

Prostatitis with mild chronic inflammation



Joan C. Vilanova, MD, PhD
Clínica Girona - Institute of Diagnostic Imaging (IDI)
Girona - Spain

Patient history

61-year-old man with clinical history of prostate cancer (pT2N0. Gleason 3+4 and PSA [Prostate Specific Antigen] 9 ng/ml) was treated with brachytherapy (BT) eight years ago. Two years later from initial treatment, PSA value was 0,39 ng/ml. Actually, the patient presents high serum PSA level: 3,49 ng/ml. A PET-CT choline suggests local recurrence. An MRI is performed using conventional sequences, diffusion weighted imaging (DWI) and dynamic contrast enhancement (DCE).

Morphological findings

Conventional sequence on axial spin echo T2 (T2WI) shows a low diffuse signal intensity in the gland (secondary to brachytherapy). Several brachytherapy seeds can be depicted. A possible recurrent cancer is not visible on this sequence. A possible focal recurrence requires the analysis of the post-processed Diffusion-Weighted Images (DWI) and Dynamic contrast enhancement (DCE) maps.

Post-processing and analysis

Dynamic maps such as Peak Enhancement, Curve Washout, Washin, Ktrans were computed using the Extended Tofts Model available in the Automated Prostate Olea Sphere® application (Olea Medical®, La Ciotat, France).

A multiparametric display (Permeability maps, T2, DWI ADC) available in Olea Sphere® was used to draw regions of interest (ROI) and to provide quantitative values of the gland.

Dynamic contrast enhancement (DCE) post-processing using permeability models

Qualitative and quantitative analysis of DCE shows a nodular area within the transition zone of the right gland with a fast wash-in and a plateau curve overtime. The perfusion information could be suspicious for tumor, but the consecutive image demonstrates the same perfusion profile is extending through the peri-urethral tissue anteriorly on a more lineal - fusiform morphology. A high perfusion profile could be also due to inflammatory tissue, that means that a possible etiology of prostatitis cannot be ruled out (Franiel T, et al. Invest Radiol. 2008) [ref. 1]

Diffusion-Weighted Images (DWI)

The findings described as a high perfusion area from DCE on the pseudonodular area from the gland, shows no area of suspicion of tumor from the DWI analysis. That means that ADC is not low ($ADC=1.51 \cdot 10^{-3} \text{ mm}^2/\text{s}$) and there is no high signal on the DWI ($b=1400 \text{ sec}/\text{mm}^2$). Inflammatory cells could show low ADC values but usually they are $> 1.0 \cdot 10^{-3} \text{ mm}^2/\text{s}$ (Nagel K, et al. Radiology 2013) [ref. 2].

Histopathology diagnosis

The final histologic examination of prostatitis was confirmed on target fusion biopsy with several cores within the possible suspicious area. The pathological report was benign prostate tissue with mild chronic inflammation and post treatment changes, without evidence of malignancy.

Conclusion

Local tumor recurrence after radiotherapy is not uncommon. Tumor recurrence might show a high perfusion profile but it should also be combined with a restricted diffusion with low ADC values; that is precisely what this case was not showing. The combination of functional analysis with simultaneous multiparametric display and conventional sequences allows to evaluate the morphologic features of perfusion and diffusion on the same screen as a multiparametric analysis, in order to integrate the information for a more specific diagnosis. In this case, an inflammatory and not tumoral tissue was correctly evaluated. The precise post-processing evaluation is the key of correct functional assessments.

References

1. Franiel T, et al. Evaluation of normal prostate tissue, chronic prostatitis, and prostate cancer by quantitative perfusion analysis using a dynamic contrast-enhanced inversion-prepared dual-contrast gradient echo sequence. *Invest Radiol.* 2008 Jul;43(7):481–7.
2. Nagel K, et al. Differentiation of Prostatitis and Prostate Cancer by using Diffusion-weighted MR imaging and MR-guided biopsy at 3T. *Radiology* 2013; 267: 164–7

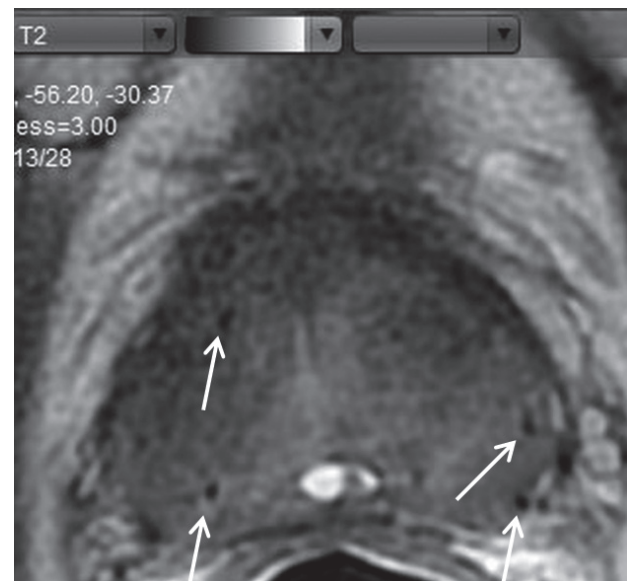


Figure 1 Axial T2WI shows diffuse low signal intensity of the transition and peripheral zone. Small signal voids are due to seeds from the brachytherapy.

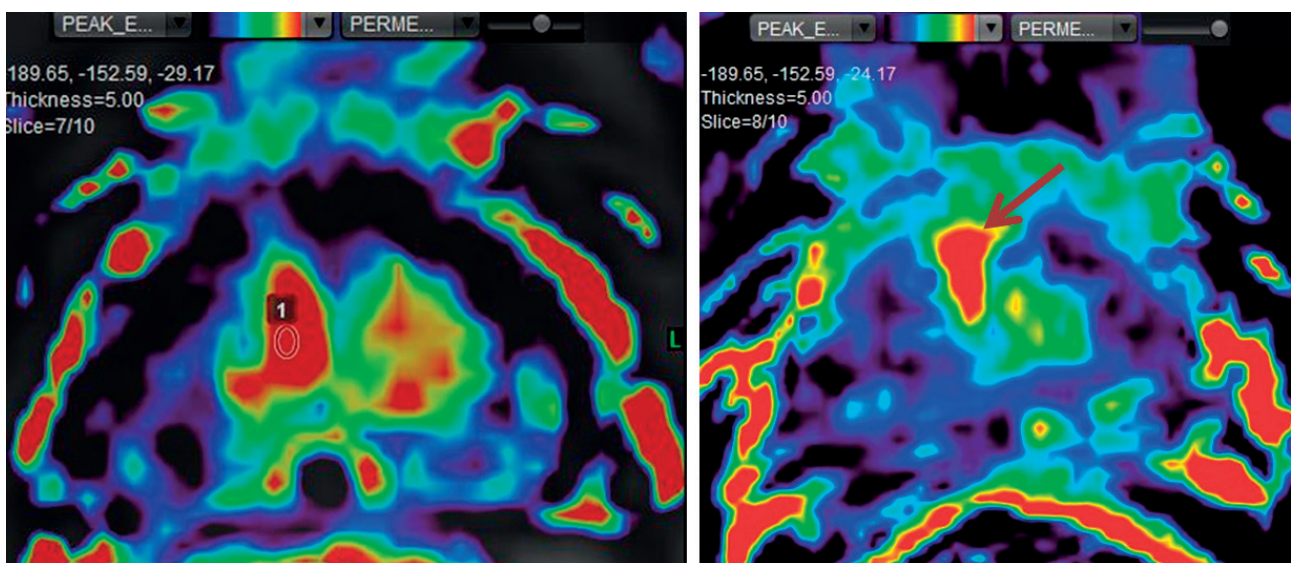


Figure 2 A focal area of high perfusion profile is shown on the right side of the transition zone of the prostate from the color-coded image with a ROI 1. A consecutive image depicts the high perfusion profile as a more linear - fusiform morphologic area extending in the peri-urethral zone.

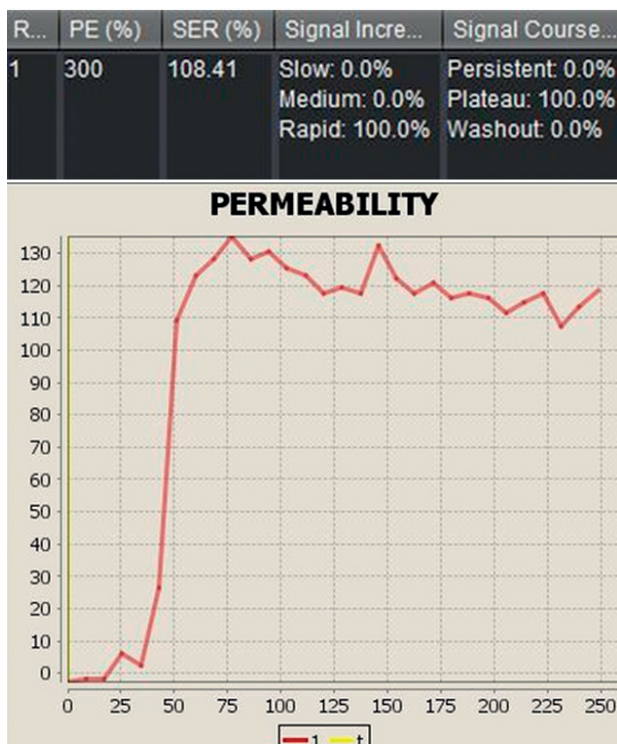


Figure 3 Quantitative and qualitative values of the region of interest from the kinetics and permeability analysis shows a high peak enhancement of 300%, Signal enhancement ratio of 108,4%, a rapid signal enhancement washin of 100% and a signal course enhancement washout of plateau of 100%.

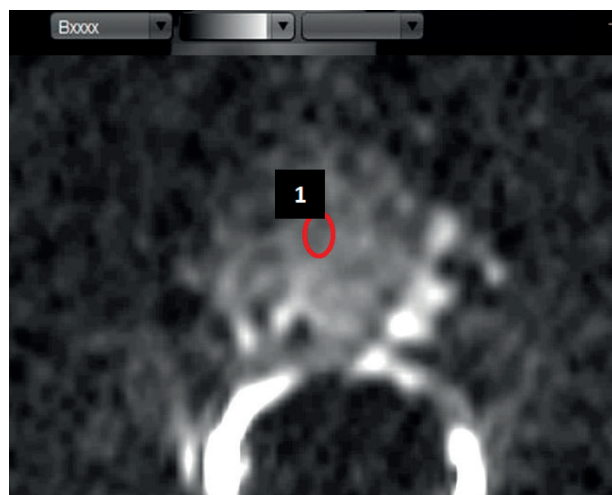
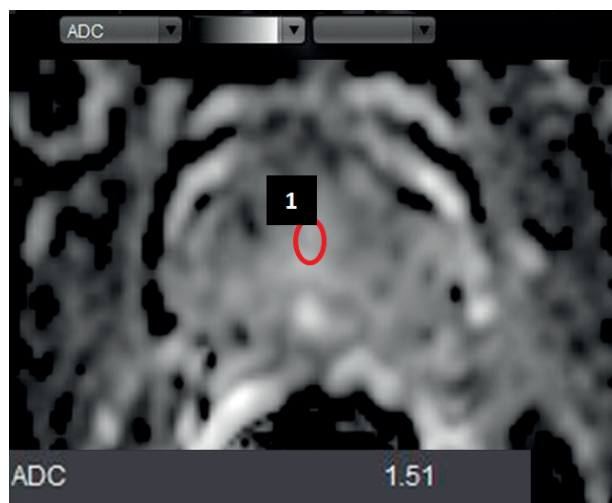


Figure 4 & 5 The ADC map and DWI image ($b=1400\text{sec/mm}^2$) shows the ADC value $=1.51 \cdot 10^{-3} \text{ mm}^2/\text{s}$ within the ROI (1)

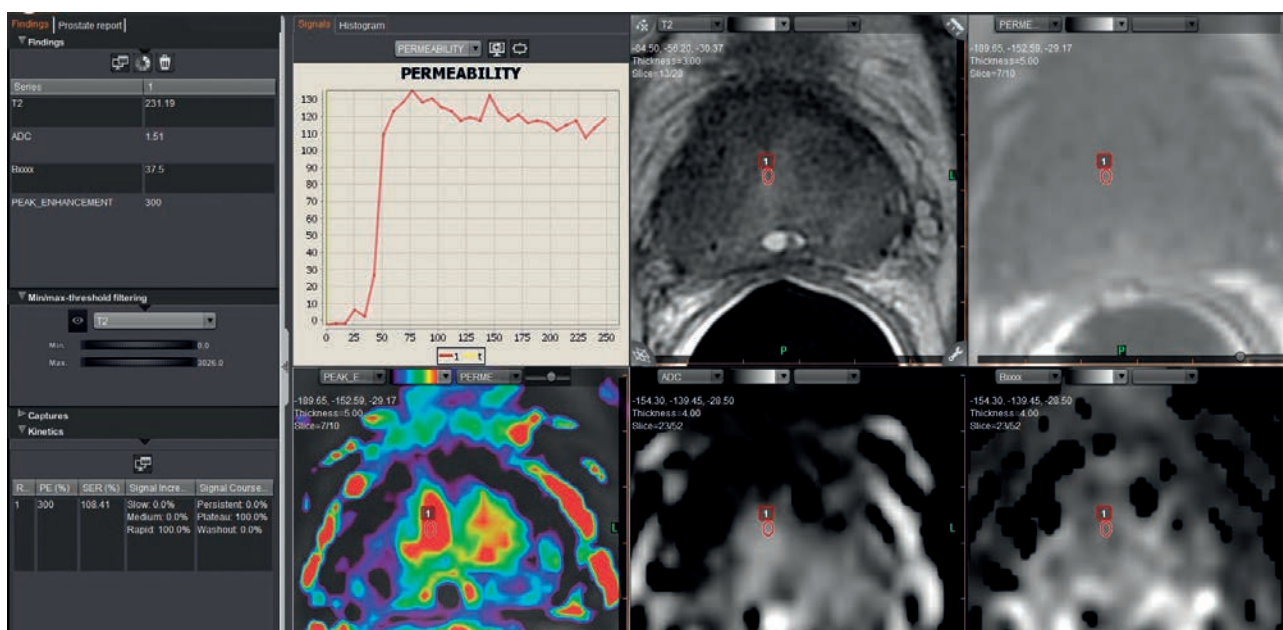


Figure 7 Multiparametric display: T2, peak enhancement, curve washin, washout and permeability curves combined with the diffusion and ADC analysis can be performed on the same screen.

OLEA MEDICAL®

www.olea-medical.com

Olea Sphere® v3.0, medical imaging post-processing software, is a medical device manufactured and marketed by Olea Medical®. This medical device is reserved for health professionals. The software has been designed and manufactured according to the EN ISO 13485 quality management system. Read the instructions in the notice carefully before any use.

Instructions for Use are available on <http://www.olea-medical.com/en/> Manufacturer: Olea Medical® S.A.S. (France). Medical devices Class IIa / Notified body: CE 0459 GMED.

**IMPROVED
DIAGNOSIS
FOR LIFE**