - 4 / 100,000
- Female : Male 1 : 1
  - Meningiomata are more common in female population
- Pathology
  - 90 % benign
  - Congenital tumours (dermoids, teratomas) more common in children
  - Site : Tx spine > Cx spine > Lx spine
  - Extramedullary > Intramedullary
    - Intramedullary tumours more common in children

Primary Spinal tumours : Classification

- Extradural :
  - Primary spinal tumours
    - Chordoma, Osteoid osteoma, ABC
  - Metastatic
    - Lung, Breast, Prostate
- Intradural :
  - Extramedullary : 75%
    - Meningioma
    - Schwannoma / Neurofibroma
  - Intramedullary : 25%
    - Ependymoma
    - Astrocytoma
    - Dermoid

Presenting clinical symptoms

- Related to site of the lesion
- Related to pathology
  - Histological diagnosis
  - Mechanical
  - Vascular
    - Venous compression
    - Arterial occlusion

Presentation

- Pain
  - Radicular, nocturnal, persistant, Valsalva
- Neurological deficit due to :
  - Neuraxial compression
  - Vertebral column instability
    - Motor weakness
    - Sensory loss
    - Gait disturbance
    - Sphincter disturbance

Investigations

- Plain X ray
  - Usually unhelpful but 10% of tumours may demonstrate a plain radiological abnormality
    - Expansion of intervertebral foramen
    - Scalloping of vertebral body with chronic compression
    - Calcification in tumour
- Lumbar puncture
  - Non - diagnostic
  - Raised protein
  - Cytology
- MRI with gadolinium enhancement is primary diagnostic modality
- Most tumours are isodense or slightly hypointense compared with normal spinal cord
  - Majority enhance with contrast
- CT / Myelography when MRI contraindicated

Intradural - Extramedullary tumours

- Incidence :
  1 - 2 / 100,000 population
- 90 % :
  Meningioma
  Schwannoma

10 % hetereogeneous group

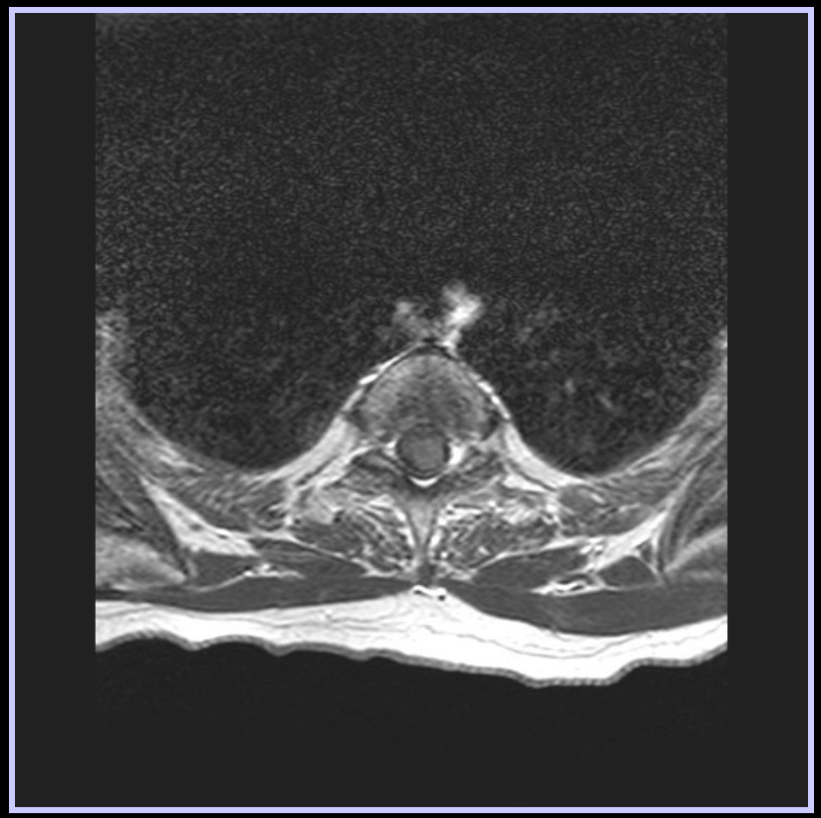
- Chordoma
- Ependymoma
- Dermoid / Epidermoid
- Lipoma
- Spinal metastasis (4%)
- Lymphoma
- Arachnoid cyst

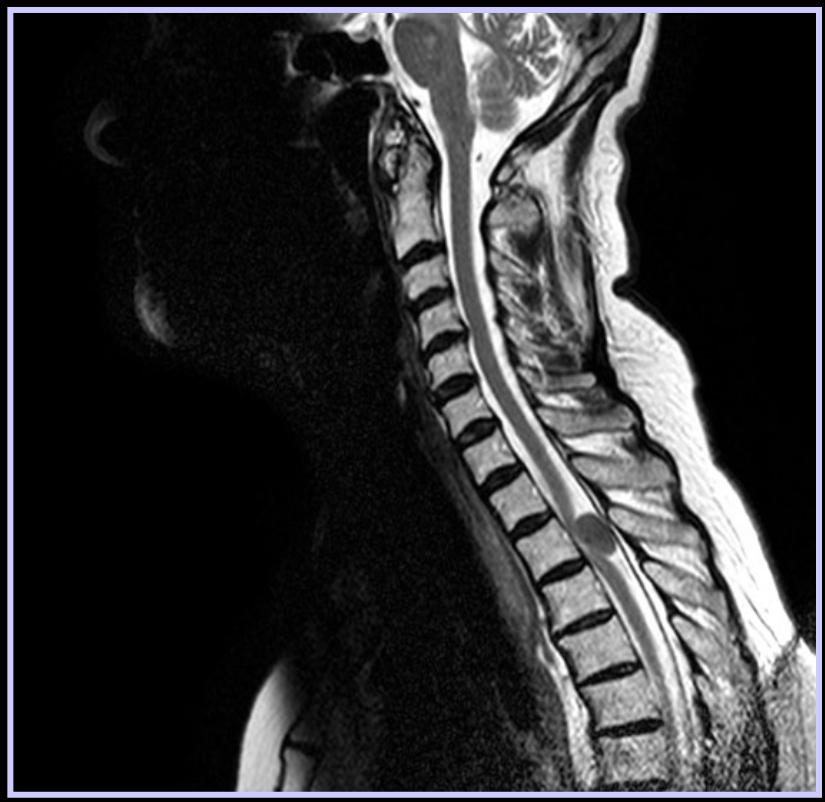
Intradural - Extramedullary
Spinal Meningioma

- Age : 50 - 70 decade
- Female more common : 75 - 85 %
  - ? Growth related to female sex hormones - progesterone receptors
    - Increased growth rate in pregnancy and pt with breast Ca has been observed
    - Radiation induced
- Site
  - Single lesion (rarely multiple)
  - Mainly thoracic : posterolateral (? Arise from arachnoid cell clusters at level of nerve root)
  - Cervical : more commonly anterior
  - 10 % have an intradural and extradural component

Extramedullary tumour : Meningioma

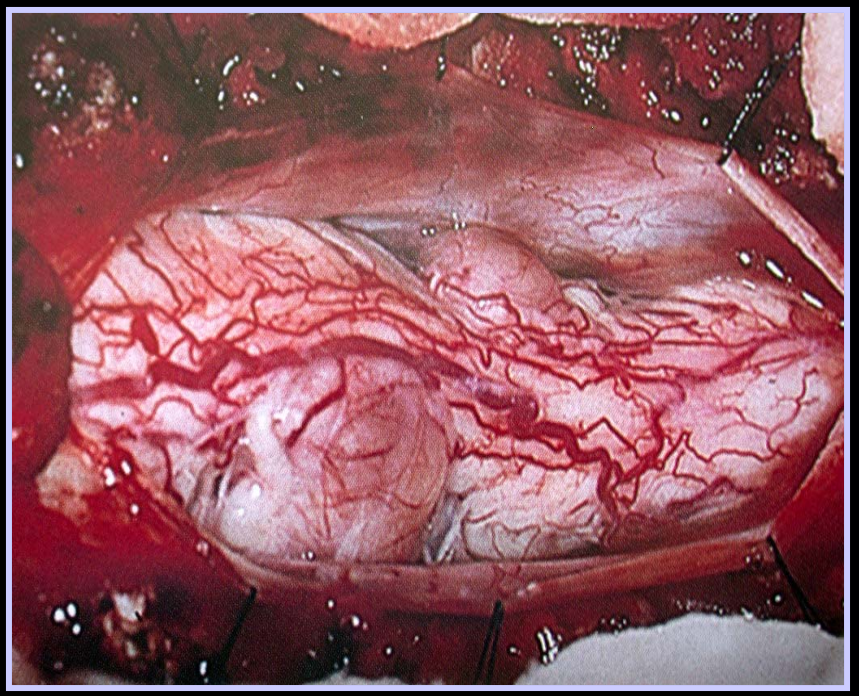
73 yr female (T.G) with thoracic pain and 6/12 increasing difficulty in walking : spastic paraperesis





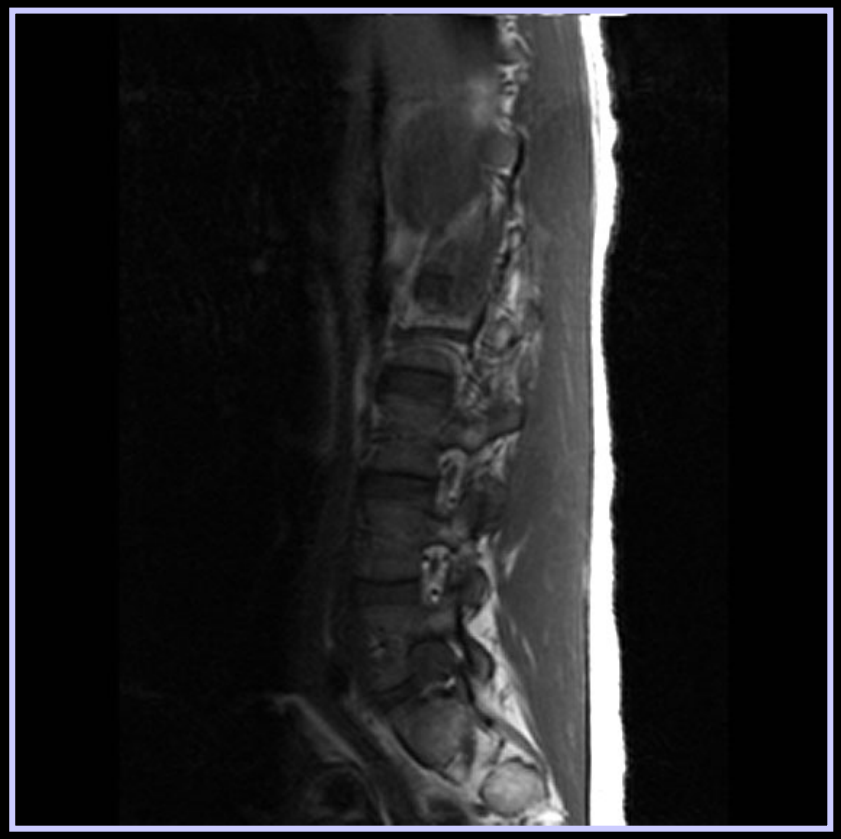
Extramedullary tumour Nerve Sheath Tumours
Neurofibroma / Schwannoma

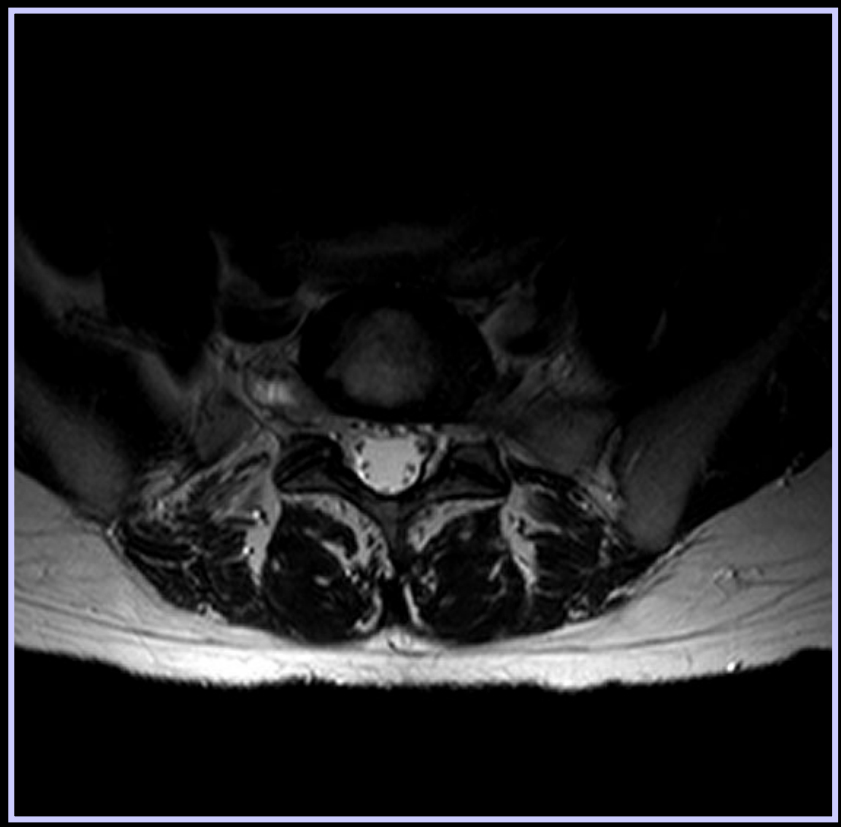
- Neurofibroma
  - Single / Multiple (NF1 / NF2)
  - Arise from sensory root, dumbell shaped
  - More frequent in Tx spine
  - 30 - 50th decade
  - Surgical removal of multiple lesion difficult or impossible
- Schwannoma
  - commoner in absence of NF
  - Isolated single lesion
  - Arise from sensory root
  - Complete excision possible



Extramedullary tumour : Neurofibroma

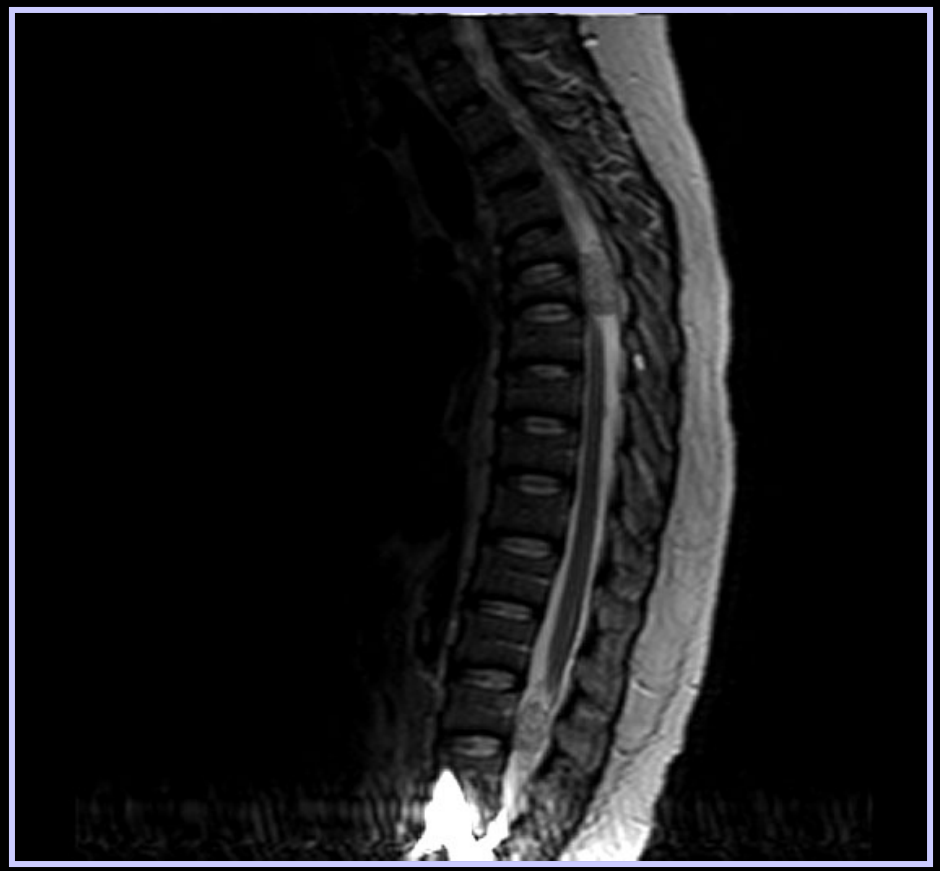
33 yr (C.S) female with 18/12 sciatica.





Intradural Extramedullary tumour : Metastasis

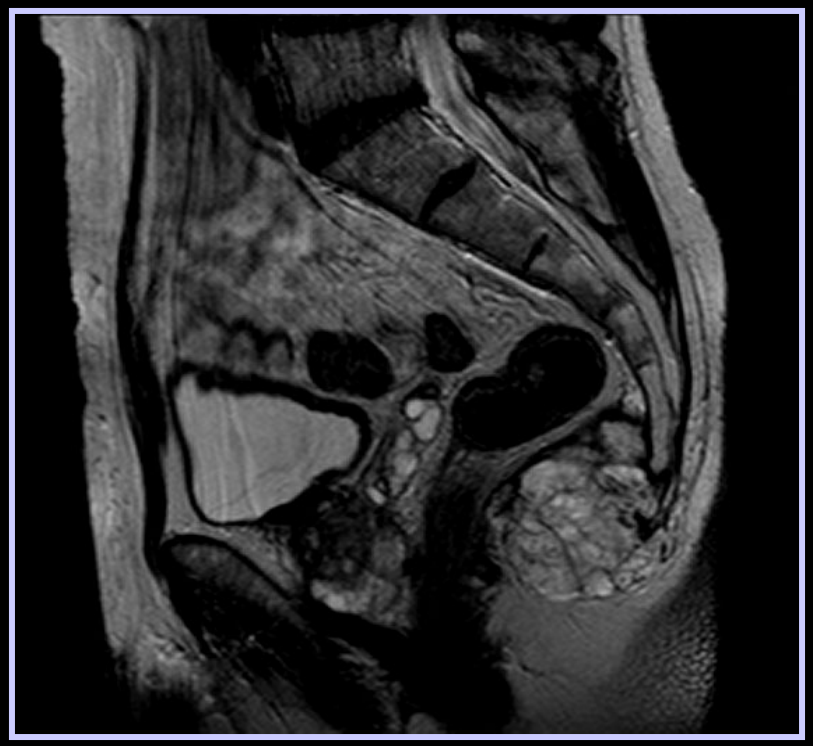
27 yr (M.S) male with malignant pituitary macroadenoma (Cushings disease) and 6/12 progressive difficulty in walking



Intradural - Extramedullary tumour

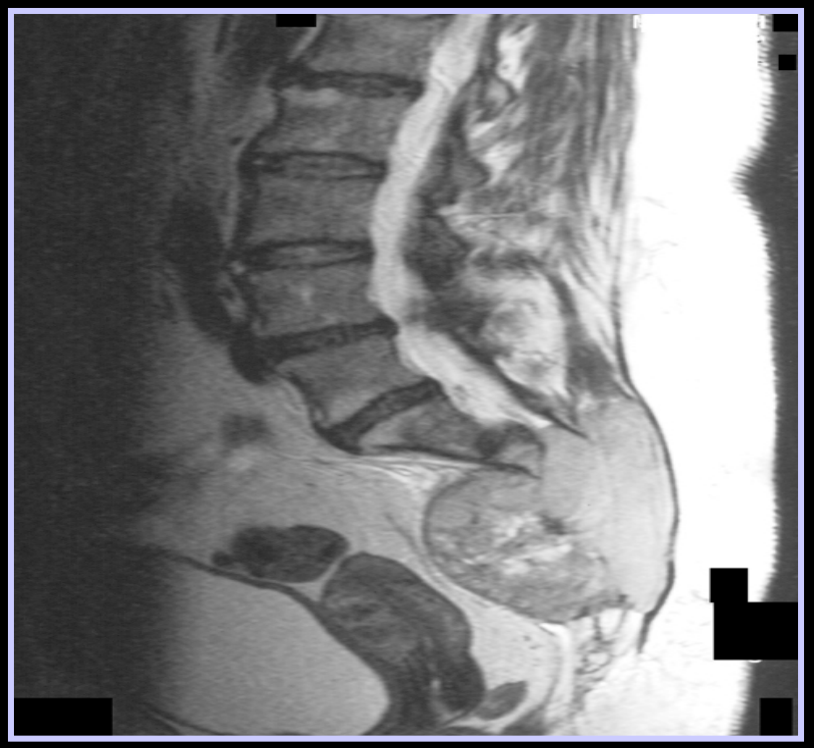
Chordoma

66 yr (C.G) male with 2 yr history of coccydynia



Metastasis

65 yr female with Lx/Sacral pain : Breast Ca



Intradural - Intramedullary tumours

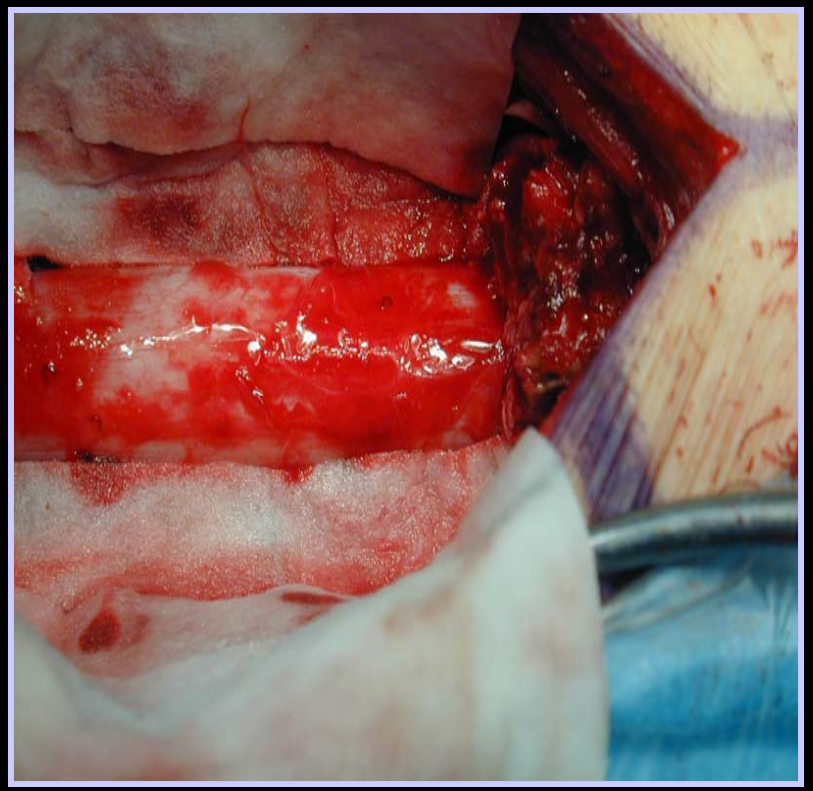
- Incidence
  - 2 - 4 % of all CNS tumours
  - Adult : 20 % of all intradural tumours
  - Children : 50% of all intradural tumours
- Ependymoma : 30%
- Astrocytoma : 30%
  - High grade glioma (10 %)
  - Low grade glioma
  - Oligodendroglioma
- Rare lesions : 30%
  - Dermoid / Epidermoid
  - Cavernous angioma
  - teratoma
  - haemangioblastoma
  - lipoma
  - neuroma
  - lymphoma
  - metastasis
- Expansile non tumourous lesions
  - Multiple sclerosis
  - Bacterial abscess / empyema
  - Sarcoidosis

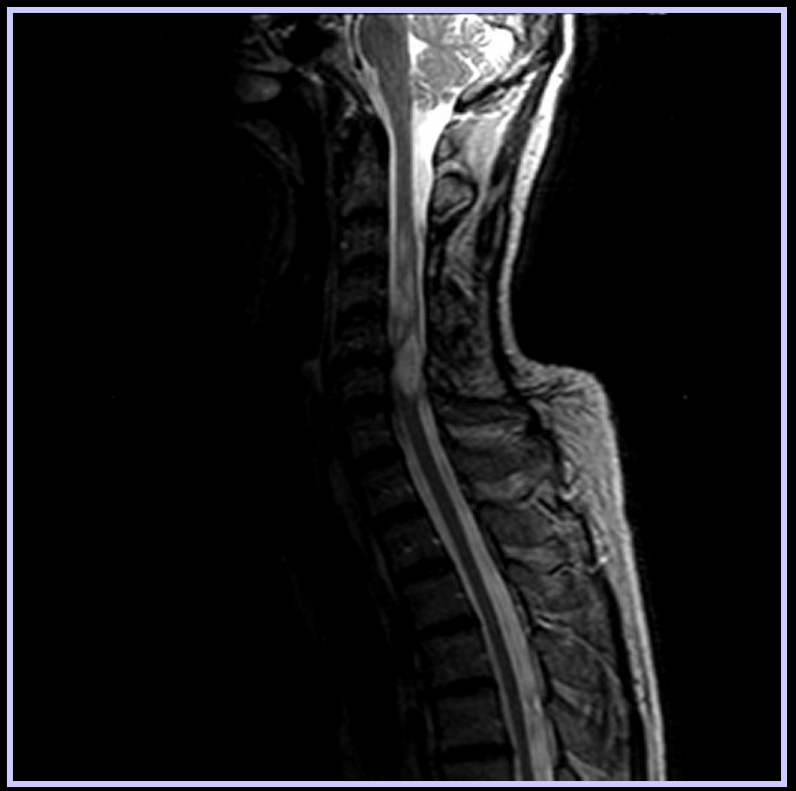
Intradural - Intramedullary tumours : Ependymoma

- Most common intramedullary tumour in adult population over 30 yrs of age
- 50% of all CNS Ependymoma arise in spinal canal
  - 30 % occur in filum terminale
- Pathology
  - Macroscopic : Solid grey / purple tumour, occ cystic, well demarcated
  - Microscopic : Majority are histologically benign but biological variable behaviour
- Therapy
  - Surgical
    - Macroscopic excision can be achieved in about 80%
      - Recurrence Rate : 5 - 10 % in 10 years
  - Radiotherapy
    - following subtotal excision
    - Lack of evidence for efficacy

Intramedullary tumour : Ependymoma

58 yr male (B.F) with 6 yr progressive leg weakness, 5 yr arm pain and 18/12 sensory disturbance in hands with tetraparesis



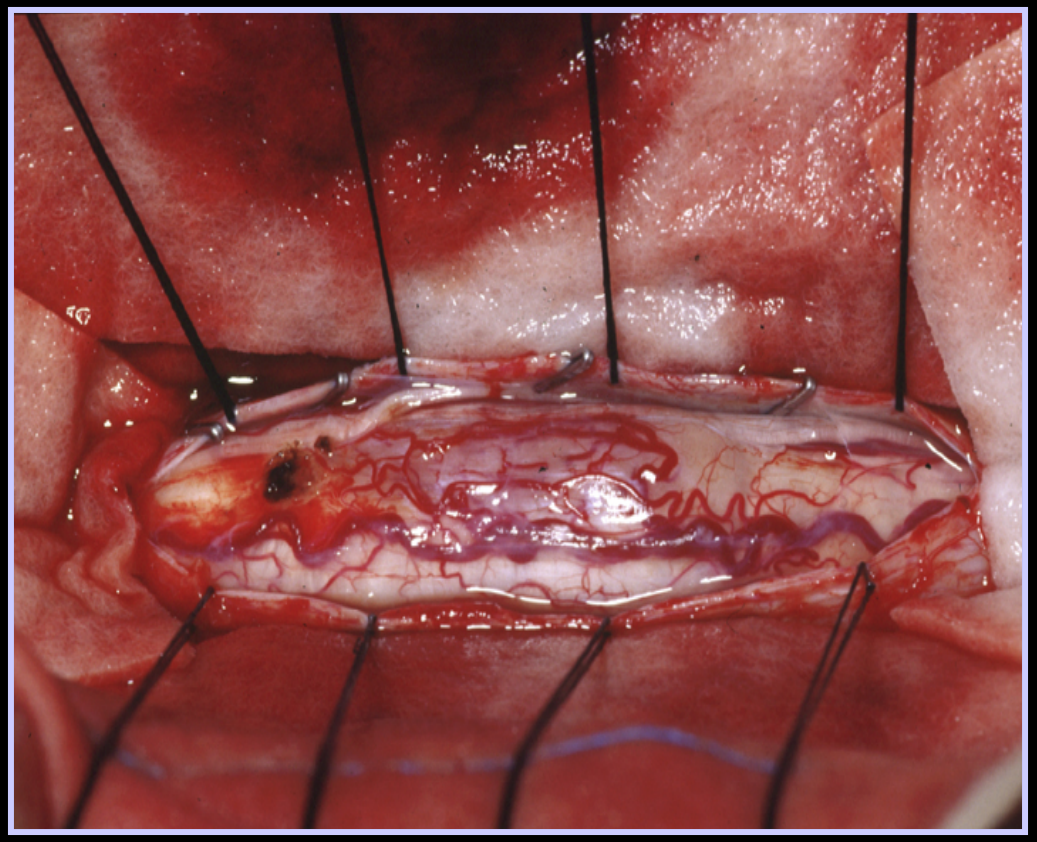


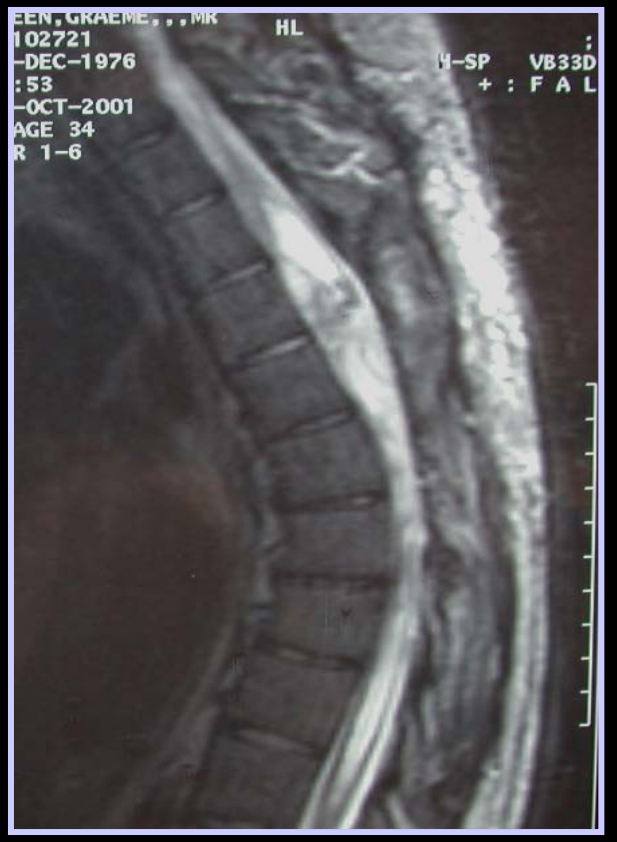
Intradural - Intramedullary tumours : Astrocytoma

- 2 - 4 % of all CNS Astrocytoma arise in spinal cord : consistant with relative volume
- Occur at any age but more common in 1st 3 decades
- In children / adolescence Astrocytoma > Ependymoma ; 5 : 1
- 90 % Low grade
- 10 % High grade
  - In Adult population : 20 % High grade astrocytoma
- Prognosis
  - In childhood astrocytoma
    - 80% 5 year survival , 55% 10 year survival
  - Adult high grade astrocytoma : Poor prognosis
    - Median Life expectancy < 2 yrs

Intramedullary tumour : Astrocytoma

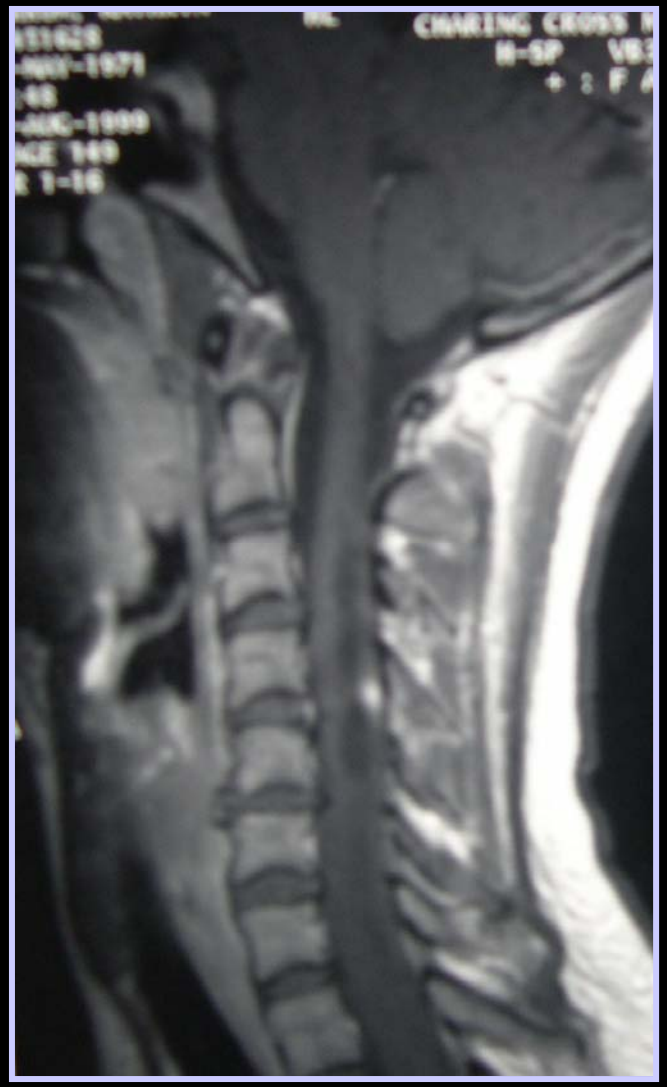
24 yr male (G.G) with 18/12 Tx pain with bilateral leg radiation. 5/52 of increasing difficulty with micturition





Intramedullary tumour : Haemangioblastoma

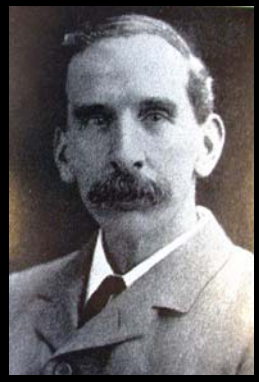
- 32 yr female (K.J)
- progressive arm weakness
- Sx 3 yrs prior to diagnosis
- Surgical excision
- Complete recovery



Surgery : Historical perspective

- 1887 : William Gowers clinical diagnosis of spinal tumour
- 1887 : Victor Horsley excised intradural tumour under ether anaesthesia.
- 1925 : Elsberg diagnosis and excision of intradural intramedullary tumour.
- 1968 : Greenwood reports the first surgical series of patients following treatment of intradural tumour

Historical perspective



- 1883 : McEwan undertook a laminectomy and excised a ‘fibrous neoplasm of the theca’

McEwan W: An address on the surgery of the brain and spinal cord. Br Med J. 1888 ; 2 : 302 - 309

Pt had a complete paraplegia but was playing football again after 5 years!

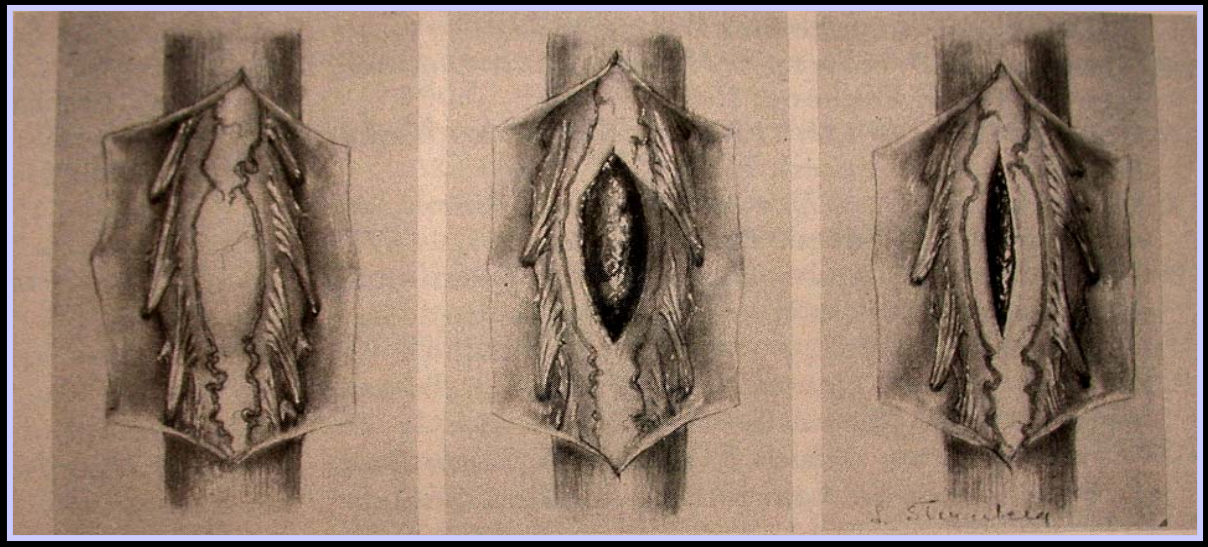
- 1888 : William Gowers referred a patient to Victor Horsley who undertook a laminectomy and could not find the lesion . His assistant Charles Ballance ‘encouraged’ him to go a level higher and then excised a ‘ fibro-myxoma of the theca’

Gowers W, Horsley VA. A case of tumour of the spinal cord : removal and recovery. Med Chir Tr. 1888 ; 53 : 379 - 428

The ‘extrusion’ method

Elsberg CA, Beer E: The operability of intramedullary tumours of the spinal cord : A report of two operations with remarks upon the extrusion of intraspinal tumours. Am J Med Sci. 1911: 142 ; 630 - 647

- Elsberg proposed a two stage operation
  - Initial laminectomy + myelotomy
  - Extirpation following delivery of the tumour



Aims of surgical treatment

- Total excision of lesion
  - No recurrence
- Complete neurological recovery
  - prevent neurological progression
- No postoperative complication / disability

Surgical approaches

- Cervical
  - Transoral
  - Far lateral
  - Posterior cervical laminectomy
  - Anterior approach
- Thoracic
  - Posterior laminectomy
  - Costo - tranversectomy
  - Thoracotomy
- Lumbar
  - Posterior laminectomy
  - Far Lateral
  - Anterior retroperitoneal

Surgical approach : Posterior decompressive laminectomy

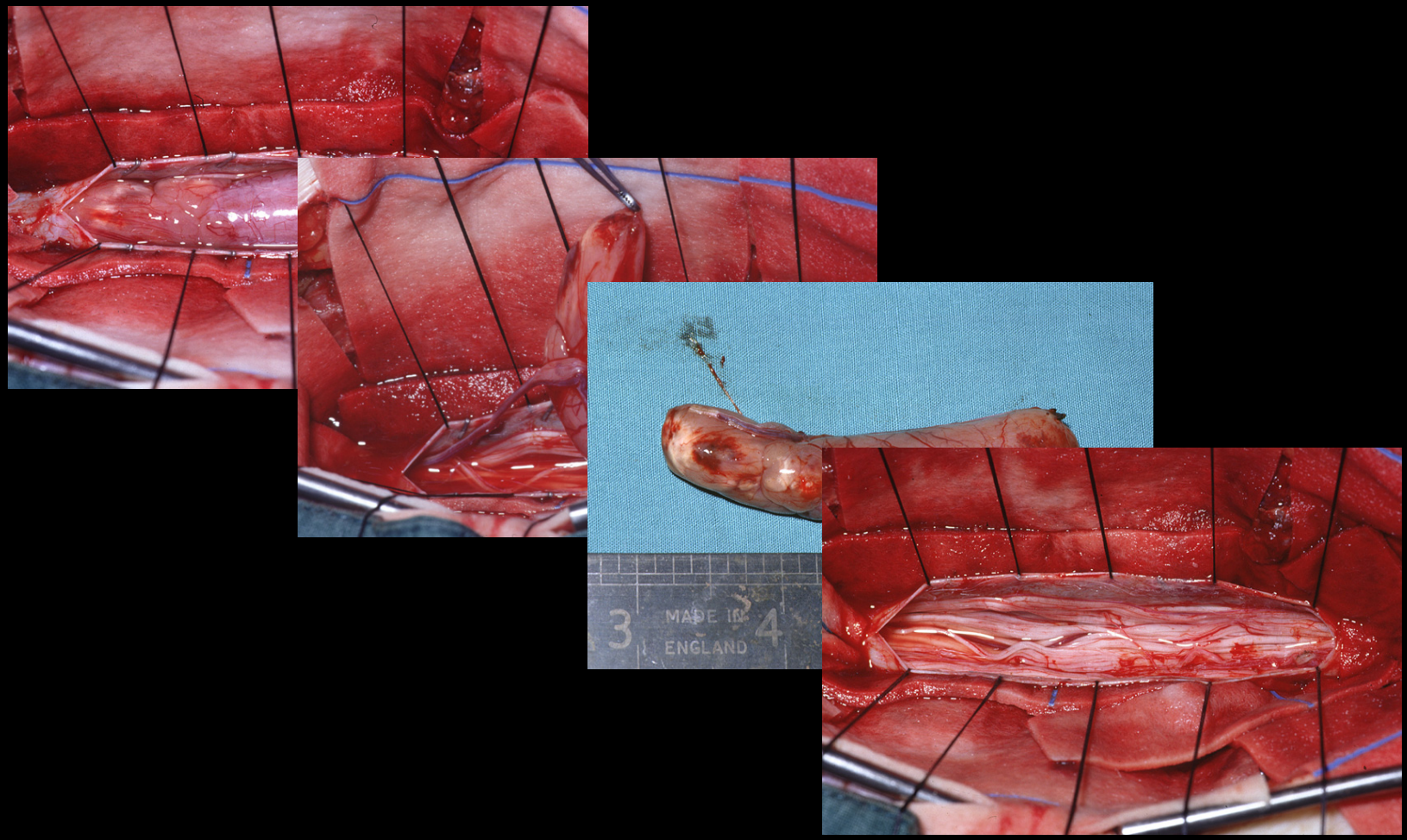
- Preoperative spinal marker to localise level
- Anaesthesia : General
- Position : Prone
  - Montreal cushion
    - Allow good chest expansion & ventilation
    - Allow space for the abdomen to expand
- Midline incision
  - Subperisosteal muscle dissection
  - Decompressive laminectomy
    - High speed drill / Punches
  - Dural opening : Arachnoid opened seperately
- Tumour Excision
  - Operating microscope
  - Ultrasonic aspirator
  - Bipolar diathermy
- Closure
  - Layered
  - Drainage
    - prevent CSF leak
  - Spine reconstruction
    - prevent instability especially in children

Prognostic factors influencing surgical outcome

- Preoperative neurological functional disability
  - Children better recovery compared to adult
  - Good function preop associated with post op function
  - Severe disability has poor prognosis but full recovery can still occur
- Complete resection
- Histological diagnosis

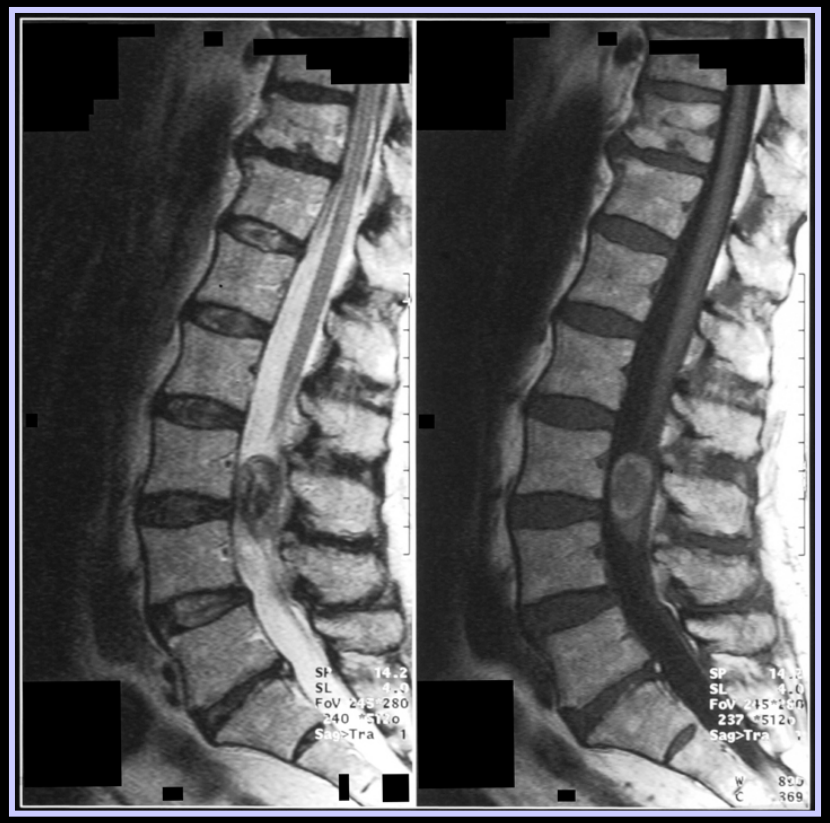
Intradural Extramedullary Tumour : Neurofibroma

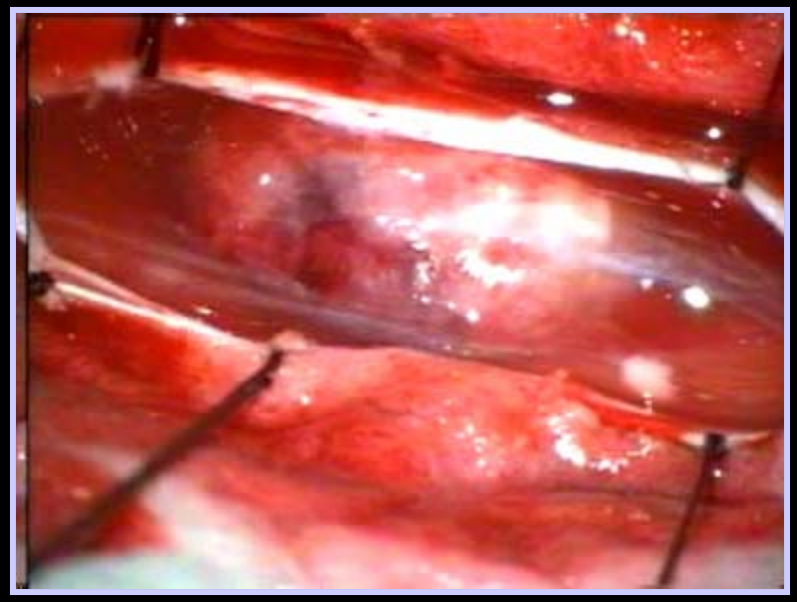
35 yr male with 18 / 12 persistant back and leg pain



Intradural Extramedullary Tumour : Neurofibroma

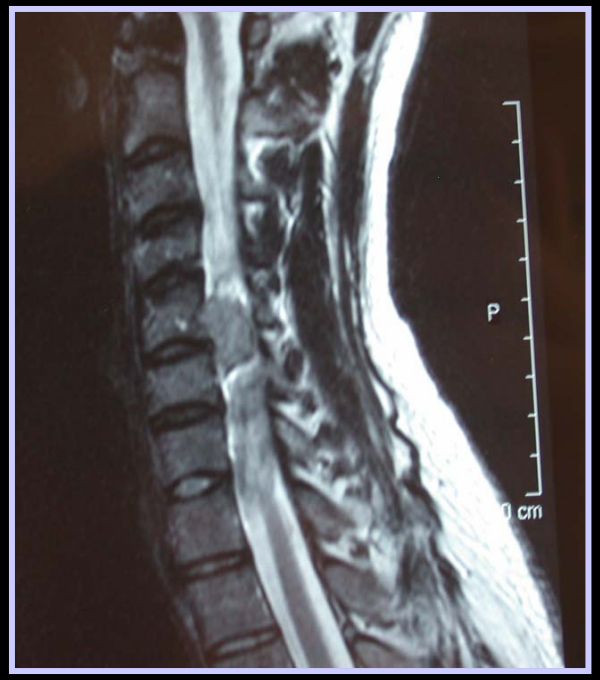
35 yr male with 18 / 12 persistant back and leg pain

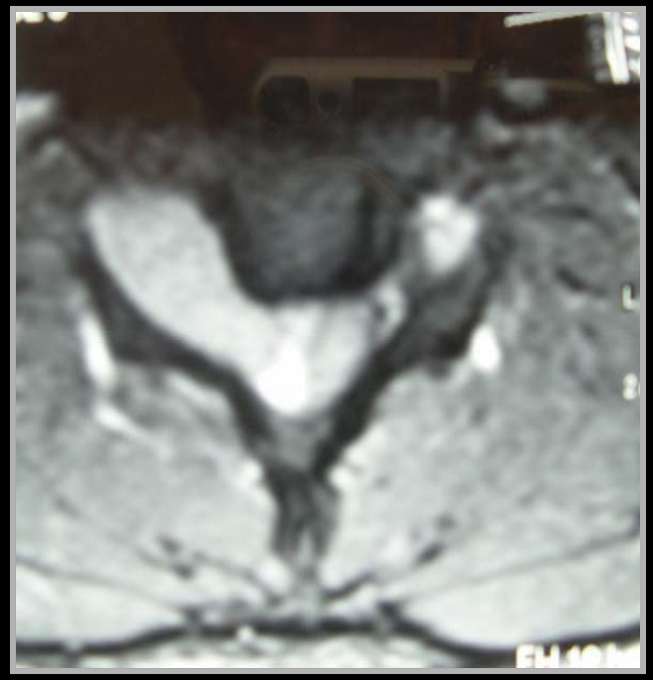


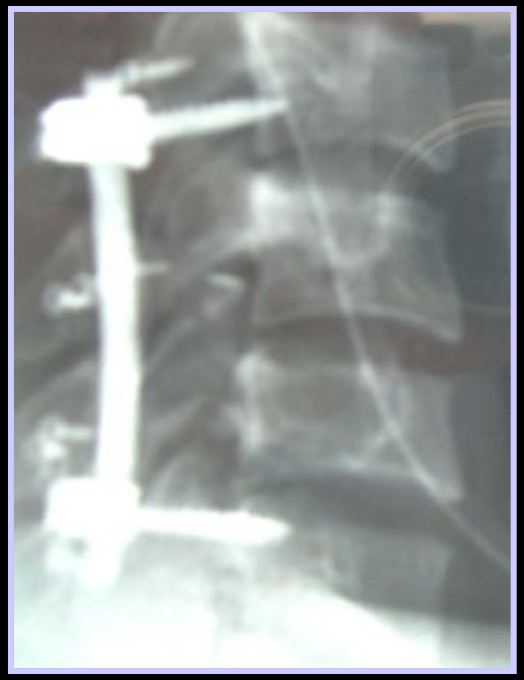


Spinal intradural tumour : Neurofibroma

30 yr male (A S) with 12 / 12 history of arm pain and progressive arm weakness

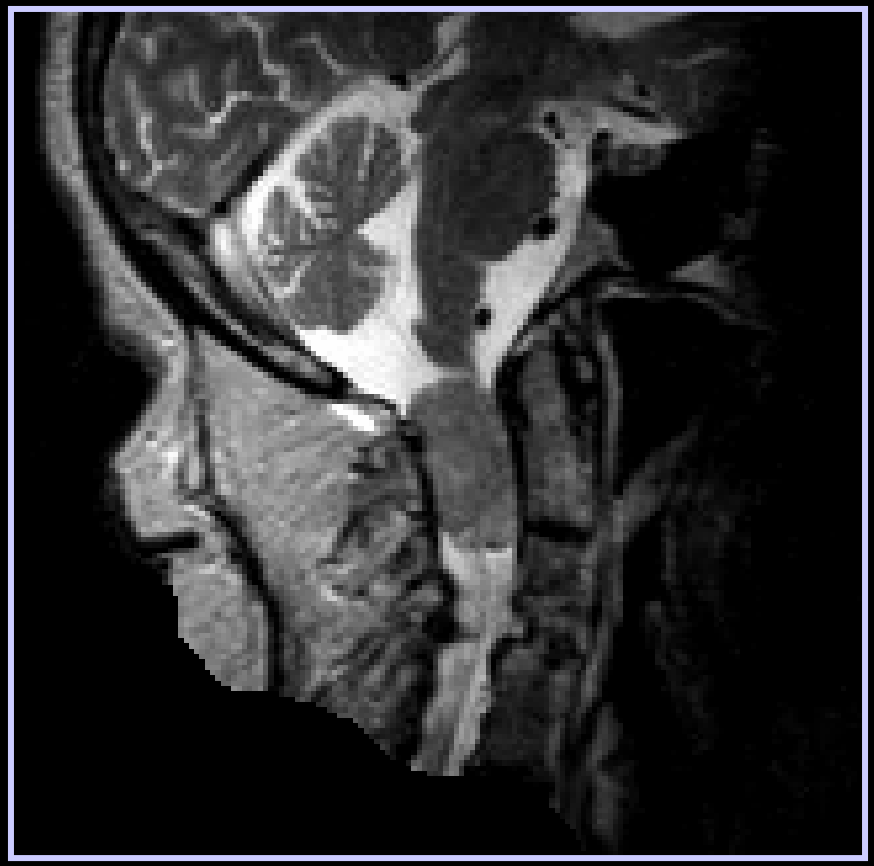


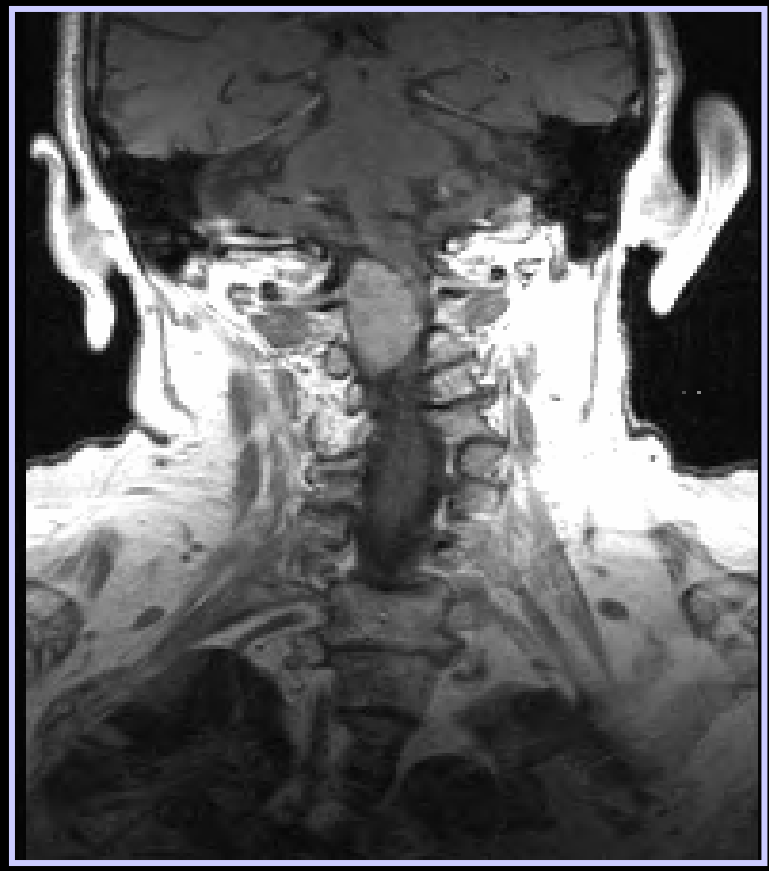




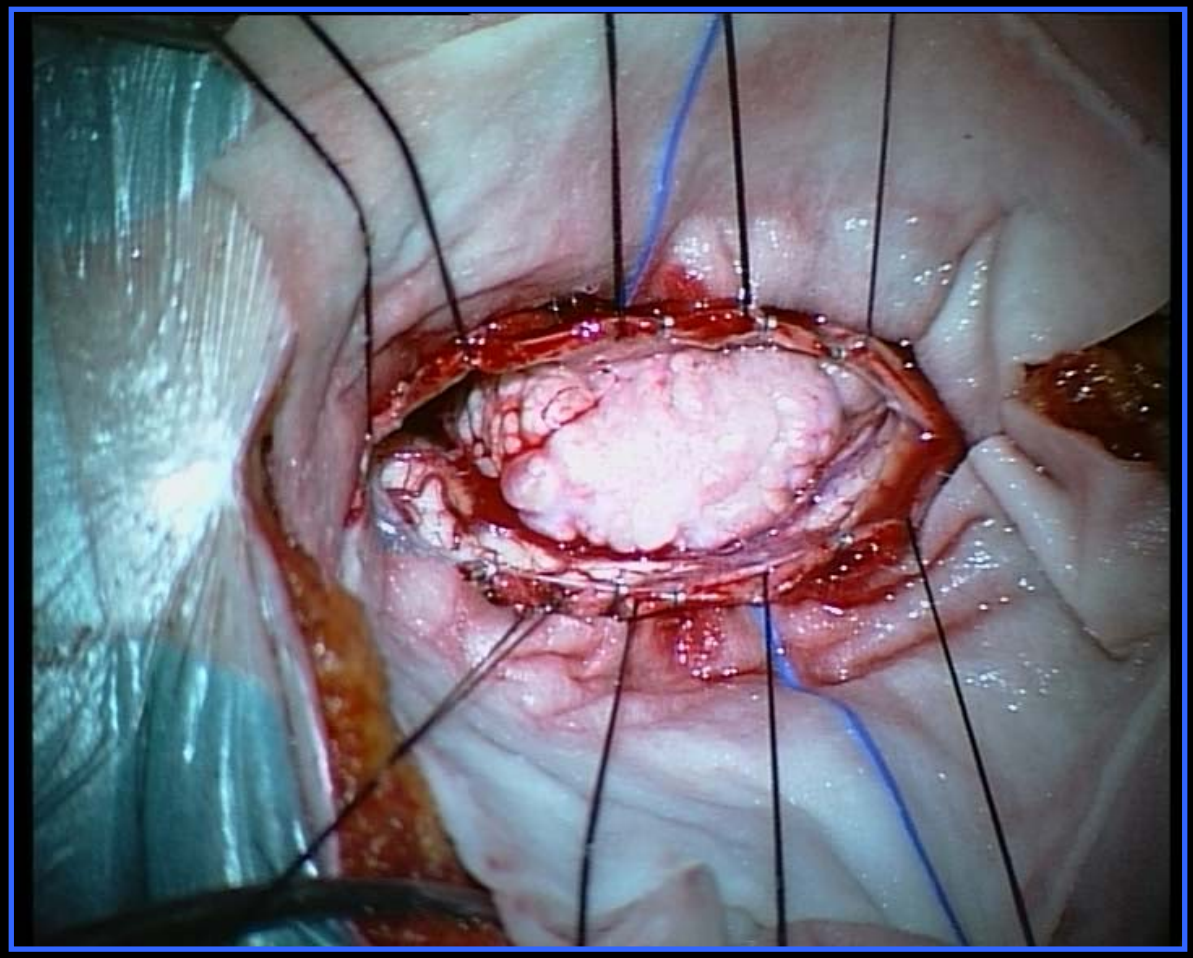
Intradural Extramedullary Tumour : Meningioma

73 yr female (M.S) with 2 year progressive tetraparesis, urinary retention and dysphagia



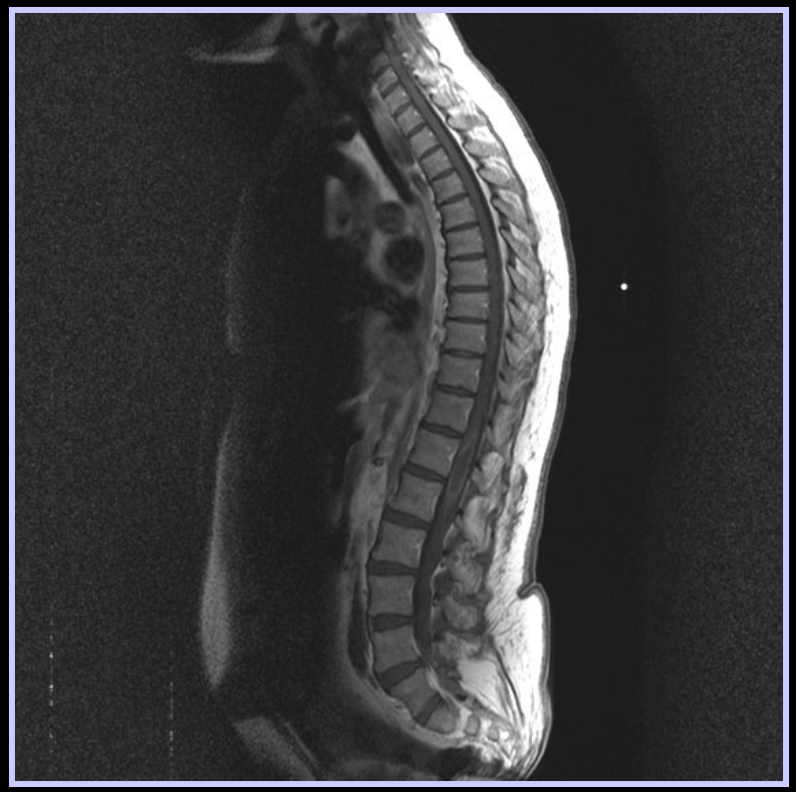


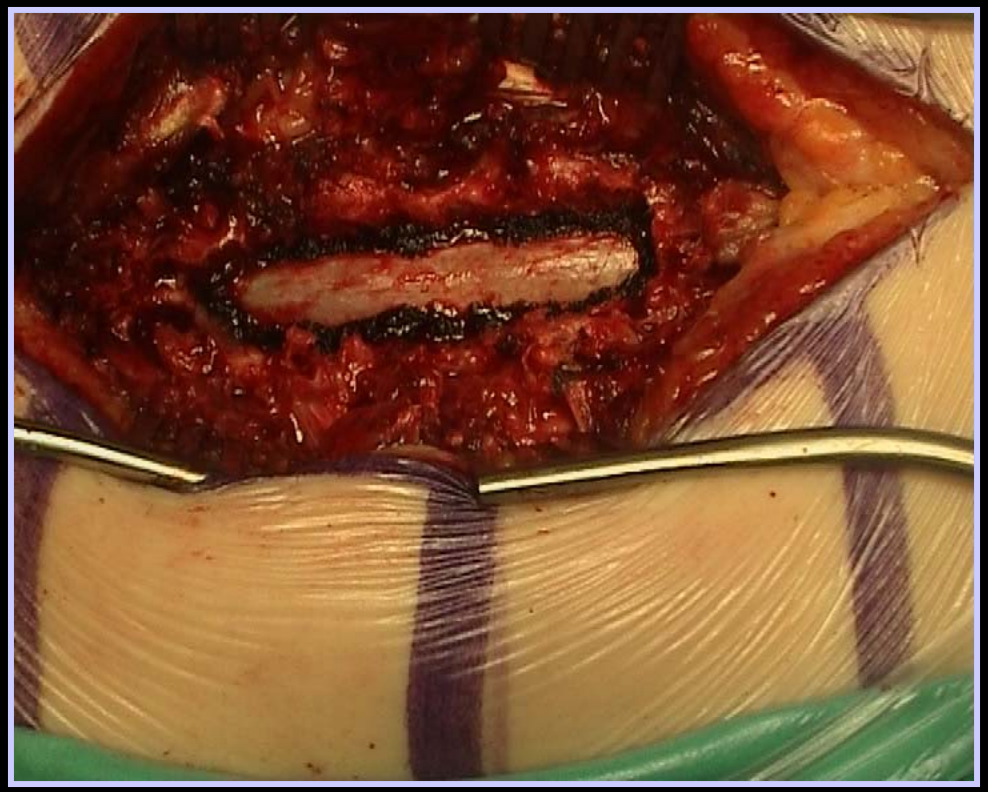
Intradural Extramedullary Tumour : Meningioma



Spinal intramedullary tumour : Astrocytoma

73 female (I A-S) with 3/12 progressive paraparesis





Spinal intradural tumours : Part 1 - Extramedullary

El-Mahdy, Kane P, Powell M, Crockard A. Br J Neurosurgery 1999; 13 : 550-557

1st reported series in post scan era : all had CT or MRI

- 1980 - 1996 : 66 pts underwent surgery for intraspinal nerve sheath tumour
  - 64% Schwannoma
  - 26% Neurofibroma
- 54% male : 46% female ,
- Age 12 - 81 years, F/U 1 - 12 years Mean F/U : 6.6 years
- Cx : 45%, Tx : 26%, Lx : 29%
- 18 pts had NF1, 2 pts had NF2
- 6% malignant tumour
- Mean time of Symptoms to diagnosis : 30 months

Spinal intradural tumours : Part 1 - Extramedullary

El-Mahdy, Kane P, Powell M, Crockard A. Br J Neurosurgery 1999; 13 : 550-557

- 90 procedures undertaken : 66 initial procedures, 24 for residual / recurrent lesion
  - Radical excision + / - vertebral reconstruction
  - 72% posterior laminectomy
  - 11 operations required spinal stabilisation
- Results
  - 90 % pain relief
  - Frankel grade : 37 pts improved > 1 grade, 26 pts unchanged, 3 pts were worse
- Complications
  - 5 CSF leak, 1 VA injury, 1 post op kyphosis, 1 DVT
  - No deaths

Spinal intradural tumours : Part 2 - Intramedullary

Kane P, El-Mahdy, Singh A,Powell M, Crockard A. Br J Neurosurgery 1999; 13 : 558-563

- 1980 - 1996 54 patients underwent surgery for intradural intramedullary tumour

  Cervical 33%, Thoracic 30%, Lumbar 24%

  36 Male : 18 Female. Age 11 - 81 yrs

  – Ependymoma 21/54, Astrocytoma 14/54, Lipoma 6/54, Haemangioblastoma 6/54

  Symptoms : Spinal pain 52%, Limb weakness 65%, Sensory Sx 55%, Sphincter disturbance 44%

  Duration of symptoms to diagnosis : 1/52 - 38 yrs

- Surgery

  50% had Total tumour excision,

  3 pts developed tumour recurrence (5/12, 2 yr and 13 yr post Rt)

Spinal intradural tumours : Part 2 - Intramedullary

Kane P, El-Mahdy, Singh A,Powell M, Crockard A. Br J Neurosurgery 1999; 13 : 558-563

- Complications
  - 4 Deaths within 1/12 of Surgery
  - 6 CSF leak
- F/U : 2 - 18 yrs in 40 pts
  - 90% remain independently mobile
- Outcome
  - 3 patients regained ability to walk
  - 3 had increased post op motor deficit : unable to walk

Conclusions

- Intradural tumours are rare
- Delay in diagnosis is common
- Majority of lesions are benign
- Maintain index of suspicion in patients with *persistant and progressive* neurological symptoms and signs
- Good recovery can occur even with significant neurological deficit

Thank you