



# Radiotherapy in Practice

August 2016

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# Introduction and learning objectives

- This interactive clinical case supports 'Module 3: radiotherapy in practice'
- It should take less than 30 minutes to complete

By the end of the case you should:

- Have an understanding of a patient's pathway from diagnosis to completion of radiotherapy treatment
- Be able to provide basic information about radiotherapy treatment to patients

A 68 year old lady, Mrs Donnelly, presents to her GP with a chronic cough. She has a background of COPD, a previous right breast cancer treated with a wide local excision only in 2001, and hypertension.

Her medications include:

Seretide 2 puffs twice daily

Tiotropium 1 puff once daily

Salbutamol 2 puffs as needed

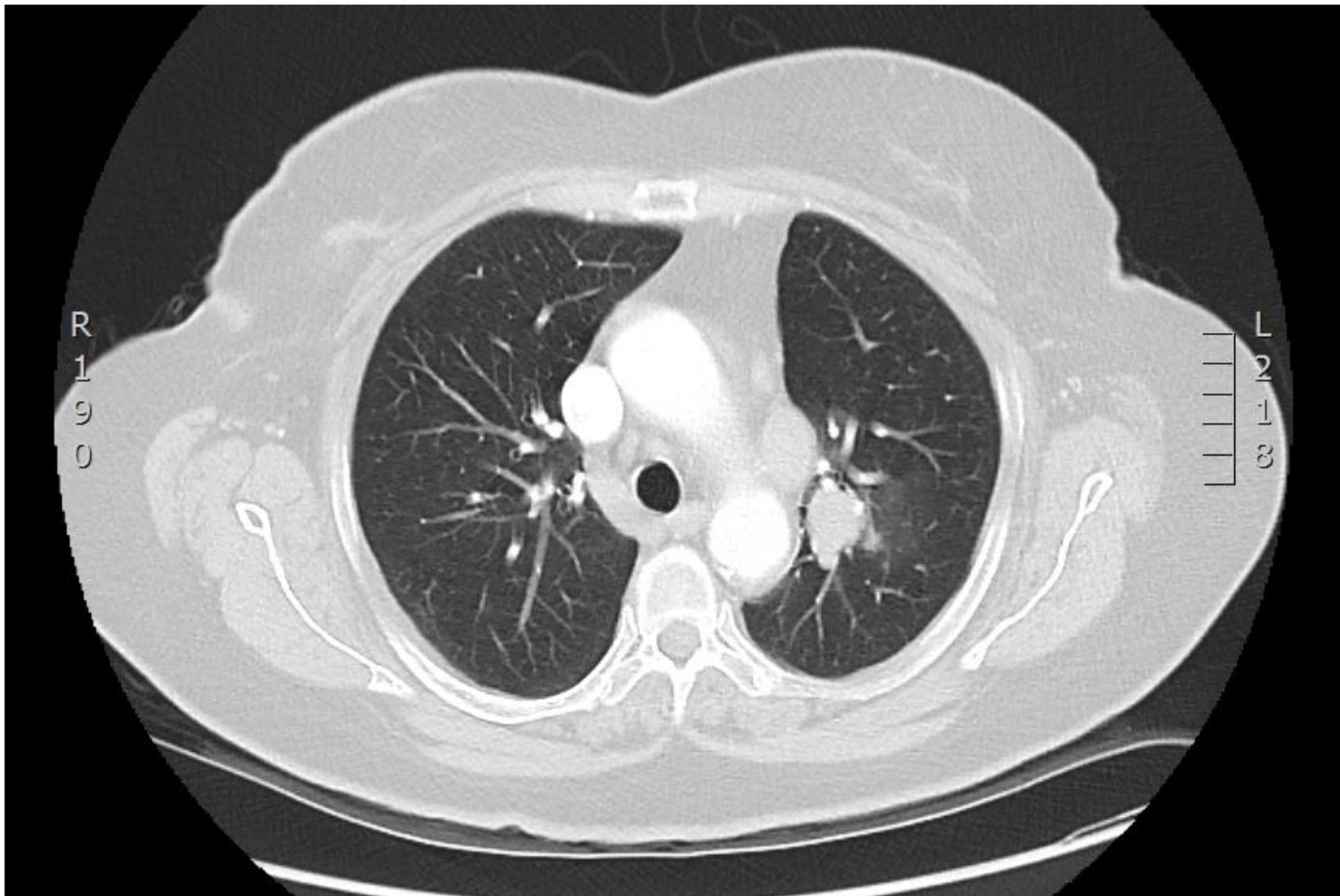
Ramipril 2.5mg once daily

Amlodipine 10mg once daily

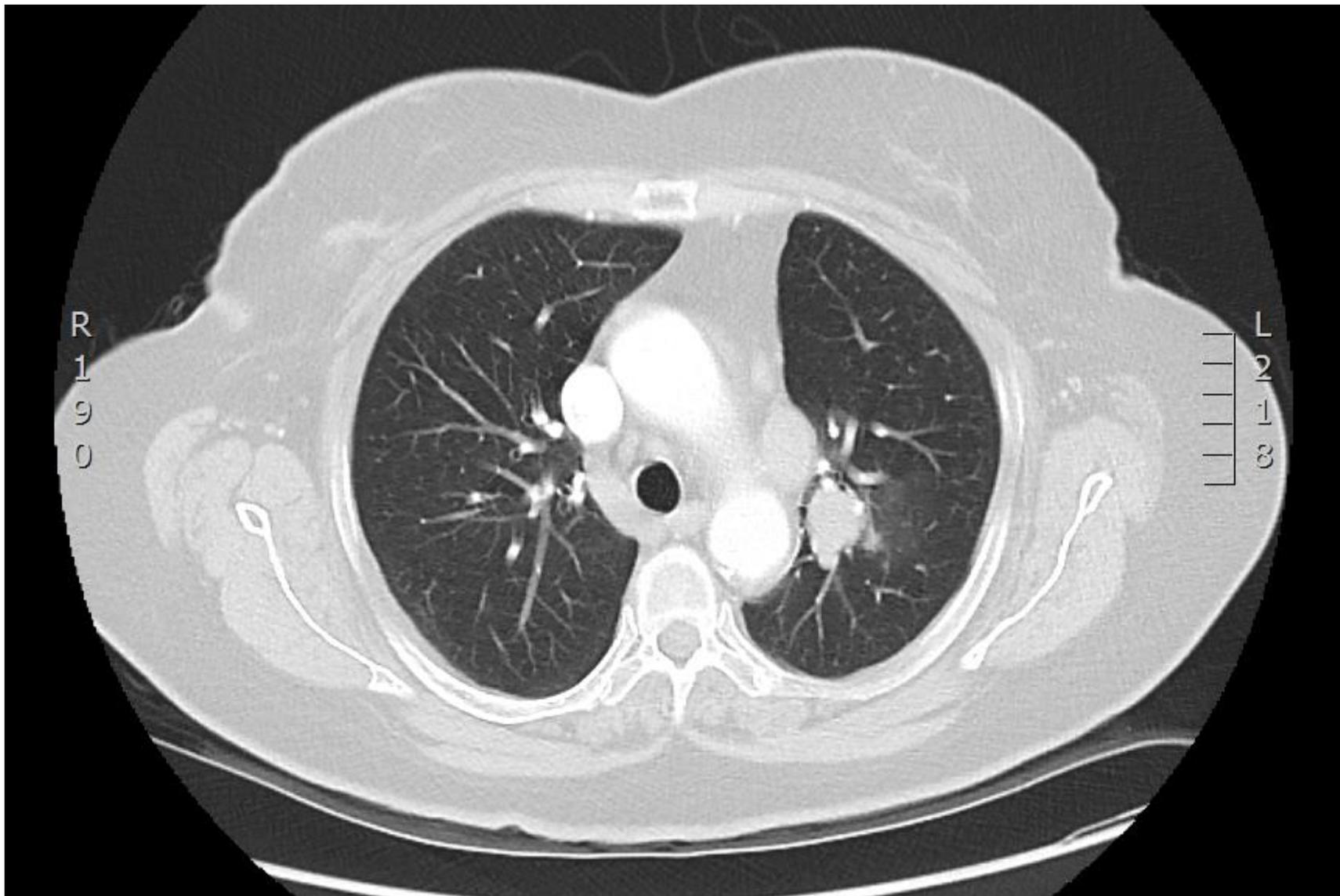
Aspirin 75mg once daily

Atorvastatin 10mg once daily

An initial chest radiograph shows a possible hilar mass, and she has a CT scan to investigate further...



What does this slice from her CT scan show?



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The CT shows a 3cm mass in the left upper lobe, just below the level of the arch of the aorta. In addition there is an enlarged lymph node in the mediastinum. There is no evidence of metastatic disease on the rest of her CT scan.



Mrs Donnelly's case is discussed at the lung MDT and a bronchoscopy and PET-CT scan is recommended. A biopsy is performed a bronchoscopy, and shows adenocarcinoma.

What is the reason for doing a PET-CT, and what does this slice show?



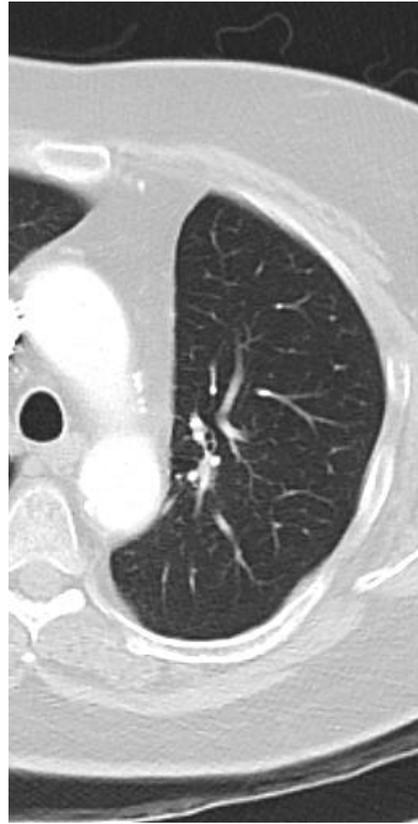
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What is the reason for doing a PET-CT, and what does this slice show?

As the original CT scan showed no metastatic disease, it may be possible to offer Mrs Donnelly curative treatment. A PET scan is a functional scan using radioactively labelled glucose, and provides images of very metabolically active areas within the body. Areas which are yellow-white in colour have high uptake of glucose, ie are metabolically very active. PET is not specific and will show any metabolically active areas; this can be cancer, infection/inflammation or physiological. However if metastatic disease is confirmed which was not seen on CT alone, the patient can avoid intensive curative treatment and all its side effects, which would not benefit them, and this is the reason for doing a PET scan.

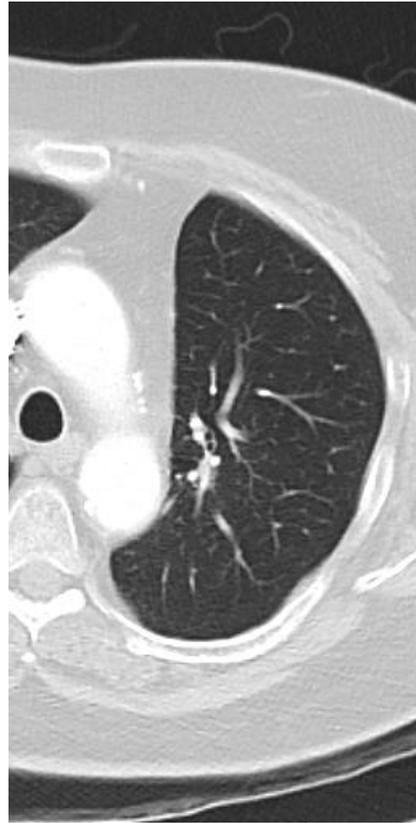
Fortunately for Mrs Donnelly, her scan shows only the areas in this slice. This shows the left upper lobe mass and two enlarged and 'avid' (high uptake) local lymph nodes.

Mrs Donnelly was again discussed at the lung MDT. Her lung cancer was staged as T2aN2M0. The surgeons did not feel her disease was operable and so instead was offered neo-adjuvant chemotherapy (cisplatin and vinorelbine) followed by radical radiotherapy, 55Gray in 20 fractions.



Spot the difference between these two scans?!

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The left scan is the patient's original staging CT scan that we have seen previously. The right scan was performed after 3 cycles of chemotherapy. On this slice the tumour and enlarged node are no longer seen, showing an excellent response to chemotherapy.

Mrs Donnelly comes back to clinic to discuss her CT results and the next stage of her treatment. She sees a registrar in clinical oncology together with her specialist nurse.

Dr: Good to see you again Mrs Donnelly. How are you feeling after your last cycle of the chemotherapy?

Mrs D: Well, I'm pleased it's over of course. I felt pretty bad for most of the time whilst I was having it, to be honest. Sick for a lot of the time, and just so exhausted. I had a scan last week, have you got the result?

Yes, and it's good news. It showed that the tumour has shrunk down with the chemotherapy.

Oh, that's such a relief. So what happens next?

Now we should talk about the next part of your treatment...radiotherapy. I'd like to talk you through what will happen during your treatment, and the possible side effects you might have.

OK

Radiotherapy is very high energy X-rays. We give it as a course of short sessions, given every day Monday to Friday. Each session lasts about 15 minutes, though there is likely to be some waiting time too. During the treatment you will lie on a couch with your arms on arm rests above your head, which helps to keep your position stable. Most of the time each day is spent with radiographers in the room, getting you into the same position each day. Then there will be a few minutes where everyone goes out and the treatment is actually delivered. Altogether you will need 20 treatments, which is 4 weeks total. The treatment itself is not painful at all, but you are likely to get some side effects during your treatment and for a few weeks after.

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**Early side effects include:**

- oesophagitis (manifesting as pain on eating, drinking or swallowing)
- cough +/-haemoptysis
- dyspnoea
- skin reddening and hair loss in the treated area ie chest hair
- fatigue
- nausea

These are likely to come on gradually, usually starting during the 2<sup>nd</sup> or 3<sup>rd</sup> week of treatment, and often getting worse during treatment, peaking the week or two after treatment ends, and then improving and resolving completely.

**Late side-effects include:**

- dyspnoea/reduction in lung function
- oesophageal stricture
- very rarely damage to the heart or spinal cord

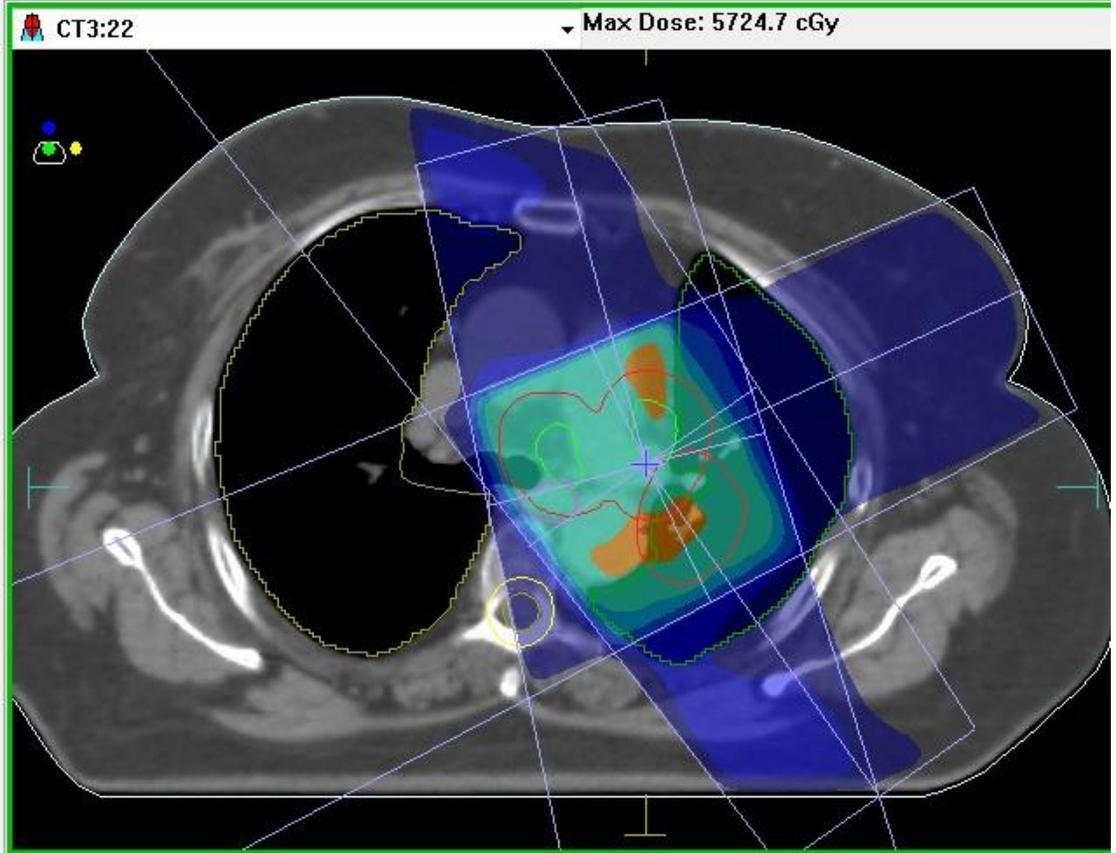


Mrs D agrees to radiotherapy treatment, and goes for a planning CT scan. This usually happens the same week as the patient is consented and sometimes even the same day! At the time of the planning scan, the radiographers mark tiny point tattoos on her chest, and use these to help put her in a position that is reproduced for each treatment.

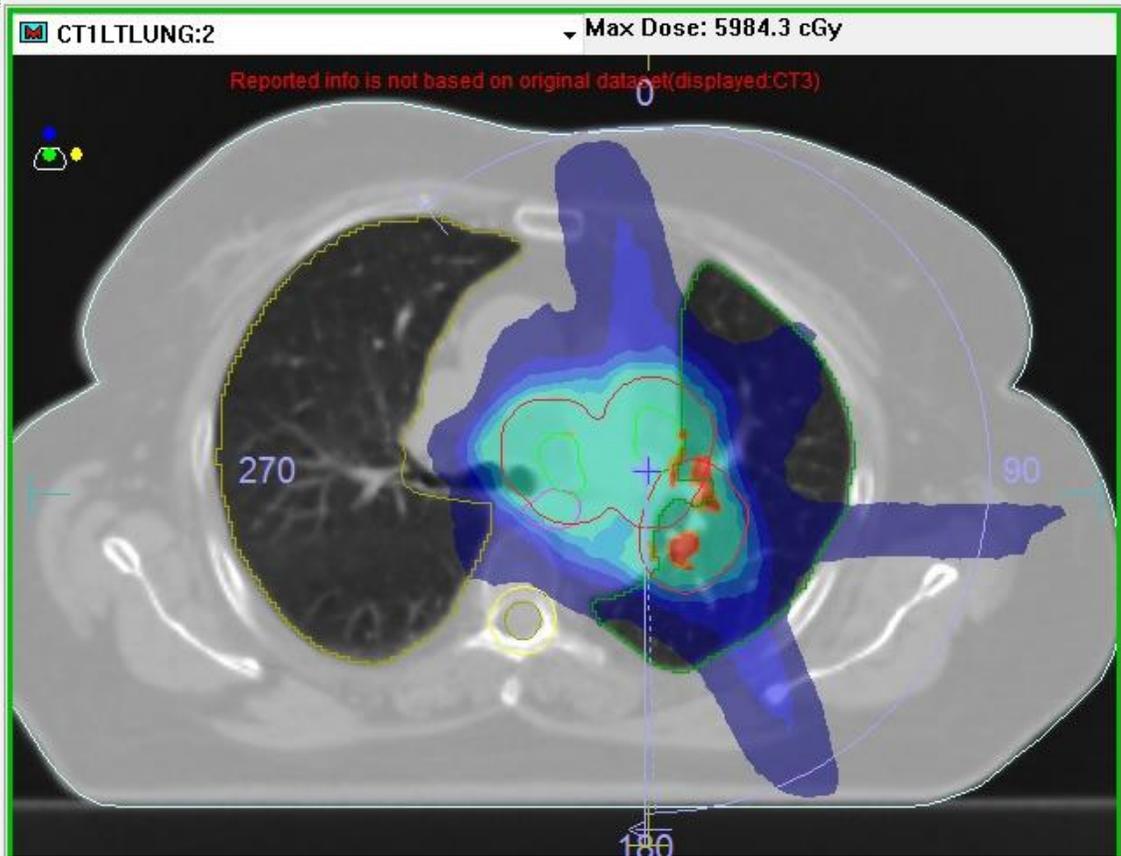
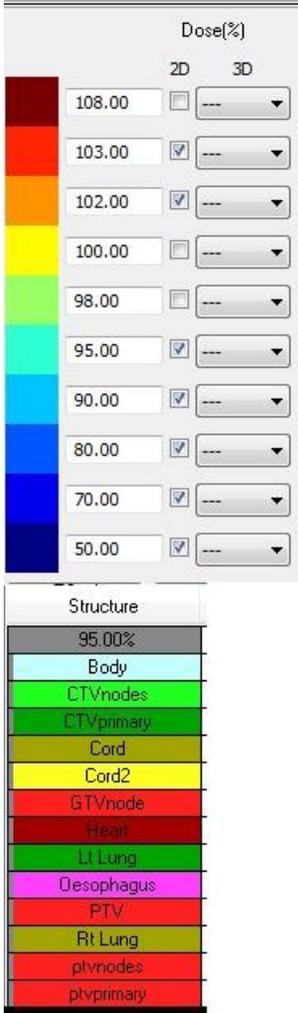


Then 1-2 weeks are needed for the clinicians to outline the tumour target and the organs at risk, and the physicists and dosimetrists to plan the treatment. For Mrs D, there was some discussion if she should have three-dimensional conformal radiotherapy or intensity modulated radiotherapy (IMRT).

In basic terms, IMRT is more complex and more shaped to the tumour than 3D conformal treatment. This allows greater sparing of vital organs and the beams can be weighted away from these 'at risk' areas. However it does usually mean larger areas of normal tissue receive low doses of radiation, and the very long term effects of this are not yet well characterised.



Conformal plan



IMRT plan

Mrs Donnelly's treatment was planned with both techniques and the two plans compared. The colour blocks represent different percentages of the total dose that different areas receive. You can see that the turquoise area receiving 95% is more shaped around the target tumour areas in the IMRT plan, and the 50% dose dark blue area has been shaped away from the spinal cord, meaning the spinal cord gets a lower dose. Therefore in this case the IMRT plan was preferred.

Mrs Donnelly starts her treatment and is seen in the radiotherapy review clinic during her second week of treatment. She tells the registrar she has pain when eating and drinking but no other symptoms.

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**It is important to establish severity to know how best to treat her. It is also important to ask how much she is eating and drinking to know if she is maintaining an adequate fluid intake or becoming dehydrated. It may be helpful to refer to a dietician or start liquid food supplements if food intake is poor.**

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Mrs Donnelly's pain is more manageable with your treatment and she completes her course of radiotherapy. She is seen back in clinic 4 weeks after finishing her treatment, and then has regular follow up appointments to monitor for recurrence.

# Learning points

- Interpretation of CT and PET scans in a patient with lung cancer
- What radiotherapy treatment entails for patients
- The patient pathway for a radiotherapy treatment:
  - diagnosis
  - MDT decision
  - consent to treatment
  - planning CT scan
  - treatment planning
  - treatment delivery
- Side effects of lung radiotherapy