Summing up- Overview and take home message on recent advances in Radiotherapy of carcinoma Cervix.

Dr Susovan Banerjee
Consultant Radiation Oncologist .
Medanta the Medicity
Gurgaon.

Many of the following slides has been collected (with or without modifications) from other eminent presenter's on the subject. – gratefully acknowledged.

Radiotherpy- role in management of cervical cancers

- **1.** Early stage cervical cancer

  -Post operative radiation

- 2. Locally advanced cervical cancer

  - External beam with concurrent chemo followed by brachytherapy.

Management of IB1: Radical Hysterectomy

- Landoni et al. Lancet 350: 535, 1997.
- RCT of 469 IB or IIA cervical cancer patients, 87 months. 54% of IB1 & 84% of IB2 surgical pts had ART.
- GOG 92 update IJROBP 65(1):169-176, 2006
- Post-op Chemo-RT: SWOG 8797

  Peters et al. JCO 18:1606-13, 2000

Summary of post op RT

High risk features – includes

LVI,

Bulky tumor

Stromal invasion.

- LN +
- + Margins
- + Parametria.

Conclusions

After Sx, RT is required in 50% of patients.

Sx followed by SX +RT gives same result with significantly added toxicity including sub acute toxicity.

NATIONAL CANCER INSTITUTE CLINICAL ANNOUNCEMENT

'CONCURRENT CHEMORADIATION FOR CERVICAL CANCER'

in February 1999

"Five major randomized phase III trials show that platinum based chemo when given concurrently with RT prolongs survival in women with locally advanced cervical cancer stages Ib2 - IVa as well as in women with stage I / IIa found to have metastatic pelvic lymph nodes, positive parametrial disease and positive surgical margins at the time of primary surgery "

Major Trials

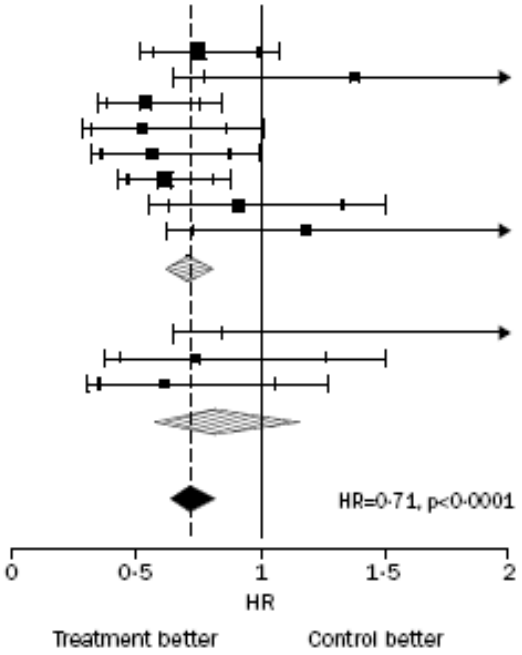
Author	Trial	No.	Investigational Arm	Control Arm	Tumor	Comment
Keys 1999	GOG 123	369	RT+ Cisplatin **Surgery**	RT alone **Surgery** →	Stage IB (≥ 4cm)	Combined with Surgery
Peters 2000	SWOG 8797	243	**Surgery** → RT+Cisplatin+5FU →	**Surgery** RT alone →	IA2, IB, IIA (with postop high risk)	Combined with Surgery
Morris & Eifel 1999 &.2004	RTOG 9001	388	RT+Cisplatin+5FU	**Extended -field RT**	IB or IIA (≥5cmorPLN+) IIB, III, IVA	**Surgical** staging for PALN
Whitney 1999	GOG 85	368	RT+Cisplatin+5FU	RT+ **Hydroxyurea**	IIB, III, IVA	**Surgical** staging for PALN
Rose 1999	GOG 120	526	RT+Cisplatin RT+Cisplatin + 5FU +Hydroxyurea	RT+ **Hydroxyurea**	IIB, III, IVA	**Surgical** staging for PALN
Pearcey 2002	NCIC	253	RT+Cisplatin	RT alone	IB2, IIA(≥5cm), IIB, III, IVA	No surgical staging for PALN

Concurrent Chemoradiation Results of Meta-analyses

Cochrane Collaborative Group (19 Trials) (4580 patients)

Green JA et al Lancet 358;781 (Sept. 2001)

- **19 RCTs between 1981 and 2000 : 4580 randomized patients**
- **Increase in OAS by 12% & RFS by 16% (absolute benefit) (p=0.0001)**
- **Greater benefit in patients in stages IB2 and IIB**
- **Decrease in local and systemic recurrence (p=0.0001)**

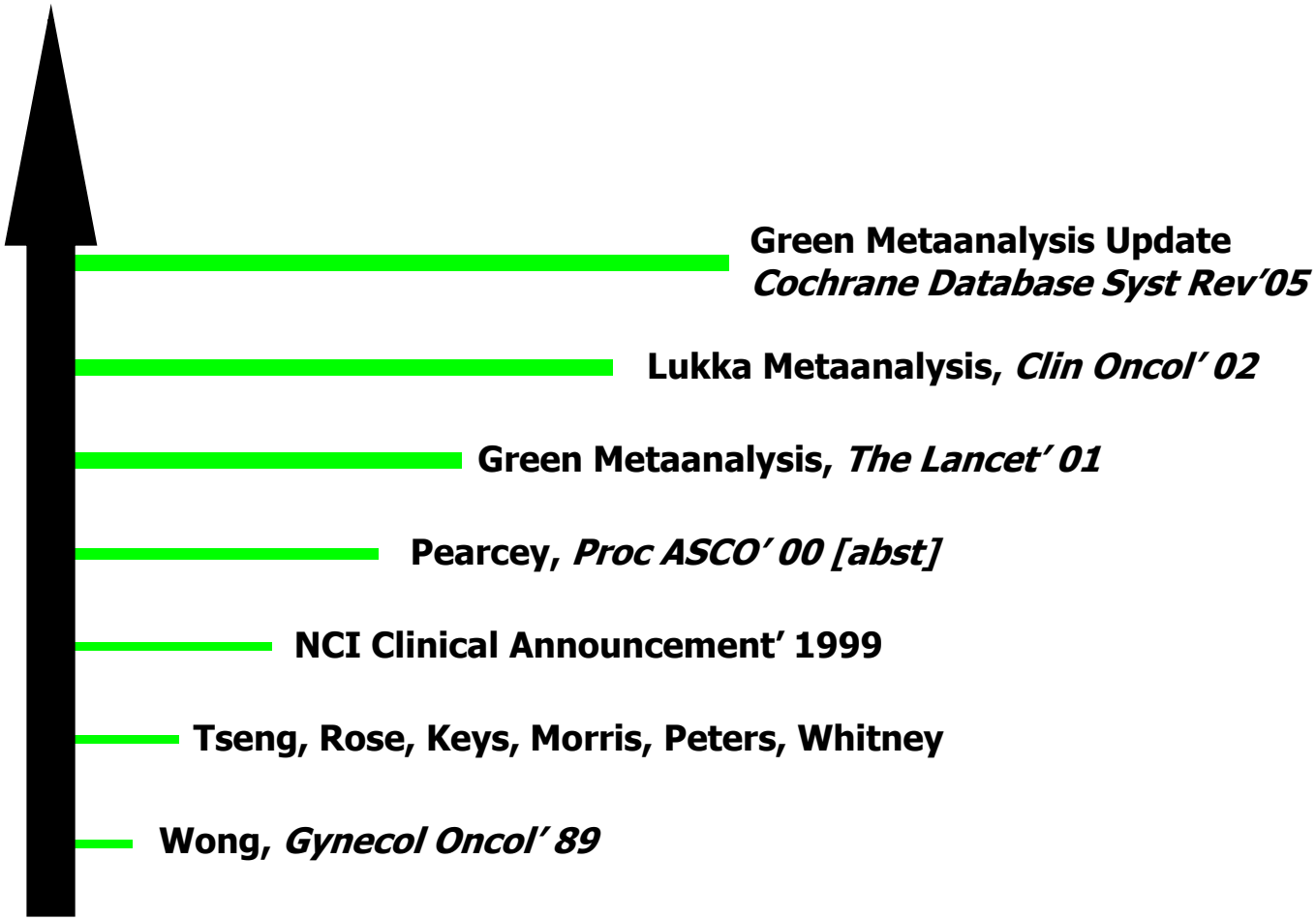


Update in July 2005: 21 trials and 4921 pts

- **Similar findings (absolute benefit: 10%)**
- **Test for Heterogeneity : Positive**
- **No data on late toxicities**

Cochrane Database Syst Rev. 2005 Jul 20;(3):CD002225.

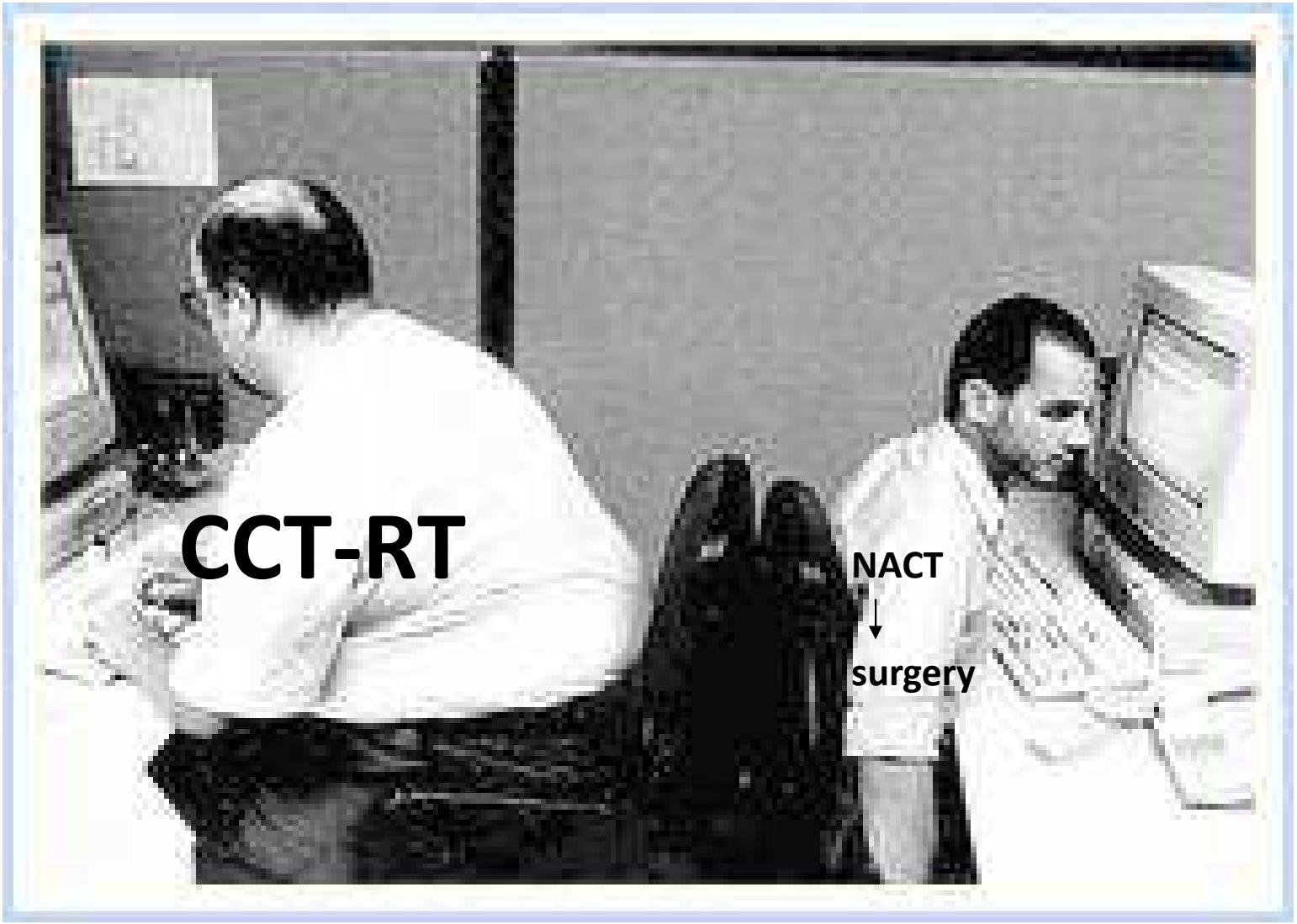
Chemoradiotherapy in Ca Cervix



Cochrane Meta-analysis of Individual Patient Data (2010)- MRC (UK) group

- 18 RCTs (15 eligible), N=3452
- 5-yr OS improved by 6% (p<-0.001), DFS (8% improvement at 5 years) & local control (9% improvement at 5 years) also significantly improved. Similar benefit for platinum (10 trials) vs non-platinum
- Greater benefit for adjuvant chemotherapy (2 trials, 19% OS benefit at 5 years)
- Trend towards greater benefit of OS for early stage disease: 10% improvement for IB-IIA, 7% for IIB, 3% for III-IV. No such trend for DFS.

Summarizing CTRT Vs NACT in cancer cervix



Slide of Dr Sanjoy….Just see among other things the NACT person is actually not working at all.

Pitfalls

- **Various 'standard treatments' in cntrl arm**

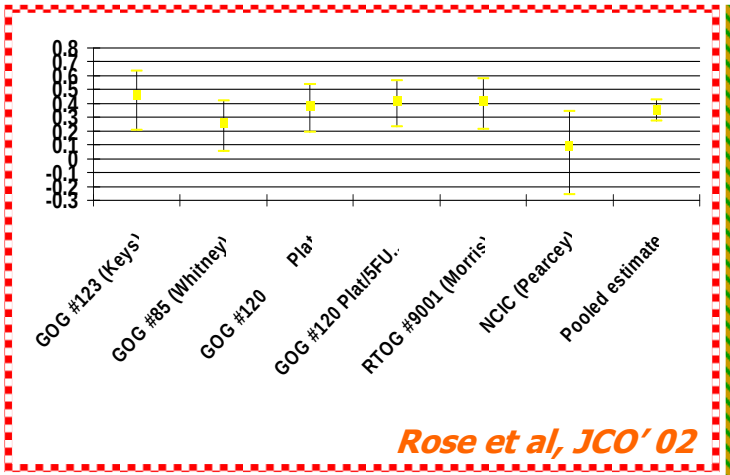
  eg RT alone arm
  RT+HU arm
  EFRT arm

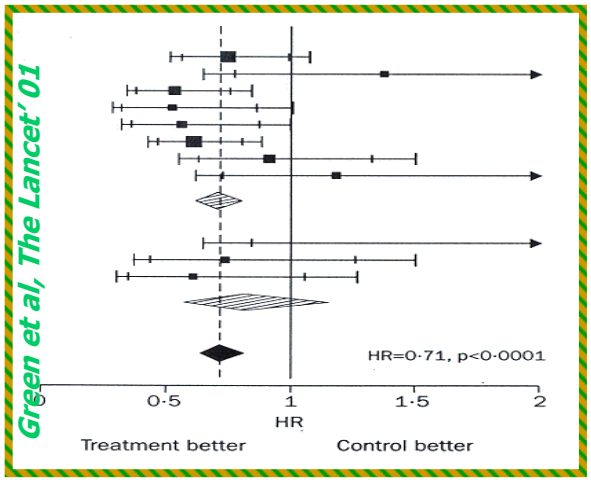
- **Differences in exp arm**

  eg CDDP alone arm
  CDDP+others
  Pre & Post-op RT
  Stage distribution

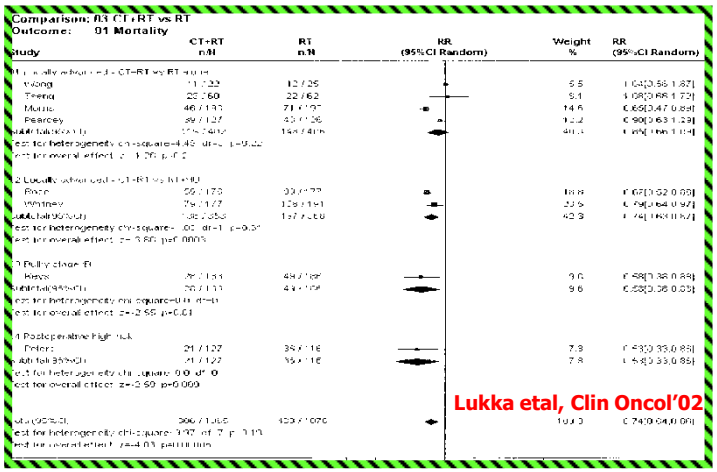
Sig heterogeneity & difficulty in interpretation in metaanalysis

Summary: *Evidence in favor*





Cochrane Meta-analysis of Individual Patient Data (2010)- MRC (UK) group



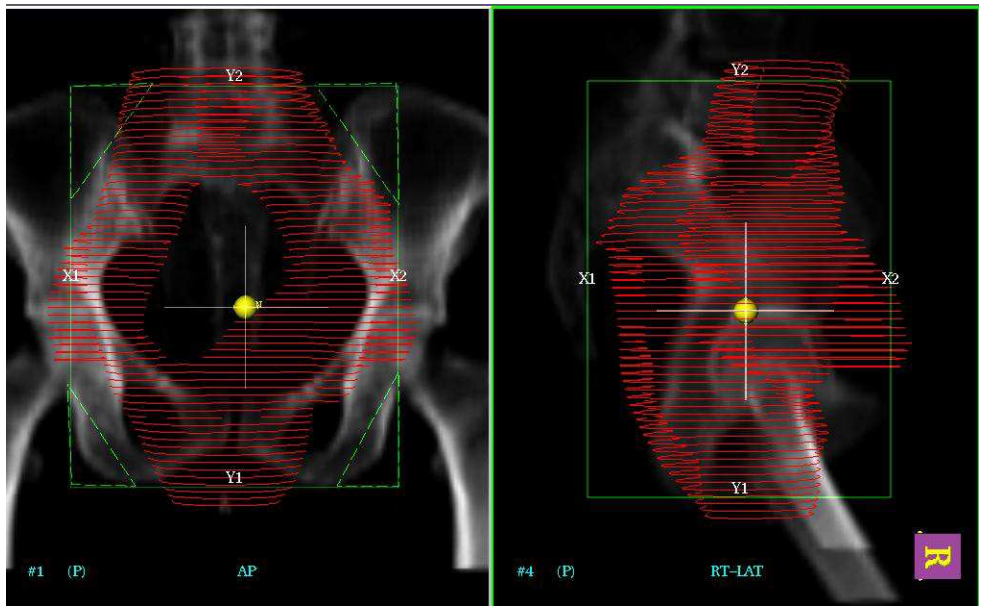
Green et al metaanalysis on concurrent chemoradiation: *update*

Cochrane Database Syst Rev, 2005;Jul 20: (3)

Meta-analysis. NR Datta et al ,Gyn Oncol 2017

Conventional vs Conformal technique in EBRT

- There is significant geographic miss superiorly (common iliac nodes) and laterally (external iliac nodes) in particular
- This correlates with the sites of intra-pelvic failures.
- Majority of failures are marginal. Of these most common is ABOVE the field.



Beadle et al. Int J Radiat Oncol Biol Phys (2010) 76:1396-1403

Need for improvement in techniques of EBRT

- To lower toxicity both acute and late.
- Treating PA nodes.
- Boost to pelvic nodes.
- Decrease morbidity and to treat second primary/recurrent disease if required.

Advancements in use of radiotherapy in treatment of cancer cervix

- Advances in techniques.

Diagnosis and Imaging.

Contouring techniques and target volumes.

Advancements in EBRT (3DRT/IMRt and now SBRT).

Advancements in Brachytherapy (IGRT/interstitial).

- Advancement in outcomes with Radiotherapy.

Role of PET CT

- Primary Tumor Staging
- Lymph Nodal Staging : Early Vs Advance Stages
- Pre-treatment Prognostic Value
- Treatment Plan Optimization : Single modality.
- Post-therapy Surveillance
  -Local
  -Regional (Pelvic / Para-aortic)
  -Distant Metastasis

MRI is the gold standard for evaluation of cervical cancer

Indications for MRI in cervical cancer

- Diagnosis
- Local staging of disease
- Burden of nodal Disease: Pelvic and para-aortic
- Supplements in RT Planning (EBRT) and is of definitive use in IGBT.
- Evaluation of response to treatment
- Recurrent disease/ fibrosis
- Prediction of response to treatment

CT vs MRI vs PET-CT for determination of nodal disease: Meta-analysis

- 41 studies
- PET or PET-CT showed highest sensitivity (82%) and specificity (95%)
- CT sensitivity 50% and specificity 92%
- MRI sensitivity 56% and specificity 91%

Choi et al. Cancer Science (2010)

Internal target motion

- Systematic review of organ motion -(Jadon R. et al. 2014).

- 39 relevant studies
- Patient specific motion: 5-40mm
- Population based margins would be large (up to 40mm)

uterine motion is greater than cervical.

Uterine motion is predominantly influenced by bladder filling, cervical motion by rectal filling.

Organ motion patterns are patient specific.

Individualised PTV margins and adaptive IGRT strategies have also been recommended to ensure target volume coverage while increasing OAR sparing.

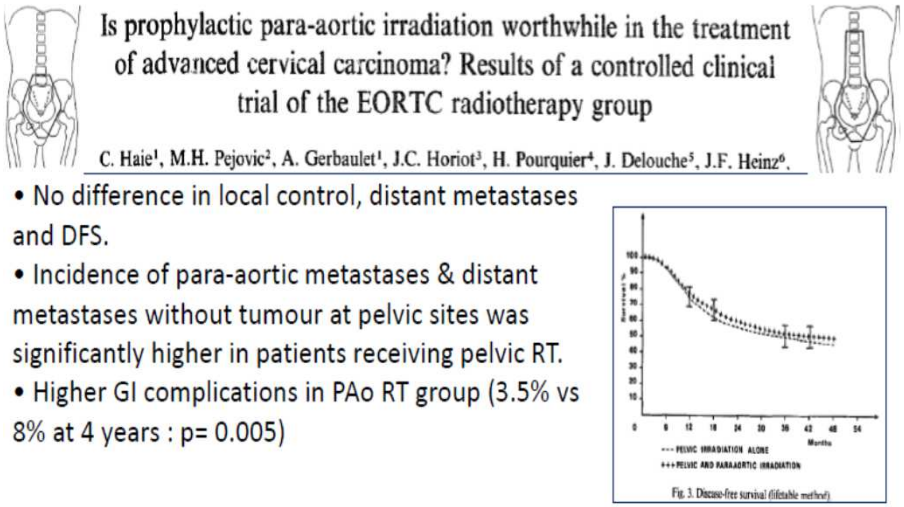
Note-Uninvolved uterus is not the most critical target 15-20mm is common for CTV-T LR to PTV margin.

For nodes 5-7 mm margin is considered adequate.

EFRT – Landmark trials.

RT versus RT and chemotherapy RTOG 90-01: 8 yr update J Clin Oncol 22(5):872-880, 2004
IB1, IB2, IIA (N+ or >5cm); IIB-IVA; PAN neg
(• 403 patients
• Arm 1: Extended field RT (pelvic & PAN)
RT dose: 45Gy pelvis and PAN + 40 Gy point A
• Arm 2: RT+CDDP
OS with CTRT was significantly greater than with EFRT (67% v 41% at 8 years; *P .0001).*

Overall reduction in the risk of disease recurrence of 51% (95% CI, 36% to 66%) for patients who received CTRT.
serious late complications of treatment was similar .
stage IB to IIB had better OS and DFS (*P .0001)*



Is prophylactic para-aortic irradiation worthwhile in the treatment of advanced cervical carcinoma? Results of a controlled clinical trial of the EORTC radiotherapy group

C. Haie[1], M.H. Pejovic[2], A. Gerbaulet[1], J.C. Horiot[3], H. Pourquier[4], J. Delouche[5], J.F. Heinz[6].

• No difference in local control, distant metastases and DFS.
• Incidence of para-aortic metastases & distant metastases without tumour at pelvic sites was significantly higher in patients receiving pelvic RT.
• Higher GI complications in PAo RT group (3.5% vs 8% at 4 years : p= 0.005)

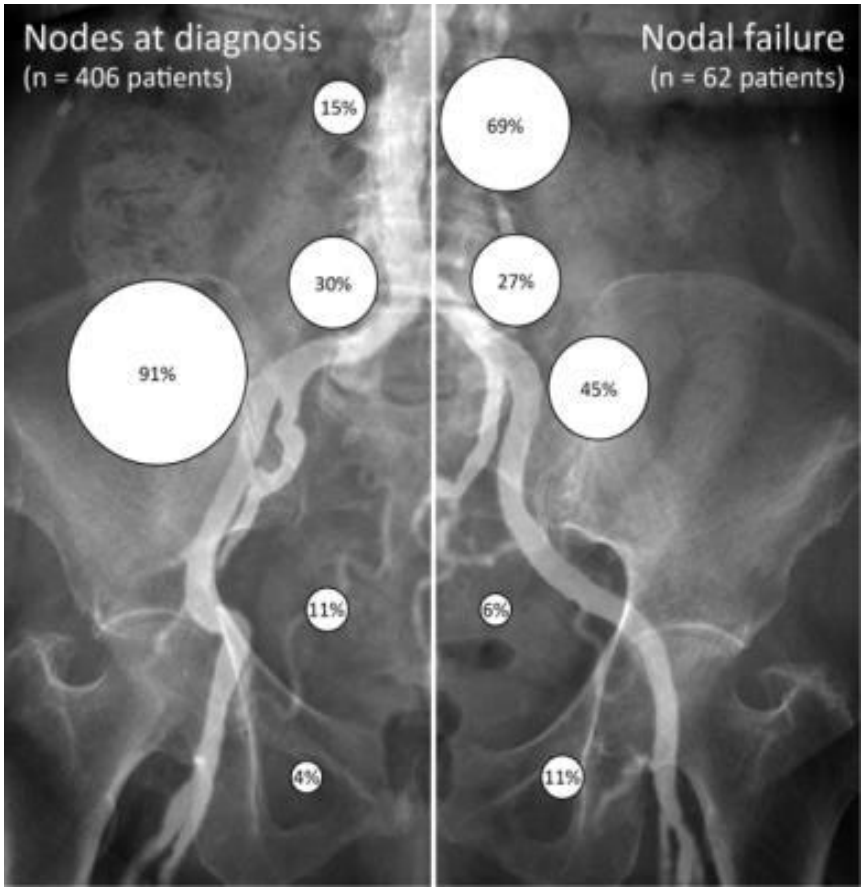
Fig. 3. Disease-free survival (lifetable method)

Conclusions:

- Routine para-aortic RT for all high risk patients with cervical carcinoma is of limited value.
- Patients with a high probability of local control can benefit from extended field irradiation, despite an increase in severe digestive complications.

Patterns of spread and prognostic parameters for nodal pelvic and para-aortic recurrences

- 47 % of the patients had nodal metastases time of diagnoses. mainly located in the pelvis.
- Para-aortic failures contributed with 69% of all nodal failures. strongest predictor being nodal disease at time of diagnosis).
- 78% of para-aortic failures in EMBRACE were in patients who did not receive para-aortic irradiation.
- PAN irradiation will investigated in EMBRACE II .
- location of nodes (common iliac), number of nodes (≥3) and also to some degree nodal size.



Taking a risk based approach- may be the next step

Conclusions

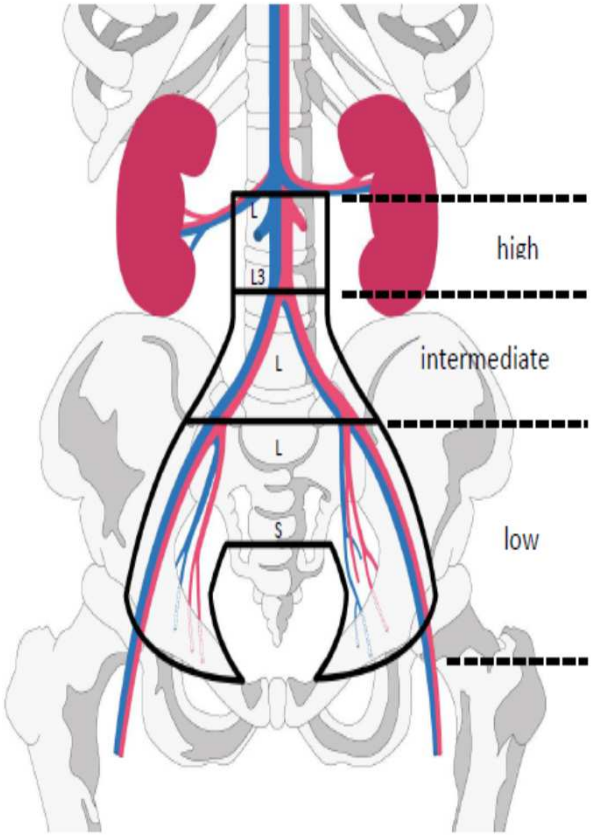
PA field irradiation seems to have positive results.

Toxicities are high and bothersome, specially can decrese CT cycles and increase total treatment time.

Risk based approach

- Limited PA irradiation.
- Classifying the high risk patients who have more chances of PA failure.
- Limited PA irradiation fields with concurrent chemotherapy.
- Using better techniques/IMRT/IGBT and

Risk categorization and EBRT portals in EMBRACE II.



Risk Group LN	Definition	EBRT lymph node regions
Low Risk (LR LN)	Tumour size ≤4cm AND stage IA/IB1/IIA1 AND N0 AND squamous cell carcinoma AND no uterine invasion	**"Small Pelvis"** internal iliac external iliac obturator presacral
Intermediate Risk (IR LN)	Not low risk No high risk features	**"Large Pelvis"** Nodes included in "Small Pelvis" and common iliac region (including the aortic bifurcation). In addition: • inguinal in case of distal vaginal involvement. • Mesorectal space in case of mesorectal nodes and advanced local disease
High Risk (HR LN)	Based on nodal pathology • ≥ 1 pathologic node at common iliac or above • OR ≥ 3 pathologic nodes	**"Large Pelvis + Para-aortic"** Nodes included in "Large Pelvis" and para-aortic region with the upper border of CTV minimum at the level of renal veins (usually incl. L2), and at least 3 cm cranial of the highest pathological node in case of para-aortic nodes].

Adopted from EMBRACE II protocol

Use of IGRT in cancer cervix

IGRT is seeing before hitting the target.
Use of more conformal planning techniques (IMRT, VMAT, tomotherapy) has raised the importance of IGBT so that the target is not missed CONFORMALLY!

- When it's a bony target or elective LN region- Simple EPID may be good enough.
- But to see bladder/rectum filling and the movement of uterus or cervix we need CBCT.

Use of regular image guidance can reduce target margins causing less bowel irradiation.

Advanced IGRT

- **Basic IGRT**- standard margins from CTV-T to ITV-T are applied to compensate for internal target motion. Daily online position verification using CBCT, kV or EPID imaging.
- **Intermediate IGRT**- CTV-T to ITV-T margin is individualized based on multiple pre-treatment imaging series. ITV-T can become more representative in individual case. CBCT imaging is used for daily.
- **Advanced IGRT**: is based on individual library plans in which different plan specific ITV-T margins are applied. Daily CBCT is required to select the best treatment plan covers the CTV-T on that day.

Dosimetric and toxicity summary from - Dr MG Janki

Bowel	V100	reduced by 50 %
Bladder	V100	reduced by 23 %
Rectum (as an IMRT Boost)	V66	reduced by 22%
Bladder (as an IMRT Boost)	V66	reduced by 19%
Bone marrow (BMS IMRT vs 3DCRT vs AP/PA)	V20	72 vs 97.8 vs 99 % (lesser gr 3 & 4 toxicity)

GU gr II	IMRT vs 4 field	reduced from 91 to 60 %
Chronic GI	IMRT vs 4 field	reduced from 20 to 3 %
Hematological (gr III)	IMRT vs 3 DCRT	24 % for pelvic 28 % for para aortic (similar)

IMRT studies with clinical results

- Gandhi AK al,. 2013, IJROBP - WP-IMRT is associated with significantly less toxicity compared with WP-CRT and has a comparable clinical outcome. Further studies with larger sample sizes and longer follow-up times are warranted to justify its use in routine clinical practice.
- Bone Marrow-sparing Intensity Modulated Radiation Therapy With Concurrent Cisplatin For Stage IB-IVA Cervical Cancer: An International Multicenter Phase II Clinical Trial (INTERTECC-2) 2017- MRT reduces acute hematologic and GI toxicity compared with standard treatment, with promising therapeutic outcomes. Positron emission tomography IG-IMRT reduces the incidence of acute neutropenia.

PARCER trial

2015 American Society for Radiation Oncology (ASTRO) 57th Annual Meeting
News Briefing, Monday, October 19, 2015, 10:30 a.m., Central time

Plenary Session: Monday, October 19, 2015, 2:15 – 3:15 p.m., CT, the Henry B. González Convention Center

8 **Phase III RCT of Postoperative Adjuvant Conventional Radiation (3DCRT) Versus IGIMRT for Reducing Late Bowel Toxicity in Cervical Cancer (PARCER) (NCT01279135/CTRI2012/120349): Results of Interim Analyses**

Author Block: S. Chopra[1], R. Engineer[2], U. M. Mahantshetty[2], T. Dora[1], S. Kannan[1], R. Phurailatpam[1], S. N. Paul[1], J. Swamidis[1], J. Ghosh[1], S. Gupta[1], T. Shylasree[2], A. Maheshwari[2], R. Kerkar[2], and S. K. Shrivastava[2];[1]*ACTREC,Tata Memorial Centre, Navi Mumbai, India,* [2]*Tata Memorial Centre, Parel, Mumbai, India*

Conclusion: There is no difference in late grade ≥2 late bowel toxicity with the use of IG-IMRT. However significant reduction is observed in incidence of late grade ≥3 toxicity with use of IG-IMRT. Final analyses will be conducted after completion of accrual and median follow up of 3 years.

Conventional vs IMRT/IGRT

Cheap and cost effective
Treatment of mass
Effective for the purpose and reliable.
Time tested
I just love my Maruti my first Car!!

Effective for purpose and reliable.
Comfortable journey (less acute toxicity) along with GPS(Image guidance).
Costly.
Better for long drive (EFRT)
I aspire to drive it one day.

Can SBRT/IMRT replace brachytherapy

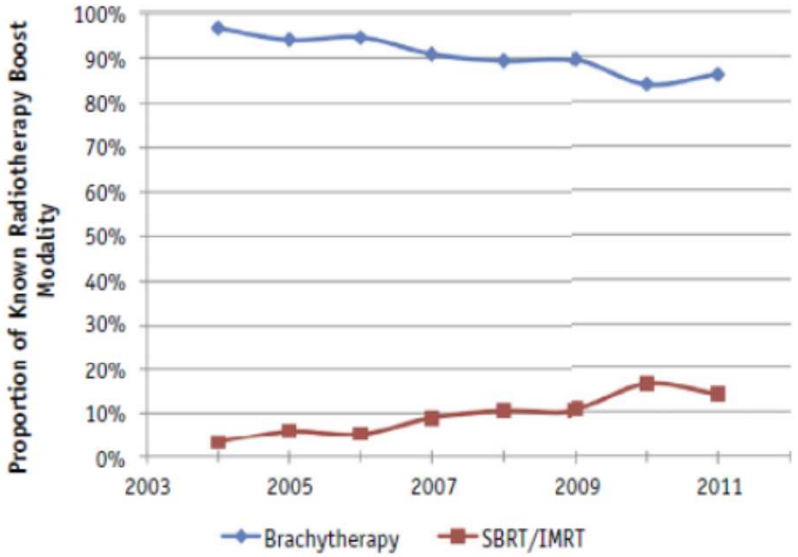


Fig. 1. Changes in radiation therapy boost modality utilization over time from 2004 to 2011. IMRT = intensity modulated radiation therapy; SBRT = stereotactic body radiation therapy.

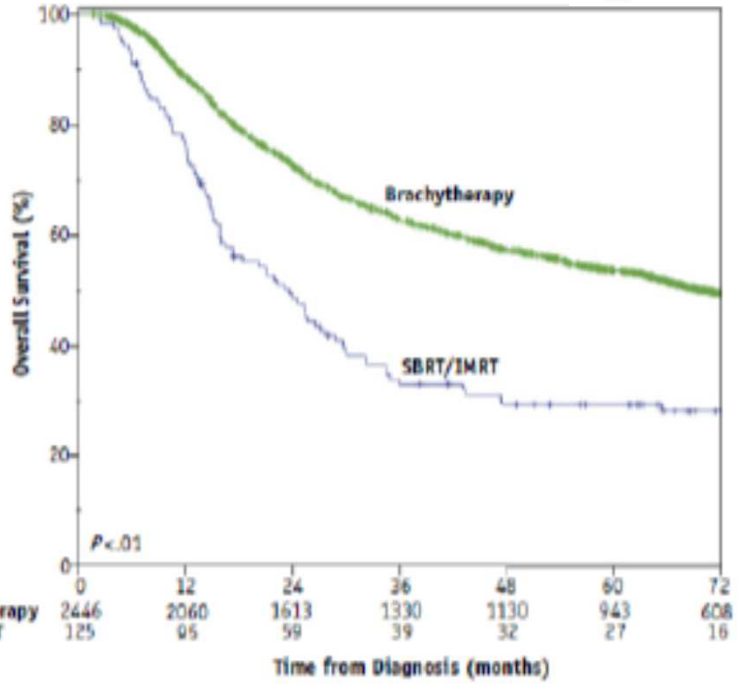
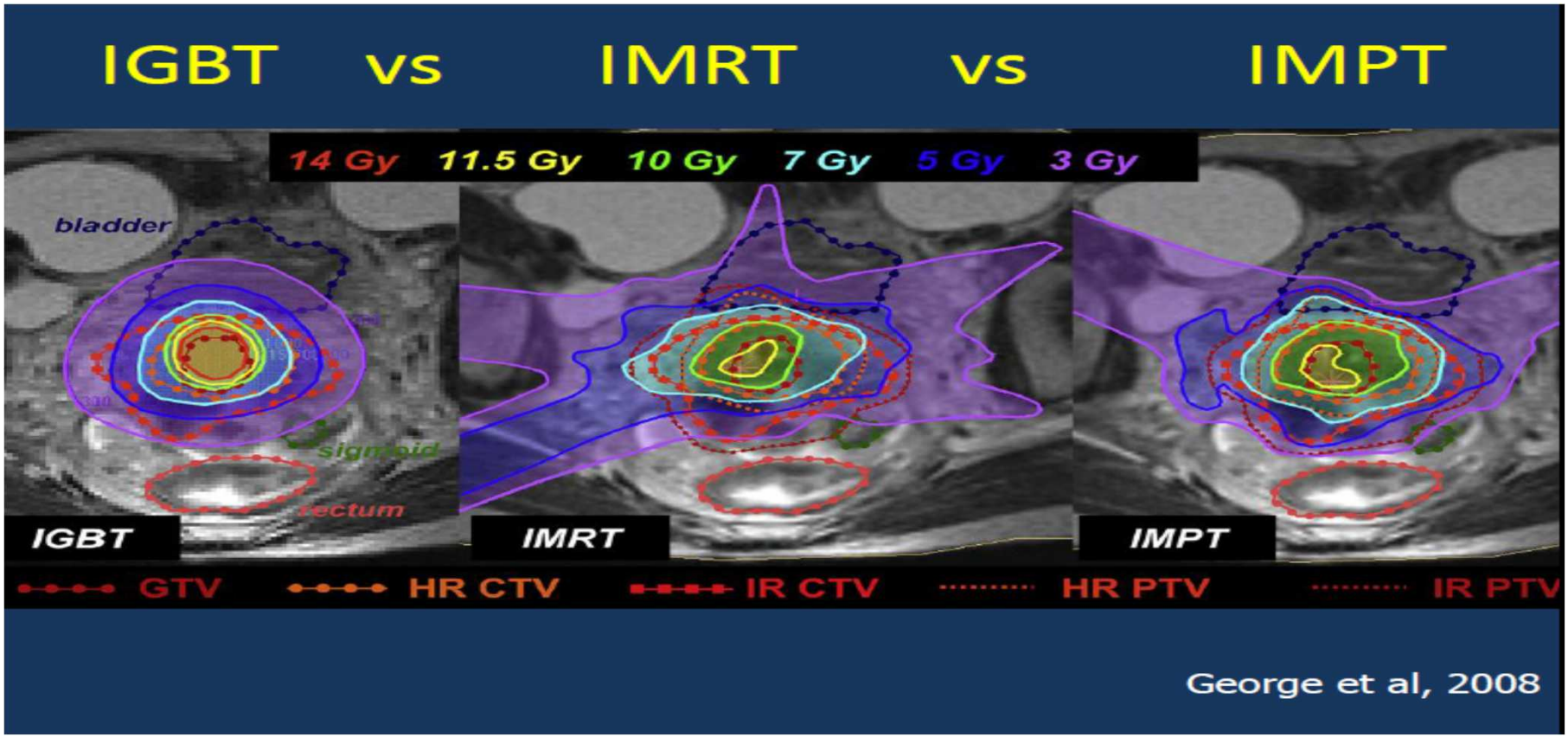


Fig. 2. Kaplan-Meier overall survival estimate stratified by boost modality. IMRT = intensity modulated radiation

National Cancer Data Base Analysis of Radiation Therapy Consolidation Modality for Cervical Cancer: The Impact of New Technological Advancements

Int J Radiation Oncol Biol Phys, Vol. 90, No. 5, pp. 1083–1090, 2014

If you are waiting for proton – Don't wait!



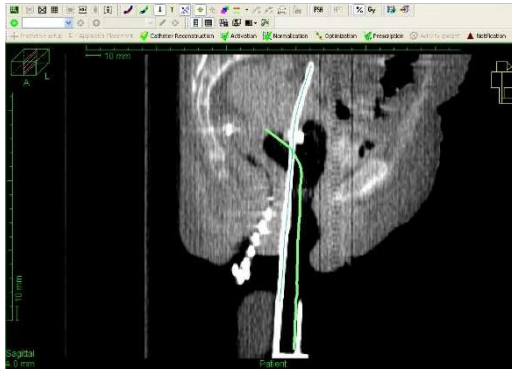
AROI ESTRo slide

Use of IGRT in Brachytherapy…..IGBT

- Advancements in IGRT

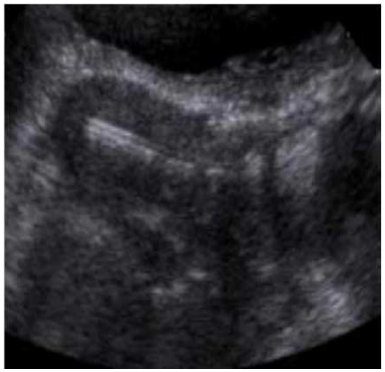
IGBT is not

Doing an MRI brachytherapy always.



Even simple USG/CT scan in ICA applications can improve outcome by making sure that the tandem is in the uterus.

Upto 10 % false passage is documented in literature even in best hands. (I doubt its an conservative estimation).

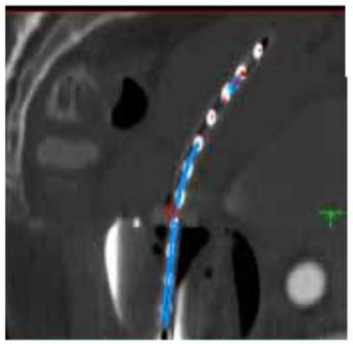


Doing an Simple USG TAUS/TRUS during USG will improve the success rate.

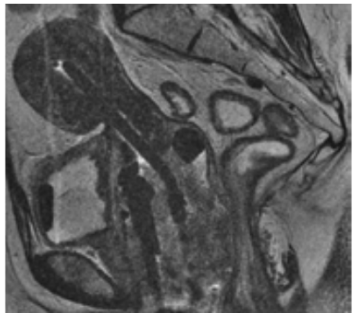
CT is now widely available and can be widely used to plan Brachytherapy.

Evolution of imaging in brachytherapy

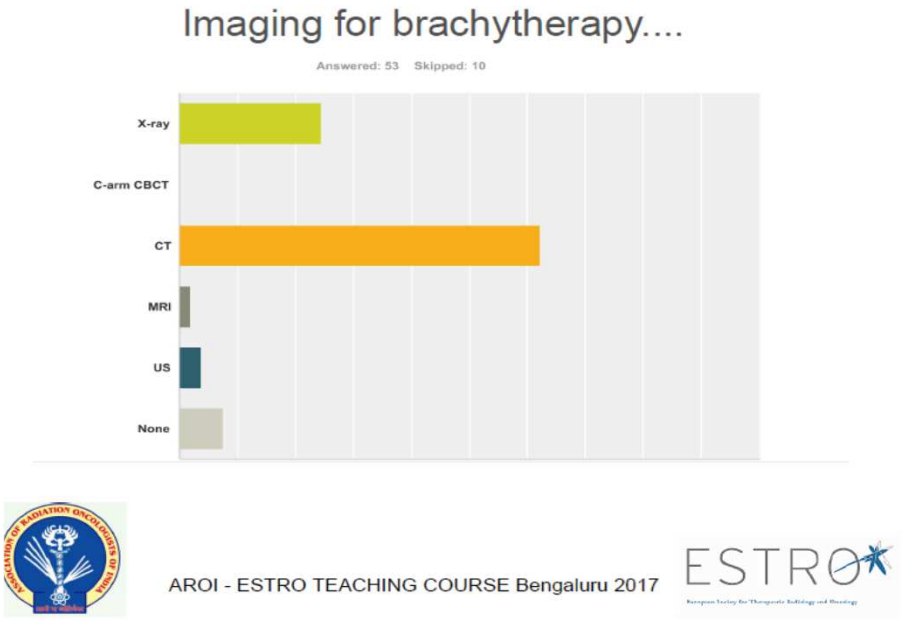
Plain x ray
International standard until 2002



2002-2011, more and more centers in India are using CT based planning



After 2011
Use is increasing slowly



AROI - ESTRO TEACHING COURSE Bengaluru 2017

Upcoming use of USG in Gyn Brachytherapy

- Maximilian P. Schmid et al,Transrectal ultrasound for image-guided adaptive brachytherapy in cervix cancer – An alternative to MRI for target definition? Radiotherapy and oncology:2016- *TRUS is superior to CT as it yields systematically smaller deviations from MRI, with good to excellent image quality.*- meaningful for a resource starved country like India.
- Mahanshetty U - Trans-abdominal ultrasound (US) and magnetic resonance imaging (MRI) correlation for conformal intracavitary brachytherapy incarcinoma of the uterine cervix.*Radiother Oncol* 2012;

Use of ultrasound in image-guided high-dose-rate brachytherapy: enumerations and arguments

Susovan Banerjee, MD, Tejinder Kataria, MD, DNB, Deepak Gupta, MD, Shikha Goyal, MD, DNB, Shyam Singh Bisht, MD, Trinanjan Basu, MD, Ashu Abhishek, MD

Department of Radiation Oncology, Medanta – The Medicity, Gurgaon, Haryana, India

Abstract

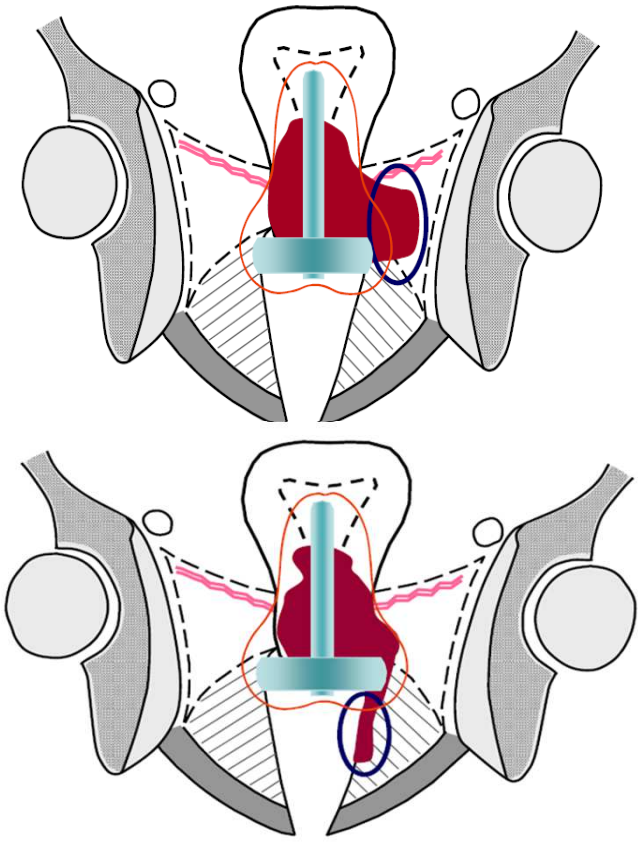
Inherently, brachytherapy is the most conformal radiotherapeutic technique. As an aid to brachytherapy, ultrasonography (USG) serves as a portable, inexpensive, and simple to use method allowing for accurate, reproducible, and adaptive treatments. Some newer brachytherapy planning systems have incorporated USG as the sole imaging modality. Ultrasonography has been successfully used to place applicator and dose planning for prostate, cervix, and anal canal cancers. It can guide placement of brachytherapy catheters for all other sites like breast, skin, and head and neck cancers. Traditional USG has a few limitations, but recent advances such as 3-dimensional (3D) USG and contrast USG have enhanced its potential as a dependable guide in high-dose-rate image-guided brachytherapy (HDR-IGBT). The authors in this review have attempted to enumerate various aspects of USG in brachytherapy, highlighting its use across various sites.

J Contemp Brachytherapy 2017; 9, 2: 146–150
DOI: https://doi.org/10.5114/jcb.2017.67456

Key words: image guided brachytherapy, high-dose-rate, ultrasonography.

Indications of IC+IS/IS brachytherapy

- Extensive parametrial disease(More than 2.5 cm from OS)
- Lower vaginal involvement
- Distorted anatomy
- Central Recurrence/reradiation
- Unacceptable dose to normal tissue dose from IC applications.



Summarizing the volumes of CTVs of Brachytherapy

- HRCTV= Whole cervix + GTV/ Nodularity (from clinical assessment or MR) + Grey zones (MR).

intent- 85 to 90 + Gy total dose (EQD2) to HRCTV in definitive radiotherapy.

Dose comparable with dose to point A

Most important of all the volumes

Reproducible- least interobserver variation.

Dose volumes of HRCTV predicts outcomes most consistently.

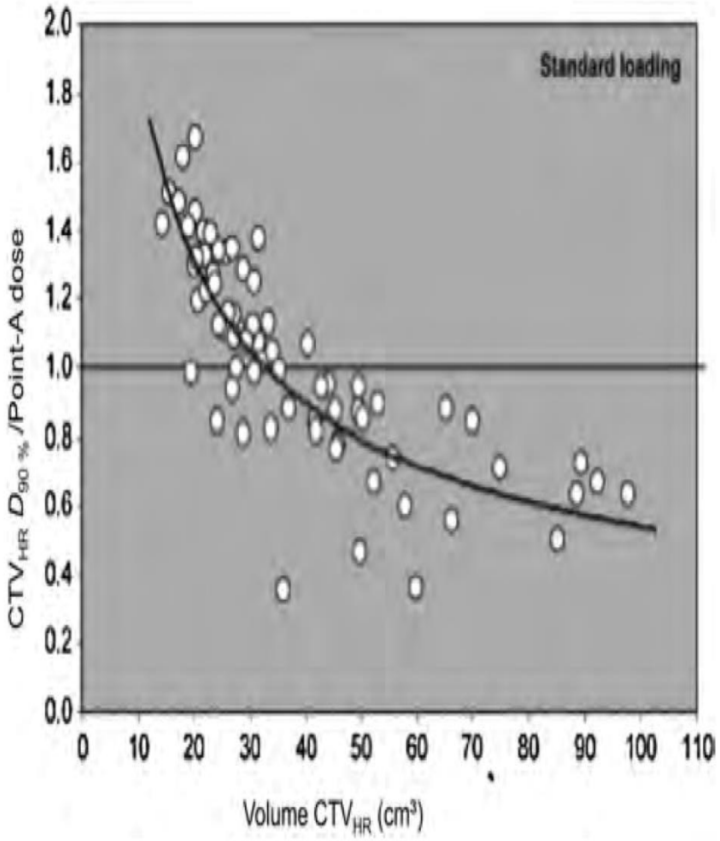
- IRCTV- Pre EBRT disease (Always includes HR-CTV with safety margins).

Intent: 60 + Gy total dose to CTV,

Comparable with dose to the 60Gy isodose(ICRU recommendations) .

Points to volumes- summary of correlations

- Point A provides an estimate of the average CTVHR D90 % for a large patient population with a balanced disease-stage distribution.
  Point A is a good representation of “an average position” of the tumor.
  Helps in introducing / check for major dose escalation or reduction for such patient

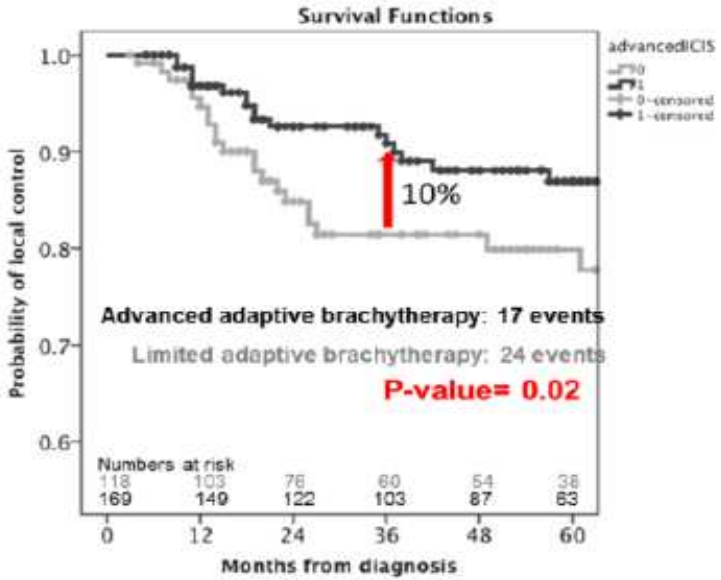


- ICRU rectal reference point correlates with the D2cc dose of the organ rectum

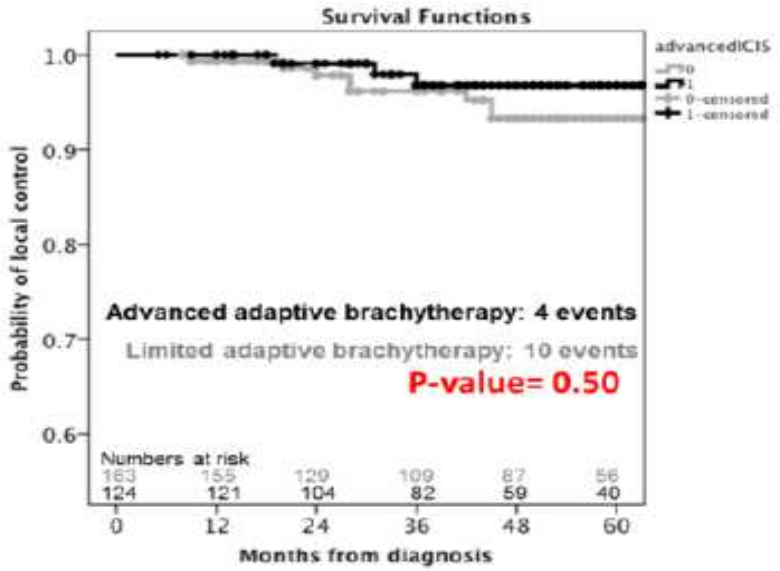
- ICRU bladder reference point, does not correlate well with bladder complications (ICRU 38 bladder point underestimates the bladder dose)

Importance of advanced IC/IS technique

CTVHR ≥ 30 cm^3



CTVHR < 30 cm^3

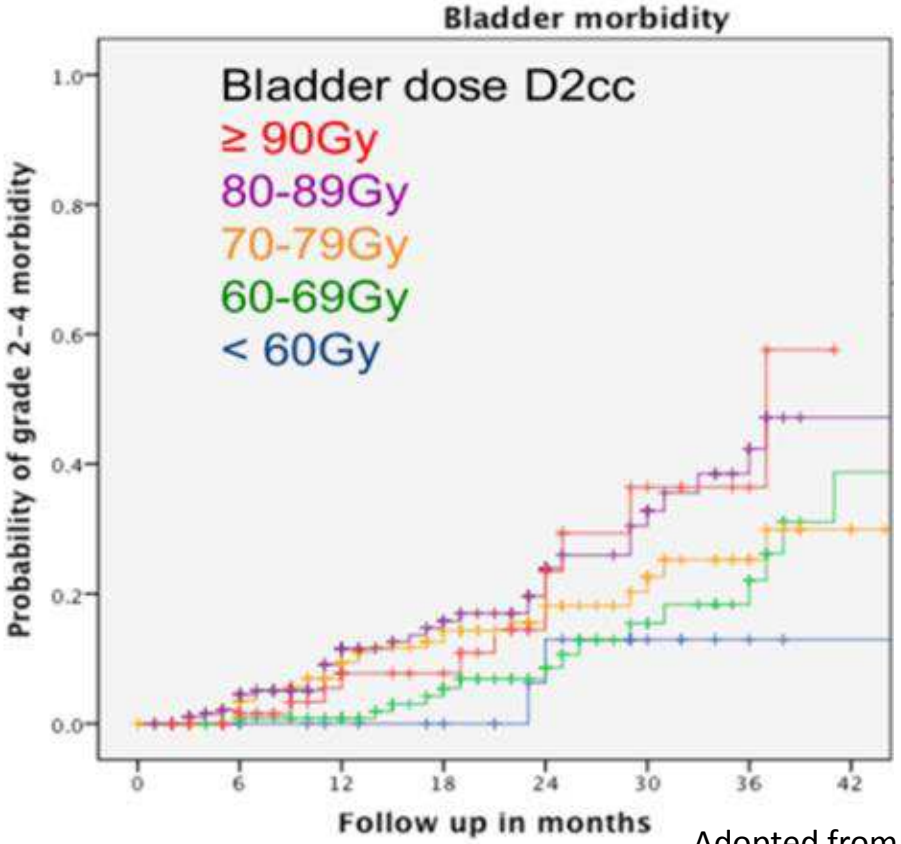


Increased dose resulted in improved local control in patient cohorts where application of IC/IS was performed in at least 20% of the patients

Adopted from EMBRACE II protocol

Urinary morbidity and bladder D2cm3

- 680 pts from EMBRACE, 95 events of ≥G2 morbidity occurred (ureter stenosis excluded).
- The dominating events were frequency, urgency and cystitis.
- A significant dose relationship -dose beyond 80Gy EQD2 there is a clinically significant increase in ≥G2 morbidity.

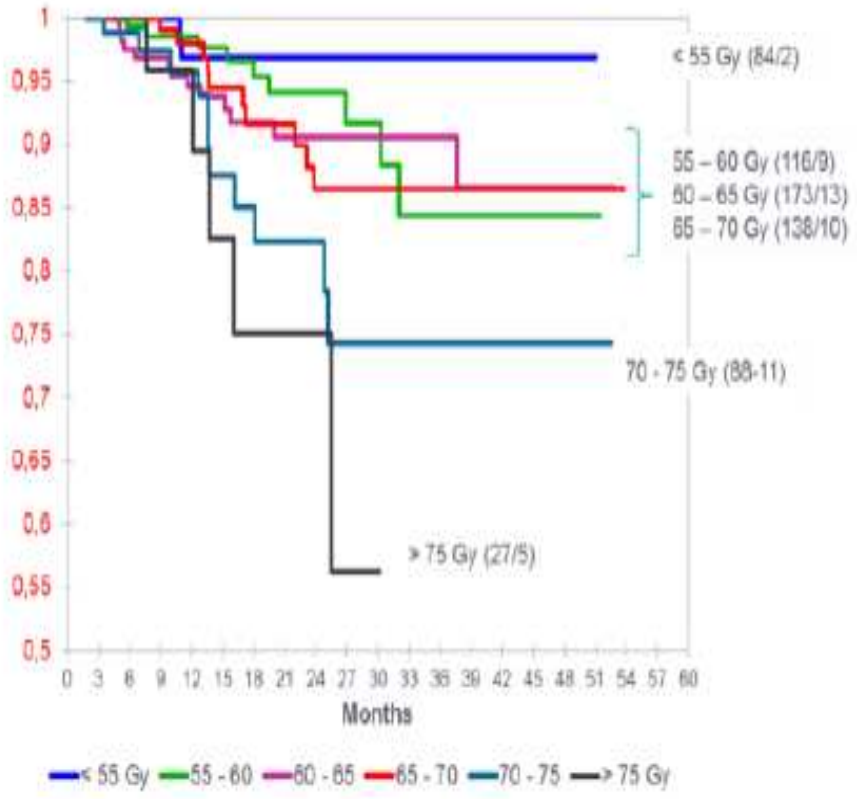


Adopted from EMBRACE II protocol

Actuarial incidence of G≥2 urinary morbidity (all endpoints except ureter stenosis) grouped according to D2cm3 dose levels (Tanderup K. et al. 2014,

Rectal bleeding and rectum D2cm3

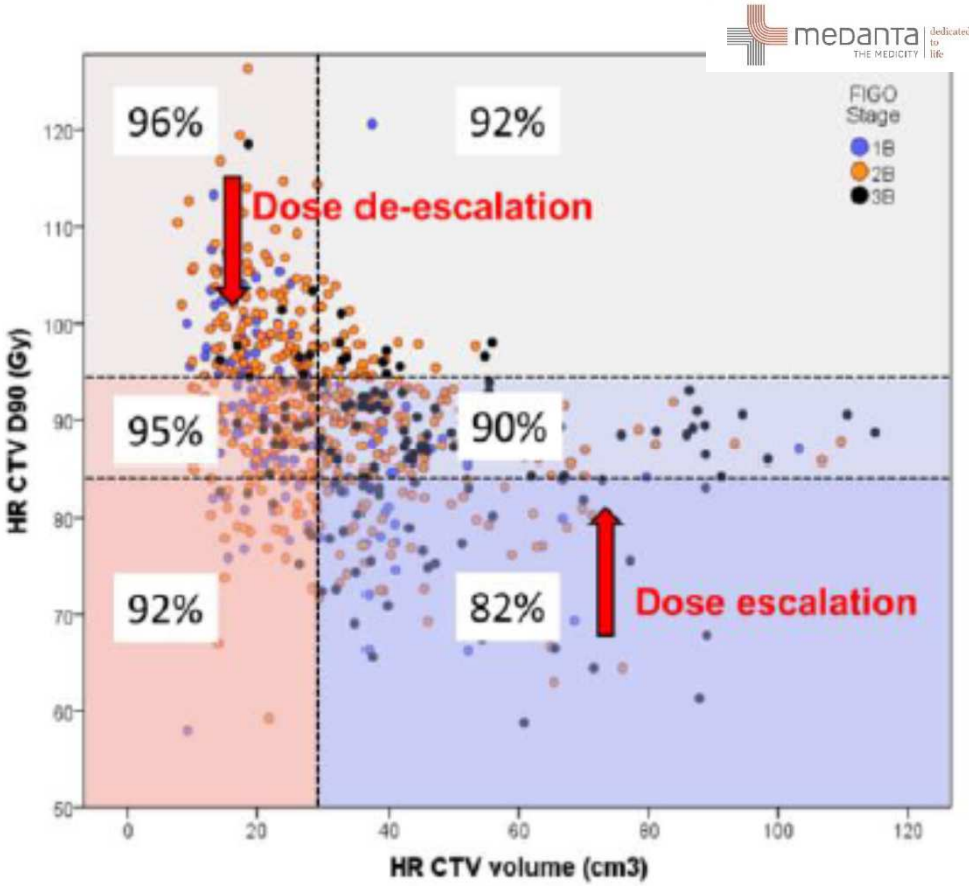
- 701 patients from EMBRACE -Rectal bleeding (50 events)
- The dose response was shallow below 70Gy, and it is unclear how much clinical impact dose de-escalation below 70Gy could have.
- However, for doses above 70-75Gy there is a steep increase in risk of rectal bleeding.



Adopted from EMBRACE II protocol

Principles for dose de-escalation and dose escalation in EMBRACE II

- We are actually treating small volume diseases to a high dose the dose can be de-escalated.
- While at the same time patients with high volume disease needs some dose escalation as the LC can be better that we currently see.
- Improved IC/IS techniques are required to achive this and is currently being evaluated in EMBRACE II trial.



Principles for dose de-escalation and dose escalation in EMBRACE II.
CTVHR dose and volume in the EMBRACE study (each point represents one patient).
A number of 6 dose and volume groups are defined according to cut-points of 85Gy and 95Gy for CTVHR dose and of 30cm3 for CTVHR volume.
For each dose-volume group the expected actuarial local control at 3 years is indicated

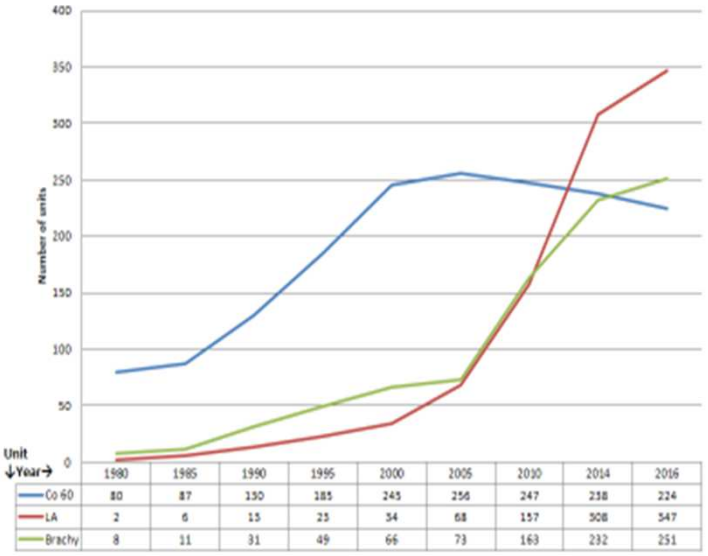
Adopted from EMBRACE II protocol

Advancement in manpower and logistics

AROI - ESTRO GYN TEACHING COURSES IN INDIA 2017- 2019

ICRO courses and classrooms being held throughout the country.

Rapid increment in trained workforce by governmental policy of increasing post graduate radiotherapy training program.



Unit ↓Year→	1980	1985	1990	1995	2000	2005	2010	2014	2016
Co 60	80	87	130	185	245	256	247	238	224
LA	2	6	15	25	34	68	157	308	347
Brachy	8	11	31	49	66	73	163	232	251

Fig. 1. Increase in the number of radiotherapy units in India, 2016

Improvement of results after IGBT

- The improvement in OS and CSS by 10% and 14%, respectively, for the Retro EMBRACE cohort compared to the historic cohorts.
- The benefit of IGBT on CSS was maintained over time (5-year differences 21%, 9%, and 5%, respectively for IB, IIB and IIIB disease.

Radiotherapy and Oncology 120 (2016) 428–433

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Image guided brachytherapy in cervical cancer

Image guided brachytherapy in locally advanced cervical cancer: Improved pelvic control and survival in RetroEMBRACE, a multicenter cohort study

Alina Sturdza [a], Richard Pötter [a,*], Lars Ulrik Fokdal [b], Christine Haie-Meder [c], Li Tee Tan [d], Renaud Mazeron [c], Primoz Petric [e], Barbara Šegedin [e], Ina Maria Jurgenliemk-Schulz [f], Christel Nomden [f], Charles Gillham [g], Orla McArdle [g], Erik Van Limbergen [h], Hilde Janssen [h], Peter Hoskin [i], Gerry Lowe [i], Ekkasit Tharavichitkul [j], Elena Villafranca [k], Umesh Mahantshetty [l], Petra Georg [a], Kathrin Kirchheiner [a], Christian Kirisits [a], Kari Tanderup [b], Jacob Christian Lindegaard [b]

[a] Medical University of Vienna, Comprehensive Cancer Center, Department of Radiation Oncology, Austria; [b] Aarhus University Hospital, Department of Oncology, Denmark; [c] Gustave Roussy Cancer Campus Grand Paris, Department of Radiation Oncology, Villejuif, France; [d] Cambridge University Addenbrooke's Hospital, Department of Radiotherapy, United Kingdom; [e] Institute of Oncology Ljubljana, Division of Radiotherapy, Slovenia; [f] University Medical Center Utrecht, Department of Radiotherapy, The Netherlands; [g] St Luke's Hospital, Dublin, Ireland; [h] Department of Radiotherapy, University Hospital Gasthuisberg, Leuven, Belgium; [i] Mount Vernon Hospital, Department of Radiotherapy, London, United Kingdom; [j] Faculty of Medicine, Chiang Mai University, Thailand; and [k] University of Navarra, Department of Oncology, Pamplona, Spain; [l] Tata Memorial Hospital, Mumbai, India

Achievement in treatment of Cervix radiotherapy

BJR, Vol 5, Issue 55, 1932, A study on 811 cases, 5 years FU.

RADIATION THERAPY IN CARCINOMA OF THE CERVIX UTERI IN INDIA

By SUBODH MITRA, M.D. (Berlin), M.B. (Cal.), F.R.C.S. (Edin.);
Superintendent, Chittaranjan Seva Sadan Women's Hospital, Calcutta, India

TABLE I

Year.	No. of Cases.	LIVING. ½ yr.	%	1 yr.	%	1½ yrs.	%	2 yrs.	%	3 yrs.	%	4 yrs.	%	5 yrs.	%
1926	24	16	66·6	12	50	8	33·3	7	29	5	20·8	4	16·6	4	16·6
1927	63	33	52·3	26	41·2	22	34·9	20	31·7	15	23·8	11	17·4		
1928	102	53	52	34	33	20	19·6	18	17·6	9	8·8				
1929	96	51	53	30	31	23	24	10	10·4						
1930	75	39	52	18	24										
Mean			55·2		35·8		27·7		22·2		17·8		17		16·6

Radiotherapy and Oncology 120 (2016) 428–433

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Image guided brachytherapy in cervical cancer

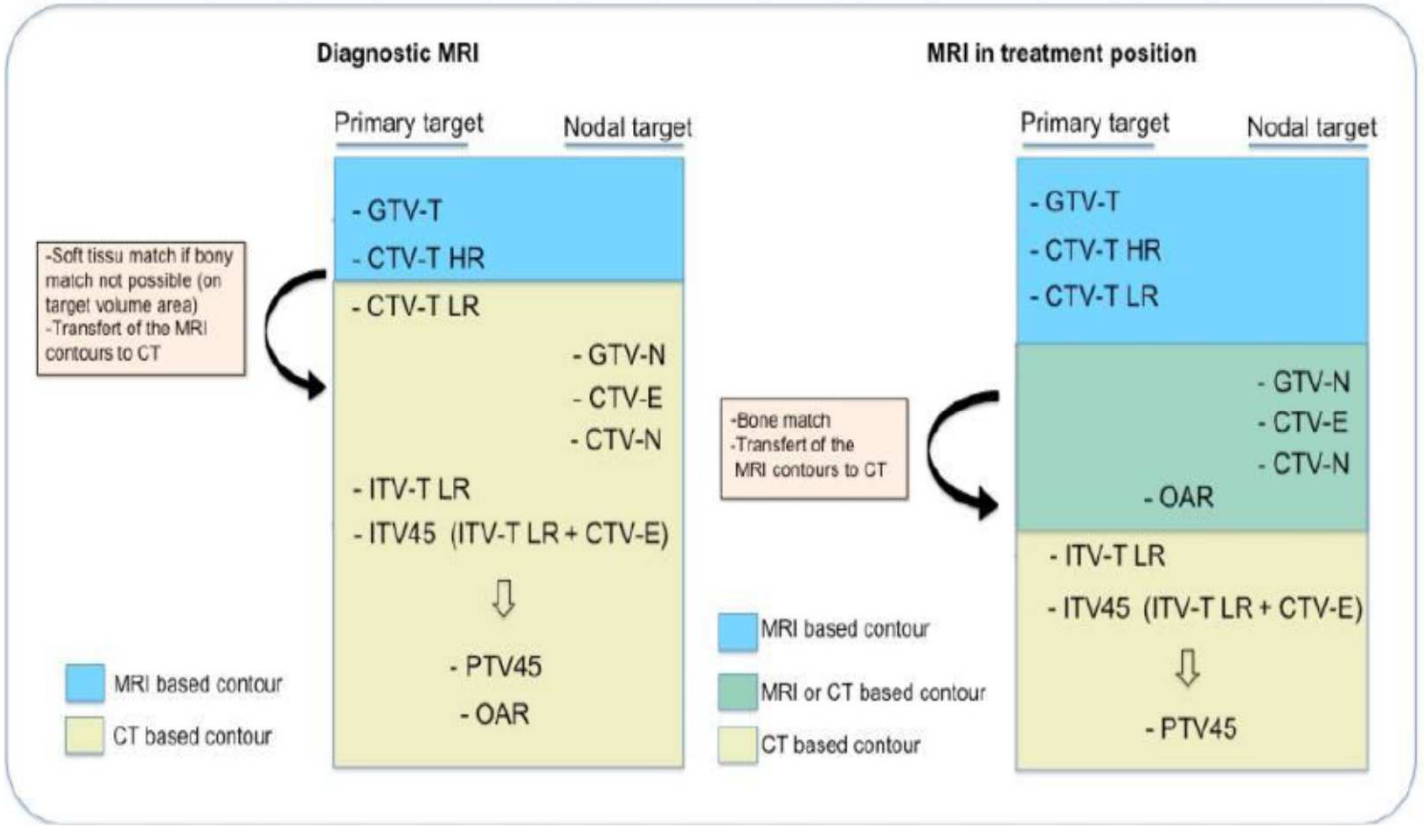
Image guided brachytherapy in locally advanced cervical cancer: Improved pelvic control and survival in RetroEMBRACE, a multicenter cohort study

Alina Sturdza [a], Richard Pötter [a,*], Lars Ulrik Fokdal [b], Christine Haie-Meder [c], Li Tee Tan [d], Renaud Mazeron [c], Primoz Petric [e], Barbara Šegedin [e], Ina Maria Jurgenliemk-Schulz [f], Christel Nomden [f], Charles Gillham [g], Orla McArdle [g], Erik Van Limbergen [h], Hilde Janssen [h], Peter Hoskin [i], Gerry Lowe [i], Ekkasit Tharavichitkul [j], Elena Villafranca [k], Umesh Mahantshetty [l], Petra Georg [a], Kathrin Kirchheiner [a], Christian Kirisits [a], Kari Tanderup [b], Jacob Christian Lindegaard [b]

[a] Medical University of Vienna, Comprehensive Cancer Center, Department of Radiation Oncology, Austria; [b] Aarhus University Hospital, Department of Oncology, Denmark; [c] Gustav Roussy Cancer Campus Grand Paris, Department of Radiation Oncology, Villejuif, France; [d] Cambridge University Addenbrooke's Hospital, Department of Radiotherapy, United Kingdom; [e] Institute of Oncology Ljubljana, Division of Radiotherapy, Slovenia; [f] University Medical Center Utrecht, Department of Radiotherapy, The Netherlands; [g] St Luke's Hospital Dublin, Ireland; [h] Department of Radiotherapy, University Hospital Gasthuisberg, Leuven, Belgium; [i] Mount Vernon Hospital, Department of Radiotherapy, London, United Kingdom; [j] Faculty of Medicine, Chiang Mai University, Thailand; and [k] University of Navarra, Department of Oncology, Pamplona, Spain; [l] Tata Memorial Hospital, Mumbai, India

FIGO stage	Number of patients	Actuarial local control at 3/5 years	Actuarial pelvic control at 3/5 years	Actuarial overall survival at 3/5 years	Actuarial cancer specific survival at 3/5 years
1A	2	100%	100%	100%	100%
1B	123	98%/98%	96%/96%	88%/83%	93%/90%
2A	42	97%/94%	95%/92%	83%/80%	87%/84%
2B	368	93%/91%	89%/87%	78%/70%	83%/77%
3A	23	71%/71%	66%/66%	54%/42%	54%/48%
3B	145	79%/75%	73%/67%	56%/42%	65%/53%

Schematic workflow for contouring primary target and nodal target and OARs



Adopted from EMBRACE II protocol

Summary and take home message

- Radiotherapy along with CT is the definitive cure.
- Technological advancements (both EBRT and brachytherapy)will led to better dose escalation and sparing of normal tissues.
- IMRT seems to be promising due to its dosimetric superiority and evolving clinical data suggests its immediate and late benefits.
- IGRT will probably reduce irradiated volume.
- In order to chase the PA disease or boost pathological nodes with conc CTRT IMRT may be a necissity.
- Individualization of radiotherapy treatment and portals for cancer cervix (depending on disease burden) seems to be better approach.
- All technological and treatment advancements should be verified and we should wait for mature data before we move from current gold standards to next step.

Gosta Forssell
Stockholm
System

Ulrich K Henschke

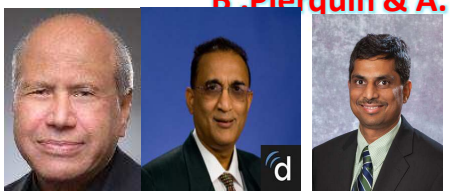
Edith Quimby
Quimby
System

Claude
Regaud
Paris
System

R. Paterson &
H.M Parker
Manchester
System

M.C.Todd
Manchester
System

B .Pierquin & A. Dutreix



Thank you all