Evaluation of positioning accuracy of the electromagnetic RayPilot® system with an *in vivo* dosimeter.

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Introduction

Electromagnetic organ positioning for radiotherapy was first described by Lennernäs & Nilsson in 1995. The RayPilot® system is a wire based positioning system with the possibility to add other functions to the implantable transmitter. However, adding a dosimeter might interfere with the positioning function. In this study the accuracy of a new implant with positioning, patient identification and an *in vivo* dosimeter is evaluated.

Materials

For testing RayPilot system accuracy the transmitter is modified and has a dosimeter (a commercially used diode for patient dosimetry in radiotherapy) connected in addition to the positioning components. The transmitter was mounted in an apparatus that moved the transmitter in 2000 random positions. The apparatus was placed on the RayPilot receiving system on a carbon fibre table top (iBeam from Medical Intelligence).

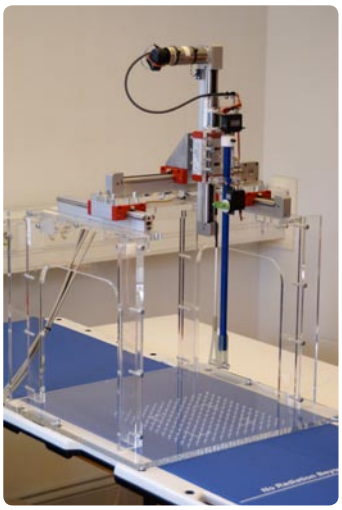

Figure 1. *Apparatus for automatic 3D movement in random positions.*

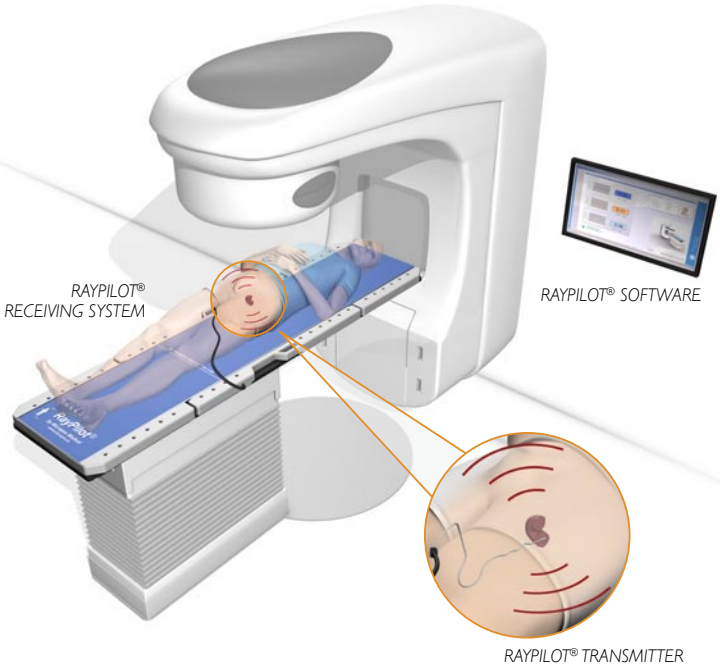

Figure 2. *Illustration of the RayPilot system.*

Figure 3. *Close up of the RayPilot transmitter*

Results & Conclusions

The accuracy of the RayPilot positioning system with a dosimeter added was 0.38 mm± 0.18 mm (radial mean ± SD). Maximum radial error was 1.57 mm. This corresponds to the precision of a non modified RayPilot system.

The tests shows that the RayPilot system is unaffected when an in vivo dosimeter is added in the transmitter and the system shows to be well suited for combined measurement of real-time position and delivered dose to a target in radiotherapy.

References: *A new patient positioning system using magnetic implants and magnetic field sensors. Lennernäs B, Nilsson S. Radiother Oncol. 1995 Dec;37(3):249-50.*