# HOPE FOR PATIENTS WITH PROSTATE CANCER WITH BONE METASTASES

In Oncology Regional Hospital Ternopil in 2015 -2017

#### Supervisors:

ABSTRACT: The process of treatment of patients with metastatic castrate-resistant prostate cancer (mCRPC) is pushing the boundaries of oncological treatments. The Ukrainian Society of Nuclear Medicine under the European Commission, Joint Research Centre has agreed on radium-223 chloride ((223) RaCl2) for the treatment of mCRPC patients whose metastases are limited to the bones. Radium 223 is a mildly radioactive form of the metal radium. It used to be called Alpharadin and now has the brand name Xofigo and accumulates in the bone.

#### BACKGROUND:

The concept of targeted alpha-therapy (TAT) is that Alpha-particle-emitting radionuclides are a subject of importance for investigation in cancer treatment. The reality of these models is that it is possible to sterilize individual cancer cells solely from self-irradiation with alpha-particle emitters, a result that is not possible to obtain with beta-particle emitters given dose-deposition characteristics, achievable radiopharmaceutical specific activity, tumor-cell antigen expression levels and the need to avoid prohibitive toxicity

#### METHOD

The aim was to see if there were better results in asymptomatic patients at baseline compared to symptomatic patients for early treatment with radium-223. Three men with ages 69, 72 and 53 diagnosed with metastatic castrate-resistant prostate cancer (mCRPC). Two approaches of targeting were used to in the treatment, The Mab J591, against the external domain of prostate-specific membrane antigen (PSMA) and PAI-2, a natural protein inhibitor of urokinase plasminogen (uPA) activator that binds to uPA bounds to surface receptor uPAR on prostate cancer cells. Each targeting molecule requires a bifunctional chelator that reacts both with the carrier molecule and the radioisotope.

**RESULTS:** 

Among the three patients that had previously not responded to available standard treatments, including surgery, external radiation, hormonal and chemotherapy, have received 225Actinium-PSMA-617 as treatment. Several months into the therapy, PSA values have dropped below the detection limit (0.1 ng/ml) from values initially surpassing 3000 ng/ml, 647 ng/ml and 419 ng/ml respectively. To date, 9 months, 17 months and 12 months after their respective treatments, all patients have very satisfactory health status. Prior to the treatment, their life expectancy was of 2-4 months. The therapeutic responses observed in the majority of patients to date indicate that TAT with 225Actinium-PSMA-617 has the potential to change the future treatment of metastatic prostate cancer. It can be confirmed that a dose of 100 kBq/kg body weight is safe and effective with the only side effect being xerostomia. The survival rate is TAT is higher than other methods and also 82% had their tumor shrunk and had lower PSA.

#### CONCLUSION

In this abstract, we highlight the recent developments in  $\alpha$ -particle therapy that have enabled me and my supervisors over the years to exploit this highly potent form of therapy by targeting tumor-restricted molecular biomarkers.

Keywords: 223Ra,  $\alpha$ -particle therapy, molecular radiotherapy, nuclear medicine, radioimmunotherapy

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