

Recommendations for cross-sectional imaging in cancer management, Second edition

Testicular cancer

Faculty of Clinical Radiology

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Testicular cancer

Clinical background

Ninety-five per cent of testicular cancers are of germ cell origin. They account for only 1% of all male cancers, but are the most common malignant tumours in males between 15 and 44 years of age. Over 95% of testicular germ cell tumours (TGCT) are curable. Approximately, 60% are non-seminomatous germ cell tumour (NSGCT) and 40% are seminoma. Mixed germ cell tumours may occur and are treated as NSGCT. Germ cell tumours are frequently associated with raised serum markers. Beta human chorionic gonadotrophin (β -HCG), and alpha-fetoprotein (AFP) are frequently elevated in NSGCT and β -HCG may be elevated in seminoma. These markers are important in diagnosis and follow-up.

Diagnosis of TGCT is made clinically and at pathology following orchidectomy. Testicular ultrasound may be used to identify an occult primary in a patient presenting with metastatic disease or small synchronous tumour in the contralateral testis.

The patterns of spread of testicular tumours are predictable. Left-sided tumours spread to the left para-aortic nodes and the pre-aortic nodes initially. Right-sided tumours spread into the aorto-caval nodes, the precaval nodes and the right paracaval and retrocaval nodes. Hematogenous spread in testicular cancer is predominantly to the lungs. Other sites of metastases in patients with advanced aggressive tumours include the brain, bone and liver. Brain metastases are more common in patients with trophoblastic teratomas (choriocarcinomas).

Before initiating therapy, assessment of disease extent is performed using the TNM staging. Patients with metastatic disease are further categorised using the International Germ Cell Cancer Collaborative Group (IGCCCG) classification which stratifies patients into good, intermediate and poor prognostic groups.¹ This latter classification is based on histology, location of primary tumour and metastases, and levels of serum markers.

Approximately 80% of seminoma patients are Stage I, whereas only about 30–50% of those with NSGCT present with Stage I disease. NSGCTs are managed by surveillance for Stage I and cisplatin-based chemotherapy for metastatic disease. Treatment options for Stage I seminoma include single-cycle carboplatin, surveillance or radiotherapy and metastatic seminoma patients are also treated with cisplatin-based therapy.

Who should be imaged?

Following orchidectomy and an established diagnosis of a testicular germ cell tumour, all patients should have initial staging with CT of chest, abdomen and pelvis. CT of the brain is performed in symptomatic patients or multiple lung metastases or with very high serum tumour markers (bHCG).

Staging objectives

- To detect lymph node metastases in abdomen, thorax and supraclavicular fossa.
- To identify lung metastases.
- To identify disseminated blood-borne metastatic disease; for example, in the liver.
- To identify brain metastases in selected patients.

Note that the primary tumour is not assessed by CT or MRI.

Staging nodal and metastatic disease

CT

CT is the preferred investigation and at initial staging of all germ cell tumours, contrast-enhanced CT of the chest, abdomen and pelvis should be obtained, although subsequently some body areas (such as the pelvis) may be omitted particularly in patients who have had standard (that is, inguinal) orchidectomy. However, in patients who have had a scrotal incision, inguinal hernia repair (where lymphatic drainage may be altered), or in patients who developed testis cancer in an ectopic, undescended testis, the pelvis should be imaged on follow-up examinations.

- Oral administration of 1 litre of water or iodinated contrast medium.
- 100–150 ml of intravenous iodinated contrast medium injected at 3–4 ml/sec.
- MDCT is commenced at 70–80 seconds post-injection to assess the abdomen and pelvis.
- Using MDCT, slice thickness will depend on scanner capability. In general, images are reconstructed from one acquisition. Image slice thickness ranges from 1–5 mm. Thin sections are needed for multi-planar reformats, for viewing in the coronal or sagittal planes.

Values of $CTDI_{vol}$ should normally be below the relevant national reference dose for the region of scan and patient group (see Appendix and section on Radiation protection for the patient in CT in Section 2).

PET

FDG-PET is not recommended for the primary staging of TGCT as it does not consistently improve the staging in patients with clinical stage I disease. Furthermore, relapse rates in PET-negative patients are high, indicating that small volume and microscopic disease are missed. PET may be used as a problem-solving tool for equivocal lesions seen on staging CT.

MRI

MRI has similar sensitivity to CT for detection of nodes in the retroperitoneum but in general is not used for this purpose. MRI is the technique of choice for detecting brain metastases if brain deposits are sufficiently likely, for example, in a symptomatic patient or if HCG is very high.

Follow-up

Surveillance

Surveillance for Stage I disease is increasingly recognised as the preferred option for both seminoma and NSGCT in compliant patients. This is as a result of growing awareness of long-term treatment-related complications. Surveillance avoids unnecessary treatment in 50–90% of patients and disease-free survival of 98% can be achieved in patients who relapse on surveillance. Surveillance protocols are designed to identify relapse at the earliest stage, thereby enabling earlier treatment. In addition to clinical

and serum marker assessment, imaging with CT forms the basis of surveillance strategies.

For Stage I, NSGCT surveillance protocols focus on the first year with investigations reducing in intensity in subsequent years. Serum markers are checked monthly for the first year, with two-monthly chest radiographs and clinical examination and CT scans (abdomen only unless the pelvis is deemed high risk) at three months and one year. For seminomas, as serum marker are less reliable, more imaging is used in surveillance with six-monthly abdominal CT and chest radiographs for the first two years and the pelvis is only imaged if there has been previous pelvic surgery. Annual abdominal CT and chest radiograph are performed until five years following the diagnosis.

Rising tumour marker levels will usually precipitate further imaging to identify metastatic disease or a new primary tumour; this usually requires CT of chest, abdomen and pelvis together with ultrasound of the remaining testicle. If no new disease is seen, an MRI of the brain and/or ^{18}F FDG PET-CT is also indicated to detect sites of occult metastatic disease.

Follow-up for metastatic disease

Non-seminomatous germ cell tumours

CT should be performed using the same protocol as for staging, using intravenous contrast medium.

All sites of disease should be assessed according to response criteria and residual masses following completion of treatment and should be assessed for possible surgical excision in terms of size, precise location and relationship to adjacent structures, including major vessels. ^{18}F FDG PET-CT is evolving as an important modality to identify residual active disease in patients with demonstrable residual masses, although mature differentiated teratoma may not be FDG-avid and cannot be excluded with a negative scan.

Seminomas

In general, seminomatous residual masses are not resected because the majority comprise fibrosis and necrosis, with no evidence of active residual malignancy. A negative ^{18}F FDG-PET-CT

of a residual mass following chemotherapy for seminoma excludes any viable disease.

Tips

- Brain metastases are haemorrhagic and are frequently clearly identified on pre-contrast scans using CT or MRI.

- Nodal metastases in non-seminomatous germ cell tumours may become cystic on treatment.

References

1. International Germ Cell Consensus Classification: a prognostic factor-based staging system for metastatic germ cell cancers. International Germ Cell Cancer Collaborative Group. *J Clin Oncol* 1997; **15**(2): 594–603.

Further reading

The Royal College of Radiologists. *iRefer: Making the best use of clinical radiology*, 7th edn. London: The Royal College of Radiologists, 2012. (www.irefer.org.uk)

The Royal College of Physicians and The Royal College of Radiologists. *Evidence-based indications for the use of PET-CT in the United Kingdom 2013*. London: Royal College of Physicians, 2013.

Authors:

Professor Andrea Rockall, Imperial College Healthcare NHS Trust, London

Dr Aslam Sohaib, Royal Marsden Hospital, London

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The Royal College of Radiologists
63 Lincoln's Inn Fields, London WC2A 3JW
Tel: +44 (0)20 7405 1282
Email: enquiries@rcr.ac.uk www.rcr.ac.uk



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