XXXIII CONGRESSO NAZIONALE AIRO

AIRO2023

BOLOGNA,
27-29 OTTOBRE 2023

PALAZZO DEI CONGRESSI

Radioterapia Oncologica: l'evoluzione al servizio dei pazienti

Associazione Italiana
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STEREOTACTIC BODY RADIOTHERAPY AND ARTIFICIAL INTELLIGENCE IN OLIGOMETASTATIC GYNAECOLOGIC CANCER: A LARGE, REAL-WORLD STUDY ON RESPONSE PREDICTION, EFFICACY AND OUTCOMES

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Radioterapia e Oncologia clinica

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Radioterapia Oncologica: l'evoluzione al servizio dei pazienti

No conflict of interest

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Radioterapia e Oncologia clinica

Review

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[2]Gynecologic Oncology, Duke Cancer Institute, Durham, North Carolina, USA

Role of stereotactic body radiotherapy in gynecologic radiation oncology

Conclusion and Future Directions

- SBRT active area of investigation
- a body of literature supports local control data in the setting of limited metastatic disease
- phase I and II trials have established the relative safety
- a dearth of phase III randomized evidence, including the use of immunotherapy

Int J Gynecol Cancer. 2022 Mar;32(3):372-37

449 lesioni, 19 centri

Radiation Oncology

The Oncologist® 2020; 25(2):e311-e320.

A Large, Multicenter, Retrospective Study on Efficacy and Safety Of Stereotactic Body Radiotherapy (SBRT) in Oligometastatic Ovarian Cancer (MITO RT1 Study): A Collaboration of MITO, AIRO GYN, and MaNGO Groups

Gabriella Macchia,[a,†] Roberta Lazzari,[b,†] Nicoletta Colombo,[c] Concetta Lauscia,[d] Giovanni Capelli,[e] Giuseppe Roberto D'Agostino,[f] Francesco Deodato,[a] Ernesto Maranzano,[g] Edy Ippolito,[h] Sara Ronchi,[b] Fabiola Paiar,[d] Marta Scorsetti,[f,i] Savino Cilla,[j] Rossana Ingargiola,[b,k] Alessandra Huscher,[l] Anna Maria Cerrotta,[m] Andrei Fodor,[n] Lisa Vicenzi,[o] Donatella Russo,[p] Simona Borghesi,[q] Elisabetta Perrucci,[r] Sandro Pignata,[s] Cynthia Aristei,[r] Alessio Giuseppe Morganti,[t] Giovanni Scambia,[u,v] Vincenzo Valentini,[a,y,w] Barbara Alicja Jereczek-Fossa,[b,k,††] Gabriella Ferrandina[u,v,††]

> Int J Radiat Oncol Biol Phys. 2023 May 5;S0360-3016(23)00417-0. doi: 10.1016/j.ijrobp.2023.04.025. Online ahead of print.

272 lesioni, 14 centri

EFFICACY AND SAFETY OF STEREOTACTIC BODY RADIOTHERAPY (SBRT) IN OLIGOMETASTATIC UTERINE CANCER (MITO-RT2/RAD STUDY): A LARGE, REAL-WORLD STUDY IN COLLABORATION WITH AIRO GYN, MITO and MaNGO Groups

Gabriella Macchia [1], Donato Pezzulla [2], Maura Campitelli [3], Concetta Laliscia [4], Andrei Fodor [5], Paolo Bonome [2], Lorena Draghini [6], Edy Ippolito [7], Vitaliana DE Sanctis [8], Martina Ferioli [9], Francesca Titone [10], Vittoria Balcet [11], Vanessa DI Cataldo [12], Donatella Russo [13], Lisa Vicenzi [14], Sabrina Cossa [15], Simona Lucci [3], Savino Cilla [16], Francesco Deodato [17], Maria Antonietta Gambacorta [18], Giovanni Scambia [19], Alessio Giuseppe Morganti [9], Gabriella Ferrandina [19]

Multicenter Study > Int J Gynecol Cancer. 2022 Jun 6;32(6):732-739. doi: 10.1136/ijgc-2021-003237.

125 lesioni, 15 centri

Stereotactic body radiotherapy in oligometastatic cervical cancer (MITO-RT2/RAD study): a collaboration of MITO, AIRO GYN, and MaNGO groups

Gabriella Macchia [1], Alessia Nardangeli [2], Concetta Laliscia [3], Andrei Fodor [4], Lorena Draghini [5], Pier Carlo Gentile [6], Giuseppe Roberto D'Agostino [7], Vittoria Balcet [8], Paolo Bonome [9], Martina Ferioli [10], Rosa Autorino [2], Lisa Vicenzi [11], Arcangela Raguso [12], Simona Borghesi [13], Edy Ippolito [14], Vanessa Di Cataldo [15], Savino Cilla [16], Elisabetta Perrucci [17], Maura Campitelli [2], Maria Antonietta Gambacorta [18 19], Francesco Deodato [9 19], Giovanni Scambia [20], Gabriella Ferrandina [20]

Artificial Intelligence In Medicine 139 (2023) 102536

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journal homepage: www.elsevier.com/locate/artmed

Check for updates

Gynecological cancer prognosis using machine learning techniques: A systematic review of the last three decades (1990–2022)

Joshua Sheehy [a], Hamish Rutledge [a], U. Rajendra Acharya [b], Hui Wen Loh [c], Raj Gururajan [d], Xiaohui Tao [e], Xujuan Zhou [e], Yuefeng Li [f], Tiana Gurney [a], Srinivas Kondalsamy-Chennakesavan [a,*]

Results

validated. Twenty-three individual studies compared ML and non-ML methods. Study quality was highly variable and methodologies, statistical reporting and outcome measures were inconsistent, preventing generalized commentary or meta-analysis of performance outcomes.

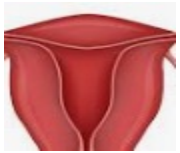
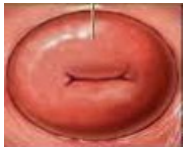
Background

No accurate prediction models for clinical outcomes of gynaecologic oligometastatic cancer treated with SBRT exist

Nor is it clear if attaining a complete response (CR) following SBRT influences oncologic outcomes

AIM

- a **pooled analysis** of a large real-world multicentric dataset of ovarian, uterine and cervical oligometastatic lesions treated with SBRT in terms of **efficacy and clinical outcomes**
- in addition, an **exploratory machine learning analysis** able to identify the covariates able to predict the complete response after SBRT

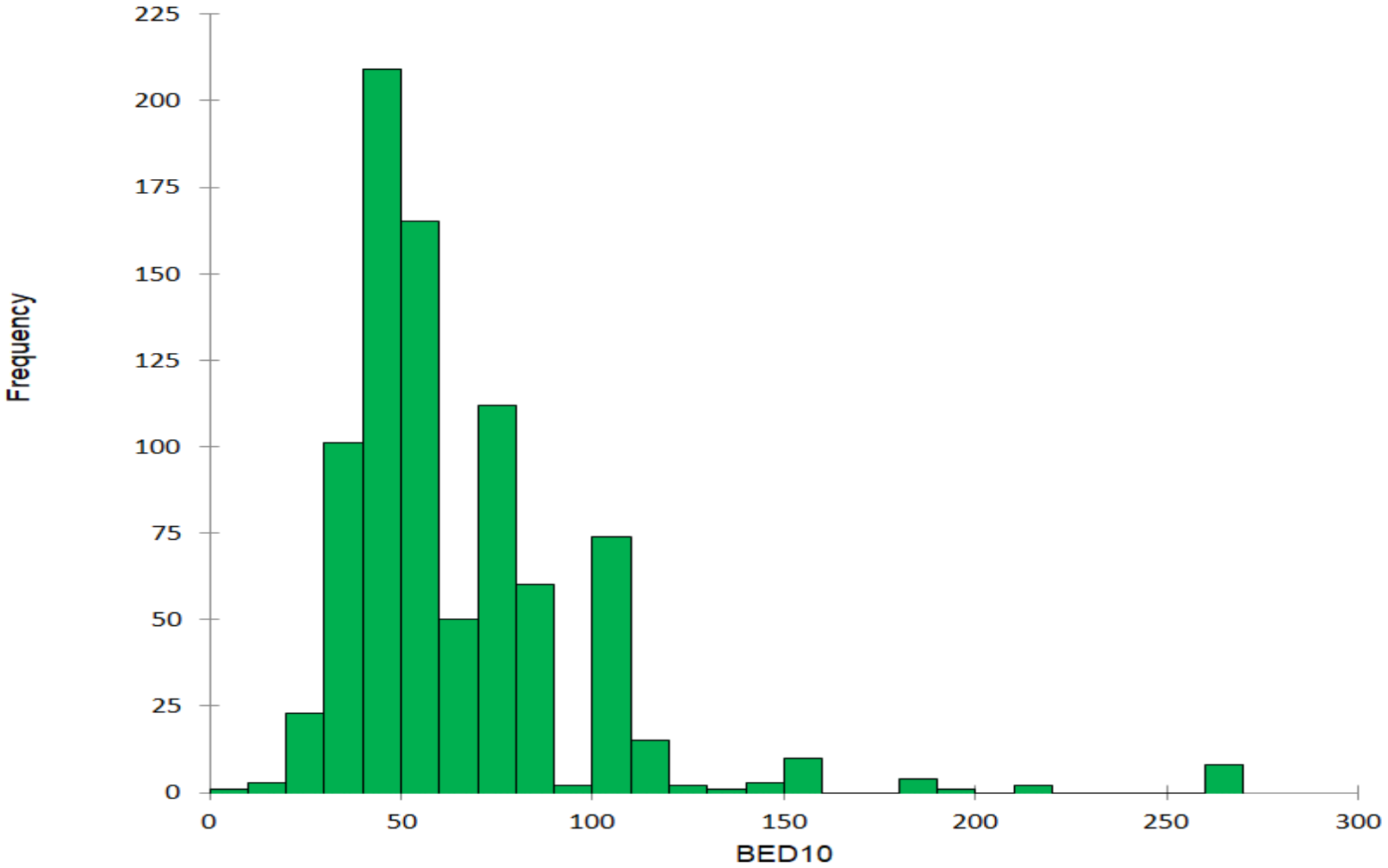




Hystology		OC	UC	CC	All
Number of patients		261	157	83	501
Median age,yrs (range)		60 (28-85)	69.7 (36-90.5)	58 (30-92)	63 (28-92)
ECOG	0	111	111	56	357
	1	40	40	22	91
	2	6	6	4	48
	3	0	0	1	5
Comorbidities per patient	None	42	42	42	238
	1	45	45	21	144
	2	34	34	9	73
	3	16	16	5	27
	4	7	7	3	12
	>5	6	6	3	10
	n.a.	6	6	0	6
Patients undergoing surgery before SBRT	no	7	7	27	37
	yes	150	150	56	459
	n.a.	0	0	0	5
Patients undergoing chemotherapy before SBRT	no	42	42	21	63
	yes	110	110	61	427
	n.a.	5	5	1	6
Patients undergoing previous in site radiotherapy	no	91	91	55	393
	yes	25	25	28	62
	n.a.	0	0	0	5

Abbreviations: yrs: years; OC: ovarian cancer; UC: uterine cancer; CC: cervical cancer; ECOG: Eastern Cooperative Oncology Group performance status; n.a.: not available; SBRT: stereotactic body radiotherapy

					ALL
GTV (range)		4.5 (0.04-68.4)	4 (0.05-181.1)	4.3 (0.2-105.1)	4 (0.04-181)
PTV (range)		17.9 (0.4-136.4)	13.7 (2-196.5)	15.7 (1.8-278.5)	16 (0.4-278.5)
Equipment	LINAC	401	115	223	739
	Ciberknife	34	10	44	88
	Tomotherapy	11	1	5	17
	Gammaknife	3	0	0	3
Techniques	VMAT	434	104	165	703
	IMRT	5	20	93	118
	3DCRT	8	1	14	23
	n.a.	0	0	0	0
Referral dose	Specific isodose	235	48	120	403
	Isocenter	159	31	88	278
	Target mean	55	46	64	165
Median Total dose (range)		25 (5-75)	35 (10-75.2)	35 (10-60)	30 (5-75.2)
Median number of fractions (range)		4 (1-13)	5 (1-10)	5 (1-10)	5 (1-13)
Median BED10 (range)		50.7(7.5-262.5)	59.5 (20-156.1)	59.5 (15-151.2)	51 (7.5-262.5)

Abbreviations: OC: ovarian cancer; UC: uterine cancer; CC: cervical cancer; GTV, gross tumor volume; PTV,


225
200
175
150
125
100
75
50
25
0
Frequency
0
50
100
150
200
250
300
BED10

AIRO2023

Efficacy

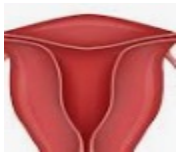
Overall series	
CR	**538 (63.7%)**
PR	189 (22.3%)
SD	80 (9.5%)
PD	38 lesions (4.5%)

Objective response rate (CR+PR): 85.9%

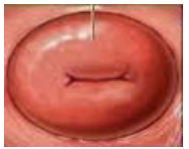
Clinical benefit (CR+PR+SD): 91.8%

OC
CR rate of 65.2%,

UC
CR rate of 64.0%



CC
CR rate of 58.4%



Variables selection and modelling

Least Absolute Shrinkage and Selection Operator (LASSO) method's application to all series→poor ability to forecast CR

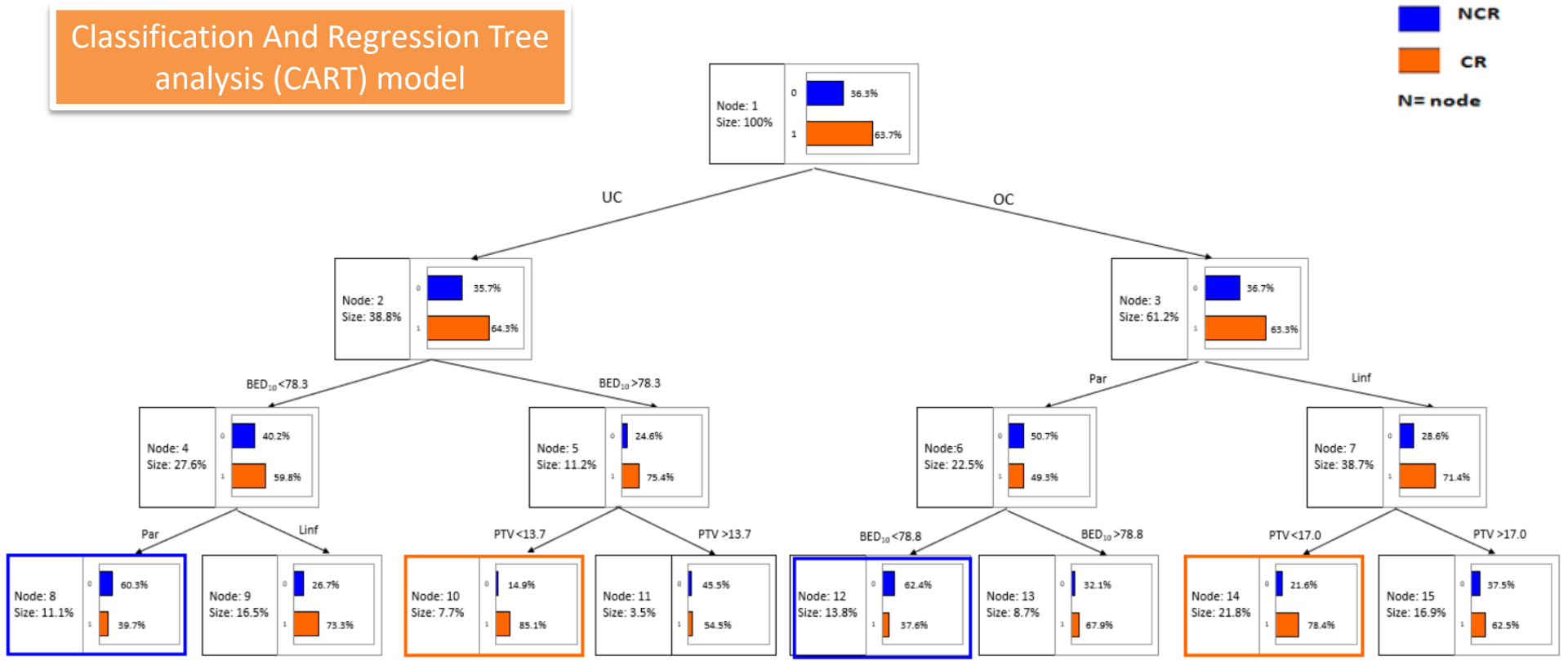
Analysis of the 3 malignancies separately

3 covariates predicted CR for ovarian or uterin lesion (LASSO coefficent not zero)

No covariates predictive for CR in cervical cancer lesions

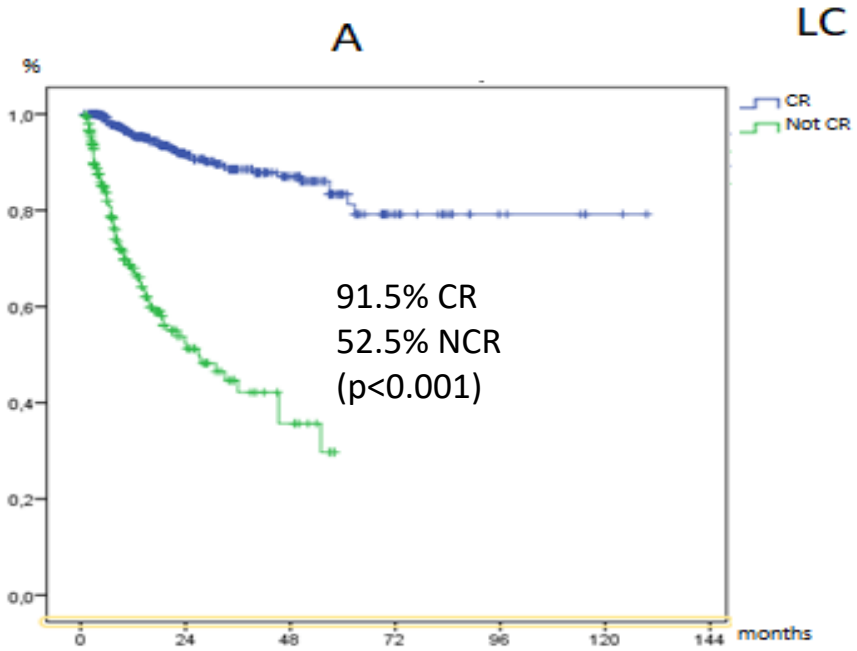
Oligometastatic/persistent/recurrent gynecologic lesion

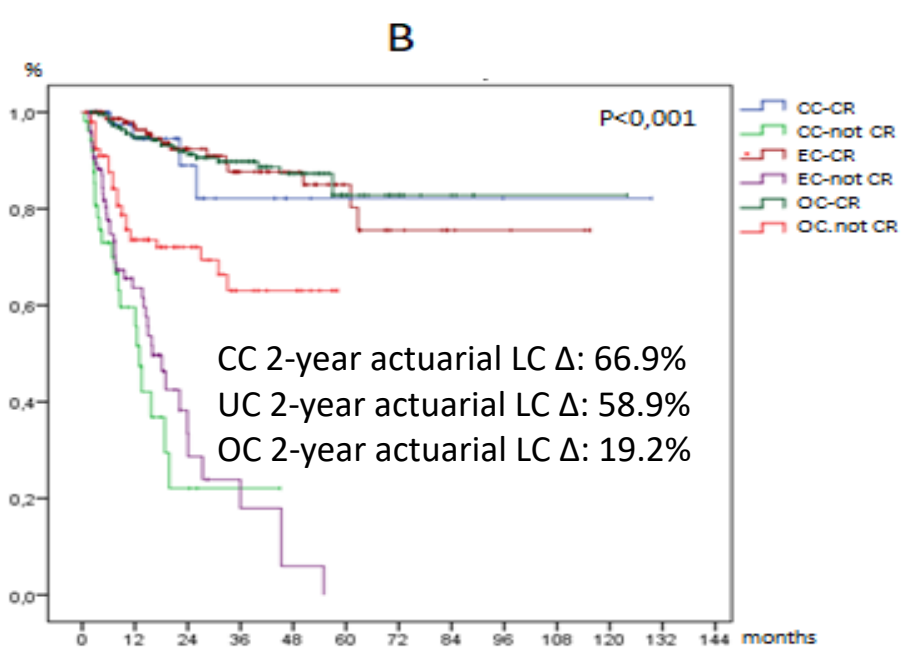
Classification And Regression Tree analysis (CART) model



Clinical Outcomes 1

The overall 2-year actuarial local control rate: 79.2%

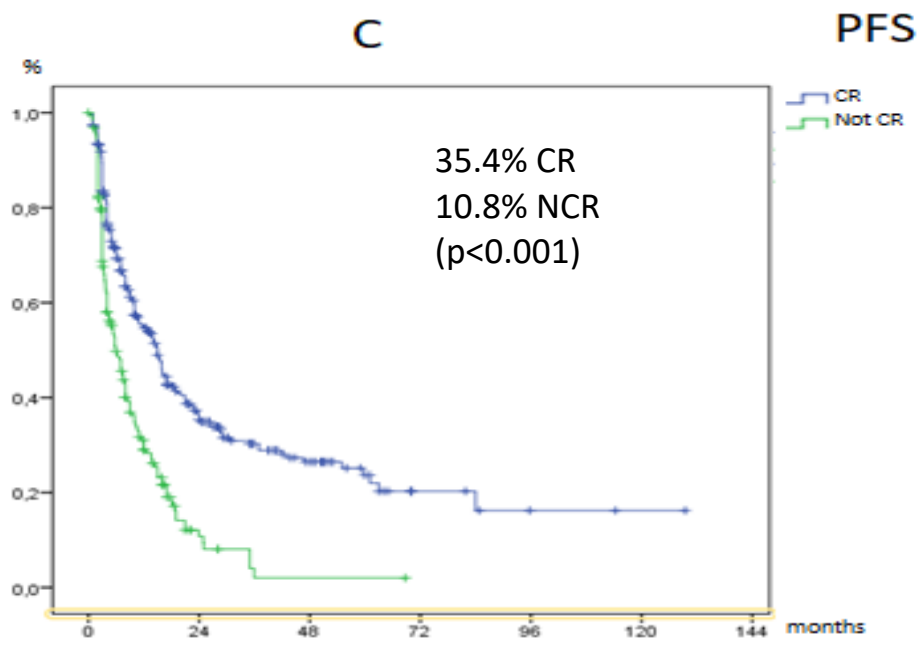


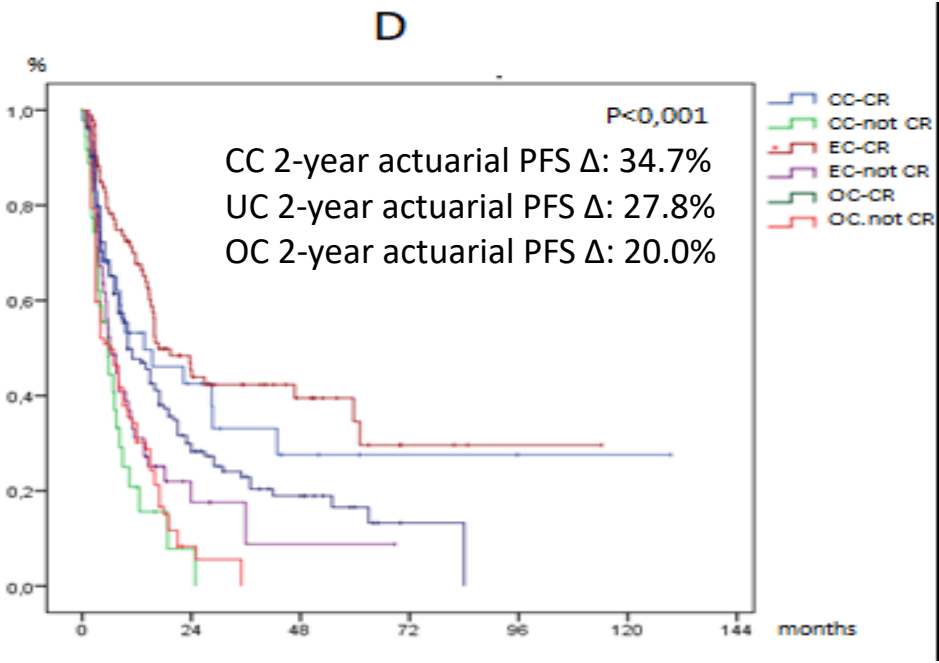


Median follow-up was 125 months (range: 1-316 months)

Clinical Outcomes 2

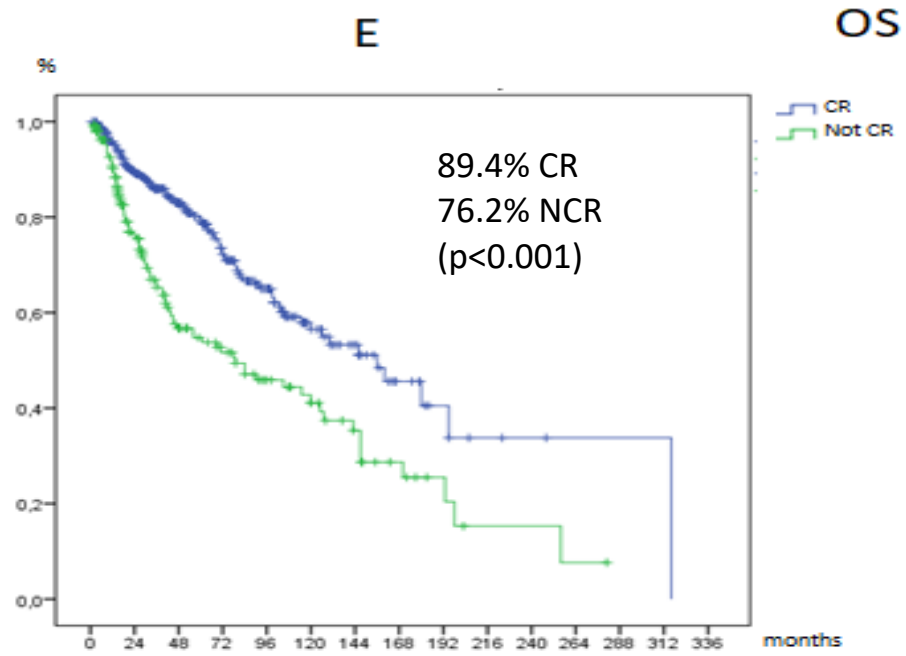
The overall 2-year actuarial PFS rate: 27.3%

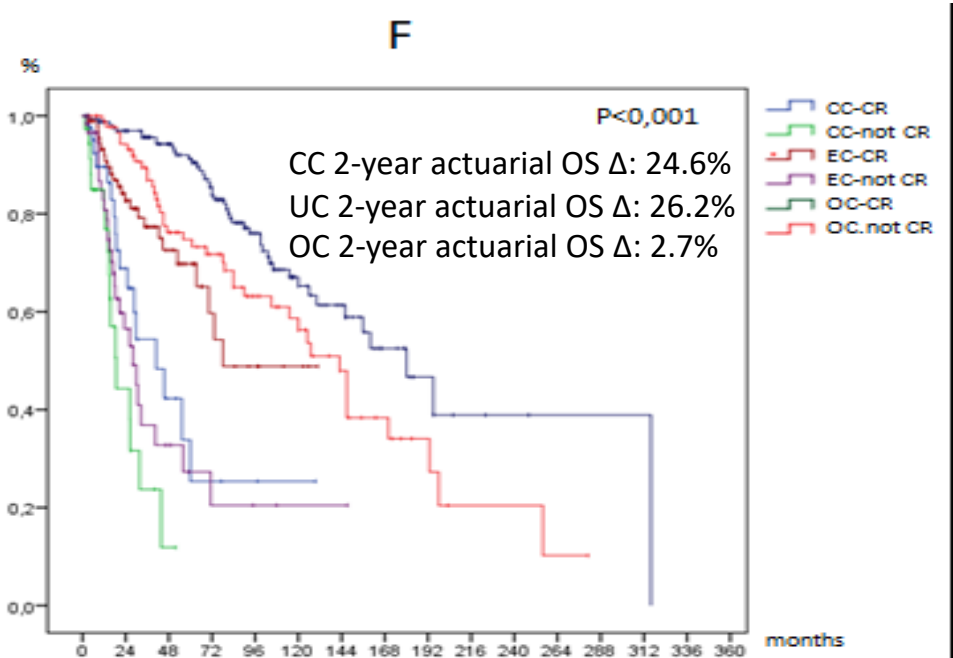




Clinical Outcomes 3

The overall 2-year actuarial OS rate: 84.7%





Key points

- **21 radiation therapy centres have combined their data on 846 lesions from 501 patients** in an effort to identify complete response predictors and to strengthen the role of SBRT in the GYN setting
- The achievement of **complete response** acts as a **major driver**
- **SBRT** gave **a high** and **long-lasting Local Control rate (2-year rate: 79.2%)**
- **A robust and consistent CART model** employing 4 clinical variables, which **may lead oncologists via the rising chance of CR**
- For **OC** lesions, **the type of lesion (lymph node or parenchyma)** was the most important variable, whereas for UC lesions, the BED_{10} was the most important one.
- the **likelihood of receiving a complete response increases with decreasing volume** for both the ovarian and the uterine lesions. The size of the lesion offers for the radio-oncologist another degree of freedom on which he can partially infer
- For the setting of cervical cancer, however, it was not possible to identify any variables that were sufficiently predictive to create a model. The **lack** of some input factors, such as the **HPV status or other genetic/ epigenetic variables** able to better determine the core biology of the disease, **or the minimal** number of **inputs** might be the cause of this failure

Limits and strength

- the retrospective nature of the data.

- This ML model is based on a modest number of clinical and dosimetric parameters→ other variables with potential influence on outcome prediction may be overlooked.

- The model was developed utilizing readily available data, which did not necessitate costly and time-consuming data processing (as in radiomics or genomics), resulting in more basic and understandable model that was also accurate. The low number of input variables should be viewed as a gain because such models will be less likely to overfit and easier to understand

Conclusions

- every effort must be made to obtain a **complete response** because seems to affects the outcomes

- the capacity to forecast it using artificial intelligence is critical in **boosting the chance of SBRT effectiveness** and driving treatment choices

- Further prospective studies to define doses, fractionations and volumes are needed, as well studies on the combination of SBRT with radiotherapy sensitizer, targeted drugs and immunotherapy.

Molise ART

Grazie