مركز مصر للأشعة
MISR RADIOLOGY CENTER
MRC

Theranostics

Therapeutic and Diagnostic

^{68}Ga-PSMA PET for diagnosis

^{177}Lu-PSMA for therapy

Prostate Cancer

19773

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For inquiries and further discussion, please contact us on

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Concept of Theranostics in Prostate Cancer

1- Prostate cancer cells have receptors on their surface called prostate specific membrane antigen (PSMA)

2- The Diagnostic exam is performed by targeting these receptors using ^{68}Gallium-PSMA-PET

3- The therapy is performed by targeting these receptors using ^{177}Lutetium-PSMA

What is the Value of Theranostics?

In Diagnosis

Develop a very sensitive and specific diagnostic scan, for each type of tumor cell

Therapy

- **Predict who will respond to therapy and who will not**

  Using the diagnostic PET/CT exam, we can identify the degree of receptors on the tumor cells. (The more receptors = The higher SUV of lesions = The better probability of good response)

- **Deliver targeted radiation therapy intra-venously**

  ^{177}Lu-PSMA is injected intravenously and targets only tumor cells all over the body, with little effect on healthy cells so decreases treatment related toxicity

Added Value of ^{68}Ga-PSMA PET

In lymph nodes assessment

1- Early detection of infiltrated lymph nodes, which are too small to be detected or characterized by other modalities (upstage the patient)

2- Can differentiate if large lymph nodes are just reactive and not infiltrated (Downstage the patient)

In bone assessment

1- Early detection of bone metastasis (upstage the patient)

2- Differentiate benign lesions with hot uptake on bone scan as degenerative changes, arthritis, trauma, enchondroma etc.(Downstage the patient)

Operative bed assessment

Can help to differentiate post-operative fibrosis from recurrent neoplasia

Initial diagnosis

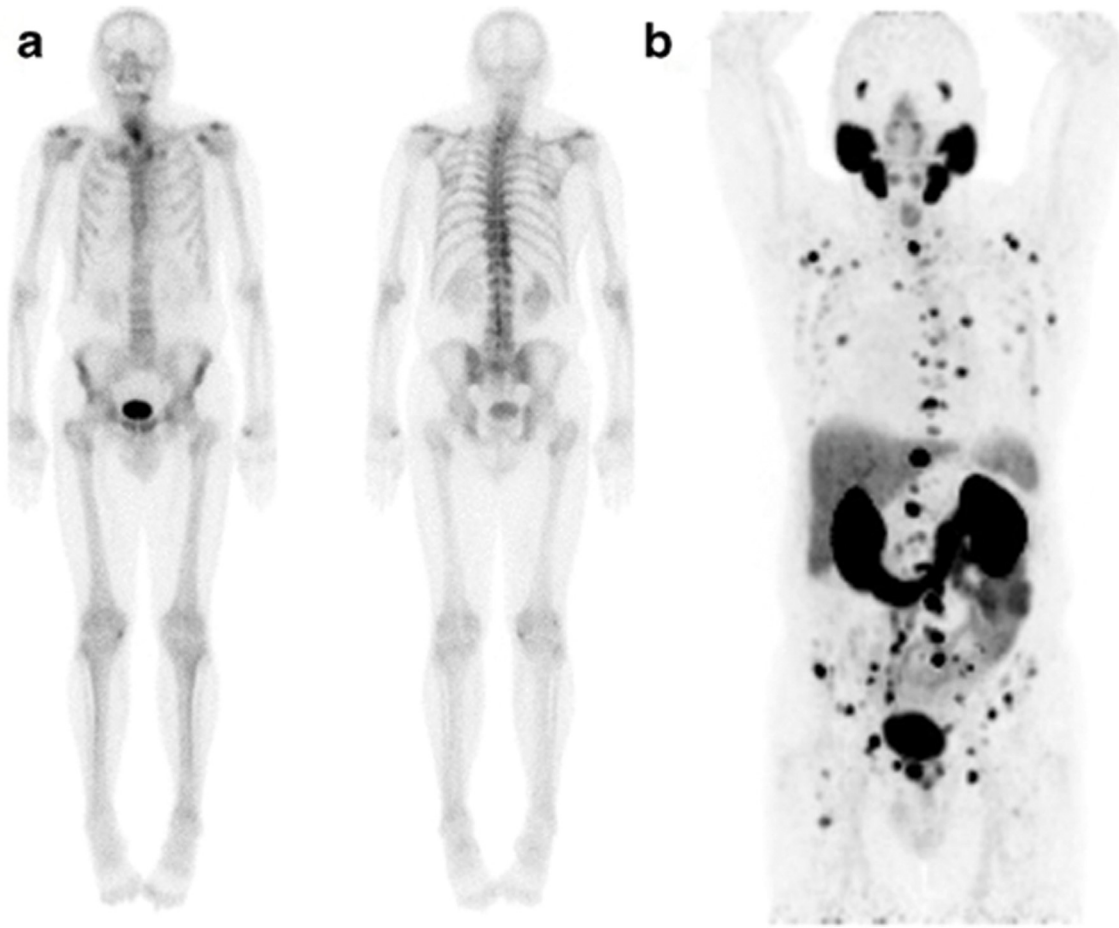
Help confirm/exclude borderline lesions detected in MRI

Case No. 1 : Bone scan Vs ^{68}Ga-PSMA scan

IMAGE OF THE MONTH

Diffuse bone metastases on ^{68}Ga-PSMA PET/CT in a patient With prostate cancer and normal bone scan

J. Lavalaye[1].P. Kaldeway[1].H.H.E.van Melick[2]



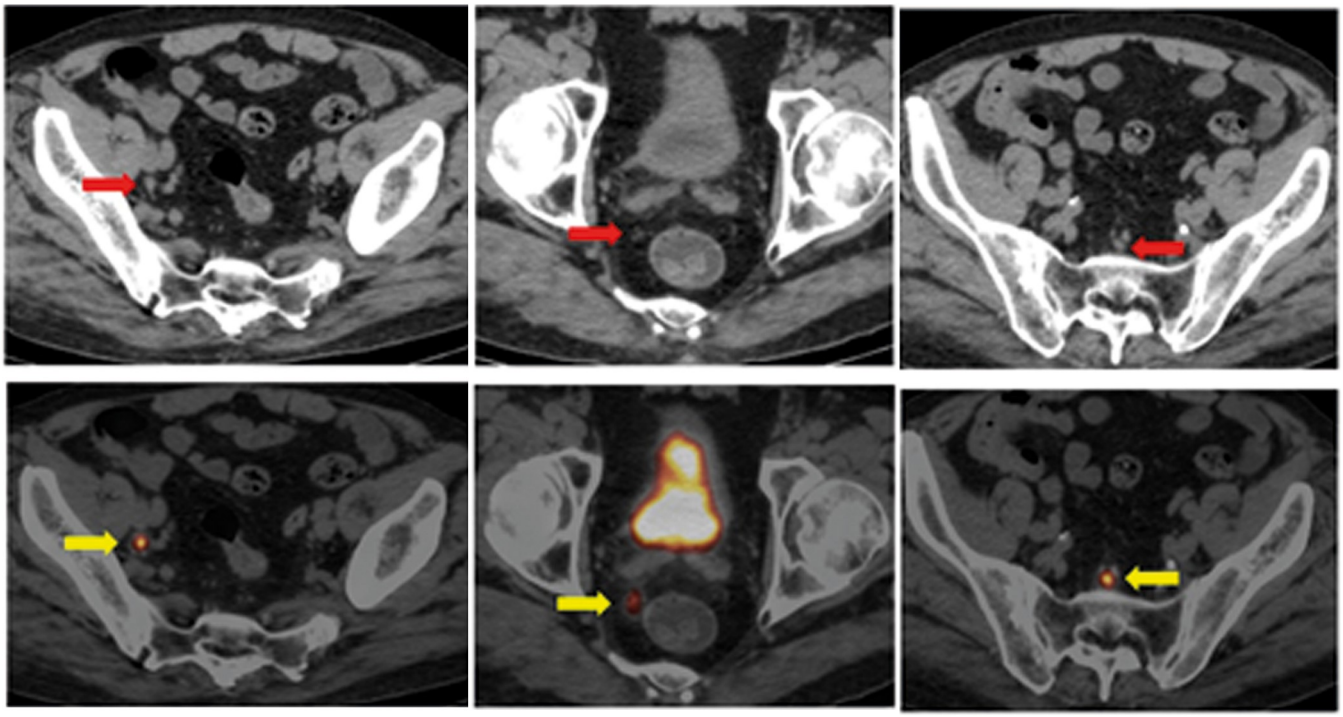
History

- A 75-year-old patient with newly diagnosed Gleason 9 prostate carcinoma His PSA level was 50.4 ng/ml

Exam Findings

- Initial staging by routine bone scintigraphy was negative for metastasis
- However, Ga-PSMA PET/CT showed diffuse bone metastasis

Case No. 2 : CT Vs ^{68}Ga-PSMA scan in metastatic lymph nodes assessment



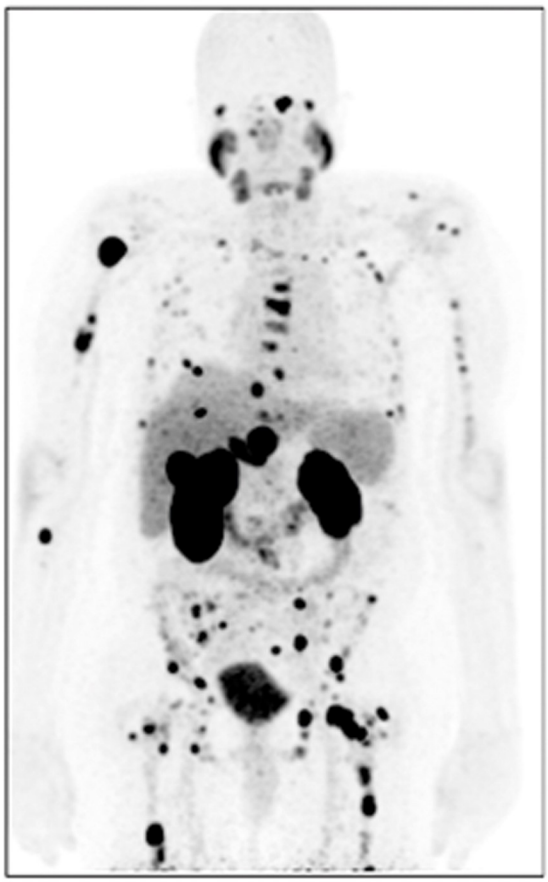
History

- A 77 years old male patient presented with recently diagnosed prostatic adenocarcinoma (Gleason score: 4+3=7) and serum PSA level:168ng/ml
- Staging pelvi-abdomen CT and bone scan were free
- Due to high PSA levels, patient performed PSMA PET/CT

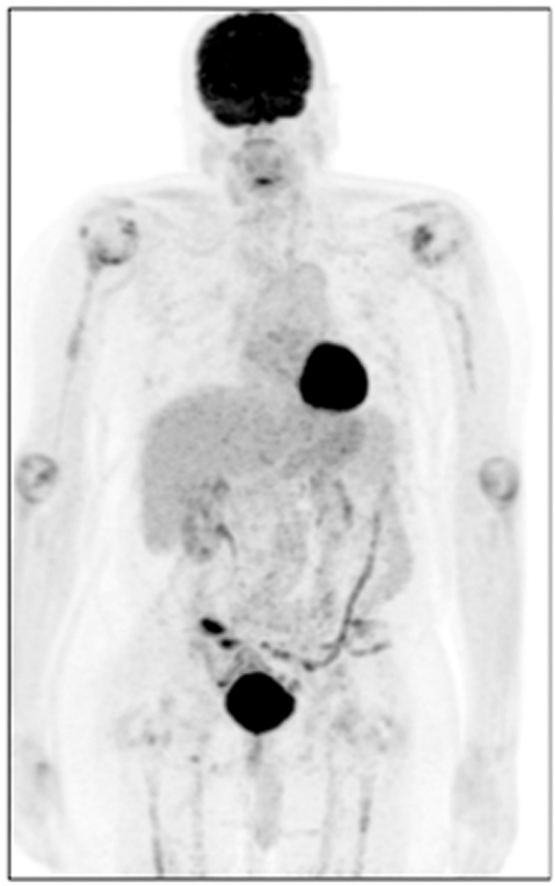
Exam Findings

- Multiple subcentimetric PSMA-avid metastatic pelvic lymph nodes at perirectal, presacral and right external iliac regions that are not detected in CT exam

Case No. 3 : FDG PET/CT Vs Ga-PSMA scan



Ga-PSMA PET/CT



FDG-PET/CT

History

- A 65 years old male patient presented with elevated PSA levels reaching 102ng/ml
- Patient performed FDG-PET/CT first then ^{68}Ga-PSMA PET/CT within the same week for better assessment

Exam Findings

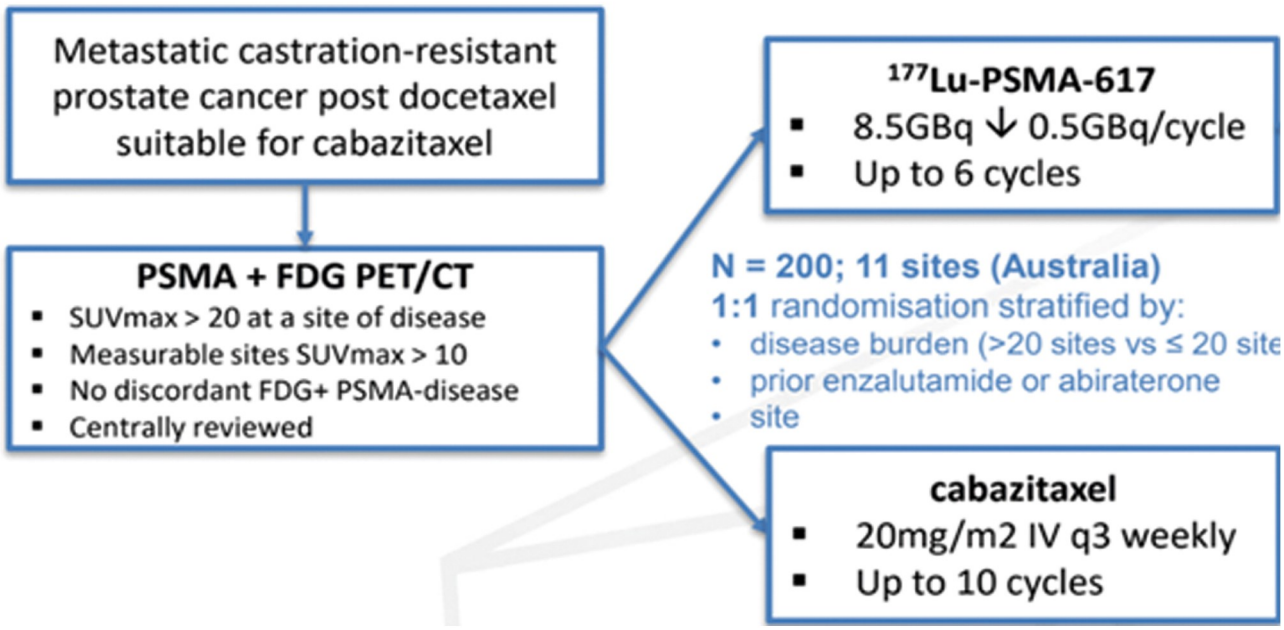
- ^{68}Ga-PSMA PET/CT revealed extensive bone and multiple hepatic deposits that were not depicted in FDG-PET/CT

Added Value of ^{177}lutetium-PSMA

A new hope for metastatic hormone resistant prostate cancer after exhaustion of medical therapies

TheraP trial ^{177}Lu-PSMA Vs Cabazitaxel Presented in

2020 ASCO ANNUAL MEETING



Efficacy Results

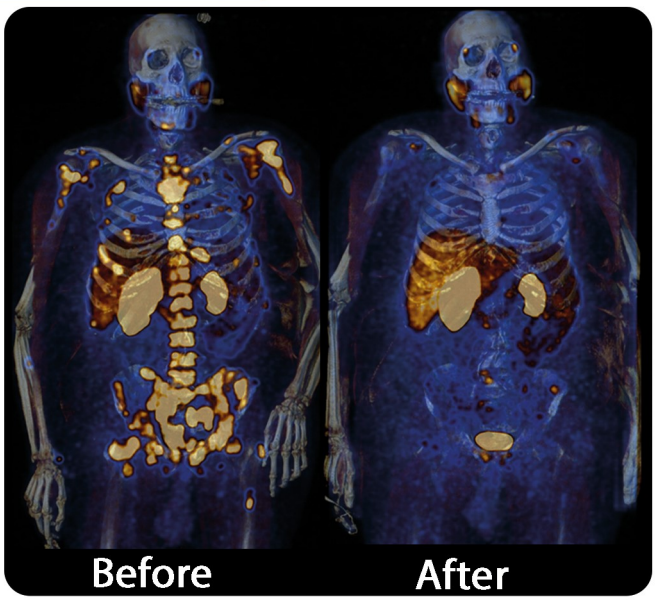
- After a median follow up of 13 months, ^{177}Lu-PSMA significantly improved PSA-PFS compared with cabazitaxel (HR 0.69)
- ^{177}Lu-PSMA had a much higher PSA50 rate (66% vs 37%) compared with cabazitaxel

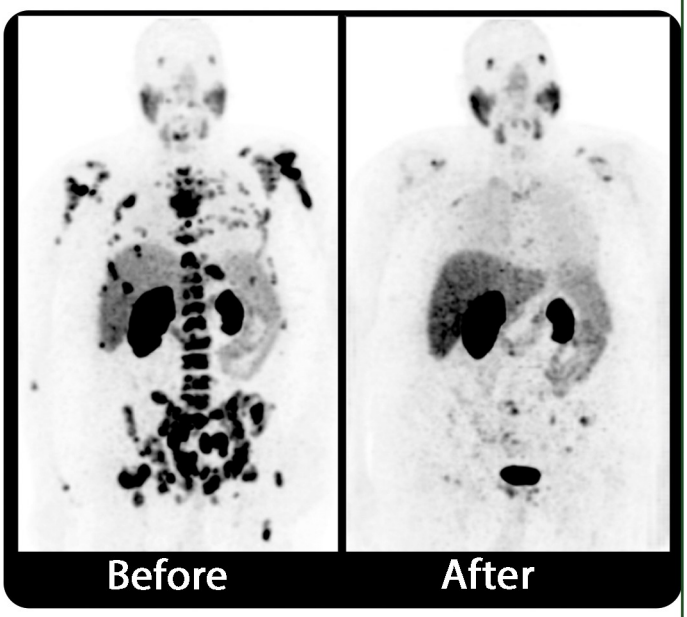
Toxicity results

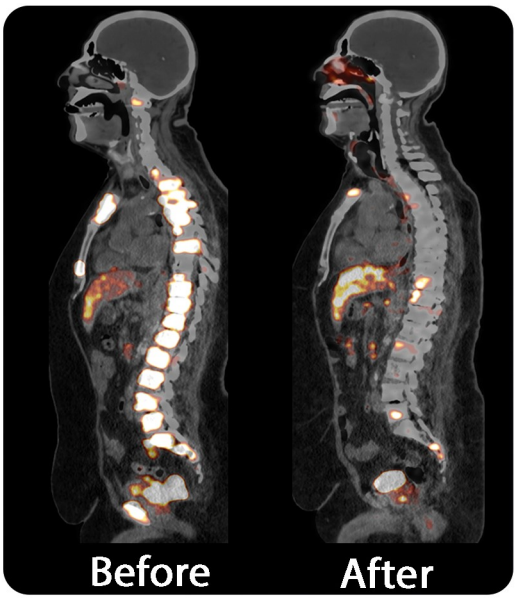
- Cabazitaxel had more neutropenia, diarrhea, dysgeusia, and neuropathy compared with ^{177}Lu-PSMA
- ^{177}Lu-PSMA had more thrombocytopenia, dry mouth, and dry eyes
- About 54% of men had grade 3/4 toxicity with cabazitaxel compared to 35% of men with ^{177}Lu-PSMA

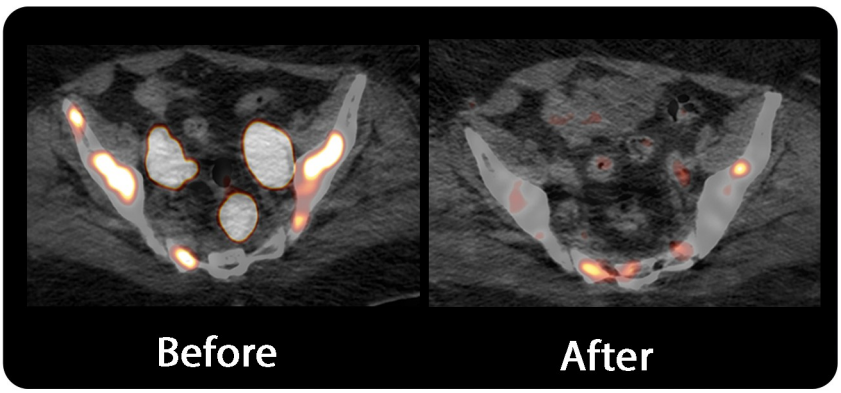
Real cases using ^{177}Lu-PSMA from our Center

Case No. 1 :









History

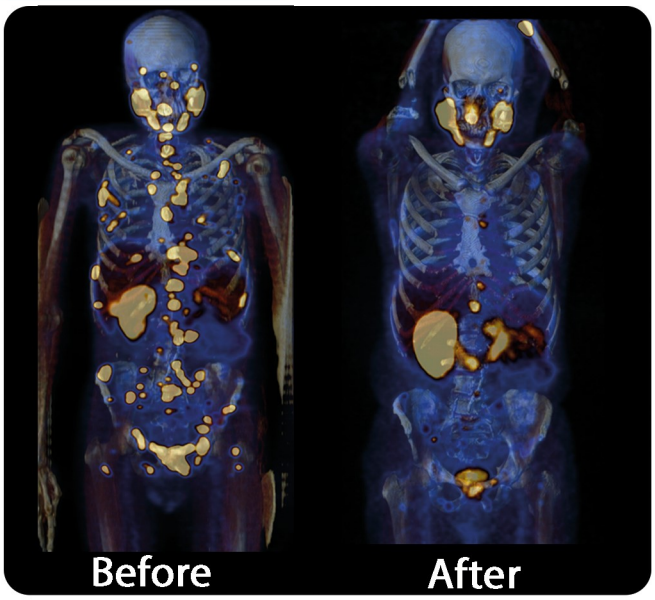
- A 63 years old male patient with castration resistant metastatic prostate cancer, post Docetaxel, Enzalutamide and Cabazitaxel. He received single ^{177}Lu-PSMA radioactive therapeutic dose which showed an exceptional response

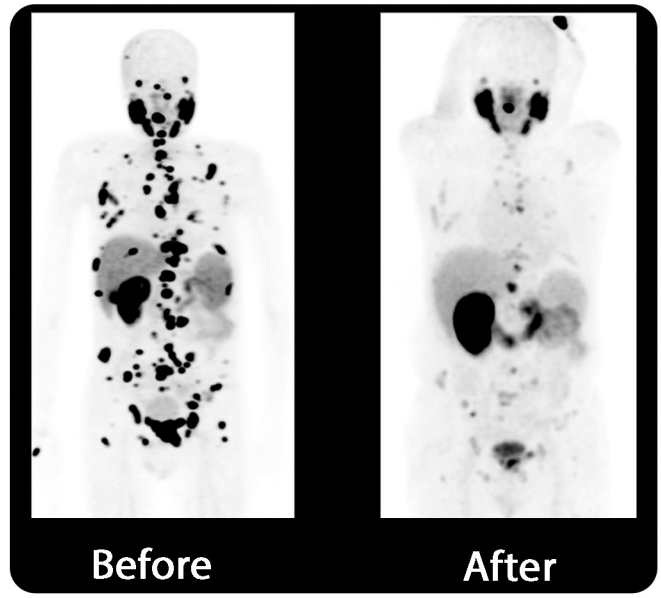
Exam Findings

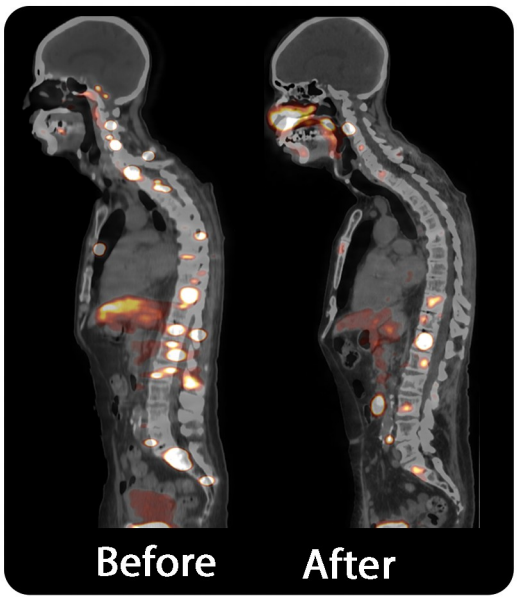
- PSA dropped by 98% from 350ng/ml to 6 ng/ml
- Resolution of all the bony pains with significant improvement in the quality of life
- The follow-up scan results showed resolution of most of the bony lesions, with few residual active foci

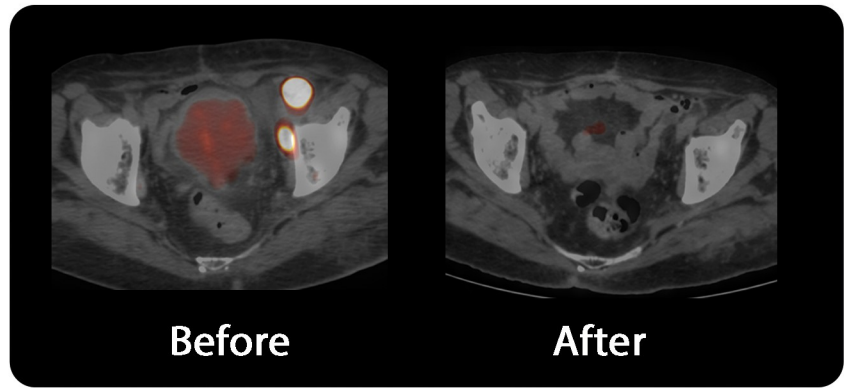
Real cases using ^{177}Lu-PSMA from our Center

Case No. 2 :









History

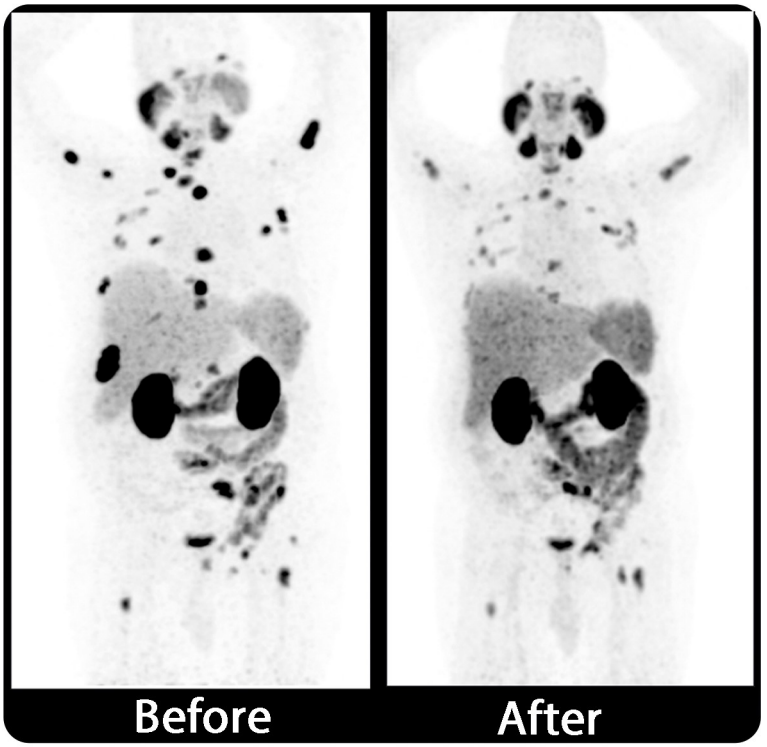
- A 74 years old male patient with castration resistant metastatic prostate cancer post Docetaxel and Abiraterone, received ^{177}lutetium PSMA radionuclide therapeutic doses

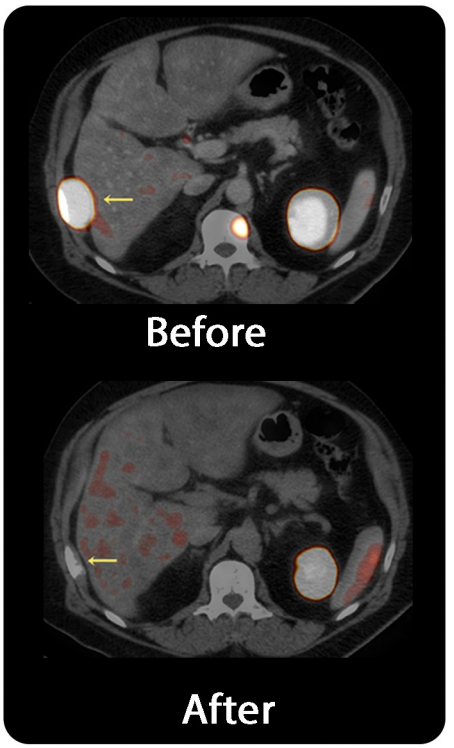
Exam Findings

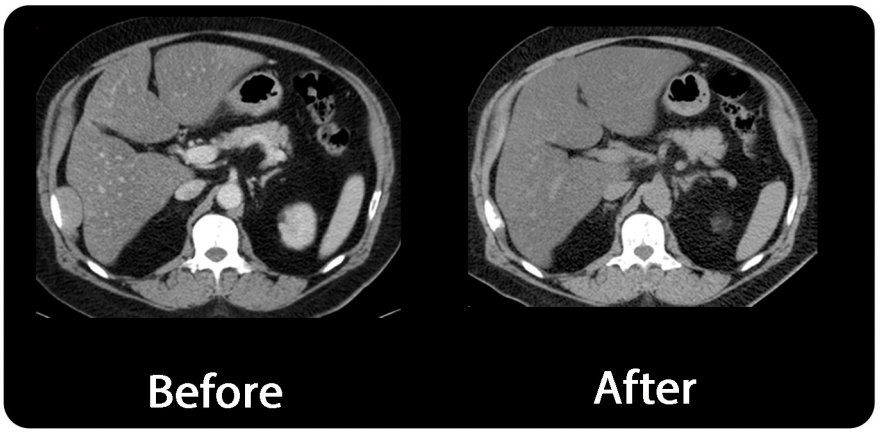
- PSA dropped by 94% after 2 doses, from 283ng/ml to 18ng/ml
- The follow-up scan showed marked regression in the metastatic bony lesions

Real cases using ^{177}Lu-PSMA from our Center

Case No. 3 :







History

- A 56 years old male patient with history of metastatic castration resistant prostatic cancer, post Enzalutamide, Docetaxel and Cabazitaxel. He received three doses of ^{177}Lu-PSMA and referred for follow-up

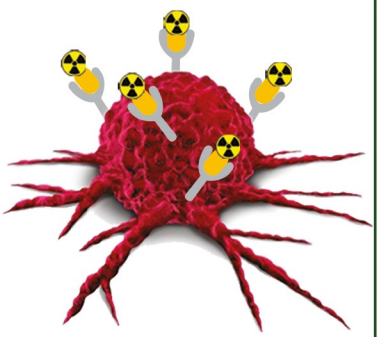
Exam Findings

- PSA dropped by 75% from 850ng/ml to 206 ng/ml after 3 doses of ^{177}Lu-PSMA over a period of 7 months
- There was associated marked improvement in quality of life and decrease in bony pains

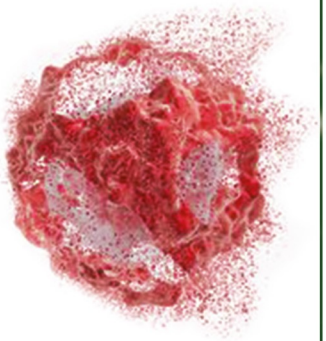
كيفية استهداف و تدمير الخلايا السرطانية
عن طريق حقن مادة ^{177}LUTETIUM-PSMA

- يوجد علي سطح الخلايا السرطانية لأورام البروستاتا مستقبلات خاصة
- يتم التأكد من وجود هذه المستقبلات قبل الحقن من خلال فحص البوزيترون المشع ^{68}GALLIUM-PSMA PET/CT

- يتم حقن المادة المشعة المحملة علي مادة الـ PSMA الحساسة لهذه المستقبلات



- تتجه المادة المشعة إلى الخلايا المصابة فقط ويتم إمتصاصها داخل الخلية



- تقوم المادة المشعة بتدمير الخلايا السرطانية فقط، مع المحافظة على الخلايا المحيطة

جرعات العلاج الإشعاعي بمادة اللوتيشيم
^{177}LUTETIUM-PSMA
لأورام البروستاتا المنتشرة بالجسم

ما هي مادة اللوتيشيوم "^{177}Lutetium"؟

- هي مادة مشعة تتميز باصدار اشعاع بيتا (β) و التي متوسط قطر انتشارها قليل جدا (0.23 ملي) مما يؤدى إلى توجيه الاشعة للخلايا المصابة بالسرطان فقط بدون التاثير علي الخلايا المجاورة.
- يتم أخذ جرعة كل شهرين علي حسب الأستجابة و الإحتياج.

كيفية عمل المادة المشعة ؟

- يتم حقن المادة المشعة من خلال الوريد الي الدورة الدموية ثم تتوجه تلقائيا الي الخلايا المصابة بالسرطان عن طريق مادة الـ PSMA التي تتعرف علي الخلايا السرطانية من خلال وجود مستقبلات خاصة علي سطحها.
- يتم ربط المادة المشعة بالخلايا السرطانية و اصدار الاشعاع الموجه داخل الخلايا المصابة بدون التاثير علي الانسجة السليمة المجاورة.

ما هى شروط اخذ العلاج ؟

- أورام البروستاتا وثانوياتها بالجسم، والتي لم تعد تستجيب للعلاج الهرموني أو الكيماوي.
- وجود مستقبلات كثيرة علي الخلايا تسمح بامتصاص المادة الفعالة المشعة، والتي تظهر من خلال فحص البوزيترون المشع بمادة الجاليوم ^{68}Ga-PSMA PET/CT قبل بدأ العلاج.
- أن تكون وظائف الكلي و الكبد و صورة الدم بحالة جيدة.

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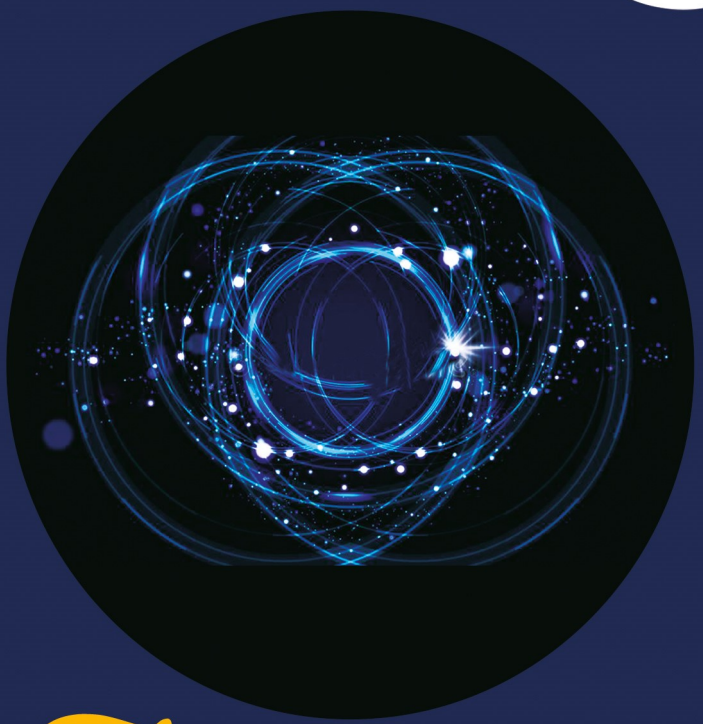

Theranostics

أمل جديد لمرضى سرطان البروستاتا المنتشر بالنظائر المشعة العلاجيه

^{177}Lu-PSMA for therapy (لوتيشيوم)

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