**INTRODUCTION**

Theragnostics are major advances in the field of personalized medicine showing promising outcomes for cancer patients. Thanks to the application of tumour-targeting tools to diagnose and treat, this discipline provides a therapy adjusted to the individualized molecular feature of the tumour, with a potential therapeutic advantage. Efficient theragnostics strategies combining positrons and gamma or alpha emitters against various cancers are still under development. We investigated the potential of the chorioallantoic membrane (CAM) of fertilized chicken eggs as a rapid preclinical theragnostic platform. In this context, we explored the efficiency of multimodal imaging to monitor the effects of the well-known \([^{68}\text{Ga}]^{/[^{177}\text{Lu}]}/^{177}\text{Lu}\)-PSMA (prostate specific membrane antigen) combination in a prostate cancer (PCa) CAM model.

**METHODS**

LNCaP (expressing PSMA) or PC3 (not expressing PSMA) PCa cells, prepared in a matrix solution were grafted onto the CAM. Eggs were grown in an incubator at 37°C with 60% humidity. Three conditions were tested (n≥6 per condition): (1) LNCaP tumours, (2) LNCaP tumours treated with the PSMA inhibitor 2-PMPA and (3) PC3 tumours. Five days after cell grafting, eggs were injected once with 20 MBq \([^{68}\text{Ga}]^{/[^{177}\text{Lu}]}/^{177}\text{Lu}\)-PSMA radiotracers than PMPA treated ones and PC3 tumours. Indeed, PMPA-treated LNCaP and PC3 tumours uptakes were at the background level. Western blot analyses confirmed that tumours accumulating \([^{68}\text{Ga}]^{/[^{177}\text{Lu}]}/^{177}\text{Lu}\)-PSMA were expressing the human PSMA receptor.

**RESULTS**

First, we demonstrate that multiple radiotracers injections are challenging but achievable in the CAM model. Then, from day 5 to day 7 after cell grafting, proliferation was efficiently monitored by fluorescence optical imaging. As described above, multimodal imaging allowed to quantify proliferation, tumour volumes and \([^{68}\text{Ga}]^{/[^{177}\text{Lu}]}/^{177}\text{Lu}\)-SPECT/CT for multimodal coregistration. PSMA expression in tumours was also quantified by western blotting to validate preclinical imaging results.

**CONCLUSION**

The CAM model is a reliable bridge between in vitro and in vivo experiments and is thus of high interest in regards to the 3Rs principles. We show that this in ovo cancer model can be monitored by multimodal imaging. This fast and cost-efficient theragnostic platform will allow high-throughput workflow evaluation of different schemes of combined therapies, paving the way for advances in personalized medicine.