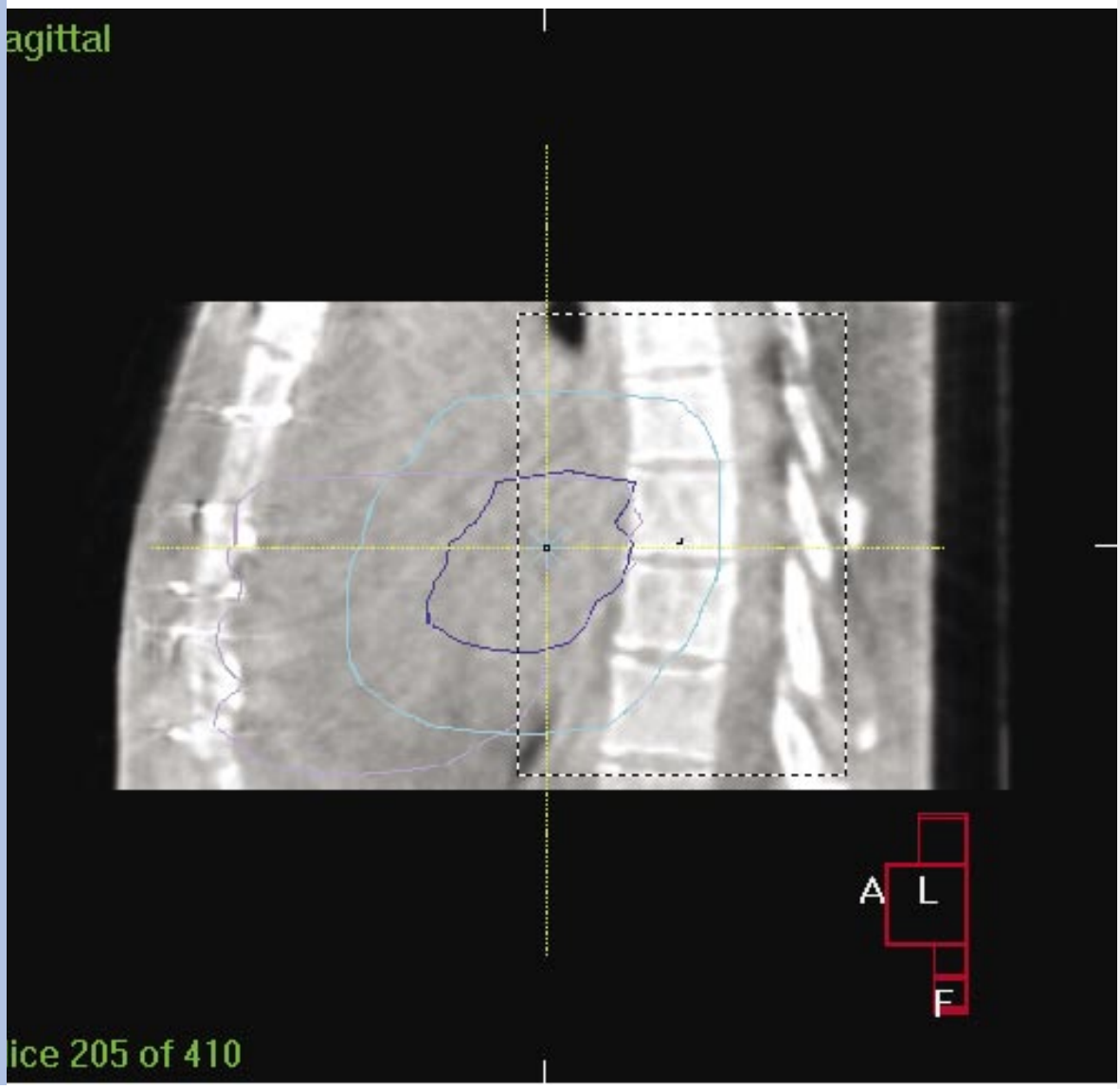
Case Study



Treatment of left atrium myxoid sarcoma using Elekta Synergy®

Institution: The Christie Hospital NHS Trust, Manchester, UK
Wade Centre for Radiotherapy Research
Patient: Female, 37 years
Diagnosis: Left atrium myxoid sarcoma
Plan: Five-field IMRT
Image guidance: Elekta VolumeView™ on-line correction
Positioning: In-house immobilization
Treatment: 60Gy in 33 fractions
V20 <25%
Spinal cord dose <45Gy

ELEKTA®

Christie Hospital NHS
NHS Trust

Treatment of left atrium myxoid sarcoma using Elekta Synergy®

Radiation Therapists: **Claire McCarthy, Michelle Duffy, Julie Davies, Julie Stratford**
Radiation Oncologist **Dr. J. Wylie**

Patient history and diagnosis

A 37 year-old female developed right-sided chest pain which rapidly worsened and lead to the patient's collapse. A cardio echo scan revealed cardiomegaly with a filling defect in the left atrium extending through to the left ventricle. The patient went on to have open-heart surgery, where a tumor arising in atrial septum was discovered measuring 6cm x 3cm. Histology revealed the tumor to be a pleomorphic high-grade myxoid sarcoma. The initial concern was to gain local control of the disease, and taking into consideration the patient's age and otherwise excellent physical health, a course of radiation therapy was planned. The intention was to deliver a reasonable dose of radiation to a limited volume of the heart.

Planned Treatment

The clinical target volume (CTV) was identified as the left atrium, and a margin of 2cm was applied in all directions to generate the planning target volume (PTV). The dose limiting regions were the left ventricle and lung. A total dose of 60Gy in 33 fractions was prescribed. The V20 (volume of lung receiving >20Gy) was kept below 25%. The ventricle dose was kept as low as was reasonably practical and the dose to the spinal cord was maintained <45Gy. Due to the high degree of dose conformity required to avoid critical structures while delivering the planned dose, a standard conformal plan was not suitable (an initial standard conformal plan produced a V20> 25% and resulted in a high dose to the ventricles) and a five-field intensity modulated radiation therapy (IMRT) plan had to be employed. Mega-voltage imaging was deemed as unsuitable for verification purposes due to the location of the target volume and Elekta VolumeView™ 3D imaging was requested as an alternative.

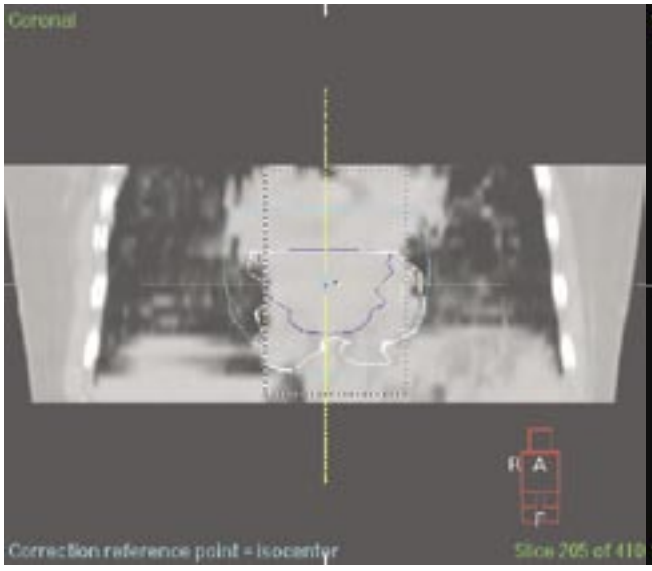


Figure 1: coronal reconstruction radiation therapy planning scan

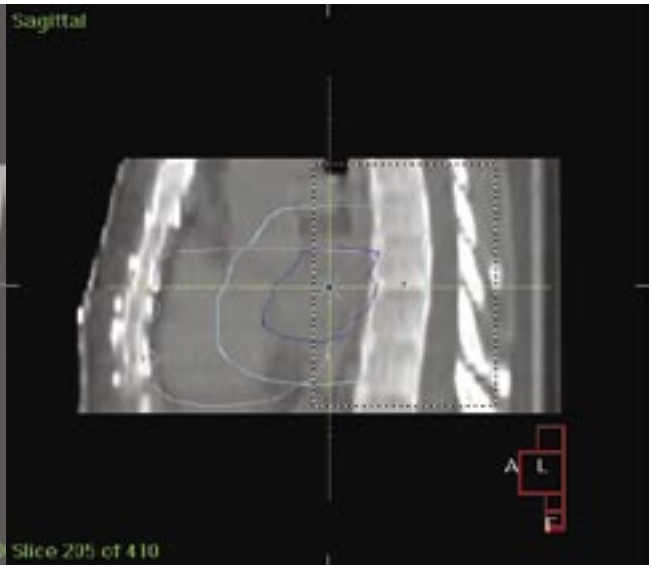


Figure 2: sagittal reconstruction

Figure 3: radiation therapy planning scan – transverse slice

Treatment time = 20 minutes:

3 mins.	positioning
2 mins.	acquisition
3 mins.	registration
2 mins.	set-up correction
10 mins.	IMRT treatment

Treatment using an image guidance technique

The patient was placed supine with arms above head using an in-house immobilization device. This ensures the reproducibility of the arm position on a day-to-day basis. Set-up tattoos were placed on the anterior, right and left lateral chest for set-up purposes and a previously established move from tattoos to isocenter was performed on a daily basis.

Due to the level of precision that was required, Elekta VolumeView™ 3D images were acquired and an on-line image registration and correction protocol was used for the first three fractions. This meant that if any deviations occurred which were greater than 3mm, an instantaneous correction could be applied. After three fractions the systematic and random errors were calculated; these demonstrated that the largest error was 2mm in the cranio-caudal direction. Consequently, further Elekta VolumeView™ 3D imaging was carried out, off-line, on a weekly basis.

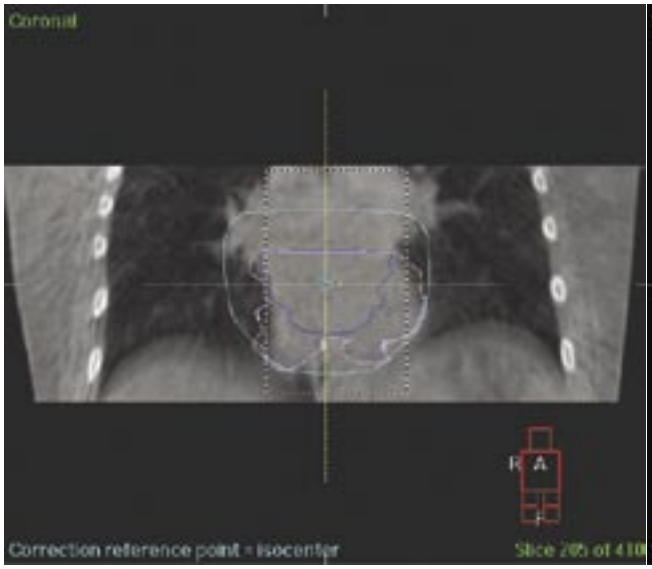


Figure 4: VolumeView™ image coronal plane reconstruction

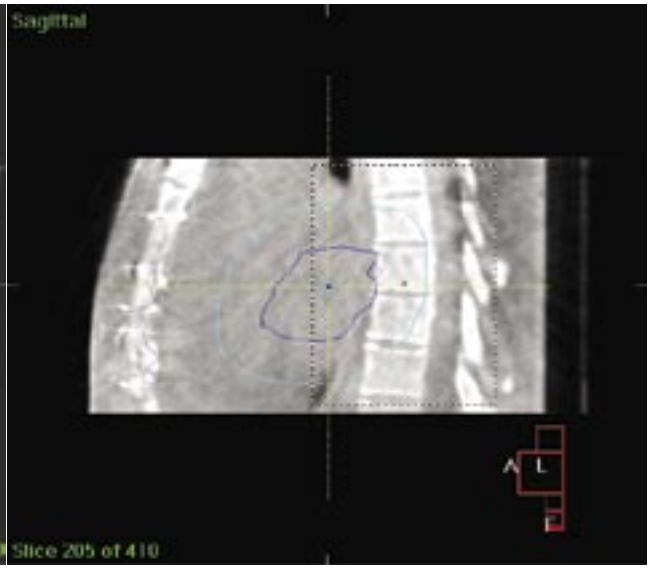


Figure 5: VolumeView™ image sagittal plane reconstruction

Continued overleaf

Figure 6: VolumeView™ transverse plane reconstruction

The areas of particular concern during the imaging process were the position of CTV, the position of the spinal cord in the dorsal/ventral plane and the right/left isocenter position in relation to lung volume.

Outcome and follow-up

The patient tolerated the treatment extremely well. The only obvious acute toxicity was mild oesophagitis and skin erythema over the back at the time of writing. This patient has only just completed treatment and not yet reached first follow-up.

Discussion

The diagnosis of this patient is the first notable point. Heart sarcomas are exceedingly rare and they tend to be highly aggressive so initial local control at an early stage is important. The fact that we had superior imaging capabilities with soft tissue visualization, in the form of Elekta VolumeView™ 3D imaging, to verify the target position gave us the confidence to design highly conformal IMRT for this patient. This in turn allowed us to deliver an acceptable dose of radiation to the CTV whilst minimizing the dose to critical structures.