

“Precision Oncology”

Personalised oncology

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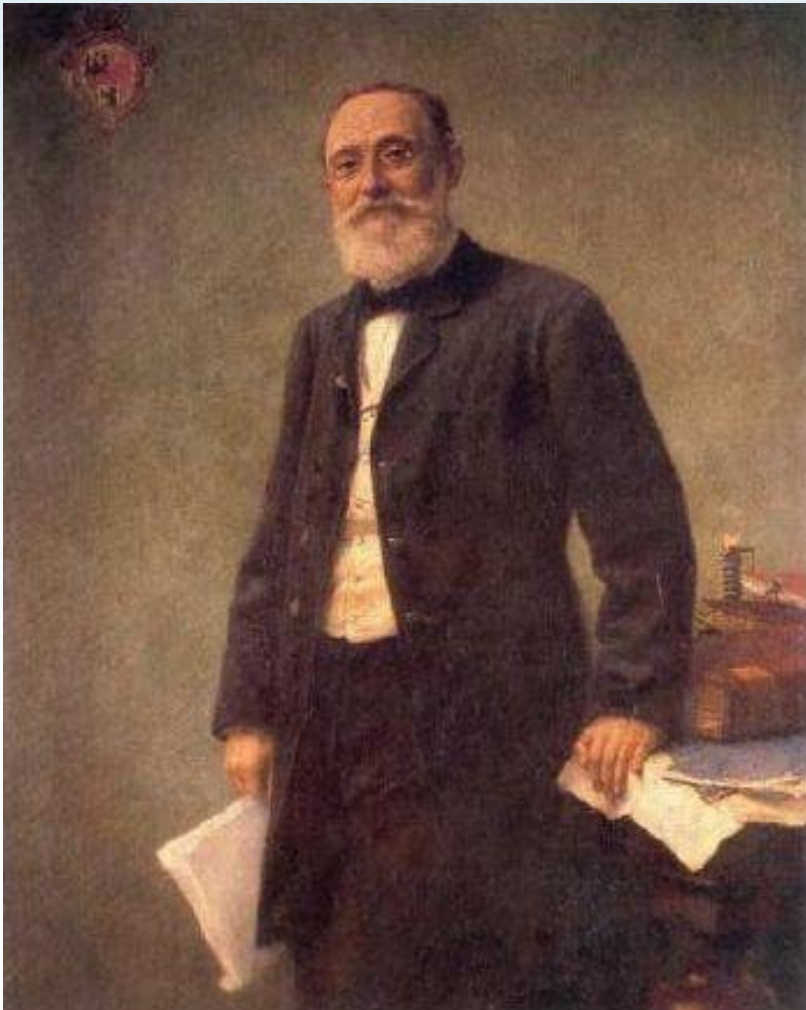
University College London
Cancer Institute

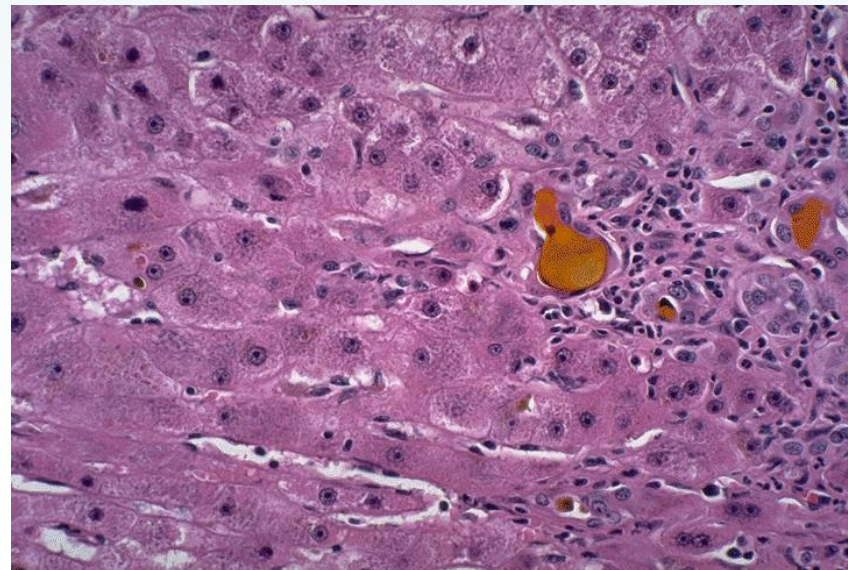
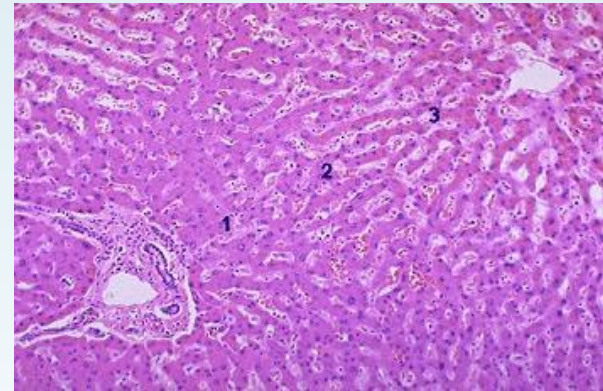
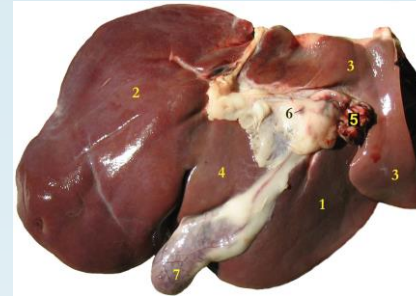
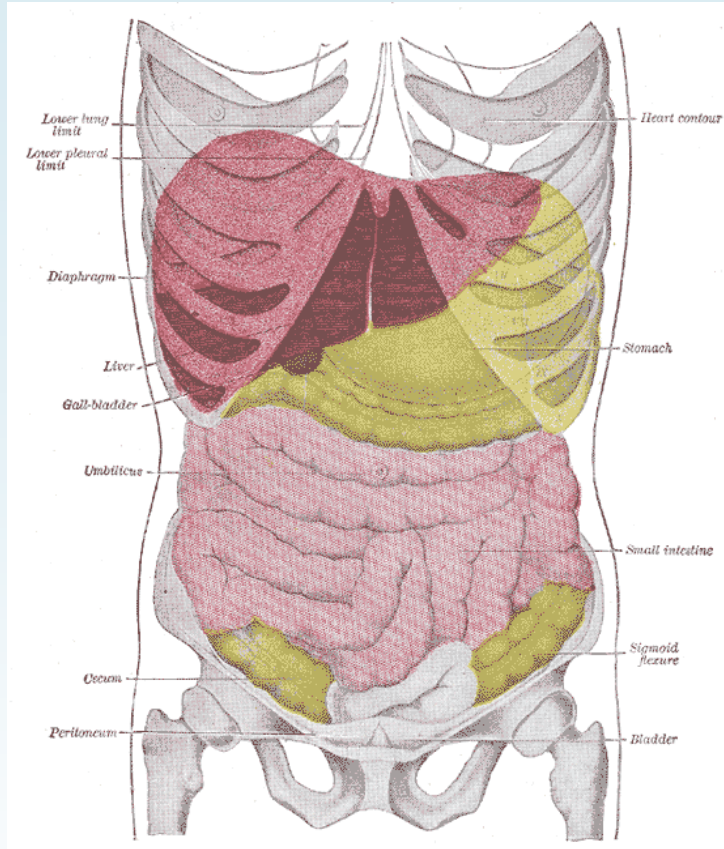
"an emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle for each person."

This approach will allow doctors and researchers to predict more accurately which treatment and prevention strategies for a particular disease will work in which groups of people.

Team Work..every stage of clinical management is important for outcome

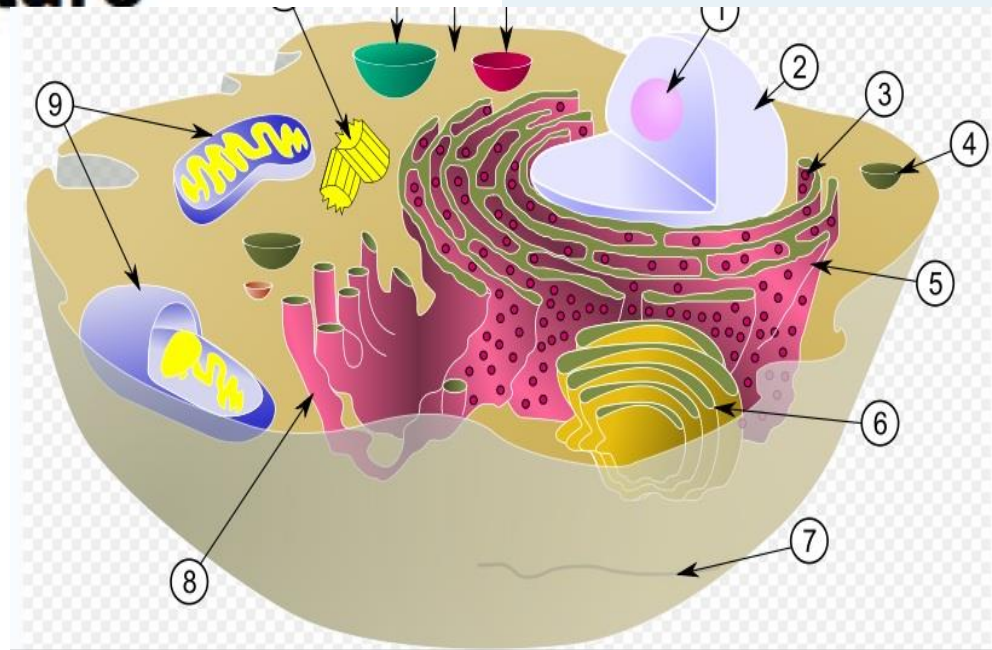
Doctor and the microscope



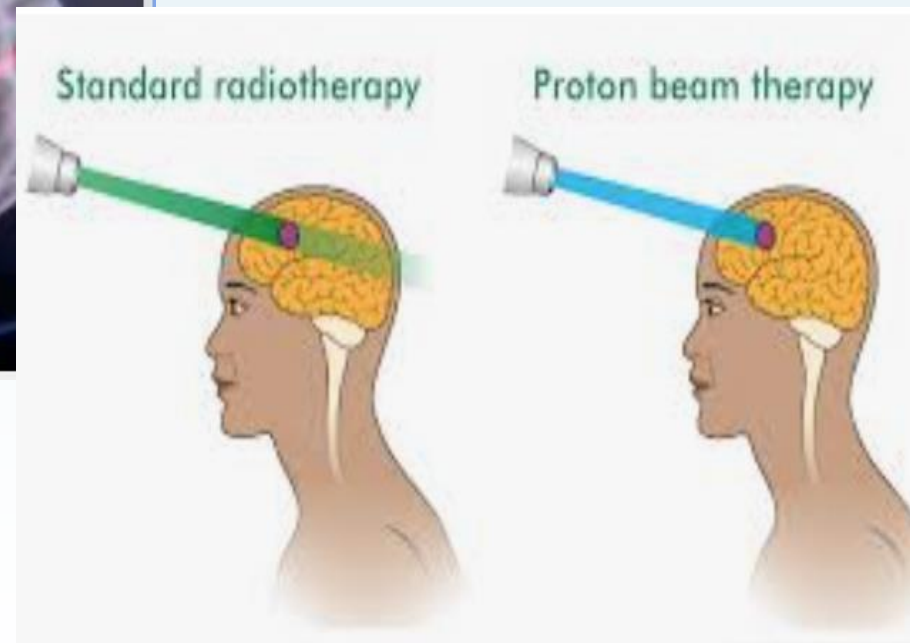


DNA – genome; the powerhouse of the cell

DNA structure

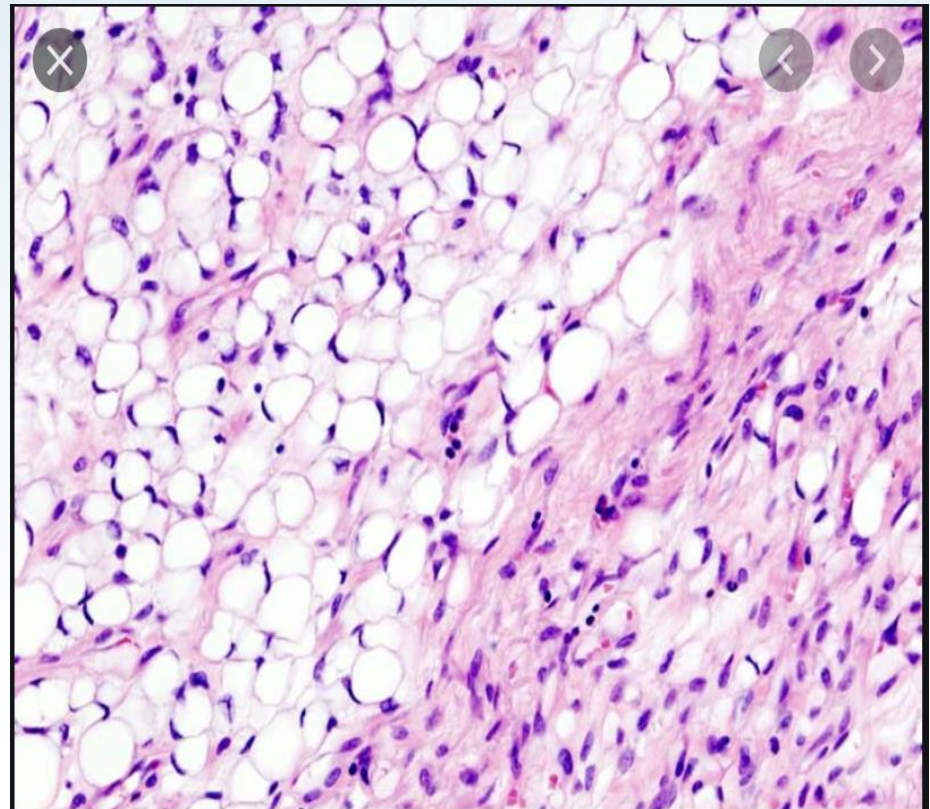
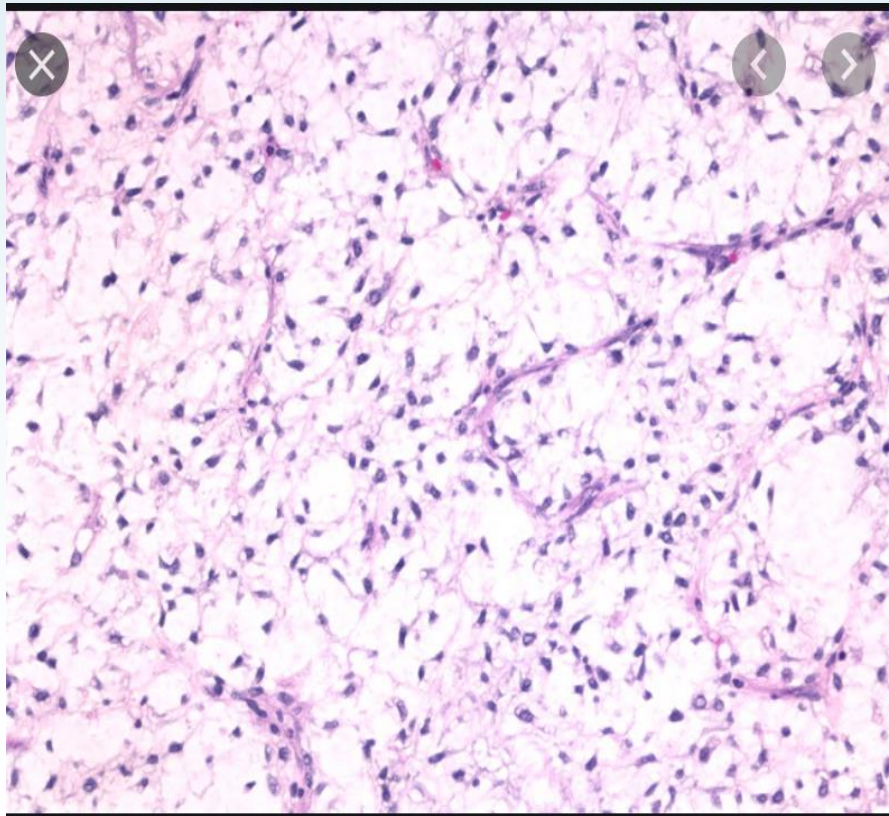


“Precision Oncology” Proton Beam Therapy



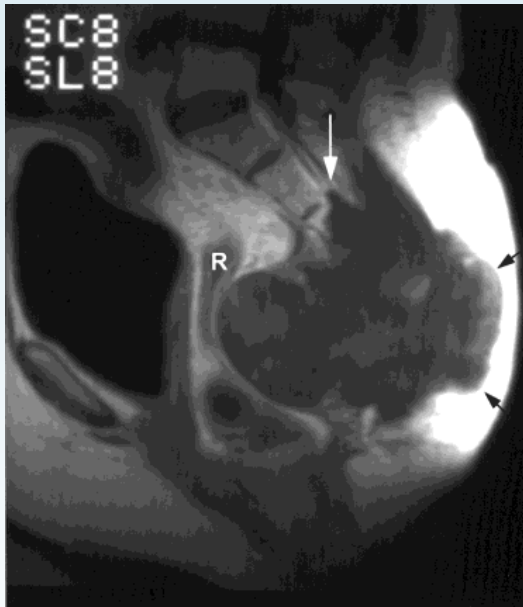
Precision Radiotherapy

- Myxoid liposarcoma



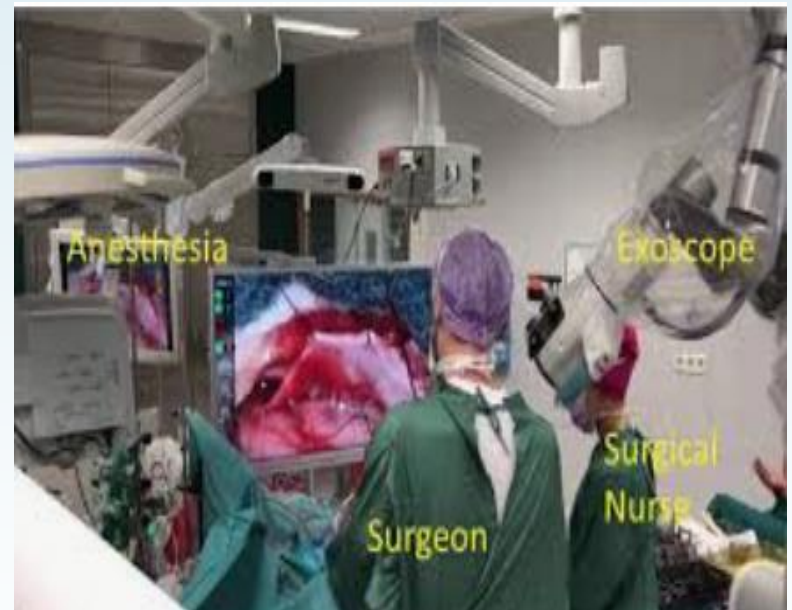
FUS-CHOP (DDIT3)

“Precision Oncology” Robotic-assisted Surgery



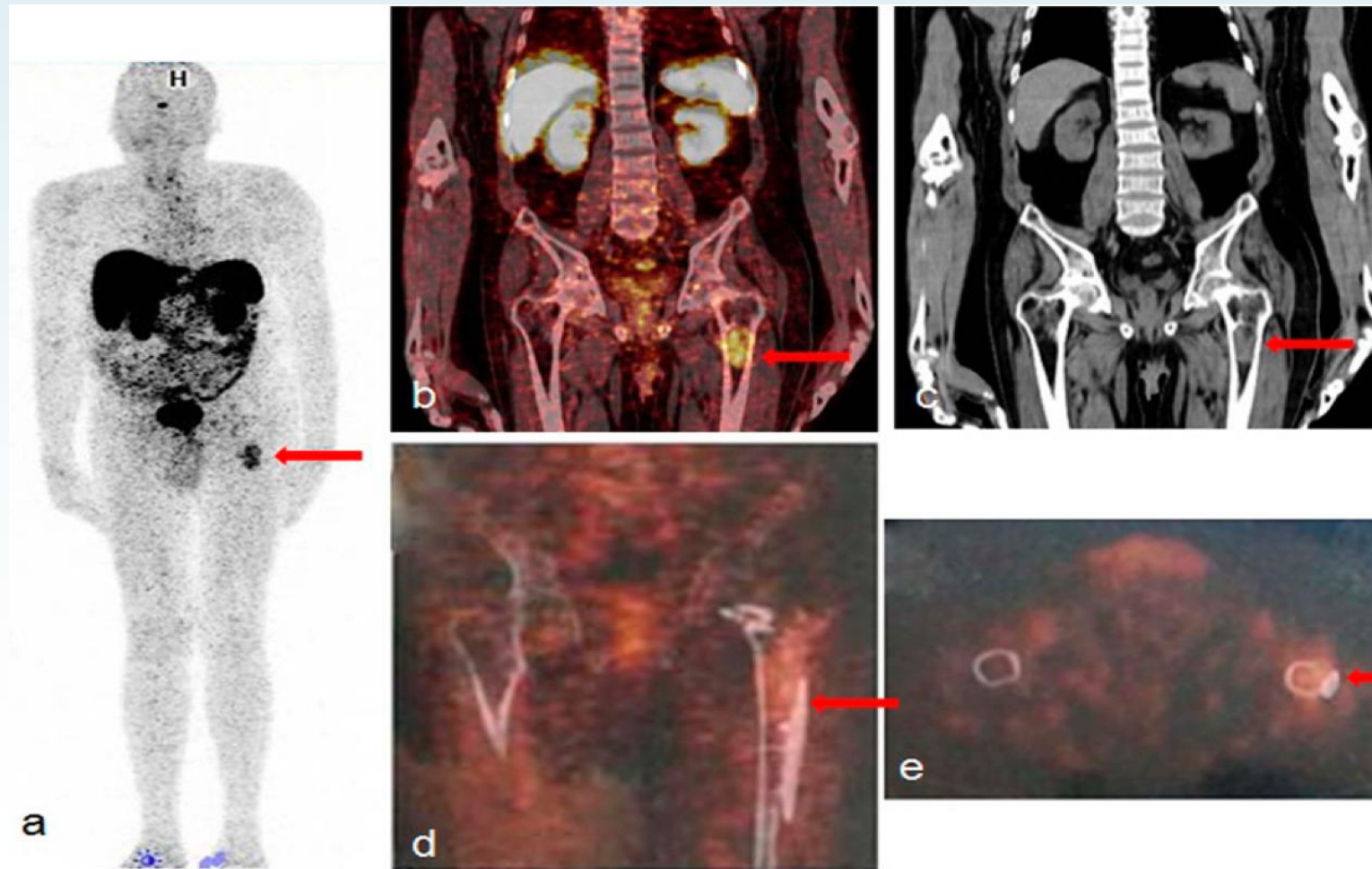
“Precision Oncology”

Exoscopic neurosurgery



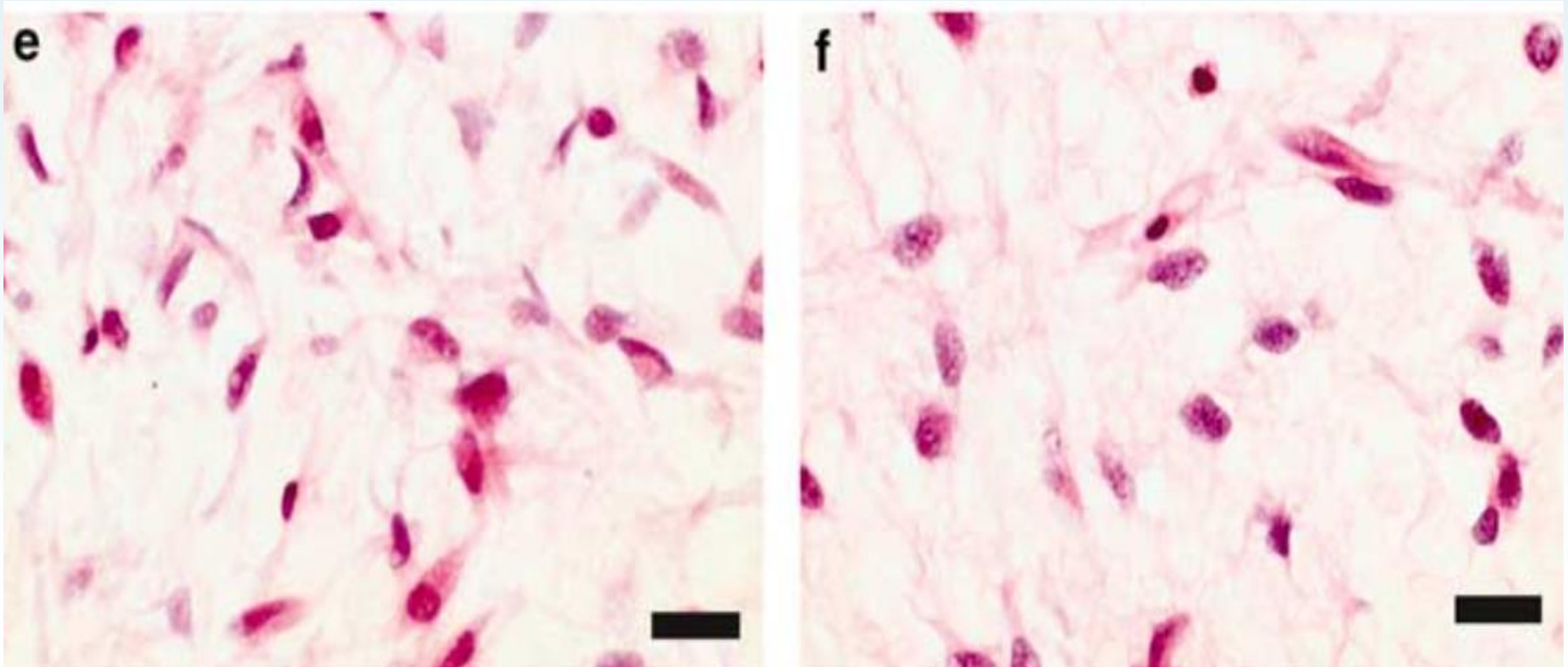
Precision Oncology – Imaging

^{68}Ga -DOTANOC positron emission tomography (PET)/CT



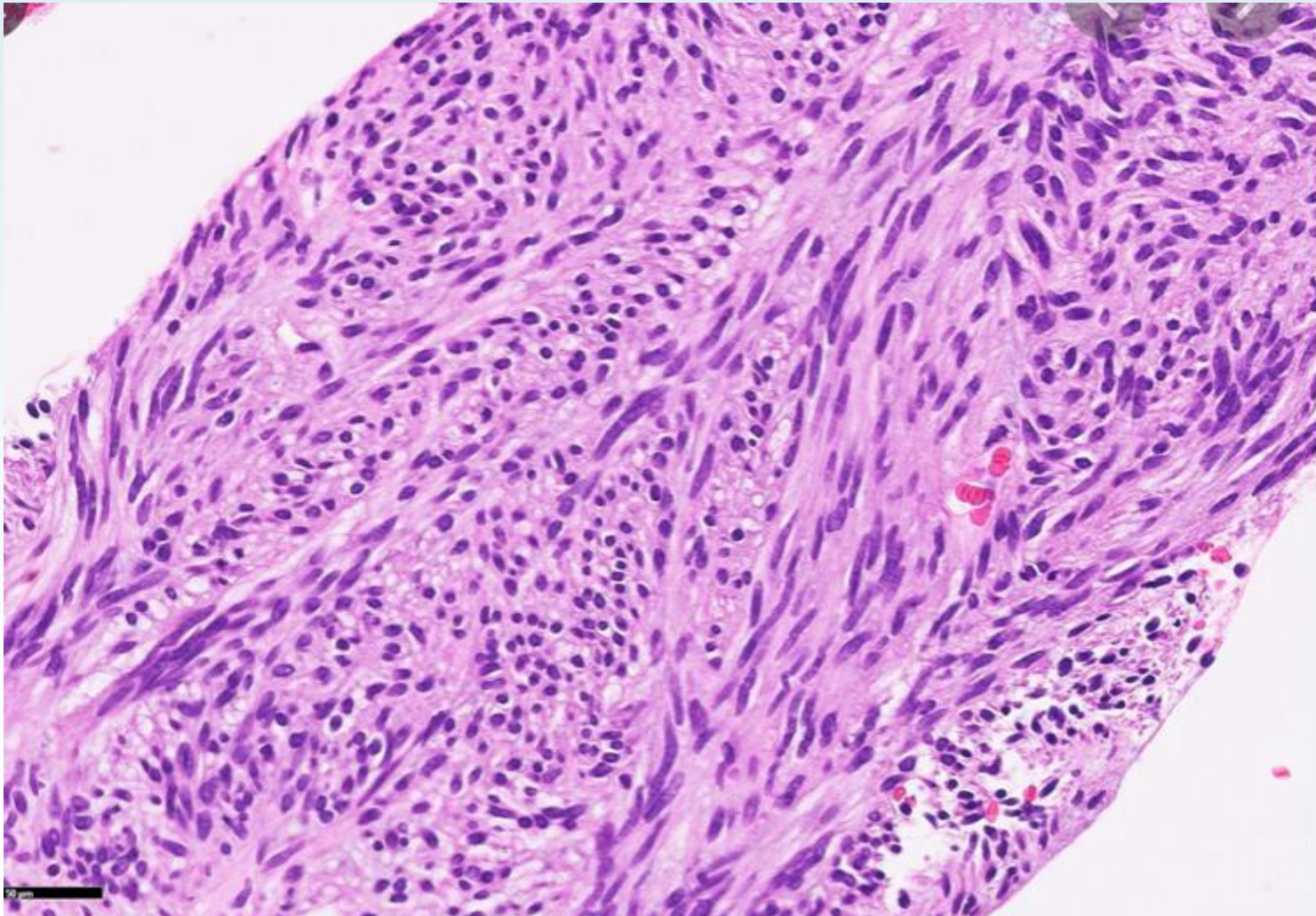
The challenge of sarcoma - diagnosis

1. Rare
2. Multiple types
3. Does not resemble normal tissue

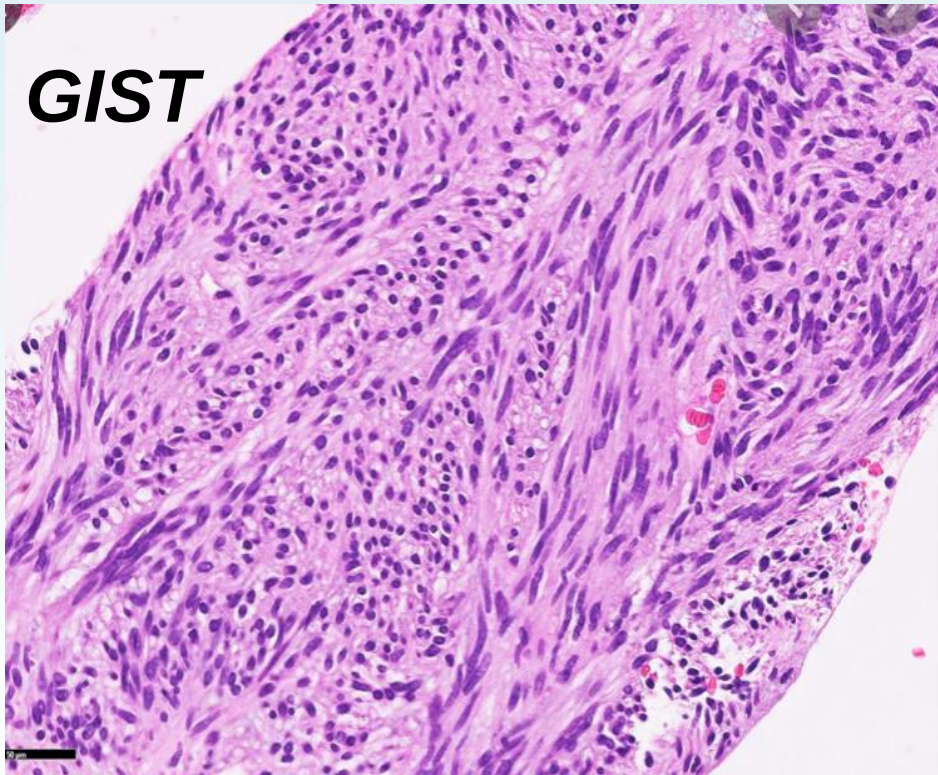


4. Getting the diagnosis right first time...One gene

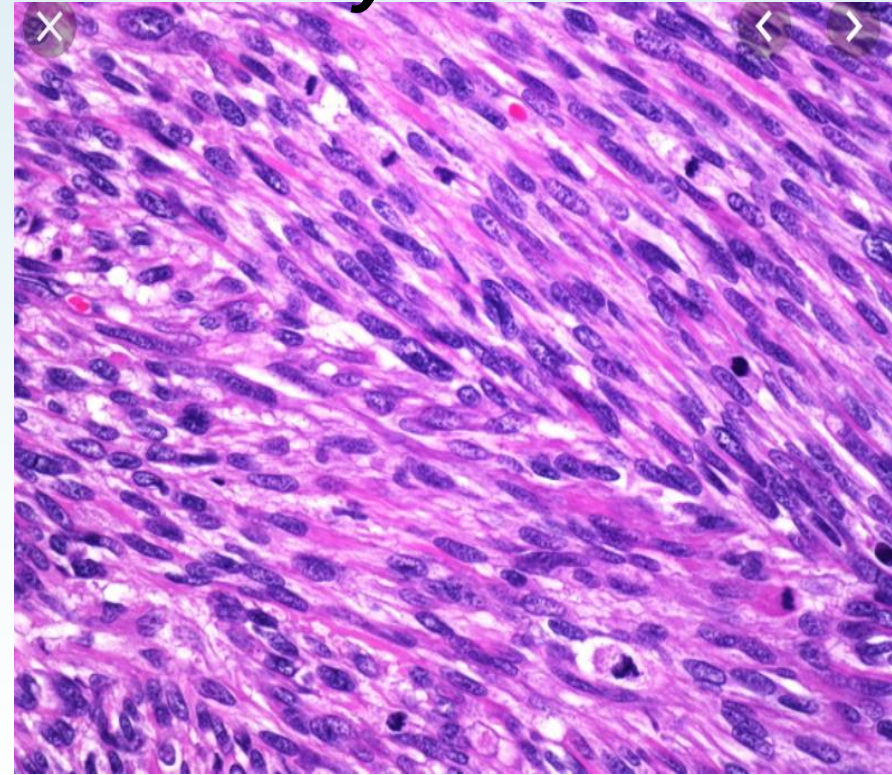
Spindle cell lesion in the abdomen



The challenge of sarcoma

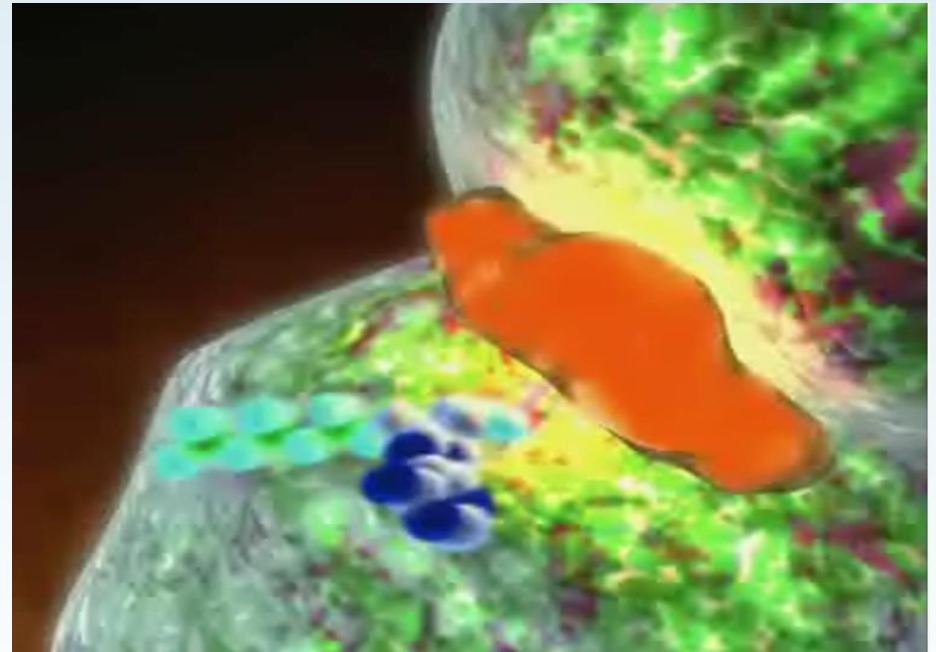
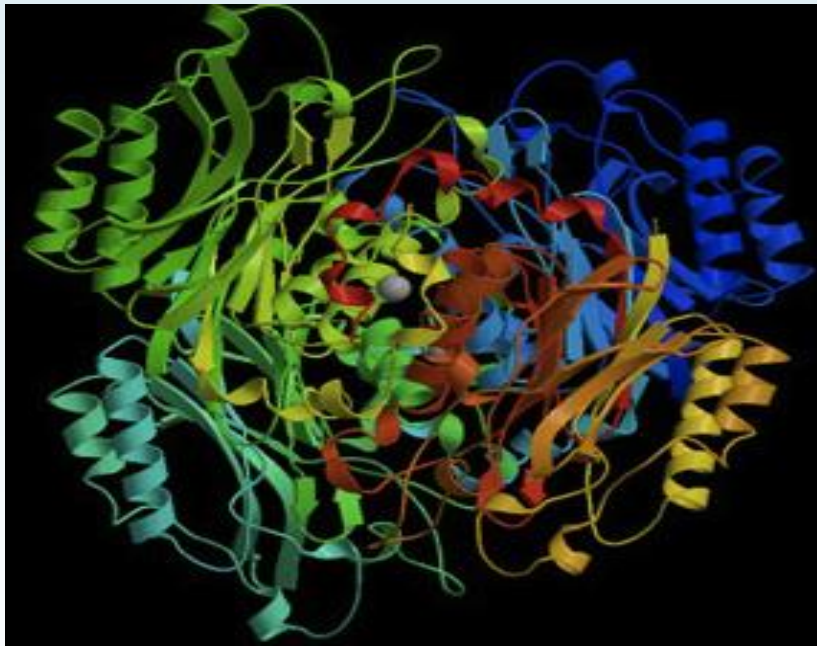


Leiomyosarcoma



Mutation in ckit / CD117

Basic research required



Tyrosine kinase receptors

And advances in sequencing technology

Targeted therapies

DNA – the double helix
it unzips to make copies of itself — confirmed suspicions that DNA carries life's hereditary information.

DNA structure



"We wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.). This structure has novel features which are of considerable biological interest."

22,000 genes

3 billion letters in a human genome



Whole genome sequencing of sarcomas?

Can we really make a difference?

Why do it?

20,000 genes

Genetic alterations

500 cancer genes

Junk DNA

Summary of a book vs an encyclopaedia

Why do it?

Sarcoma is different!

Why do individuals get sarcoma?

Particularly children

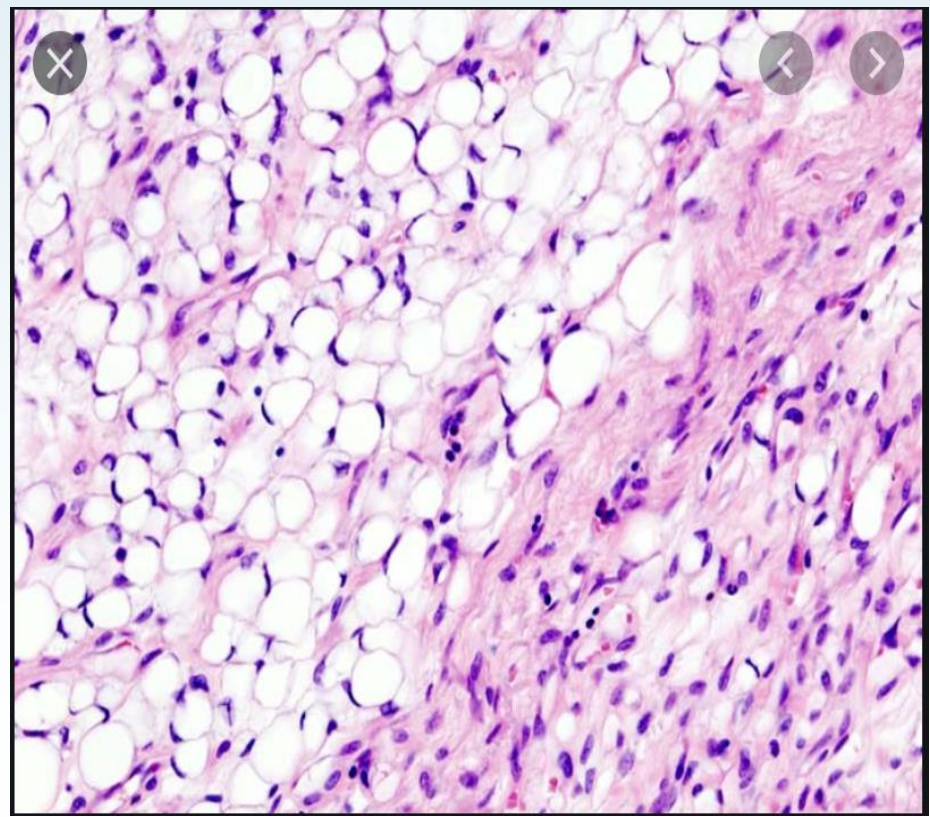
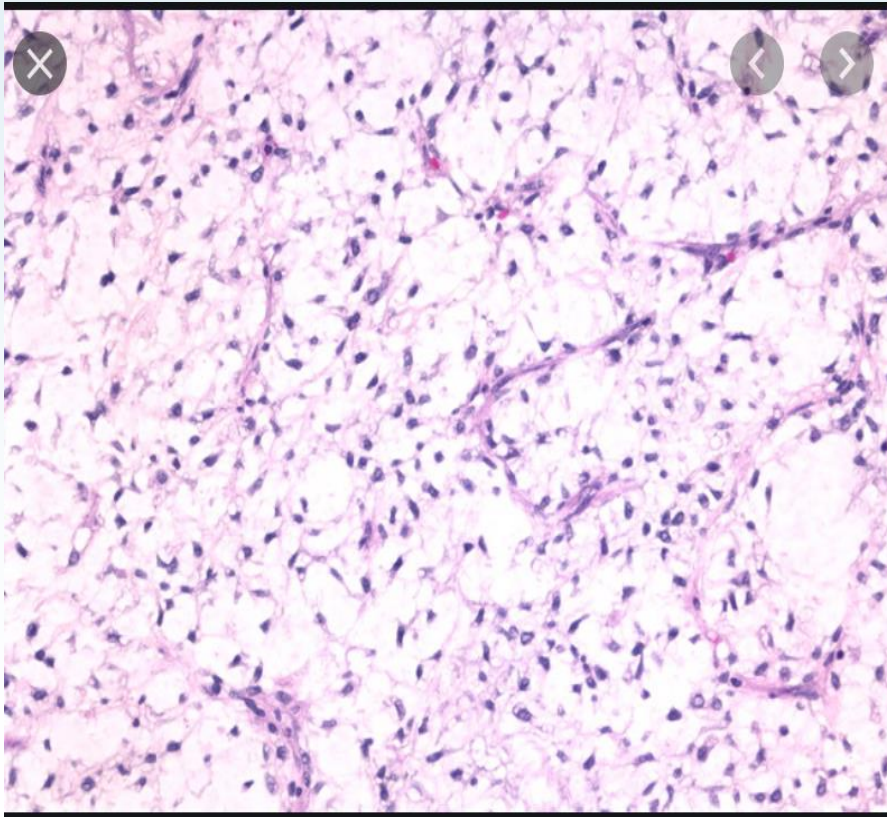
Improvement in survival

Osteosarcoma – chemotherapy?

Precision Radiotherapy

- Myxoid liposarcoma

Standard of care but not learning more



FUS-CHOP (DDIT3)

Why do whole genome sequencing?

Targeted 'hotspots' sequencing
Exome sequencing 2% of genome

Limited information
Standard of care

Single genes – Standard of care

Single gene alterations provides precise diagnoses

- Synovial sarcoma
- Ewing sarcoma
- Rhabdomyosarcoma...
- Synovial chondromatosis

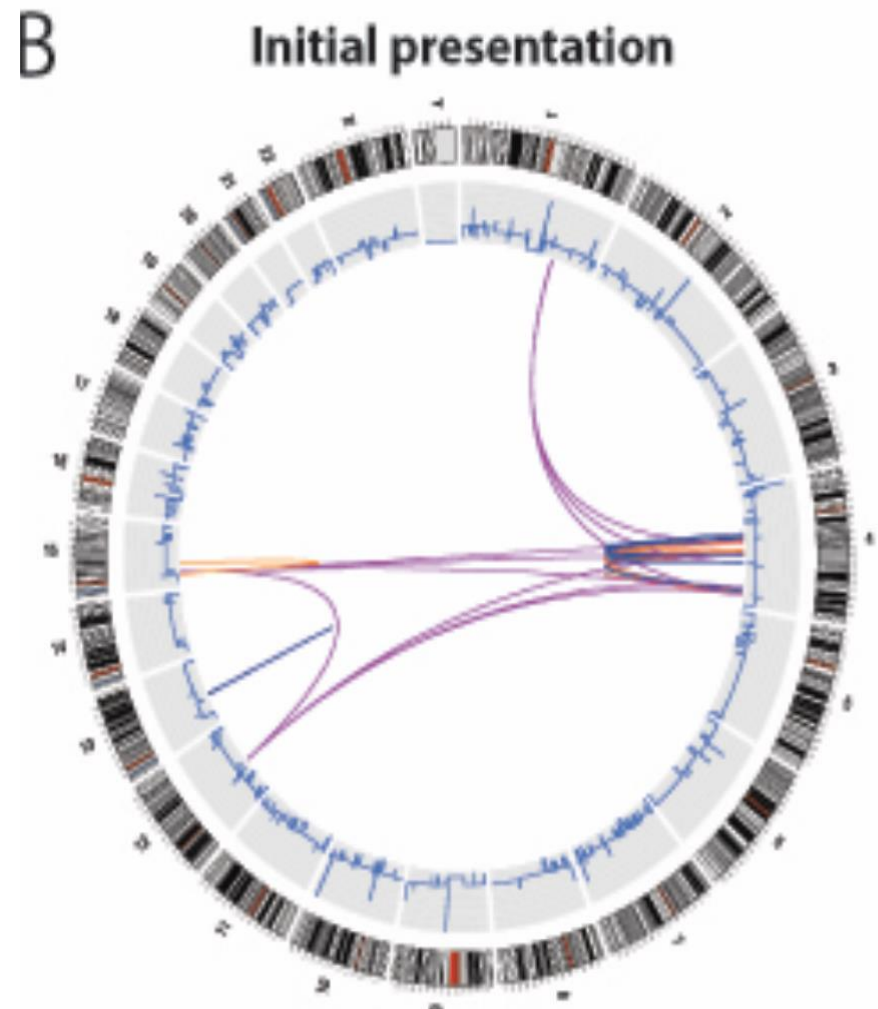
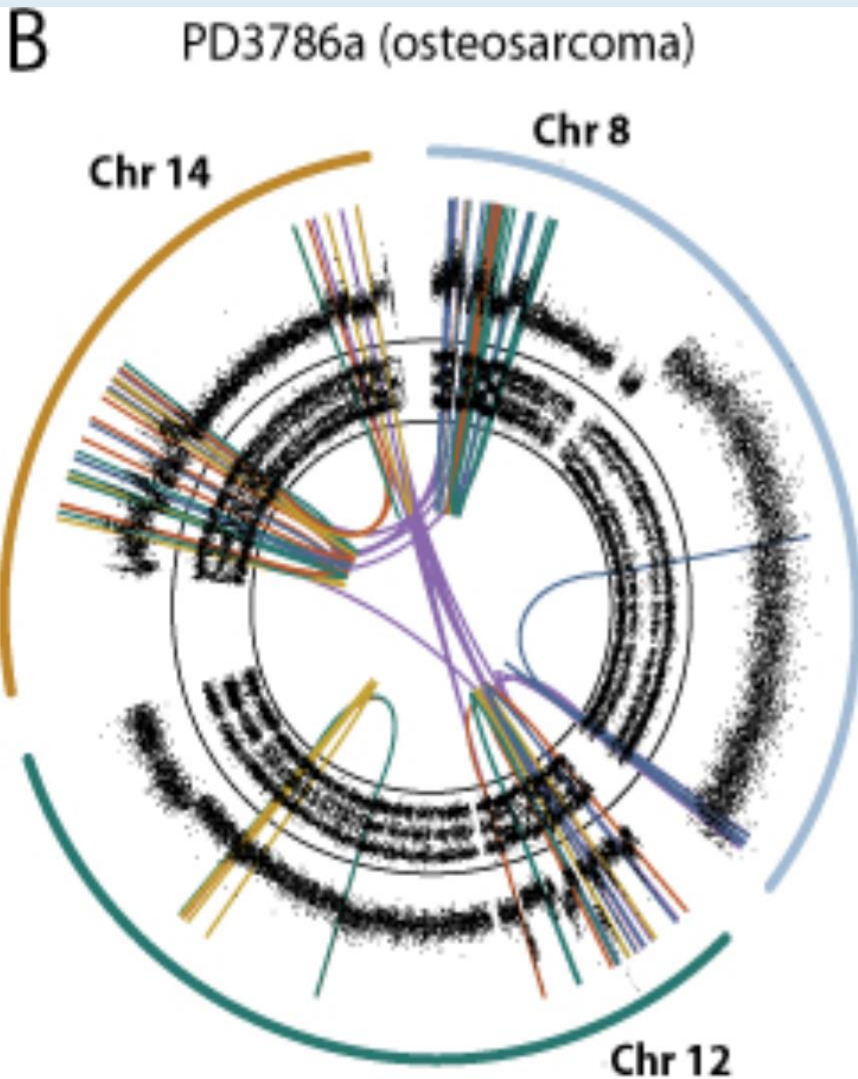
- **Prognosis**

Diagnosis of Sarcoma

The Cancer Genome Atlas Study - Sarcoma

- 25% of cases diagnosis altered
- Now important implications for treatment

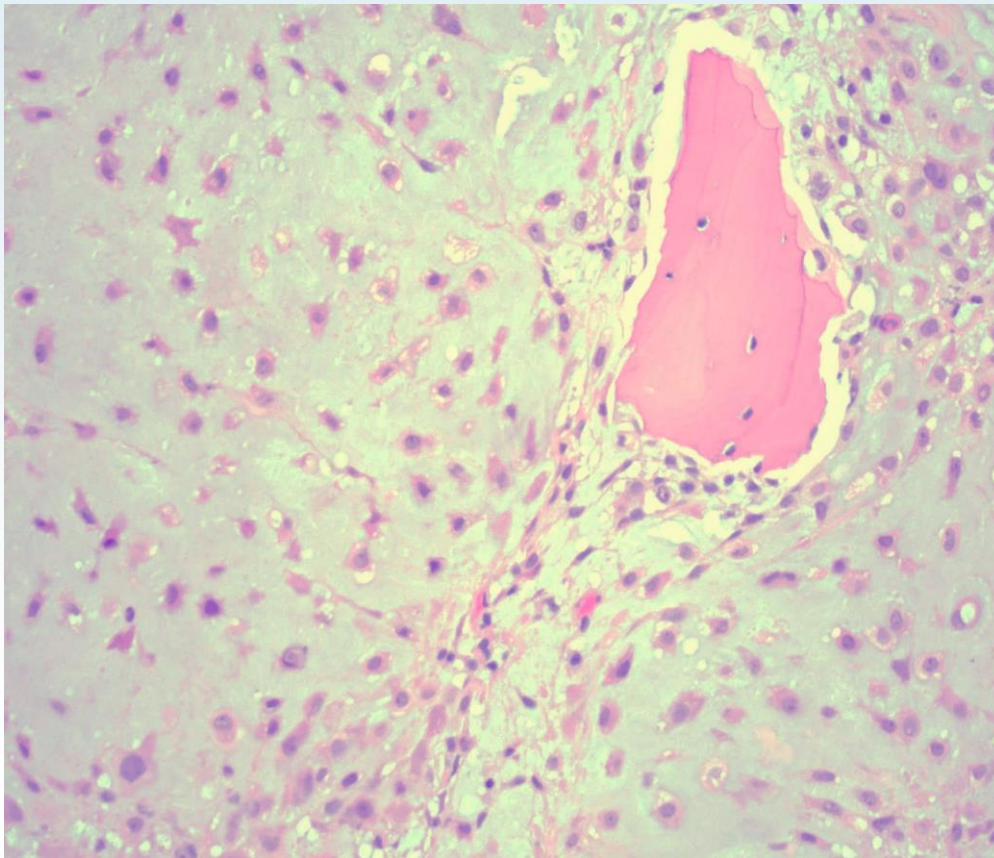
Chromothripsis



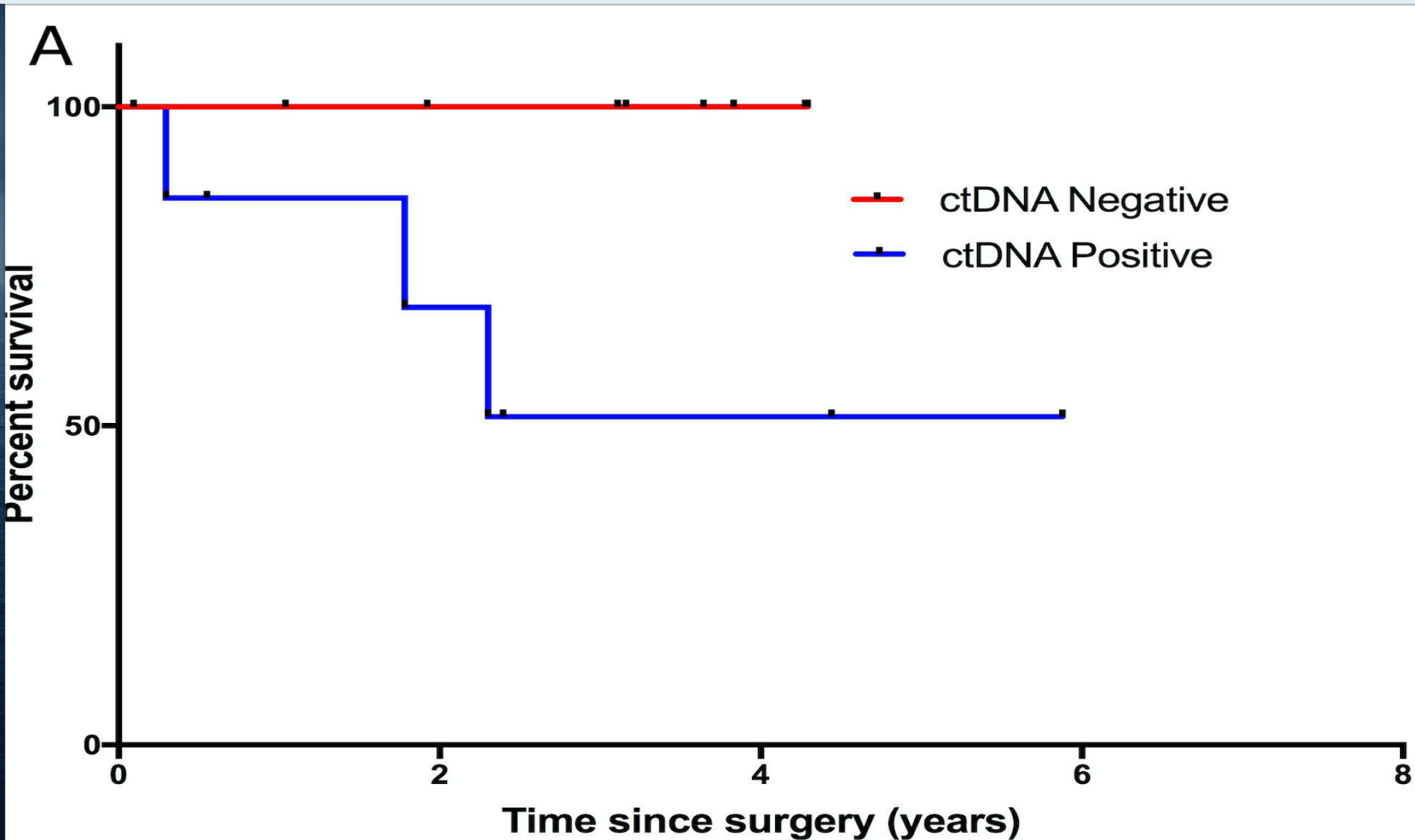
What has whole genome sequencing told us?

- Signature of radiation damage
- UV light damage
- Smoking

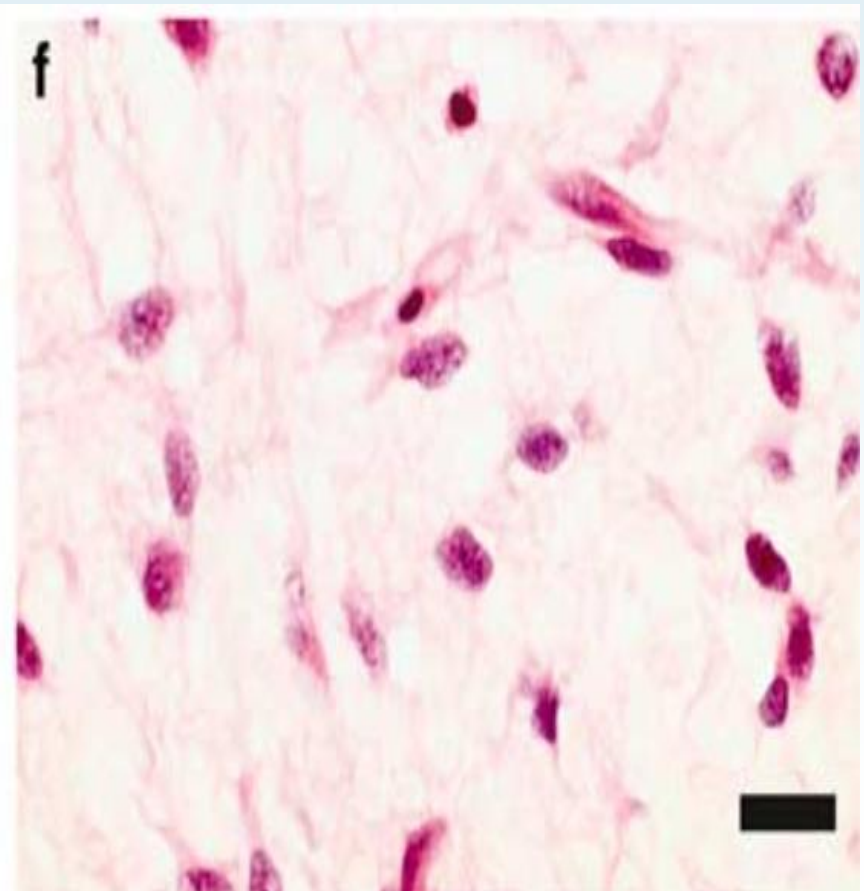
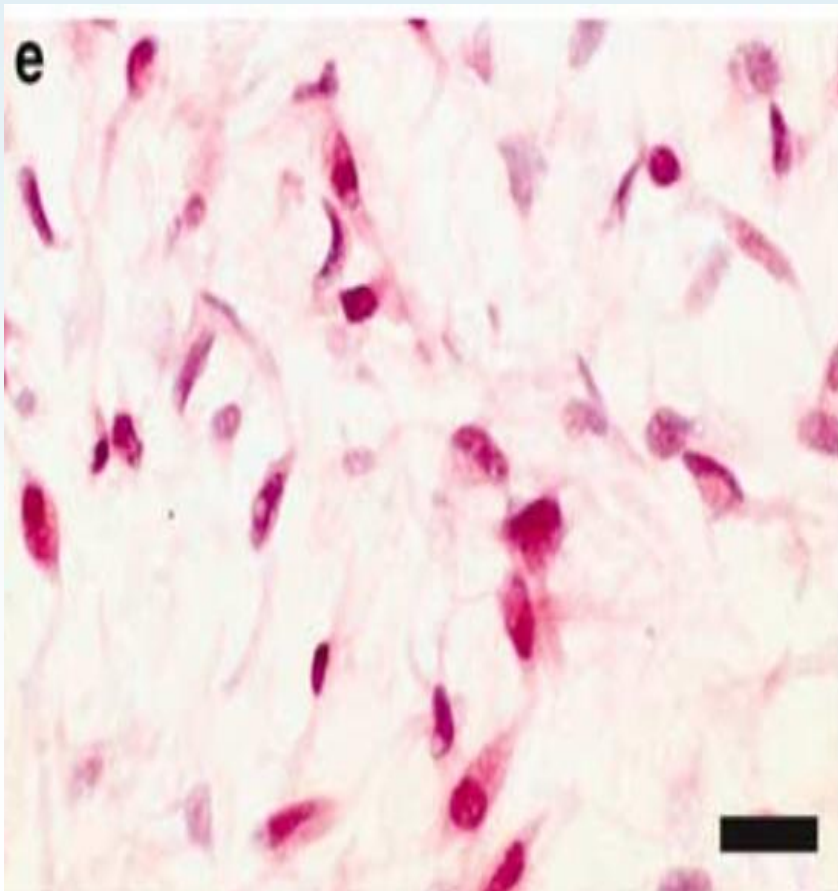
Tumour grading - chondrosarcoma



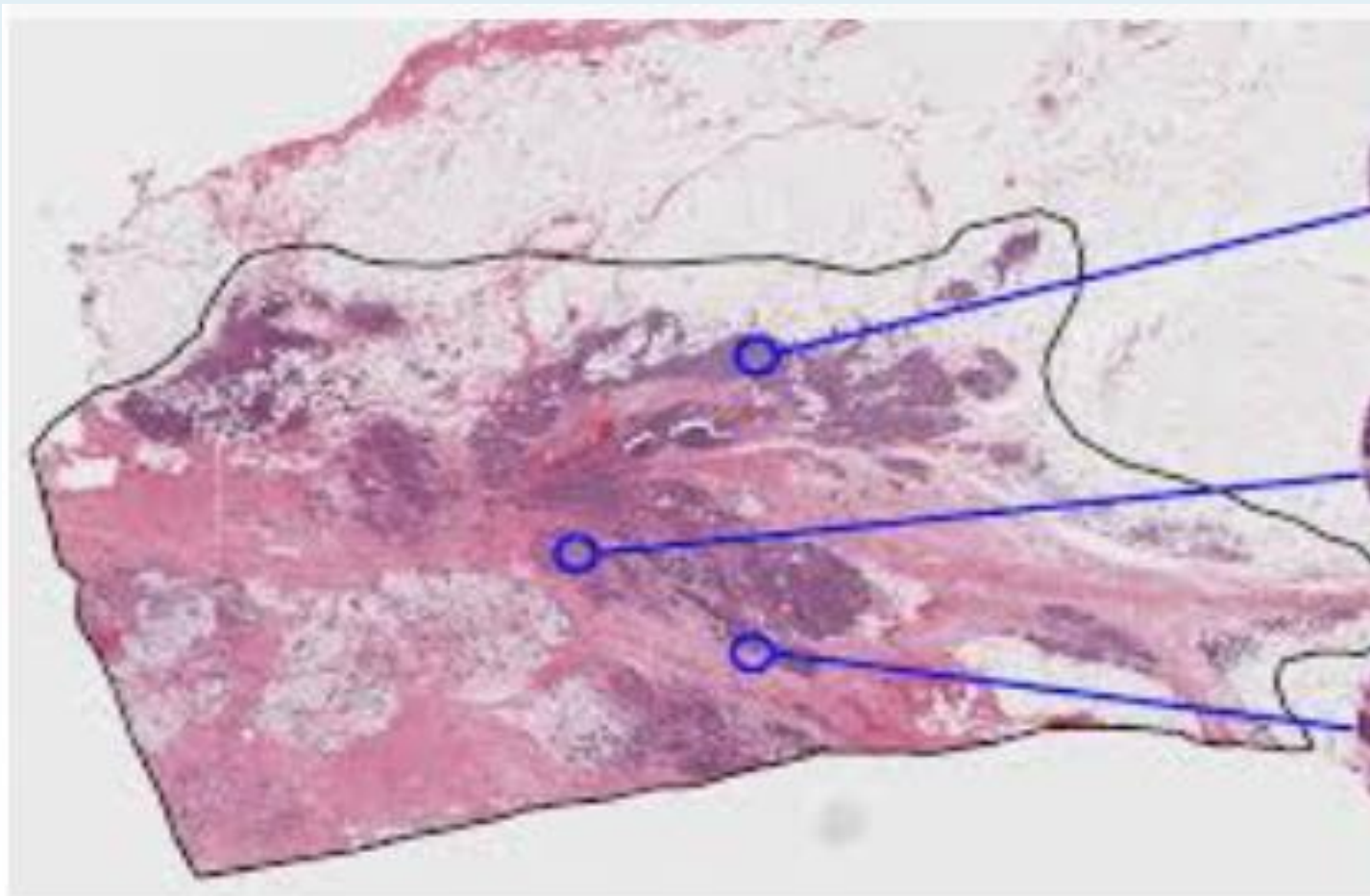
Chondrosarcoma with IDH1/2 mutations



“Precision Oncology” Digital Pathology



“Precision Oncology” Digital Pathology



Research does deliver results

- Infections
- Whole genomes gives us a 'full picture'
- Every aspect of the clinical pathway is important

Thank you

- Bone Cancer Research Trust
- Cancer Research UK
- Chordoma Foundation
- Chordoma UK
- Medical Research Council
- Rosetrees
- Sarcoma UK
- Skeletal Action Trust
- Tom Prince Cancer Trust