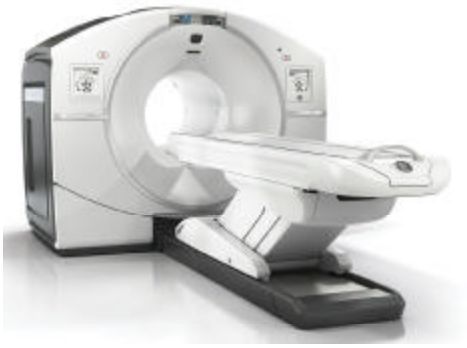
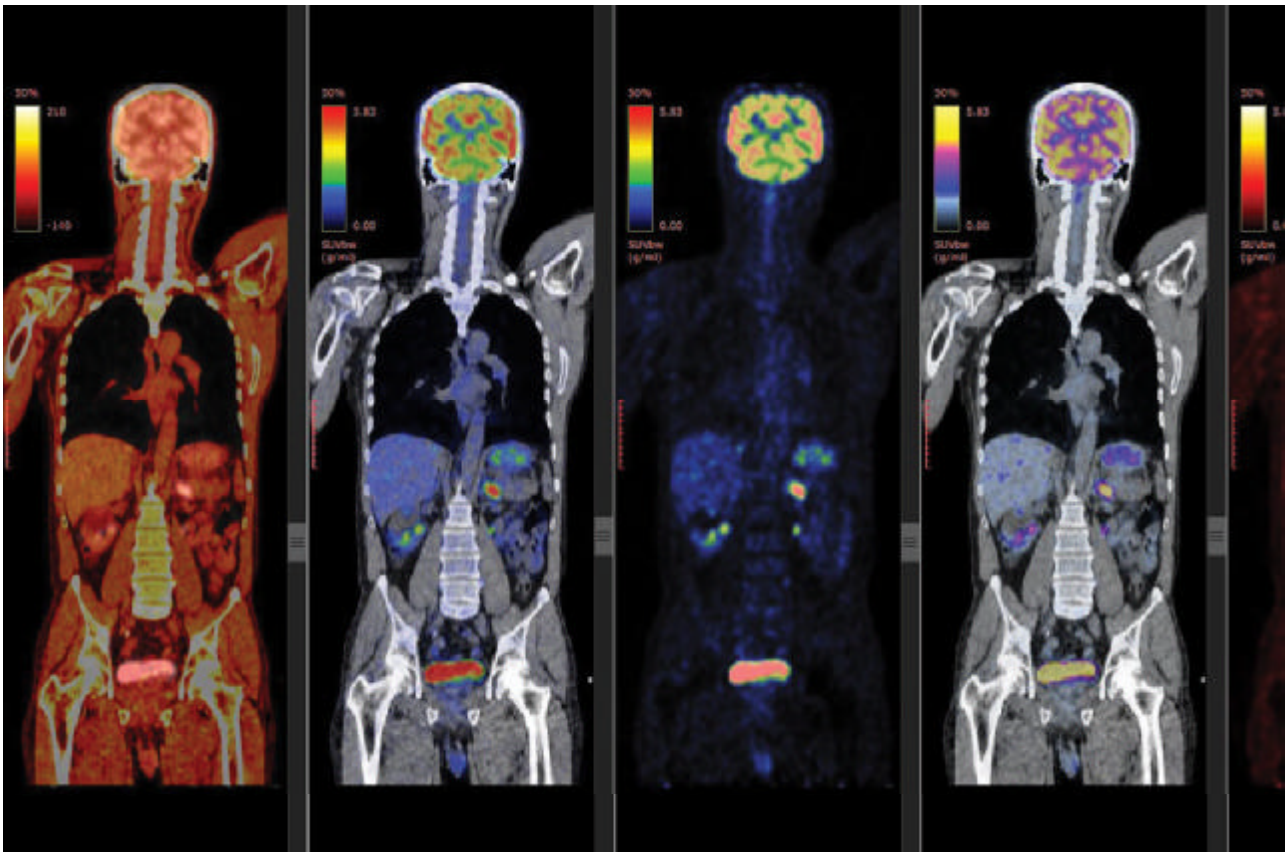


مرکز پزشکی هسته ای و تصویربرداری مولکولی بوشهر

تصویربرداری پت-سی تی
در آنکولوژی



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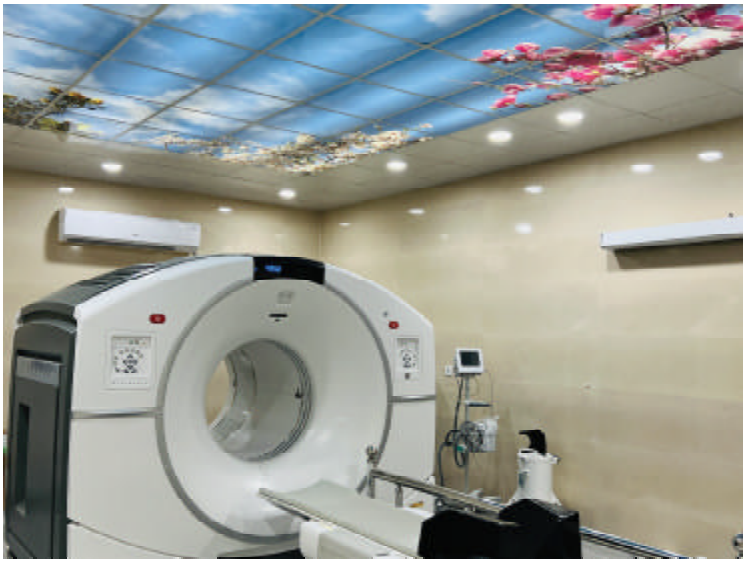
پت-سی تی چیست؟

پت-سی تی یک **روش تشخیصی دوگانه** هیبرید است که در آن طراحی تابش پوزیترون (پت اسکن) با سی تی ادغام شده است. جزء پت این سیستم عملکرد ارگان ها را به تصویر می کشد و جزء سی تی تعیین محل یا جانمایی را انجام می دهد.

امروزه شایع ترین کاربرد این روش بررسی **تومورهای بدخیم** می باشد. این ر.وش اطلاعات ارزشمندی از **وضعیت تومورهای بدخیم اولیه**، **میزان گسترش موضعی** و **متاستازهای دور دست** در بدن فراهم میکند که میتواند راهنمای درمان خوبی برای پزشک معالج باشد.

این روش برای ارزیابی وضعیت بیماری حین درمان، یا پس از پایان درمان، نسبت به روش های معمول تصویربرداری مانند سی تی اسکن و ام آر آی ارجحیت های بسیار بیشتری دارد.

در این مرکز علاوه بر رادیوداروی معمول فلورو-دی اکسی-گلوکز از **رادیوداروهای اختصاصی** تر به منظور تشخیص سرطان هایی مانند پروستات، غدد نوروآندوکراین، پستان و مغز نیز استفاده می شود. بنابراین در در جاهایی که بافت زمینه ای مصرف گلوکز بالایی دارد و یا در تومورهای سر و گردن که استفاده از رادیوداروی معمول فلورو-دی اکسی-گلوکز محدودیت هایی دارد، به کارگیری رادیوداروهای جدید کمک شایانی به تشخیص و متعاقبا **درمان دقیق تر و فردی** را فراهم می آورد



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اندیکاسیون های پت-سی تی

الف- اندیکاسیون های کلی ^{18}F-FDG PET/CT در کانسرهای مختلف

۱. کارسینوم آنال (staging, radiotherapy planning)

۲. کوردوما (staging)

۳. سارکوم یوئینگ (staging, restaging after chemotherapy, surveillance)

۴. استئوسارکوم (staging, restaging after chemotherapy, surveillance)

۵. آدنوکارسینوم پستان (staging, restaging, suspected recurrence)

۶. تومورهای مغزی (گلیوم آناپلاسیتک در افتراق عود از رادیونکروز، متاستاز مغز یا نخاع با منشا ناشناخته، staging لنفوم مغز)

۷. سرویکس (staging, suspected recurrence, radiotherapy planning)

۸. آدنوکرسینوم کولورکتال (بررسی تعداد سایت‌های متاستاز قبل از درمان، افزایش CEA بعد از درمان)

۹. کانسر مری (restaging after chemotherapy, radiotherapy planning)

۱۰. کانسر معده (staging, restaging, radiotherapy planning)

۱۱. کانسرهای سر و گردن (تعیین منشأ اولیه متاستاز، staging اولیه در موارد شک به پیشرفته بودن بیماری و ملانوم مخاطی، restaging after therapy، radiotherapy planning)

Loremipsum

۱۲. آدنوکاسینوم هپاتوبیلیاری (staging, suspected recurrence)

۱۳. لنفوم هوچکین (staging, interim, restaging, radiation planning)

۱۴. لنفوم غیرهوچکین (لازم در staging اولیه DLBL و مفید در staging اولیه MALToma، لنفوم فولیکولار گرید ۱ و ۲، لنفوم بورکیت، Mantel cell lymphoma و برخی موارد نادر دیگر، تشخیص ترانسفورماسیون)

۱۵. کانسر کلیه (suspected recurrence)

۱۶. مزوتلیوم (staging, radiotherapy planning)

۱۷. ملانوم (staging در موارد با برسلو بالا، شک به عود یا متاستاز در موارد stage بالا)

۱۸. میلوم و پلاسموسیتوم (یافتن کانون‌های فعال اولیه، پس از درمان اولیه جراحی یا پرتودرمانی بر

۱۹. کانسر ریه Non-small cell: (بررسی ندول ریوی منفرد غیرکلسیفیه بالای ۸ میلی‌متر، staging اولیه تمام بیماران، بررسی پاسخ به درمان، تعیین پلن رادیوتراپی)

۲۰. کانسر ریه (small cell staging) اولیه و تعیین پلن رادیوتراپی

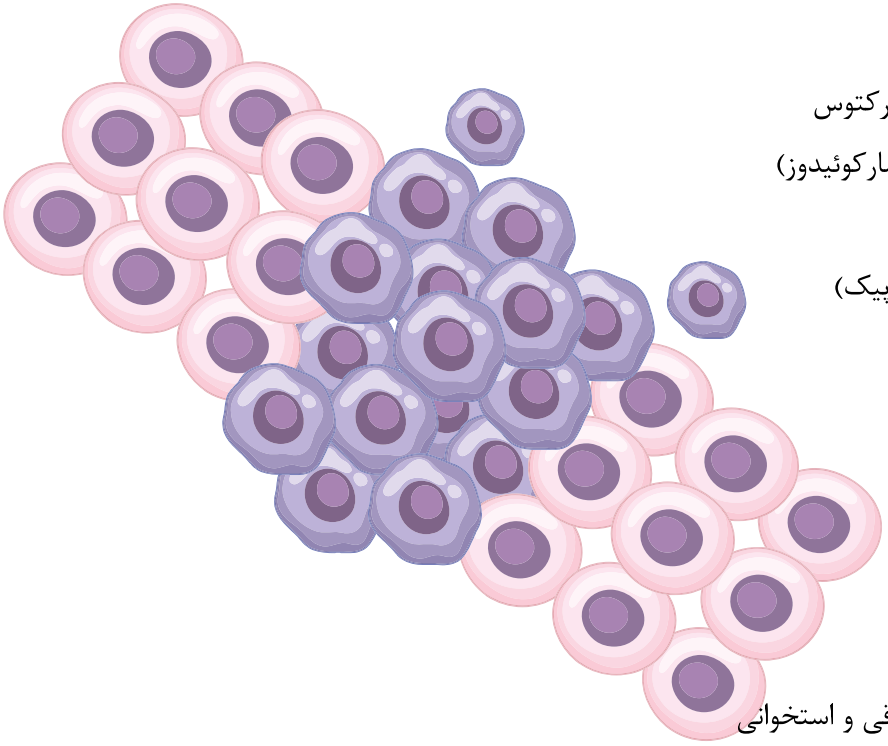
۲۱. کانسر تخمدان (بررسی ضایعات لگنی بینابینی، بررسی پاسخ به درمان، افزایش تومور مارکر و شک به عود یا متاستاز)

۲۲. کانسر پانکراس (بررسی متاستاز دوردست)

۲۳. سارکوم بافت نرم (بر حسب موارد بالینی برای staging، بررسی پاسخ به درمان، شک به عود یا تعیین پلن رادیوتراپی)

۲۴. GIST (بررسی تومور اولیه و متاستاز احتمالی، بررسی پاسخ به ایماتینیب و نیاز بع تغییر درمان به خط بعدی درمان)

۲۵. تومور ژرم سل بیضه سمینوم: بررسی بعد از کموتراپی در توده باقی مانده رتروپریتوئن به خصوص اگر بالای ۳ سانتی‌متر باشد و تومور ماکرها منفی باشد.



ب) کاردیولوژی

۱. بررسی Viability میوکارد پس از انفارکتوس

۲. بررسی بیماری‌های التهابی میوکارد (سارکوئیدوز)

ج) نورولوژی

۱. بررسی بیماری‌های شناختی (آلزایمر، پیک)

۲. بررسی تومورهای مغزی

۳. بررسی منشأ صرع

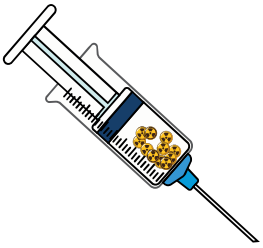
۴. بررسی بیماری‌های حرکتی

د) بیماری های عفونی و التهابی

۱. استئومیلیت

۲. بررسی تب با منشأ ناشناخته

۳. بررسی عفونت در پروتزهای قلبی، عروقی و استخوانی



انواع رادیو داروها

^{18}F-Fluorodeoxyglucose

یکی از شایع ترین رادیو داروهایی که به این منظور استفاده می‌شود F-FDG (فلوئورودئوکسی گلوکز) است که طول عمر نسبتا کوتاهی، معادل حدود ۱۱۰ دقیقه دارد.

^{68}Ga-DOTA-peptides (TOC, TATE and NOC)

رادیو داروهای فوق، گروهی از مواد مخصوص PET هستند که به صورت اختصاصی به گیرنده های سوماتراستاتین (SST) که به شدت در تومورهای نوروآندوکرین (NET) نمایان می شوند، متصل می گردند و اسکن PET/CT برای نشان دادن تومورهای نرواندوکرین بسیار کارآمدتر از CT اسکن می باشند.

همچنین مطالعات بالینی، برتری این نوع PET را بر اسکن pentetreotide-SPECT جهت بررسی متاستازهای NET و یافتن تومورهای اولیه، به اثبات رسانده است. ^{68}Ga-DOTA-TATE همچنین در یافتن محل های تومورهای تیغه عصبی همچون پاراگانگلیوما، نسبت به MIBG ارجهیت دارد.

^{68}Ga-DOTA-PSMA

آنتی ژن غشائی اختصاصی پروستات (PSMA) گلیکو پروتئین اختصاصی دیواره‌ای است که در سطح سلول‌های پروستات به شدت افزایش می‌یابد. در سال‌های اخیر، از نشاندار کردن این آنتی ژن با ^{68}Ga برای تشخیص و ^{177}Lu برای درمان استفاده شده است. در سطح PSA>۲.۲ به میزان کشف توده‌های پروستات توسط این اسکن، حدود ۱۰۰ تعیین شده است.

^{68}Ga-FAPI

ریزمحیط پیرامون ضایعات بدخیم علاوه بر خود سلول‌های توموری، توسط چندین نوع دیگرسلول دیگر احاطه شده‌اند که بر رشد، تهاجم و پیش آگهی آن‌ها تأثیر می‌گذارد. فیبروبلاست‌های مرتبط با سرطان (CAFs) یکی از عوامل ضروری در اکثر کارسینوم‌های سلول‌های اپیتلیال هستند. این سلول ها پروتئین فعال کننده فیبروبلاست (FAP)، یک گلیکوپروتئین متصل به غشاء را بیش از حد بیان می‌کنند. FAP از دیرباز هدفی برای تصویربرداری و درمان بوده است. اخیراً، مهارکننده مولکول کوچک (FAP FAPI) که به تازگی توسعه یافته است، توجه قابل توجهی را برای تصویربرداری مولکولی و درمان در پزشکی هسته‌ای به خود جلب کرده است. FAPI با رادیونوکلئیدهای مورد استفاده برای توموگرافی گسیل پوزیترون (PET)، مانند گالیم-۶۸ و فلوراید-۱۸، و همچنین رادیو ایزوتوپ‌های مورد استفاده برای درمان، از جمله لوتتیوم-۱۷۷ نشاندار شده است و در بحث PET نتایج بسیار امیدوار کننده‌ای داشته است و در مواردی که FDG PET نقصان دارد، می‌تواند بسیار مفید باشد.

^{68}Ga-pentixafor

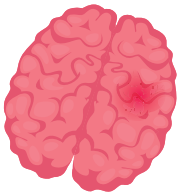
در این نوع پت اسکن، از گیرنده کموکاین ساب تایپ ۴ (chemokine receptor subtype ۴) که در بسیاری از بدخیمی‌های خونی و تومورهای جامد موجود است، تصویربرداری می‌شود و به نوعی محدودیت‌های FDG PET در مواردی مثل مالتیپل مایلوما، بعضی از لنفوهای غیرجاذب FDG و نیز تومورهای مغز برطرف می‌گردد.

MAJOR CLINICAL APPLICATIONS OF PET/CT

Brain

•Assist in decision-making and target selection for biopsy by identifying the grade of malignancy where there is uncertainty on anatomical imaging.

•Suspected relapse where magnetic resonance imaging (MRI) is equivocal to inform decisions regarding surgery or radiotherapy planning.



• Assessment of suspected high-grade transformation in low-grade glioma.

• To differentiate recurrent glioma from post-treatment effects when MRI is unhelpful.

•Differentiation between glioma and primary central nervous system lymphoma limited to the brain in combination with MRI in highly selected cases.

•Differentiation of cerebral tumor from atypical infection in immuno-compromised patients with indeterminate lesions on MRI/CT.

Head and neck tumors

•Staging of patients where staging is difficult clinically; for example, where there is uncertainty on other imaging or equivocal findings that would preclude radical treatment.

•Staging or restaging of patients with a high-risk of disseminated disease such as advanced loco-regional disease and primary sites with a high propensity for disseminated disease such as nasophayngeal and hypopharyngeal cancer.

•To identify the primary site in patients presenting with metastatic squamous cell carcinoma in cervical lymph nodes, with no primary site identified on other imaging.

•Response assessment three to six months' post chemoradiotherapy in head and neck cancer with advanced locoregional or metastatic disease.

•To differentiate relapse from treatment effect.

Thyroid carcinoma

•Assessment of patients with elevated thyroglobulin levels and negative iodine scintigraphy with suspected recurrent disease.

•To evaluate disease in treated medullary thyroid carcinoma associated with elevated calcitonin levels with equivocal or normal cross-sectional imaging, bone and octreotide scintigraphy.

•Monitor response to tyrosine kinase inhibitor (TKI) therapy in patients with FDG-avid and non-iodine-avid disease.

•Evaluation of anaplastic thyroid cancer in highly selected cases based on a multidisciplinary decision where impact on clinical management is expected.

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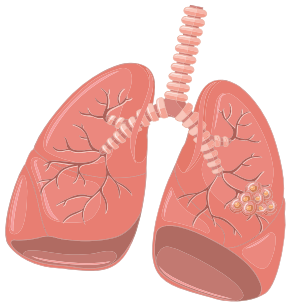
Lung carcinoma

•Staging of patients considered for radical treatment of non-small cell lung cancer.

•Characterization of a solid solitary pulmonary nodule with an initial risk of malignancy of >10%. – Especially in the case of failed biopsy, a technically difficult biopsy or where there is a significant risk of a pneumothorax in patients with medical co-morbidities. – Smaller nodules in the upper lobes may be considered after multidisciplinary team (MDT) discussion or discussion if biopsy and/or CT follow-up are not appropriate.

•Assessment of response to chemotherapy and/or radiation treatment in selected patients who have had an apparently very good response on conventional imaging and surgery is being considered.



•Assessment of suspected disease recurrence •To differentiate between treatment effects and recurrent cancer.

•Staging of patients with small-cell lung cancer with limited disease on CT being considered for radical therapy.

Pleural malignancy

To guide biopsy in patients with suspected pleural malignancy with pleural thickening. – FDG is less likely to be useful in patients presenting with a pleural effusion only or with a history of previous pleurodesis.

• To exclude extra-thoracic disease in proven mesothelioma in patients considered for multimodality treatment including radical surgery/decortication.

•Response assessment to therapy where there is uncertainty on conventional imaging.

Thymic tumors

•Staging of patients considered for surgical resection.

•Assessment of indeterminate thymic lesions if being considered for radical treatment.

•Response assessment to therapy where there is uncertainty on conventional imaging.

Breast tumors

•Indeterminate or equivocal breast lesions

•In case of an FDG-avid intramammary incidental abnormality on a FDG PET-CT scan (performed for reasons other than breast cancer), it is recommended to evaluate on further investigations to exclude breast cancer, including correlation with dedicated breast imaging and, not infrequently, histological confirmation

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Primary staging

• To be performed when standard staging imaging studies are equivocal or suspicious and particularly when required to guide management decisions such as pre-operative systemic therapy.

• Staging of inflammatory or non-inflammatory locally advanced breast cancers (LABC) instead of and not in addition to CT scan and bone scan.

Replacing or complementing standard staging imaging studies in high-risk patients, such as patients with: – High tumor burden*: Large tumors (e.g. > 5 cm, T3) and/or; Clinically positive axillary nodes (cN+); – Aggressive tumor biology, e.g. triple-negative breast carcinoma** – Clinical signs, symptoms or laboratory values suggesting the presence of metastases.

• To identify occult primary breast cancers in a highly selected group of patients with proven lymph nodal (particularly axillary) or distant metastatic disease but undetecte lesions on dedicated breast imaging.

• Replacing standard staging imaging studies in patients with proven or suspected allergy to CT or MRI contrast agent.

Notes:

*In the initial staging, FDG PET-CT imaging has been suggested in patients with clinical stage IIA (T1N1 or T2N0) and strongly recommended in patients with clinical stage >=IIB breast cancer, and is better when performed before surgery;

**Other aggressive breast cancer phenotypes which are known to be FDG-avid include grade 3 ductal cancer, high Ki67, ER/PR-negative, luminal B cancers.

• Recurrence assessment

• To be performed in patients in which standard imaging studies are equivocal or suspicious of recurrent disease (problem-solving).

• For restaging of patients with confirmed locoregional recurrence or clinical suspicion of relapsed disease

• Response to treatment

• For early evaluation of response to neoadjuvant therapy, particularly in triple negative or Her2+ disease.

• Assessing response to systemic treatment, as clinically indicated, particularly in patients whose disease is not well demonstrated using other diagnostic techniques (for example, bone metastases) or in complex patients with multisystemic disease (fo identifying differential response and guide clinical management).*(e.g. chest wall tenderness, elevated tumor markers and so on) equivocal on standard imaging.

• Differentiation of treatment-induced brachial plexopathy from tumor infiltration in symptomatic patients with an equivocal or normal MRI.

• Replacing standard restaging imaging studies in patients with proven or suspected allergy to CT or MRI contrast agents

Esophageal and esohago-gastric junction cancers

• For staging/re-staging patients with esophageal or esohago-gastric carcinoma, particularly if considered at risk of metastases, suitable for radical treatment, including patients who have received neo-adjuvant treatment.

• Evaluation of suspected recurrence of esohago-gastric tumors when other imaging is negative or equivocal.

• For radiotherapy planning/volume delineation of esophageal and esohago-gastric junction cancers.

• To evaluate response assessment after primary treatment in patients with esophageal or esohago-gastric junction cancers.

Gastric cancer

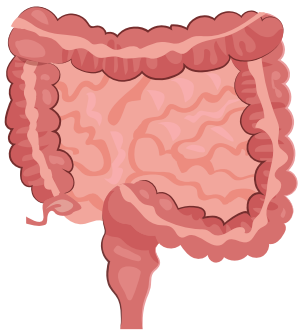
• To identify primary gastric tumors in case of equivocal findings on conventional imaging for patients which are eligible for radical treatment.

• For staging and re-staging of confirmed gastric cancer if there is a curative treatment intent.

• Assessment of suspected relapsed or disease progression in patients who are candidates for further chemotherapy or radiotherapy.

• To identify recurrent disease in gastric bed, near anastomoses or stumps.

• For treatment response assessment (particularly in cases of renal insufficiency or allergy to CT contrast.



Gastrointestinal stromal tumors

• Staging prior to treatment in patients who are likely to require systemic therapy. Response assessment to systemic therapy.

• Early treatment response (six to eight weeks) to imatinib Hepatopancreatobiliary disease

Pancreatic cancer

•Staging of patients with localized pancreatic cancer on CT before they have surgery, radiotherapy or systemic therapy to help in planning appropriate treatment.

•Suspected recurrence of pancreatic cancer, where cross-sectional imaging is equivocal or negative.

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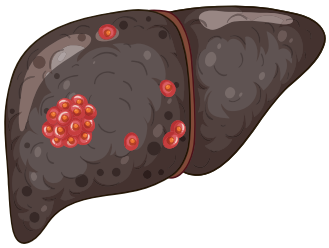
Hepatocellular carcinoma

• Suspected recurrence of hepatocellular carcinoma (HCC), where cross-sectional imaging is equivocal or negative.

• Identification of poor prognosis HCC.

• Predicting probability of early recurrence after liver transplantation for HCC. Colorectal carcinoma



• Staging of patients with synchronous metastases at presentation suitable for resection or patients with equivocal findings on other imaging; for example, pulmonary or liver lesions.

• Restaging of patients with recurrence being considered for radical treatment and/or invasive targeted techniques (for example, metastatectomy/selective internal radiation therapy [SIRT]).

• Assessment of treatment response in patients with rectal carcinoma post (chemo) radiotherapy with indeterminate findings on other imaging.

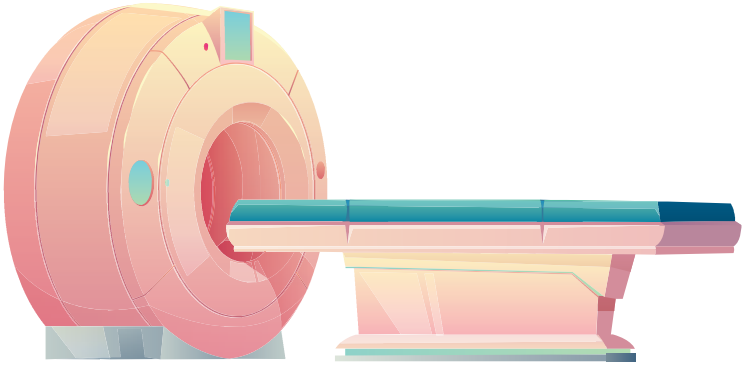
• Evaluation of indeterminate pre-sacral masses post-treatment.

• Assessment of treatment response following targeted therapy (ablative techniques for liver or lung metastases, selective internal radiotherapy for liver metastases) in metastatic colorectal carcinoma when findings on other imaging are inconclusive.

• PET-CT follow up after liver metastasis ablation.

• Detection of recurrence in patients with rising tumor markers and/or clinical suspicion of recurrence with normal or equivocal findings on other imaging.

• Monitoring metabolic response in patients with metastatic colorectal cancer being treated with oral multikinase and immune checkpoint inhibitors



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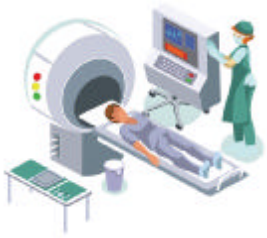

Anal carcinoma

• For staging in patients with T2-T4 anal tumors suitable for radical treatment.

• For re-staging/re-assessment in patients treated with radical chemoradiotherapy.

Urological malignancy.

Renal cancer

• Assessment of metastatic renal or ureteric carcinoma in staging and restaging of extra-renal or extra-ureteric disease in selected cases with equivocal imaging.

• Assessment of disease recurrence within the nephrectomy bed.

• Monitoring response to treatment if previously FDG-avid metastatic disease.

Bladder cancer

• Staging – In the setting of proven muscle invasive bladder cancer or high-risk non-muscle-invasive bladder cancer before radical treatment if there are indeterminate findings on CT or MRI, or a high-risk of metastatic disease (e.g., T3b disease).

• Re-staging following treatment or in suspected extra-vesical recurrence (nodal or visceral).

PSMA Scan

Prostate malignancy

• Positive FDG PET is a poor prognostic marker in prostate malignancy and can be used in combination with multitracer imaging (e.g., prostate-specific membrane antigen (PSMA) tracer imaging, …) in highly selected patients based on MDT approach. See 68Ga-PSMA PET/CT in prostate malignancy

Testicular malignancy

• In selected cases of primary staging of testicular germ cell tumors with equivocal findings on conventional work-up.

• Assessment of recurrent disease in seminoma patients with elevated or rising tumor markers and equivocal or normal anatomical imaging.

• Post chemotherapy assessment of residual masses in patients with metastatic seminoma

Penile carcinoma

• Staging of high-risk penile carcinoma

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Gynecological malignancy

• Staging of patients with locally advanced cervical cancer being considered for radical chemoradiotherapy.

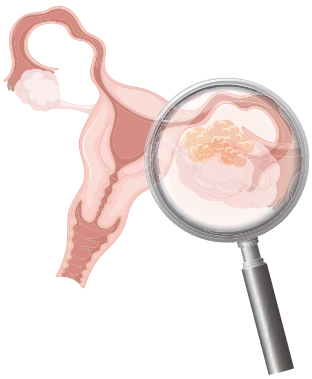
• Response assessment of locally advanced cervical cancer after chemoradiotherapy if felt clinically warranted.

• Suspected recurrence of vulval, endometrial or cervical carcinoma when other imaging is equivocal.

• Staging or restaging of patients with vulval or uterine (cervix/endometrium) carcinoma considered for exenterative surgery.

• Detection of tumor in selected patients with ovarian carcinoma who have rising CA125 levels and equivocal or negative imaging.

• Staging of high-risk endometrial cancer with equivocal findings on conventional work-up.



Lymphoma

• Staging and restaging of FDG-avid lymphoma (including indolent lymphoma and post-transplant lymphoproliferative disorder (PTLD) in patients being for considered for active treatment.

• Response assessment using Deauville criteria and Lugano classification.

• In cases where there is a high index of clinical suspicion for high grade transformation

to identify a suitable biopsy site in low grade lymphoma. Re-biopsy is not required prior to immunochemotherapy based on standardized uptake value (SUV) alone.

• Evaluation of suspected relapse for FDG-avid lymphomas in symptomatic patients. Surveillance imaging is not recommended.

• Prior to bone marrow transplant to assess remission status and residual volume of disease and suitability for transplant.

Myeloma

• Work-up of patients with newly diagnosed, relapsed or refractory multiple myeloma.

• Work-up of patients with a solitary extramedullary plasmacytoma, as well as in cases of solitary bone plasmacytoma if whole-body MRI is not available or contraindicated.

• Distinguish between smouldering and active myeloma.

• Monitor the effects of treatment

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Skin tumors

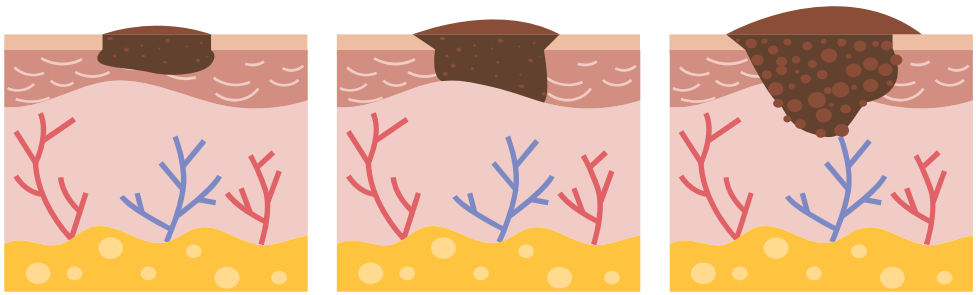
• Staging of patients with known disseminated melanoma to assess extent of disease prior to treatment.

• To assess for distant disease in patients with melanoma when radical dissection is contemplated (nodal or metastatic disease).

• To assess response to isolated limb infusion for malignant melanoma.

• FDG PET-CT is a useful non-invasive tool in the work-up of locally advanced (unresectable) and metastatic Merkel cell carcinoma, providing information for initial staging, therapy response evaluation, and monitoring of recurrent disease.

• To exclude systemic involvement in skin lymphomas and exclude large cell transformation in



Musculoskeletal tumors

• Staging of high-grade sarcomas (e.g., Ewing's sarcoma, rhabdomyosarcoma, osteosarcoma), unless already proven to have metastatic disease.

• In the pre-amputation setting of a high-grade sarcoma where detection of distant disease will alter the surgical management.

• Staging of patients with metastatic sarcoma considered for liver or lung metastatectomy where anatomical imaging has not identified any extra-thoracic or extra-hepatic disease which would preclude surgery.

• Treatment response assessment in high-grade sarcomas.

• Follow-up assessment post-surgical treatment (ie, operative bed surveillance for local recurrence), particularly in cases where metallic orthopaedic implants preclude or complicate conventional imaging.

• Aid in differentiation of equivocal findings from conventional imaging in selected cases

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Neuroendocrine tumors

• Staging or restaging (including pre-operative assessments) of selected patients with poorly differentiated neuroendocrine tumors (NETs) including phaeochromocytoma and paraganglioma (in particular those with succinate dehydrogenase mutations) prior to treatment with negative somatostatin receptor imaging with SPECT techniques or 68Ga-DOTATATE PET-CT.

• Staging of well-differentiated neuroendocrine tumor with lesion(s) showing rapid progression.

• Staging of well-differentiated neuroendocrine tumor with lesion(s) on cross-sectional imaging that is negative on SSR imaging to evaluate for secondary pathology or dedifferentiation.

• Identify patients who are unlikely to respond to 177 Lu-DOTATATE therapy (ie, discordant lesions that are SSR negative and FDG positive).

• Risk stratification of well-differentiated NETs for treatment planning.

• Assessment of possible multifocal disease in patients with paraganglioma considered for surgery in combination with 68Ga-DOTATATE PET-CT.

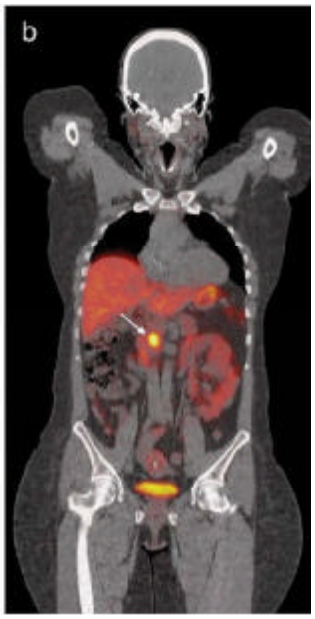
• Assessment of selected patients with adrenocortical carcinoma being considered for invasive treatment where cross-sectional imaging is inconclusive.

Paraneoplastic syndromes

• To detect an occult primary tumor in selected patients with non-metastatic manifestations of neoplastic disease when other imaging is negative or equivocal.

Carcinoma of unknown primary

• Detection of the primary site when imaging and histopathology has failed to show a primary site, where the site of tumor will influence choice of chemotherapy.



• Most NETs have low uptake of FDG; however, tracers that bind to somatostatin receptors,which are expressed by these tumours have high uptake. Somatostatin receptor (SSR) scintigraphy using SPECT tracers, for example 111 In-octreotide, have been clinical use for a number of years. Newer peptide labelled with 68Ga such as DOTATATE show much higher affinity for NETs. Recently radionuclide treatments using SSR agents have resulted in improved quality of life and an 82% increase in progression free survival for patients with NETs and SSR imaging helps to select and manage patients for radionuclide therapy.

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Vasculitis

•Suspicion of vasculitis

• To determine the presence, extent and distribution of active extracranial disease in patients with suspected medium or large vessel vasculitis.

•To exclude other pathological processes which could result in atypical clinical presentation mimicking vasculitis, such as infection, multisystemic inflammatory disease, malignancies and potential paraneoplastic phenomenon.

•To confirm active extracranial vascular disease in patient with clinical suspicion of vasculitis in which conventional imaging (ultrasonography, CT angiography or magnetic resonance angiography) is negative or equivocal.

•Suspicion of vasculitis relapse (during glucocorticoid taper and/or immunosuppressive therapy)

•In case of suspicion of vasculitis relapse (vasculitis-related inflammation of the aorta and/or its proximal branches), investigation with FDG PET-CT imaging should be considered.

Infection and inflammatory disorders

•Specific indications where FDG PET-CT may offer advantages over other forms of imaging include the following:

– suspected implantable cardiac device related infection in selected cases provided sufficient time has elapsed since surgery;

– suspected central or peripheral vascular graft infection;

– bone and soft tissue infections in the feet of patients with diabetes mellitus;

– detection of focal site(s) of infection in immunocompromised patients;

– spinal infections;

– possible multi-resistant tuberculosis especially in HIV positive or otherwise immunocompromised patients;

– post-fracture osteomyelitis.

•For diagnosis and prognostication of idiopathic retroperitoneal fibrosis.

•May be considered as a problem-solving tool in complex cases of autoimmune disease.

Pyrexia of unknown origin

•To identify the cause of pyrexia of unknown origin where conventional investigations have not revealed a source

•Three point visual grading score for prosthetic vascular graft infection.

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68Ga-PSMA PET/CT imaging of prostate cancer

•Localization of tumor tissue in recurrent prostate cancer

• Primary staging in high-risk disease before surgical procedures or planning RT

• Staging before and during PSMA-directed radiotherapy (mainly in mCRT)

• Targeted biopsy after previous negative biopsy in patients with high suspicion of prostate cancer

• Monitoring of systemic treatment in metastatic prostate cancer

• Biochemical relapse post radical radiotherapy Offer PSMA PET in patients with biochemical recurrence after radical radiotherapy/brachytherapy (PSA nadir + 2 ng/ml) in patients fit for salvage local therapy (salvageprostatectomy.

• Metastatic prostate cancer Patients being considered for 177Lu-labelled PSMA-ligand therapy, a PSMA PET should be performed. Consider paired FDG PET to optimize patient selection.

- Increased [18F]FDG uptake seems to be more frequent in aggressive forms, aberrant histology (e.g., neuroendocrine), and advanced cases of metastatic castration- resistant PCa (mCRPC).

• Staging in high-risk prostate cancer

- Equivocal lesions: Consider PSMA PET in selected patients with equivocal lesions on baseline conventional staging investigations where management will be directly influenced by the PSMA result.

• Discordant biopsy or contraindications to biopsy: Consider PSMA PET in high-risk patients who have discordant biopsy results (ie,negative repeated biopsy, patient refusal, or contraindication to biopsy due to comorbidities) where exclusion of nodal or visceral metastatic disease is required

68Ga-DOTATATE PET/CT

•Assessment of neuroendocrine tumors Localization of primary tumor in patients with known metastatic disease but unknown primary.

– Selection of patients for somatostatin receptor-targeted peptide receptor radionuclide therapy PRRT of G1 and G2 neuroendocrine tumor, especially if negative on 111In or 99mTc somatostatin receptor imaging.

• Staging of NETs before planned 'curative' surgery.

• Evaluation of mass suggestive of NET not amenable to endoscopic or percutaneous biopsy (e.g., ileal lesion, hypervascular pancreatic mass, mesenteric mass).

• Monitoring of NETs seen predominantly on SSTR PET though interval of scanning needs careful thought. For most patients a gap of 12 months between studies should be sufficient unless rapidly progressive or in active treatment phase or determining progression pre-PRRT.

• Evaluation of patients with biochemical evidence and symptoms of NET without evidence on cross-sectional imaging and without prior histologic diagnosis of NET.

• Imaging phaeochromocytomas and paragangliomas with succinate dehydrogenase (SADHD) mutation.

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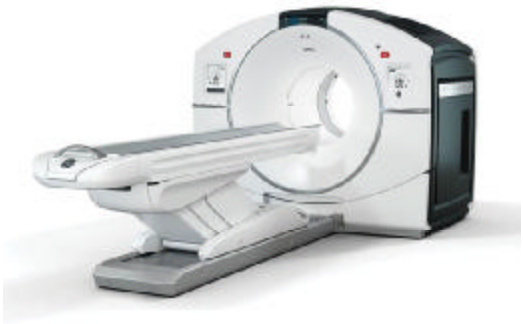
مرکز پزشکی هسته ای بوشهر به عنوان یکی از جامع ترین و پیشرفته ترین مراکز این حوزه در دنیا مجهز به جدیدترین تکنولوژیهای تشخیصی و روشهای درمانی در زمینه انسانی و حیوانی در دو مکان مجزا آماده ارایه خدمات تخصصی و فوق تخصصی با دستگاهها و روشهای زیر می باشد:



پت سی تی (GE Company)

اسپکت سی تی (Siemens Heathineers Company)

اسپکت دوسر

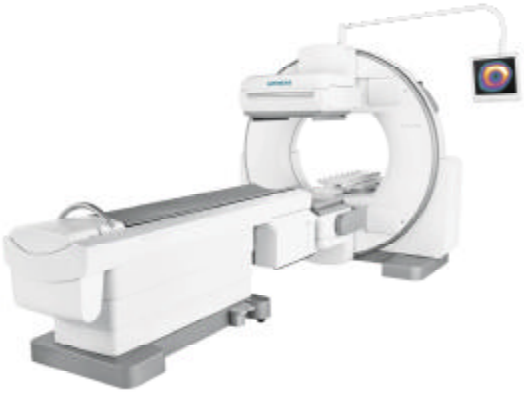
تراکم سنجی استخوان (DXA Hologic)

پت حیوانی

سی تی اسکن حیوانی

اسپکت حیوانی

تصویربرداری نوری حیوانی



درمان نوین بیماریهای سرطانی و غیرسرطانی :

تیرویید

پروستات

غددی عصبی

نوروبلاستوم (کودکان)

استخوان

روماتیسم

پرکاری تیرویید