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Interpretation and Reporting of Positron Emission Tomography–Computed Tomographic Scans

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Body oncology positron emission tomography–computed tomographic (PET-CT) exams are particularly complex and time-consuming studies to interpret and report. An integrated approach is required to provide the referring physician with the full clinical value of this combined modality. Special attention to the Positron Emission Tomography–Computed Tomographic Report Findings section and Impression section is necessary to insure all the information relevant to the patient's care are clearly communicated to the referring physicians.
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Positron emission tomography–computed tomography (PET-CT) body oncology examinations are among the most complex and time-consuming medical imaging studies to interpret and report. This reflects both the typical coverage of the whole torso of the body and the tasks of interpreting and merging the metabolic findings on the 2-deoxy-2-[F-18]fluoro-D-glucose (FDG) PET images and the morphologic diagnostic findings on the registered and aligned CT images. In no small part as well, the patients commonly undergoing a PET-CT body oncology exams have complex histories related to their particular cancer and treatments, and these patients are additionally prone to complications related to their disease and treatments. The integrated findings of a properly performed, interpreted, and reported PET-CT scan can be of enormous value in management of cancer patients.

The intent of the inventors of PET-CT was to merge the full capabilities of CT and FDG PET imaging into one combined imaging procedure.[1] From the first commercial PET-CT scanners, state-of-the-art PET tomographs have been merged with mid to high-end CT scanners, capable of fully optimized body CT relative to the standards of the time.[2,3] Subsequent advances in PET and multidetector CT capability now make it practical to obtain high-quality PET and fully optimized breath-hold CT images in a single integrated examination.[4] Currently, combined PET-CT imaging of the whole torso can be accomplished in as little as 20 minutes, with near term prospects of total scan acquisition times approaching 10 minutes. In busy practices this has put increasing pressure on the physicians interpreting and reporting PET-CT examinations, due to both the sheer number of images requiring interpretation and the task of integrating disparate PET and CT imaging findings with prior exams findings and the patient's treatment history and particular exam indication. Additionally, as PET-CT has become an essential part of patient management, referring physicians are expecting prompt exam scheduling and reporting; the "stat" PET-CT exam is no longer an anomaly.

Previous articles in this issue of *Seminars in Ultrasound, CT, and MRI* deal with current optimal approaches to performing PET-CT scans and issues of workflow germane to an efficient PET-CT practice. Interpretation of PET-CT exams requires a fully capable workstation, either of the scanner's manufacturer or of the Picture Archiving and Communication System (PACS) vendor. Ample screen space is essential for displaying the transaxial PET and CT images and coronal or sagittal image reformats of the PET and CT images, as well as the PET maximum intensity projection (MIP) rotating image display. Display screens must have full resolution and grayscale depth to adequately display the CT images, and, if fusion images are desired, color capability is also needed. CT images must be displayed of sufficient size that they can be fully interpreted, and this means at least for whole torso scan acquisitions, a coronal or sagittal image (CT and PET) will usually need to fill an entire display screen (Fig. 1). Essential to a PET-CT interpretation are the PET images reconstructed as transaxial images and as a set of MIP images, as well as transaxial CT images reconstructed with soft-tissue kernels, and transaxial CT images of the lungs reconstructed as lung kernels (if a

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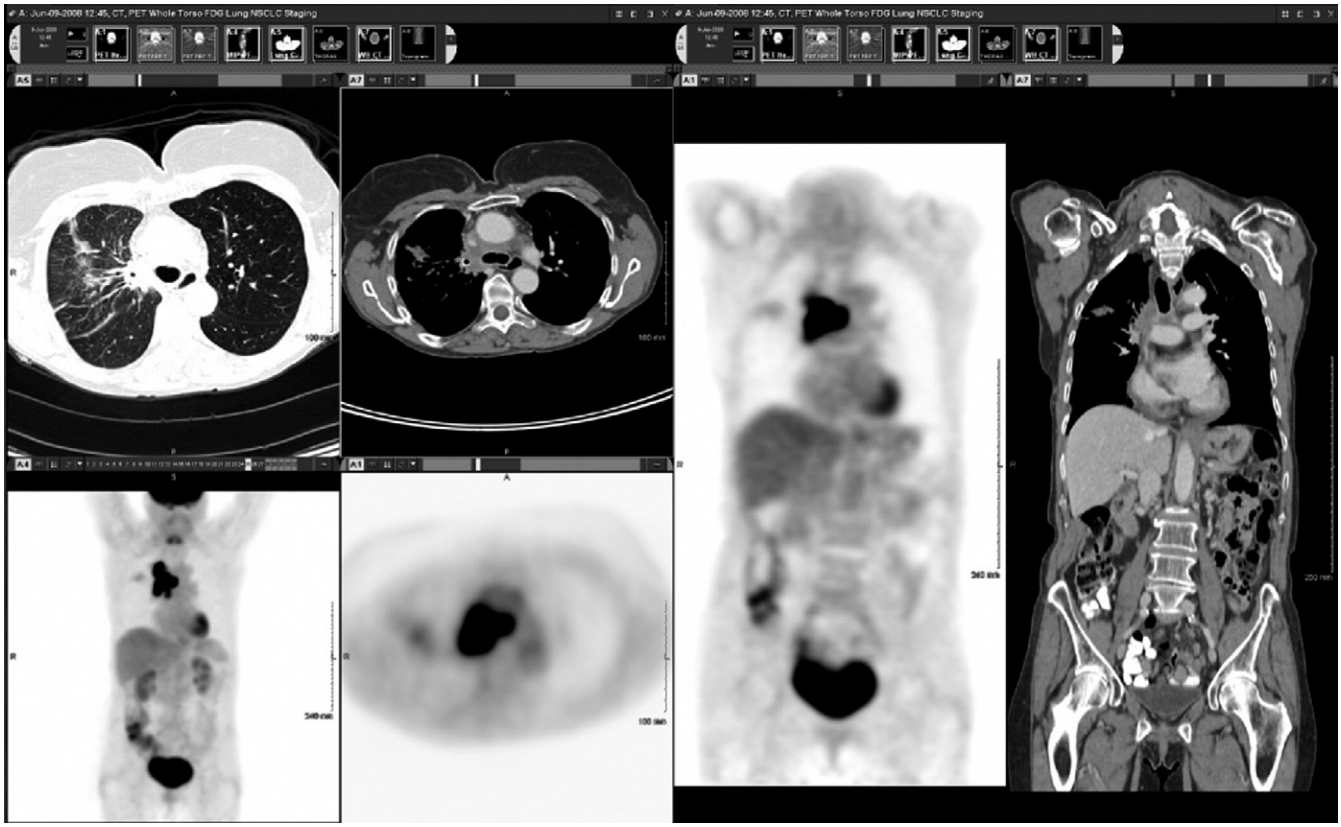

Figure 1 Typical display for interpretation of a body oncology PET-CT study. Images displayed include the maximum intensity projection (MIP) PET image (lower left hand corner of the left display screen), transaxial soft-tissue algorithm reconstructed CT images, and iteratively reconstructed FDG PET images (right side of left display screen), transaxial lung algorithm reconstructed CT images (lungs only, on the upper left hand corner of the left display screen), and the coronal reformat images of the iteratively reconstructed FDG PET images and soft-tissue algorithm reconstructed CT images on the right display screen. Note the size of the CT images, transaxial and coronal, are sufficiently large to allow for diagnostic interpretation. Other image reconstructions, including non-attenuation-corrected filtered back projection PET images and other CT reconstruction algorithms, can be introduced as needed from the thumb nail references at the top of the screen, and different level/window of the CT images displayed conveniently obtained by "hot keys" or drop-down menu. Increasing the number of images on the display decreases the image size to the point where interpretive utility is compromised.

breath-hold CT acquisition was obtained). Workstations and PACS displays typically perform the sagittal and coronal image reformats on-the-fly and can produce fusion images as desired, so there is no need to routinely archive such images.[5] It is also very important to include nonattenuation corrected PET emission images using filtered back projection for reference of attenuation-related artifacts and noise-related artifacts (noise is constrained to points of activity on iterative reconstructed images). PET image quality has improved substantially with refinements in iterative image reconstruction algorithms. The optimal iterative reconstruction parameters employed will depend on the scanner vendor, patient size, image matrix used (128 versus 256), and interpreting physician's preference for image detail versus image noise, in much the same way for CT images generated by different image reconstruction kernels.

The tasks of interpretation of a PET-CT examination begin with full interpretation of the PET and CT images and integration of the findings. Having the PET and CT images registered and aligned allows for identification of the anatomic feature exhibiting a given focus of abnormal glucose metabolism and provides specificity in terms of whether the PET abnormality corresponds to a benign source of FDG tracer uptake or malignant neoplasm. At the Best Practices in PET/CT Symposium it was widely agreed[6] that it is not sufficient, not at all good practice, to use the CT images for "anatomic localization purposes" only, but that the morphologic features depicted on the CT images must be identified and characterized. This can be as simple and common as identifying a healing benign fracture as the origin of a focus of abnormal FDG tracer in a rib or as unusual as identifying CT features of pleurodesis as the source of intense pleural-based FDG tracer uptake.

Not all cancers and metastatic manifestations of malignancy are detected on the FDG images but may well be readily depicted on the CT images, whether fully optimized contrast-enhanced CT or reduced beam current noncontrast CT (Table 1). For example, there are cancers not consistently

Table 1 Malignant Disease Not Reliably Detected on FDG PET

Small tumor mass (<5-6 mm) including pulmonary nodules or lymph nodes
Mucinous dominant cancers (ovarian, breast, colon)
Lobular breast cancer
Cystic neoplasms (pancreatic, ovarian)
Renal cell carcinoma, prostate cancer, small lymphocyte subtype lymphoma and other low grade lymphomas, carcinoid, bronchoaveolar lung cancer, transitional cell carcinoma
Highly necrotic tumors
Peritoneal carcinomatosis
Brain metastases

highly FDG avid such as renal cell carcinoma or bronchoalveolar lung cancer, and mucinous forms of colon, ovarian, and breast cancer can be only faintly positive, or even "cold," on FDG PET images. Small (less than 5 mm) pulmonary nodules, even of FDG avid cancer, can be below the reliable detection threshold of FDG PET but are readily seen on a properly performed CT. Certain manifestations of metastatic disease such as peritoneal carcinomatosis can be diagnosed more reliably on CT images than FDG PET images. Hence in the process of interpreting PET-CT examinations, the PET findings are related to the corresponding CT findings, and CT images completely reviewed, with abnormalities on CT checked against the presence or absence of abnormal FDG tracer activity.

Judging abnormal FDG tracer uptake requires thorough knowledge of physiologic and normal variant sources of FDG tracer uptake.[7] Determining whether the level of FDG tracer uptake of a lung nodule or lymph node or in a solid organ is abnormally elevated can be accomplished by a qualitative comparison with the level of tracer activity seen in normal tissues such as mediastinum, soft tissue, and liver. Focal FDG tracer activity greater than mediastinal background or liver background tracer activity, for example, is potentially due to malignant neoplasm if not explained by normal physiologic or a benign pathologic process, keeping in mind inflammatory and malignant neoplasm sources can give rise to the same level of FDG tracer accumulation. Qualitative assessment of abnormal FDG tracer uptake is easily assessed on the MIP PET images, as this depiction of FDG tracer distribution allows comparison with all tissues and organs (Fig. 2). Liver background tracer activity and mediastinal background activity, as well as cerebellum (a "hot" tissue reference) activity, appear to be reliable reference tissues in terms of intrasubject variation as well.[8]

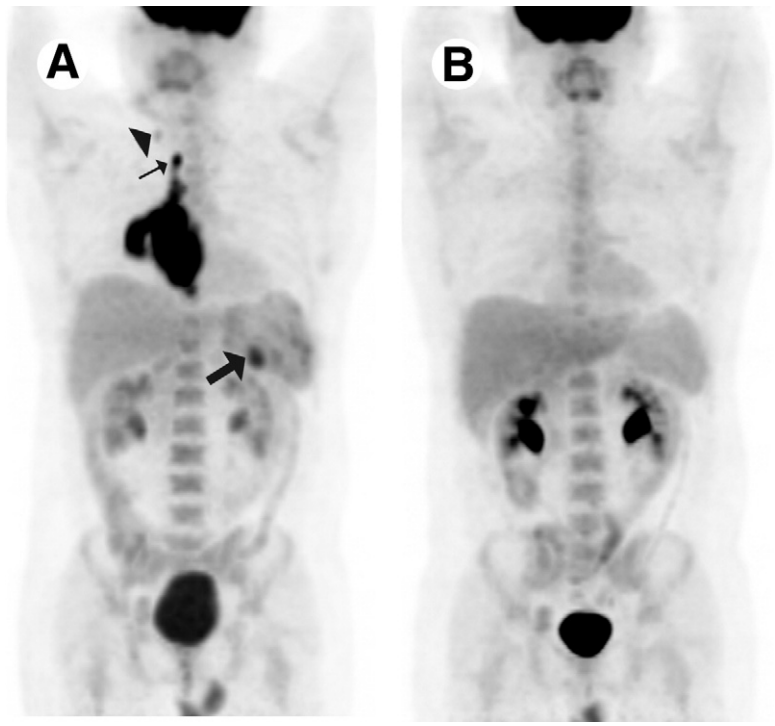

Figure 2 Evaluation of Response to Therapy on Maximum Intensity Projection (MIP) FDG PET images. On the pretreatment image for Hodgkin's lymphoma (A) intense abnormal FDG tracer activity is clearly present in the right hilum and mediastinum. Focal tracer activity in a high right paratracheal lymph node is clearly well above mediastinal or liver background tracer activity (thin arrow), and foci of tracer activity in the spleen are also above liver tracer background activity, consistent with splenic (below diaphragm) involvement (thick arrow). A small focus of right supraclavicular tracer activity, equivalent in intensity to mediastinal background (arrowhead), corresponds to a 6-mm lymph node, and allowing for the small node size, is considered abnormal as well. None of these abnormalities required an SUV measurement to identify. On the posttreatment images (B) there is complete resolution (a complete metabolic response) to the aforementioned abnormalities; there is no residual tracer activity above mediastinal background level.

Standardized uptake values (SUVs) should be used with caution, if at all, in the setting of staging or restaging and certainly should not be the sole criteria as to whether a focus of FDG tracer activity is deemed abnormal and hence suspicious for malignant neoplasm. There are numerous factors that affect the SUV obtained in a clinical setting (Table 2), which, if not properly accounted and standardized, result in departures of SUVs from historic norms and renders comparison of values obtained at one site versus another unreliable. Even in the early 1990s, when PET tomographs and imaging protocols were largely the same, the potential nonstandard nature of SUVs was recognized.[9] The advent PET tomographs with different detector designs, scatter and random correction and image reconstruction strategies, and widely varying approaches to body oncology imaging has only further exacerbated the problem. The earliest studies of FDG PET evaluation of indeterminate solitary pulmonary nodules found diagnostic performance using qualitative assessment versus SUVs comparable,[10] and this was confirmed in a large prospective multicenter study.[11] It is particularly important to recognize that SUVs in the published literature are not necessarily comparable to values obtained at a given imaging center both with respect to a "cutoff" value for malignancy (and there really is no "cutoff" value as such actually reflects a given expected relationship of sensitivity to specificity) and with respect to "cutoff" values used in stratifying prognosis, due to multiple factors which are currently not standardized among different institutions and practices.[12] When evaluating changes in FDG tracer uptake in tumors following interval therapy, SUVs, if rigorously standardized, can be compared when the same type of scanner and entirely consistent protocols are used as SUV measurements have been shown under such circumstances to be reproducible.[13]

In body oncology imaging there are three principal tasks to PET-CT interpretation (Table 3). A central task is integrating the PET abnormalities and corresponding morphologic abnormalities on CT and conversely identifying CT abnormalities that may reflect malignancy. Assessing the size and extent of the primary tumor and presence of local invasion (T-staging) is largely based on CT image interpretation, and such findings are often relevant in the setting of restaging if resection of a recurrent tumor is contemplated. Similar morphologic assessment is important in evaluating nodal metastases in terms of extracapsular spread of tumor such as in head and neck cancer, lymph node necrosis, and conglomeration of nodal metastases such as in the axilla in breast cancer patients. Incidental, but clinically relevant, CT findings not directly related to a patient's malignancy must also be assessed,[14,15] requiring complete review of the CT images.

Table 2 Factors Influencing SUVs

FDG uptake time
Residual dose of FDG at injection site or in tubing
Cross-calibration of scanner and dose calibrator
Accuracy of patient weight; patient lean body mass
Method of attenuation correction used
Method of randoms and scatter correction used by specific PET tomograph
Scanner detector resolution and matrix size on image reconstruction
Image reconstruction method (number of iterations vs filtered back projection)
Serum glucose level
Partial volume effect (lesions <2.5 cm)
Method of measurement (max pixel vs average pixel value)

Table 3 Interpretive Tasks of Body Oncology PET/CT*

Localization and morphologic characterization of abnormal FDG tracer uptake
Size of primary or recurrent tumor and invasion of adjacent structures (T-staging)
Incidental and unexpected findings on CT and PET

*These tasks, associated interpretative workload and reporting details, are the same regardless if the CT scan is a low-dose noncontrast CT or a fully optimized CT using oral and IV contrast enhancement.

There are multiple approaches to interpretation of PET-CT exams. The MIP images are particularly useful for overall assessment of the presence and extent of abnormal FDG tracer uptake. Abnormal FDG tracer activity is further identified and morphologically characterized on the axial, coronal, or sagittal registered and aligned PET and CT images. The entire set of CT images requires independent review to insure manifestations of malignancy negative on PET are not overlooked, and incidental clinically relevant CT findings unrelated to malignancy are identified and reported. Some physicians review the entire set of CT images before reviewing the FDG PET findings to insure relevant CT findings are not missed. It is important to note that even when there has been a recently (within 4 weeks) performed CT scan of the corresponding body parts, the CT portion of the PET-CT exam still requires complete independent review, as a patient's condition can change in as little time, or there can be interval procedures (for example, a port placement causing a pneumothorax), and important findings may have been overlooked on the recent CT interpretation.

While the elements of a good imaging exam report are well described,[16,17] PET-CT reports require an added level of depth due to the complex treatment history and number of prior imaging exams associated with patients typically undergoing these studies. The report of a PET-CT exam should be treated as a consultation, with particular attention to a concise history and an impression that directly addresses the key clinical issues relevant to the patient's subsequent management.

The report should contain four basic components: clinical information, protocol information, PET-CT findings, and impression.

The *history* or *clinical information* should be a concise summary of the patient's disease and treatment history, current clinical status, and indication for the PET-CT exam. When possible, the method, date, and findings of the original histological diagnosis should be stated. For example, "Classic Hodgkin's lymphoma on right supraclavicular excisional bi-

opsy 02/12/08." The initial clinical stage, if available, and pertinent restaging should be included, for example, "Stage IIIA treated with chemo and radiation therapy, subsequently developed liver metastases.". Relevant surgery and treatment history can be brief, but it is important to specify the time of recent surgery, radiation therapy, and chemotherapy, for example, "Right upper lobectomy 03/21/06. Hilar recurrence treated with radiation therapy, completed 04/18/07. Chemotherapy completed 11/23/07." If there is ongoing chemotherapy, the most recent dose date should be included in the history. Relevant clinical or laboratory findings should also be stated, such as serum markers, new findings or physical examination or imaging studies, and related patient symptoms. For example, "Now with rising serum CEA and enlarged retroperitoneal lymph nodes," or "Now with palpable axillary lymph nodes," or "Now with abdominal pain and increasing abdominal girth." Finally, the History section should specify the indication for the exam, such as diagnosis, staging, and restaging, but also specifically in terms of current or anticipated patient management, for example, "For staging prior to consideration of consolidative radiation therapy."

Comparison imaging studies, at least the most recent or relevant imaging studies that are used for comparison in the PET-CT exam interpretation, should be listed including type of exam, date of procedure, and originating site of the exams. This can be done under the heading of *Comparison studies* or in the *Findings* section. This usually involves prior PET-CTs and CT exams but can include bone scans, magnetic resonance images (MRIs), and even radiographs and ultrasound exams. It is useful to distinguish between imaging studies performed at one's own institution or practice versus an outside institution, and whether the images were consulted directly or only the report was available.

The *procedure* or *technique* section should include technical details about both the PET and the CT scan portions of the exam. As with any nuclear medicine imaging procedure, the tracer, tracer dose, and route of administration must be stated. In addition, the FDG uptake time, at least approximately, should be noted. The axial coverage of the scan should be noted in terms of which major body parts are included in the procedure. Details concerning emission imaging time and PET image reconstruction details are optional. Likewise, details of the CT portion of procedure concerning milliamperes-seconds, reconstructed slice thickness, and image reconstruction methods is optional; however, use or nonuse of oral and intravenous contrast should be stated, including the amount and type of intravenous contrast. It should be noted that whether a fully optimized CT with oral and IV contrast is performed or a low-dose noncontrast CT, both are fully interpreted as diagnostic CT scans (which they are) and hence a statement such as "CT performed for attenuation correction and anatomic localization" is in fact not true and should not be stated; to use the CT scan only for anatomic localization only would be substandard practice.[6] The serum glucose at the time of FDG administration should be noted. In addition any medications administered which are dispensed at the institution performing the scan, such as anxiolytics or diuretics, should be noted as well. If most of the scanning parameters are consistent from one patient to the next, a "single key" response can be arranged with transcription. In this case the interpreter would only have to state, "Auto-intro for low dose PET/CT...5.3 millicuries" and the entire descriptive paragraph would be automatically transcribed, filling in a blank with "5.3 millicuries." Details including injection site, PET image reconstruction parameters, CT beam current settings, rate of IV contrast infusion, amount of oral contrast, and the like are typically recorded on a worksheet, and this can be kept separately in the patient record or scanned into PACS or Radiology Information System.

The *findings* section of the examination involves the full interpretation of the PET and CT scans performed, with particular attention to the integration of the PET-based metabolic findings and the CT morphologic findings. This is the case whether the CT is performed as a fully optimized CT with oral and intravenous contrast material or a low-dose CT without contrast. There are different styles of reporting, including structuring the report along body part or organ system divisions, reporting PET and CT findings together in an integrated fashion, or reporting the PET and CT findings under different headings. When there is to be billing of the CT body parts of the study, either globally or professional only, there should be a separate complete report for each CT body part. This must be specifically ordered by the referring physician on a separate prescription, in order for the scan to be transcribed and billed properly, and distinct CT image sets should be archived. When a PET-CT and fully optimized CT (or CT interpretation) are requested by the referring physician, it is essential that the PET and CT reports are both individually comprehensive. The body of these CT reports should be equivalent to that of dedicated CT scans alone (ie, CT thorax, CT abdomen, etc), and include all relevant comparisons and measurements to prior CT and PET-CT exams. The PET report should be similarly comprehensive in reporting the metabolic findings with corresponding morphologic findings from the CT scans. Although this results in some redundancy, the situation is similar to the setting of a bone scan report and correlative radiograph report. In the situation of no separate diagnostic CT request, the relevant CT findings must be included in the PET-CT report. Clinically relevant CT findings unrelated to PET findings should be summarized in a single paragraph, and if there are none, a simple statement such as "no other significant abnormalities are noted on the unenhanced CT images" should be included in the report.

Abnormal foci of FDG tracer uptake must be identified, and the coregistered and aligned CT images used to determine the anatomic origin of the PET abnormality and morphologically characterize the lesion, to the extent possible, as a benign process or due to malignant neoplasm. Conversely, abnormalities on the CT portion of the exam such as enlarged lymph nodes, pulmonary abnormalities, soft-tissue lesions, and the like must be identified and compared to the coregistered and aligned PET images to determine whether abnormal glucose metabolism indicating active inflammation or malignant neoplasm is present or absent. For foci of FDG

uptake that do not represent malignancy, when possible, the etiology of the tracer uptake should be noted, such as brown fat, healing fracture, degenerative joint disease, bursitis, uterine/ovarian physiologic activity, diffuse thyroid activity and possible thyroiditis, abscess and fistulas, healing wounds, and the like.

As noted in Table 1, there are manifestations of malignant disease depicted on the CT portion of the study that may be absent or subtle on the PET portion of the study that should not be overlooked. This overall process of combined PET and CT interpretation is easier and more comprehensive with a fully optimized CT scan but is nonetheless fully operative and equivalent in terms of interpretive workload and integrated diagnosis with a low dose non-contrast-enhanced CT. The extent of tumor involvement with adjacent structures, again chiefly depicted on the CT images, should be described for primary and recurrent neoplasm, and for metastases which have extended beyond the tissue or organ metastatic site.

For many PET-CT examinations, a good portion of the interpretive workload is the comparison with prior examinations. This most frequently involves prior CT scans, either very recent in terms of a week or two or more distant in terms of months. These prior CT scan reports are often carefully reviewed by the physician ordering the subsequent PET-CT scan, and consequently, the findings reported on the antecedent scan need to be referenced and reevaluated in the PET-CT report in light of the findings on the combined PET-CT scan. This "deconstruction" of the prior report can be a substantial portion of the interpretive workload and occurs even if the referenced CT scan was performed only a few days prior, as clinically relevant CT findings may be easily overlooked without the benefit of the PET findings.

Whether the prior imaging study was a combined PET-CT or CT or MRI alone, changes in the size and morphology of the primary tumor and metastatic deposits requires comment, and referring clinicians often desire bi-dimensional measurements. It should be noted that, while in diagnostic imaging the short axis is used to determine whether a lymph node is technically enlarged by established criteria, in oncology the longest dimension is measured for assessing changes in response to therapy.[18]

When there is a prior PET-CT available for comparison and there has been interval treatment, the comparison becomes more complex, as the metabolic response in addition to the anatomic response must be assessed. Changes in tumor size depicted on the CT images is usually straightforward with established methods of measurement.[18] Means of evaluating and reporting changes in FDG tracer activity in tumor deposits have yet to be standardized, although at least for lymphoma, an international committee recently published a consensus for qualitative assessment.[19] Qualitative comparison of tumor FDG tracer activity in response to therapy requires the images compared are displayed at comparable levels of background tracer activity and window width (Fig. 2), such that tumor deposits can be compared to similarly displayed background tracer activity such as mediastinal background or liver background tracer activity. Descriptors such as interval increase in glucose metabolism, no appreciable change in glucose metabolism, small or modest decrease in glucose metabolism, substantial or near complete resolution of abnormal glucose metabolism, and complete resolution of abnormal glucose metabolism can be used in the PET-CT report to communicate changes in tumor glucose metabolism in response to therapy.

As noted above, if SUVs are to be reported as a measure of therapy response, rigorous consistency in the PET imaging protocol and method of SUV measurement must be followed, and referring physicians should be advised the values reported may not be compared reliably to values reported with scans performed at other institutions or values reported in the literature.

Patients enrolled in treatment protocols often require specific comparison of landmark tumors, primary and metastatic, size measurements, and this can be combined with SUVs, if such are to be reported. It can be helpful to also identify the image in which the measurement were made:

Right hilar node (image #42): 1.3 cm compared to 2.8 cm on 12/20/07
SUV 5.6 compared to 10.8 on 12/20/07

Left axillary node (image #18): 1.1 cm compared to 2.1 cm on 12/20/07
SUV = 2.4 compared to 5.6 on 12/20/07

Right inguinal node (image #198): 1.5 cm compared to 2.6 cm on 12/20/07
SUV = 3.2 compared to 8.3 on 12/20/07

Such organization is helpful to the referring physician, but also the interpreter of the follow-up PET-CT.

Incidental findings on the CT portion of the PET-CT exam (Table 4) should be described in the PET-CT report or, if a separate CT report for each body part is generated, such findings can be described in the separate CT reports. Clinically significant findings should be included in both the re-

Table 4 Incidental Findings on PET-CT Exams Requiring Specific Physician Communication or Recommended Follow Up

PET findings (indicating a possible additional malignancy):
–Focal abnormal FDG uptake in colon reflecting possible polyp or colon cancer, in the thyroid reflecting possible primary thyroid cancer, in neck reflecting possible primary cancer
CT findings (not directly related to a malignancy):
–Pneumothorax in patients such as post placement of port or lung biopsy
–Incorrect central venous catheter position
–Deep venous thrombus and pulmonary embolism
–Large aortic aneurysms
–Small pulmonary nodules requiring CT follow-up
–Non- or minimally-FDG avid tumors
–Active inflammation including colitis, diverticulitis, cholecystitis, abscess
–Pleural and pericardial effusions
–Ascites, pneumoperitoneum
–Obstructive uropathy

ports and the impressions as well. Unexpected findings reflecting malignant or premalignant lesions on the PET portion of the PET-CT exam[20] should be described and also be given separate mention in the Impression portion of the report.

When there are separate PET and CT reports, it is critically important that the two reports are consistent. This is especially important when the PET and CT portions of the studies are interpreted by different physicians, such as modality or body part subspecialists, in which case the readers must communicate and agree on the final impression. In most cases the PET and CT findings are concordant, but in some instances apparent discrepancies between the PET and CT findings need to be resolved. For example, in a lung cancer patient with a 2-cm left adrenal mass demonstrating abnormal FDG uptake (above liver background tracer activity) but measuring 5 HU attenuation on the CT portion of the PET-CT exam, a diagnosis of a benign adenoma is made. In this situation one approach to organizing the separate reports for PET and CT is to include all of the modality-specific findings in the body of each report and have the same comment in each impression (which incorporates both the PET and CT conclusions) in both the PET and the CT. In the aforementioned example, an Impression item in both the PET and the CT reports would be "left adrenal adenoma," for example. This provides the referring clinician with a concise bottom-line result for the combined PET/diagnostic CT study and complies with required reporting and billing requirements.

The *Impression* should be just that, an impression, as opposed to a long list of abnormal findings. It should answer the question the referring physician has posed. The Impression component of the report should take into account all of the PET and CT findings as a whole, and be as definitive as possible. This is also best performed using a bulleted format, as opposed to long paragraphs of description, for example:

1. Increase in intensity and extent of abnormal foci of glucose metabolism in the spleen and retroperitoneal lymphadenopathy, representing progression of lymphomatous involvement since prior study.
2. No significant change in distribution of abnormal elevated glucose metabolism in the mediastinum and hila corresponding to the stable lymphadenopathy.

These PET-CT-related impressions should be listed in order of most significant first, followed by the additional CT findings, if any:

1. Stable 4.4-cm infrarenal abdominal aortic aneurysm
2. Stable 4-mm right lower lobe pulmonary nodule
3. Cholelithiasis

Unless referring clinicians specifically request a statement of TNM stages based on the imaging findings, such should not be included in the report. TNM staging is based on clinical, laboratory, pathologic, as well as imaging findings and is performed by the surgeon or oncologist managing the patient. It can be helpful to give the findings relevant to T, N, and M staging in the Impression in a bulleted format, including very brief specific findings relevant to the TNM staging such as:

1. 3.5 cm mass in left lower lobe is hypermetabolic and does not abut the pleural or left hilum
2. Hypermetabolic left hilar and ipsilateral mediastinal lymphadenopathy
3. No evidence for distant metastatic disease

If there are findings that require immediate patient attention, such as unexpected pulmonary emboli, this should be communicated (and documented in the report) to the referring physician at the time they are observed such as:

1. Pulmonary emboli, as detailed above. This finding was called to Dr. ____ at 2:35 PM on 2/12/08.

The interpretation and reporting of PET-CT scans for body oncology imaging requires broad clinical focus, multiple levels of integration, and, in no small part, perseverance to provide the referring clinician with comprehensive yet concise and consistent information for the management of their patients.

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