

# Quoi de neuf en radiothérapie?

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# La RT, un traitement adjuvant indispensable

## INDICATIONS

Soft Tissue Sarcoma  
RP sarcoma  
ChondroSarcoma  
Chordoma  
Pediatric Sarcomas

Augmenter la dose  
(tumeur)

Radiations ionisantes  
Plus efficaces

Traitements  
combinés

Réduire la dose  
(tissus sains)

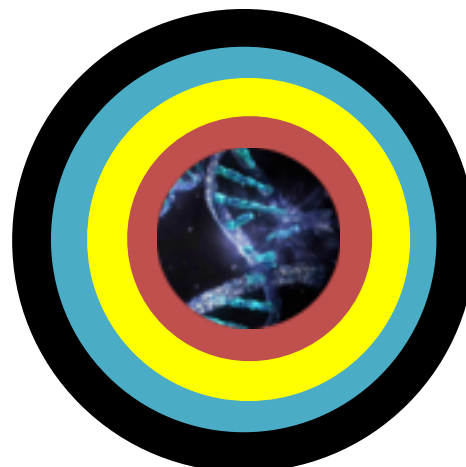
Définition précise  
des volumes cibles

Délivrance précise  
De la dose

## PRESCRIPTION



**EFFICACITE**

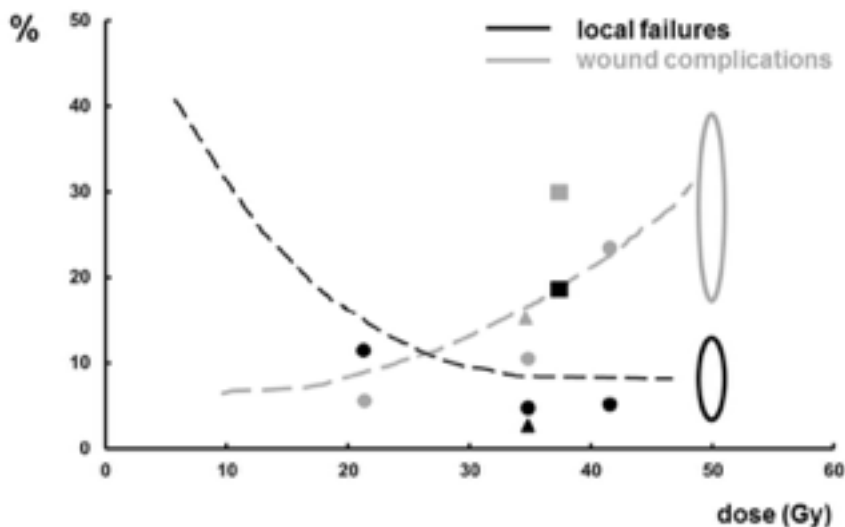


**TRAITEMENT**



**TOXICITE**

# Optimisation de la dose



## Sarcomes à haut risque

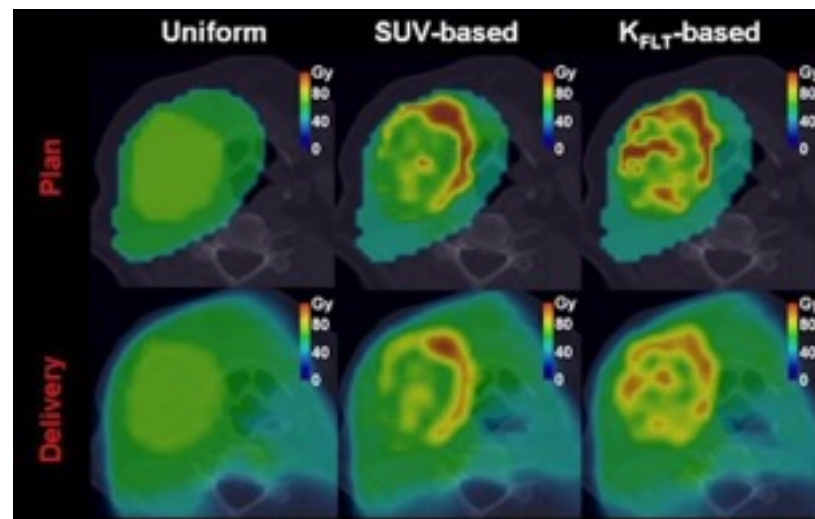
- Rétropéritone
- > 50 ans, > 5 cm, R1 planifié, MFS-MPNST

MSKCC phase II (Short course preop 5x5 Gy)

→ 81% estimated 5y LC

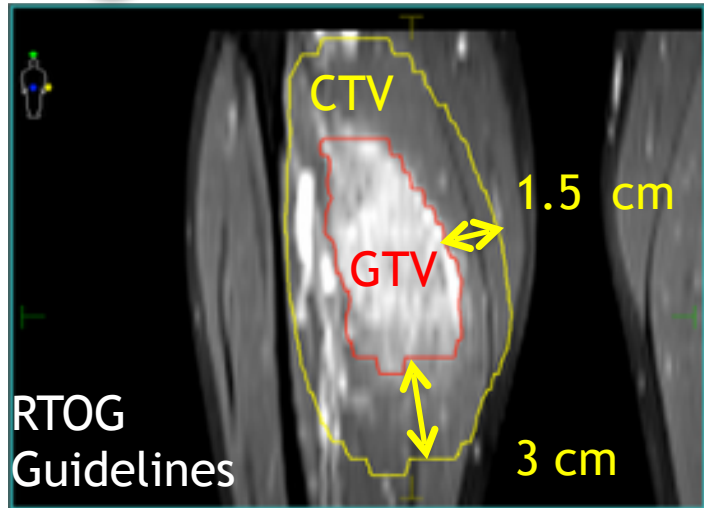
Dose reduction in LS myxoid

Preoperative 18x2 Gy  
→ % necrosis, LC

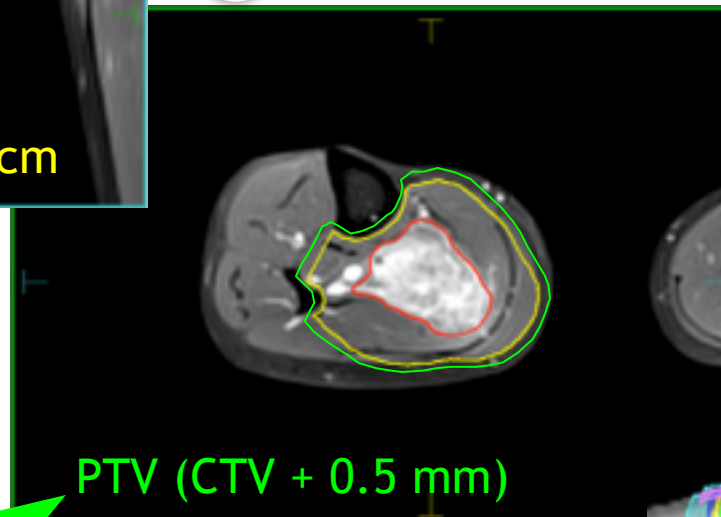


# Les améliorations en photonothérapie

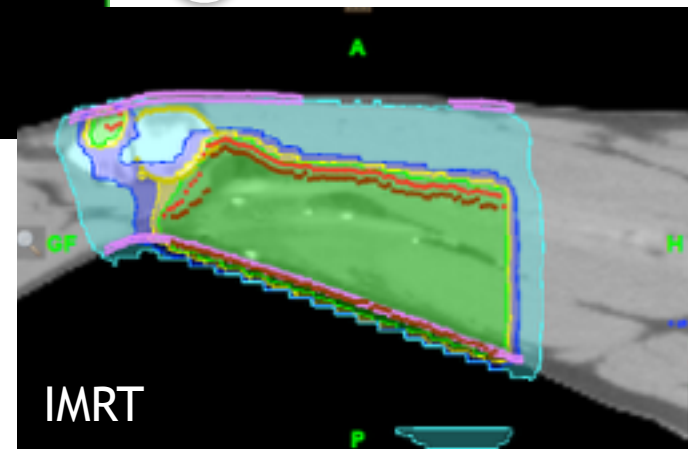
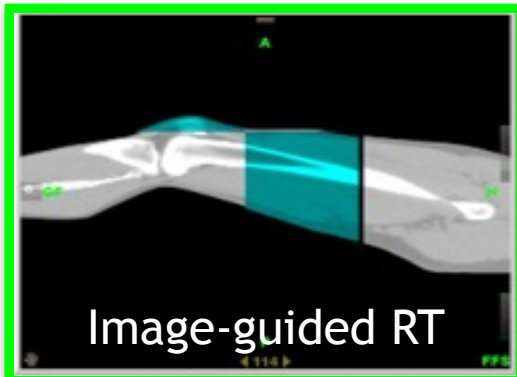
## 1 Du GTV au CTV



## 2 Du CTV au PTV



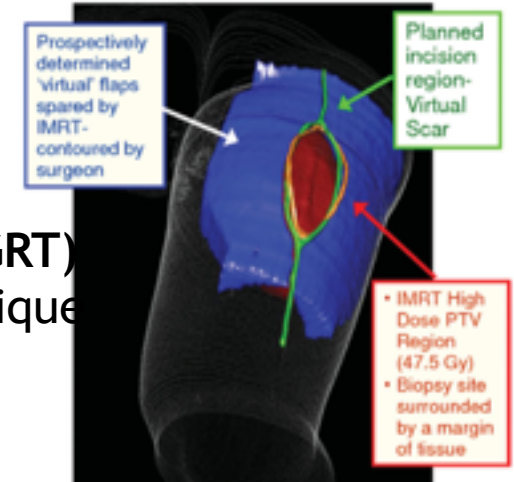
## 3 Du PTV à la dose



# Une photonthérapie plus précise

## Impact sur les toxicités aiguës et tardives

PMH trial (IMRT/IGRT)  
Flap sparing technique

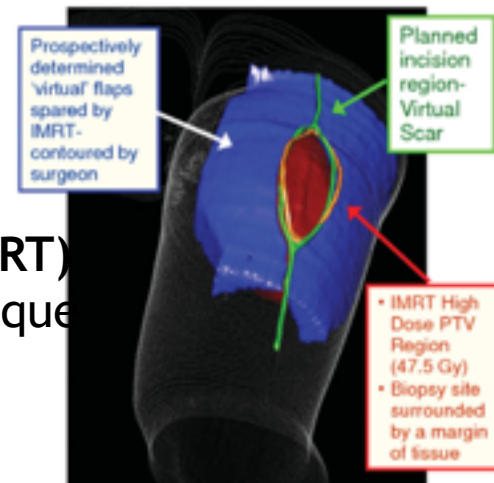


TRIALS	DOSE	VOLUME	TECHNIQUE	LCR	ACUTE TOXICITIES		LATE TOXICITIES		
					WC	Primary closure	Fibrosis	Joint stiffness	Oedema
SR2 trial n=92	50 Gy 2Gy/#	PTV=GTV+5 (2)	2D 3D-CRT	87%	35%	66%	31.5%	17%	15%
PMH trial n=59	50 Gy 2Gy/#	CTV=GTV+4 (1.5) PTV=CTV+0.5	IMRT IGRT	93%	30.5%	93.2%	9.3%	5.6%	11.1%
RTOG 0630 n=79	50 Gy 2Gy/#	CTV=GTV+3 (1.5) PTV=CTV+0.5	IMRT/3D-CRT IGRT	90%	36.5%	-	5.3%	3.5%	5.5%

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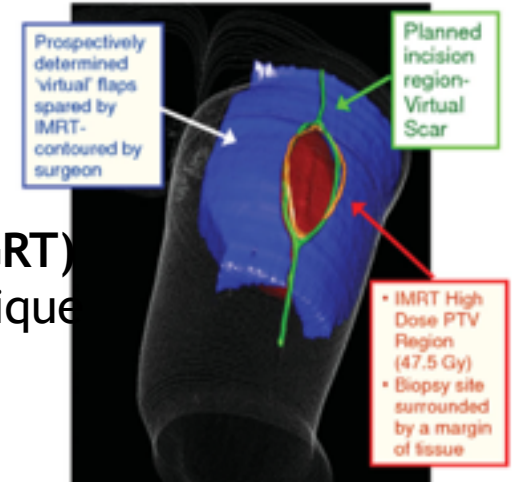


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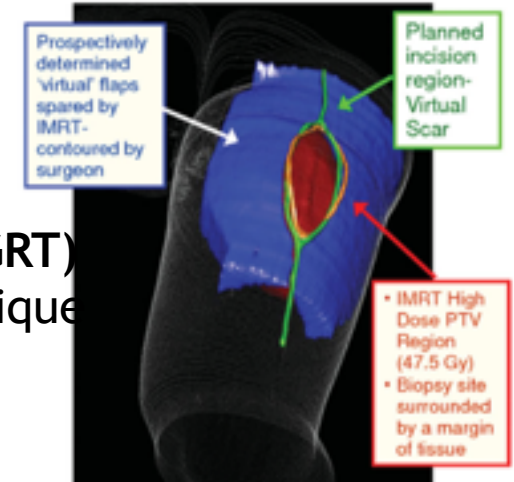
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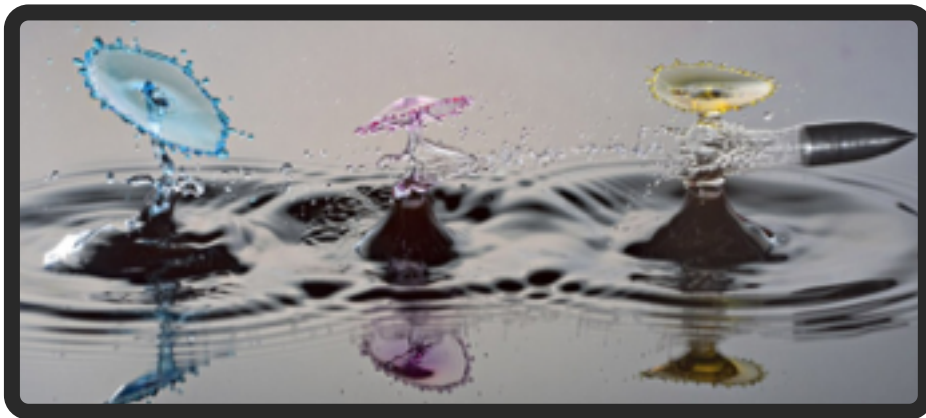
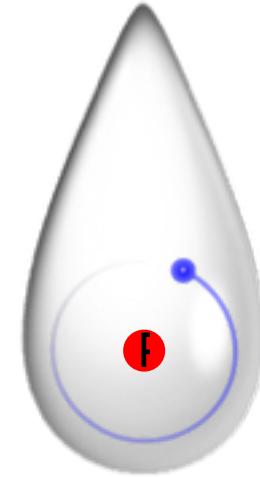
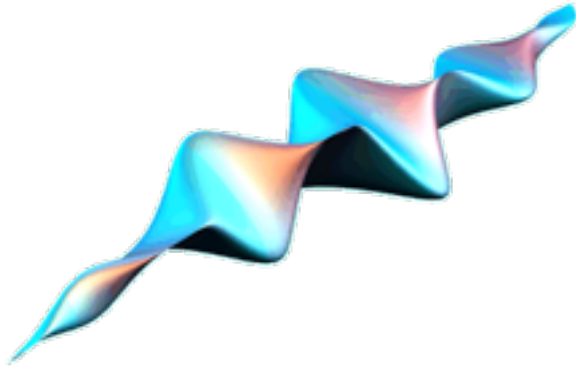


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# Proton Therapy, des rayons qui s'arrêtent

L'avantage balistique des protons



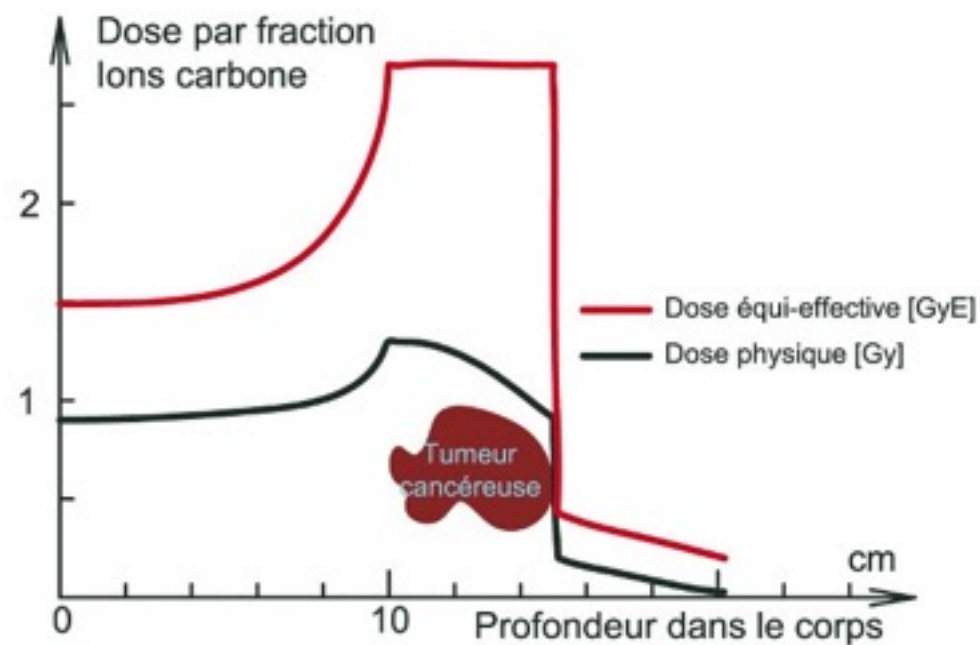
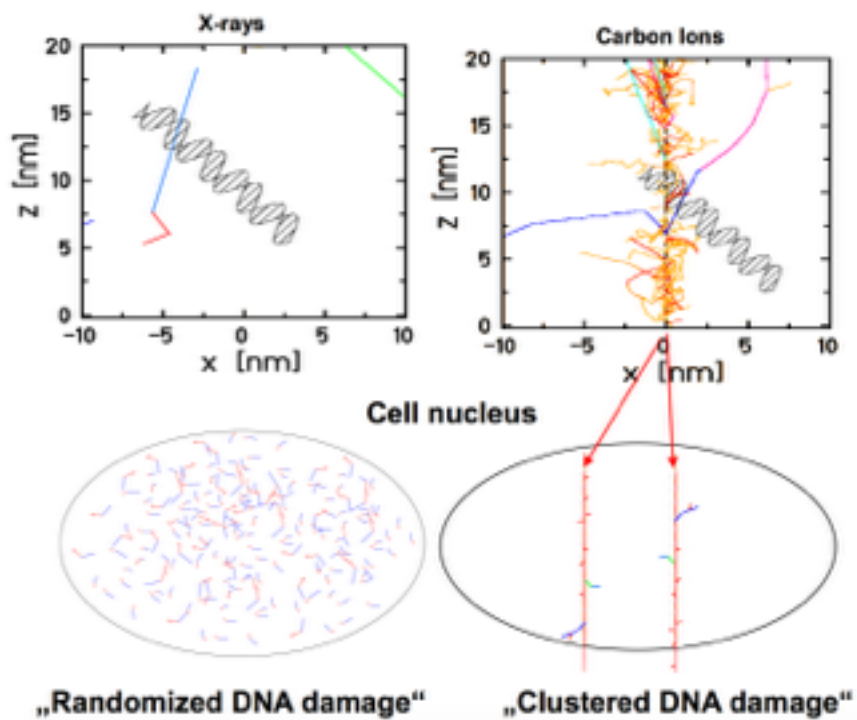
PHOTON THERAPY



PROTON THERAPY

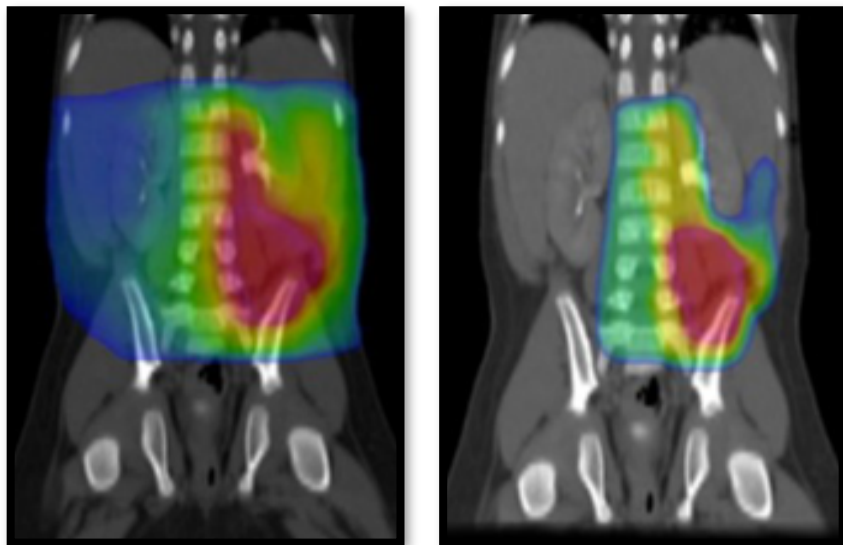
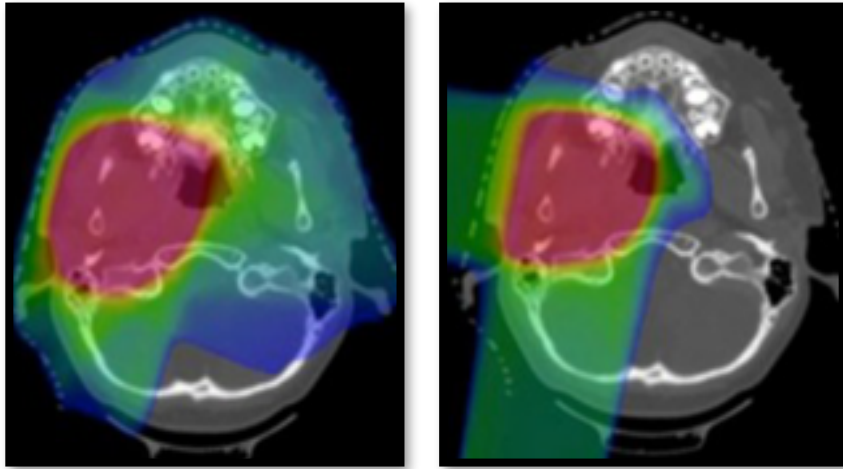
# Carbon ions therapy

## Avantages balistique ET biologique



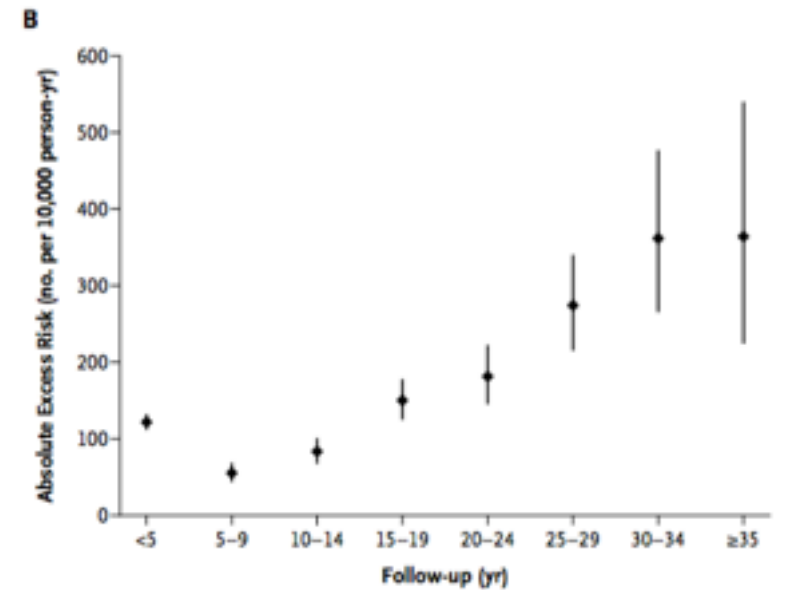
# Rationnel hadrontherapy et sarcome

Les enfants, des patients particulièrement sensibles aux radiations



PHOTON

PROTON



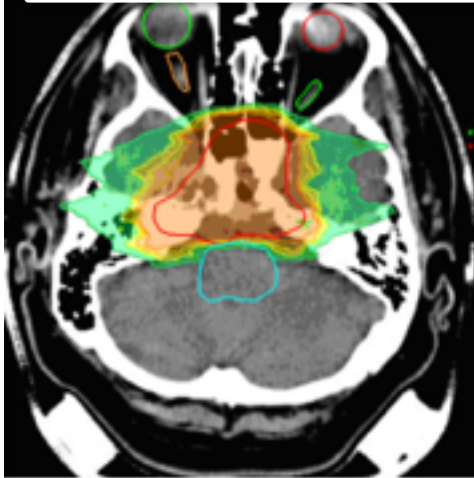
**Figure 1.** Standardized Incidence Ratios and Absolute Excess Risks of Any Subsequent Malignant Neoplasm after Treatment for Hodgkin's Lymphoma, According to Follow-up Interval.



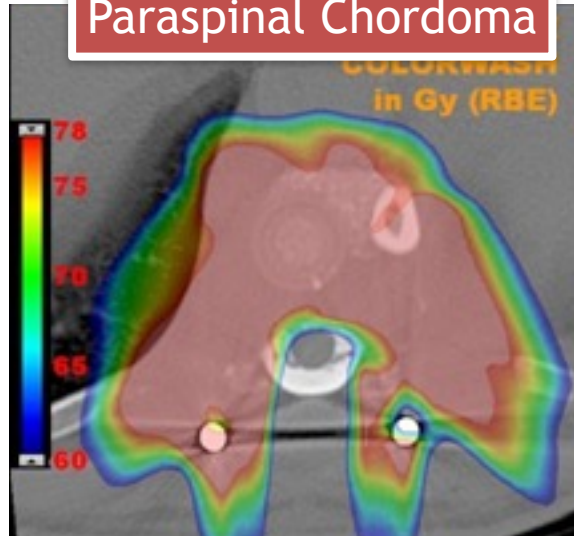
# Rationnel Hadrontherapy et sarcome

Des tumeurs radioresistantes dans un environnement radiosensible

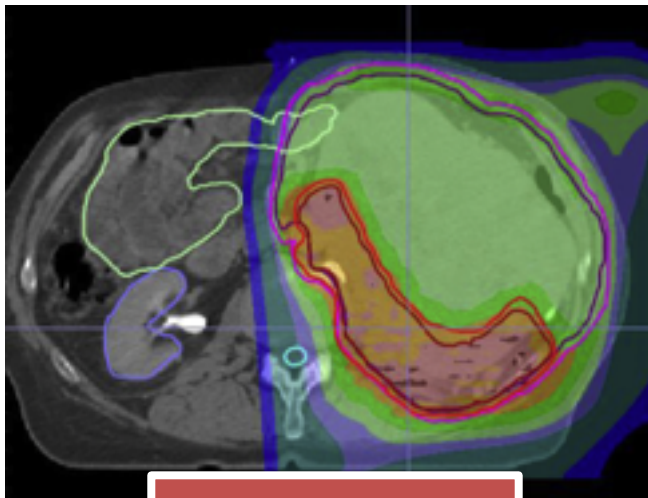
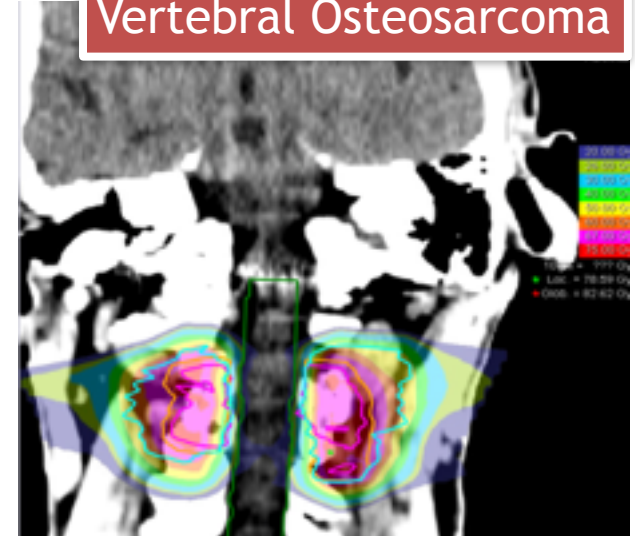
BS Chondrosarcoma



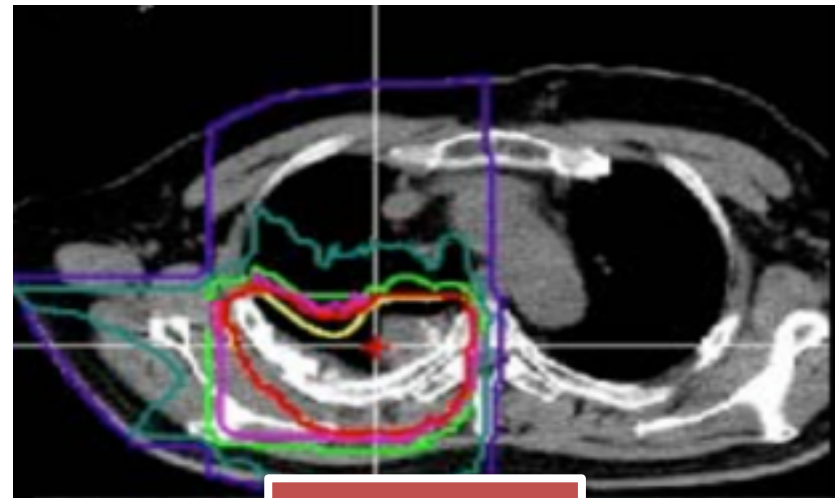
Paraspinal Chordoma



Vertebral Osteosarcoma



RetroP Sarcoma



Ribs Sarcoma

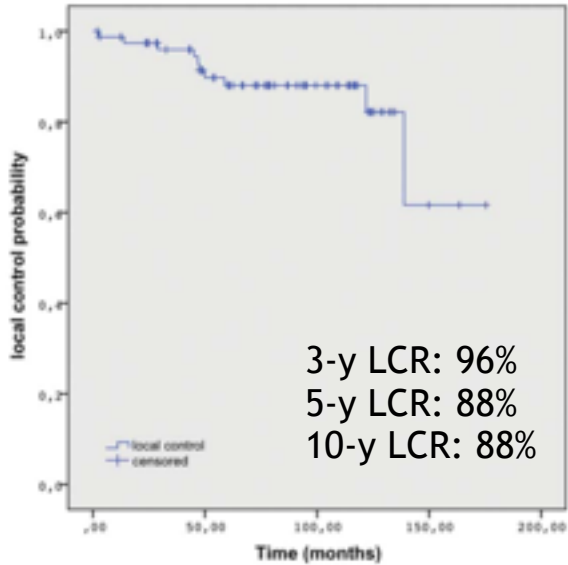


# Chordome de la base du crane

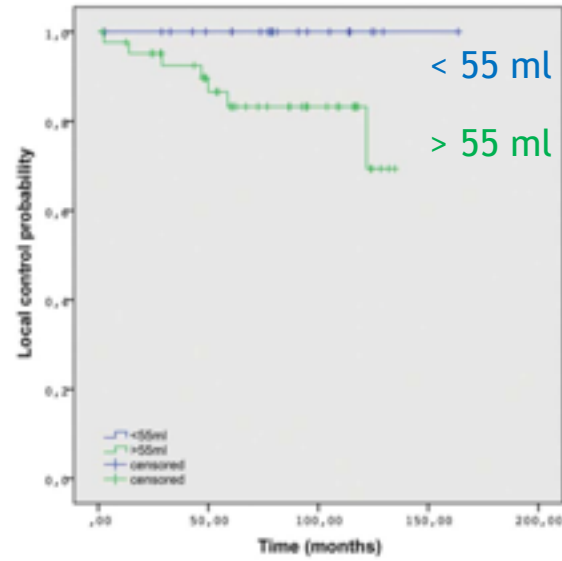
	Authors	N	Median dose	Median f/u (y)	Local control rate (%)		
					3-y	5-y	10-y
Photon	Catton et al . 1996	24	50	5.2		23	15
	Romero et al. 1993	18	50	3.1		17	
	Forsyth et al. 1993	39	50	8.3		39	31
	Magrini et al. 1992	12	58	6		25	25
Proton (+/- photon)	Munzenrider et al. (MGH) 1999	169	66-83	3.4		73	54
	Noel et al. (CPO) 2003	100	67	2.6	86 (2y)	54 (4y)	
	Igaki et al. (Tsukuba) 2004	13	72	5.8	67	46	
	Ares et al. (PSI) 2009	42	73.5	3.2 (mean)		81	
Helium	Castro et al. (LB) 1994	53	65	4.3		63	
Carbon	Shults-Ertner et al. (GSI) 2007	96	60	2.6 (mean)	81	70	
	<b>NIRS</b>	<b>44</b>	<b>60.8</b>	<b>4.8</b>	<b>91</b>	<b>88</b>	<b>79</b>

# Chondrosarcome de la base de crâne

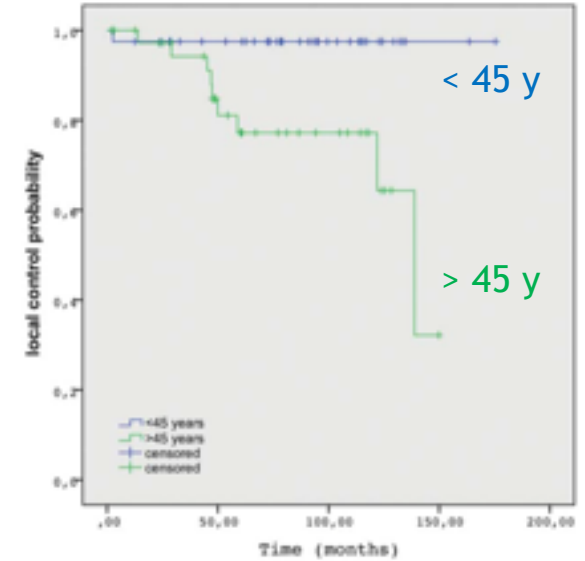
Long-term result from Heilderberg (n=79, 60 GyE, 3 Gy/#)



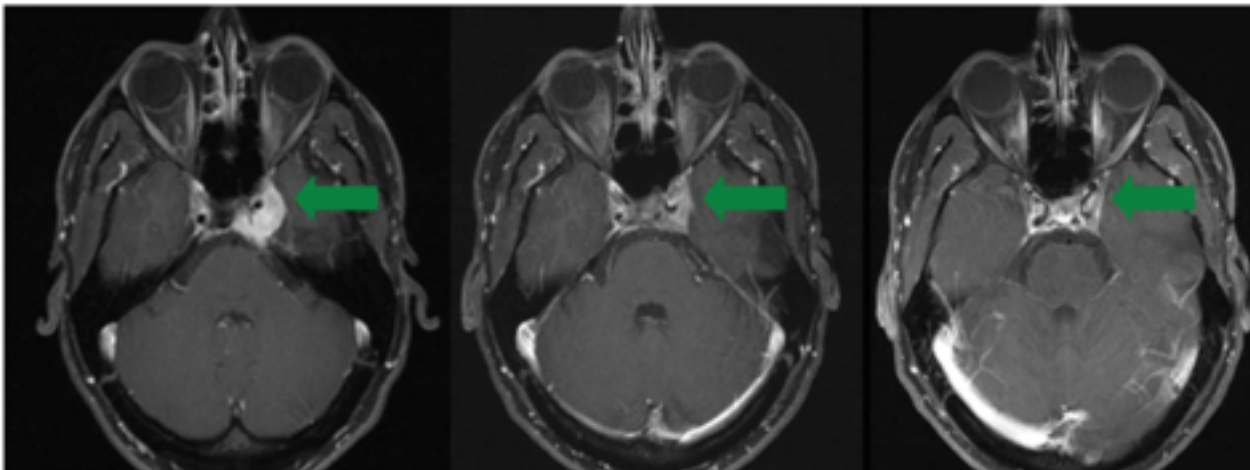
2005



2007

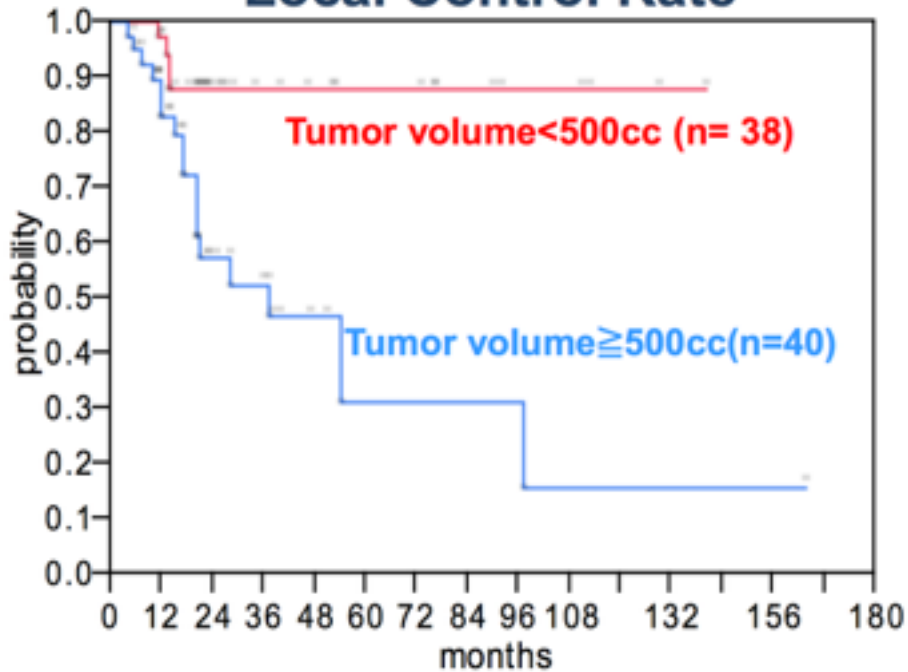


2013

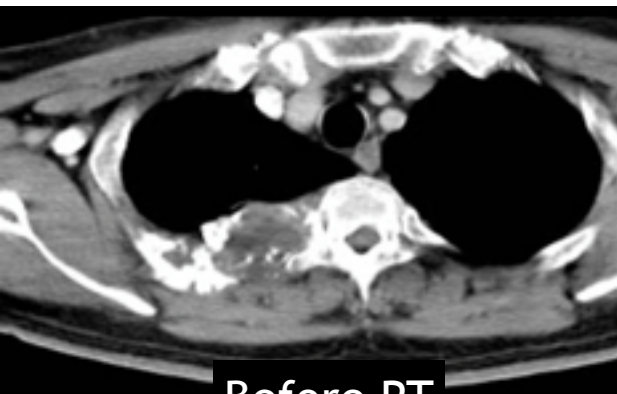
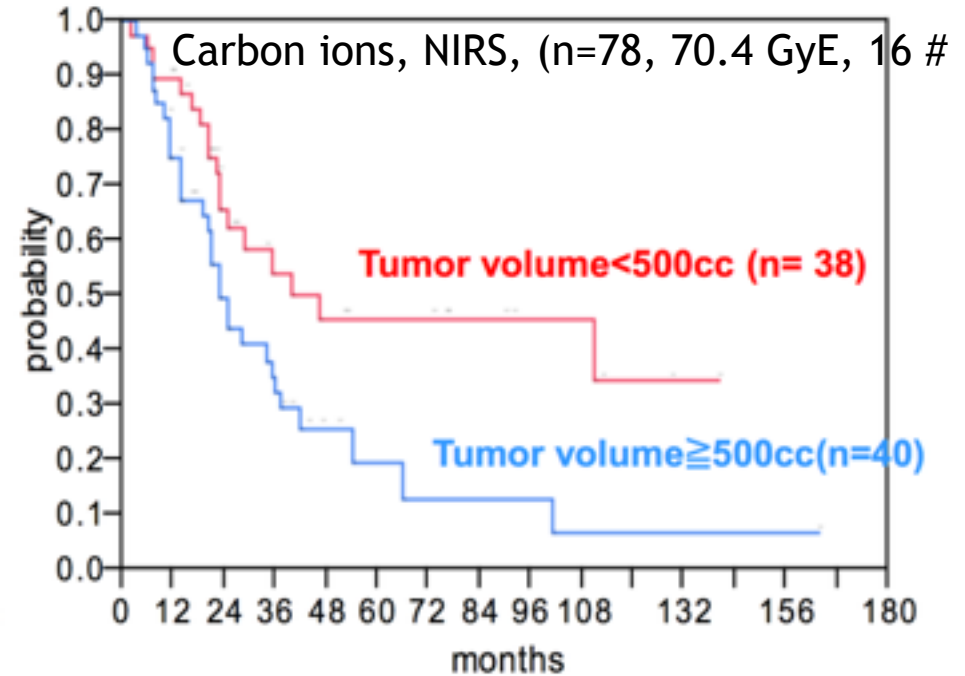


# Ostéosarcomes non résecable

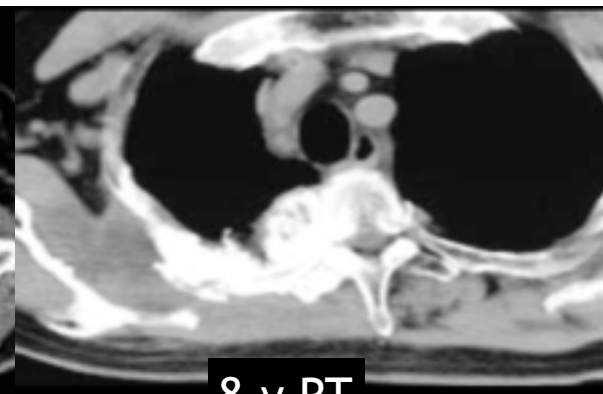
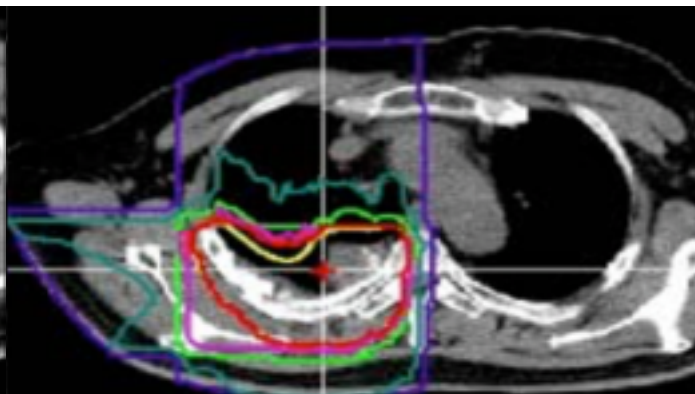
## Local Control Rate



## Overall Survival Rate



Before RT

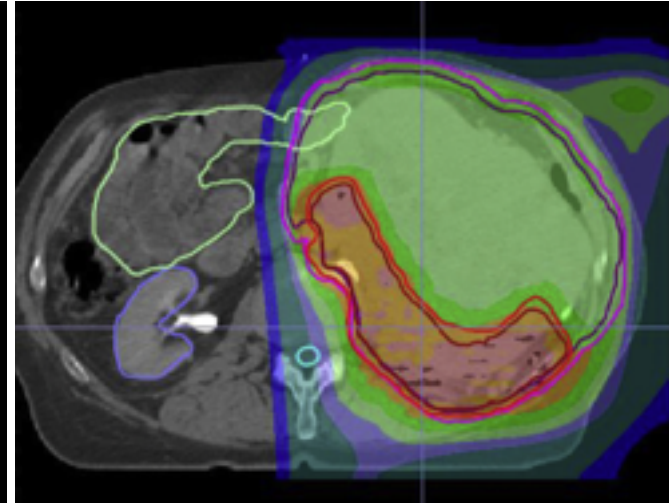
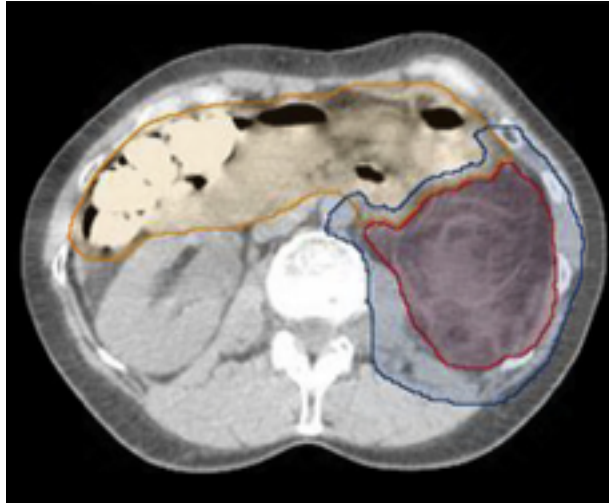
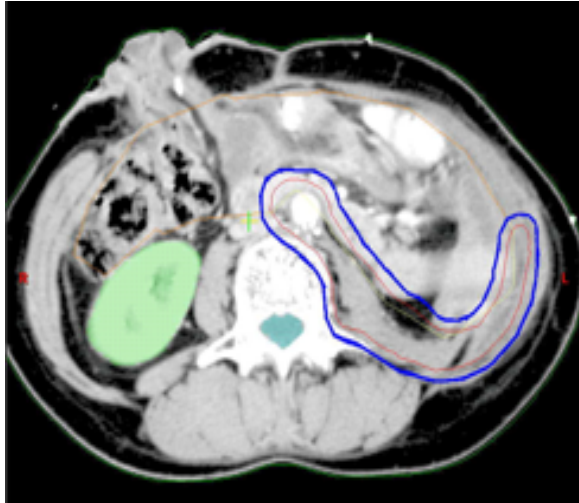


8-y RT



# Sarcome du rétropéritoine

## Un challenge thérapeutique



### RT POST-OPERATOIRE

- TV difficile à définir
- Organes dans le PTV
- Hautes doses (60-66 Gy).
- Toxicités aiguës/tardives

**Non recommandé**

### RT PRE-OPERATOIRE

- TV facile à définir
- Organes en-dehors du PTV
- Dose plus faible (50 Gy)
- Faible incidence toxicité

**Investigationnel  
→ STRASS trial**

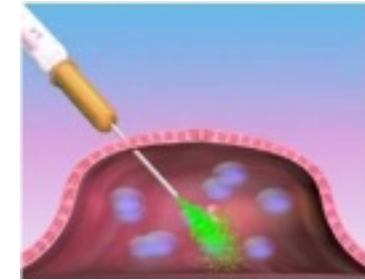
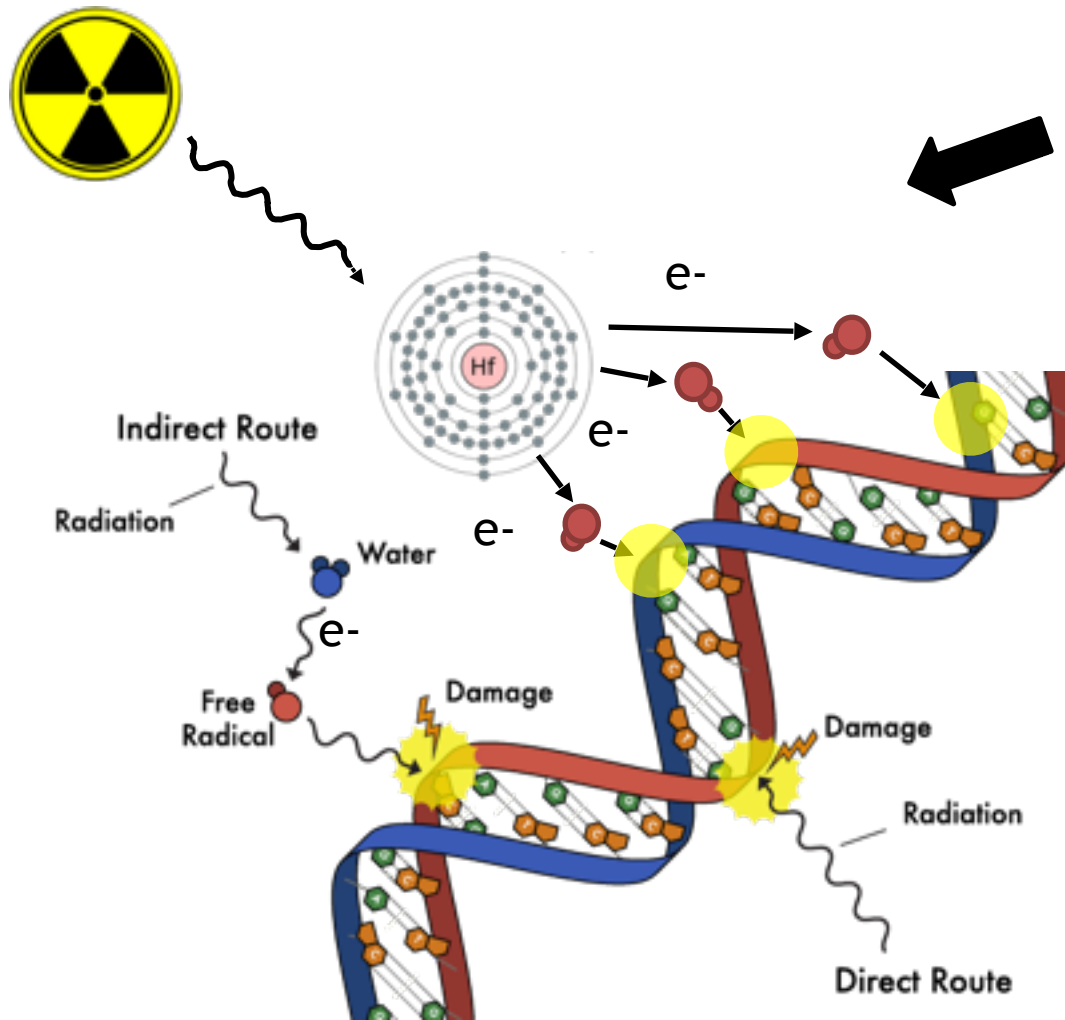
### HADRONTHERAPY ET BOOST

- Excellente épargne OARs
- Surdosage potentiel des zones à risque de récurrence

**Investigationnel  
→ Prospective trials**

# Les nanoparticules activées par rayons X

Potentialiser l'effet local des radiations ionisantes



Halfium oxide nanoparticle

# Nanoparticules et sarcomes

## Phase I trial (n=20):

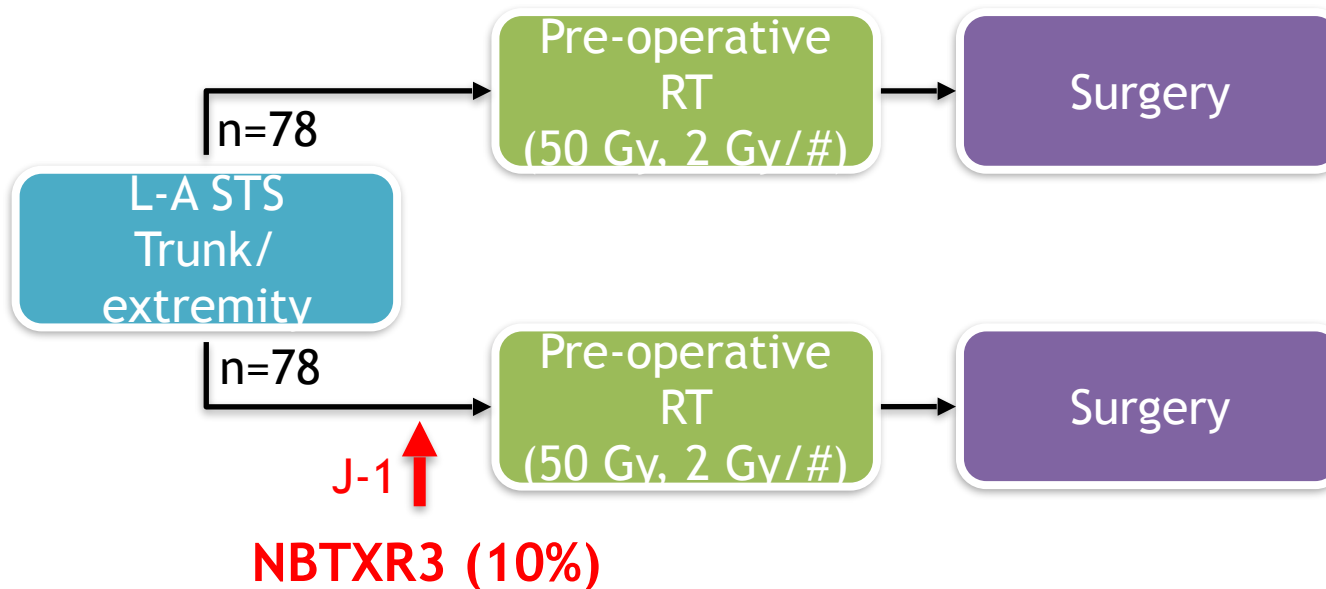
« In-human clinical trial (NBTXR -101) in locally-advanced STS of the extremity and trunk »

- Intratumor NBTXR3 (2.5%, 5%, 10%, 20% TV)
- à Activation by RT (25x2 Gy), 24h later
- à Surgery at 5 to 6 weeks post-RT

**AE:** Site pain (depending on volume)  
Abdominal pain (1), pyrexia (1)

**RES:** pCR (1), nearly pCR (2), viable cells  
median volume change 40% (levels 2-4)  
wide resection in all patients

## Ongoing phase II-III randomized trial (n=156):



Primary objective

→ pCRR

Secondary objectives

à Safety profile

à ORR (MRI)

à Tumor volume change

à Margin status (R)

**MERCI POUR VOTRE ATTENTION**