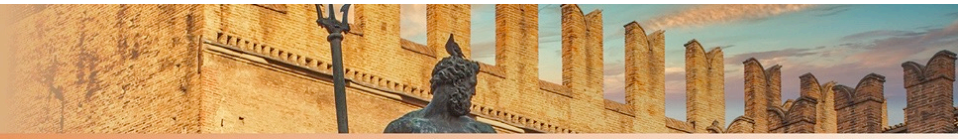
Can external beam radiotherapy replace interventional radiotherapy?

Andrea Vavassori

Divisione Radioterapia - Unità Brachiterapia
Istituto Europeo di Oncologia - Milano

Associazione Italiana Radioterapia e Oncologia clinica

Società Italiana di Radiobiologia



DICHIARAZIONE

Relatore: Andrea Vavassori

Come da nuova regolamentazione della Commissione Nazionale per la Formazione Continua del Ministero della Salute, è richiesta la trasparenza delle fonti di finanziamento e dei rapporti con soggetti portatori di interessi commerciali in campo sanitario.

- Posizione di dipendente in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Consulenza ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Fondi per la ricerca da aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazione ad Advisory Board **(NIENTE DA DICHIARARE)**
- Titolarità di brevetti in compartecipazione ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazioni azionarie in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Altro

Han. Trends in the utilization of BT in cervical cancer in the United States. IJROB 2013

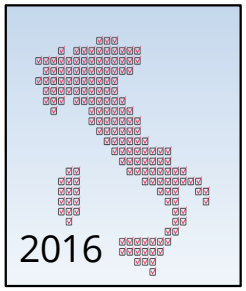
Gill. National Cancer Data Base analysis of RT consolidation modality for cervical cancer: the impact of new technological advancements IJROB 2014

Eifel. Patterns of RT practice for patients treated for intact cervical cancer in 2005 to 2007: a quality research in radiation oncology study IJROB 2014

- SEER (Surveillance Epidemiology and End Results)
- NCDB (National Cancer Data Base)
- Quality Research in Radiation Therapy

a gradually decreased use of **IRT**

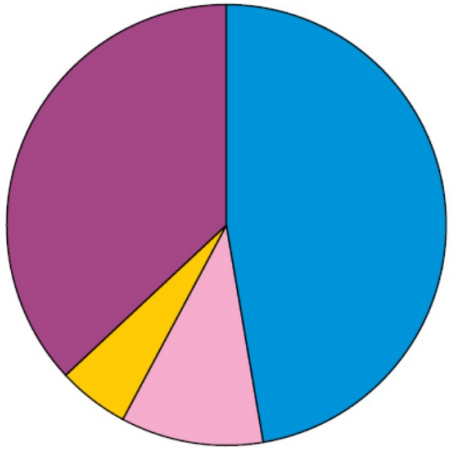
an increased use of **IMRT** and **SBRT**



A national survey of AIRO (Italian Association of Radiation Oncology) brachytherapy (Interventional Radiotherapy) study group

Rosa Autorino, MD, PhD[1], Lisa Vicenzi, MD[2], Luca Tagliaferri, MD, PhD[1], Carlo Soatti, MD[3], Prof. Gyeorgy Kovacs, MD, PhD[4], Cynthia Aristei, MD[5]

J Contemp Brachytherapy 2018; 10, 3: 254–259



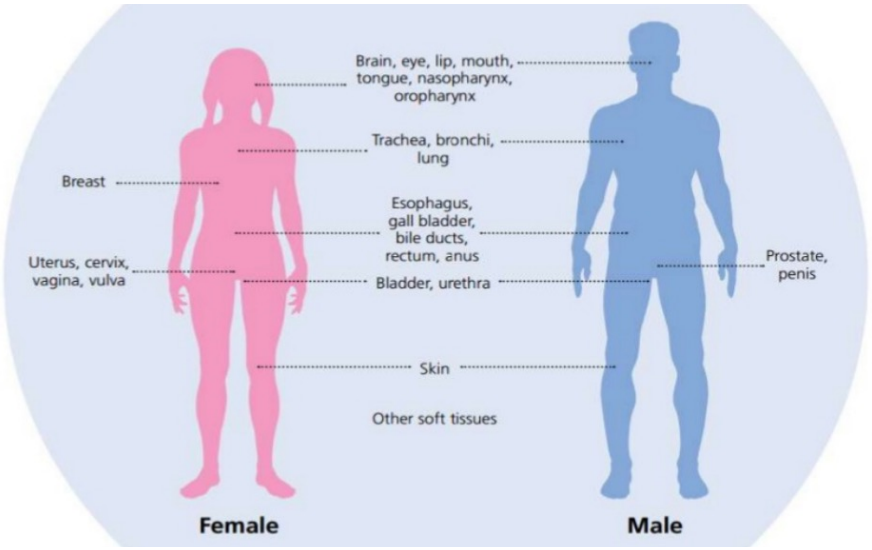
>50% of centres did not deliver IRT treatments because of **lack of skilled personnel**

- Lack of personel (47%)
- Lack of expertise (11%)
- Need to update equipment (5%)
- CPSTS/TIME consuming (7%)
- Not specified (30%)

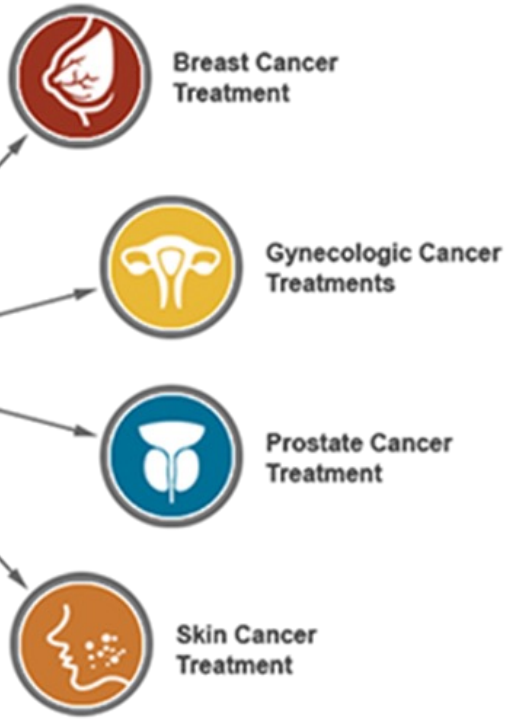
Some patients cannot be treated by IRT:

- tumor dimensions and/or locations
- anatomical variations
- risk of bleeding
- medical comorbidities that preclude anesthesia

  especially in the interstitial procedures
- patient's refusal due to anxiety or discomfort


Brain, eye, lip, mouth, tongue, nasopharynx, oropharynx
Trachea, bronchi, lung
Breast
Esophagus, gall bladder, bile ducts, rectum, anus
Uterus, cervix, vagina, vulva
Bladder, urethra
Prostate, penis
Skin
Other soft tissues
Female
Male

EBRT
vs
IRT


Breast Cancer Treatment
Gynecologic Cancer Treatments
Prostate Cancer Treatment
Skin Cancer Treatment

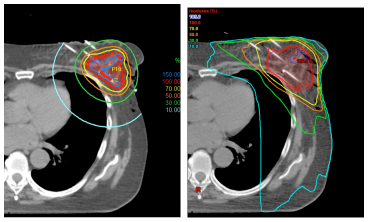
Radiotherapy and Oncology 122 (2017) 17–23
Contents lists available at ScienceDirect
Radiotherapy and Oncology
journal homepage: www.thegreenjournal.com

Breast brachytherapy

Multicatheter interstitial brachytherapy versus intensity modulated external beam therapy for accelerated partial breast irradiation: A comparative treatment planning study with respect to dosimetry of organs at risk

Tibor Major*, Gábor Stelczer, Csilla Pesznyák, Norbert Mészáros, Csaba Polgár

- **IMRT** vs HDR-BT
- APBI: 7 x 4.3 Gy

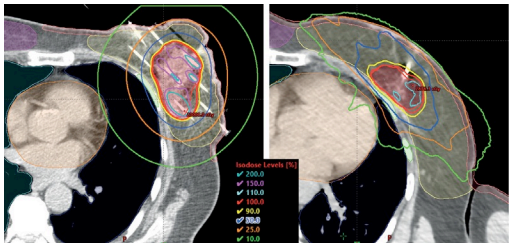


The target volume can be appropriately irradiated by both techniques, but MIBT spares OAR better than IMRT

Multicatheter interstitial brachytherapy versus stereotactic radiotherapy with CyberKnife for accelerated partial breast irradiation: a comparative treatment planning study with respect to dosimetry of organs at risk

András Herein[1,2], Gábor Stelczer[1,2], Csilla Pesznyák[1,2], Georgina Fröhlich[1,3], Viktor Smanykó[1], Norbert Mészáros[1,4], Csaba Polgár[1,4], Tibor Major[1,4]
Radiol Oncol 2021; 55(2): 229-239.

- **CK** vs HDR-BT
- APBI: 4 x 6.25 Gy

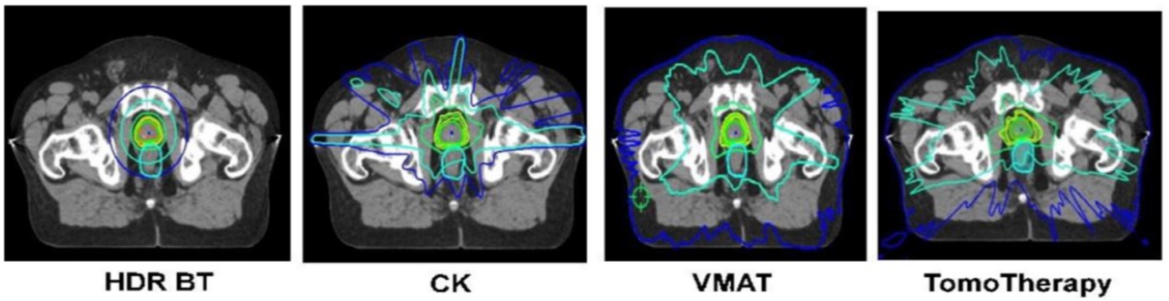


The target can be properly irradiated by both techniques with similar dose distributions and high dose conformity

Medical Dosimetry 47 (2022) 61–69
Medical Dosimetry
journal homepage: www.meddos.org

Assessment of HDR brachytherapy-replicating prostate radiotherapy planning for tomotherapy, cyberknife and VMAT

Romena de Chavez, MSc[†,#,*], Garry Grogan, MSc[†], Ben Hug, MSc[¶], Kate Howe, BSc[‡], Alice Grigg, BSc[§], David Waterhouse, PhD[†,#], Jonathan Lane, MSc[†], Alan Glyde, BSc[‡], Elizabeth Brown, PhD[‡], Sean Bydder, BHB, MBChB, MBA, MPH, FRANZCR[†,¶], David Pryor, BSc, MBBS, FRANZCR[‡], Cathy Hargrave[‡,§], Paul H. Charles, PhD[‡,§,**,††,1,2], James Hellyer, MSc[#], Martin A. Ebert, PhD[†,¶,‖]



SBRT cannot achieve the same high intraprostatic doses as HDR BT while respecting the OAR constraints

BUT…

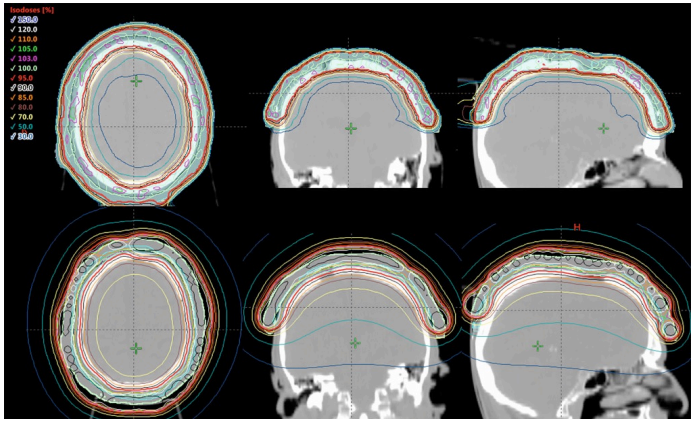
Physician preference remains the most significant factor in the nonutilization of IRT

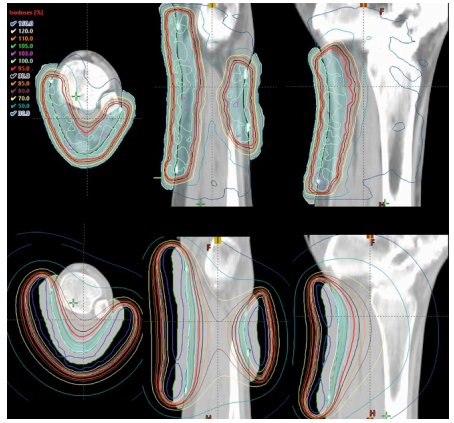
Strahlenther Onkol (2021) 197:547–554
https://doi.org/10.1007/s00066-021-01759-4

ORIGINAL ARTICLE

Dosimetric comparison of volumetric modulated arc therapy (VMAT) and high-dose-rate brachytherapy (HDR-BT) for superficial skin irradiation with significant curvature in one or more planes

Rachel J. Wills[1] · Gerry Lowe[1] · Caroline L. Jones[2] · Peter J. Hoskin[1,3]





14 pts HDR-BT or VMAT (scalp and lower limbs)

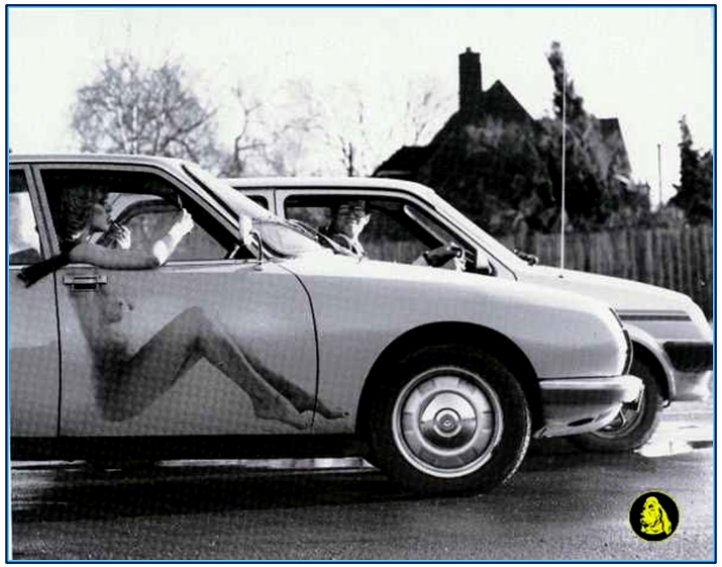
Maximum skin surface dose: HDR-BT > VMAT

Volumes of OAR: VMAT < HDR-BT → **TPS?**

Applied Radiation Oncology 2015

Non-brachytherapy alternatives in cervical cancer radiotherapy: Why not?

Sarah Kilic, BA, MA; Bernadette Cracchiolo, MD, MPH; Omar Mahmoud, MD, PhD



- Cervical cancer is the 3rd / 4th most common cancer
- **IRT is the gold standard boost** (improves OS & LC)

ELSEVIER
Int. J. Radiation Oncology Biol. Phys., Vol. 71, No. 4, pp. 1272–1278, 2008

0360-3016/08/$–see front matter
doi:10.1016/j.ijrobp.2008.03.032

2008

PHYSICS CONTRIBUTION

IMAGE-GUIDED RADIOTHERAPY FOR CERVIX CANCER: HIGH-TECH EXTERNAL BEAM THERAPY VERSUS HIGH-TECH BRACHYTHERAPY

Dietmar Georg, Ph.D., Christian Kirisits, Ph.D., Martin Hillbrand, M.Sc., Johannes Dimopoulos, M.D., and Richard Pötter, M.D., Ph.D.

Strahlenther Onkol (2022) 198:93–109
https://doi.org/10.1007/s00066-021-01867-1

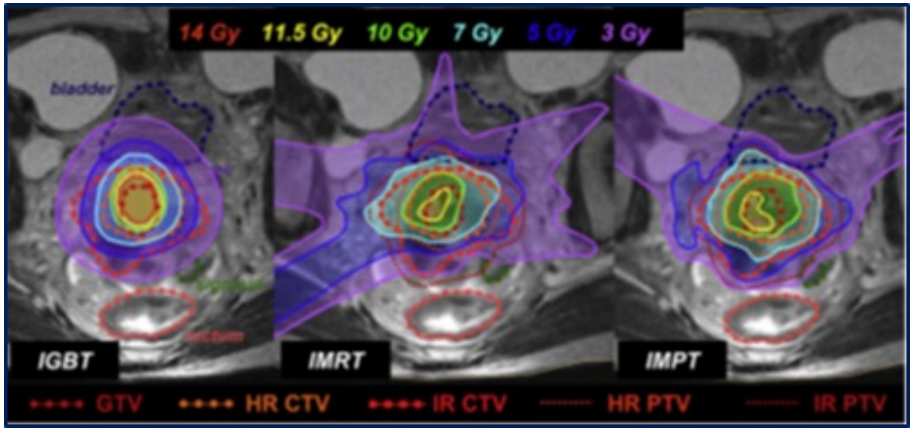
REVIEW ARTICLE

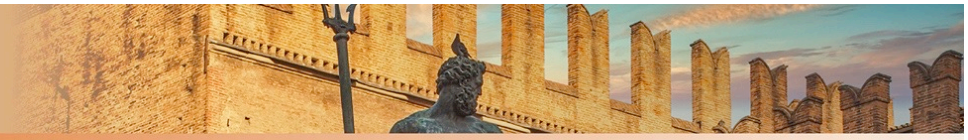
The value of brachytherapy in the age of advanced external beam radiotherapy: a review of the literature in terms of dosimetry

Tibor Major[1,2] · Georgina Fröhlich[1,3] · Péter Ágoston[1,2] · Csaba Polgár[1,2] · Zoltán Takácsi-Nagy[1,2]

The superiority of IRT is explained by its unparalleled dose distribution:

- low integral dose
- sharp dose gradient
- maximum OAR sparing
- high doses to tumor





Review Article
Ann Transl Med 2017;5(10):207

External beam techniques to boost cervical cancer when brachytherapy is not an option—theories and applications

Omar Mahmoud[1,2], Sarah Kilic[2], Atif J. Khan[1,2], Sushil Beriwal[3], William Small Jr[4]

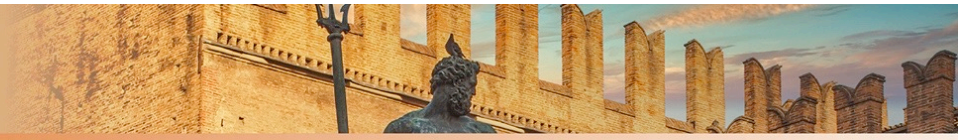
The **applicator** inserted in the target volume eliminates the requirement of additional margins to account for set up error and/or to adapt to changes in bladder/rectal filling

The continuous non-systemic cervical motion can be as large as 18 mm

Mean interfractional cervical motion:

- 2.3-16 mm in the anterioreposterior
- 2.7-8 mm in the superior-inferior
- 0.3-10 mm in the lateral directions

Jadon. A systematic review of organ motion and image-guided strategies in external beam radiotherapy for cervical cancer. Clin Oncol 2014



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Limited number of studies evaluated
high-tech EBRT as IRT alternative

Table 2 Studies using non-brachytherapy techniques to deliver boost dose in cervical cancer treatment

Study	NGyn (cervical)	MFU (month)	Boost technique	WPI dose/dose per Fx	Boost dose/dose per Fx	Median OTT (days)	Tumor $BED_{\alpha/\beta}$	NT (rectal/bladder) $BED_{3/\beta}$	LC (%)*	> G2 Tox (%)*
Kagei *et al.* [2003] (65)	25 [25]	139	Proton	50.4/1.8	36/2.5–4	63	110	166	75	4
Park *et al.* [2004] (66)	10 [10]	18	3DCRT	50/2	30/5	NR	105	NR	60	0
Chan *et al.* [2006] (49)	12 [8]	23	3DCRT	45–50/1.8–2	25.2/1.8–2	63.5	85–90	NR	83	17
Matsuura *et al.* [2007] (67)	7 [7]	17	3DCRT	45/1.8	20–24/1.2–1.6[@]	42	80	NR	86	0
Barraclough *et al.* [2008](18)	44 [38]	27	3DCRT	40–45/2–2.5	15–25/1.8–2.5	54	66–87	91–128	79	2
Mazzola *et al.* [2016](68)*	30 [30]	30	IMRT	54/1.8	66/2.2	NR	80.5	114	80	NR
Haas *et al.* [2012] (69)	6 [6]	14	SBRT (CK)	50.4–^61.2/1.8	19.5/6.5–20/4	NR	78–85	109/110[@]	100	0
Marnitz *et al.* [2013] (16)	11 [11]	6	SBRT(CK)	50.4/1.8	30/6	50	108	103/137	100	0
Kubicek *et al.* [2013] (70)	11 [4]	4	SBRT (CK)	45/1.8	25/5	NR	77	110	75	25
Hsieh *et al.* [2013] (71)	9 [9]	36	SBRT (HT)	50–50.4/2–1.8	16–27/2–4.5	79	91.2	197/189[@]	78	0
Mantz [2016] (72)**	42 [30]	62	SBRT (NR)	45/1.8	40/8	NR	125	245	78.6	0

- retrospective
- small population size
- various follow up time
- heterogeneous in dose
- heterogeneous in fractionation
- heterogeneous in technique

Review Article
Ann Transl Med 2017;5(10):207

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SIB-RT vs SBRT

If IRT is deemed inadequate before starting CT-RT, **IMRT with SIB** should be the suggested technique to deliver the total dose in a shorter duration

Conversely, **SBRT** should be the preferred route in cases when IRT is deemed not applicable towards the end of the conventionally fractionated CT-RT regimen

Review Article
Ann Transl Med 2017;5(10):207

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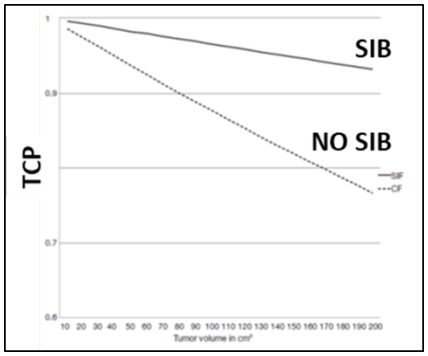
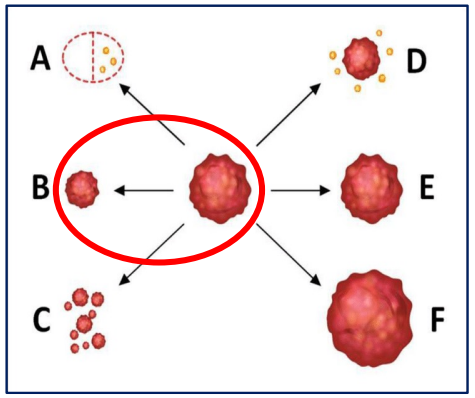
IMRT with SIB



The IMRT-SIB model may be preferred in the presence of **hypoxia** (hypoxic cells within cervical tumors 20–60%)

Adaptive replanning strategy to accentuate the precision by allowing modifications of the target volume due to **bladder/rectal infill** and/or any **anticipated tumor shrinkage**



Review Article
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SBRT

SBRT is capable of **emulating HDR-IRT dose distribution** (high inhomogeneous dose to the tumor & OAR sparing)

The aim of **hypofractionation** is to target rapid cervical cancer cell repopulation through **avoiding overall treatment time** prolongation

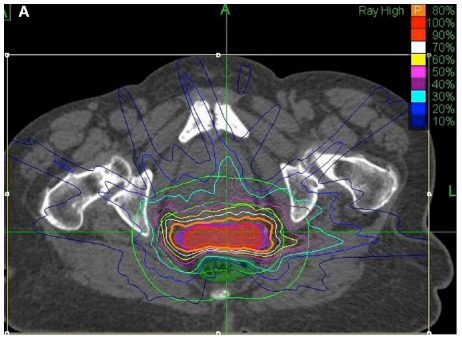
USA 2012

frontiers in ONCOLOGY

ORIGINAL RESEARCH ARTICLE
published: 21 March 2012
doi: 10.3389/fonc.2012.00025

CyberKnife boost for patients with cervical cancer unable to undergo brachytherapy

Jonathan Andrew Haas[1], Matthew R. Witten[2], Owen Clancey[2], Karen Episcopia[2], Diane Accordino[1] and Eva Chalas[3]*



- 6 pts
- IMRT (pelvis) 45 Gy
- IMRT (uterus) 50.4-61.2 Gy
- SBRT-CK (cervix) 19.5-20 Gy in 3-5 fr
- Fiducials (cervix and fornices)

- LC @1y 100%
- no G3-4

CK

Germany 2013

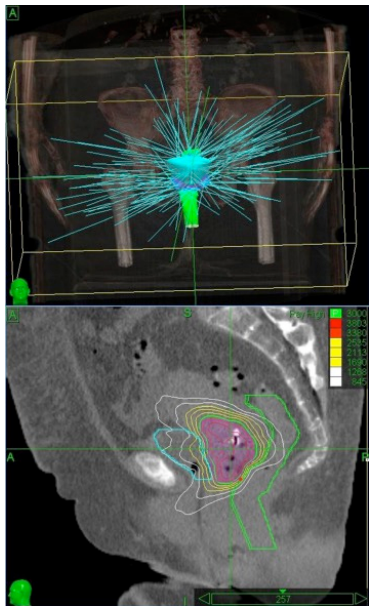
Marnitz *et al. Radiation Oncology* 2013, 8:109
http://www.ro-journal.com/content/8/1/109

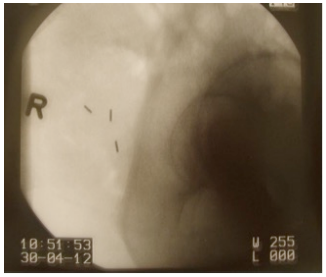
RADIATION ONCOLOGY

SHORT REPORT Open Access

Brachytherapy-emulating robotic radiosurgery in patients with cervical carcinoma

Simone Marnitz[1*], Christhardt Köhler[2], Volker Budach[1], Oliver Neumann[1], Anne Kluge[1], Waldemar Wlodarczyk[1], Ulrich Jahn[1], Bernhard Gebauer[3] and Markus Kufeld[4]





- 11 pts
- 3D-CRT 50.4 Gy
- SBRT-CK (cervix) 30 Gy in 5 fr
- Fiducials

- LC @6 months 100%
- no G3-4

Lee et al. Radiat Oncol (2021) 16:148
https://doi.org/10.1186/s13014-021-01877-4
Radiation Oncology

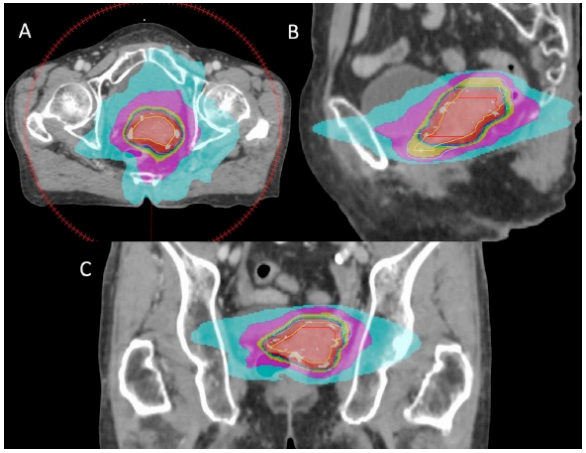
RESEARCH Open Access

Stereotactic ablative body radiotherapy boost for cervical cancer when brachytherapy boost is not feasible

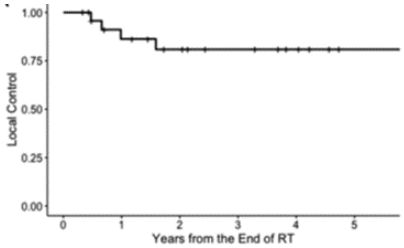
Tae Hoon Lee[1], Changhoon Song[2], In Ah Kim[2], Jae-Sung Kim[2], Yong Beom Kim[3], Kidong Kim[3], Jae Hong No[3], Dong Hoon Suh[3], Jin-Beom Chung[2] and Keun-Yong Eom[2*]

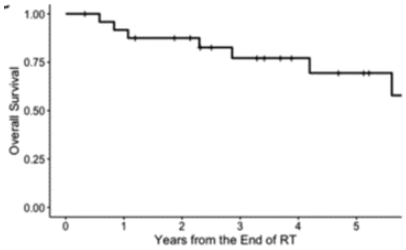
Korea 2021

- 25 pts
- 3D-CRT/IMRT 44-50.4 Gy in 25-28 fr
- SBRT (VMAT) 20-33 Gy in 4-6 fr
- median EQD2 75,5 Gy (69.3-92.2 Gy)



- no G4
- LC @5yy 80.9%
- OS @5yy 69.4%



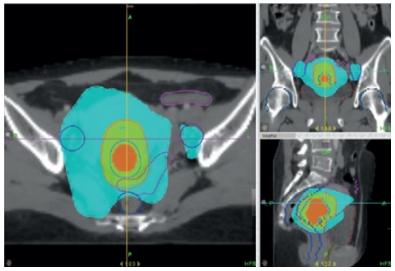


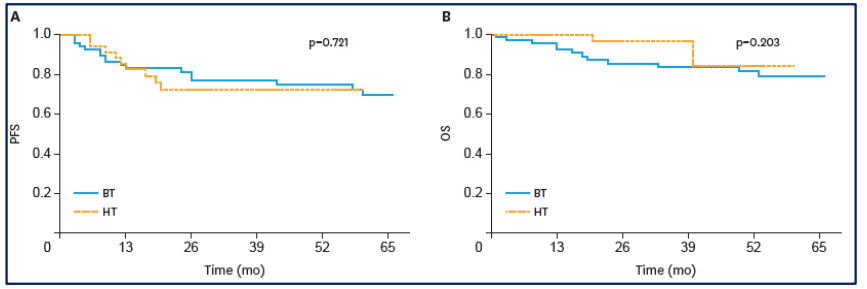
Korea 2020

J Gynecol Oncol. 2020 Jul;31(4):e42
JOURNAL OF GYNECOLOGIC ONCOLOGY

Comparing efficacy of high-dose rate brachytherapy versus helical tomotherapy in the treatment of cervical cancer

Seongmin Kim,[1,2] Sanghoon Lee,[2] Jin Hwa Hong,[2] Young Je Park,[3] Jae Yun Song,[2] Jae Kwan Lee,[2] Nak Woo Lee[2]





matched population 70 IRT pts vs 35 HT pts

- 3D-CRT 45-54 Gy
- SBRT (HT) 30 Gy in 10 fr
- HDR IRT 24-30 Gy in 6 fr

- PFS @5-yy IRT 72.6%
  HT 72.5%
- OS @5-yy IRT 78%
  HT 76.5%


WARNING

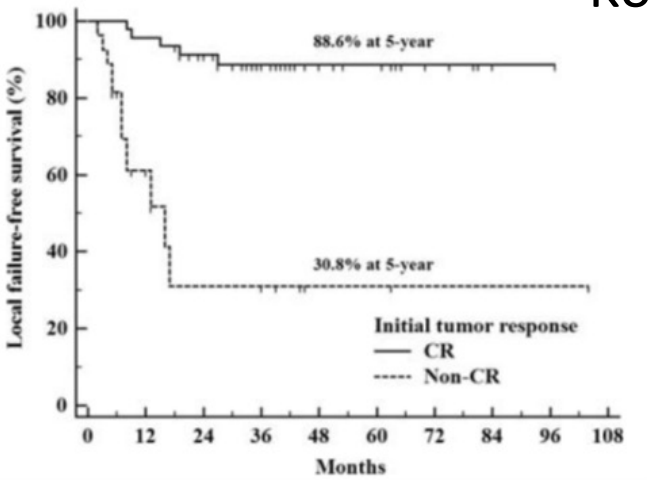
Korea 2018

Tumor Boost Using External Beam Radiation in Cervical Cancer Patients Unable to Receive Intracavitary Brachytherapy

Outcome From a Multicenter Retrospective Study (Korean Radiation Oncology Group 1419)

Haeyoung Kim, MD, Young Seok Kim, MD,† Ji Hyeon Joo, MD,† Keun-Yong Eom, MD,‡ Won Park, MD,§ Jin Hee Kim, MD,|| Jong Hoon Lee, MD,¶ Yeon Sil Kim, MD,# Seok Ho Lee, MD,** Kijung Ahn, MD,†† Yong Bae Kim, MD,‡‡ Me-Yeon Lee, MD,§§ and Sei Kyung Chang, MD||||*

(*Int J Gynecol Cancer* 2018;28: 371–378)



- 75 pts (multicentric)
- 3D-CRT box (pelvis) 40-54 Gy
- 3D-CRT / IMRT 9 – 35 Gy
- median EQD2 70 Gy (49.6-80.7 Gy)

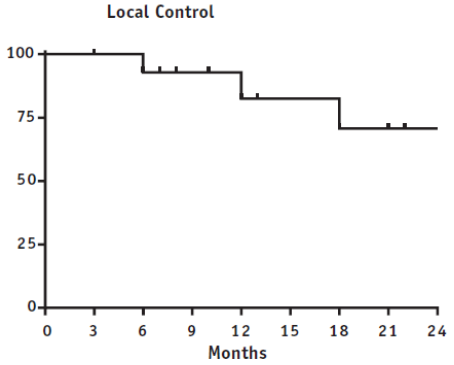
- **G3-4 12%**
- LC @5-yy 70%
- DFS @5-yy 54.7%
- OS @5-yy 75%

USA 2020

Clinical Investigation Int J Radiation Oncol Biol Phys, Vol. 106, No. 3, pp. 464–471, 2020

A Phase II Trial of Stereotactic Ablative Radiation Therapy as a Boost for Locally Advanced Cervical Cancer

Kevin Albuquerque, MD,*,† Vasu Tumati, MD,* Jayanthi Lea, MD,†,‡ Chul Ahn, PhD,§ Debra Richardson, MD,†,‡ David Miller, MD,†,‡ and Robert Timmerman, MD*,†

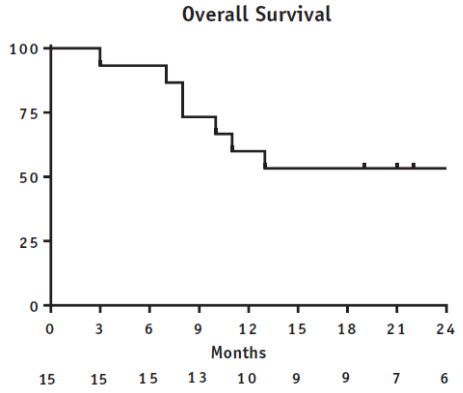


- phase II trial
- 15/21 pts: **closed for toxicity**

- IMRT 45 Gy
- SBRT 28 Gy in 4 fr (fiducials)

- **G5 3 pts**

- LC @2yy 70.1%
- PFS @2yy 46.7%
- OS @2yy 53.3%



USA 2021

Gynecologic Oncology 152 (2019) 540–547

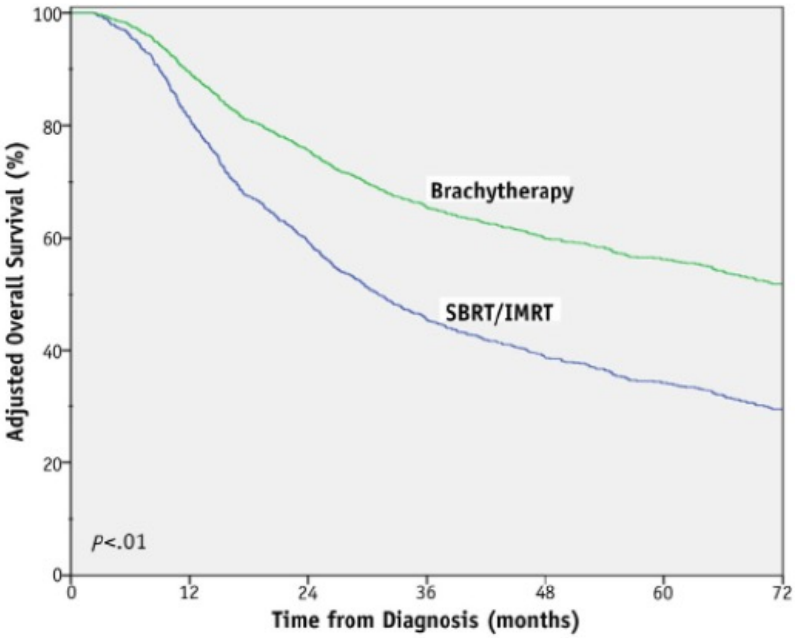
Contents lists available at ScienceDirect

Gynecologic Oncology

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

Brachytherapy: A critical component of primary radiation therapy for cervical cancer
From the Society of Gynecologic Oncology (SGO) and the American Brachytherapy Society (ABS)

Christine H. Holschneider [a,*], Daniel G. Petereit [b], Christina Chu [c], I-Chow Hsu [d], Yevgeniya J. Ioffe [e], Ann H. Klopp [f], Bhavana Pothuri [g], Lee-may Chen [h], Catheryn Yashar [i]



The declining utilization of IRT is coupled with increased mortality risk

JJCO Japanese Journal of Clinical Oncology

Japanese Journal of Clinical Oncology, 2019, 49(3) 270–275
doi: 10.1093/jjco/hyy187
Advance Access Publication Date: 20 December 2018
Original Article

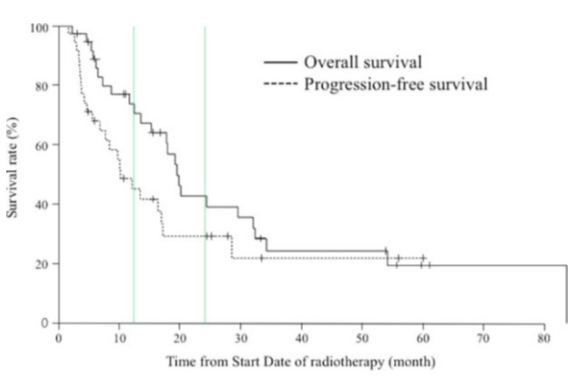
Original Article

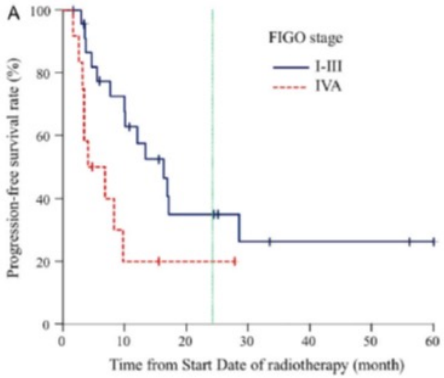
Clinical outcomes following conventional external beam radiotherapy boost in Japanese patients with cervical cancer who are ineligible for intracavitary brachytherapy

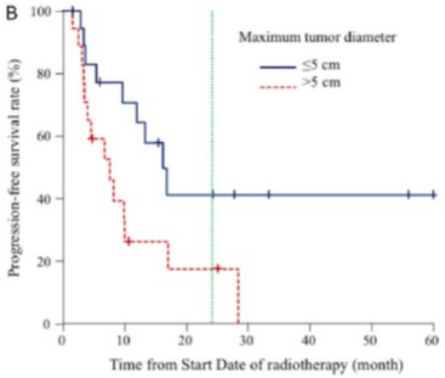
Kei Ito*, Takuya Shimizuguchi, and Katsuyuki Karasawa

Japan 2019

- 37 pts
- 3D-CRT pelvis + 3D-CRT boost
- Total dose 56 - 70 Gy
  - ➢ **PFS @2-yy 29%**
  - ➢ **OS @ 2-yy 43%**





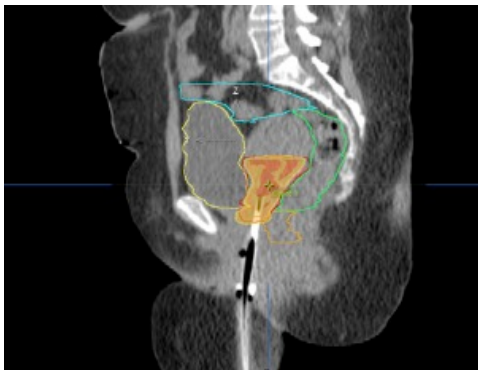


These findings stress the need for devising **alternative treatment approaches**

Intensity modulated radiation therapy boost in locally-advanced cervical cancer in the absence of brachytherapy

Int J Gynecol Cancer 2020;30:607–612.

Roberta Lazzari,[1] Giulia Riva,[2] Matteo Augugliaro,[1] Andrea Vavassori,[1] Samantha Dicuonzo,[1] Federica Cattani,[3] Stefania Comi,[3] Nicoletta Colombo,[4] Barbara Alicja Jereczek-Fossa[1,5]



Milano 2020

- 25 pts
- 3D-CRT / IMRT (pelvis) 45 - 50.4 Gy
- SBRT (cervix) 25 Gy in 5 fr

- No G3-4

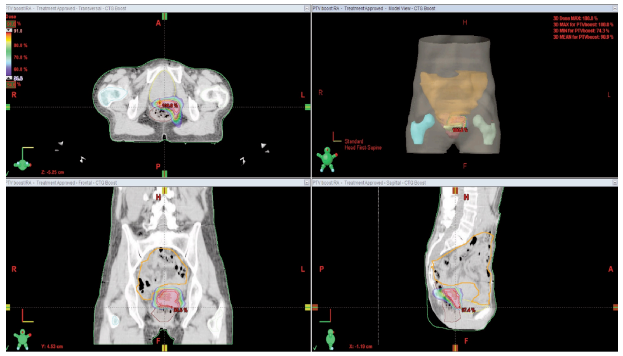
- LC @2-yy 78%
- PFS @2-yy 55%
- OS @2-yy 67%

Roma 2021

CANCER DIAGNOSIS & PROGNOSIS
1: 53-60 (2021) doi: 10.21873/cdp.10008

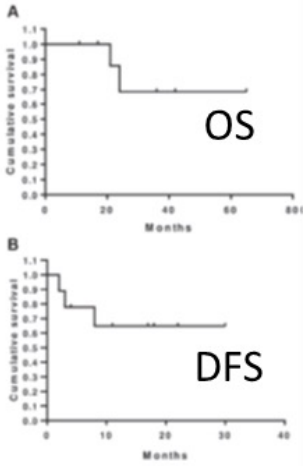
Stereotactic Body Radiation Therapy Boost in Patients With Cervical Cancer Ineligible for Brachytherapy

GIUSEPPE FACONDO*, GIANLUCA VULLO*, VITALIANA DE SANCTIS, MAURIZIO VALERIANI, ANNA MARIA ASCOLESE, MARIA MASSARO, DIMITRI ANZELLINI and MATTIA FALCHETTO OSTI

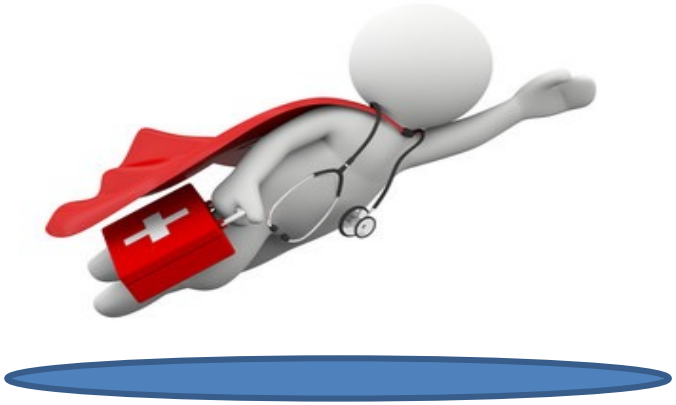


- 9 pts
- IMRT (pelvis) 50.4 + SIB (cervix +/- N) 61.6 Gy
- SBRT (cervix) 15-25 Gy in 3-5 fr
- median EQD2 80.8-92.4 Gy

- 1 pt local recurrence
- 2 pts PD
- OS @2-yy 70%



Salvage treatment or reirradiation



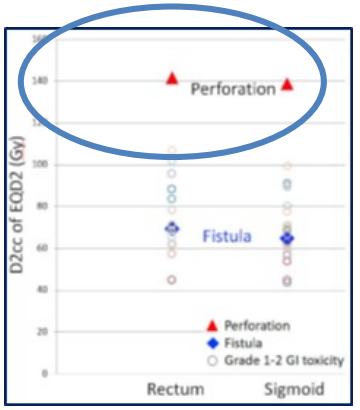
Taiwanese Journal of Obstetrics & Gynecology 60 (2021) 111–118
Contents lists available at ScienceDirect
Taiwanese Journal of Obstetrics & Gynecology
journal homepage: www.tjog-online.com

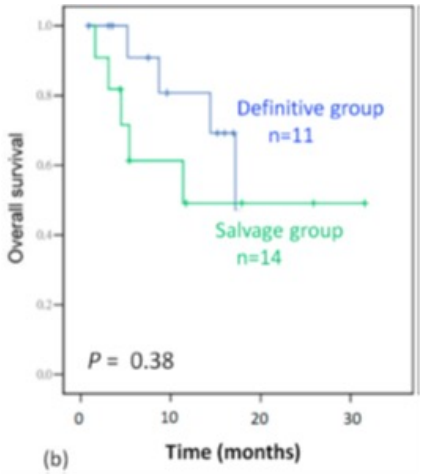
Original Article

Stereotactic body radiotherapy for pelvic boost in gynecological cancer patients with local recurrence or unsuitable for intracavitary brachytherapy

Hsin-Yi Cheng [a], Ji-An Liang [a, b], Yao-Ching Hung [b, d], Lian-Shung Yeh [d], Wei-Chun Chang [b, d], Wu-Chou Lin [b, d, e], Shang-Wen Chen [a, b, c, *]

Taiwan 2021





- 11 pts cervix/uterus
- 3D-CRT 45-65 Gy
- SBRT 25 Gy in 5 fr

- 14 **recurrent** cancer (5 reirradiation)
- 3D-CRT 50-65 Gy
- SBRT 10-30 Gy in 2-6 fr

- G3-4 2 pts
- OS @1yy 80.8% def
  49.1% rec

Hadi *et al. Radiation Oncology* (2022) 17:8
https://doi.org/10.1186/s13014-022-01981-z

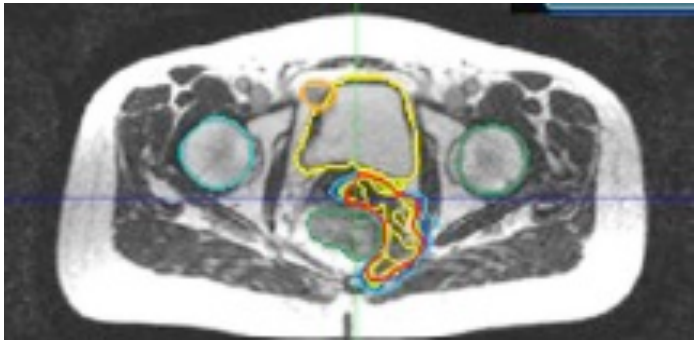
Radiation Oncology

RESEARCH Open Access

MR-guided SBRT boost for patients with locally advanced or recurrent gynecological cancers ineligible for brachytherapy: feasibility and early clinical experience

Indrawati Hadi[1], Chukwuka Eze[1*], Stephan Schönecker[1], Rieke von Bestenbostel[1], Paul Rogowski[1], Lukas Nierer[1], Raphael Bodensohn[1], Michael Reiner[1], Guillaume Landry[1], Claus Belka[1,2], Maximilian Niyazi[1,2] and Stefanie Corradini[1]

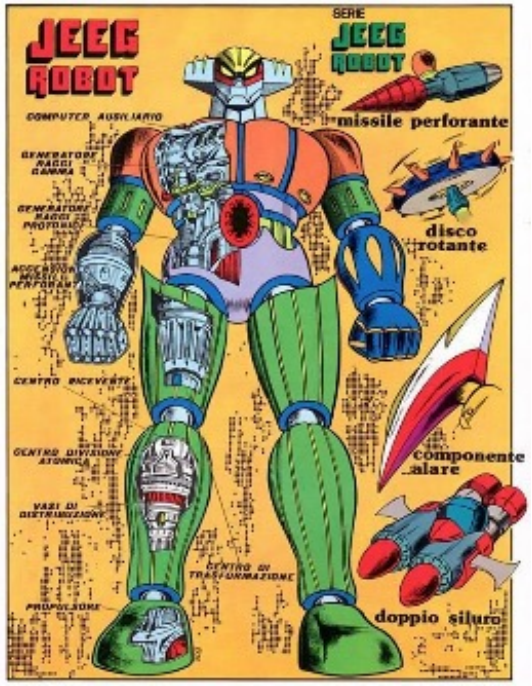
Germany 2022



- 10 pts (8 **recurrent** cervical / vaginal cancer)
- VMAT 45-55 Gy in 25 fr
- MRI-SBRT median 21 Gy in 4 fr
- median EQD2 73.6 Gy (69.3-83.9 Gy)

- no G3-4
- LC @5yy 80.9%
- OS @5yy 69.4%

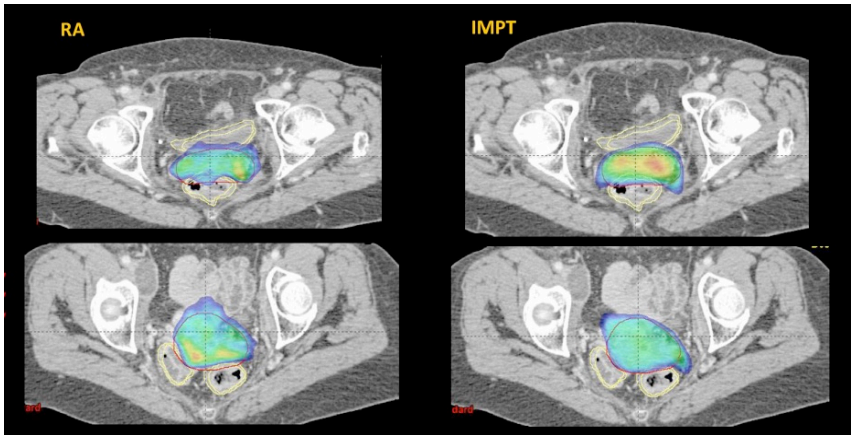
A new possibility: PROTON & CARBON ION



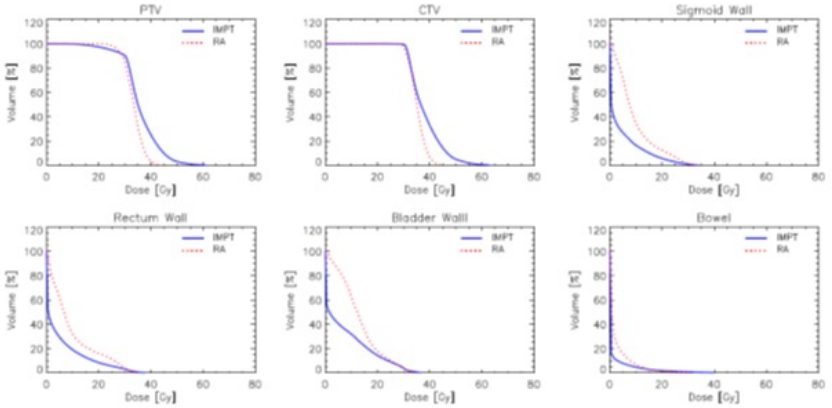
Int J Radiation Oncol Biol Phys, Vol. 87, No. 5, pp. 897–903, 2013

Intensity Modulated Proton Beam Radiation for Brachytherapy in Patients With Cervical Carcinoma

Alessandro Clivio, MSc,* Anne Kluge, MSc,† Luca Cozzi, PhD,* Christhardt Köhler, MD,‡ Oliver Neumann, MD,† Eugenio Vanetti, MSc,* Waldemar Wlodarczyk, MD,† and Simone Marnitz, MD†

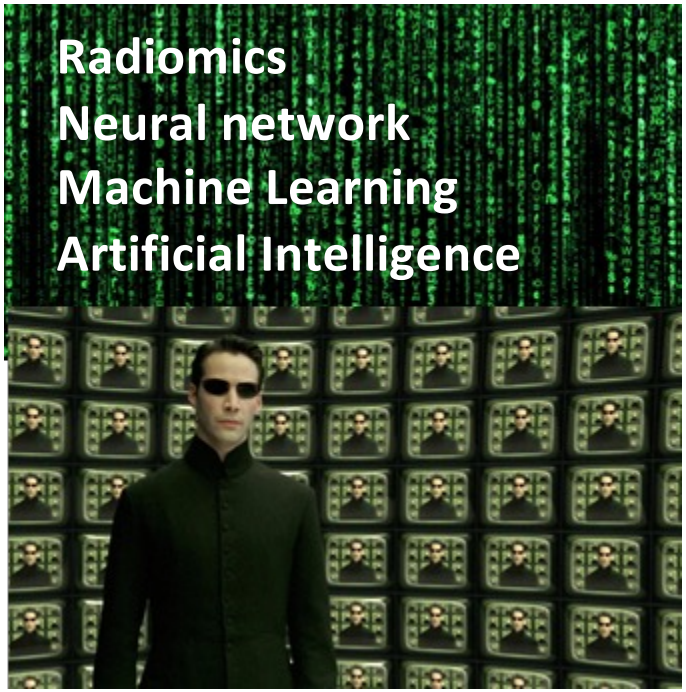


- 11 pts (cervical cancer)
- IMRT (VMAT or Helical) 50.4 Gy
- SBRT (CK) 30 Gy in 5 fr
- median EQD2 89.6 Gy



As an alternative

- IMPT 30 Gy in 5 fr
- Reference comparison plans with VMAT



Personalized treatment adaptation for improved treatment efficacy

IOP Publishing Phys. Med. Biol. 67 (2022) 12TR02 https://doi.org/10.1088/1361-6560/ac6fab

Physics in Medicine & Biology

IPEM Institute of Physics and Engineering in Medicine

CrossMark

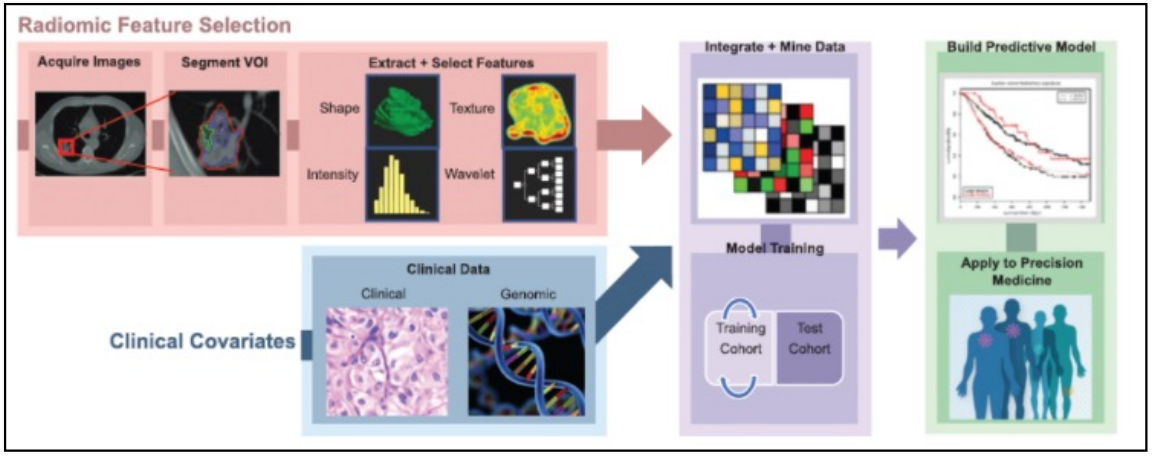
TOPICAL REVIEW

OPEN ACCESS

RECEIVED
13 December 2021

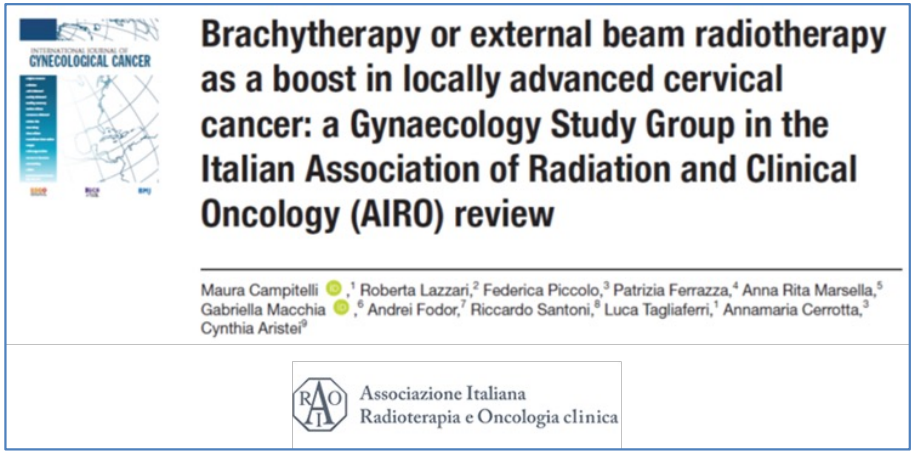
Radiomics-guided radiation therapy: opportunities and challenges

Hamid Abdollahi[1,2], Erika Chin[3], Haley Clark[4,11], Derek E Hyde[5], Steven Thomas[6], Jonn Wu[7,8], Carlos F Uribe[9,10] and Arman Rahmim[2,9,11,*]



CONCLUSIONS

Italy 2021



High-tech EBRT may be suitable only for carefully selected patients

Image guided IRT still remains the clear standard of care and efforts should be made to maintain expertise and skills

TAKE-HOME MESSAGE

Instead of comparing them, future studies should focus on **combining advanced EBT and advanced IRT** by using the inherent advantages of both options, to fully exploit the potential of advanced RT