

PSMA-PET-Guided Salvage Radiotherapy Among Prostate Cancer Patients in the Post-Prostatectomy Setting: A Single Center Post-Hoc Analysis

Smith CP,¹ Grogan T,² Armstrong WR,³ Clark K,³ Moore K,³ Moore J,³ Roberts M,³ Farolfi A,³ Reiter RE,⁴ Rettig M,⁵ Shen J,⁵ Valle L,¹ Nickols NG,¹ Steinberg ML,¹ Czernin J,³ Kishan AU,¹ Calais J.³
 1. Department of Radiation Oncology, 2. Division of General Internal Medicine and Health Services Research, 3. Ahmanson Translational Theranostics Division, Department of Molecular and Medical Pharmacology, 4. Department of Urology, 5. Department of Medical Oncology



Introduction

- Patients who undergo radical prostatectomy (RP) for prostate cancer (PCa) can develop biochemical recurrent (BCR) disease, often detected at very low PSA levels.
- Salvage radiation therapy (sRT) is standard of care in the setting of BCR, but target volumes can depend on what restaging imaging shows.
- Prostate Specific Membrane Antigen (PSMA) PET/CT has superior sensitivity and specificity for localizing recurrent disease, especially at low PSA levels.
- Providers are now utilizing PSMA PET findings to guide their salvage radiotherapy (sRT) treatment.
- It is uncertain how PSMA impacts patients' rates and patterns of recurrence when used to guide sRT.

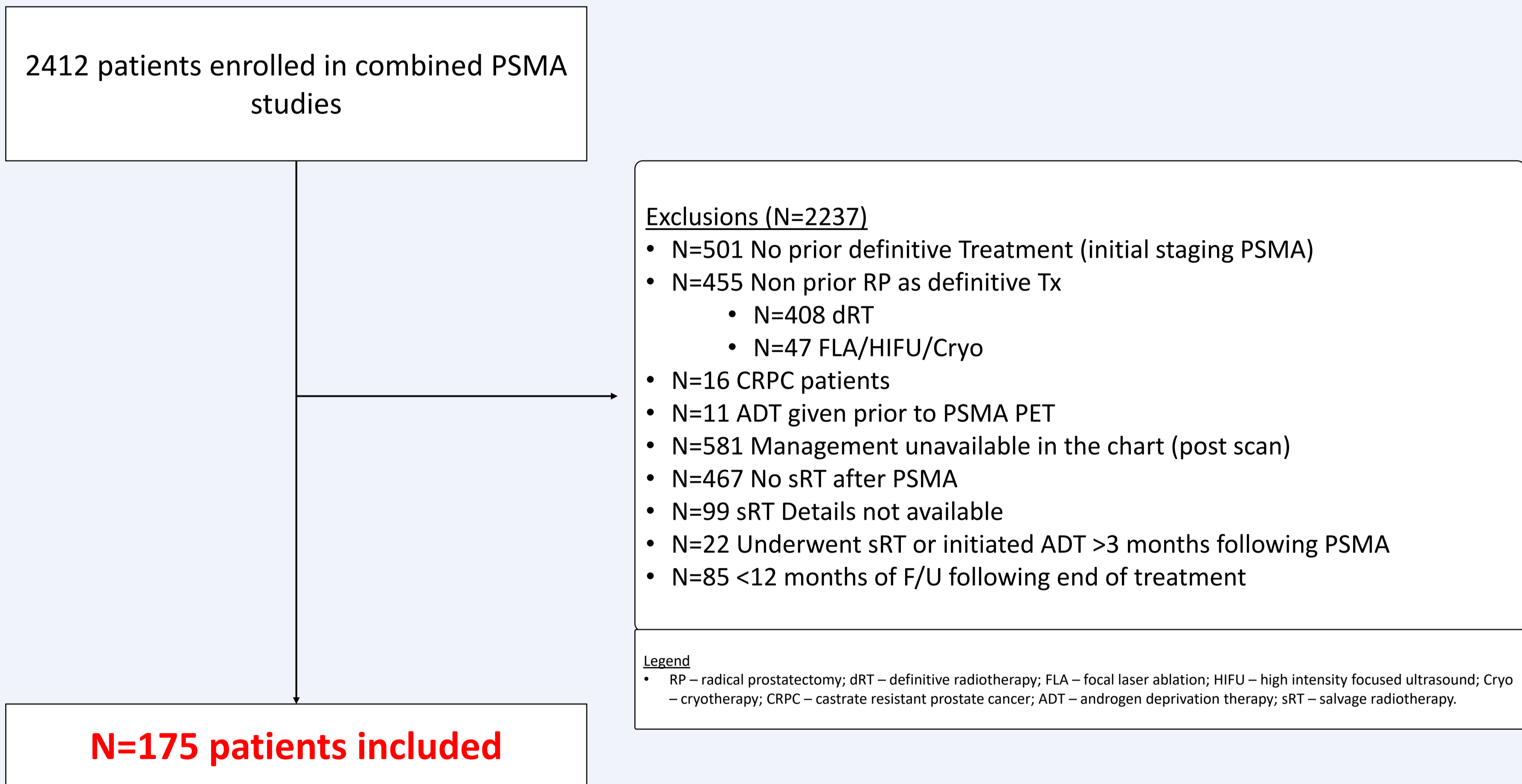
Objectives

- To study the outcomes among those who underwent PSMA PET/CT guided sRT
- To find predictors of recurrence in this population

Methods

- This was a *post-hoc* analysis of 5 prospective studies of PSMA PET conducted at UCLA from 2016-2021
- Recurrence following sRT was defined as 0.2 ng/mL above the post sRT nadir.
- Kaplan Meier method utilizing the log-rank test was used to estimate and visualize time to biochemical recurrence/progression. Univariable Cox Proportional Hazard models were run for PFS using imaging variables, baseline pathology, and treatment characteristics.

Patient Selection Flowchart



Baseline Characteristics	N=175
Age at PSMA PET/CT, median (years)	67 (range: 43-83)
iPSA before Surgery, median (ng/mL)	8 (range: 1.2-105)
ECE	N=48 (27%)
Gleason Score ≥8	N=66 (38%)
Pre PSMA-PET PSA, median (ng/mL)	0.625 (range 0.063-35)
≤0.5	N=78 (45%)
0.51-1	N=35 (20%)
1.1-2	N=28 (16%)
>2	N=34 (19%)
Pre sRT PSA, median (ng/mL)	0.68 (range: 0.063-35)
Time between RP and PSMA, median (months)	38 (range: 1-329)
Follow-Up, median (months)	32 (range: 12-70)
Previous sRT	N=56 (33%)

Results

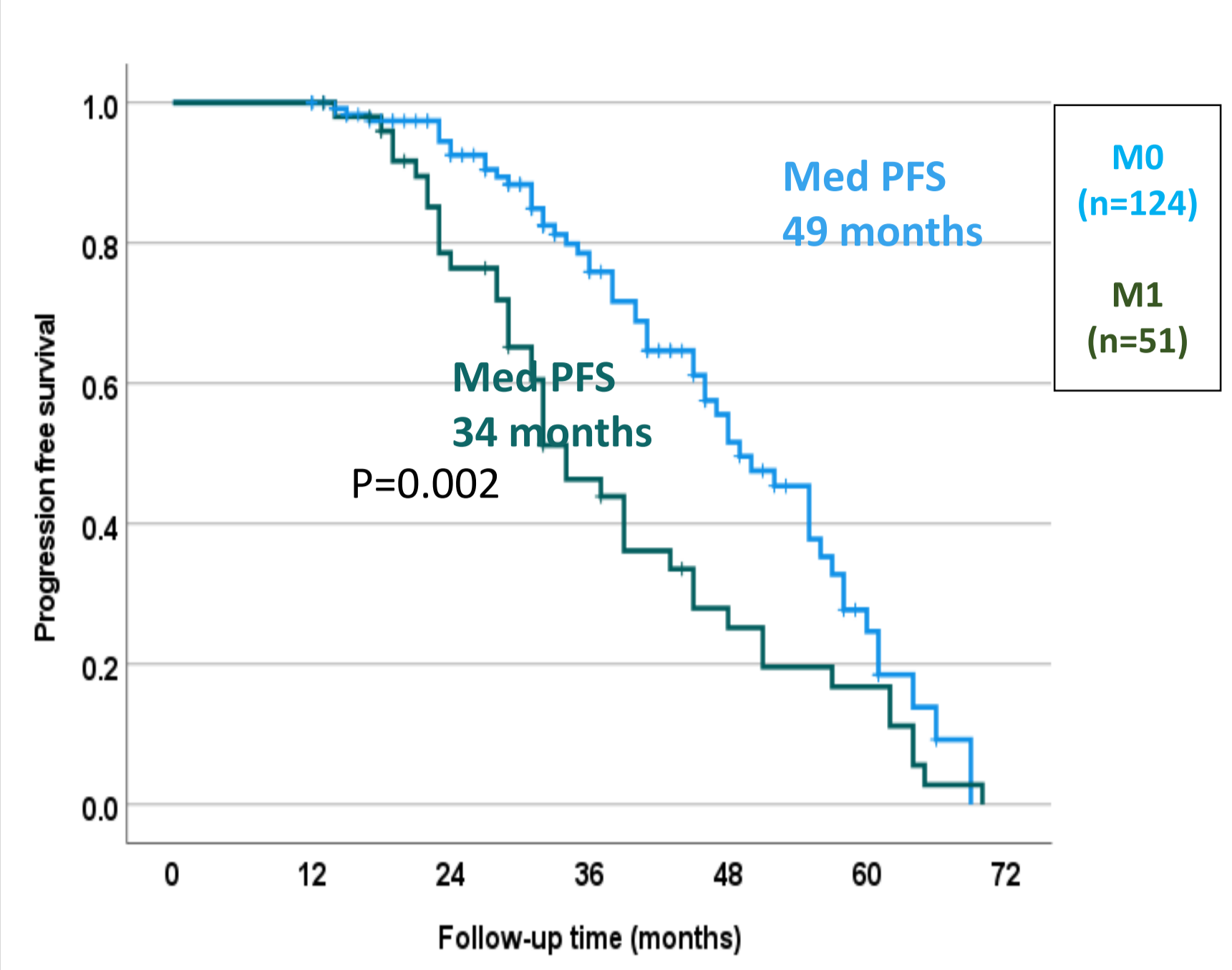
PSMA PET findings	Entire Cohort (n=175)	1 st BCR Group (n=117)	≥2 nd BCR Group (n=58)
TONOMO	48 (27%)	48 (41%)	0 (0%)
≥1 lesion on PSMA-PET	127 (73%)	69 (59%)	58 (100%)
# Lesions on PSMA-PET, median	1 (range: 1-8)	1 (range 1-8)	1 (range 1-6)
miTrNOMO	21 (12%)	20 (17%)	1 (2%)
miTxN1M0	55 (31%)	33 (28%)	22 (38%)
miTxNxM1	51 (29%)	16 (14%)	35 (60%)
M1a	19 (11%)	3 (3%)	16 (28%)
M1b	30 (17%)	12 (10%)	18 (31%)
M1c	2 (1%)	1 (1%)	1 (2%)

Treatment Details	Entire Cohort (n=175)	1 st BCR Group (n=117)	≥2 nd BCR Group (n=58)
ADT Use	116 (66%)	80 (68%)	36 (62%)
Duration of ADT, median (months)	6 (range 1-39)	6 (range 3-58)	6 (range 1-24)
RT Target Volumes			
Prostate Bed +/- PLNs	98 (56%)	96 (82%)	2 (3%)
PB Only	39 (22%)	38 (32%)	1 (2%)
PB + PLNs	59 (34%)	58 (50%)	1 (2%)
PLNs Only	32 (18%)	7 (6%)	25 (43%)
M1 +/- PB +/- PLNs	45 (26%)	14 (12%)	31 (53%)
PB + PLNs + M1	7 (4%)	6 (5%)	1 (2%)
PLNs + M1	7 (4%)	2 (2%)	5 (9%)
M1 Only	31 (18%)	6 (5%)	25 (43%)

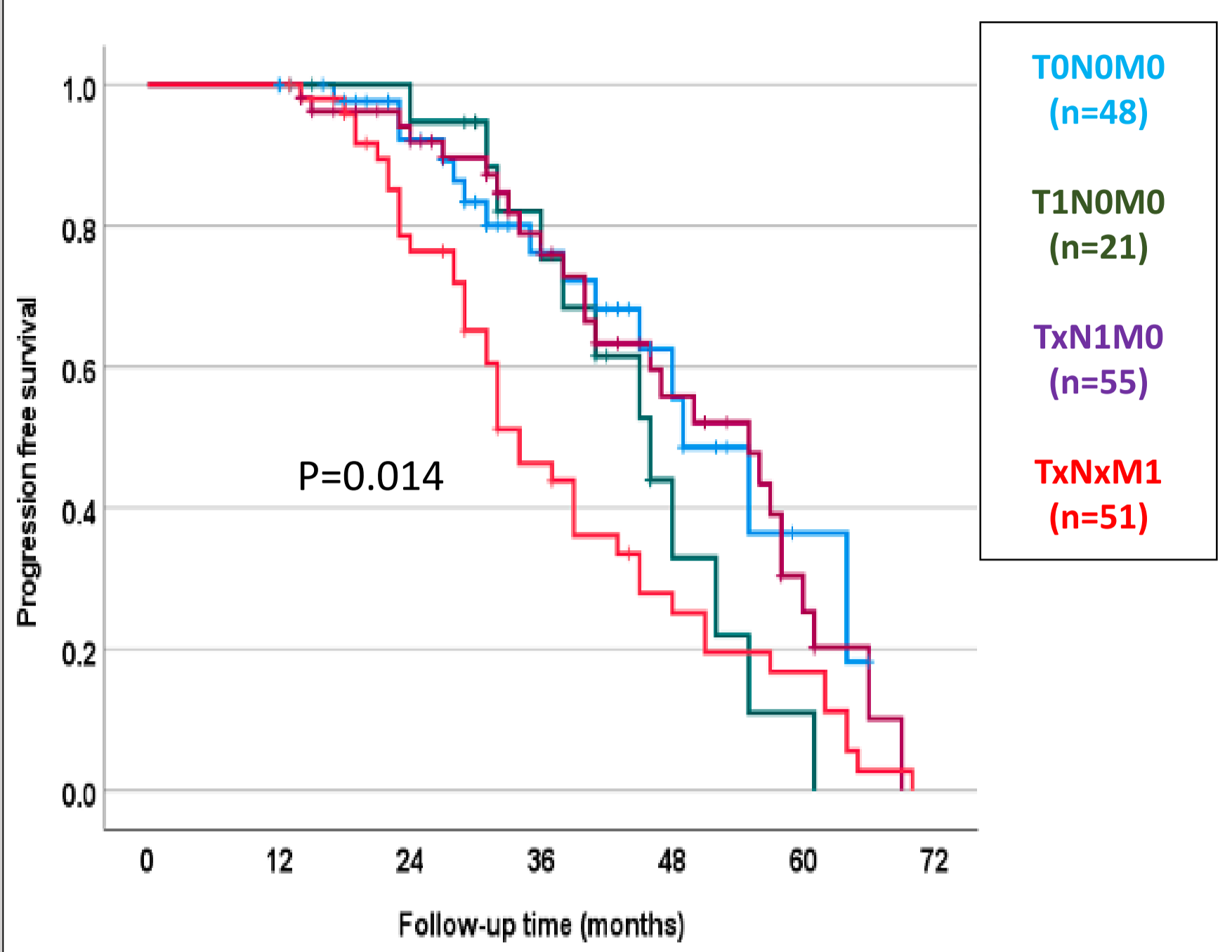
Recurrence Details	Entire Cohort (n=175)	1 st BCR Group (n=117)	≥2 nd BCR Group (n=58)
PSA recurrence	93 (53%)	48 (41%)	45 (78%)
Time to PSA recurrence median (months)	15 (range 1-48)	16 (range 3-48)	15.5 (range 1-36)
Imaging recurrence (by PSMA PET, CT MRI, bone scan)	69 (39%)	36 (31%)	33 (57%)
Time to imaging recurrence median (months)	19 (range 6-61)	19 (range 7-50)	19 (range 6-61)
Both PSA & Imaging recurrence	68 (39%)	36 (31%)	32 (55%)
Time to any recurrence median (months)	15.5 (range 1-48)	16 (range 3-48)	16 (range 1-36)

Univariate Analyses	All patients (n=175)		1 st BCR Group (n=117)	
	HR (95% CI)	p-value	HR (95% CI)	p-value
Imaging				
PSA at time of PSMA (numeric)	0.99 (0.94 - 1.04)	0.656	0.95 (0.81 - 1.11)	0.535
N0 vs N1	1.06 (0.70 - 1.60)	0.771	0.84 (0.46 - 1.56)	0.588
M0 vs M1	1.86 (1.23 - 2.83)	0.003	1.22 (0.59 - 2.56)	0.591
# PSMA lesions (numeric)	1.14 (1.00 - 1.30)	0.045	0.98 (0.79 - 1.21)	0.831
Treatment characteristics				
ADT use	0.78 (0.51 - 1.18)	0.241	0.72 (0.40 - 1.29)	0.270
sRT to PLNs	0.46 (0.23 - 0.93)	0.030	0.46 (0.23 - 0.93)	0.030

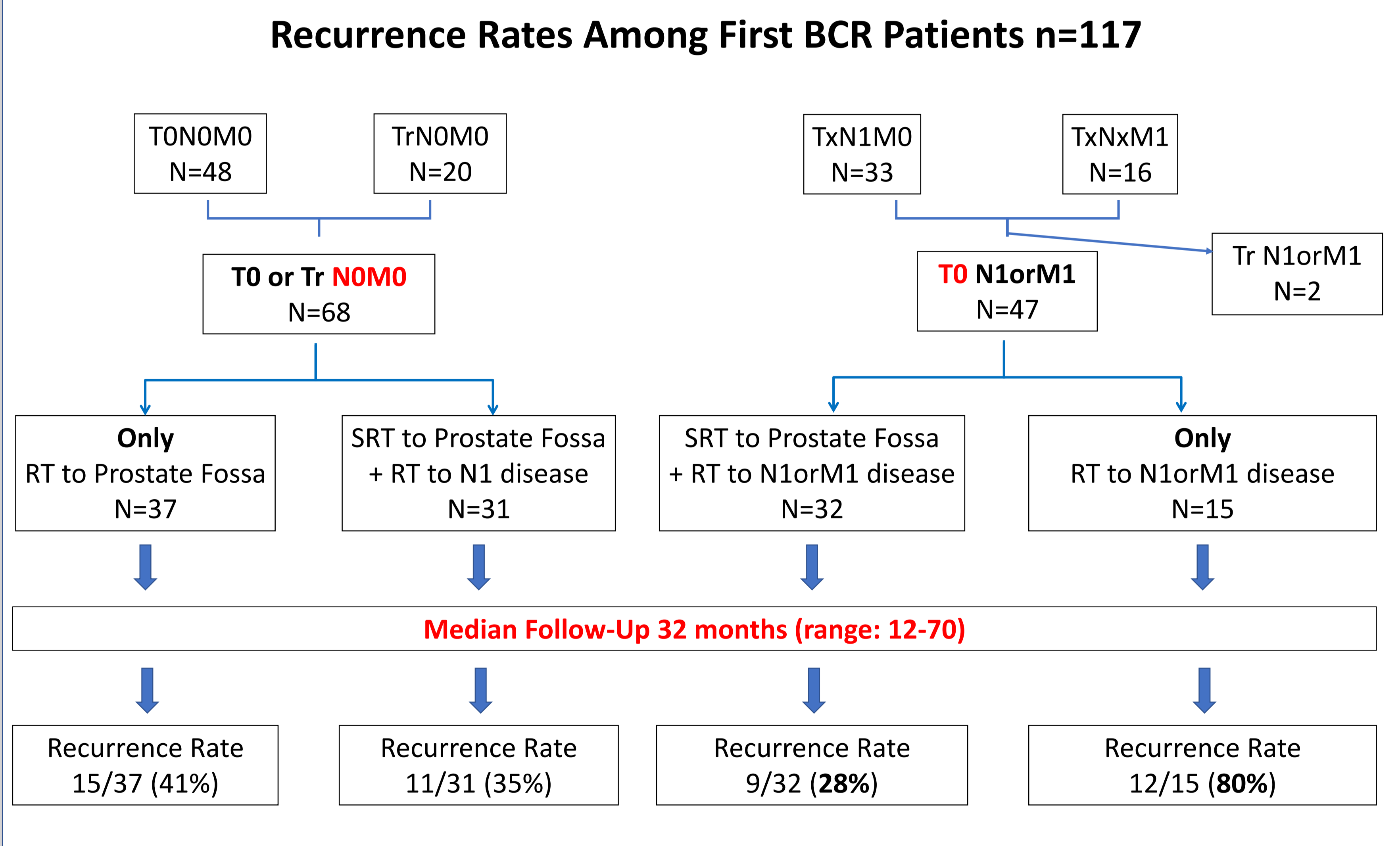
PFS Between M0 and M1 Patients (n=175)



PFS Between All Stages (n=175)



Out Of the 96 patients treated with PSMA+ N1 or M1 disease (with all PSMA lesions included in the sRT fields) 39 (40%) did not develop subsequent disease relapse.



Conclusions:

- Patients who undergo PSMA guided sRT have worse PFS when the PSMA PET scan shows M1 disease and an increased number of lesions
- First BCR Patients never treated with prior SRT who have N1 or M1 disease on PSMA rarely have PSMA avid disease in the fossa, although they tend to still benefit from fossa sRT.
- Prospective studies are underway assessing patient outcomes among those undergoing PSMA guided sRT. We eagerly await the maturation of those data.