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Real-World Performance of Pelvic MRI and Abdominopelvic CT for Nodal Staging in Higher-Risk Prostate Cancer and the Incremental Clinical Value of CT

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Research Article

Keywords: prostate cancer staging, lymph node involvement, CT scan, pelvic MRI, PSMA-PET/CT, clinical utility

Posted Date: June 5th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9172519/v1

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Additional Declarations: No competing interests reported.

Abstract

Background and Objective:

Conventional imaging with pelvic magnetic resonance imaging (MRI) and abdominopelvic computed tomography (CT) is still used for staging of prostate cancer (PCa), particularly when molecular imaging is unavailable. mpMRI is currently recommended before prostate biopsy. We evaluated the agreement between MRI and CT for nodal and distant staging, their diagnostic accuracy against surgical nodal staging, and the real-world clinical utility of CT when pelvic MRI is already available.

Methods:

Among consecutive prostate biopsies, we retrieved patients with unfavorable intermediate- or high-risk PCa who underwent both pelvic MRI and abdominopelvic CT (and bone scan). Agreement for nodal staging was assessed using Cohen's κ. Diagnostic performance was evaluated in patients undergoing radical prostatectomy with pelvic lymph node dissection, using final pathology as the reference standard. The clinical yield of CT was assessed post hoc, considering nodal or metastatic reclassification or urgent non-PCa-related findings.

Key Findings and Limitations:

We included 323 consecutive patients. MRI and CT identified cN1 disease in 6.8% and 8.1% of cases, respectively, and showed moderate agreement for pelvic nodal staging (κ = 0.51), with higher agreement in non-surgical patients. Both modalities demonstrated very low sensitivity for nodal metastases (≤ 20%) compared with pathology, with area under the curve (AUC) < 0.60. In the subgroup of patients with also molecular imaging available (n = 82) PSMA PET/CT showed superior performance (AUC = 0.86). MRI and CT (plus bone scan) showed moderate agreement for distant metastasis (κ = 0.56). CT provided clinically relevant information not detectable in mpMRI in 14.1% of patients (number needed to scan = 7). Limitations include the retrospective design and lack of centralized imaging review.

Intervention:

Imaging strategies were evaluated observationally.

Conclusions and Clinical Implications:

Pelvic MRI and CT show moderate agreement for nodal staging but poor diagnostic accuracy. Although the incremental value of CT beyond pelvic MRI is limited, it may still contribute to change management when PSMA PET/CT is unavailable.

What does the study add?

This study shows that MRI and CT demonstrate moderate agreement and poor accuracy for nodal staging in PCa. However, in real-world practice, approximately one in seven CT scans provides clinically

relevant information in addition to pelvic MRI and bone scintigraphy.

Patient Summary

MRI and CT scans often agree when staging prostate cancer but frequently miss small lymph node metastases. PSMA PET/CT scan proves more accurate; however, CT scan can sometimes add relevant information when molecular imaging is not available.

1. Introduction

Accurate staging of lymph-node and distant metastatic disease is a cornerstone in the management of unfavourable-intermediate and high-risk prostate cancer (PCa), as it directly influences treatment selection and prognosis. Conventional cross-sectional imaging with contrast-enhanced abdominopelvic computed tomography (CT), pelvic magnetic resonance imaging (MRI), and bone scan have historically represented the standard approach for initial staging; nodal assessment relied primarily on morphological criteria such as nodal size, shape, and anatomical distribution [1,2].

In recent years, prostate-specific membrane antigen positron emission tomography (PSMA-PET/CT) has significantly improved the detection of nodal and distant metastases and is recognized as the best staging modality [3]. Nevertheless, conventional imaging continue to be used in daily clinical practice, particularly in settings where PSMA PET/CT is unavailable, difficult or limited to access, not reimbursed, or not routinely indicated [4,5]. Importantly, both CT and MRI are known to have limited sensitivity for the detection of small-volume nodal metastases and early metastatic disease, especially when based on size-based criteria alone [6]. As a result, clinicians must often rely on predictive nomograms - such as the Briganti, MSKCC, and CAPRA scores - to estimate the preoperative risk of lymph node invasion (LNI) and guide decisions regarding pelvic lymph node dissection (PLND)[7–9].

The optimal use and sequencing of conventional imaging modalities for staging remain incompletely defined. When PSMA PET/CT is not available, the European Association of Urology (EAU) guidelines recommend cross-sectional abdominopelvic imaging combined with bone scan for staging patients with ISUP grade group ≥ 3 PCa, whereas the American Urological Association (AUA) guidelines consider pelvic MRI and abdominopelvic CT largely interchangeable for nodal staging [7,8]. Since the majority of patients undergo pelvic MRI before diagnostic biopsy as standard of care, this divergence raises a clinically relevant question regarding the incremental value of performing a subsequent abdominopelvic CT scan for staging purposes.

The present study aims to assess the accuracy and the agreement between CT scan and pelvic MRI for nodal and distant staging in a large contemporary cohort of patients with unfavourable-intermediate and high-risk prostate cancer and to evaluate whether an additional CT scan is necessary when a pelvic mpMRI is already available in men at risk of nodal metastases.

2. Patients and Methods

2.1 Study Cohort and data collection

We screened for study eligibility all 1786 consecutive men undergoing prostate biopsy (targeted and systematic cores) from February 2020 to October 2024 at AOU Città della Salute e della Scienza di Torino(Turin, Italy). Inclusion criteria were: (1) prostate biopsy positive for PCa; (2) ISUP grade group ≥ 3 and/or pre-biopsy PSA > 20 ng/ml; (3) availability of a pelvic multiparametric MRI and an abdominal contrast-enhanced CT scan. Exclusion criteria were: (1) MRI and/or CT scan performed outside a 6-month interval from the first assessment; (2) unavailability of patient data.

We evaluated also two sample strata: (1) patients who underwent radical prostatectomy (final histology available) vs patient who underwent non-surgical management (radiation, systemic therapy or palliation – no histology available) and (2) patients who underwent a PSMA-PET/CT scan for staging purposes.

Data were retrospectively analyzed and prospectively collected in an institutional database. The imaging reports were reviewed before data analysis, but no imaging review was performed (real-life setting).

2.2. Definitions

Nodal anatomy and staging Imaging reports were used to define the clinical nodal (cN) and metastatic (cM) status, according to the TNM classification of prostate cancer[10]. Pelvic lymph-nodes (below the common iliac artery bifurcation) were considered regional, while extrapelvic lymph-nodes were classified as metastatic (M1a). Lymph nodes were deemed positive when the short-axis diameter exceeded 8 mm for pelvic nodes or 10 mm for extrapelvic nodes, both for MRI and CT scan; when size was not reported, classification relied on the radiologist's judgement.

Distant metastasis staging. When considering distant metastasis staging, bone-scan was considered together with MRI and/or CT scan for conventional imaging assessment. We compared the results of the "MRI + bone scan" and "CT + bone scan" approaches before further assessments were performed (e.g. PSMA-PET/CT, additional CT scan, multidisciplinary judgement, histology, etc.); for this analysis, suspect lesions at bone scan were considered positive if confirmed at morphological imaging or when the latter was not available.

RP pathology. Regional and non-regional lymph-nodes were classified as previously stated. Tumor grading was reported as Gleason score and/or International Society of Urological Pathology (ISUP) grade groups. Local staging was expressed accordingly to the cited TNM classification.

PSMA-PET/CT. Whenever a PSMA-PET/CT scan was available, PSMA-RADS 3 or higher findings were considered as positive [11]; when PSMA-RADS were not reported, the patient was classified according to the nuclear medicine specialist's judgement.

Non-PCa-related findings. Incidental findings at CT scan were registered; an incidental (or "additional") finding was retrospectively classified as "irrelevant" when it did not require any follow-up (e.g. simple

renal cyst, hepatic angioma), as “follow-up needed” when it implied monitoring (e.g. complicated cyst, renal stones, pulmonary micronodules) or “urgent” when prompting to an urgent invasive diagnostic or therapeutic maneuver (e.g. hydronephrosis, ureteral stone, pulmonary nodule requiring biopsy).

Clinical yield. In a post-hoc analysis, the clinical yield of CT scan in addition to pelvic MRI was evaluated. On a patient-basis, the CT scan was considered:

- “useful”: if providing TNM upstaging or downstaging; if providing morphological confirmation to bone scan-detected areas not described by pelvic-MRI; if revealing urgent non-PCa-related findings.
- of “limited added value”: if confirming the TNM staging already known with no urgent findings.
- “confounding”: if providing an incorrect TNM upstaging or downstaging, determined *a posteriori*.

2.3. Study Outcomes

The primary outcomes were: (1) to assess the prevalence of the cN1 and cM1 conditions in our unfovorable intermediate- and high-risk cohort, when explored by pelvic MRI or by an abdominopelvic CT scan (plus a bone scan) and (2) to evaluate the agreement between these two imaging modalities, stratifying for treatment allocation.

Secondary outcomes were: (1) to evaluate the diagnostic accuracy for nodal disease detection of MRI, CT scan and, when available, PSMA-PET/CT scan, adopting the final pathology as the reference standard (sub-cohort of RP patients); (2) to evaluate the incidental non-PCa-related findings and (3) to evaluate the added value of performing a CT scan when pelvic MRI is already available by determining the number needed to scan (NNS).

2.4. Statistical Analysis

Continuous variables were expressed as medians and interquartile ranges (IQR) and compared with the non-parametric Mann-Whitney U test. Categorical variables, expressed as counts and percentages, were compared with the Pearson’s chi-square test.

Raw agreement was defined by the percent of cases categorized in the same way (either positive or negative) by two assessment modalities. The agreement between the imaging modalities was also evaluated with Cohen’s κ statistic. As described by Landis et al., agreement was considered: “almost perfect” above 0.81, “substantial” 0.61–0.80, “moderate” 0.0.41–0.60, “fair” 0.21–0.40; “slight” 0.00-0.20; “none” <0.00 [12].

Although otherwise specified, all the analyses (node-staging, metastasis-staging, clinical yield were performed per-patient).

Diagnostic parameters for each imaging modality compared to a reference pathological standard were expressed as sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), and

the area under the receiver-operating characteristics (ROC) curve (AUC). The number needed to scan was calculated as the inverted proportion of clinically meaningful CT scans and its confidence interval (CI) via the Wilson method.

For each test, a threshold of p = 0.05 was adopted as significance level.

Calculations were performed using SPSS, version 29.0.1 (IBM Corp., Armonk, NY, USA).

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3. Results

A total of 323 patients with unfavorable intermediate- or high-risk PCa undergoing initial staging were included in the analysis (Fig. 1). Patient flow through conventional imaging staging pathways and subsequent treatment allocation is illustrated in Fig. 2.

Baseline demographic, clinical, and imaging characteristics of the overall cohort and stratified by treatment allocation are summarized in Table 1. Patients managed non-surgically were significantly older and had a higher comorbidity burden compared with those undergoing radical prostatectomy (RP), whereas PSA levels and biopsy grade distribution were comparable between groups. On conventional

imaging, MRI identified pelvic nodal disease (cN1) in 22 patients (6.8%) and, complemented with bone scan results, distant metastases (cM1) in 37 patients (11.5%), while CT scan detected cN1 disease in 26 patients (8.1%) and cM1 disease, along with bone scan, in 23 patients (7.2% -Table 1).

Table 1
Population characteristics

Variable		All Cohort N = 323	RP patients N = 220	Non-surgical N 103	Missing	p
Age	years	72 (66–77)	70 (64–74)	76 (70–81)	0	< 0.001
PSA	ng/ml	7.9 (5.5–13.6)	7.73 (5.5–13.87)	8.7 (5.42–13.32)	3	0.688
BMI	kg/m^2	25.58 (23.6–27.68)	25.40 (23.50–27.68)	25.64 (24.80–29.30)	113	0.229
Prostate volume	ml	40 (30–54)	39 (29–52.4)	43.1 (31.3–62)	34	0.043
Family history of PCa		35 (12.3%)	22 (10.8%)	13 (16.0%)	39	0.23
ASA score	ASA ≤ 2	232(83.4%)	168 (80.7%)	64 (91.4)	45	0.102
	ASA ≥ 3	46 (16.5%)	40 (19.2%)	6 (8.5%)		
CCI	≤ 2	47 (16.9%)	30 (14.5%)	17 (24.2)	46	0.021
	3–4	154 (55.6%)	112 (54.1%)	42 (60%)		
	≥ 5	76 (27.4%)	65 (31.4%)	11(15.7%)		
cT stage	cT1	156 (49.1%)	109 (50%)	47 (47%)	5	0.017
	cT2a/b	153 (48.1%)	107 (49.1%)	46 (46%)		
	cT2c	6 (1.9%)	2 (1.9%)	4 (4%)		
	cT3	3 (0.9%)	0 (0%)	3 (3%)		
PI-RADS score	≤ 3	14 (4.5%)	13 (6.1%)	1/95 (1.1%)	17	0.089
	4	147 (48%)	106 (50.2%)	41 (43.2%)		
	5	145 (47.4%)	92 (43.6%)	53 (55.8%)		
MRI T-stage	≤ T2b	239 (76.3%)	156 (73.9%)	83 (81.3%)	10	0.006
	T2c	16 (5.1%)	10 (4.7%)	6 (5.9%)		

Variable		All Cohort N = 323	RP patients N = 220	Non-surgical N 103	Missing	p
	≥ T3	78 (25%)	45 (21.3%)	13 (12.7%)		
ISUP GG at biopsy	2	8 (2.5%)	6 (2.7%)	2 (2.9%)	0	0.107
	3	160 (49.5%)	117 (53.2%)	43 (41.7)		
	4	101 (31.1%)	67 (30.5%)	34 (33%)		
	5	54/323(16.7%)	30/220(13.6%)	24 (23.3%)		
MRI N1		22 (6.8%)	12 (5,5%)	10 (9.7%)	0	0.164
CT scan N1		26 (8.1%)	14 (6.4%)	12 (11.8%)	1#	0.123
CT scan + bone scan M1		23 (7.2%)	5 (2.3%)*	18 (17.2%)	2#	< 0.001
MRI + bone scan M1§		37 (11.5%)	14 (6.4%)	23 (22.8%)	2#	< 0.001
PSMA-PET/CT performed	yes	82 (25.3%)	66 (30%)	16 (15.5%)	0	0.03
PSMA N1		31 (37.8%)	26 (39.4%)	5 (31%)	241	0.775
PSMA M1		14 (17.1%)	10 (15.1%)**	4 (25%)	241	0.486
Additional findings at CT scan (per patient)	None	188 (58.2%)	134 (60.9%)	54 (52.4%)	0	0.11
	Irrelevant	84 (26%)	49 (22.3%)	35 (34%)		
	Follow-up needed	35 (10.8%)	27 (12.3%)	8 (7.8%)		
	Urgent management	16 (5%)	10 (4.5%)	6(5.8%)		

Variable	All Cohort N = 323	RP patients N = 220	Non-surgical N 103	Missing	p
*= Two patients was considered cM1 at CT scan + bone scan but mi-M0 at PSMA-PET; two were considered cM1a and one cM1b and underwent surgery as part of a multimodal approach					
**= 2 patients were mi-M1a, 8 patients had one or two PSMA-avid bone lesions (oligo-mi-M1b) with variable degree of suspicion and underwent surgery as part of a multimodality treatment.					
§= for this evaluation, based on pelvic MRI and bone scan only, a suspect bone scan was considered as M1b; subsequent morphological investigations are not accounted for in this table line.					
#= insufficient quality or anatomically incomplete acquisition					
Legend: RP, radical prostatectomy; BMI, body mass index; PCa, prostate cancer; ASA, American Society of Anesthesiology; CCI, Charlson Comorbidity Index; cT stage, clinical tumour stage; MRI, Magnetic Resonance Imaging; PI-RADS, Prostate Imaging Reporting and Data System (version 2.1); ISUP GG, International Society of Urological Pathology Grade Group; CT, computed tomography; N1, node-positive disease; M1, metastatic disease; PSMA PET/CT, Prostate-specific membrane antigen Positron emission tomography and computed tomography.					

Table 2

Comparative performance of imaging modalities for nodal and distant staging Legend: MRI, magnetic resonance imaging; CT computed tomography; PSMA, prostate specific membrane antigen; PET, positron emission tomography; cN1, clinically node-positive (pelvic nodes); cM1, clinically metastatic; pN1, pathologically node-positive; AUC, area under the Receiver Operating Characteristics (ROC) Curve; κ, Cohen's kappa.

	Endpoint	MRI	CT scan	PSMA PET/CT*
Whole cohort (N = 323)	cN1 rate (%)	6.8	8.1	37.8
	κ for cN1	*0.51 ± 0.09 (moderate)*		-
	cM1 rate**	11.5	7.2	17.1
	*κ for cM1 **	*0.56 ± 0.08 (moderate)*		-
Radical prostatectomy cohort (N = 220)	Sensitivity for pN1 (%)	15.2	19.6	87.0
	Specificity for pN1 (%)	97.0	97.6	85.7
	AUC for pN1	0.56	0.58	0.86
	κ with pN1	0.17 (slight)	0.23 (fair)	0.71 (substantial)
*PSMA PET/CT performed in a sub-cohort of patients undergoing radical prostatectomy (n = 65).				
** cM1 evaluation includes bone scan results both for MRI and CT scan				

Agreement between MRI and CT scan for pelvic nodal staging was moderate at the patient level: in the overall cohort, raw agreement for cN1 disease reached 94.0%, corresponding to a Cohen's κ of 0.51. Agreement was lower in patients undergoing RP (92.7%; κ = 0.35, fair) and higher in non-surgical patients (95.1%; κ = 0.70, substantial). When stratified by biopsy grade, agreement was fair in ISUP grade group (GG) 3 patients (κ = 0.23) and moderate in GG4 and GG5 patients (κ = 0.56 for both). These findings indicate consistent classification between the two modalities at the patient level, with variability according to disease risk and clinical context (**Supplementary Table S1**).

Among the 220 patients undergoing RP, final pathology revealed node-positive disease (pN1) in 45 patients (20.5%) and metastatic disease (pM1a) in 1 patient (0.5%) (**Supplementary Table S2**). Pelvic lymph node dissection was performed in 98.2% of cases, with a median of 19 (IQR: 14–25) nodes removed. Diagnostic performance of conventional imaging for nodal staging was limited when benchmarked against pathology. MRI demonstrated a sensitivity of 15.2% and a specificity of 97.0% for detection of pN1 disease, with an area under the ROC curve (AUC) of 0.56 and slight agreement with pathology (κ = 0.17). CT scan showed similarly low sensitivity (19.6%) and high specificity (97.6%), with an AUC of 0.58 and fair agreement (κ = 0.23). ROC curve analysis confirmed comparable performance of MRI and CT for nodal staging in the RP cohort (Fig. 3A). In contrast, in the subgroup of RP patients also staged with PSMA PET/CT (n = 65), molecular imaging achieved substantially higher sensitivity (87.0%), AUC (0.86), and agreement with pathology (κ = 0.71), clearly outperforming both MRI and CT (Fig. 3B; **Supplementary Table S3**).

Distant metastasis staging by conventional imaging is detailed in **Supplementary Table S4**. In the overall cohort, CT plus bone scan classified 92.8% of patients as M0, 3.4% as M1a, and 3.7% as M1b. MRI nodal status was strongly associated with metastatic classification: among MRI-N0 patients, 97.6% were staged as M0, whereas MRI-N1 patients showed a significantly higher prevalence of metastatic disease (31.8% M1 overall; $p < 0.001$). Non-surgical patients demonstrating significantly higher rates of M1a and M1b disease compared with RP patients ($p < 0.001$). "MRI + bone scan" approach had a moderate agreement with "CT + bone scan" approach for cM1 (κ = 0.56), suffering from a relatively high bone false-positive rate (not shown).

Additional non–prostate cancer findings at CT scan were frequent (Table 1 and **Supplementary Table S5**). At the patient level, 41.8% had at least one additional finding, although only 5.0% required urgent management and 10.8% warranted further follow-up.

A post-hoc assessment of CT clinical usefulness is summarized in **Supplementary Table S6**. CT scan provided no additional staging or clinically relevant information in 82.5% of the overall cohort, including 82.8% of RP patients. When clinically relevant information was defined as the detection of urgent non–prostate cancer findings or nodal or metastatic upstaging or downstaging, such information was obtained in 45 patients (14.0%), corresponding to a number needed to scan of 7.2 (CI: 5.6–9.9) in the overall cohort. Stratified analyses showed comparable results irrespectively of treatment allocation (Fig. 4).

4. Discussion

In this study, we compared pelvic magnetic resonance imaging (MRI) and abdominopelvic contract-enhanced computed tomography (CT), including bone scan, for nodal and distant metastasis staging, in a contemporary cohort of patients with PCa undergoing primary staging for unfavorable intermediate- or high-risk prostate cancer. Several relevant findings emerged. MRI and CT showed only moderate agreement for pelvic nodal and distant metastatic staging at the patient level and, as expected, both techniques demonstrated limited diagnostic accuracy for nodal involvement (LNI) when benchmarked against final pathology, with very low sensitivity. Remarkably, although the staging performance of CT was limited in most patients, the number needed to scan (NNS = 7.2) to obtain clinically relevant information was relatively low, representing one of the key strengths of this study, offering a pragmatic measure of the real-world clinical yield of conventional staging imaging.

The agreement observed between MRI and CT for pelvic nodal staging requires careful interpretation. While raw agreement exceeded 90%, Cohen's κ indicated only moderate concordance. Although these data are rarely reported in the literature, a certain degree of consistency is logically expected when size- and shape-based criteria are applied [13,14]. Importantly, agreement varied according to clinical context and disease risk, being lower in patients undergoing radical prostatectomy and in intermediate-risk (ISUP GG 3) subgroups. This heterogeneity suggests that concordance is influenced not only by diagnostic performance but also by underlying disease burden and pretest probability of LNI.

When compared with histopathology in the radical prostatectomy cohort, both MRI and CT showed very low sensitivity for detecting nodal metastases despite high specificity. This finding reflects a shared limitation intrinsic to conventional cross-sectional imaging[14]. Lymph node metastases in prostate cancer are frequently small and fall below commonly used detection thresholds, with a substantial proportion classified as micro-metastases [6]. As a result, conventional imaging modalities may agree in classifying patients as node-negative, missing clinically relevant disease.

Comparable accuracy outcomes have been reported in prior studies in the contemporary era: Peabody et al. reported 8.9% sensitivity for pN1 using CT scans in a RP registry, while Franklin et al. showed 22.4% sensitivity for preoperative MRI; moreover, Gabriele et al., using the EUREKA-1 registry, demonstrated no added predictive value beyond clinical nomograms [15–17]. Noticeably, the sensitivity for pN1 disease observed in our study was lower than that reported in smaller series [13,18]. This likely reflects: (1) our real-life setting, with imaging reports redacted in different centers, without centralized review; (2) a cognitive interpretative bias for MRI, performed before biopsy, if compared to CT scans, acquired after tumor diagnosis; (3) a higher incidence of pN1 disease in our cohort. Moreover, narrative and systematic reviews similarly report low sensitivity for nodal metastasis detection with both CT and MRI [14,19]. Our results extend this evidence by showing that acceptable agreement does not translate into meaningful clinical utility when pathology is used as the reference standard.

The role of bone scan and distant staging warrants brief consideration. In our cohort, CT combined with bone scan identified distant metastases in a small but non-negligible proportion of patients, with higher

rates among non-surgically managed individuals. This aligns with existing evidence supporting the continued use of bone scintigraphy in certain clinical contexts, particularly given its historical role in defining metastatic disease burden [20]. The possibility of false-positive findings highlights the need for a morphological assessment in every suspect case.

Population-based and registry studies have already questioned the utility of CT scans, based on the low rates of positive findings in high-risk prostate cancer, particularly in patients with lower PSA levels and more favorable risk profiles [20]. More comprehensively, our study provides a pragmatic assessment of the real-world clinical yield of CT imaging. By quantifying the proportion of patients in whom CT provided clinically relevant information - defined as urgent non–prostate cancer findings or nodal/metastatic upstaging or downstaging - we were able to calculate a NNS of 7.2 (95% CI: 5.6–9.9) in the overall cohort. Although this indicates that the majority of CT scans in this setting did not alter clinical management, we feel that it is not justified to omit this exam when molecular imaging staging is not feasible or readily available as in one in seven men it adds important information that alters and potentially improves patient management. Although the risk of relevant findings is greater in very high-risk patients (e.g. cN1 at MRI), we were not able to identify subgroups in which the CT scan can be safely avoided, highlighting the risk characteristics of our cohort.

Although not a primary focus of this study, prostate-specific membrane antigen positron emission tomography (PSMA PET/CT) provides important context. In the subgroup undergoing molecular imaging, diagnostic performance for nodal staging was markedly superior to that of MRI and CT, consistent with previous reports [21–23]. Nevertheless, even PSMA PET/CT is constrained by lesion size and tumor biology, and small-volume nodal disease may still escape detection [6].

Strengths of this study include a well-characterized cohort, pathological validation in surgically treated patients, inclusion of consecutive cases irrespective of treatment allocation, and a patient-centred evaluation of clinical yield using NNS. Importantly, this represents one of the largest contemporary cohorts evaluating conventional cross-sectional imaging for nodal and metastatic staging in prostate cancer, with most comparable series published several years earlier. Limitations include the retrospective design, lack of centralized imaging review, potential selection bias in the PSMA PET/CT and RP subgroups, and the exploratory, post-hoc definition of clinically relevant CT findings.

5. Conclusions

Pelvic MRI and abdominopelvic CT show moderate agreement for pelvic nodal staging in prostate cancer, with poor diagnostic accuracy when benchmarked against RP pathology. Nevertheless, CT scan may add clinically valuable information in one out of seven patients. Research-wise, our findings emphasize the distinction between agreement, accuracy and true clinical utility. From a clinical point of view, the global added value of CT in the contemporary era - in addition to pelvic MRI - appears justified when PSMA-PET/CT is not available.

Declarations

Ethics and patient consent:

The study has been registered and approved by local ethical committees at San Giovanni Battista Hospital, Turin, Italy (local ethical committee approval and registration protocol number 39636). All included patients provided written informed consent.

Conflict of Interest:

The Authors have no conflict of interest to disclose regarding this publication.

Data sharing:

the data will be made available to bona fide researchers upon reasonable request to the corresponding author

Author contributions:

Giorgio Calleris and Umberto Merani had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Marra, Calleris, Gontero.

Acquisition of data: Arcuri, Dematteis, Sasia, Venturi

Analysis and interpretation of data: Calleris, Merani, Arcuri, Marra

Drafting of the manuscript: Calleris, Merani, Marra

Critical revision of the manuscript for important intellectual content: Marquis, Oderda

Statistical analysis: Calleris, Merani

Obtaining funding: None.

Administrative, technical, or material support: None.

Supervision: Marra, Gontero

Other: None.

Acknowledgements: none

Financial Disclosures: none

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Figures

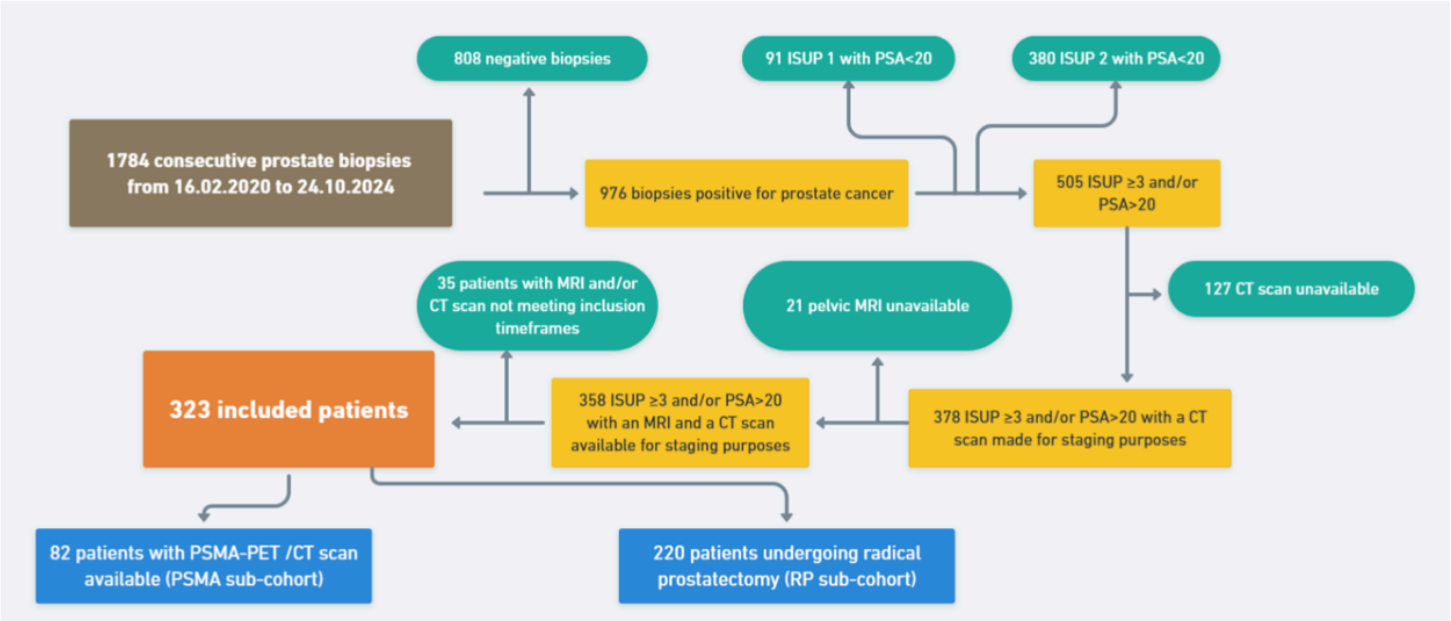


Figure 1

Patient inclusion flowchart

Legend: ISUP, International Society of Urological Pathology Grade Group; PSA, prostate-specific antigen; CT, computed tomography; MRI, magnetic resonance imaging; PSMA, prostate-specific membrane antigen; PET, positron emission tomography; RP, radical prostatectomy

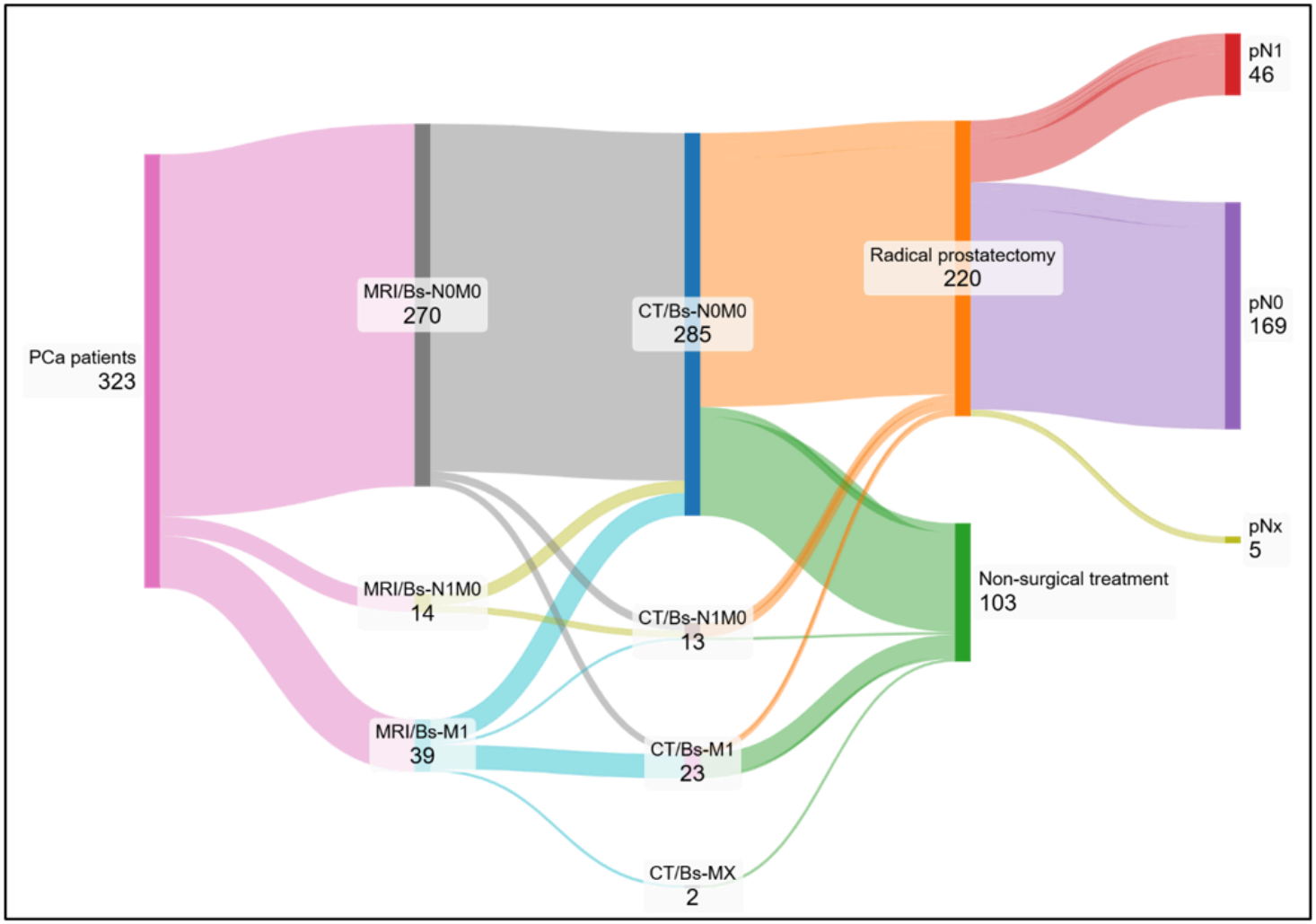


Figure 2

Sankey diagram of patient flow through conventional imaging staging and treatment assignment.

Legend: PCa, prostate cancer; MRI/Bs, magnetic resonance imaging and bone scan; CT/Bs, computed tomography scan and bone scan (i.e., conventional imaging); N0, node-negative (pelvic nodes); N1, node-positive (pelvic nodes); M0, non-metastatic disease; M1, metastatic disease; Nx/Mx, dubious or unavailable nodal/metastatic status; pN, nodal status at final pathology.

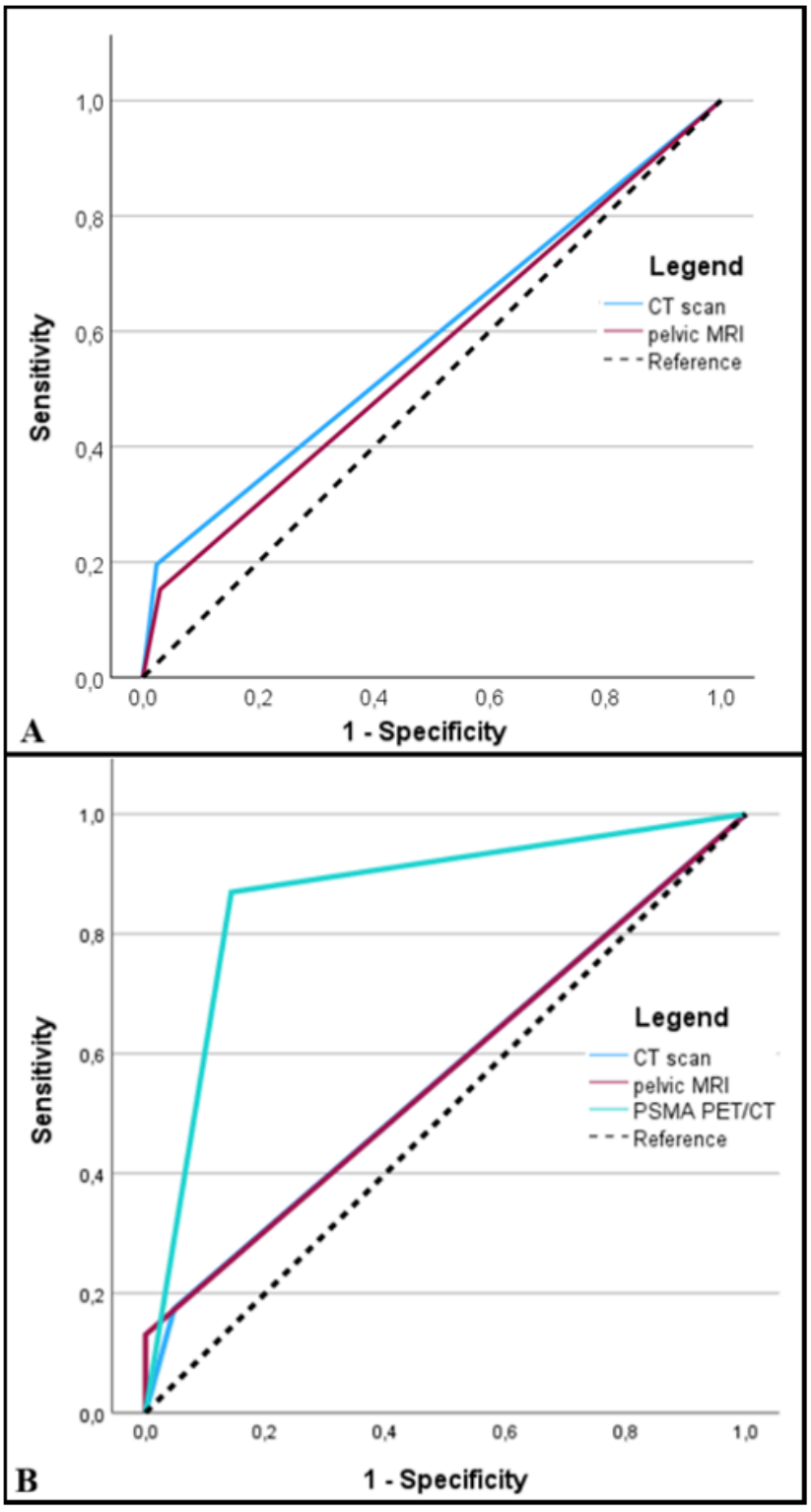


Figure 3

A, 3B. ROC curve for nodal staging (pN1). A, ROC based on RP cohort (N=215), AUCs are 0.59 for CT scan and 0.56 for pelvic MRI; B, ROC based on RP cohort staged by PSMA PET/CT (N=65), AUCs are 0.56 for CT scan, 0.56 for pelvic MRI, 0.86 for PSMA PET/CT.

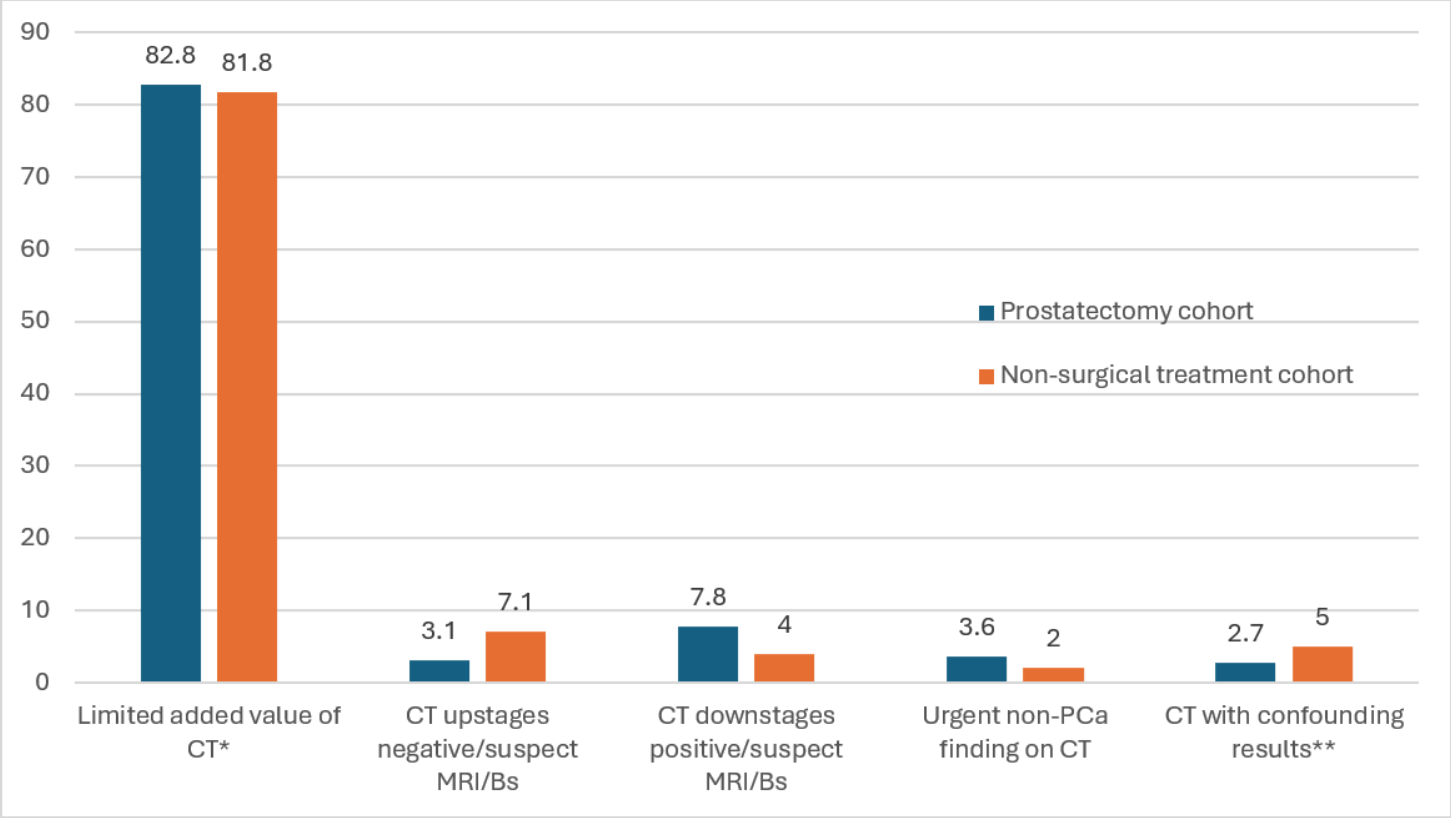


Figure 4

Clinical yield of CT scan according to treatment allocation.
Bar plot showing the proportion of patients in whom computed tomography (CT) provided limited additional clinical value, resulted in nodal or metastatic upstaging or downstaging (cN and/or cM), detected urgent non–prostate cancer findings or had confounding results (i.e. incorrectly changed cN and/or cM staging). Percentages are stratified per treatment group (radical prostatectomy vs non-surgical management).

*This category includes patients whose cN or cM MRI/Bs-staging was not modified by CT/Bs. For the prostatectomy cohort, CT/Bs confirmed MRI/Bs-N0M0 in 80.5% and MRI/Bs-N1/M1 in 2.3%; for the non-surgical treatment cohort, CT/Bs confirmed MRI/Bs-N0M0 in 72.7% and MRI/Bs-N1/M1 in 9.1%.

** This category includes patients whose cN or cM MRI/Bs-staging was incorrectly modified by CT/Bs, as determined by subsequent evidence (e.g., PSMA/PET-CT; multidisciplinary decision; pathology; etc.)

Supplementary Files

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