Chordomas and Chondrosarcomas:

Discuss the embryogenesis of chordoma:

- Chordomas are osseous tumours arising from the remnants of notochord. At 2 week of gestation the embryo has **2 layers ectoderm** and **endoderm**. The **prochordal plate** marks the cranial end and the **primitive streak** marks the caudal end. At the cephalic end of the streak, the **primitive node** appears and contains the **primitive pit**.
- The mesoderm is formed by ectodermal cells that migrate through the primitive streak .Ectodermal cells migrate through the **primitive pit** remain in the midline and form the **notochordal process** which then becomes the canalised **notochord** which fuses with the endoderm. Communication between the notochordal canal and the endoderm forms the neuroenteric canal. Most of the notochord involutes. N. pulposus is the remaining part of the notochord.

Discuss the location, epidemiology, features and natural history of chordoma:

- 0.2% of all intracranial tumours and 6% of skull base tumours. 3-5th decades. Grouped together because of their location. Often difficult to differentiate radiologically and histologically
- Chordomas are osseous tumours of the remnants of notochord. Most commonly occur in **sacrococcygeal region**, **clivus and sphenooccipital synchondrosis,** less commonly in the **sellar, cervical regions and mediastinum**. When small they are localised to the middle plate of the bone, but as they enlarge, they tend to erode the bone. Lobulated surrounded by pseudocapsule from stretched dura and periosteum. **Histologically composed of lobules of large clear mucin containing cells (physaliferous cells) in mucinous background**. They stain +ve for epithelial markers (cytokeratin and EMA) and oncofetal markers (AFP and CEA). Three variants have been described classic, chondroid and atypical. Chondroid variant has better prognosis.
- Chondrosarcomas are low grade malignant tumours of the chondral elements of the bone. They can occur any where in the skeleton. In the skull most commonly occur in the sphenoid bone and clival basiooccput. They tend to be off the midline. When small they are localised to the middle plate of the bone, but as they enlarge, they tend to erode the bone. Lobulated surrounded by pseudocapsule from stretched dura and periosteum. Histologically they are composed atypical chondrocytes in hyaline cartilage matrix. They stain –ve for epithelial and oncofetal markers. Depending on mitosis, cellularity and pleomorphism, three grades have been described
- Clinically they present with headaches and neck pain (cervicocranial involvement), cranial nerves neuropathy and endocrine hypopituitarism (sellar lesions).
- Natural history: **without treatment prognosis is poor with average survival of 6-20 months**. Old patients, those with chordoma in particular a typical and those with high mitotic figures do worse. Patients with

chondrosarcoma, chondroid variant of chordoma , low mitosis and young do better

Describe the radiological features of chordoma and differential diagnosis:

1. CT scan: hyperdense enhancing osteolytic lesion with calcification near the midline mostly in the clival region
2. MRI-T1-hypo or isointense enhancing lesion, T2-hyperintense lesion
3. MRA of formal angio if there is suggestion of arterial involvement.

Differential diagnosis:

1. Chondrosarcoma: off midline usually
2. Pituitary tumour
3. Craniopharyngioma
4. meningioma
5. Schwannoma
6. Metastases
7. Nasopharyngeal carcinoma

Discuss the therapeutic options in the management of chordoma:

Treatment: Read Kaye 862 for more detail

1. Biopsy followed by radiotherapy (external beam or proton beam if available): This is an option in elderly and when surgical resection is contraindicated. Biopsy carries potential risk of complication because of the deep location of the lesion and the surrounding neuronal and vascular structures. In addition the specimen may be not diagnostic. 5 year survival after proton beam RT in one study was 56%.

2. **Surgical resection** of the lesion followed by radiotherapy.

A. Transoral approach for extradural midline clival lesions

B Far lateral or extreme lateral approach for intradural paramedian lesions to avoid CSF leak and meningitis (10-50% with Transoral approach)

C. Combination of the above. Start with removing intradural part and repairing the dura

With radical surgery and radiotherapy recurrence free survival at 5 years was 90% for patients with chondrosarcomas and 65% for those with chordomas

Describe the indications for and type of adjuvant therapy for chordomas:

1. Radiotherapy:

A. conventional external beam RT: improves survival as above. Risk for brain stem and cranial nerves radiation injury

B. Heavy particle RT: using high energy particle beams (Helium and proton beam) best results 5 year disease control 56% for chordomas and 98% for chondrosarcomas

C. stereotactic radiosurgery: less effective than for meningiomas and schwannomas because of the large size and multidirectional expansion of the lesion

2. **Chemotherapy**: several regimes have been tried without appreciable success

- All tumours eventually reoccur locally. The average survival with recurrence is 40% at 3 years and 5% at 5 years. RT if it was not given or occasionally surgery

Discuss the implications of incomplete resection for prognosis and adjuvant therapy:

1. The relation between the extent of resection and survival in chordoma is controversial. Many series reported higher recurrence rate and reduced survival with incomplete resection. On the other hand other series documented better neurological outcome with debulking and radiotherapy. In summary one should aim at maximal safe resection followed by radiotherapy.

2. Debulking should aim at reducing the volume of tumour and removing the central part to reduce the dose of radiation particularly to the central part around the brain stem