Centre
de Cancérologie
du Grand Montpellier

Housfield CT-values correction with the iMAR software, impacts on dosimetrics calculation for radiation therapy
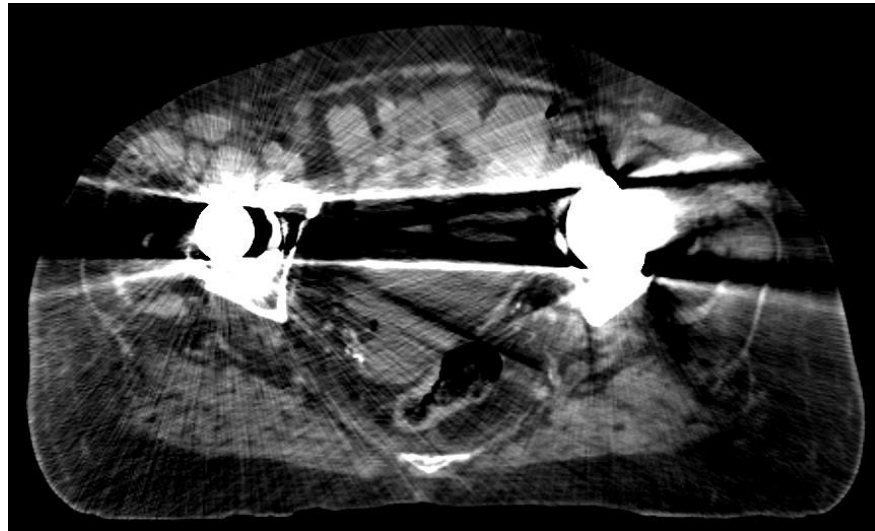
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Purpose

- iMAR : iterative Metal Artefact Reduction algorithm by Siemens

- Hips prosthesis implants artifacts ⟹ uncertainties on HU values

- Metal Artifacts create several approximations in radiation therapy

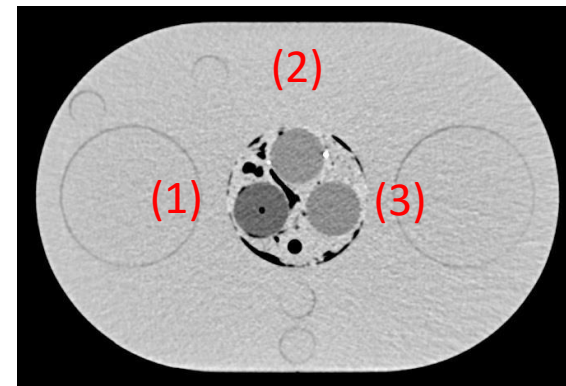   ↳ For contouring and dose calculation

Methods

- Study on 30 patient with/without prosthesis implants :

  - ➢ Evaluate the gain of iMAR in CT-Scan images (HU)

  - ➢ Dose calculation comparison before/after iMAR with Eclipse®

- Study with phantom :

  - ➢ Accuracy in retrieving correct HU and Standard Deviation ?

  - ➢ Dose calculation comparison before/after iMAR with Eclipse®

  - ➢ Monitoring of a real treatment on a Clinac 2100C

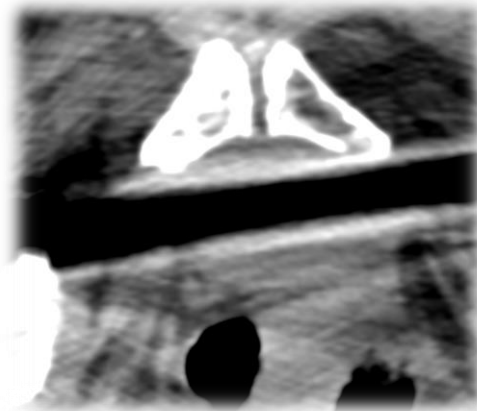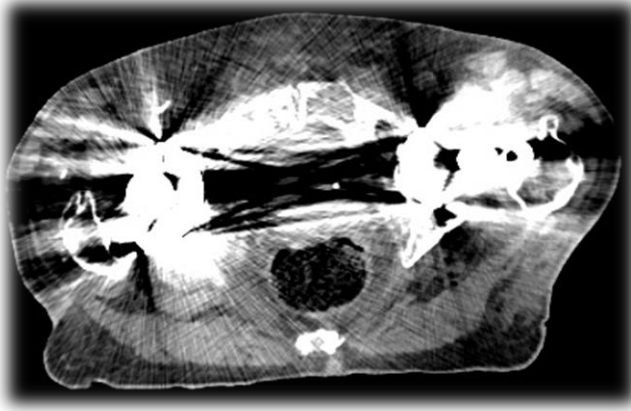## *Customized phantom : Quasar + Prostatic insert*

- Quasar™ with 2 metal and 2 acrylic inserts

- Customized prostatic insert :

  ➢ 4 gold seeds

  ➢ 3 inserts from the CIRS MODEL 062
  ⟹ H_2O (1), Liver (2), Muscle (3)

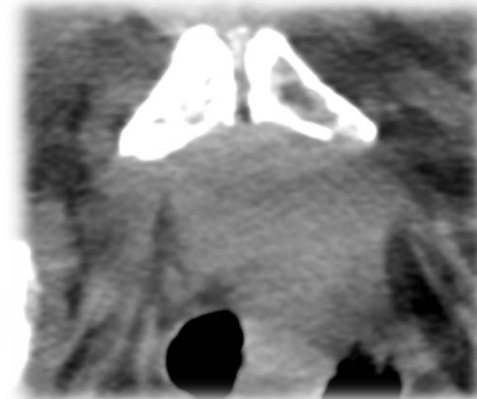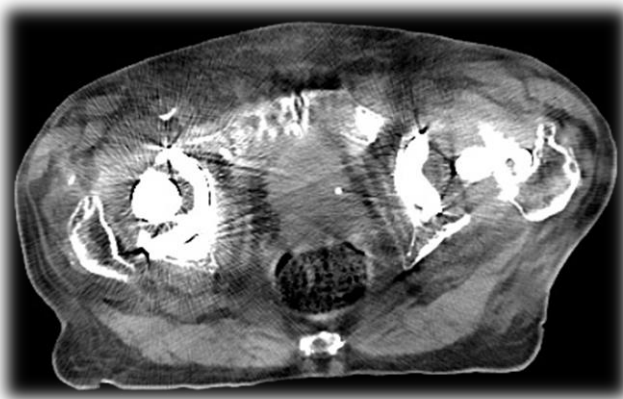 ➢ 1 ion chamber insert holder for dosimetry

Image quality : contouring
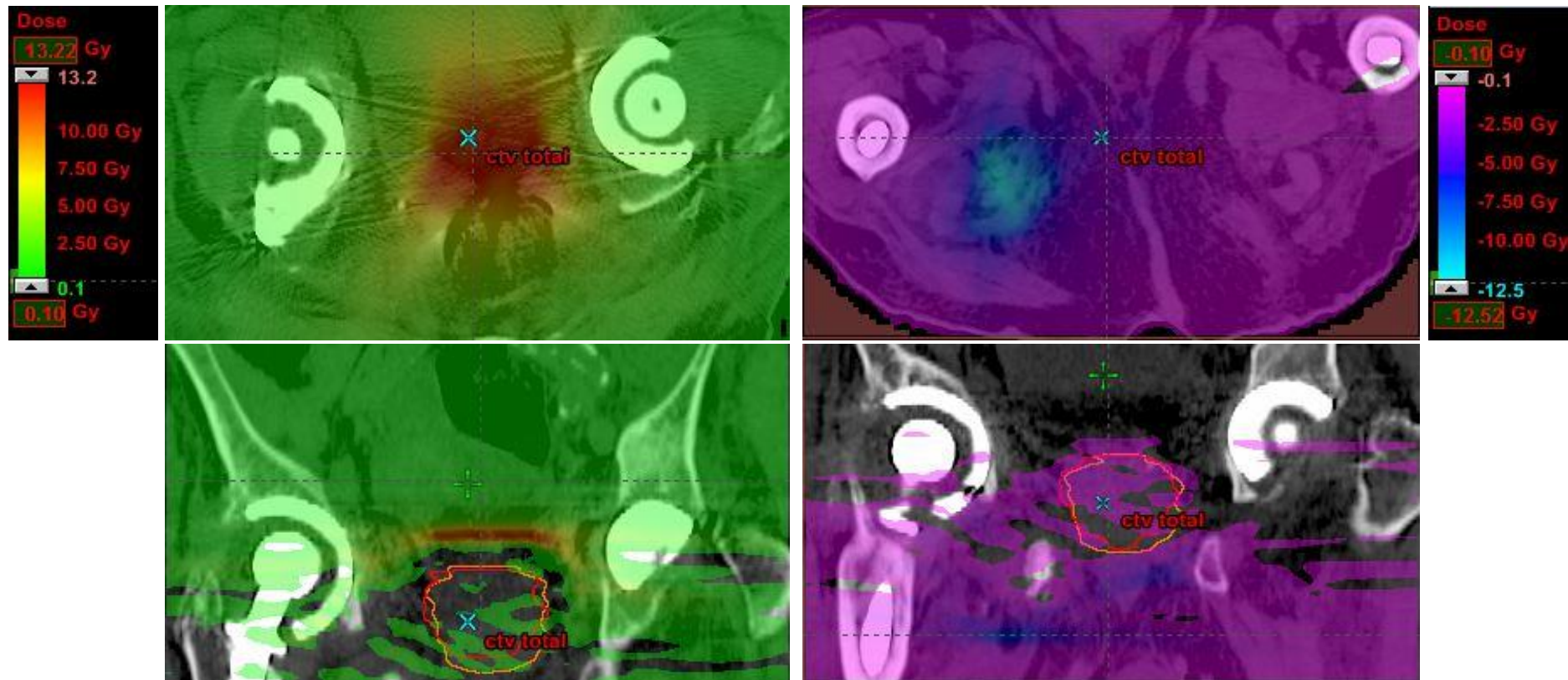
- Streaking artefacts prevent proper definition of tissue outline

- Accuracy increased with iMAR for contouring the prostate

Dosimetry analysis

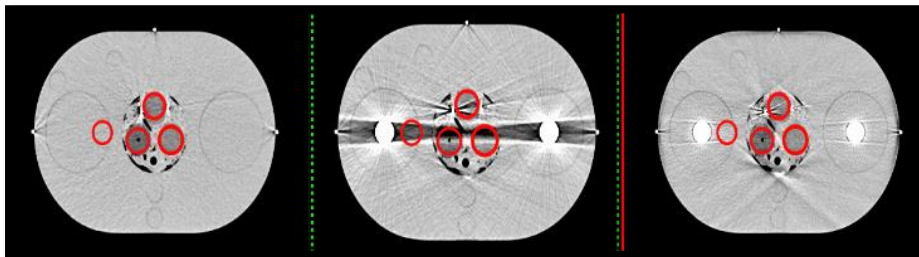- Substraction dose calculation with/without iMAR

Dose calculation differences : range of +13,22 Gy to -12,52 Gy

Before/after iMAR correction

- Inside streaking artifact :
  - ➢ HU and SD are improved

- Outside streaking artifact :
  - ➢ HU and SD are constant

ROI	HU values (Standard Deviation)			
	Muscle	**Liver**	**H$_2$O**	**In Artifacts**
Reference	53,6 (±15,6)	58,7 (±18,6)	-2,3 (±56,6)	119,5 (±11,8)
No iMAR	22,1 (±104,9)	58,3 (±24,6)	-24,6 (±117,4)	20,6 (±102,8)
iMAR	64,4 (±26)	59,6 (±19,6)	9,4 (±58,5)	130,4 (±30)

Results : Phantom study

## *Dose calculation (VMAT 23X) in T.P.S. Eclipse®*
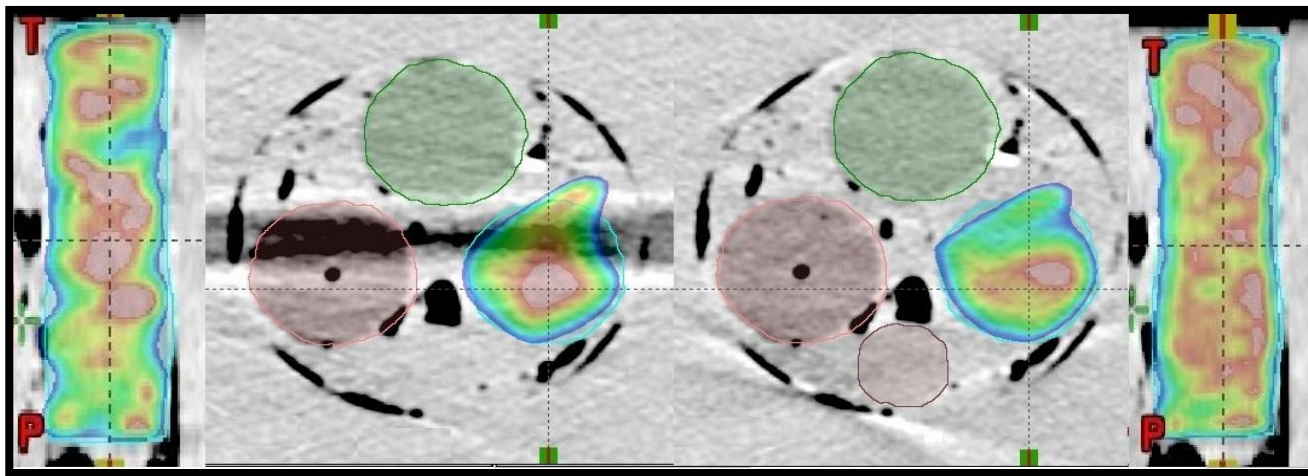
- Same dose constraint (VMAT Optimization) is applied

- Dose distribution different between the two treatment plans

- For same Dose Max : dose covering improved in muscle by iMAR

Results : Phantom study

Real treatment in Clinac (with/without iMAR correction)

- 2 measured points : outside dose constraint and in Muscle insert

Difference between dose measured and dose calculated (%)

8,1 — No iMAR
3,0 — iMAR
1,0 — No iMAR
0,2 — iMAR
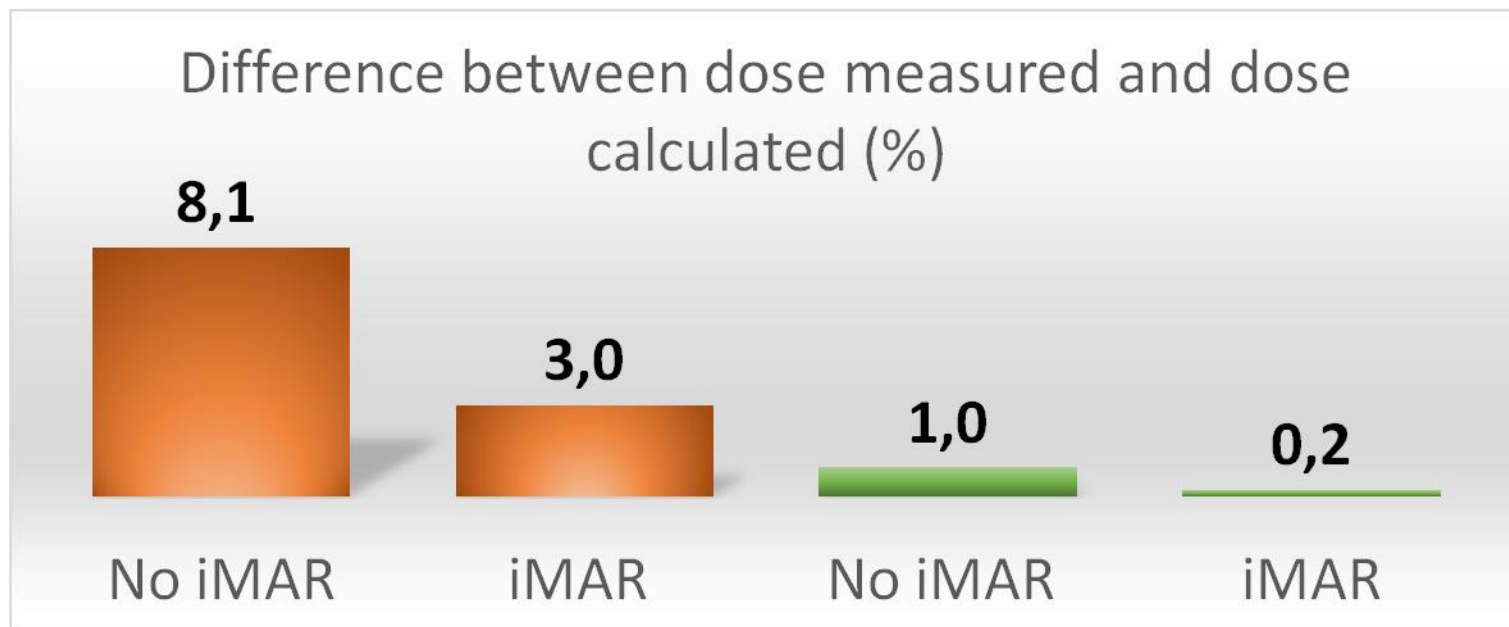
- Dose calculated is more accurate with dose measured

- Impact is more important out of dose constraint

Conclusions

iMAR :

- Increase confidence in countouring

- Very close reproduction of HU values and SD

- Dose calculation is improved for the dose covering

iMAR improves patients treatment