Utility of positron emission tomography in biochemically recurrent prostate cancer: A comparison of carbon-11 acetate & 68Ga-prostate specific membrane antigen radiotracers

Indiana University School of Medicine, Department of Urology

INTRODUCTION & OBJECTIVE: Carbon-11 acetate (C11) and 68Ga-prostate specific membrane antigen (Ga PSMA) radiotracers are commonly used radiotracers. Ga PSMA is small molecule that is prostate-specific at a molecular level, while C11 acetate relies on a pattern of rapid uptake and metabolism common in several cancers [1]. We sought to determine whether our institution’s application of these radiotracers corroborated previous findings regarding rate of positive scans for graded PSA categories, quantify lesion-specific positive predictive value for C11 acetate and Ga PSMA based on post-scan follow up data, and directly compare C11 acetate and Ga PSMA PET performance.

METHODS: A database of 230 patients was queried for PET/CT scans and sufficient post-scan data. All scans were read by a board-certified radiologist and PET findings suggestive of malignancy were characterized separately from non-PET findings. Site-specific radiotracer avidity was recorded. Pre-scan PSA range categories (i.e., < 0.5 – 5 ng/ml) were chosen. The outcomes (positive or negative) within these categories were subjected to Pearson’s chi2 test regarding percent of scans read as positive to assess for significant variance between radiotracers. Positive scans were classified as true or false and a lesion-specific positive predictive value (PPV) was calculated for each radiotrac. Three methods were used to confirm a positive site: 1) histology, 2) non-confounded, post-targeted therapy PSA trend, and 3) non-PET imaging. False positives were confirmed by histology. RESULTS: The rate of positives was greater in higher PSA categories for both radiotracers. At PSA < 2 ng/ml, no significant difference was observed at any PSA category or when comparing PSA > 2 as a group. At PSA of 2 – 4, Ga PSMA begins to demonstrate a significantly (p < 0.01) higher rate of positives. For PSA 2 – 20, Ga PSMA was positive in 15/36 (42%) with C11 as (1/20). C11 ac:PPVs were 93.9% and 88.4% for all cases and biopsy-confirmed cases, respectively. Ga PSMA PPVs were 97.4% and 92.9%. CONCLUSION: Ga PSMA demonstrates a high positive read-rate (nearly 100%) above 2 ng/ml. C11 ac demonstrates a slower climb in positive read-rate as PSA increases. C11 ac and Ga PSMA both demonstrate high PPVs for prostate malignancy at all sites, with Ga PSMA demonstrating fewer false positives relative to C11 ac.

REFERENCES

LIMITATIONS
- A portion of the patients with positive scans were lost to follow up or the scan was obtained too recently for sufficient post-scan confirmatory data.
- A binary “positive” or “negative” designation was assigned to scan readings. At times radiology reports indicated graded levels of suspicion. These nuances remained below the resolution of our data collection and reporting.

CONCLUSIONS
- Ga PSMA increases the rate of positive reads relative to C11 acetate at PSA values greater than 2 ng/ml, with 37/38 scans read positive.
- Our positive read rate for PSA categories less than 2 ng/ml was slightly less than rates cited elsewhere [2][3]. We hypothesize that this may be due to a greater number of hormone naive patients in our cohort.
- C11 and Ga PSMA radiotracers demonstrate high PPVs for prostate malignancy, with Ga PSMA producing fewer false positives than C11 acetate.
- Further study regarding ideal application and limitations of Ga PSMA is warranted. Additionally, study to determine the significance of a negative scan in the context of a rising PSA should be assessed with longer term clinical outcome follow up.

METHODS

CONCLUSIONS

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