HealthManagement
Promoting Management and Leadership

Volume 9 - Issue 1, 2009 - Features

Managing Imaging Patient Referrals: The Case for Adrenal Tumour Imaging

Author

Prof. Simone Maurea

Dipartimento di Scienze

Biomorfologiche e

Funzionali (DSBMF)

Università degli Studi di

Napoli Federico II (UNINA)

Istituto di Biostrutture e

Bioimmagini (IBB)

Consiglio Nazionale

delle Ricerche (CNR)

Naples, Italy

maurea@unina.it

In adrenal tumour imaging, there are several imaging techniques that may be used to manage the patient, depending on their clinical scenario. But which one is best for patient safety as well as for cost-effectiveness? This article explores each relevant imaging modality and their use in different clinical cases.

Unlike in patients with hypersecreting adrenal lesions, where tumour diagnosis is easily made on the basis of clinical and laboratory data, patients with non-hypersecreting adrenal tumours and normal laboratory data, are challenging to diagnose and treat. Particularly in some complicated cases, the need for complementary imaging techniques still remains; for this purpose, functional diagnostic information provided by nuclear radionuclide modalities are helpful and are explained here.

Radionuclide Imaging

Radionuclide imaging using specific tracers such as norcholesterol, MIBG, SAs, FDG or carbon-11 (C-11) metomidate may provide in-vivo tissue characterisation of adrenal tumours that differentiate between benign and malignant abnormalities. In particular, radiolabeled norcholesterol scintigraphy allows the diagnosis of benign adrenocortical adenomas, both in hyper- and non-hypersecreting lesions; in particular, for these latter disorders nor-cholesterol is able to offer specific information for lesion characterisation. Similarly, MIBG imaging has been demonstrated to be useful to identify chromaffin tissue tumours. Preliminary and limited data suggest a role of SAs to detect the presence of somatostatin receptors in malignant adrenal masses. Fluoro-18 FDG using PET scanning has been shown to be able to recognise malignant adrenal tumours on the basis of increased glucose metabolism. High C-11 metomidate uptake has been reported both in normal adrenal cortex as well as in benign and malignant cortical adrenal tumours, but differential diagnosis between these adrenal lesions may be not performed with this agent.

MIBG Imaging

Previous studies have clearly demonstrated the usefulness of radioactive MIBG imaging in the diagnostic evaluation of patients with pheochromocytoma as well as extraadrenal paragangliomas. However, in these experiences MIBG scintigraphy was used to localise and detect tumour sites only in patients with hypersecreting lesions and, particularly, no data regarding non-hypersecreting pheochromocytoma have been reported. We specifically investigated the role of MIBG imaging to identify nonhypersecreting pheochromocytoma in a subgroup of patients with indeterminate adrenal masses; in such patients, the clinical diagnosis of pheochromocytoma using laboratory tests was not possible, while the integrated imaging results of MIBG with those of CT and/or MR were clinically relevant for this purpose.

MIBG uptake in a non-hypersecreting adrenal mass characterises the lesion as a pheochromocytoma. In this regard, whereas this tumour-type specifically concentrates MIBG into its catecholamine storage granules, other adrenal space-occupying abnormalities do not accumulate this

© For personal and private use only. Reproduction must be permitted by the copyright holder. Email to copyright@mindbyte.eu.

agent. Thus, MIBG scintigraphy may be diagnostically useful to identify or rule out non-functional tumours of medullary chromaffin tissue.

FDG PET-CT Imaging

Although there are CT and MR imaging patterns to suggest the diagnosis of malignancy such as large tumour size, high contrast or gadolinium enhancement as well as increased signal intensity on T2-weighted MR images or no signal change on chemical-shift MR sequence, these criteria are suggestive but not diagnostic of malignancy. In the absence of specific endocrine hyper-secretion, no individual finding can absolutely resolve this issue.

FDG uptake has been reported to reflect high tumour metabolism. Its concentration in malignancies has been associated with proliferative tissue activity and to the amount of viable cells, thus, being an accurate indicator of tissue viability in malignant adrenal lesions.

Therefore, presumptive specific metabolic criteria may be included in radionuclide adrenal imaging to evaluate patients with radiographically indeterminate adrenal masses in which there is a high risk of malignancy. In this regard, the possibility to make a differential diagnosis between benign and malignant adrenal masses using FDG PET imaging shows a relevant clinical impact, and this application has been widely demonstrated.

This diagnostic information allows one to plan appropriate treatment in such patients, avoiding unuseful surgical interventions in cases of benign tumours or metastatic malignant lesions; in this regard, a significant advantage in terms of cost-effectiveness is reached since surgical procedures are clearly associated with greatest cost (20,000 – 30,000 dollars for laparotomy, probably somewhat less for laparoscopy because of shorter hospital stays). Conversely, the accurate characterisation of an adrenal mass as a malignant tumour with localised increased FDG activity suggests the need of immediate surgical resection.

Moreover, in patients with proven malignant adrenal tumours, the evaluation of regional and distant spread by whole-body PET FDG realises accurate disease staging for a complete work-up before any treatment strategy, using a single technique instead of several conventional imaging techniques.

In the last years the combined imaging technique represented by PET-CT offers unique diagnostic informations in patients with malignant adrenal tumours. In fact, PETCT combines the attenuation and morphologic details of CT with the metabolic information from PET FDG to allow accurate coregistration of anatomic and functional data and, thus, leading to more assured anatomic localisation of areas of increased metabolic activity. Though its relatively high cost limits the availability of PET-CT centres, its wide-spread applications to image malignant tumours is currently a reality.

Conclusions

On the basis of our experience, radionuclide imaging may have a significant role to noninvasively characterise adrenal tumours particularly in patients with non-hypersecreting lesions and, hence, it should be inserted in the diagnostic algorithm of such patients to supplement CT and/or MR findings when these are uncertain as well as inconclusive for lesion characterisation. This latter approach could avoid the need to perform fine-needle biopsy, which is invasive and uncomfortable for the patient.

In this setting, the selection of the appropriate radiotracer for adrenal scintigraphy depends on clinical patient history and department availability of radiocompounds and equipments. Since benign adenomas are the most common cause of adrenal tumours, labeled nor-cholesterol could be useful as a first choice for patients with no history of cancer disease; in case of normal nor-cholesterol scan, MIBG could be used to confirm or rule out the presence of pheochromocytoma; if MIBG is also normal, FDG PETCT may be considered when the clinical suspicion of malignancy is high.

Conversely, when neoplastic patients are evaluated, FDG PET-CT should initially be performed followed, if normal, by nor-cholesterol and, in sequence, MIBG studies. In particular, combined FDG PET-CT reflects the diagnostic significance of morpho-functional integrated imaging which simultaneously offers information regarding the anatomic characteristics and metabolic features of malignant adrenal tumours.

Finally, clinical applications for labeled somatostatin analogues in adrenal lesions are still uncertain since limited experience has been obtained; however, the potential role of these radiocompounds consists of somatostatin receptors' identification on adrenal tumours for possible somatostatin therapy when conventional treatments are not effective. Therefore, adrenal scintigraphy with different radiophamaceuticals plays a clinically relevant role in the evaluation of adrenal masses and, hence, this imaging technique should be inserted in diagnostic algorithms for managing such patients integrating CT and/or MR scans.

Published on : Tue, 1 Sep 2009

© For personal and private use only. Reproduction must be permitted by the copyright holder. Email to copyright@mindbyte.eu.