

## Evaluation of new markers for the interstitial plastic component in MR-Based cervix brachytherapy

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### AIM

MR-based (T2) clinical dosimetry is the ESTRO-ABS recommended planning procedure in cervix brachytherapy planning. To improve efficiency and accuracy, the planning should be done based exclusively in MR, avoiding CT registration. The use of interstitial needles improves both coverage and organs at risk sparing. This is the case of the Utrecht applicators (Elekta). Currently, there are dummies only for the endocavitary component (Perez-Calatayud 2009) but not for the Utrecht plastic needles, because their small diameter.

In our hospital, the needles reconstruction is managed using a self-developed virtual library (Otal 2017). The concern here is that it is based on the measurement provided by the Rad-Onc of the inserted depth derived from the reading of a special ruler.

The purpose of this work is to evaluate a new marker for the 1 mm inner diameter Utrecht interstitial component.

### METHOD

The HDR MRI Lumen Marker (C4 Imaging) is a new sealed high-density polyethylene tube containing a cobalt chloride:N-Acetylcysteine saline solution. All MRI acquisitions were performed with Signa HDxt 3T (General Electric) with T2 mode and a slice thickness of 2.5 mm and the protocol described in Richart J (2018). The viability of the dummies was assessed in five patients. In order to adjust the solution distal limit inside the dummy with the maximum Source to Index Distance (SIDmax, it is 129 cm) of the microSelectron V3 (Elekta), a homemade gadget was added to the dummies.

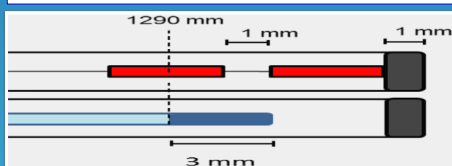


Figure 1. Scheme of the Utrecht plastic needle tip and the source cable at maximum position (upper side), and the position of the tip of the new dummy when the developed gadget is used (bottom).

### RESULTS

In all the patients the dummies were completely visible in the axial sequence, allowing the complete catheters reconstruction. The homemade gadget improved the accuracy and efficiency of the determination of SIDmax avoiding the uncertainty coming from the dark line generated by the plastic needles in the MRI images.

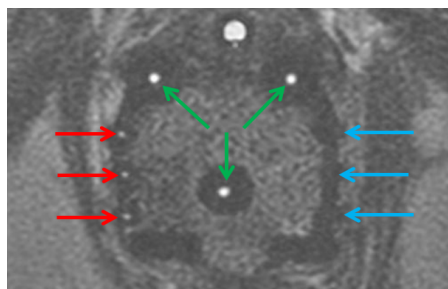


Figure 2. Axial slice with just three of the new dummies in the left-hand side (red arrow), self-developed dummies for tandem and colpostats (green arrow) and no dummies in the right-hand side.

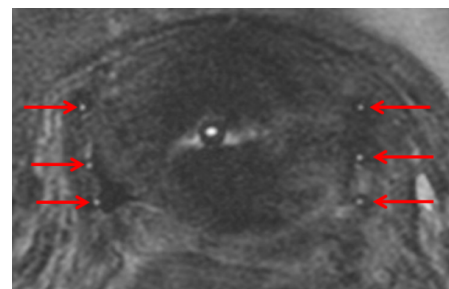


Figure 3. Axial slice, deeper than the colpostats, of patient 4 in which all needles had the new dummy.

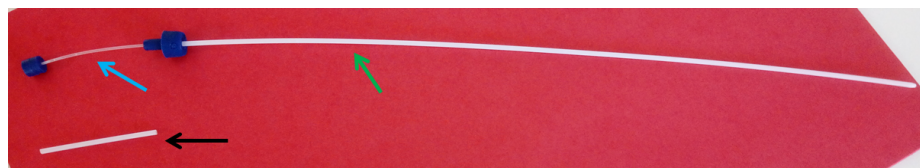


Figure 4. Dummy (blue arrow) inserted inside an Utrecht plastic needle (green arrow) and the gadget developed (black arrow) to adjust the tip of the solution inside the dummy to the position 1290 mm.

### CONCLUSIONS

The new dummies are visible in MRI 3T T2 allowing improving reconstruction efficiency and accuracy.

### ACKNOWLEDGEMENTS

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### REFERENCES

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