



## REVIEW ARTICLE

# The role of positron emission tomography/computed tomography imaging with radiolabeled choline analogs in prostate cancer<sup>☆</sup>



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### KEYWORDS

Prostate cancer;  
Choline;  
PET/CT;  
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### Abstract

**Introduction:** Prostate cancer is the most frequent solid malignant tumor in Western countries. Positron emission tomography/X-ray computed tomography imaging with radiolabeled choline analogs is a useful tool for restaging prostate cancer in patients with rising prostate-specific antigen after radical treatment (in whom conventional imaging techniques have important limitations) as well as in the initial assessment of a selected group of prostate cancer patients. For this reason a literature review is necessary in order to evaluate the usefulness of this imaging test for the diagnosis and treatment of prostate cancer.

**Evidence acquisition:** A MEDLINE (PubMed way) literature search was performed using the search parameters: «Prostate cancer» and «Choline-PET/CT». Other search terms were «Biochemical failure» and/or «Staging» and/or «PSA kinetics». English and Spanish papers were selected; original articles, reviews, systematic reviews and clinical guidelines were included.

**Conclusions:** According to available data, radiolabeled choline analogs plays an important role in the management of prostate cancer, especially in biochemical relapse because technique accuracy is properly correlated with prostate-specific antigen values and kinetics. Although is an emerging diagnostic technique useful in treatment planning of prostate cancer, final recommendations have not been submitted.

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**PALABRAS CLAVE**

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## Papel de la tomografía por emisión de positrones/tomografía computarizada con análogos radiomarcados de colina en el cáncer de próstata

**Resumen**

**Introducción:** El cáncer de próstata es el tumor maligno sólido más frecuente en los países occidentales. La tomografía por emisión de positrones/tomografía computarizada con análogos radiomarcados de colina es una herramienta útil en la re-estadificación de pacientes con aumento del antígeno prostático específico después de tratamiento radical—donde las técnicas de imagen convencional tienen limitaciones importantes—así como en un seleccionado grupo de pacientes en la valoración inicial de esta neoplasia. Esta situación nos lleva a plantear una revisión de la literatura donde se evalúe la utilidad de esta exploración en la toma de decisiones diagnóstico-terapéuticas en el cáncer de próstata.

**Evidencia de adquisición:** Realizamos una búsqueda bibliográfica a través de la base de datos Medline (vía Pubmed) utilizando los términos *Prostate cancer* y *Choline-PET/CT* a los que añadimos los términos *Biochemical failure* y/o *Staging* y/o *PSA kinetics*. Así mismo, seleccionamos los trabajos en lengua inglesa y española e incluimos artículos originales, revisiones, revisiones sistemáticas, metaanálisis y guías de práctica clínica.

**Conclusiones:** De acuerdo con los datos disponibles los análogos radiomarcados de colina desempeñan un papel importante en el manejo del cáncer de próstata, especialmente en la recurrencia bioquímica, donde la exactitud de la técnica se correlaciona bien con el valor del antígeno prostático específico y su cinética. Aunque esta técnica se perfila como una modalidad diagnóstica de aplicación en la planificación del tratamiento del cáncer de próstata, aún no se han realizado recomendaciones finales sobre su uso.

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## Introduction

### Epidemiology

Prostate cancer (PC) is one of the most important medical problems of the male population today. It is the most common solid tumor in the European Union and it causes a significant number of deaths in industrialized countries.<sup>1</sup>

The diagnostic instruments to obtain signs of this cancer include digital rectal examination (DRE), serum prostate specific antigen (PSA) concentration, and transrectal ultrasound; however, definitive diagnosis is based on the presence of adenocarcinoma in the prostate biopsy.

### Initial staging

Local staging (T staging) of PC is based on the results of TR and MR. Possibly the latter is the technique of choice for the correct delimitation of its extension, as the new techniques—endorectal coils, spectroscopy, and combination of MR with dynamic contrast and enhanced MR in T2—offer better results in terms of PC staging.<sup>2</sup>

The nodal status (N staging) is especially important when a potentially curative treatment is expected. Conventional imaging tests have limitations in detection of metastases <5 mm, so that the pelvic lymphadenectomy remains the most reliable method; however, it is still a controversial and invasive procedure with regard to the most appropriate technique to perform (standard or extended).<sup>3</sup>

Metastatic bone site is the most frequent in PC, and the best way to evaluate it is the bone scan, which has traditionally shown a high sensitivity. In contrast, it seems not to be indicated in asymptomatic patients when the serum PSA concentration is <20 ng/ml in well or moderately differentiated tumors.<sup>4</sup>

### Biochemical recurrence

Tumor recurrence is an event that occurs in 20–50% of patients after radical prostatectomy (RP) and in more than 30–40% of those who received external beam radiotherapy (RT). After a RP, only 2 consecutive values >0.2 ng/ml represent a recurrent cancer. However, the failure of RT has been redefined several times, now being known as PSA elevation >2 ng/ml above the PSA nadir. There is no consensus for the other treatments—cryotherapy or brachytherapy—and therefore it is not possible to give definite recommendations on biochemical failure in these cases.<sup>3</sup>

Only the PSA concentration and, ultimately, the RT are the only tests to routinely be performed during the follow-up. The identification and precise localization of recurrences has not yet been achieved. CT has a low sensitivity and specificity in this context, particularly if the size of the recurrence is <2 cm. For its part, the MR is not a first-line diagnostic tool either, although some authors suggest that the incorporation of endorectal coils makes it a sensitive and predictive technique in identifying recurrence after RP. Bone scintigraphy is indicated in the control of

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