EVALUATION OF DEEP-LEARNING AUTO-SEGMENTATION METHODS IN CERVIX CANCER PATIENTS

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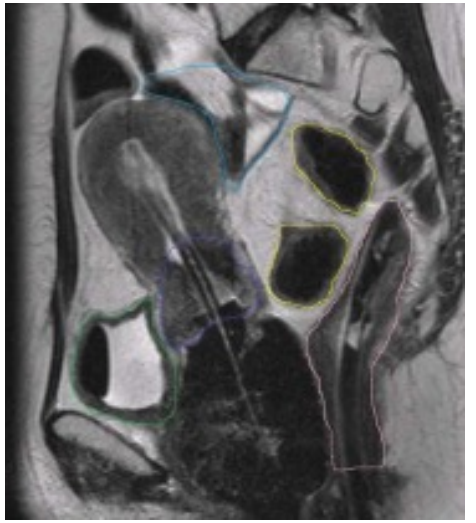
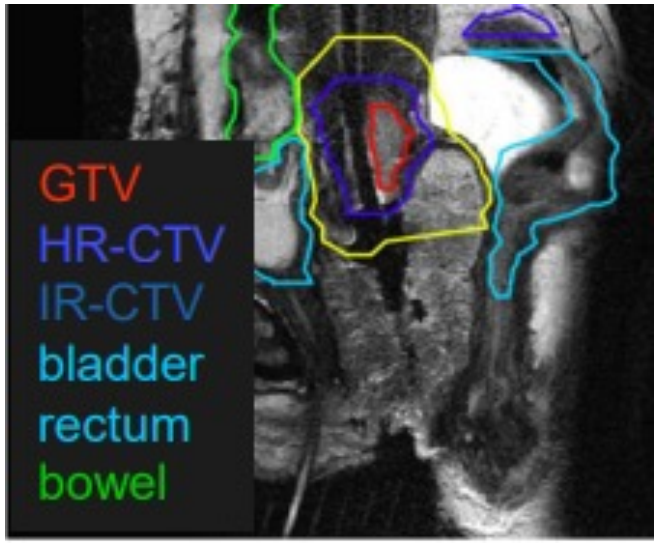
Contouring of OARs and target volumes is an essential step in interventional radiotherapy (IRT, brachytherapy, BT) treatment planning

However, the delineation quality and time spent on contouring depend on the experience of the radiation oncologist

In the last decades, auto-segmentation algorithms have been developed, including atlas-based methods and deep-learning algorithms based

This study evaluated existing standard quantitative geometric measures using atlas-based and deep-learning auto-segmentation methods for OARs and target volume in the pelvis





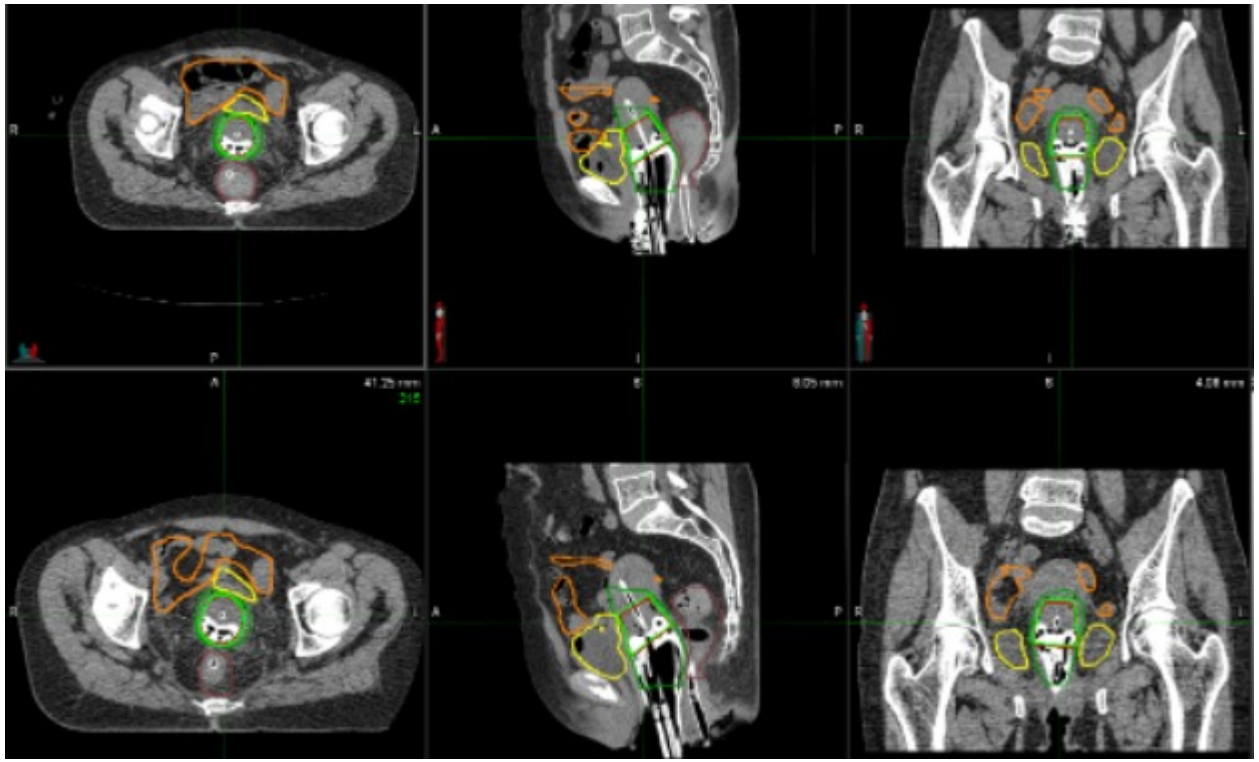
23 patients with LACC

Rectum, bladder, small bowel and target volumes (high (HR) and intermediate risk (IR) clinical target volume (CTV) were manually contoured on each CT

An ad hoc workflow was optimized in MIM in order to perform a rigid registration followed by a deformable registration and the subsequent automatic creation of the region of interests (ROIs) on the second CT

The manual ROIs were therefore compared to the automatic ROIs with the use of the Dice Similarity Coefficient (DSC: (2 | A∩B | / | A | + | B |) and the Jaccard Similarity Coefficient (JSC: (| A∩B | / | AUB |)

It is generally accepted that a value of DSC and JSC > 0.7 represents excellent agreement



	BLADDER		RECTUM		SMALL BOWEL		HR-CTV		IR-CTV	
	DI	JI	DI	JI	DI	JI	DI	JI	DI	JI
Mean	0.82	0.68	0.64	0.49	0.46	0.31	0.77	0.64	0.85	0.69
Median	**0.82**	**0.70**	0.64	0.48	0.52	0.35	**0.79**	**0.66**	**0.88**	**0.79**
Std Dev										
Max	0.94	0.90	0.79	0.94	0.74	0.59	0.89	0.81	0.90	0.82
Min	0.58	0.41	0.32	0.35	0.04	0.02	0.58	0.41	0.76	0.61

Quantitative evaluation results showed that the proposed method could segment the HR/IR-CTV and bladder with relatively good accuracy

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Project for interventional Oncology LArge-database in liveR Hepatocellular carcinoma – Preliminary CT-based radiomic analysis (POLAR Liver 1.1)

The aim of the study was to develop the tools for liver radiological imaging analysis, creating a radiomics model based on dynamic contrast-enhanced CT images which can predict incomplete response in patients with a single HCC lesion after locoregional treatments

This model could grant early identification of poor responder patients

Patients affected by hepatocellular carcinoma treated using focal therapies (radiofrequency or microwave ablation) from September 2018 to October 2020 were retrospectively enrolled

The whole gross tumor volume (GTV) of treated lesions was contoured by a radiologist and independently evaluated and validated by an expert radiologist as defined in International Commission on Radiation Units and Measurements [ICRU] No. 83

The radiomics analysis was performed in R (version 3.4.1) using an in-house developed open-source R library for radiomics analysis called Moddicom

Inclusion Criteria	Exclusion Criteria
Age > 18 years	Oral anticoagulant drugs in the 5 days before the procedure
Signed informed consent	Known allergy to iodinated contrast medium
Single or multiple HCC lesions with multidisciplinary indication to treatment with locoregional ablative techniques	Kidney function impairment (Glomerular Filtration Rate < 60 mL/min/1.73 m^2)
Contrast-enhanced CT examination performed 1 month or less prior to locoregional treatment	Pregnant or lactating women
6-month Contrast-enhanced CT or MRI follow-up examination	Platelet count < 50,000/mm^3
	International Normalized Ratio < 1.5
	Thromboplastin time < 45 s
	Prothrombin time < 15 s

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The CT images and the corresponding segmented ROIs, namely the GTV, were imported in Moddicom
208 radiomic features were extracted from each GTV. These included 17 first order statistics, 14 morphological and 177 texture features

Treatment response was evaluated on a per-target-nodule basis on the 6-months follow-up contrast-enhanced CT or MR imaging using the mRECIST criteria

Sex	8 F (19%)
Age	67.5 ± 11
Lesion size	3.4 ± 0.7 (2.2-4.7)
Lesion Number	
- 1	31 (73.9%)
- 2	8 (19%)
- 3	3 (7.1%)
Lesion Location	
Perivascular	41 (73.2%)
Non-Perivascular	15 (26.8%)
Child-Pugh class	
- A5	22 (52.4%)
- A6	9 (21.4%)
- B7	5 (11.9%)
- B8	4 (9.5%)
- B9	1 (2.4%)
- C	1 (2.4%)
Cirrhosis etiology	
- Viral (HBV / HCV)	29 (69%)
- Alcohol	9 (21.5%)
- Metabolic (NASH/NAFLD)	4 (9.5%)
Bilirubin (mg/dL)	1.21 ± 0.69
Albumin (g/dL)	6.9 ± 10
Treatment modality (%)	
- RFA	25 (44.6%)
- MWA	31 (55.4%)
Treatment response (%)	
- CR	26 (46.4%)
- PR	18 (32.1%)
- SD	10 (17.9%)
- PD	2 (3.6%)

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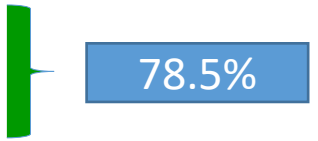
56 treated lesions from **42** patients were selected

Treatment responses were:

- complete response for 26 lesions (46.4%)
- 18 partial responses (32.1%)
- 10 stable diseases (17.9%)
- 2 progression diseases (3.6%)



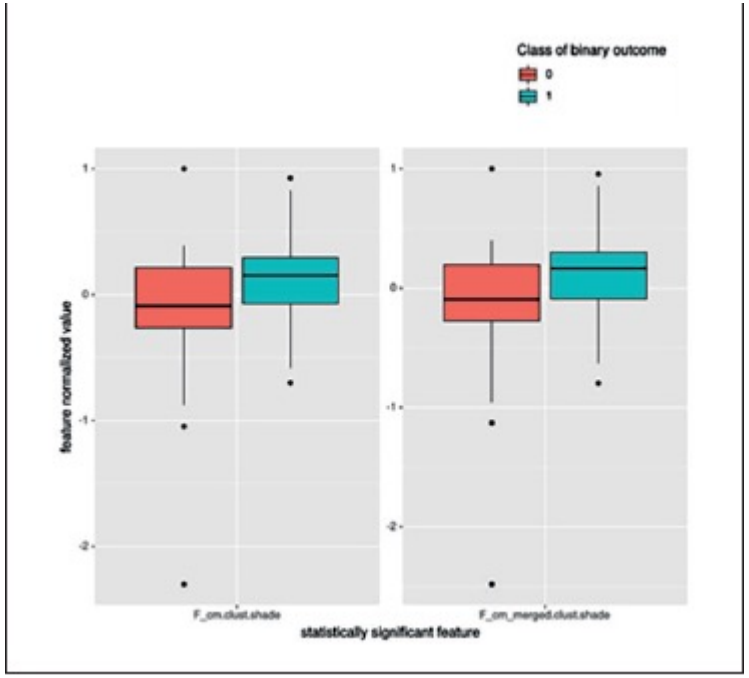
No significant differences were observed in the baseline characteristics of patients treated with RFA or MWA, with different tumour location (perivascular/non-perivascular)

No significant differences were obtained in terms of complete/ incomplete response based on ablation technique used or tumor location

When considering radiomics analysis, two radiomics features resulted statistically significant: F_cm.clust.shade (*p* = .032) and F_cm_merged. clust.shade (*p* = .035)

Area-Under-Curve value was 0.667 (95% CI: 0.527-0.806)

Accuracy, sensitivity, specificity, positive and negative predictive values were respectively 0.66, 0.85, 0.50, 0.59 and 0.79



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This contrast-enhanced CTbased model can be helpful to early identify poor responder's hepatocellular carcinoma patients and personalize treatments

The results of this study are encouraging, but further studies must be performed to confirm and validate the proposed predictive model

We constructed a convenient and feasible radiomics model that could be helpful to identify whether a treatment intensification could modify clinical outcomes

Preoperative treatment response stratification could favorably influence the decision-making process for the best therapeutic strategy for each patient, reducing recurrence rates and improving patient safety and overall survival

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