North, South East and West of Scotland Cancer Networks

Sarcoma
National Managed Clinical Network

Sarcoma

Use of PET-CT imaging in the management of Sarcoma patients

National Guideline

Prepared by	Dr Jeff White, Dr Des Alcorn, Dr Milind Ronghe and Dr Ioanna Nixon
Approved by	SSN, MSN C&YP with Cancer, SCIN, NOSCAN, SCAN and WoSCAN
Issue date	August 2017
Review date	August 2020
Version	2.0 (replaces v1.0 May 2015)

1. Introduction

This guideline brings together the agreed indications for PET-CT scanning of sarcoma patients in Scotland. This was developed following the 2016 update of the PET-CT indications by the Royal College of Radiologists[1] and discussion at the Scottish Sarcoma Managed Clinical Network education days.

The guideline has been developed by the Scottish Sarcoma Network (SSN) in partnership with the Scottish Clinical Imaging Network (SCIN) and SCIN's review of indications concluded PET-CT is not routinely commissioned for sarcoma.

The total estimated number of scans for adult (16 and over) sarcomas in Scotland is 124 per year. Regional breakdown would be 57 per year in the West of Scotland (46%), 34 per year in the South East of Scotland (27%) and 34 per year in the North of Scotland (27%).
The total estimated number of scans for paediatric (birth to 15) sarcomas in Scotland is 40 per year. Regional breakdown would be 18 per year in the West of Scotland, 11 per year in the South East of Scotland and 11 per year in the North of Scotland.

All PET-CT examinations are requested after the cases have been discussed at the Scottish sarcoma or Aberdeen/Dundee/Edinburgh/Inverness centre upper gastrointestinal cancer multi-disciplinary team (MDT) meeting and discussion of the request with the relevant PET-CT clinical lead in the first instance, if they **don't** comply with these agreed indications for PET-CT.

2. The use of PET-CT in the management of gastrointestinal stromal tumour (GIST) patients

Patients in the North and South East of Scotland are managed by the specialist centre (Aberdeen/Dundee/Inverness and Edinburgh) upper gastrointestinal cancer MDT with support from the Scottish sarcoma MDT. Patients in the West of Scotland are managed by the Scottish sarcoma MDT.

Indications for the use of PET-CT

All patients with high risk or metastatic GIST being considered for treatments that are likely to require systemic therapy are discussed and imaging reviewed at the Scottish sarcoma MDT meeting.

All patients on systemic therapy treatment should have their response assessed by PET-CT.

Exact numbers are hard to estimate in these rare cancers. Published literature[2] suggest around 60 new cases/ year in Scotland; however the Scottish sarcoma MDT activity analysis for 2012[3] only recorded 23 new cases while analysis of Cancer Registry for 2010 to 2014[4] indicates 34 new cases per year on average. Approximately 50% cases[5] will fall into a high risk category this means this figure isn't likely to be significantly influenced by age or co-morbidity depleting the number of potential cases as the systemic therapy for this disease is relatively well tolerated even in such cases. Based on the above assumptions the impact of utilising PET-CT as described above is;

Estimated number of scans for staging for Scotland = 30 per year
Estimated number of scans for follow-up for Scotland = 30 per year

3. The use of PET-CT in the management of musculoskeletal tumour adult patients

Despite guidance from The Royal College of Physicians and the Royal College of Radiologists[1] and other organisations, the evidence base for PET-CT in the management of sarcoma is not very strong.

Indications for PET-CT in musculoskeletal tumours

In the first instance, the focus should be on where a PET-CT scan would/could change management/treatment plans. A PET-CT scan is only appropriate where there was some indication that it would change management and this role of the PET-CT scan should be subject to detailed prospective audit, especially where the evidence base for this instruction of PET-CT use is weak, such as for routine staging of certain sub- types.

3.1 Staging of high-grade sarcomas

For patients with certain subsets of high grade sarcoma with a high tendency to have early metastatic disease PET-CT may add to staging information.

- Ewing's sarcoma (17*)
- rhabdomyosarcoma (including alveolar) (6*)
- osteosarcoma (5*)
- synovial sarcoma (5*)
- myxoid liposarcoma (n/a*)

* Actual number of cases with these sub-types recorded by the Scottish sarcoma MDT during 2012[3.]

These specific sub-types represent less than 15% of all soft tissue sarcomas. Other types of high grade sarcoma PET-CT should **not** be routinely used for staging. Use of PET-CT for staging rhabdomyosarcoma is compatible with current NCCN guidelines[6].

3.2 Pre-amputation of high-grade sarcomas

To assess for distant disease that would alter surgical management, for example if amputation is considered as the definitive treatment of a limb primary sarcoma.

3.3 Metastatic high-grade sarcomas

To assess patients being considered for liver or lung metastectomy. This is compatible with current EMSO guidance[7, 8].

Exact numbers are hard to estimate in these rare cancers especially as we are proposing to use PET-CT in only a subset of cases. Information Services Division Scotland data[9] reports 208 new cases (bone and connective tissue) in 2014 in Scotland, however the Scottish sarcoma MDT 2012 activity analysis[3] reports 255 new cases, neither of these sources give reliable stage information. These are likely to be under estimates as 2010 data from National Cancer Intelligence Network[10] (NCIN) reported 322 new cases of sarcoma in Scotland. This figure is likely to be significantly influenced by age or co-morbidity depleting the number of potential cases. Based on the above assumptions the impact of utilising PET-CT as described above is;

Estimated number of scans for staging for Scotland = 64 per year

- **less than 15% of all STS = 40 per year**
- **a maximum of 50% of bone sarcomas = 24 per year**

4. The use of PET-CT in the management of musculoskeletal tumour paediatric patients

Sarcoma management clearly depends on risk stratification at diagnosis and treatment response. Despite guidance from the Royal College of Radiologists[1] and other organisations[11, 12], the evidence base for PET-CT in the management of sarcoma is limited.

Current established assessment methods in paediatrics include CT, MRI, bone scan, biopsy and bone marrow trephines. Advanced functional imaging such as FDG PET has potential to improve staging accuracy, response assessment and influence management strategies.

BMJ Openbmjopen.bmj.com
There was a systematic review done recently (Bob Phillips et al, BMJ Jan 2015)[13] which highlights potential from PET-CT in imaging of children and adolescents with rhabdomyosarcoma (RMS) but there is still some level of uncertainty in these data and their relevance to clinical practice. Rigorous methodology applied in this analysis identified the limitations of the existing research supporting the use of PET-CT in the staging, prognosis development and outcome assessment of diagnosed RMS. However limited evidence from this systematic review does suggest that PET-CT has potential to increase initial staging accuracy, specifically detection of nodal involvement and distant metastatic spread. Clear research recommendations for incorporation of PET-CT into future treatment trials in unbiased and transparently selected cohort of patients are recommended.

Indications for PET-CT in musculoskeletal tumours

For the staging, response to therapy and restaging/detection of relapse of osteosarcoma, Ewing's sarcoma and rhabdomyosarcoma.

Estimated number of scans for staging for Scotland = 20 per year
Estimated number of scans for follow-up for Scotland = 20 per year

References

1. The Royal College of Radiologists. *Evidence-based indications for the use of PET-CT in the United Kingdom 2016.* London: RCR, 2016.
2. *Annals of Oncology 17 (Supplement 10): x280–x286, 2006.*
3. *Scottish Sarcoma MDT analysis of 2012 activity (available from Lindsay Campbell, SSN Manager)*
4. Analysis of Scottish Cancer Registry for 2010 to 2014 (available from Lindsay Campbell, SSN Manager)
5. *Cancer* 2005 Feb 15;103(4):821-9
6. *www.nccn.org/professionals/physicians_gls/pdf/sarcoma.pdf* accessed on 26th November 2013.
7. *Annals of Oncology 23 (Supplement 7): vii100–vii109, 2012.*
8. *Annals of Oncology 23 (Supplement 7): vii92–vii99, 2012.*
9. *http://www.isdscotland.org/Health-Topics/Cancer/Cancer-Statistics/Bone-and-Connective-Tissue/* accessed on 23rd June 2016.
10. *http://www.ncin.org.uk/cancer_type_and_topic_specific_work/cancer_type_specific_work/sarcomas/* accessed on 23rd June 2016.
11. The Royal College of Radiologists. *Guidelines for the use of PET-CT in children, second edition.* London: The Royal College of Radiologists, 2014.
12. *Eur J Nucl Med Mol Imaging. August 2008; Vol 35 (8), 1581-1588.*
13. Norman G, Fayter D, Lewis-Light K, et al. An emerging evidence base for PET-CT in the management of childhood rhabdomyosarcoma: systematic review. BMJ Open 2015;5:e006030. doi:10.1136/bmjopen-2014-006030