SPECT/CT: A Clinical Testament

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Equipment prior to Symbia installation-

GE SMV- for planar and SPECT imaging
Siemens Orbiter- generally for paediatric and renal work
Hybrid system installation

- Symbia T16 Truepoint SPECT/CT
- Hybrid system combining a variable angle dual detector SPECT with a 16 slice CT.
Why we use SPECT/CT?

- to localise areas of abnormal uptake,
- to define the involved organ and show presence or absence of invasion into surrounding tissues,
- to localise uptake to normal organs and avoid the need for delayed imaging on additional days,
- following diagnosis to determine extent of disease and influence choice of treatment
Routine use of SPECT/CT

Our SPECT/CT workload reflects the close proximity of the BHOC site.

- I123 MIBG
- In111 Octreotide (NET imaging)
- Gallium
- I131 thyroid ablation
- Parathyroid
- Skeletal (limited osteomyelitis use)

Other examinations which may include SPECT/CT dependant on planar findings, but not part of routine protocol –

- Red cell
- White cell
- Meckels

Notable absentees from routine use include- cardiac and skeletal orthopaedic imaging.
55 year old male.

Previous history of adrenalectomy for phaeochromocytoma in 1998.

Referral from another hospital.

Active focus identified on MIBG scan without corresponding abnormality on CT.
I123 MIBG Imaging

Cylindrical focus of intense activity registering on CT to a modestly distended intrahepatic inferior vena cava.

Likely to represent recurrent pheochromocytoma.
56 year old male.

Known diagnosis of metastatic carcinoid.

There has been mixed response to treatment.

The patient is under consideration for radiolabelled octreotide treatment.
In 111 Octreotide Imaging

Octreotide avid metastases within the liver.

Octreotide avid metastases also demonstrated throughout the skeleton.

Patient not suitable for surgical treatment.
68 year old female, oncology in-patient

Known rhabdosarcoma

Now recurrent fever and PUO.

Cause not found on previous CT of chest and abdomen.
Gallium Imaging

Multiple high volume metastases (pulmonary, left axilla and soft tissue)

Appearances suggest that the PUO may relate to tumour activity rather than occult lesion
76 year old female with thyroid carcinoma. Thyroidectomy carried out and treated with I131 ablation.

3 GBq capsule given in radiotherapy dept.

Referred to nuclear medicine for imaging four days later.
I131 Thyroid Ablation Imaging

In general SPECT/CT imaging has had a direct impact on patient management, often resulting in a reduction of ablation treatments if imaging is all clear.

Uptake localised to a skeletal metastases in 6th posterior rib.

As a result this patient went for a further ablation treatment.

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67 year old lady awaiting mastectomy for breast cancer.

Previous bone scan showed no evidence of metastases.

Recent incidental finding of hyperparathyroidism and raised calcium.
Parathyroid Imaging

Single intense focus of activity localised on SPECT/CT to a soft tissue nodule around 15mm in diameter.
Skeletal Imaging

51 year old male with chronic osteomyelitis to his mandible. Unresolving over one year and increasing in pain. Surgical intervention is being considered.
Skeletal Imaging

SPECT/CT demonstrates intense activity extending into the ramus of the mandible.

There is also a separate area of activity relating to the mandibular condyle.
Impact of SPECT/CT on workload

- Lasting changes made to the make-up of our daily workload.

- In addition to a wide range of existing nuclear medicine planar imaging, there has been a major impact on oncology workload as most protocols now include SPECT/CT as standard.

- This generally involves the use of ‘long-lived’ isotope examinations as already mentioned (In111, I123, Ga67) - impact on staff finger doses.

- ARSAC licence holder now protocols such examinations for SPECT/CT, so bookings can reflect extra scanning time needed.

- Clinicians have commented on increased reporting confidence in such examinations- leading to a steady increase in referrals.
Increase in referrals for tumour imaging

A steady increase in long lived isotope examinations has been noted since SPECT/CT was introduced in Aug 2008.
Using the Diagnostic CT

- Full range of diagnostic scans carried out- overflow from CT dept.
- 9-5 use and out of hours lists to help with urgent ‘fast track’ patients.
- Full use of IV and oral contrast for diagnostic imaging.
- Staging CAP, Urograms, CTPA, Lower limb angiogram, CT Guided biopsies
- Do not scan heads as gantry does not tilt to avoid irradiating eyes.
- CT lists can be generally organised when isotope injections are booked (i.e in the morning).
- Now begun combining staging bone scans and staging CTs into one appointment.
- Particularly useful for elderly/non mobile patients.
CT workload

High CT workload due to:

- CT trained staff already in dept.
- NM dept based within radiology.

Figures here represent only CT scans done during 9-5 hours. Further evening scanning takes place (5-8) - staff dependant.
Impact on Staffing

**Positives**
- Latest technology increases interest in NM, more staff interested in joining dept.
- Chances for CPD, increasing an individuals skill base with new techniques.
- Financial gain from out-of-hours CT lists.

**Negatives**
- *Increased pressure in terms of workload.*
- Increased finger and body doses from more ‘long-lived’ isotope examinations being undertaken.
Future developments

- Already increasing links with radiotherapy department-
- CT planning scans and I 131 thyroid ablation scanning.

- Next step may introduce Image Guided Radiation Therapy (IGRT) using SPECT/CT-
- allowing the adjustment to variations in target volumes over the course of treatment
- and identifying areas of uptake with functional data to define Biological Target Volumes (BTV)

- Possibilities lie within the areas of lung perfusion and prostate imaging using IMRT, whereby the highest dose is concentrated on tumour site sparing normal tissue according to functional data produced by SPECT/CT.
Future developments

By contouring dose profile, site of highest tumour concentration can receive boosted dose, while dose is reduced to surrounding tissues.

IMRT CT based SPECT/CT data showing tumour in relation to 82-, 75.6-, 70- and 60-Gy isodose lines.