Rationale for Clinical Use of 11C-Choline PET/CT in Prostate Cancer Patients

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Editorial

Prostate cancer is the most frequent cancer among older men, with a critical impact in social, sanitary and economic grounds for Western societies. Imaging techniques have proved useful for disease staging, for determining disease volume in terms of a better therapeutic approach, as well as for re-staging after disease recurrence [1].

Early diagnosis of prostate cancer relies on serum concentration of total prostate–specific antigen (PSA), digital rectal exam and trans rectal ultrasound of prostate. Once clinical-analytical suspicion of prostate cancer is arised, trans rectal ultrasound guided biopsy allows for histo pathological confirmation. Prostate biopsy is the gold standard in tumor characterization [1-4].

Disease staging prior to any therapeutic approach relies on a combination of different imaging techniques. Lymph node involvement is assessed by CT or MRI, with sensitivity values ranging between 60-70%. This not very high sensitivity is due to the fact that radiology diagnosis depends on morphometric criteria, and especially on the size of lymph nodes. Bone involvement is routinely assessed by means of the bone scan, with high sensitivity results, but low specificity (50%, approx.). MRI imaging is superior to bone scan, however whole body is not routinely scanned in MRI [1,2,5-8].

The therapeutic approach in prostate cancer, thus with palliative or radical aim, depends on how aggressive local tumor is (Gleason score), as well as on disease spread (TNM, PSA, Roach formula) [1-4].

After radical treatment of prostate cancer has been performed and disease recurrence is suspected clinically or by a PSA increase, several known procedures are implemented to localize and evaluate disease spread, and results of which will delineate the new therapeutic approach suitable in these patients. Bone scan and CT are also used for determining bone and lymph involvement respectively, likewise in the primary tumor staging. Transrectal ultrasound is used for guiding biopsy in the prostatic bed, as well as for lymph node evaluation. MRI performance is similar to CT, with its accuracy being improved with the aid of the spectroscopy information [5-10].

However, in many patients, and despite of applying all the available diagnostic procedures, disease location remains unsuccessful and therefore real disease spread is not available for their accurate clinical management [8].

Metil-11C-Choline (11C-Choline) was first introduced by Hara et al. as a new PET tracer for oncology imaging. 11C-Choline shows a high affinity for proliferative tissue. Its uptake mechanism depends on phospholipid biosynthesis, which is a critical compound found in cell membranes. Since carcinogenesis is characterized by a high cell proliferation rate, a high phospholipid concentration is expected in malignant tissues, and consequently, a high 11C-Choline uptake. The amount of 11C-choline transporters also plays a role in uptake process of 11C-Choline, although the exact mechanism underlying is still under investigation. 11C-Choline PET has been reported to be useful for studying several tumours with high tumor/background signal ratio, even in slow tumor growth kinetics and/or well differentiated lesions

time (PSAdt) allowing early diagnosis of recurrence and potentially