Parador de Antequera

JORNADAS SARH

Nuevas Técnicas y Retos de los Sistemas de Planificación de Tratamientos de Radioterapia

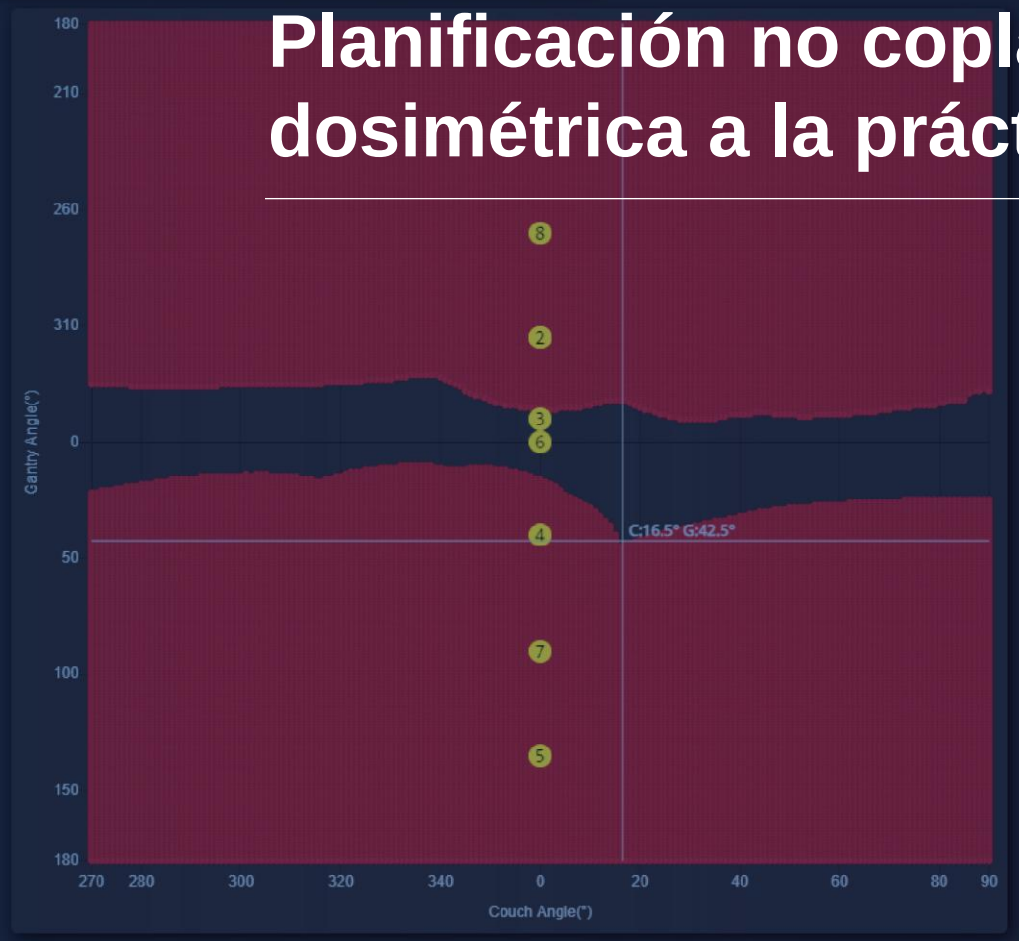
Antequera, 23 de octubre 2026

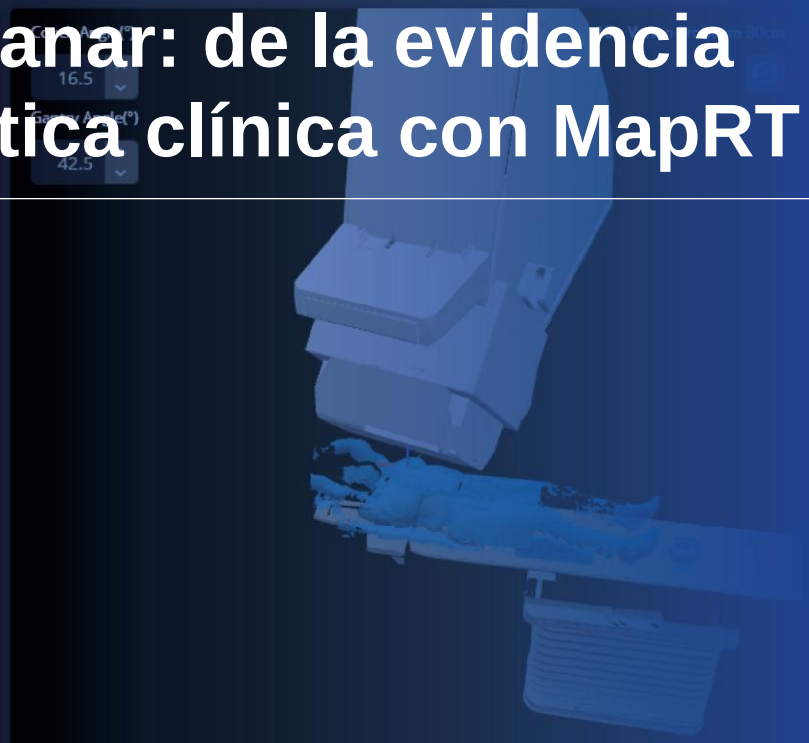


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Planificación no coplanar: de la evidencia dosimétrica a la práctica clínica con MapRT





23 de septiembre de 2026

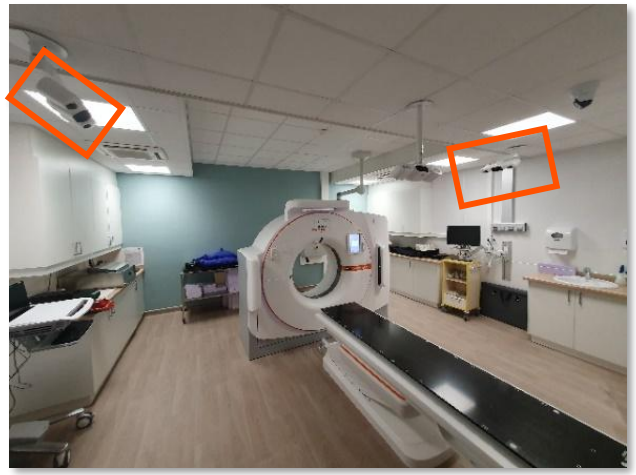
Carmen Serrano

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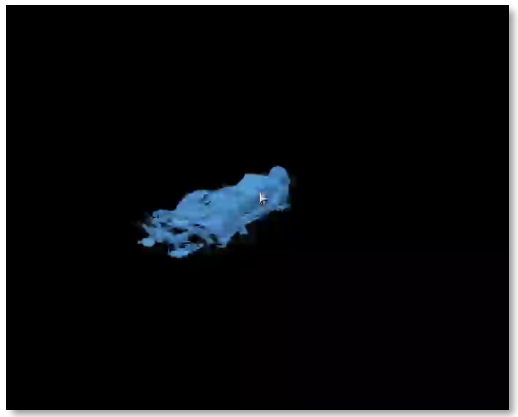
maprt®

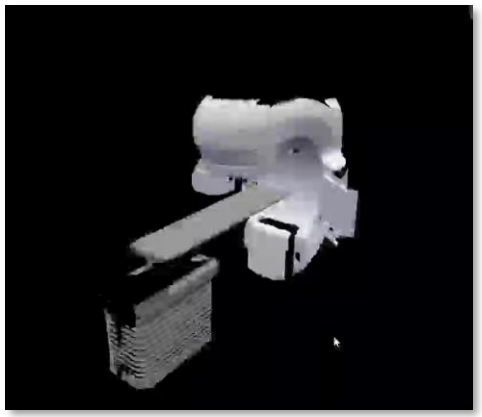
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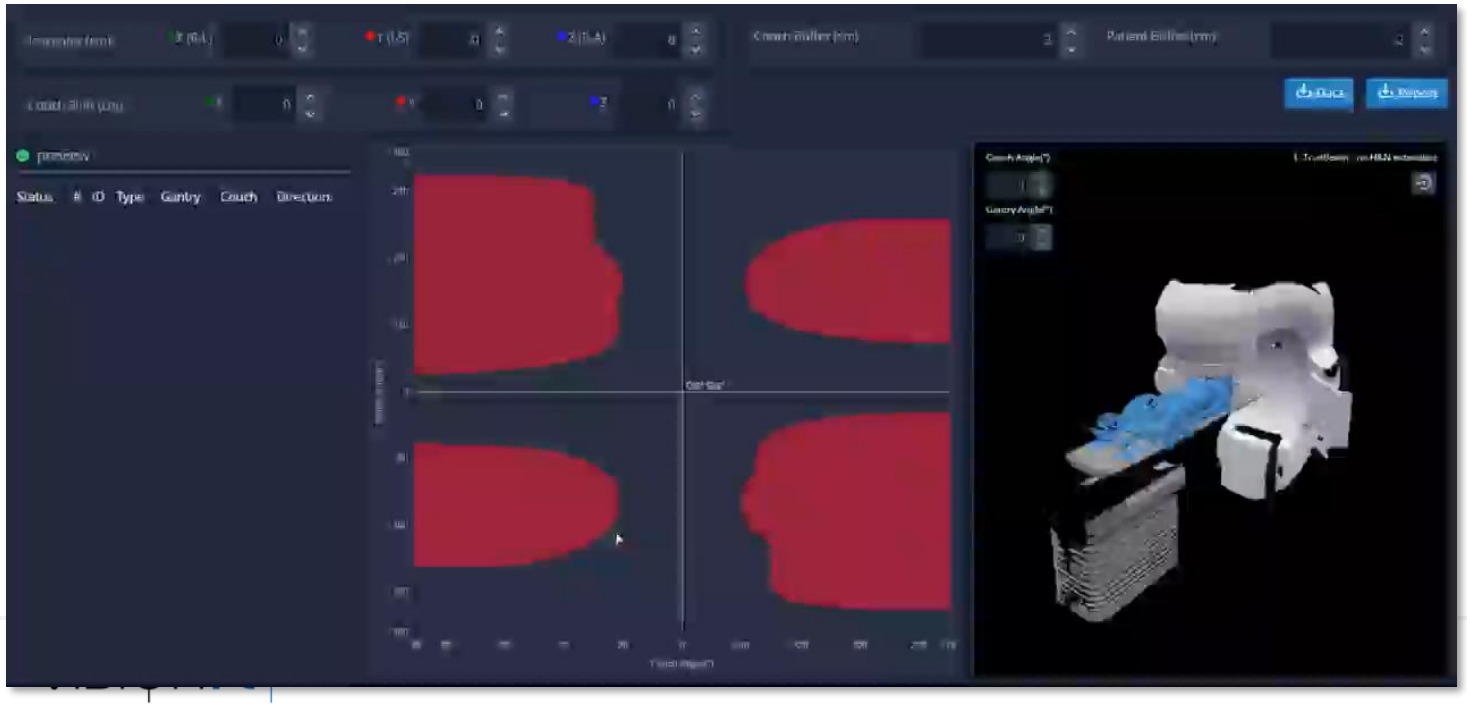
MapRT: ¿Cómo funciona?











1. **Comprobar** y optimizar el posicionamiento del paciente antes del TC
2. **Evitar** colisiones, sesiones blancas y replanificaciones
3. **Mejorar** los planes de dosimetría y optimizar las rotaciones de mesa/gantry y la extensión de los arcos

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Modelos de máquinas incluidos en MapRT

Elekta

VersaHD

Harmony

Varian

TrueBeam

Halcyon & Ethos

C-series 21EX (nuevo)

ProBeam360 (nuevo)

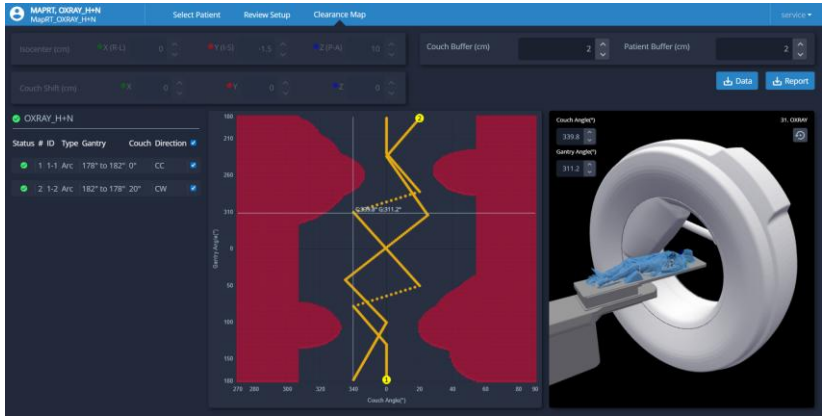
Hitachi

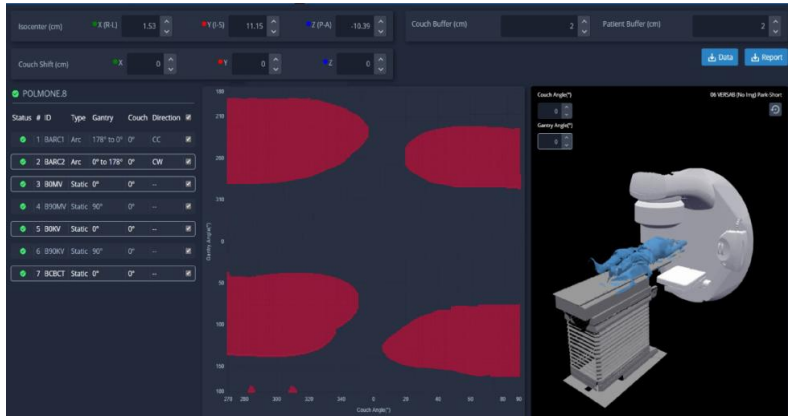
OXRAY (nuevo)

IBA

Proteus Plus y

Proteus One (nuevo)



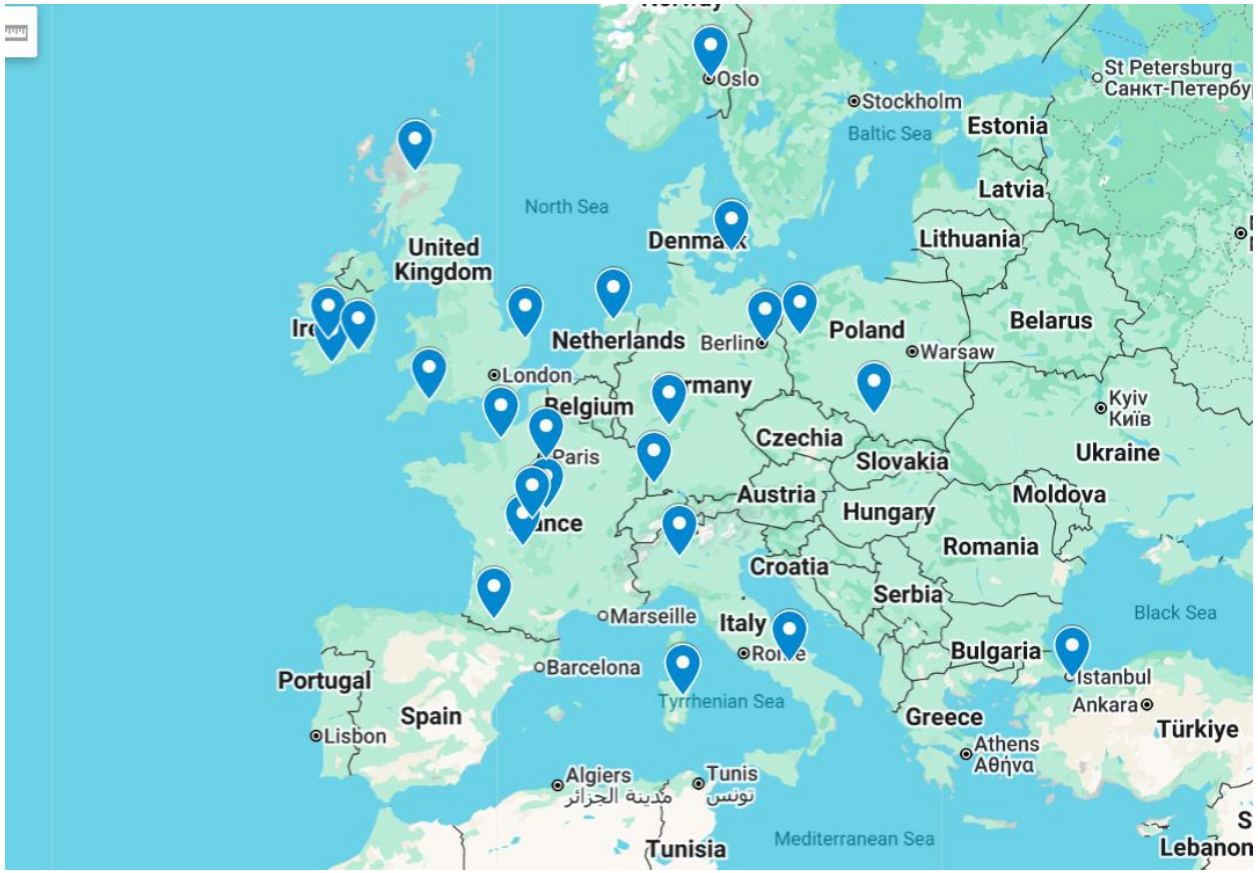




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Datos de la literatura de MapRT y beneficios clave

60 sistemas en todo el mundo



¿Primeros en España?

Quantification of Dosimetry Improvement With or Without Patient Surface Guidance

Ke Sheng, PhD, FAAPM, DABR,[a,*] Minsong Cao, PhD,[b] Andrew Godley, PhD,[c] Mu-Han Lin, PhD,[c] Lukas Henze, MEng,[d] Laura Hammond, MSc,[e] Laurence Delombaerde, PhD,[f] Kirsten Hierholz, Dipl -Ing,[g] and Jana Kouptsidis, MSc[g]

[a]Department of Radiation Oncology, University of California, San Francisco, California; [b]Department of Radiation Oncology, University of California, Los Angeles, California; [c]Department of Radiation Oncology, The University of Texas Southwestern Medical Center, Dallas, Texas; [d]Cancer Center Berlin-Neukölln, Vivantes Klinikum Neukölln, Berlin, Germany; [e]Radiotherapy Department, Raigmore Hospital, Inverness, United Kingdom; [f]Department of Oncology, UZ Leuven, Leuven, Belgium; and [g]Klinikum Darmstadt GmbH, Institut für Radionkologie und Strahlentherapie, Darmstadt, Germany

RESEARCH ARTICLE

JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS

Clinical implementation and evaluation of a patient-specific surface-guided clearance mapping system for collision avoidance and noncoplanar beam planning

Siqiu Wang | Eric Chambers | Ruiqi Li | Yesenia Gonzalez | Xinran Zhong | Zohaib Iqbal | Kara James | Jennifer Cleaton | David Sher | Andrew Godley | David Parsons

Journal of Applied Clinical Medical Physics

Benchmarking MapRT and first clinical experience: a novel solution for collision-free non-coplanar treatment planning

Open Access

DOI: 10.1002/acm2.14572

Status: In Production

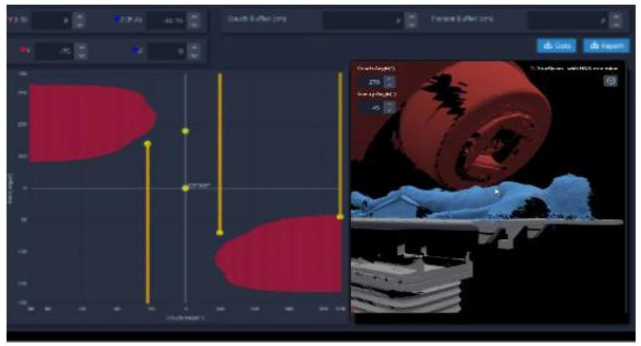
Mathieu Gonod[1], Ilyas Achag[1], Jad Farah[2], Léone Aubignac[1], Igor Bessieres[1]

1 – Department of Medical Physics, Centre Georges-François Leclerc, Dijon, France
2 – Sales and clinical applications, Vision RT Ltd, London, United Kingdom

Submitted June 18, 2024
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Accepted October 22, 2024
In Production

From Dosimetric Potential to Clinical Reality: Patient Specific Clearance Mapping and the Adoption of Non-Coplanar Radiotherapy

Carmen Santos, Regional Clinical Application Manager Iberia, VisionRT

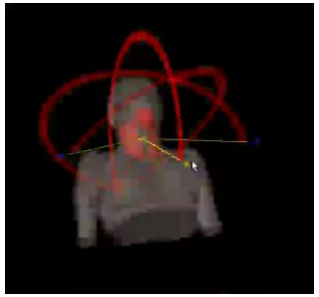


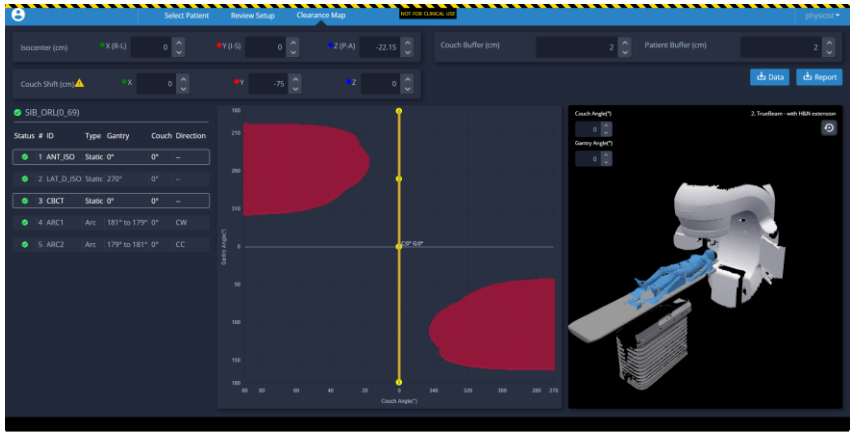
visionrt | Guiding Radiation Therapy™

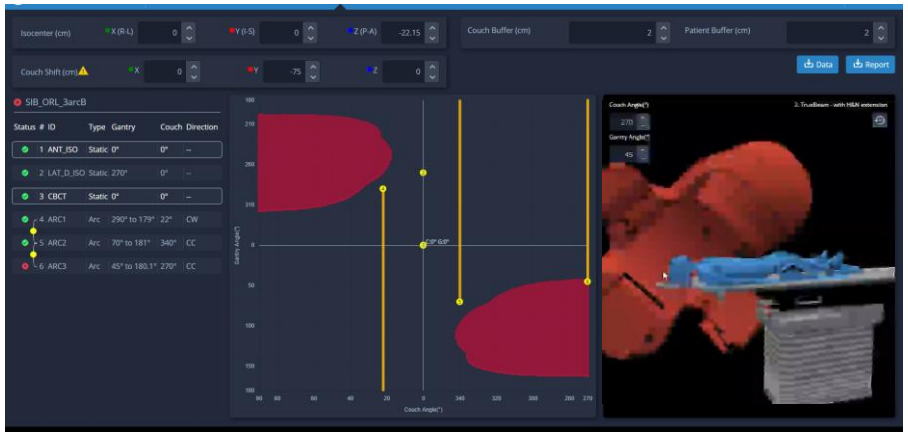
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Comprobación de colisiones



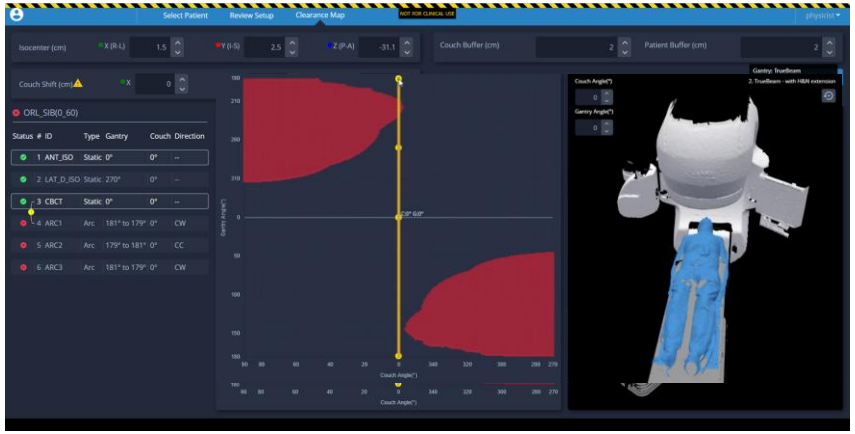


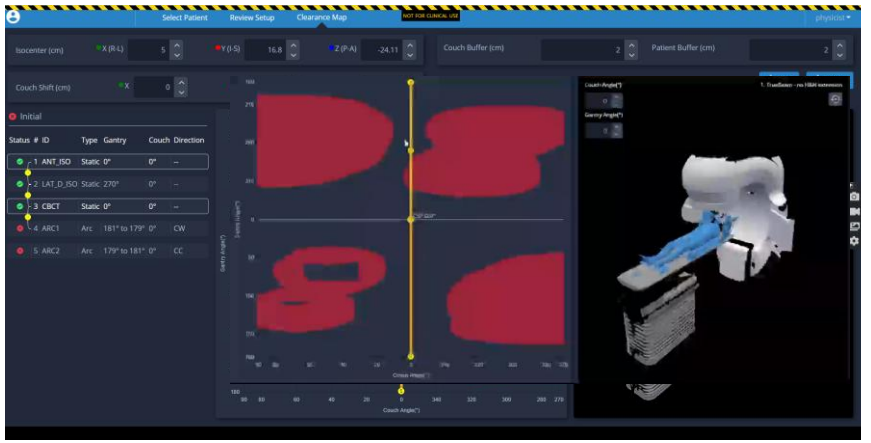




100% de las colisiones anticipadas, sesiones blancas totalmente eliminadas







Gonod et al (2025)

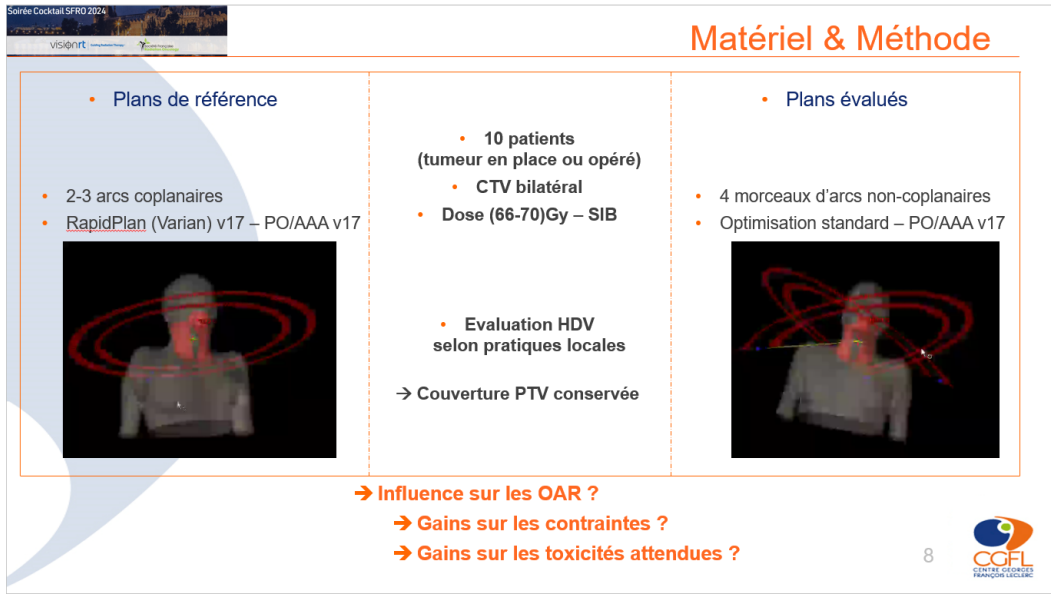
Wang et al (2026)

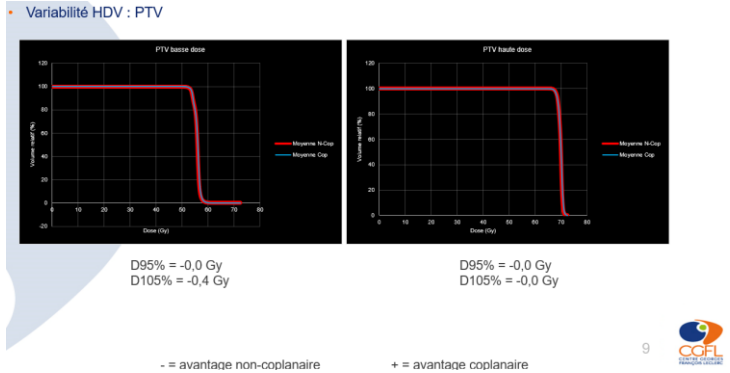
© Vision RT 2026

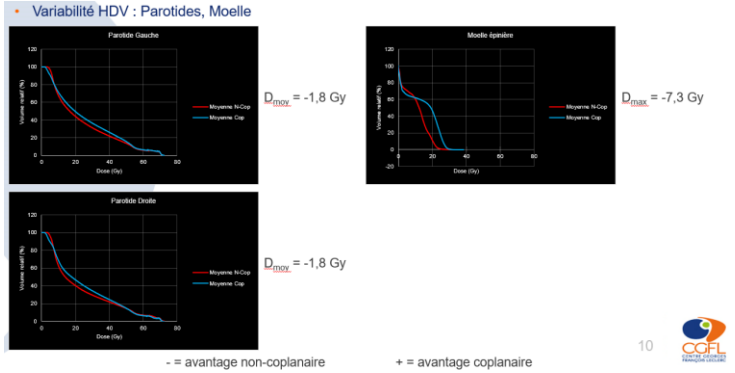
No-coplanar como estándar en tratamientos de cabeza y cuello

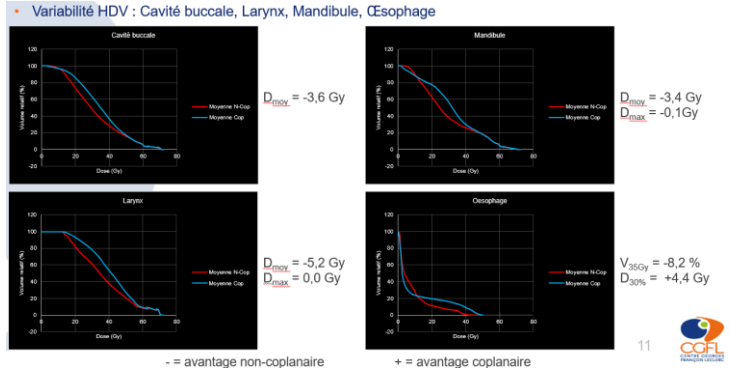
H&N non-coplanar: First dosimetric results from CGFL

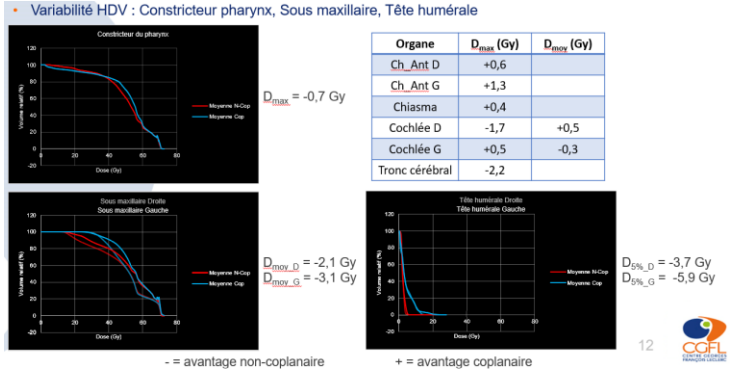
Dr Cédric Chevalier et Mathieu Gonod, SFRO 2024









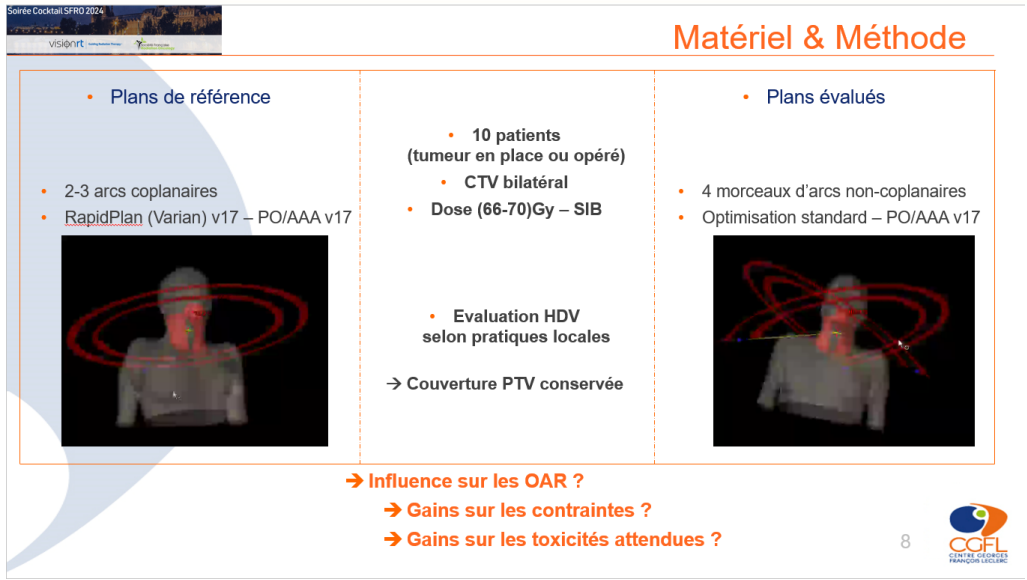


Organe	D_{max} (Gy)	D_{moy} (Gy)
Ch_Ant D	+0,6	
Ch_Ant G	+1,3	
Chiasma	+0,4	
Cochlée D	-1,7	+0,5
Cochlée G	+0,5	-0,3
Tronc cérébral	-2,2	

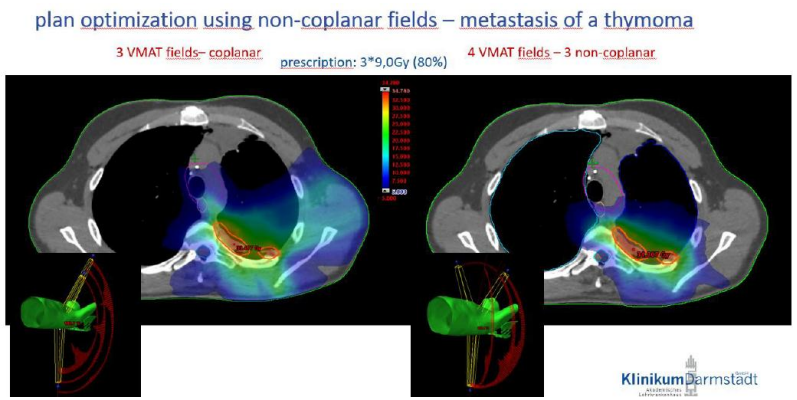
- ✓ Improve DVH and OAR sparing
- ✓ Dose constraints easier to achieve
- ✓ Lower toxicities
- ✓ ~50s longer session minus 24 ± 8.5 min dry run

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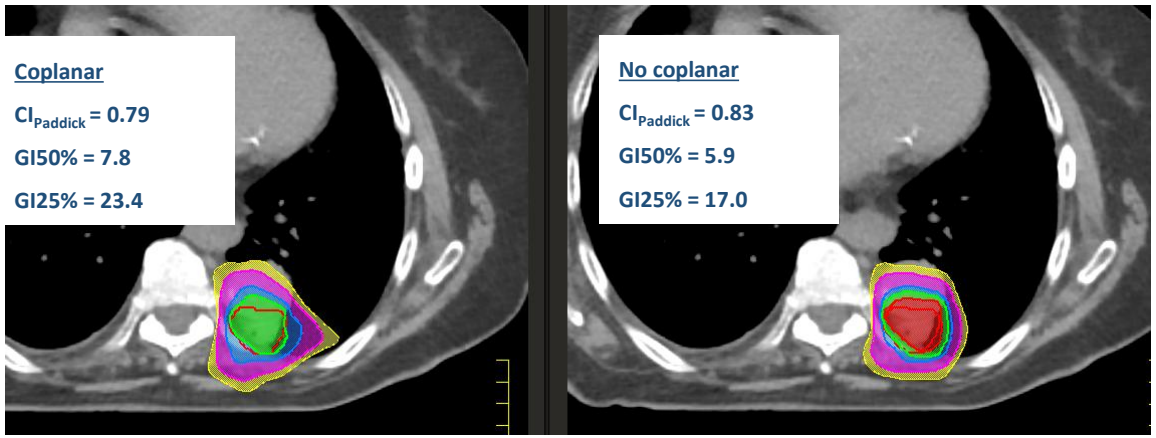
Optimización



Estandarización de H&N no coplanar, *Gonod et al 2025*

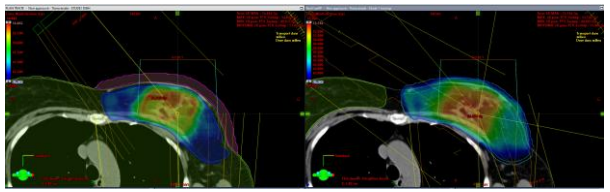


No coplanar para gestionar reirradiaciones, *Hierholz et al 2025*



Escalada de dosis en SBRT de pulmón con protección de OAR, *Cilla et al 2025*

CENTRE de RADIOTHÉRAPIE Guillaume Le Conquérant



Objectifs cliniques : Tous les plans — Évaluer les objectifs pour tous les plans

Plan			■ SEING_DIBH	▲ NONCOP
Dose totale			52.200 Gy	52.200 Gy
Récapitulatif des objectifs cliniques			2 0 14	1 0 15
PTV_Axill Susclav	P1	D 95.0 % ≥ 40.19 Gy	40.17 Gy	41.02 Gy
PTV_CMI	P1	D 95.0 % ≥ 40.19 Gy	40.22 Gy	40.99 Gy
PTV_Mammaire	P1	D 95.0 % ≥ 40.19 Gy	40.52 Gy	41.53 Gy
PTV_Surimp	P1	D 2.0 % ≤ 107.0 %	100.80 %	98.74 %
	P1	D 95.0 % ≥ 95.0 %	95.32 %	95.24 %
BrachialPlexus_homolateral	P3	Dmax < 46.25 Gy	43.20 Gy	43.28 Gy
Coeur	P2	Dmoy < 5.10 Gy	4.18 Gy	3.62 Gy
	P2	V 35.00 Gy ≤ 5.0 %	0.00 %	0.00 %
	P2	V 17.00 Gy ≤ 10.0 %	0.54 %	0.49 %
Foie	P2	Dmoy < 26.00 Gy	1.33 Gy	1.04 Gy
	P2	V 30.00 Gy < 30.0 %	0.00 %	0.00 %
Moelle	P3	Dmax < 38.54 Gy	20.90 Gy	10.42 Gy
Poumon homolateral	P2	V 17.00 Gy ≤ 30.0 %	22.22 %	24.60 %
	P2	Dmoy < 16.00 Gy	10.88 Gy	11.31 Gy
Poumons	P2	V 17.00 Gy ≤ 22.0 %	10.08 %	11.13 %
Sein controlateral	P3	Dmoy < 2.00 Gy	2.80 Gy	2.80 Gy

VMAT no coplanar de mama como alternativa a DIBH, *Dadoun et al 2026*

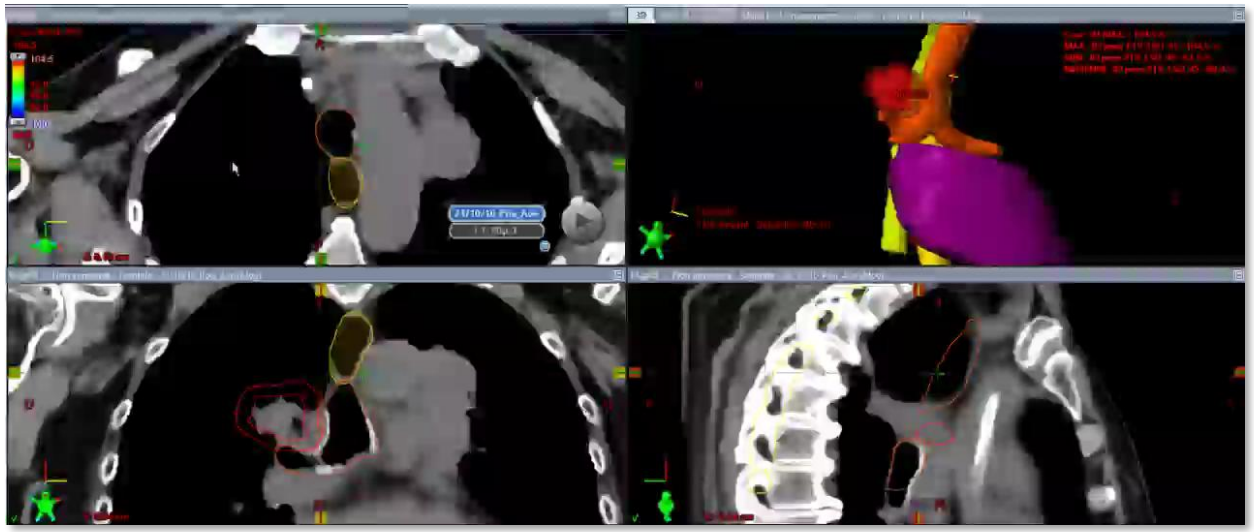
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No-coplanar para anatomías desfavorables

SBRT pulmonar: 5 × 9 Gy al 80 %. PTV en la tráquea y esófago muy próximo.

→ Se requiere una balística/plan atípico para evitar los 3 OAR (des)alineados.

Uso de arcos no coplanares con MapRT para definir las posiciones adecuadas de la mesa y los límites de los arcos.



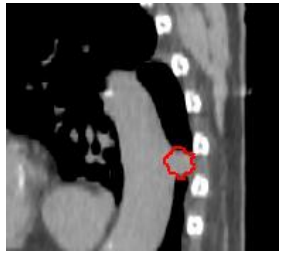


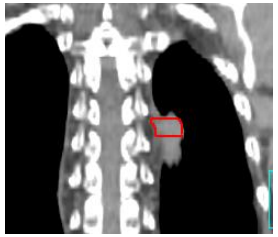
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No-coplanar para anatomías desfavorables

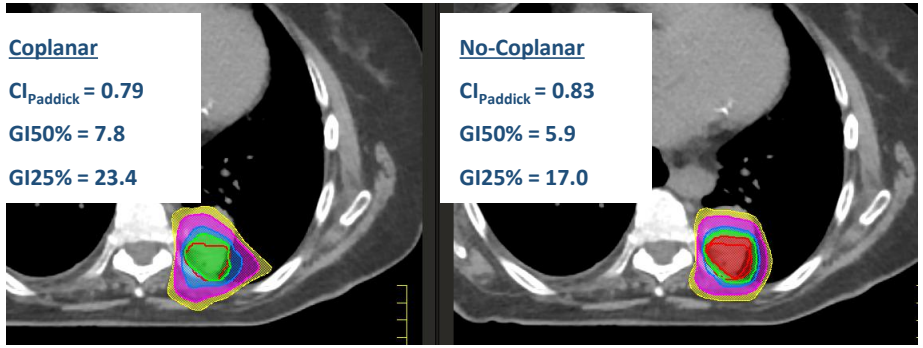
Lung SABR – case 1



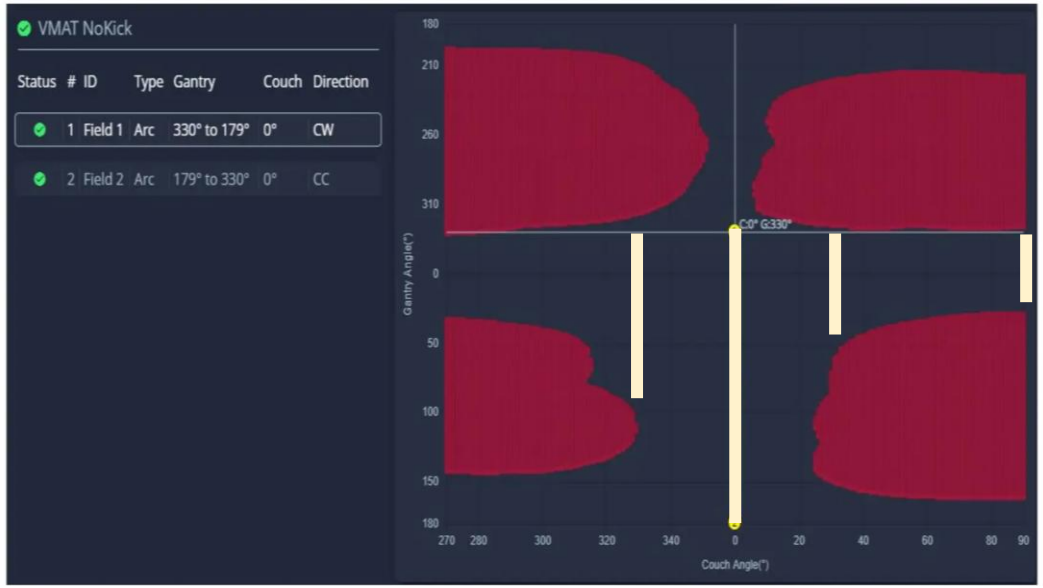


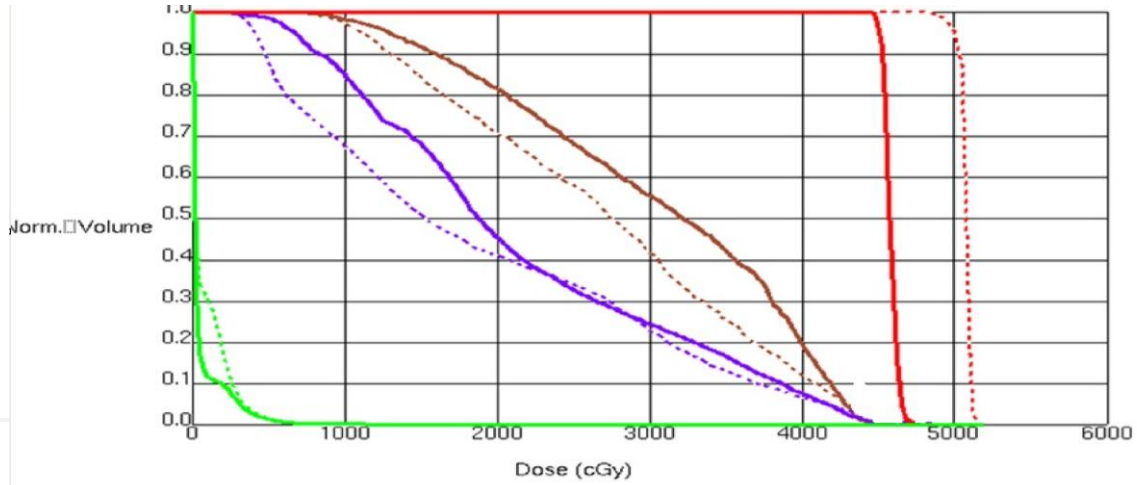


Dose prescription was de-escalated to 45 Gy in 5 fx to satisfy the dose constraint for the rib ($D_{0.1cc}$ < 43 Gy)



Non-Coplanar SABR VMAT for Dose Escalation



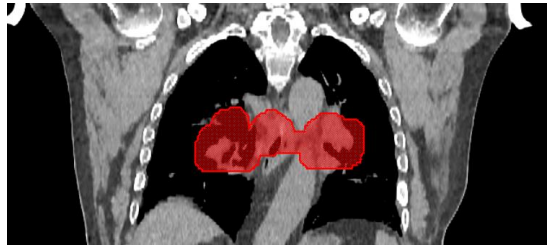


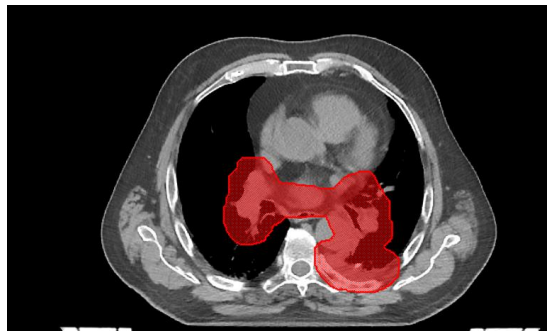
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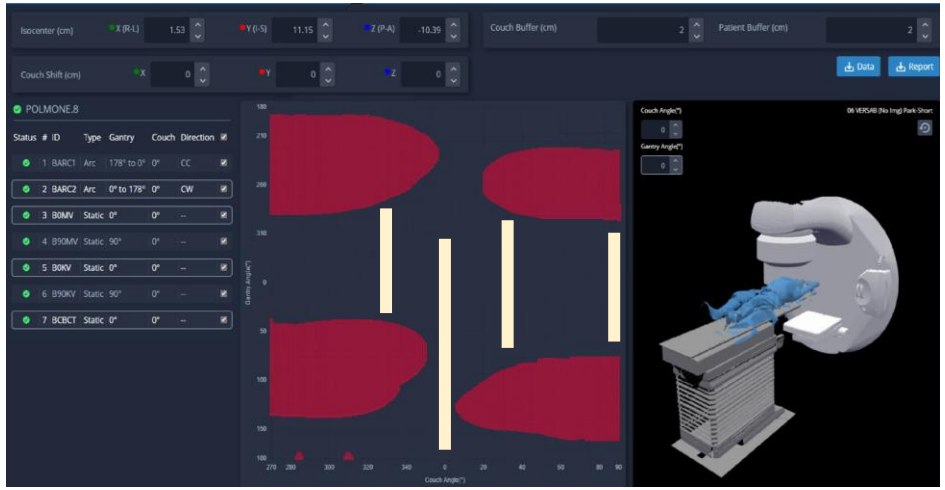
No-coplanar para tumores y volúmenes pulmonares grandes

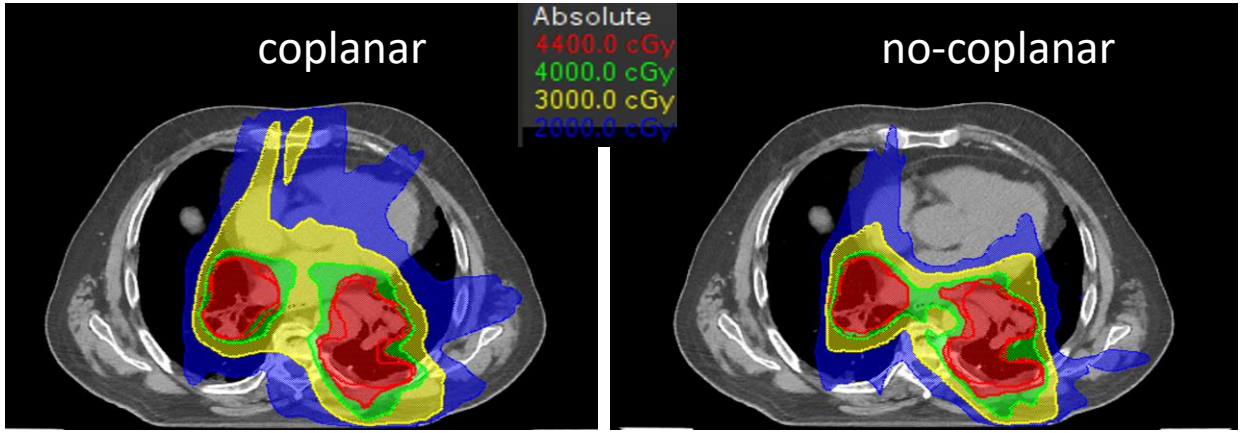
Lung – case 2

- 76-year old male
- Dual-arc SIB VMAT candidate:
  PTV: 558 cm^3, 45.0 Gy in 25 fx
- Limiting dose OARs:
  left and right lungs, heart

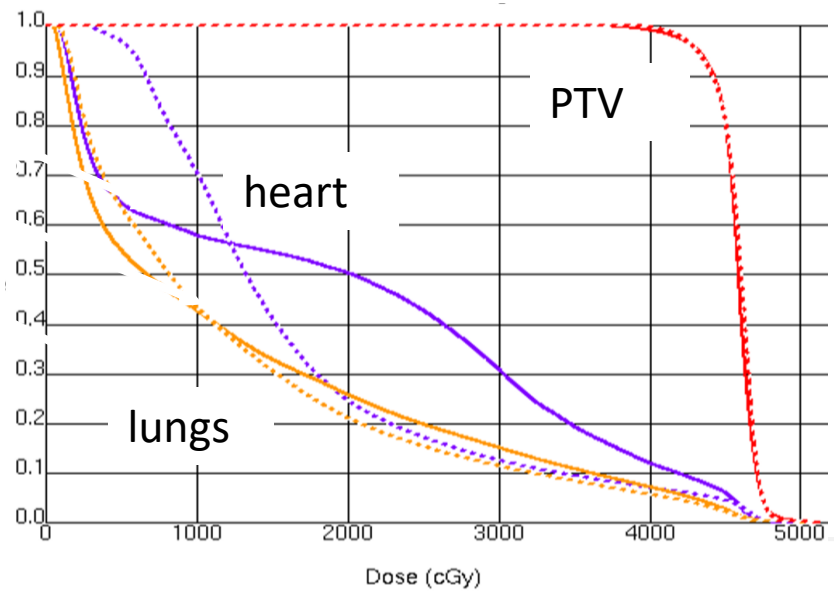








	Coplanar	No-cop
Heart:		
D_{mean} (Gy)	19.5	16.2
V_{20Gy} (%)	50.2	24.8
V_{30Gy} (%)	30.2	12.0
V_{5Gy} (%)	64.0	97.8
Lungs:		
D_{mean} (Gy)	12.8	12.2
V_{20Gy} (%)	27.2	20.2
V_{30Gy} (%)	16.2	11.1
V_{5Gy} (%)	52.0	66.8



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No-coplanar como alternativa a DIBH en pacientes no candidatos



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Guillaume Le Conquérant

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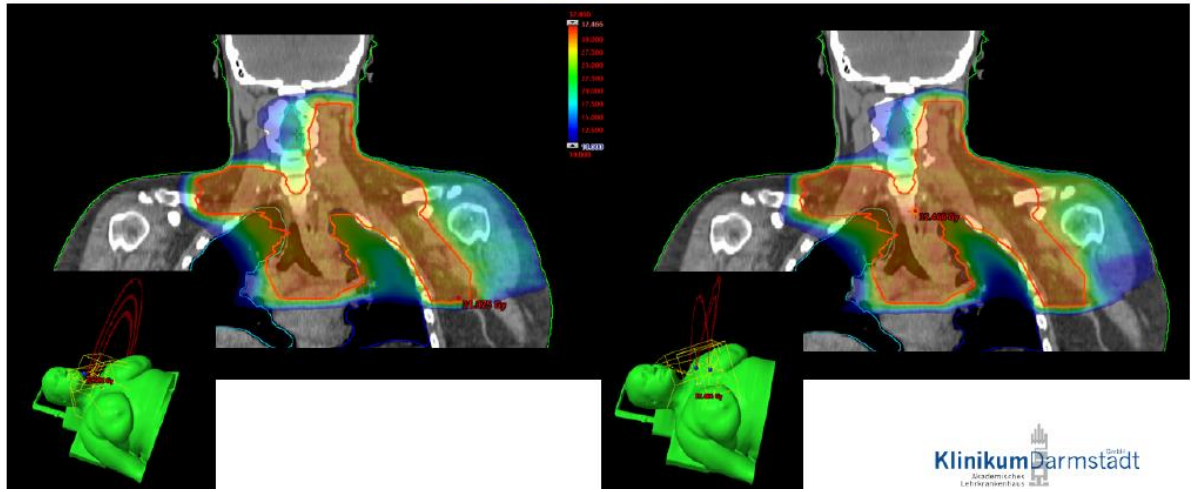
No-coplanar para reirradiaciones

plan optimization using non-coplanar fields – Hodgkin-lymphoma

3 VMAT fields– coplanar

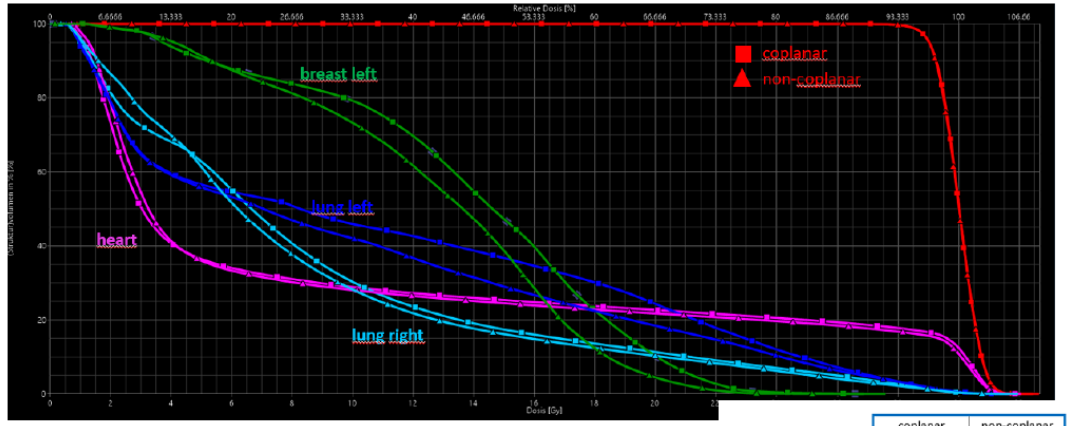
prescription: 15*2,0Gy

3 VMAT fields – 1 non-coplanar



KlinikumDarmstadt

plan optimization using non-coplanar fields – Hodgkin-lymphoma



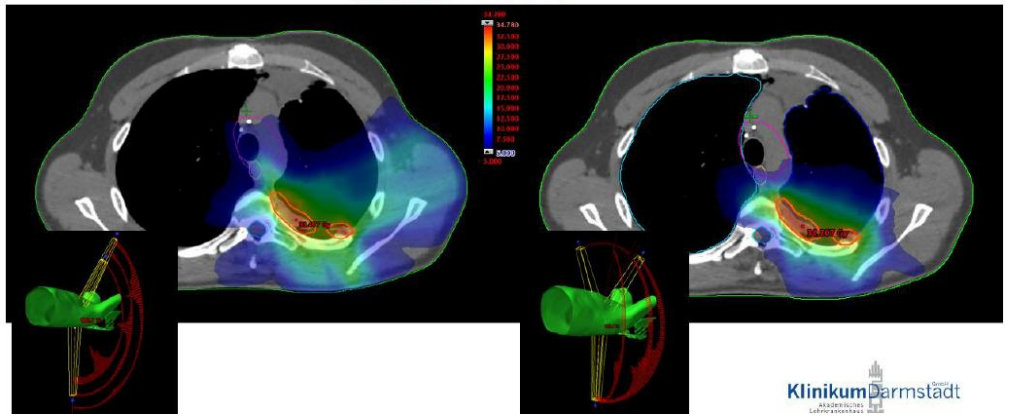
	coplanar	non-coplanar
MU	751,5	830,1
delta MU [%]		10,5
homogeneity index HI	0,081	0,081

plan optimization using non-coplanar fields – metastasis of a thymoma

3 VMAT fields– coplanar

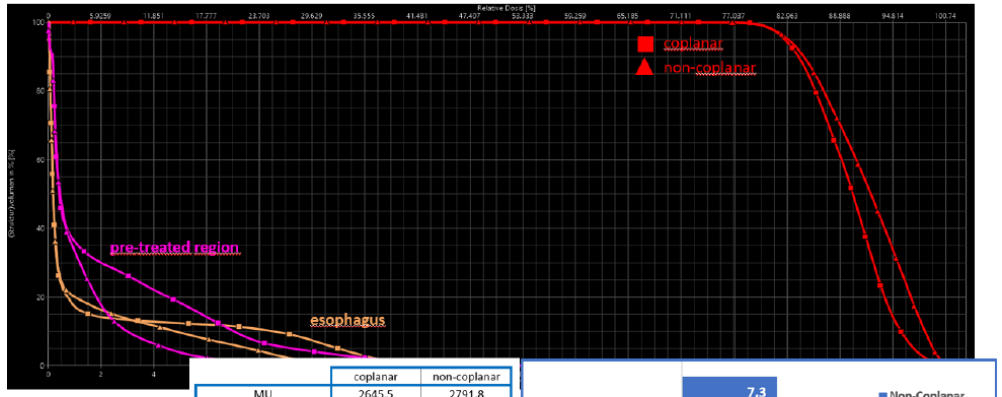
prescription: 3*9,0Gy (80%)

4 VMAT fields – 3 non-coplanar



KlinikumDarmstadt

plan optimization using non-coplanar fields – metastasis of a thymoma



	coplanar	non-coplanar
MU	2645,5	2791,8
delta MU [%]		5,5
conformity index CI	0,630	0,678
gradient index GI	4,380	3,450



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Maximizar la protección de OAR (plantillas N/C)

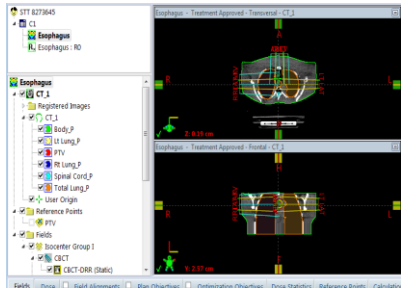
Localización anatómica	Referencia	Prescripción	Población del estudio	Nº de arcos coplanares	Amplitud del arco coplanar	Nº de arcos N/C	Posición de mesa	Amplitud del arco NC
Mama izquierda	*Xie et al (2020)*	25x2Gy	15	2	NA	2	20°	NA
							340°	NA
Mama izquierda + GL	*Xu et al (2021)*	25x2Gy	10	2	310° - 140°	2	90°	345°-40°
					140° - 310°		90°	40°-345°
Mama izquierda + GL	*Frengen et al (2023)*	15x2.67Gy	20	1	178° - 280°	1	90° (plan sagital)	50° - 0°
Mamas bilaterales	*Bharati et al (2023)*	25x1.8Gy / 25x1.8Gy + 5x2Gy	9	2	179° - 181°	2	90°	30°-45°
					181° - 179°		90°	45°-30°
SBRT de pulmón	*Ye et al (2024)*	5x10Gy	24	1	181° - 30°	1	15°/30°/45° /60°/75°/ 90°	181°-30°
SBRT de pulmón DIBH	*Fleckenstein et al. (2018)*	3 x 12.5 Gy / 3 x 15 Gy	46	1	180° - 40°	3	35°	3 arcos parciales de 40° cada uno
							90°	
							345°	
SBRT de pulmón	*Kim et al. (2020)*	4 x 15 Gy	20	3	179° - 0°	1	315°	315° - 45°
					0° - 179°			
					179° - 0°			
SRT de H&N	*Biau et al. (2017)*	6 x 6 Gy	10	2	179° - 181°	2	90°	0 - 181°
					181° - 179°		270°	179° - 0°
H&N	*Gayen et al. (2020)*	35 x 2 Gy	22	2	179° - 181°	2	10° ± 10°	Arco completo
					181° - 179°		315° ± 10°	Arco completo
H&N	*Gonod et al. (2025)**	30/33 x 2 Gy / 33 x 2.09 Gy / 33 x 2.12 Gy	10	2/3	180°-0°	4	25°	181°-60°
					0°-180°		25°	60°-181°
							335°	179°-300°
							335°	300°-179°

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**Gonod et al* es el único estudio con acceso a los mapas de clearance de MapRT

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Mayor integración de MapRT con el TPS (Eclipse)



Eclipse ESAPI

DicomRT Plan y Struct

Parámetros del plan

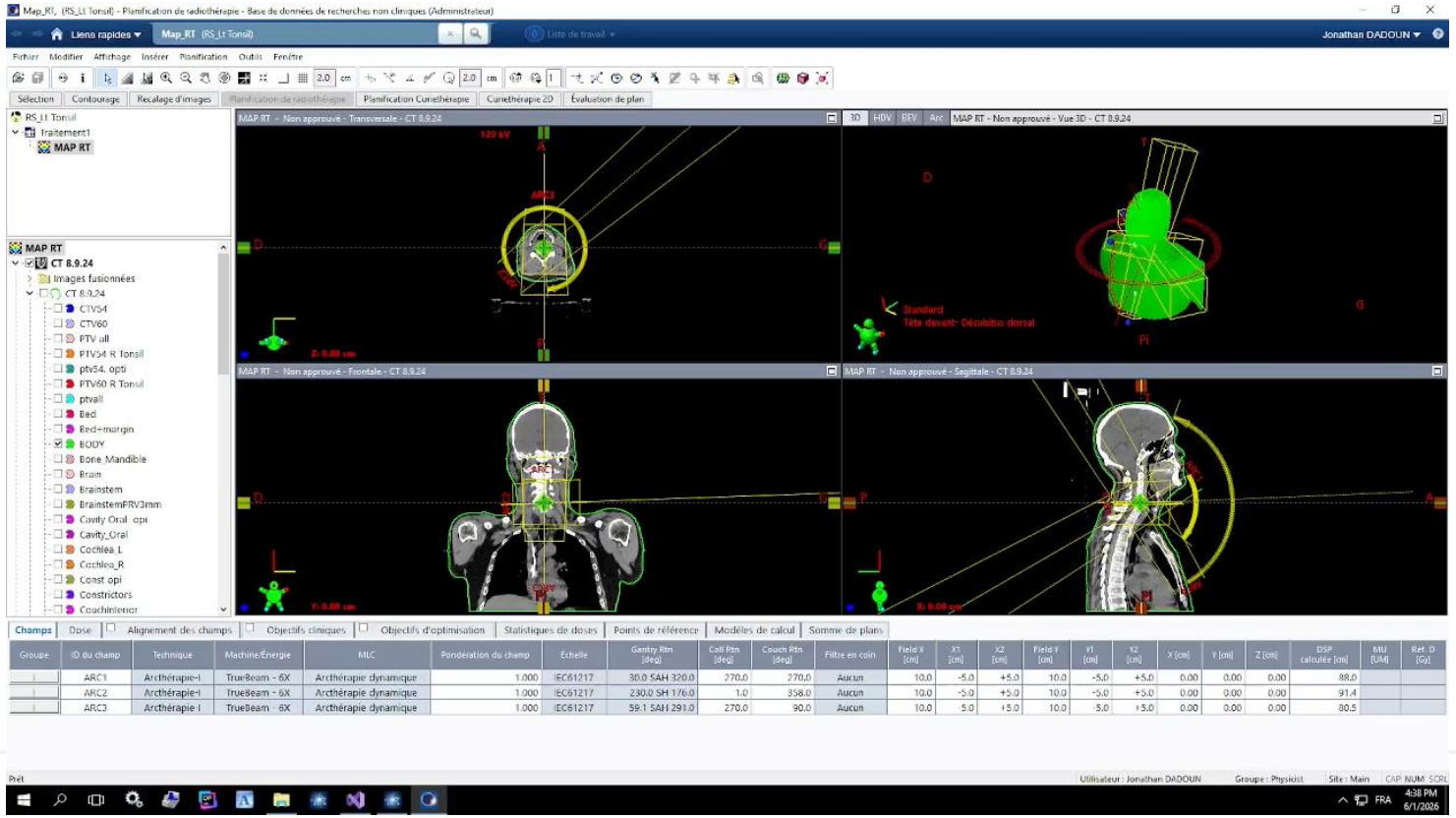


Mapa anticolisión

maprt®

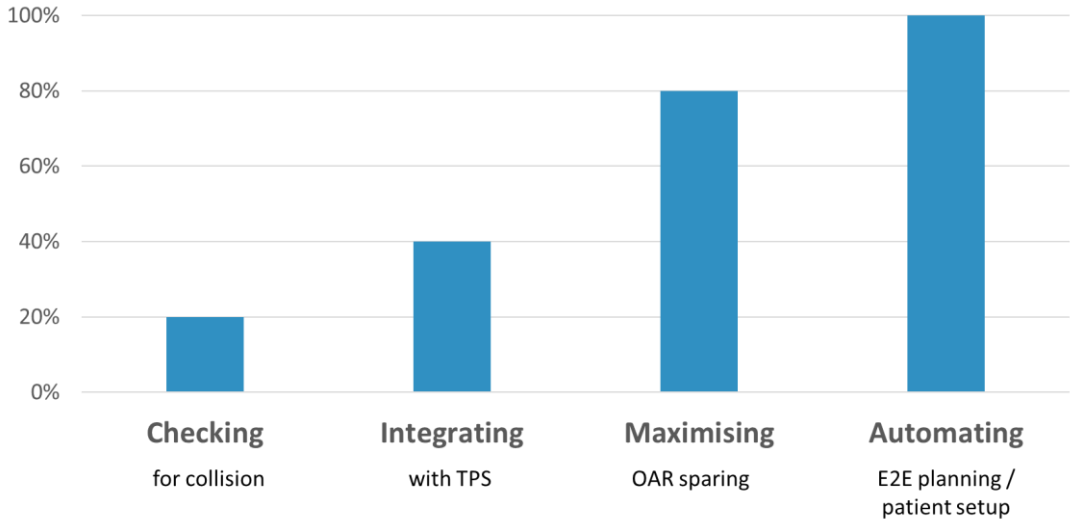
CENTRE de RADIOTHÉRAPIE Guillaume Le Conquérant

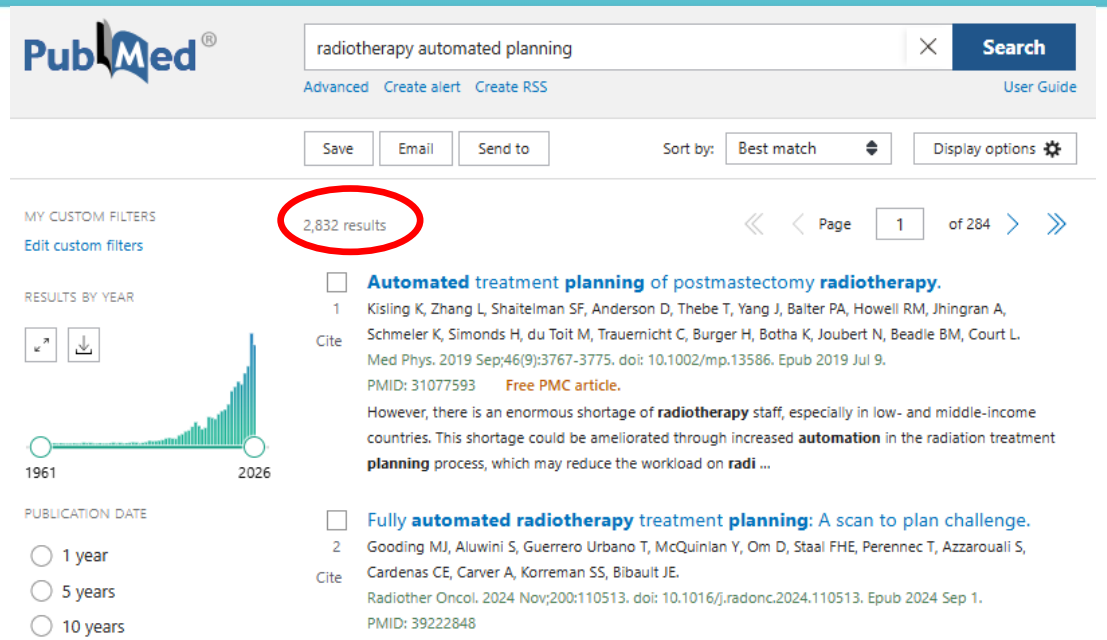
1. **MapRT – CT contour validation**
2. **Template-based Non-Coplanar plans**
3. **Maximized & Personalized ballistics**
4. **Single-click plan export to Eclipse**



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Automatización





MapRT + planificación automatizada del tratamiento

- ✓ **N/C** sin colisiones
- ✓ **Ángulos/recorridos de gantry más amplios** en configuraciones N/C
- ✓ **Planificación comparativa** convencional vs. plantilla N/C vs. N/C individualizada
- ✓ **Modelos predictivos** mejor plan según la morfología del paciente/tumor y las posiciones de los OAR

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MapRT y la radioterapia del futuro con trayectorias dinámicas

Dosimetrically motivated beam-angle optimization for non-coplanar arc radiotherapy with and without dynamic collimator rotation

MEDICAL PHYSICS

Jenny Bertholet[1] | Chengchen Zhu[1] | Gian Guyer[1] | Silvan Mueller[1] | Werner Volken[1] | Paul-Henry Mackeprang[1] | Hannes A. Loebner[1] | Marco F. M. Stampanoni[2] | Daniel M. Aebersold[1] | Michael K. Fix[1] | Peter Manser[1]

Technical note: Feasibility of gating for dynamic trajectory radiotherapy – Mechanical accuracy and dosimetric performance

MEDICAL PHYSICS

Accepted: 23 May 2023

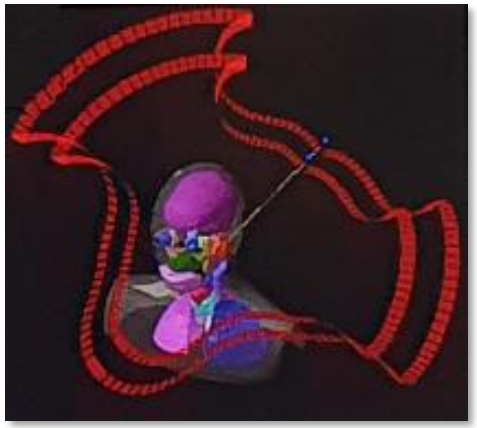
Hannes A. Loebner[1] | Daniel Frauchiger[1] | Silvan Mueller[1] | Gian Guyer[1] | Paul-Henry Mackeprang[1] | Marco F. M. Stampanoni[2] | Michael K. Fix[1] | Peter Manser[1] | Jenny Bertholet[1]

Impact of the gradient in gantry-table rotation on dynamic trajectory radiotherapy plan quality

MEDICAL PHYSICS

Accepted: 10 September 2023

Hannes A. Loebner[1] | Silvan Mueller[1] | Werner Volken[1] | Philipp Wallimann[1] | Daniel M. Aebersold[1] | Marco F. M. Stampanoni[2] | Michael K. Fix[1] | Peter Manser[1]





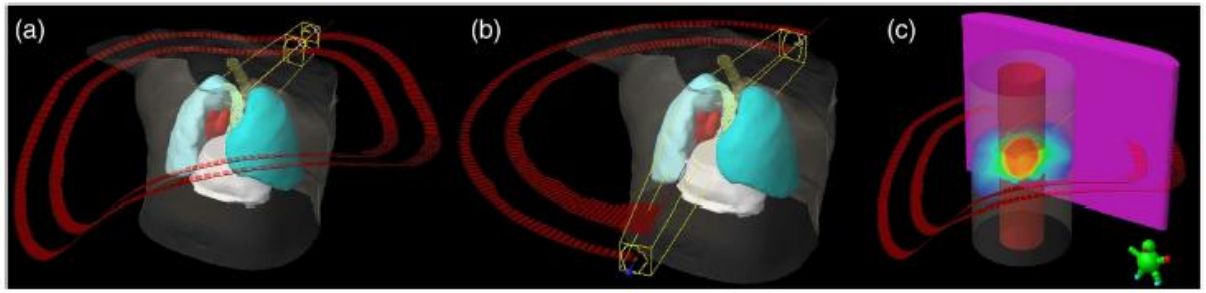


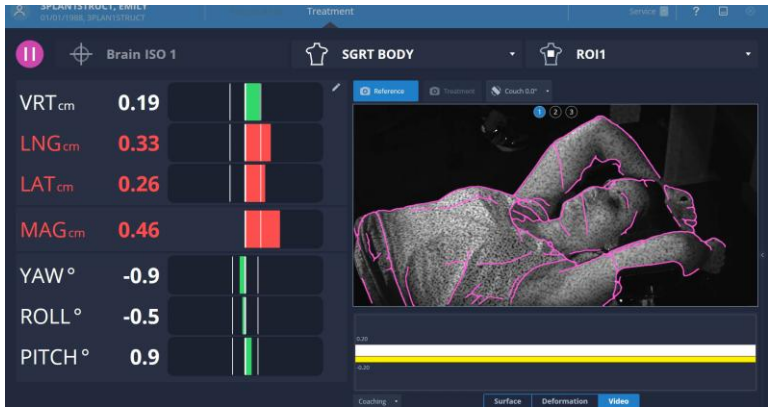
FIGURE 1 DTRT trajectories (a), VMAT arcs (b) and motion phantom with DTRT trajectories (c) for the lung cancer case. The PTV is shown in red, lungs in blue, spinal cord in yellow, oesophagus in green, heart in white and the body surface in translucent grey. The red bands indicate the beam incidences of the DTRT and VMAT plan respectively.

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SGRT/MapRT ¿y ahora qué?

(Re)Inventar/definir la SGRT más allá del control del movimiento

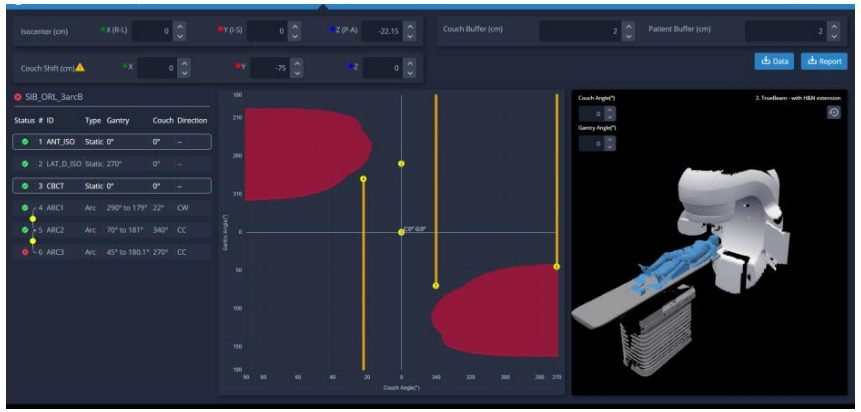
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Conocimiento de los RTD

Colisiones a tiempo real

maprt®



Oportunidades de colaboración…



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¿Alguna pregunta?

SGRT Annual European Meeting 2026: A to Z with SGRT

Date: Dec 3rd, 12:30pm - 5:30pm (w free evening event) / Dec 4th, 8:30am - 5pm

Location: London, UK

Venue: etc. venues County Hall

Join us at our Annual European SGRT Meeting, held Dec 3rd and 4th at London County Hall!

Register >



Parador de Antequera

JORNADAS SARH

Nuevas Técnicas y Retos de los Sistemas de Planificación de Tratamientos de Radioterapia

Antequera, 23 de octubre 2026



SOCIEDAD ANDALUZA DE RADIOFÍSICA HOSPITALARIA

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