Intradural Spinal Tumours

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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, persistent, 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% heterogeneous 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 paraparesis
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
  Oligodendrogloma

- **Rare lesions**: 30%
  Dermoid / Epidermoid
ependymoma
  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’


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’

The ‘extrusion’ method


• 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 separately

- 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 persistent 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


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

- 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


• 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


• 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