The Differences between Diagnostic and Therapy MRI

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Introductions

- What professions?

- Therapy Radiographer
- 16 years radiotherapy
- 10 years as pre-treatment imaging
- 3 years Proton therapy
- 2 Years MRI

The Christie Proton Beam Therapy Centre

- The first NHS national centre in the UK
- Opened 2019 – 1st year of service
- Treating varied cohort of patients
- Treating patients from across the UK with Proton beam therapy
- Fully integrated centre
  - 3 treatment machines
  - Full GA service
  - CT and MR imaging suites

Pre-treatment Imaging

- The process of preparing the patients for Radiotherapy/Proton Therapy
- First visit for many patients
- Immobilisation
- Imaging
  - CT scans
  - MR scans
- Staffed with mix of therapy and diagnostic radiographers

The Differences between Diagnostic and Therapy MRI

1. Purpose
2. Technique
3. Equipment
4. Knowledge and Skills

1. Purpose

How we use the images

- Images used exclusively to aid the planning process
- No characterisation, staging or additional diagnosis
- Must use CT date for planning radiotherapy
- Need more soft tissue information
- Used to identify anatomy
  - Organs at risk (OARs)
  - Nerves
  - Extent of tumour
  - Posts surgical changes

CT:MR Fusion

CT

MR

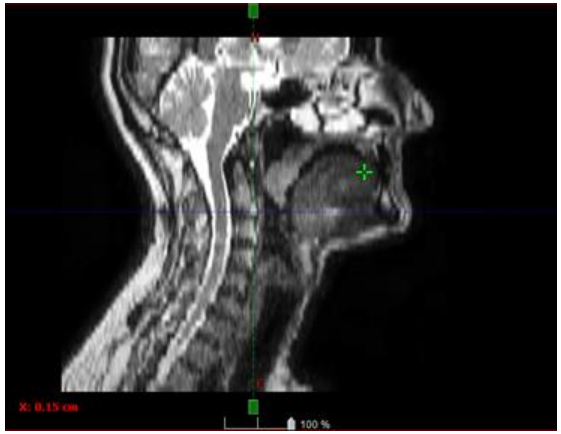
CT/MR

CT:MR Fusion

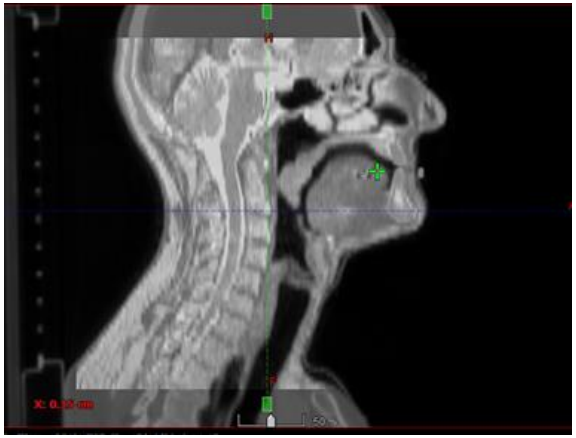
The Christie NHS Foundation Trust

CT

MR

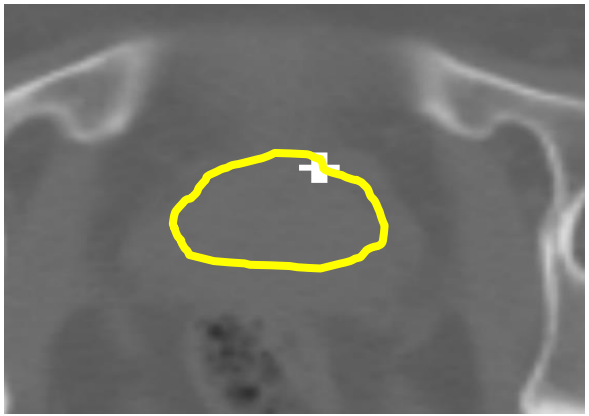


CT/MR



Contouring

CT



Vs

MR

2. Techniques

Requirements

	Treatment Planning MR	Diagnostic MR
FOV	Body contour/bony anatomy on scan	Can use reduced FOV
Slice Thickness /gaps	1-3mm slices, no gap/isotropic 3D<1mm	3-5mm slices, 0-2mm gaps
Slice angles and orientation	Axial orientations, **Do not Angle!**	Orientation angled to match the anatomy
Geometric Distortion	e.g <2mm over VOI, 3D sequences preferred	Tolerated
Patient Positioning	Imaging in the treatment position	Imaging in Free positon, close to coils

2. Techniques

How do we manage this?

- Protocol driven
  - Control FOV
  - Slice numbers
  - Slice thickness
  - Geometric distortion measured
- Exam cards assigned to specific anatomical site and diagnosis

2. Techniques

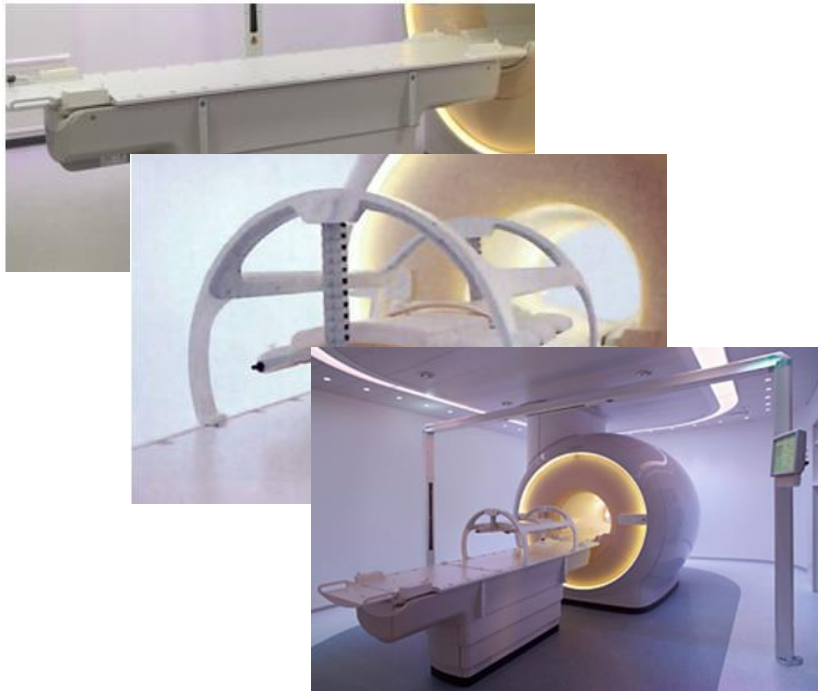
Challenges

- Covering disease extent
  - Volume imaging 3D, more slices add significant time
- Positioning and immobilisation
- Coils
  - Less channels and often further from patient surface
- Education of referring centres
  - Images used for pre-surgical comparison are diagnostic
  - Needing to educate referrers

3. Equipment

The Scanner

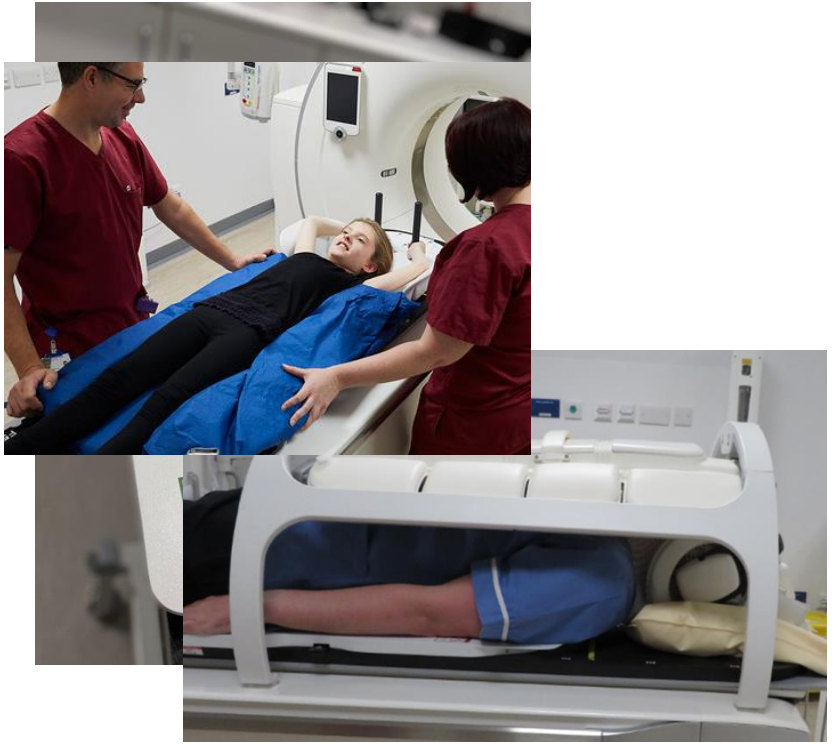
- Flat table top
- Coil bridges and supports
- Alignment lasers
- QA programme/equipment for MR-RTP
- Optimised MR-RT sequences



3. Equipment

Immobilisation

- Scanned in treatment position
- Flat couch top
- MR safe immobilisation
- Coil positioning around equipment
- Unable to use coils such as head and head and neck coil



4. Knowledge and skills

Staffing - A synergistic approach

Therapy Radiographers

- Extensive radiotherapy knowledge and experience from undergraduate programme
- Specialist imaging team with relevant experience
- Knowledge of
  - Patient positioning
  - Immobilisation
  - Pathways

Diagnostic radiographers

- Expert knowledge MR from experience undergraduate and post graduate learning
  - MR Safety
  - Anatomy
  - Sequence adjustment planning

4. Knowledge and skills

Bridging the Gap - Challenges

Therapy Radiographers

- Limited exposure to MR imaging
- Limited knowledge or skills especially regarding safety
- Limited knowledge in sequence development
- Limited inclusion in undergraduate programme
- Few post graduate training programmes relevant to therapy radiographers
- Limited guidance/legislation regarding requirements for education and learning

4. Knowledge and skills

Bridging the Gap - Challenges

Diagnostic Radiographers

- Limited exposure to radiotherapy
- Limited knowledge or skills regarding immobilisation, patient pathways and radiotherapy challenges
- Limited awareness of dosimetric implications of position or equipment
- Limited inclusion of radiotherapy in undergraduate programme
- Few relevant post graduate training programmes on radiotherapy pathways

4. Knowledge and skills

Bridging the Gap – The solution

The MR RT Radiographer

- Knowledge an skills in both MR specific for radiotherapy planning and the radiotherapy pathway
- Extended scope of practice
- Diagnostic or Therapeutic radiographer

4. Knowledge and skills

Bridging the Gap – The Christie

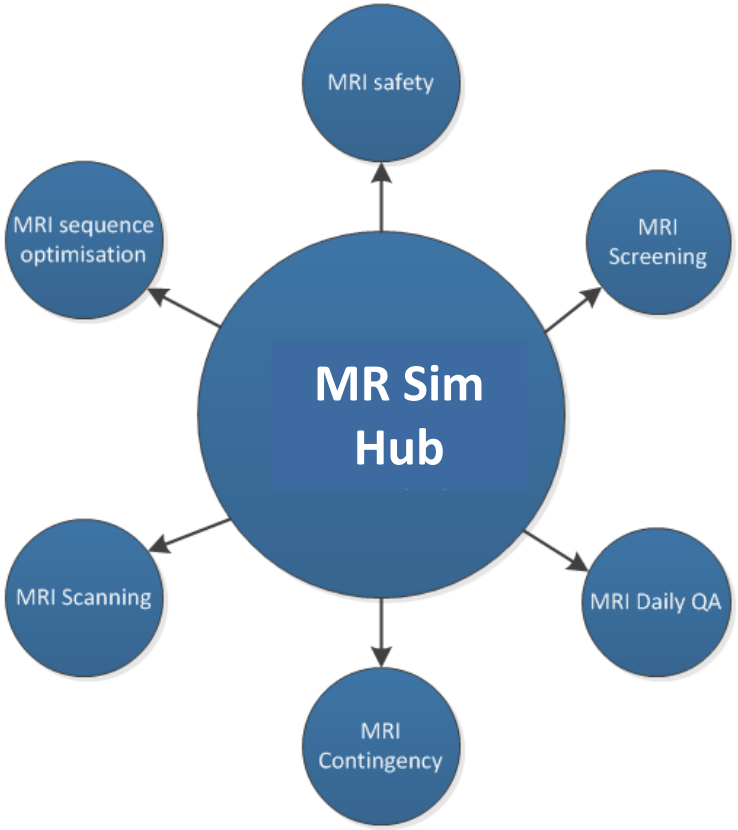
- Two professions, one training package
- In house training model developed by The Christie Radiotherapy Education team and PBT MR radiographers
- Hub and spoke system
- Modular training system
  - Developing specific core attributes based on needs of the learner
    - Knowledge
    - Skills

4. Knowledge and skills

Bridging the Gap

Hub & Spoke

- Training and trainers guides
    - Tell us what we need to teach and learn
- Assessment guides
    - Evidence assessment
    - Different methods of assessment



The MR RT Radiographer

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Questions?

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