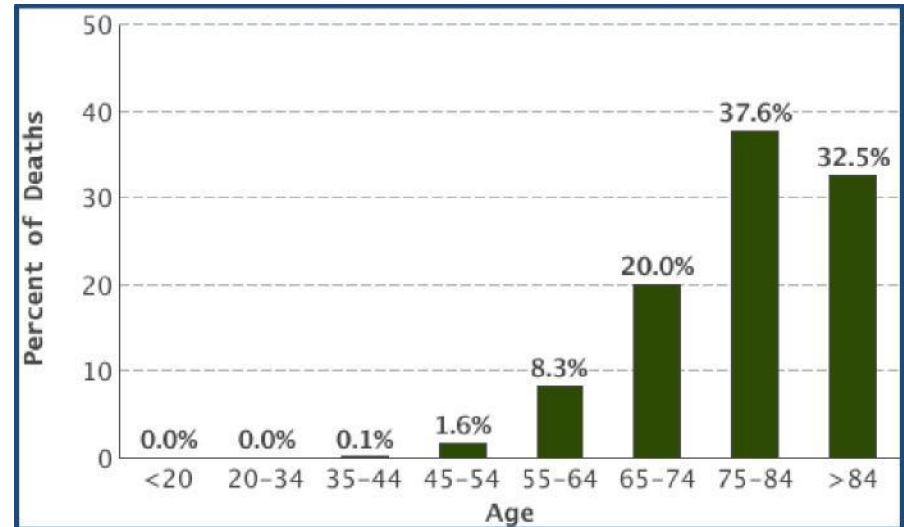


18F-Choline: Prostate Cancer

18F-choline PET/CT: an increasing role in cancer evaluation

Epidemiology

- Approximately 15.3 percent of men will be diagnosed with prostate cancer at some point during their lifetime, based on 2008-2010 SEER data.
- In 2011, there were an estimated 2,707,821 men living with prostate cancer in the United States.

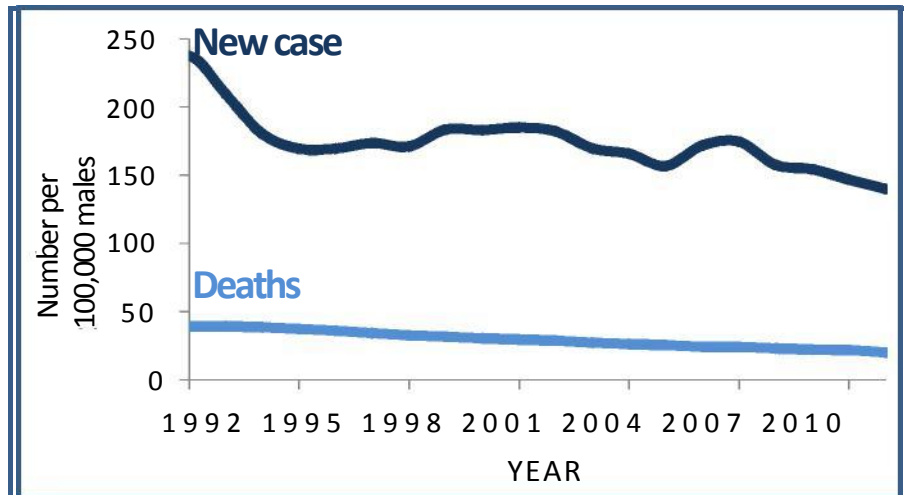


Estimated New Cases in 2014	233,000
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% of All New Cancer Cases	14,0%
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Estimated Deaths in 2014	29,480
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% of All Cancer Deaths	5,0%
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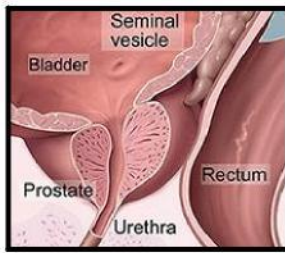
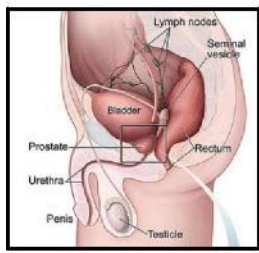


Risk factors

- Diet
 - Tomatoes, vegetables, soy, red meat,
 - fish (protect!)
- Pharmaceutical agents
- Occupational and environmental exposures
- Family history
- Genetic factors

Prostatic specific antigen

- The availability of PSA with a growing and aging population has resulted in a dramatic increase in the incidence of prostate cancer (PCa).
- Sensitivity of PSA test is roughly 67.5-80% and specificity is 60-70%
- A PSA concentration >4 ng/mL, is followed by a complete



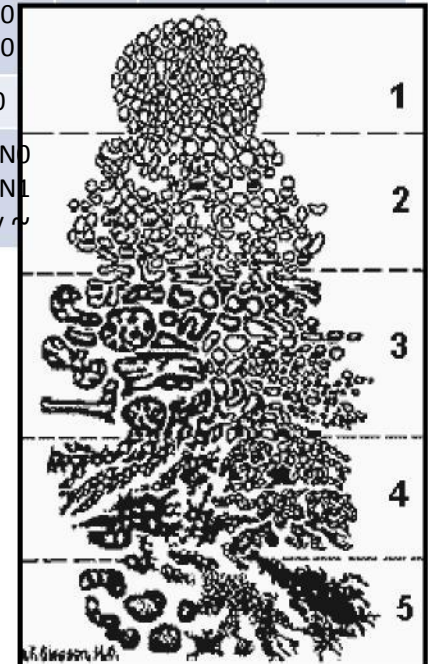
Diagnosis

- Detection or primary cancer
 - PSA (free, total, F/T ratio and trend)
 - Digital rectal examination
 - Biopsy (12-14-24 core-biopsy)

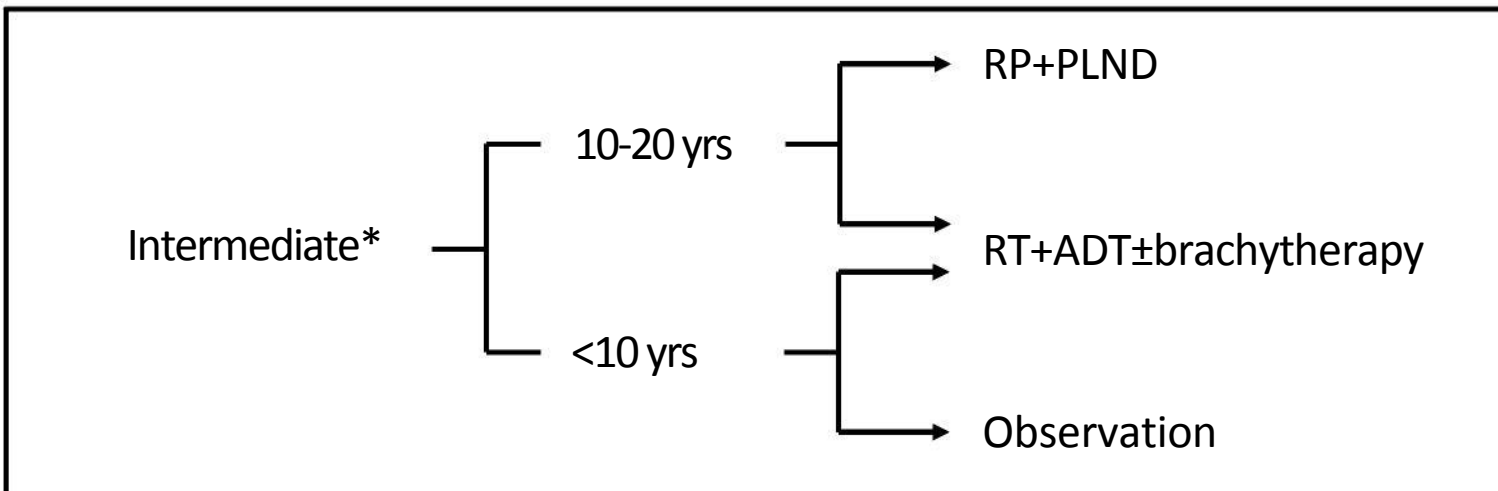
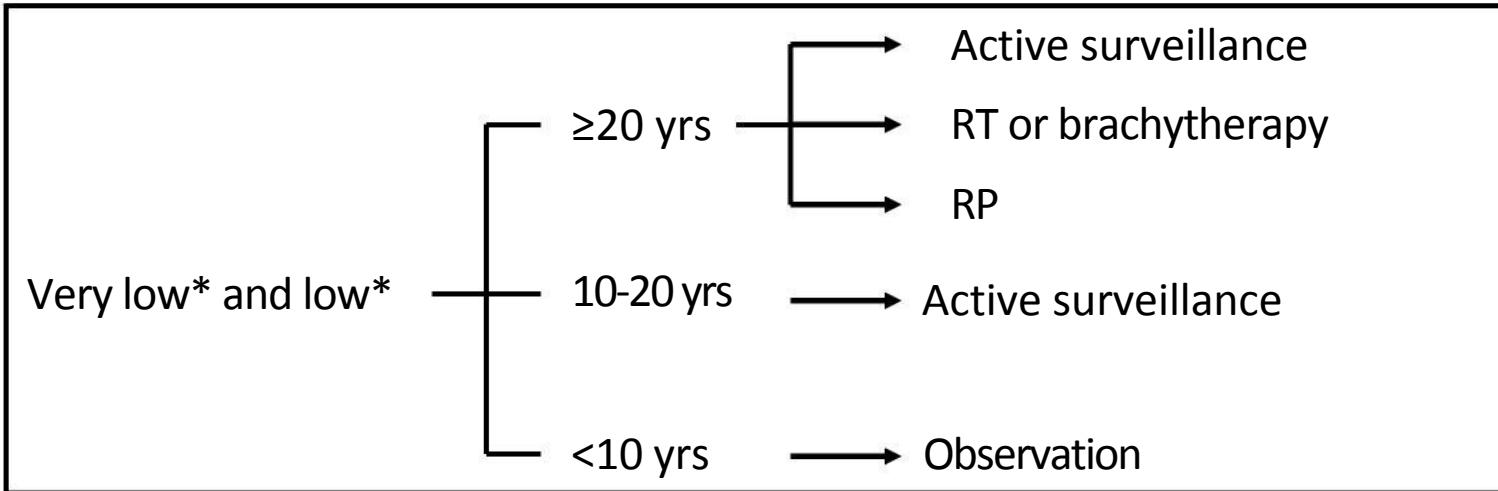
- Staging of Pca

- TNM staging system
- Histologic Grading: the Gleason Score
- Imaging (MRI/BS/c.e.CT, PET)

Group	T	N	M	PSA	Gleason
I	T1a-c	N0	M0	<10	≤6
	T2a	N0	M0	<10	≤6
	T1-2a	N0	M0	X	X
IIA	T1a-c	N0	M0	<20	7
	T1a-c	N0	M0	≥10<20	≤6
	T2a	N0	M0	<20	≤7
	T2b	N0	M0	<20	≤7
	T2b	N0	M0	X	X
IIB	T2c	N0	M0	Any	Any
	T1-2	N0			
	T1-2	N0			
III	T3a-b	N0			
IV	T4	N0			
	Any T	N1			
	Any T	Any N			



Treatment choice- risk category-based (1)

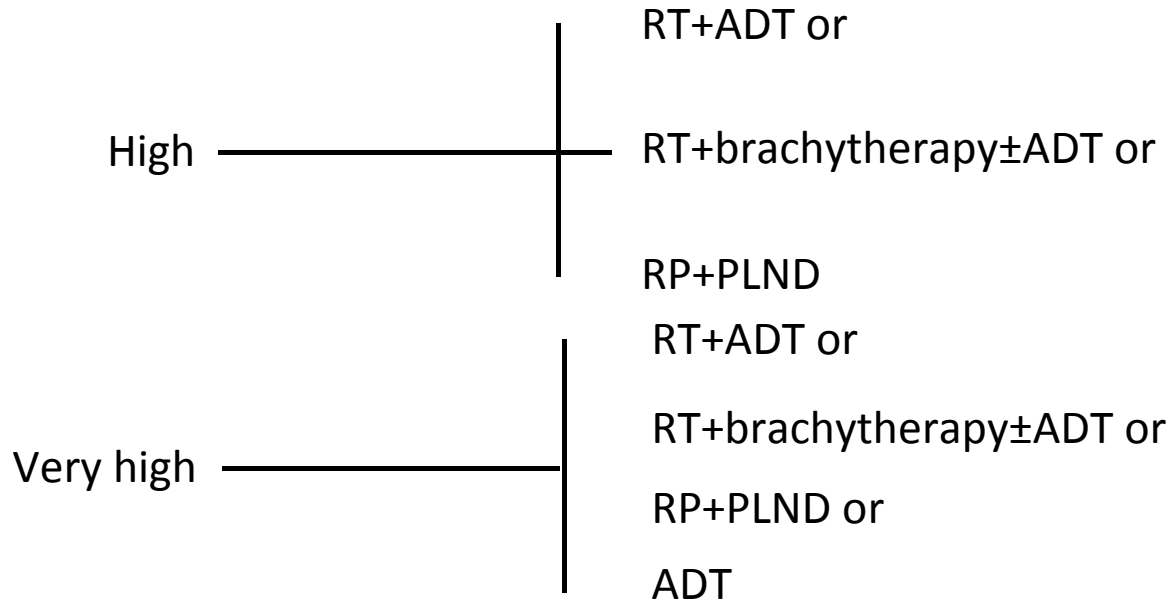


* Based on expected patient survival

Prostate Cancer

Version 2.2014
NCCN.org

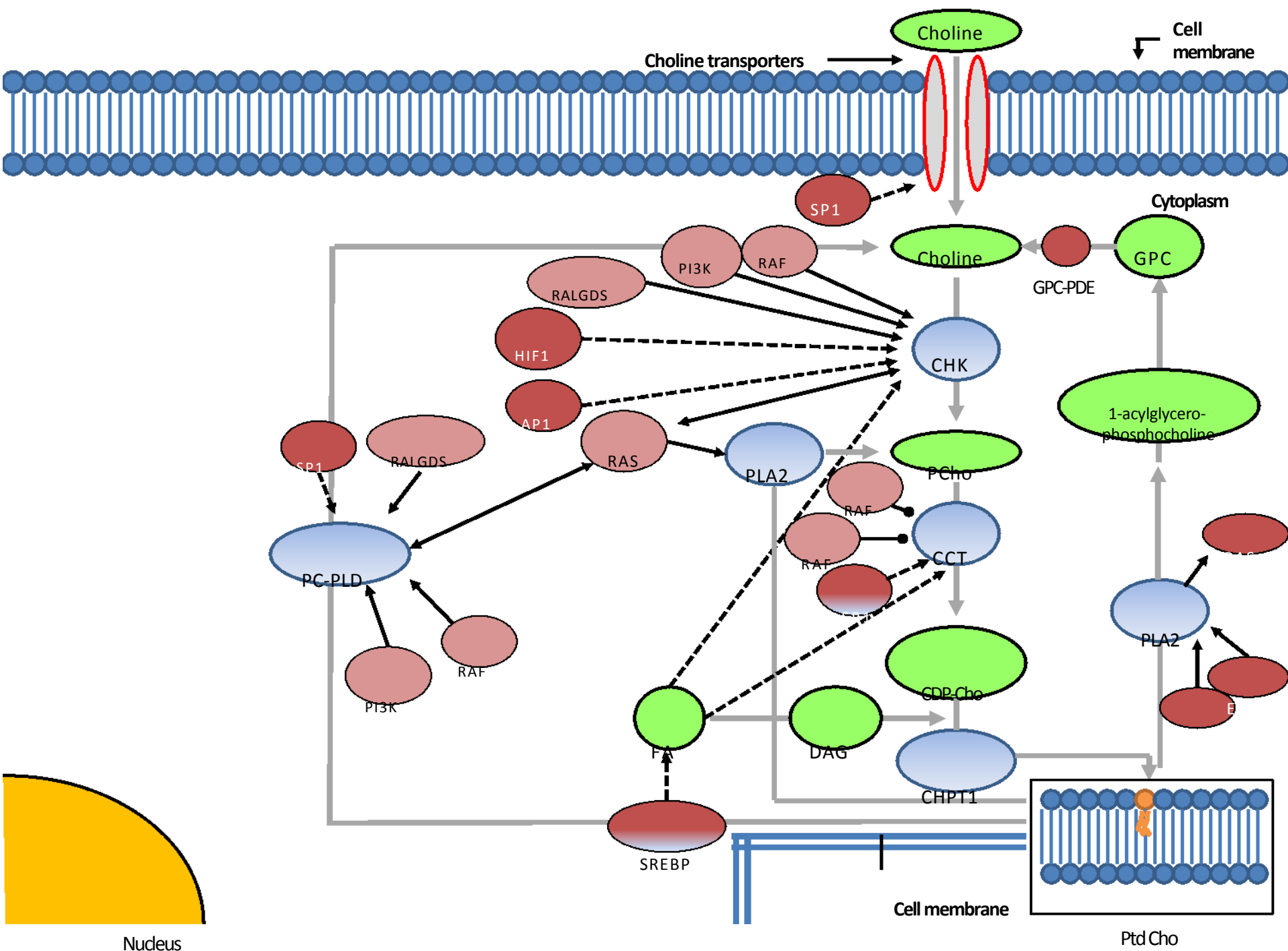
Treatment choice- risk category-based (2)



Metastatic _____ ADT or RT+ADT

Choline metabolism in Cancer

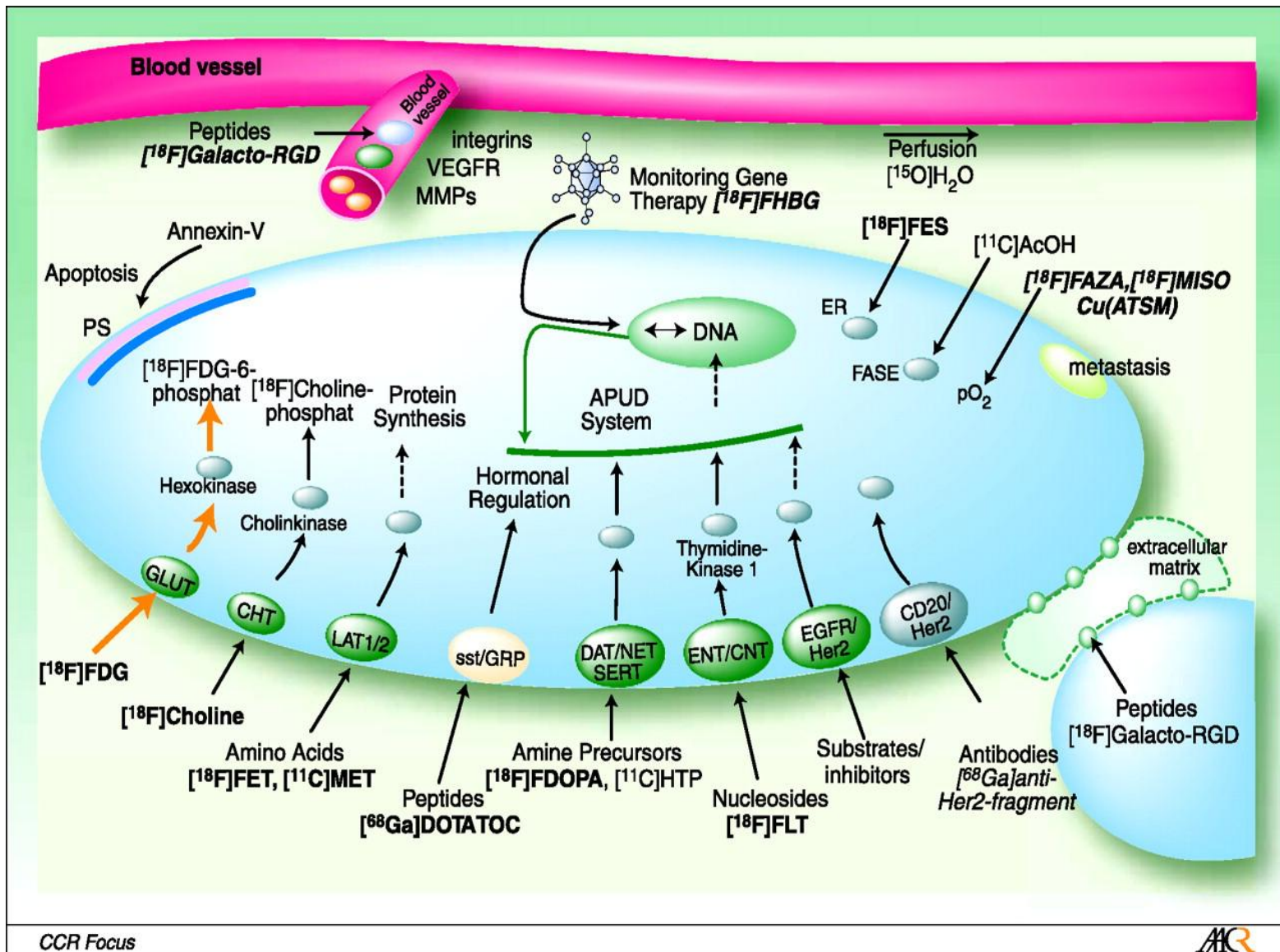
- Aboagye et al (1999; 59: 80-84) identified **malignant transformation rather than just cell proliferation** as the cause of abnormal choline metabolism in cancers (especially in breast and prostate cancer)
- Phosphocholine is both a precursor and a breakdown product of phosphatidylcholine, which together with other phospholipids and neutral lipids, **forms the characteristic bilayer structure of cellular membranes and regulates membrane integrity**
- Four different types of choline-transporting transmembrane systems have been **implicated in cancer**:
 - high-affinity choline transporters (CHTs),
 - choline transporter-like proteins (CTLs),
 - organic cation transporters (OCTs)
 - organic cation/carnitine transporters (OCTNs)



Nucleus

Cell membrane

Ptd Cho



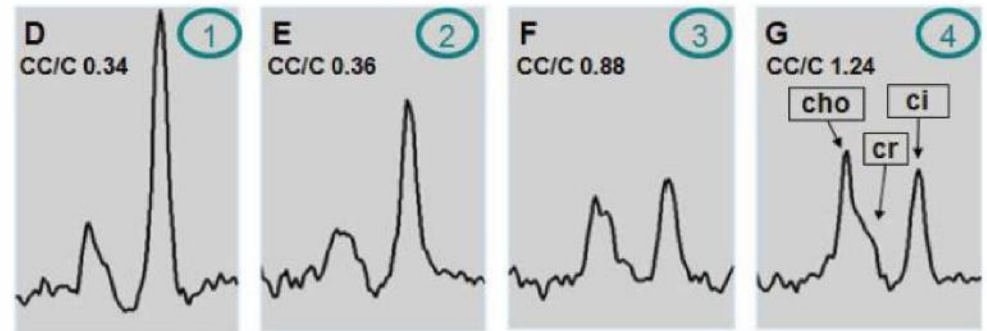
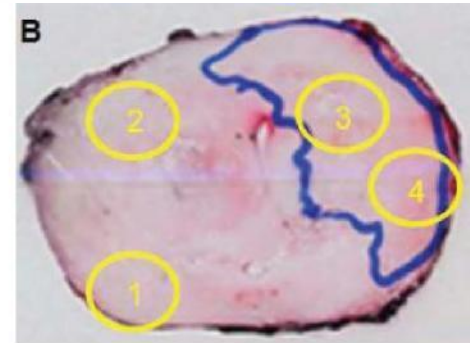
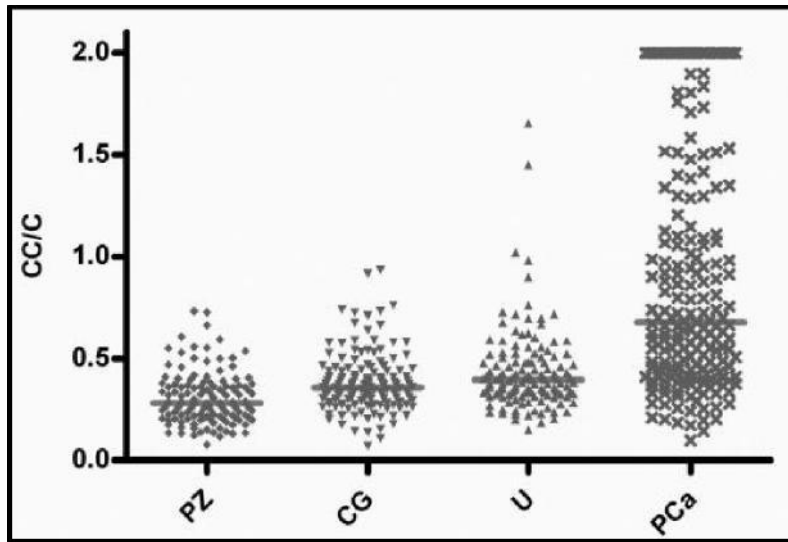
Choline metabolism in Cancer

Cancer site*	PCho		GPC		tCho		Enzyme expression	Enzyme activity
	Normal	Cancer	Normal	Cancer	Normal	Cancer		
Brain	0.48±0.08	0.91±0.20	0.86±0.11	0.68±0.17	0.64±0.10 and 1.79±0.24	1.19±0.30 and 1.88±0.33	CHKα	CHKα
Breast (?)	0.03±0.03	0.79±0.55	0.04±0.04	0.28±0.20	0.07±0.07	1.07±0.75	CHKα, CHT1, OCT2 and PLD1	CT, CHKα, CCT and PLD
Liver	0.17±0.11	1.36±0.50	2.46±0.37	0.59±0.15	ND	ND	CCT	CT, CCT and PC- PLC
Prostate	0.02±0.07	0.39±0.40	0.29±0.26	0.57±0.87	0.31±0.33	0.96±1.27	CHKα	CT

CCT, CTP:phosphocholine cytidyltransferase; CHKα, choline kinase-α; CHT1, choline transporter 1; CT, choline transport; CTL, choline transporter-like; GPC, glycerophosphocholine; OCT, organic cation transporter; PCho, phosphocholine; PC-PLC, phosphatidylcholine-specific phospholipase C; PLD, phospholipase D1; tCho, total-choline-containing compounds.

Choline metabolism in PCa

The elevation of tCho expression is a specific biomarker of prostate cancer and correlates with Gleason score and aggressiveness



CC/C= choline+creatine to citrate ratio; (1) PZ= peripheral zone; (2) CG= central gland; (3) U= peri-uretral zone; (4) PCa= prostate cancer

Choline and PET

Hara et al. J Nucl Med 1998;39:990–5.

18F-Choline*

PROS:

- The longer half-life of 18F (110 min) allows transportation of 18F-choline to centers without a cyclotron;

CONS:

- An early urinary appearance in the urinary tract due to an incomplete tubular reabsorption, that can be a drawback when considering local recurrence.

11C-Choline

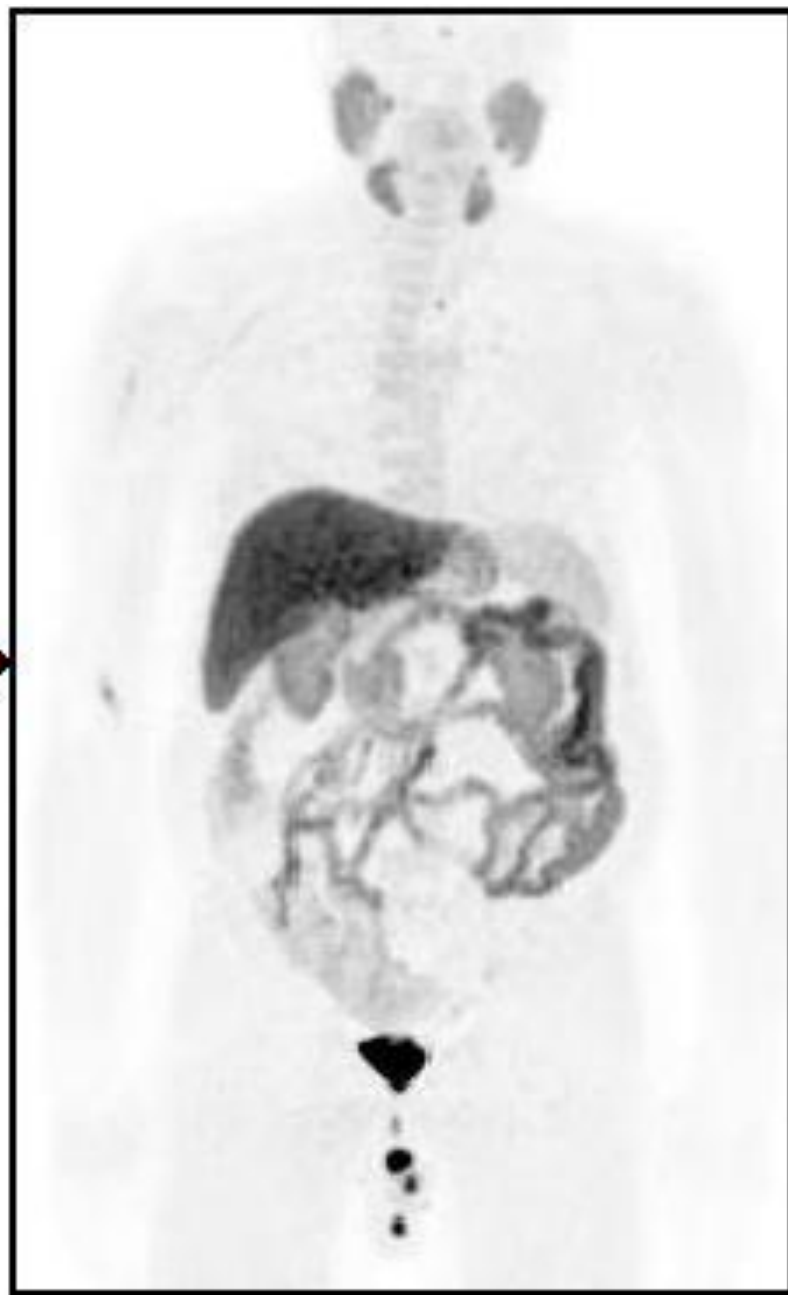
PROS:

- A major advantage of this radiotracer is its rapid blood clearance (5 min) and its rapid uptake within prostate tissue (3–5 min).
- It has a negligible urinary elimination, which, in selected cases, proves to be an advantage.

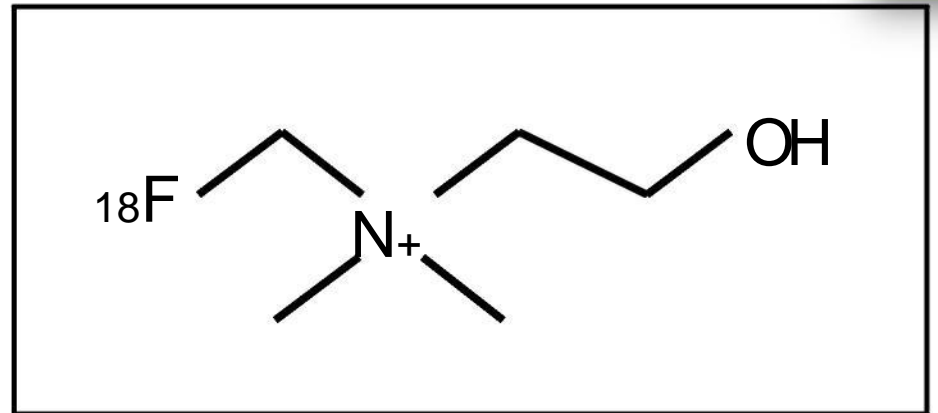
CONS:

- The 20 min half-life of 11C restricts the use of 11C-Choline to centers with an onsite cyclotron.

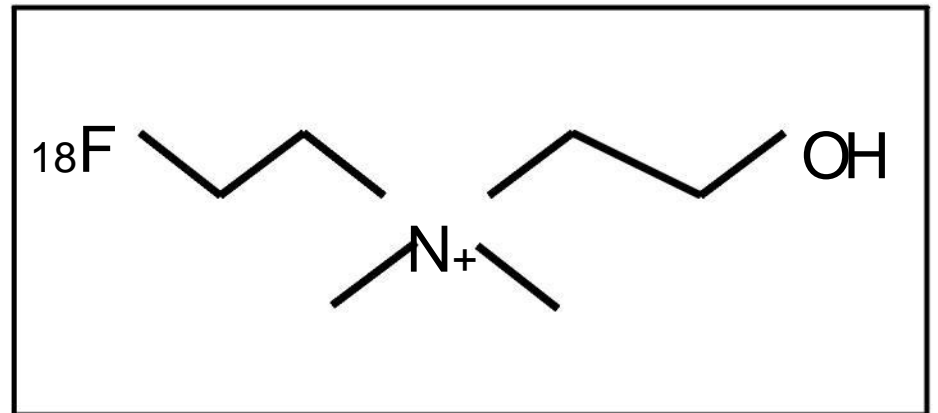
*18F-Fluoromethylcholine (FCH), 18F-fluoroethylcholine (FEC) and fluoromethyl-methylethyl-2-hydroxyethylammonium choline (FMMCH)



18F-fluoromethylcholine (FCH)

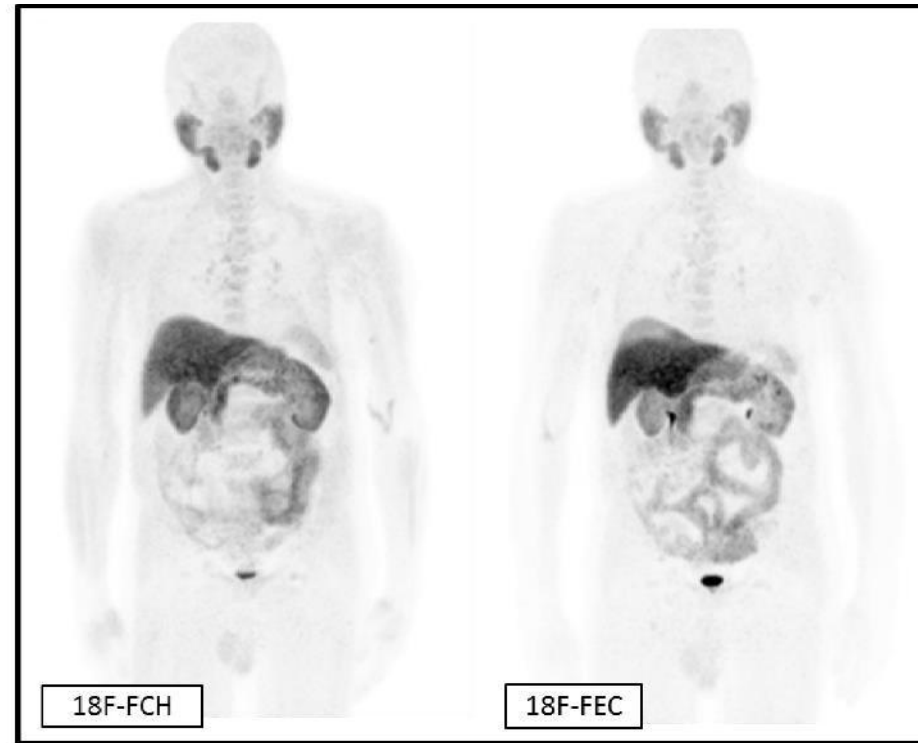
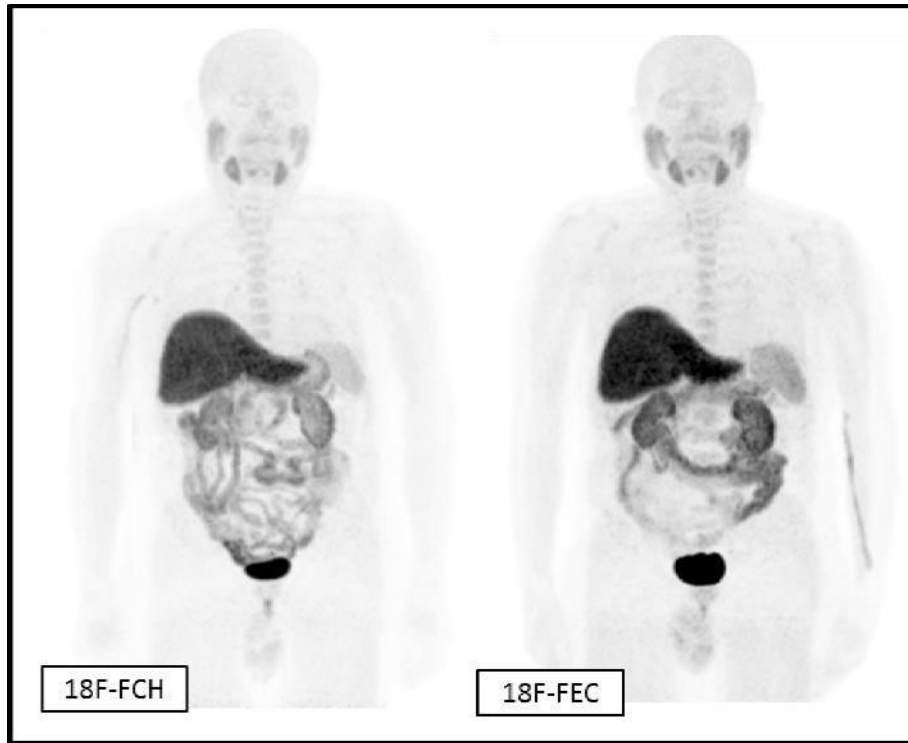


18F-fluoroethylcholine (FEC)



Biodistribution of 18F-choline PET


Thanks to Annibale Versari, Reggio Emilia, ITALY



FEC or FCH PET/CT?

A. Filice, et al. Reggio Emilia, ITALY.
(EANM 2010)

Both the 18F-labelled choline derivatives can be successfully used for detecting prostate cancer recurrence. The two tracers showed comparable physiological distribution and uptake.

Cervino et al. 2014, Padua, ITALY
(unpublished data) 

FEC					FCH				
Authors	Setting, n. pts	Sens.	Spec.	Acc.	Authors	Setting, n. pts	Sens.	Spec.	Acc.
Tilki et al**	Restaging, 56	68.4%	73.3%	70.2%	Pelosi et al*	Restaging, 56	82.7%	96.2%	89.2%
Wurshmidt et al	Restaging, 26	92%	-	-	McCarty et al**	Restaging, 26	96%	96%	96%
Steuber et al*	Staging, 20	0%	100%	-	Poulsen et al*	Staging, 25	100%	95%	96%

*patient-based analysis; **lesion-based analysis

European Farmacopea

only

Metil-18F-Choline

FCH

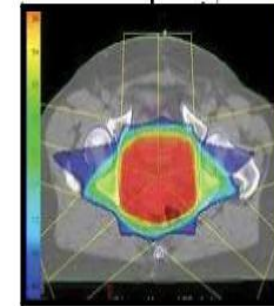
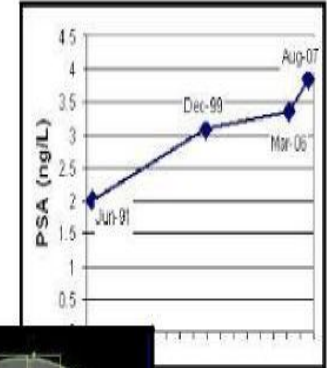
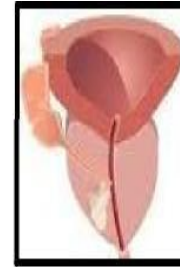
Protocol acquisition

- Patient preparation:
 - No preparation
 - A specific diet, eliminating some foods
 - A fasting of at least 6 hours
- Image protocol:
 - Dynamic image from 1 to 8 min
 - A very early WBS (8 minutes)
 - Middle early WBS (30 minutes)
 - A conventional WBS (60 minutes)
 - A late WBS after 120 minutes



18F-Choline PET or PET/CT in PCa

- Initial staging
- Restaging
 - Progressive increase in PSA value
- Radiotherapy planning
 - After RP and before a salvage RT
 - After elective RT
- Evaluation of response to therapy
 - Hormone therapy, Chemotherapy



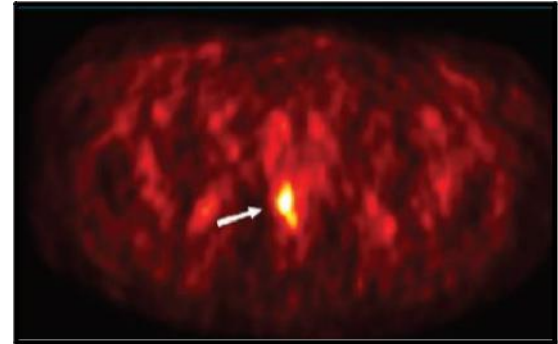
T-Staging

111 patients with an untreated PCa

~ A significant correlation between sections with highest Choline uptake and sextants with maximal tumoral infiltration at histological analysis ($r=0.68$; $p=0.0001$)

~ No correlation between SUVmax and PSA value or Gleason Score was found ($P=0.10$ and 0.28)

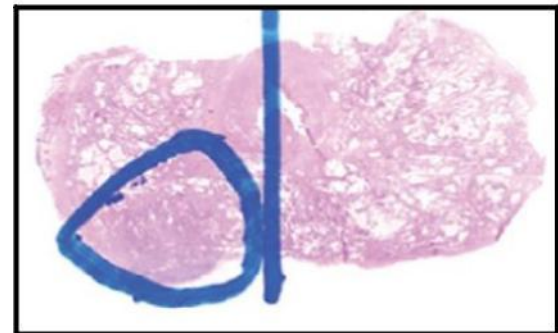
Oyama et al found that ^{18}F -FDG PET may be useful in the subset of patients with suspected poorly differentiated primary tumors (Gleason sum score above 7) and higher serum PSA values



Transaxial PET image



Fusion FCH PET/CT image



Histopathologic sextants

About T-stage

- ~ **MRI (± an endorectal coil) is superior in terms of sensitivity and specificity for initial local assessment of PCa** compared to radiolabelled choline PET/CT.
- ~ **MRI is superior to Choline PET for the detection of some features of the disease** (extracapsular disease, invasion of the seminal vesicles) that would impact the management of the PCa.
- ~ Routine **Choline-PET is not indicated** for pre-treatment local T staging.

N-Staging

Nomograms are graphical statistical tools that use different variables to correlate the potential risk (based on PSA value, Gleason Score, Clinical Staging)

USA MSKCC nomograms http://mskcc.org/applications/nomograms/prostate/index.aspx		EUROPE Briganti nomograms		USA Partin Tables (John Hopkins)						
Author, year	N of pts	Sensitivity % (IC 95%)	Specificity %, (IC 95%)	PPV % (IC 95%)	NPV % (IC 95%)	Accuracy % (IC 95%)	TP	TN	FP	FN
Hacker et al, 2006	20	10 (8-29)	80 (55-100)	33 (4-63)	47 (16-78)	45 (23-67)	1	8	2	9
Husarik et al, 2008	43	20 (15-55)	100	100	90 (81-100)	91 (82-99)	1	38	0	4
Beheshti et al, 2010	130*	45 (30-60)	96 (91-100)	82 (70-94)	79 (71-88)	80 (73-87)	18	86	4	22
Poulsen et al, 2010	25	100	95 (87-100)	75 (26-100)	100	96 (88-100)	3	21	1	0
Poulsen et al, 2012	210**	73.2 (58.1-84.3)	87.6 (81.8-91.7)	58.8 (45.2-71.3)	93.1 (88-96.1)	-	-	-	-	-

*intermediate-high risk pts; **the mean diameter of the TN-LN metastases was significantly larger than that of the FN-LN (10.3 mm vs. 4.6 mm, p < 0.001).

High risk and very high risk prostate cancer and the role of choline PET/CT at initial staging

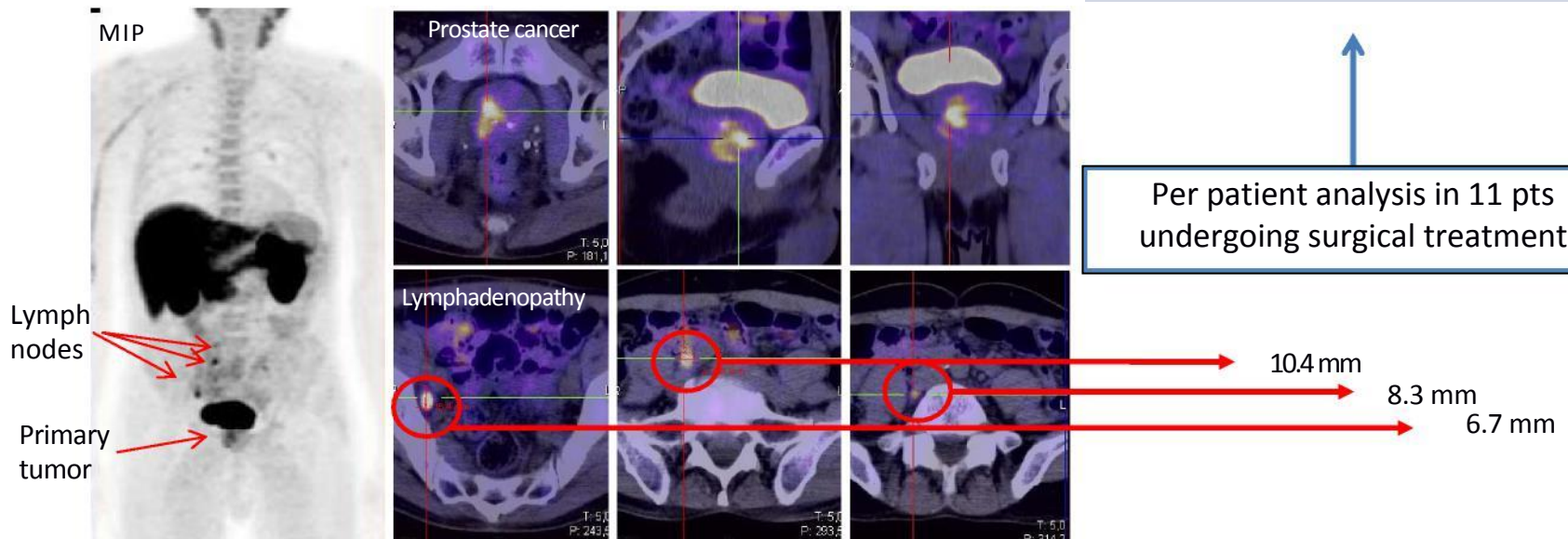
Laura Evangelista, Fabio Zattoni, Andrea Guttilla, Anna Rita Cervino, Michele Gregianin, Marta Burei, Filiberto Zattoni, Giorgio Saladini

25 PCa patients:

- 11 (44%) had a positive PET/CT finding in prostate gland,
- 7 (28%) in prostate and loco-regional lymph nodes,
- 3 (12%) in prostate, lymph nodes and bone
- 4 (16%) cases only in prostate and bone.
- The SUVmax of lymph nodes ranged between 1.51-15.89 and the value was correlated with the size of lesions ($r=0.93$; $p<0.01$).

IOV – IRCCS, Padua and University of Padua, Italy

	%
Sensitivity	100
Specificity	75
PPV	60
NPV	100
Accuracy	82



18F-choline vs. 11C-Choline and N-stage

	18F-Choline (n. study: 4)		11C-Choline (n. study: 6)	
	Pooled value (CI 95%)	Chi-square/I-square	Pooled value (CI 95%)	Chi-square/I-square
Sensitivity	0.40 (0.27-0.53)	11.35/73.6%	0.58 (0.45-0.70)	16.37/69.5%
Specificity	0.96 (0.91-0.98)	6.63/54.7%	0.94 (0.90-0.97)	4.77/0%
Positive likelihood ratio	6.44 (1.64-25.30)	1.05/56.9%	8.99 (4.43-18.27)	5.52/9.4%
Negative likelihood ratio	0.74 (0.45-1.21)	12.19/75.4%	0.39 (0.16-0.92)	33.31/85%
Diagnostic odds ratio	10.64 (1.32-85.91)	3/65%	29.19 (10.44-81.57)	5.70/12.3%

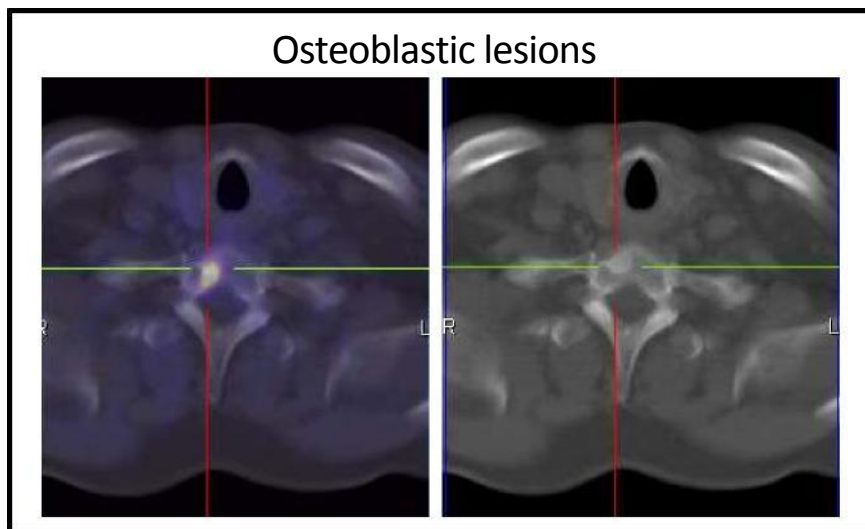
About N-stage

- **Choline-PET/CT** seems to have **better performances than conventional imaging** in LN staging.
- Choline-PET/CT accuracy is still not sufficient because of the **limited spatial resolution** of the technique.
 - NPV of the technique in identifying **microscopic disease** and/or small pathological nodes remains suboptimal, limiting its usefulness in the definition of prophylactic volumes.

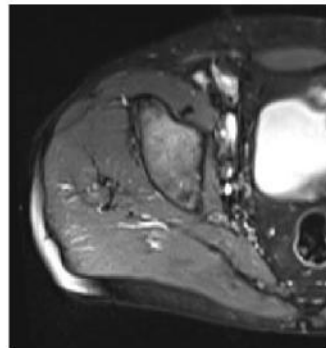
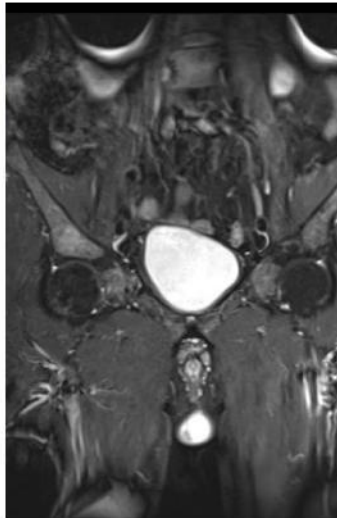
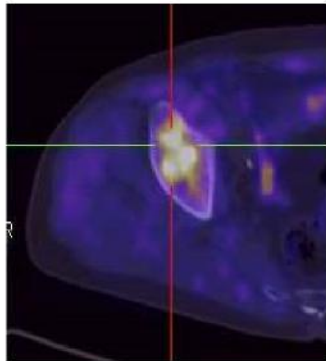
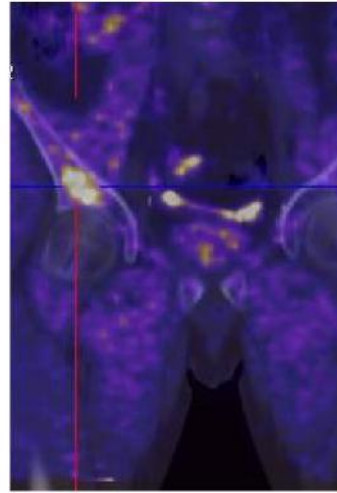
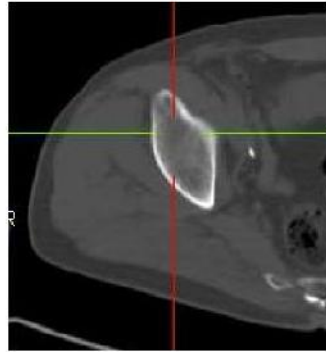
M-Staging

The majority of studies involving patients at initial staging of disease, demonstrated the advantages of ^{18}F -Choline PET for bone metastases

- ~ ~ ~ In the early phase of the bone metastatic process (bone marrow infiltration), Choline-PET is more sensitive (Beheshti et al, 2010)
- ~ ~ ~ In the last phase of the bone metastatic process, in the presence of sclerotic lesions, Choline-PET seems more specific, with no uptake in non-viable lesions (De Bari et al, 2014)



Medullary bone lesions



18F-Choline vs. 18F-Fluoride



Langsteger et al, QJNMMI 2011

Per patient overall	Sensitivity	Specificity	Accuracy	FCH and F-Na PET/CT scans indicated metastatic disease in 56% of patients with high-risk prostate cancer without conclusive evidence of metastases on a previous 99m Tc-MDP bone scan
FCH	20/22=91%	16/18=89%	36/40=90%	
F-Na	20/22=91%	15/18=83%	35/40=88%	

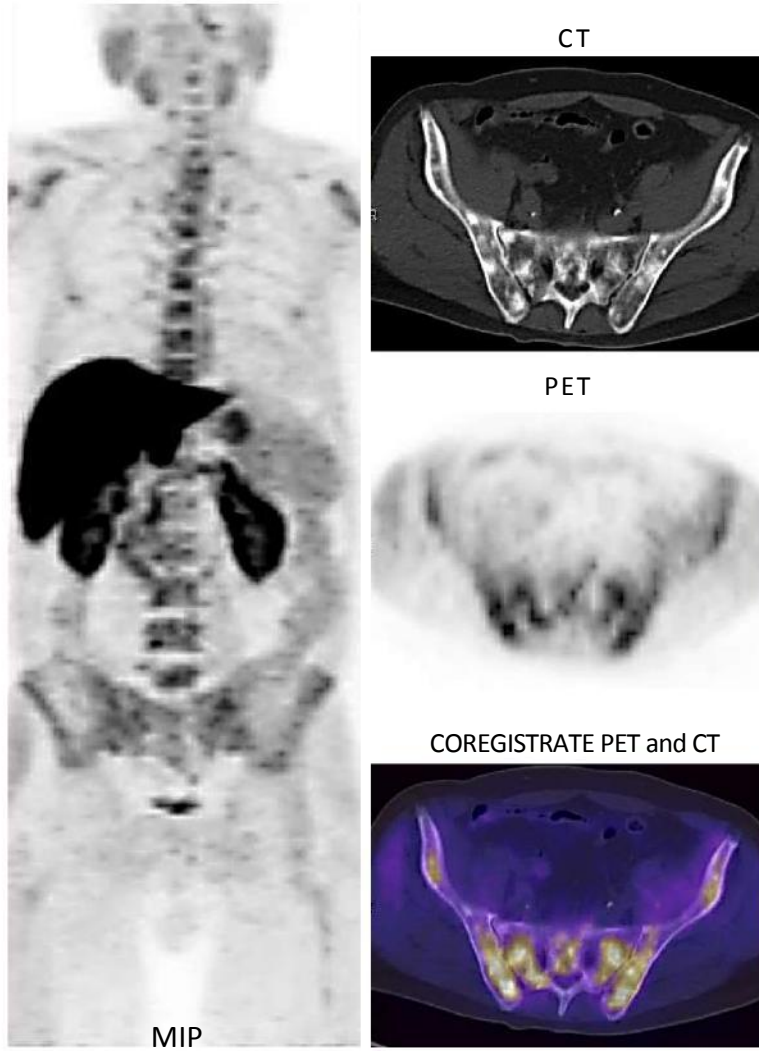
*high risk patients

Imaging Bone Scan

BONE SCAN



18F-CHOLINE PET/CT



18F-NA PET



About M-staging

- **Choline-PET/CT is an optimal imaging modality** for the assessment of viable PCa burden in the skeleton.
- Choline-PET could be recommended for all patients with suspected metastasis and/or with high risk PCa as it could potentially **change the therapeutic approach**†.

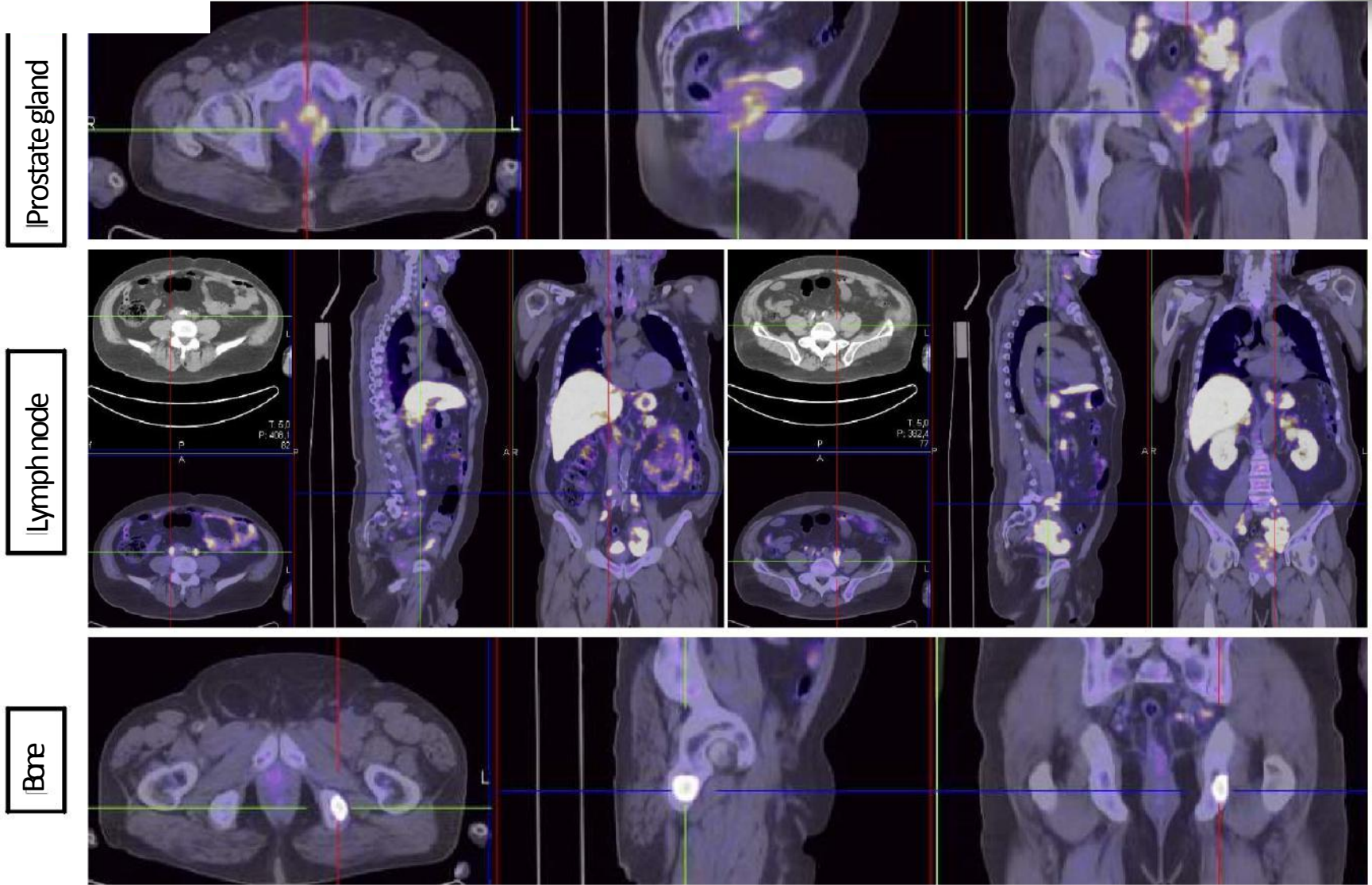
†Change in treatment

Authors, year	N of pts	Change in management	Why
Beheshti et al, 2010	130*	19 (15%)	Distant LN and bone mets
Beheshti et al, 2010	83**	17 (20%)	Distant LN and bone mets
Beheshti et al, 2008	38	2 (5%)	Osteomedullary lesions
Langsteger et al,	49	6 (12%)	Distant LN and bone mets
Evangelista et al, EANM 2013	25***	9 (36%)	Distant LN and bone mets

*intermediate and high risk patients; **high risk patients, ***high and very high risk of patients

....in staging!

..... advantages at initial staging



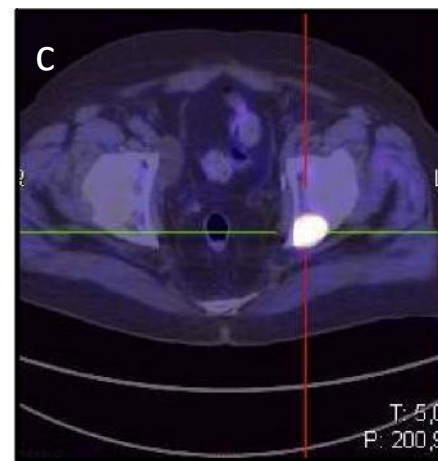
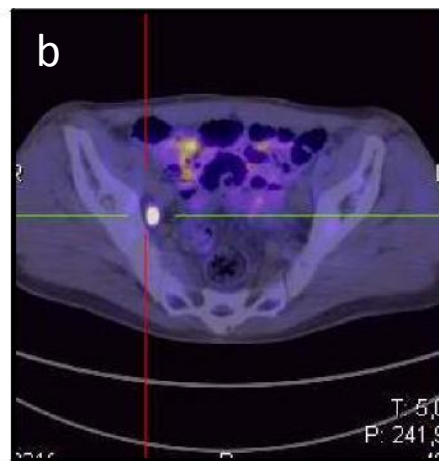
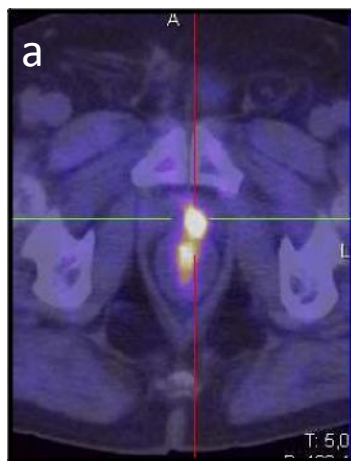
Restaging or Biochemical progression disease

- Patients with a rising PSA after a primary local treatment (radiotherapy, surgery, brachytherapy) can be considered as:
 - “oligometastatic” or “oligo-recurrent”;
 - “extensive metastatic” or with systemic disease

Diagnostic performance in restaging- setting

Author, year	N of pts	Standard of reference	Sens. % (IC 95%)	Spec. %, (IC 95%)	PPV % (IC 95%)	NPV % (IC 95%)	Acc.% (IC 95%)
Husarik et al,	68	Histological examination	90 (83-97.7)	100	100	45.5 (18-89)	91.1 (84-98)
Pelosi et al, 2008	56	Biopsy/imaging/FUP	82.7 (69-97)	96.2 (89-100)	96 (89-100)	83.8 (70-98)	89.2 (81-97)
Henninger et al,	35	Biopsy/histology/imaging/FUP	64.3 (47-82)	57.1 (21-94)	85.7 (73-99)	28.6 (5-62)	62.9 (47-79)
Schillaci et al, 2012	49	Biopsy/histology/imaging/FUP	91.7 (83-100)	100	100	81.3 (60-100)	93.9 (87-100)
Marzola et al, 2013	233	Biopsy/histology/imaging/FUP	100	97 (94-100)	98 (95-100)	100	99 (97-100)

- a) Prostatic fossae recurrence
- b) Lymph node recurrence
- c) Skeletal recurrence



Restaging in Prostatic fossae recurrence

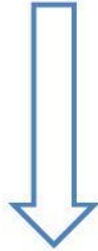
Author, year	N of pts	Site of disease	Standard of reference	Sens. % (IC 95%)	Spec. %, (IC 95%)	PPV % (IC 95%)	NPV % (IC 95%)	Acc.% (IC 95%)
Vees et al, 2007	11*	Local recurrence	Histological examination	43 (6-71)	50 (10-99)	60 (23-96)	33 (12-79)	45 (16-74)
Panebianco et al, 2010	84**	Local recurrence	TRUS biopsy and PSA values	83 (74-91)	63 (29-96)	95 (91-100)	28 (3-59)	81 (73-89)

*Pts at very low PSA values (<1 ng/mL); ** PSA ranged between 0.8-2.5 ng/mL

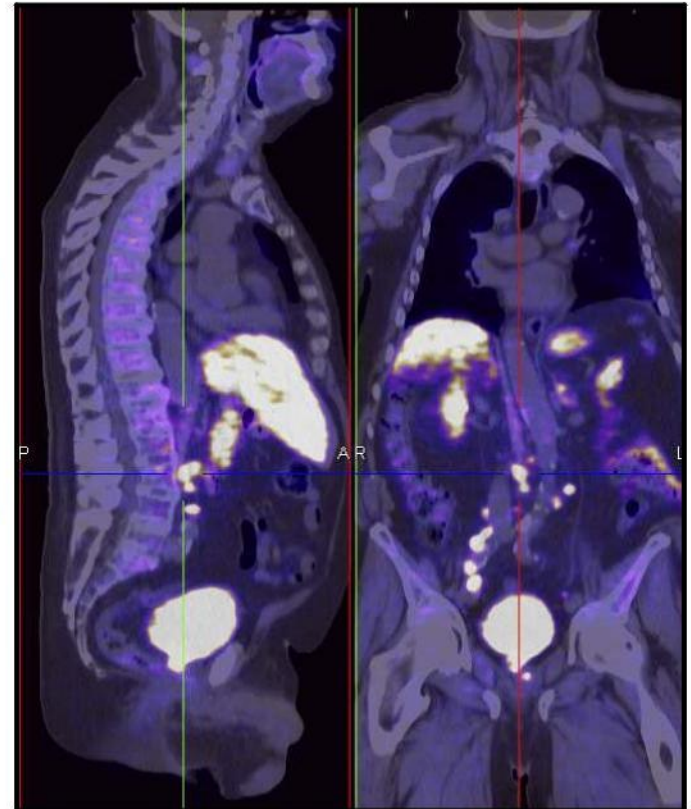
Imaging modality	Sensitivity	Specificity	PPV	NPV	Accuracy
MRI	93%	88%	99%	58%	93%
(if PSA as gold standard)	92%	75%	96%	60%	89%
(if TRUS as gold standard)	94%	100%	100%	57%	94%
PET/CT	83%	43%	95%	28%	81%
(if PSA as gold standard)	62%	50%	88%	18%	60%
(if TRUS as gold standard)	92%	33%	98%	43%	91%

Restaging LN recurrence

Author, year	N of pts	Standard of reference	Sens. % (IC 95%)	Spec. %, (IC 95%)	PPV % (IC 95%)	NPV % (IC 95%)	Acc.% (IC 95%)	TP	TN	FP	FN
Husarik et al, 2008	23	Histological examination	100	70	78.2 (59-97)	-	78 (61-95)	18	0	5	0

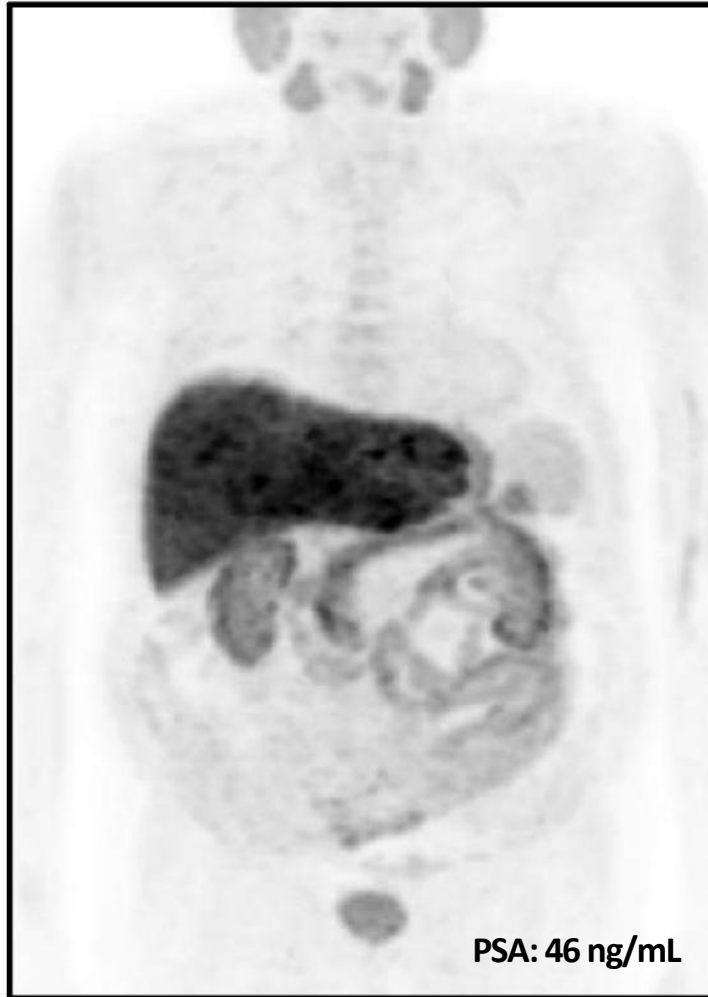


- Pelvic/retroperitoneal salvage lymph node dissection
- Limited accuracy in case of micrometastatic



Visceral Metastases

October, 2012

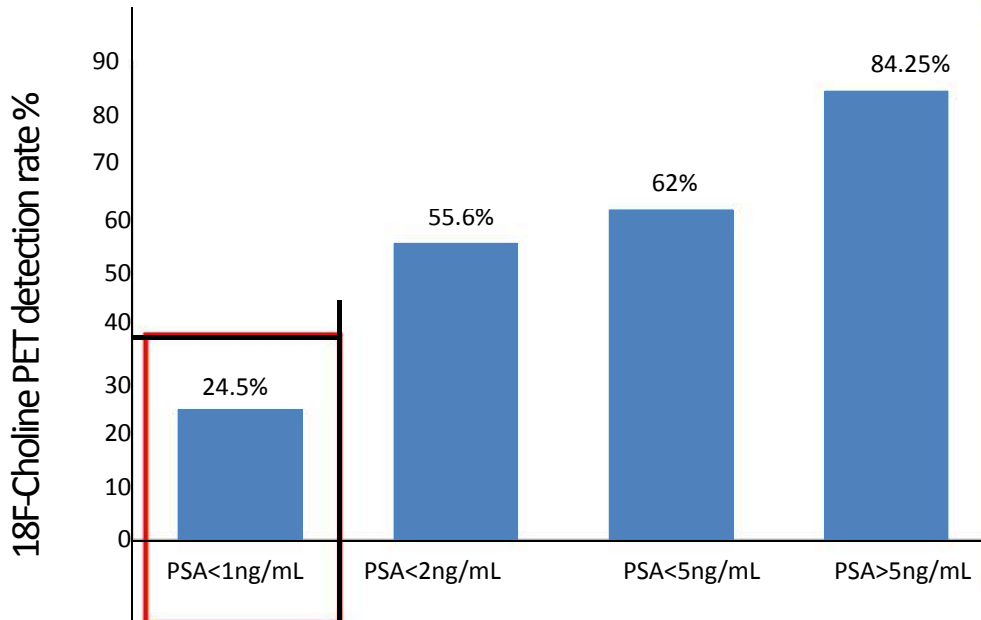


February, 2013



Trigger PSA...

	PSA<1ng/mL	PSA<2ng/mL	PSA<5ng/mL	PSA>5ng/mL
Detection rate	20%	71.4%	44%	73%
	36%	43%	62%	86.7%
	20%	55.6%	80%	87%
	29%			



PET-positive

- a "fast" PSA kinetic
- mean PSAdt=6 months
- mean PSAvel=9.3 ng/mL/yr

PET-negative

- a "slow" PSA kinetic
- mean PSAdt=15.4 months
- mean PSAvel=0.9 ng/mL/yr

(Marzola et al, CNM 2013)

...and Gleason score

A population of 1000 pts with recurrent Pca undergoing 18F-Choline PET in two Italian centers and 1 Slovene center

	Univariate			Multivariate		
	OR	IC95%	P value	OR	IC95%	P value
Age	1.038	1.020-1.056	<0.001	1.024	1.002-1.046	0.030
GS=7	0.288	0.205-0.404	<0.001	0.196	0.127-0.301	<0.001
GS>7	0.446	0.323-0.616	<0.001	0.310	0.206-0.467	<0.001
Surgery yes vs. no	0.686	0.563-0.834	<0.001	0.400	0.272-0.587	<0.001
RT yes vs. no	1.408	1.173-1.689	<0.001	1.069	0.744-1.537	0.718
HT yes vs. no	1.980	1.606-2.441	<0.001	1.437	0.900-2.293	0.129
Ongoing HT yes vs. no	1.424	1.178-1.721	<0.001	0.885	0.557-1.405	0.604
Chemotherapy yes vs. no	1.385	1.149-1.668	<0.001	1.965	1.203-3.210	0.007
1>PSA<2	0.184	0.112-0.300	<0.001	0.80	0.54-0.118	0.080
PSA≥2	0.470	0.282-0.785	0.004	0.237	0.151-0.374	<0.001

18F-choline vs. 11C-Choline and restaging

	All	11C-choline* (n. study: 12)	18F-choline* (n. study: 8)
	Pooled value (%95 CI)	Pooled value (%95 CI)	Pooled value (%95 CI)
Sensitivity	85.6% (82.9-88.1)	81.8% (77.9-85.2)	91.8% (88.0-94.7)
Specificity	92.6% (90.1-94.6)	91.4% (88.3-93.9)	95.6% (91.2-98.2)
Positive likelihood ratio	8.53 (3.62-20.09)	7.19 (2.59-19.99)	11.75 (1.86-74.39)
Negative likelihood ratio	0.17 (0.11-0.28)	0.20 (0.13-0.29)	0.11 (0.03-0.46)
Diagnostic odds ratio	62.123 (24.78-155.72)	53.77 (29.02-99.62)	132.55 (7.59-2315.5)

*all site of disease

Main critical issues

- Histological confirmation of Choline-PET/CT findings is rarely available, also because
 - anastomotic biopsy presents a low positive detection rate, especially for PSA levels <1 ng/mL;
 - salvage pelvic lymph node dissection is not routinely performed in patients with a biochemical cancer relapse and evidence of nodal disease;
 - biopsy at the bone level is not commonly performed.
- In the majority of investigations, clinical follow-up and conventional instrumental examinations are used to confirm Choline-PET findings, making these studies primarily observational.

About restaging

- The **overall detection rate** of 18F-Fluorocholine-PET was significantly **increased when the trigger PSA increases**, but higher PSA levels are often a sign of metastatic spread, which is a contraindication for potentially curable local treatments
- **PSAdt and PSAvel, should be taken into account to stratify** patients with a biochemical failure to be referred to a Choline PET/CT.
- **MRI was more helpful**, particularly when there is a **low likelihood of distant metastases**
- **Micro-metastatic lymph node lesions can be missed** by 18F-Choline PET (pay attention to guide salvage RT!!!)

ADT and 18F-choline findings

**ADT
Yes**

or

**ADT
No**

Inconclusive

- Choline-PET/CTs are more frequently **positive (higher positive detection rate) in hormone-resistant patients** than in hormone-sensitive patients.
- In patients who develop a **biochemical failure during ADT, hormone therapy itself does not significantly affect the uptake of Choline** in sites of disease recurrence.

- DeGrado et al. (DeGrado et al, Cancer Res 2001;61:110–7) confirmed the **inhibitory effect of ADT on the uptake of radiolabelled Choline**

Doubts about PET and ADT

- In vitro and in vivo studies provide quite strong evidence that the uptake of radiolabelled Choline is significantly reduced by ADT in patients with hormone-sensitive PCa. In these patients, **ADT should probably be started after the pre-treatment PET/CT**, even though this indication for the Choline-PET/CT remains debated.
- **No indications about the correct timing between the withdrawal of ADT and the execution of the PET/CT** could be obtained from the available literature.
- There is **insufficient evidence to support the withdrawal of ADT** before Choline-PET/CT in patients with hormone-resistant PCa.

Radiation treatment

- “Theragnostic imaging” in radiotherapy is the properly coined term to describe the introduction of molecular images to draw and more selectively treat each voxel of tumor volume with dose painting based on biological and functional characterization.
 - Biological Target Volume (BTV)
 - Gross Tumour Volume (GTV)

Radiation treatment planning

- In this setting, integrated PET/CT are showing **several interesting applications in defining the BTV.**
- Despite the potential interest of Choline-PET/CT, **the contouring methods based on it are still are not considered totally reliable**, due to uncertainties to establish fixed absolute and relative thresholds of primary and recurrent PCa to identify the BTV.
- **Semiautomatic segmentation techniques**, using thresholds adapted case per case, have been performed to simplify RT planning in the prostate and are under investigation.

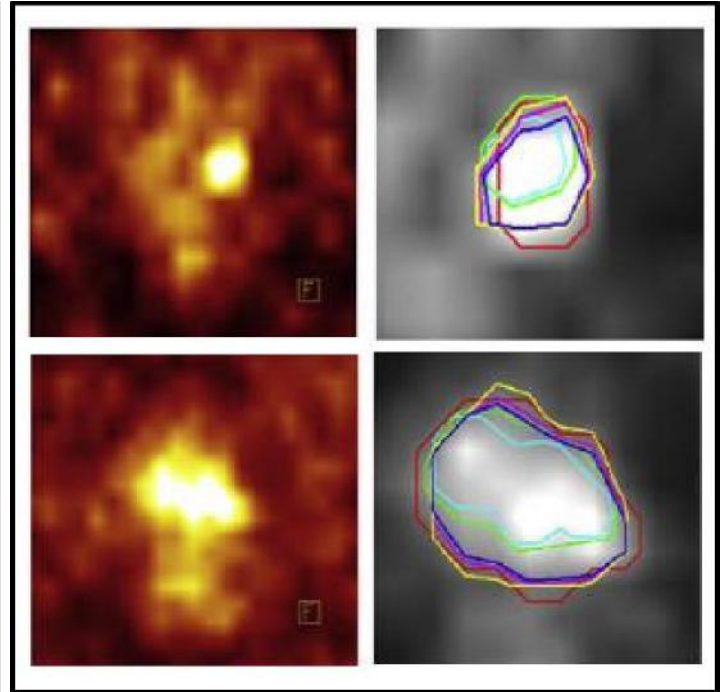
Radiation treatment planning

- In a large clinical experience on 66 PCa patients undergoing a 18F-Fluorocholine PET/CT for treatment planning: a matching between the lobe(s) with a positive biopsy and the GTV defined on PET was confirmed in 97% of cases.
- Treatment planning with dose escalation to intraprostatic lesion by 18F-Fluorocholine-PET/CT does not impact the toxicity profile (by the administration of a specific questionnaire)

Re-irradiation

18F-Fluorocholeline-PET/CT-based GTV in local recurrent PCa after initial irradiation, in 17 pts.

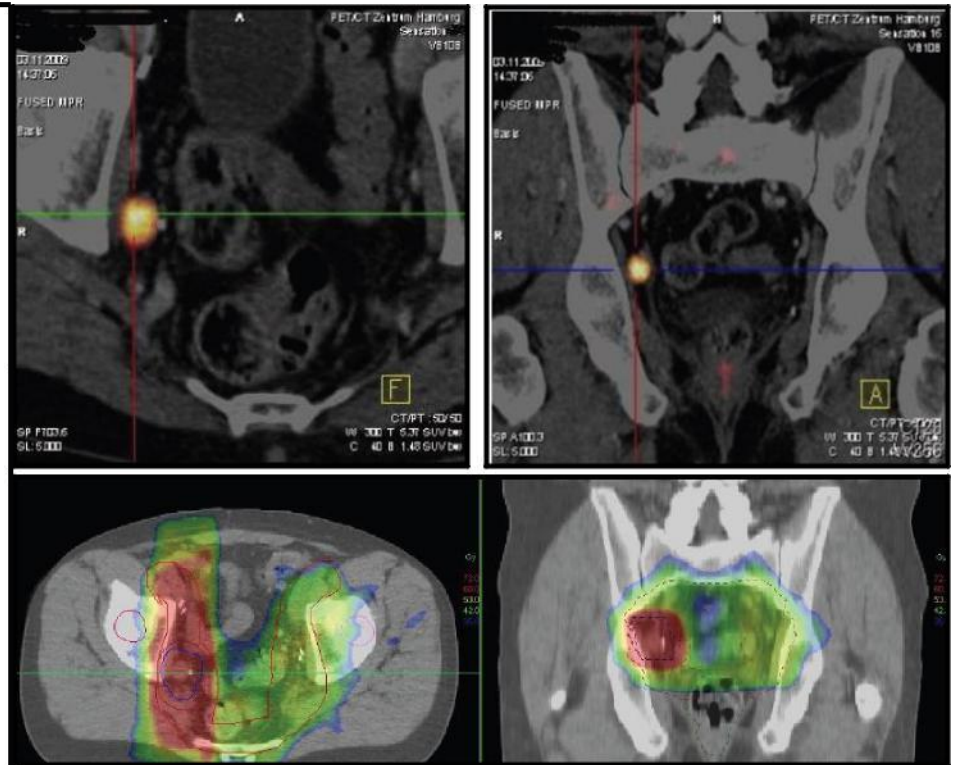
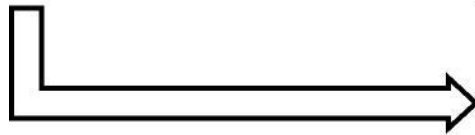
- manual delineation (GTVman) by radiation oncologist and nuclear medicine physicians,
- a fixed threshold of 40% and 50% of the maximum signal intensity (GTV40% and GTV50%),
- signal-to-background ratio-based adaptive thresholding (GTVSBR),
- a region growing (GTVRG) algorithm.



Validated semi-automated segmentation techniques for 18F-Choline PET-guided GTV delineation allow to lower inter-observer variability compared to manual techniques

FEC-PET/CT could be helpful in dose escalation in PCa allowing boost doses > 60 Gy to metastatic lymph nodal regions if PET/CT planned image-guided IMRT, is used.

(Würschmidt et al. Radiation Oncology 2011, 6:44)



RT planning and 18F-choline PET

Pros

- Promising data are emerging from several retrospective series, but other **prospective studies are needed** to implement the benefit of radiotherapy with a PTV based on Choline-PET imaging in primary and loco-regionally relapsing PCa.

Cons

- **Low negative predictive value**, because it can miss **microscopically affected nodes** and the intraprostatic microscopic disease.

Response to Enzulamide

- Enzulamide is a new generation hormone therapy, able to produce a survival improvement in CRPC pts pre-treated with docetaxel.
- Preliminary data showed a good concordance between the Choline-PET response and biochemical response in either responding or progressing pts, while most of the pts with stable metabolic parameters showed a good PSA reduction.

Metabolic response	PSA response		
	< 50%	Stable	Progression
RP ($\geq 30\%$)	9	0	1
SD	8	1	1
PD ($\leq 30\%$)	1	1	6

Agreement PSA- FCH PET

PR: 9/10= 90%

SD: 1/10= 10%

PD: 6/8= 75%

Response to Abiraterone

Design

29 metastatic CRPC pts progressing after docetaxel chemotherapy received Abiraterone acetate (1,000 mg daily with prednisone 5 mg twice daily in continuous 28-day cycles)

Results

PSA decline and CTCs levels correlated in 55%

In 41% of pts with a 50% or more decline in PSA both a CTCs response and a FCH PET/CT response was observed.

Conclusions

Monitoring pts with CRPC who receive Abiraterone using both CTCs and metabolic imaging indicate discrepancy in 45% with response assessment using PSA.

A 67-year old man with PCa treated by RP+LNPD (pT3bN1; GS: 9; positive margins). Serial monthly PSA (0.56 ng/mL->2.37 ng/mL->3.03 ng/mL) therefore HT (Enantone)

October, 2012

June, 2013



Baseline



SUVmax: 17.98
SUVavg: 6.22

Post-chemotherapy



SUVmax: 6.98
SUVavg: 4.25

Baseline



SUVmax: 4.65
SUVavg: 3.62

Post-chemotherapy



SUVmax: 14.83
SUVavg: 5.51

Take home message

