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How and when should radiologists report T-staging on MRI in patients with prostate cancer?

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In the UK, pre-biopsy magnetic resonance imaging (MRI) forms an integral part of the prostate cancer (PCa) diagnostic pathway, providing critical information for lesion detection and local staging (1). While the reporting of the likelihood of clinically significant disease has been standardised through the development of Prostate Imaging and Reporting and Data System (PI-RADS), there is currently no consensus on the reporting of PCa local staging on MRI. In centres with access to high quality MRI, radiological staging has effectively replaced digital rectal examination-based clinical staging for informing management decisions, therefore developing a uniform approach towards its reporting that aligns with the current urological (1) and pathological (2) guidelines is of high practical value.

Prognostically, the goal of PCa staging on pre-biopsy MRI is to differentiate organ-confined (T1-T2) from locally advanced (T3) disease (1). In patients with locally advanced PCa, MRI-guided subdivision of T3-stage disease into T3a (extraprostatic extension) and T3b (seminal vesicle invasion) is important for guiding management decisions and should be reported

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/bju.15824

routinely. In contrast, there is little evidence suggesting any prognostic benefit for the histopathological reporting of T1 and T2-stage subdivisions in patients with organ-confined disease (3), making the need for radiological reporting of these divisions questionable. Furthermore, in addition to identifying the optimal nomenclature for PCa radiological T-staging, it is also important to consider the timing of its definitive assessment. While explicit staging is reasonable when there are clear macroscopic features of locally advanced disease (PI-RADS category 5), definitive pre-biopsy staging of PI-RADS 3 and 4 lesions may be misleading since only 33% and 63%, respectively, of such cases harbour PCa on subsequent biopsy (4). Conversely, the knowledge of biopsy results significantly improves the detection of extracapsular extension on MRI due to increased confidence in calling T3a disease for high-grade lesions (5). Therefore, we believe future consensus-building efforts should focus not only on how but also when to report PCa T-staging on MRI.

To provide an insight into current practice, we anonymously surveyed UK-based consultant uroradiologists to analyse their current approach to PCa T-staging on MRI. The survey was disseminated through the British Society of Urogenital Radiology (BSUR) mailing list, attracting 62 respondents and representing 38% of UK-based consultant uroradiologists (6). Respondents encompassed 39 separate NHS centres, with representations from Scotland, Wales, Northern Ireland, and 11 cancer alliances within England, with 33 (53.2%) and 29 (46.8%) working at teaching and district general hospitals, respectively. **Figure 1** presents the survey results.

While the majority (59.3%) of the survey respondents only report T2 as a broad division, the remaining 40.7% still include T2a-c subdivisions in their reports (**Figure 1a**), highlighting the lack of agreement on this aspect of prostate MRI reporting. Simultaneously, only 26.7% of the survey respondents actually believe that reporting T2a-c subdivisions provides additional information beyond descriptions of lesion size/location and Likert/PI-RADS scoring (**Figure 1b**). In our view, there are more cases when T2a-c substaging can lead to confusion rather than to any prognostic or clinical benefit. For example, a small lesion crossing the midline (T2c) is unlikely to be more aggressive than a large unilateral lesion or several unilateral lesions (3). Confusion may also arise in patients with a small unilateral lesion visible on MRI (initial stage T2a), in whom an MRI-invisible contralateral Gleason 3+3=6 lesion is detected in a single systematic core, thereby up-scoring staging to T2c disease. Importantly, both T1 and T2a-c substaging has been omitted from the most recent updated version of the NICE guidelines on prostate cancer risk-stratification (1). A headline feature of the latest 8th American Joint Committee on Cancer (AJCC) TNM manual (2) is the removal of pathological pT2a-c substages. We, therefore, suggest that radiologists structure their reports accordingly, stating the broad category of "stage rT2" when reporting organ-confined disease at MRI (**Figure 1c**) and including a detailed description of each individual lesion to assist clinical decision-making. In case of biopsy-proven MRI-invisible lesions (PI-RADS 1-2), we also suggest the use of the broad category of "stage rT1", while preserving the "rT3a" and "rT3b" subcategories for locally-advanced "stage rT3" disease (**Figure 1c**). Overall, we believe that the introduction of these "radiological" T-stages is a logical step towards harmonising the existing clinical and pathological guidelines with imaging data, together providing exhaustive and unambiguous information to support clinical decision-

making. That said, individual centres employing novel treatments (e.g., focal therapy) may make a local decision to keep T2 subcategories if deemed practically useful for specific clinical scenarios. Finally, one also has to acknowledge the need for improving the performance of MRI for PCa T-staging, which currently demonstrates pooled sensitivity and specificity for overall stage T3 detection of 0.61 (95% CI 0.54–0.67) and 0.88 (95% CI 0.85–0.91), respectively (7).

In relation to the time at which MRI prostate cancer staging is recorded, 50.0% of survey respondents routinely state T-staging on pre-biopsy MRI before diagnosis is established, with a further 40.3% doing so only in case of large-volume tumours (**Figure 1d**). Simultaneously, 82.0% of the respondents routinely revisit MRI staging after biopsy in an MDT setting (**Figure 1e**), suggesting that in real-life practice the knowledge of tumour grade is key for definitive radiological staging. This aligns with previous work (5) and supports the proposal for reporting MRI-based T-staging only when biopsy results are available.

In conclusion, we propose a standardised approach to PCa MRI-based T-staging, whereby

(i) Biopsy-proven MRI-invisible lesions are assigned radiological rT1 stage
(ii) MRI-visible biopsy-proven organ-confined lesions are assigned rT2 stage
(iii) Locally-advanced rT3 lesions are subclassified as rT3a and rT3b disease in line with their respective clinical and pathological definitions.

We also suggest that definitive PCa per patient T-staging on MRI should ideally only be reported after the knowledge of biopsy results, which improves the differentiation between organ-confined and locally advanced disease. Finally, we call for further discussion and formalisation of these proposals as part of the future nationwide consensus meetings on the implementation of prostate MRI.

Declaration of Interests. The authors have nothing to disclose.

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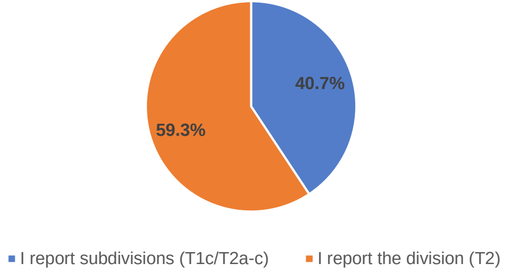
Figure Legend

Figure 1. Survey results (A-E) and the proposed radiological prostate cancer T-staging compared with the latest 8th American Joint Committee on Cancer (AJCC) TNM manual (C).

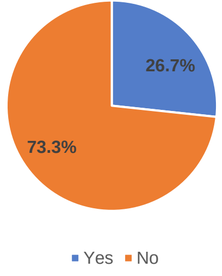
A

When T-staging is known or cancer is suspected on MRI, do you typically report subdivisions of T-stage (T1c, T2a-c) or just the division (T2)?



B

Do you believe T1c and T2a-c provides additional information beyond lesion description and Likert/PI-RADS probability for radiological staging?

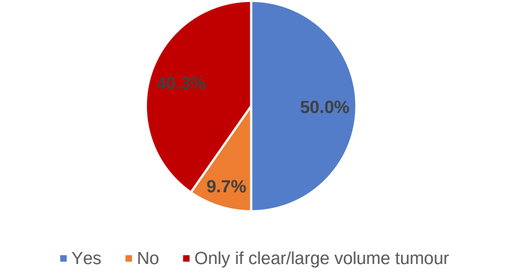


C

Clinical T-stage (TNM 8th)	T-substage	Definition (TNM 8th)	Pathological T-stage	T-substage	Definition (TNM 8th)	Radiological T-stage (rT-stage)	T-substage	Definition (rT-stage)
cT1	cT1a	Tumor incidental histological finding in ≤5% of tissue resected	-	-	-	**rT1**	-	No MR-visible lesion (PI-RADS 1-2)
	cT1b	Tumor incidental histological finding in >5% of tissue resected						
	cT1c	Tumor identified by needle biopsy found in one or both sides, but not palpable						
cT2	cT2a	Tumor involves one-half of one side or less	**pT2**	-	Organ confined	**rT2**	-	MR-visible, organ-confined, unifocal or multifocal lesion(s) of any size and location
	cT2b	Tumor involves more than one-half of one side but not both sides						
	cT2c	Tumor involves both sides						
cT3	cT3a	Extraprostatic extension (unilateral or bilateral)	**pT3**	pT3a	Extraprostatic extension (unilateral or bilateral) or microscopic invasion of bladder neck	**rT3**	rT3a	Extracapsular extension
	cT3b	Tumor invades seminal vesicle(s)		pT3b	Tumor invades seminal vesicle(s)		rT3b	Seminal vesicle involvement

D

Do you explicitly state T-staging on pre-biopsy MRI when cancer diagnosis is not established?



E

For pre-biopsy MRI, do you revisit staging after biopsy in an MDT setting?