NHS
The Christie
NHS Foundation Trust

Adaptive Radiotherapy and Pancreatic Cancer

Ganesh Radhakrishna

Declaration

The Christie NHS Foundation Trust

- I have been named on grants for research and project work from:

  Cancer Research UK

  Pancreatic Cancer UK

  BRC

- I am a clinical co lead for

  GIRFT Pancreatic Cancer

  National Pancreatic Cancer Audit

- I have received honoraria from Servier and MSD in 2024.

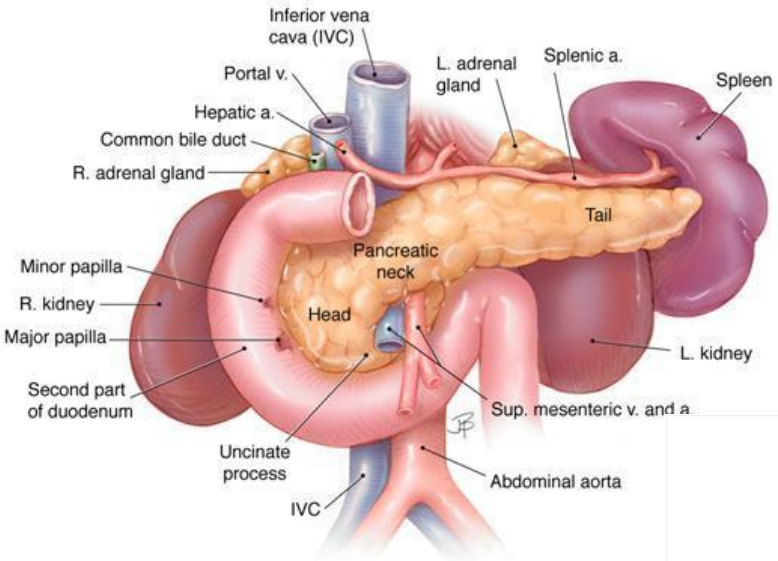
Outline of session

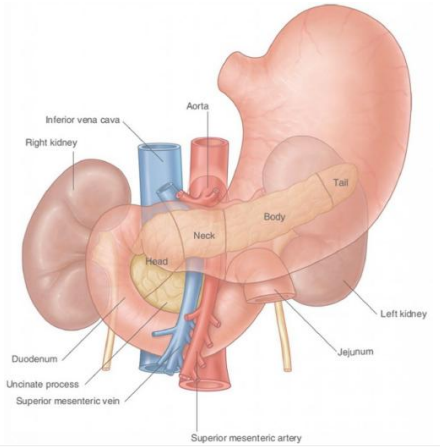
- Principles of precision (adaptive) Radiotherapy practice in the UK & ART = Adaptive RT

  - Chemo-Radiation – Neoadjuvant (+ LAPC)
  - SABR – Locally advanced non metastatic and oligometastatic
  - Hypofractionated schedules for Palliation

- Future developments on the horizon

  Promise of newer technologies





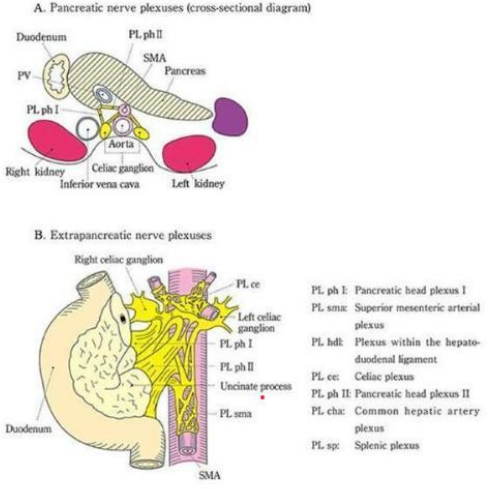
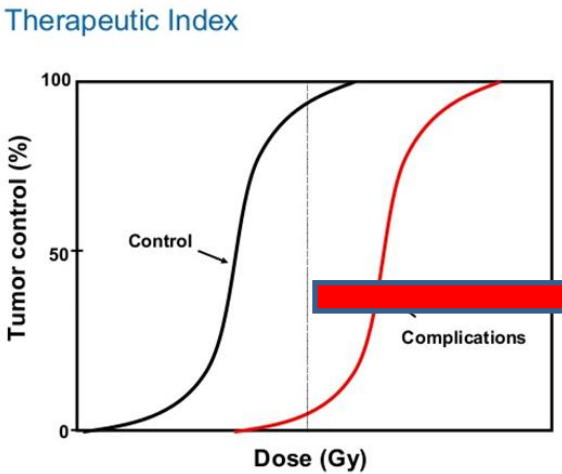


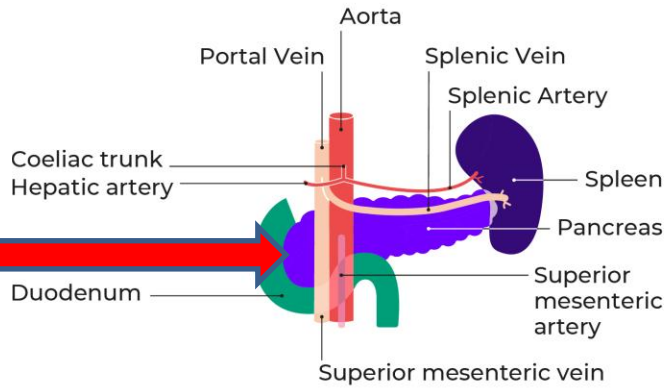
Figure 10. Nerves (yellow) serving the pancreas. The cross sectional image (**A**) emphasizes the location of the celiac ganglia of the autonomic system lateral to the aorta while (**B**) emphasizes the rich nerve plexus that connects these ganglia to the pancreas. **SMA** (superior mesenteric artery). **PL** (plexus). (Figure used with permission of the Japan Pancreas Association and the Kanehara publishers).

Histology of the Pancreas | Pancreapedia

Pancreatic RT challenges

- Target Volume delineation
  - Difficult to visualise
  - Imaging underestimates tumour
- Organs at Risk
  - Close proximity
  - Narrow therapeutic index
- Motion

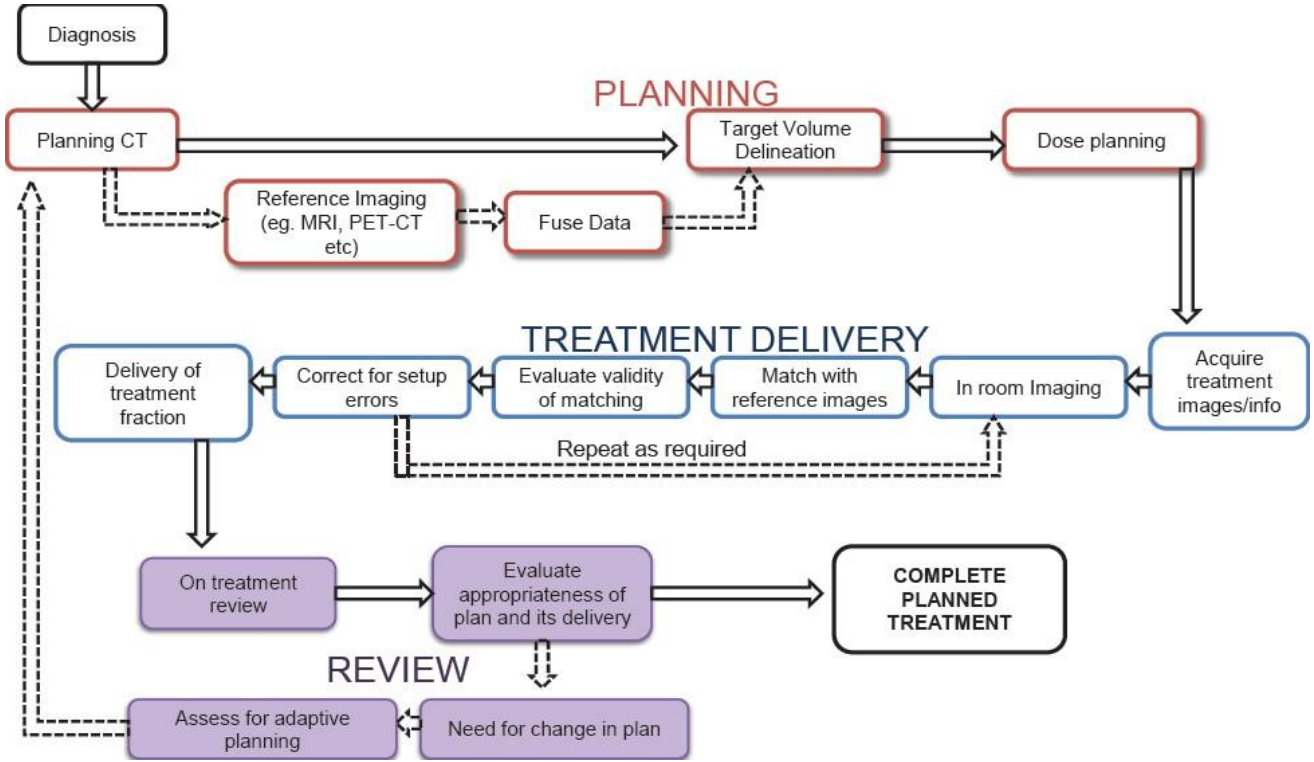




Linear Accelerators

NHS
The Christie
NHS Foundation Trust

Patient pathway



Courtesy Alan McWilliam

Neoadjuvant treatment

NEOADJUVANT RT

Role of NAT

The Christie NHS Foundation Trust

Clinical Trial/ Phase	Clinical Stage	Intervention	Comparator	Settings	No. of Patients	Median Follow-Up	Outcomes				
							RO Rate	mPFS	mOS	OS Rate (year)	AE ≥ 3
PREOPANC, 2020[13]/II	RPC	Neoadjuvant three cycles of Gem + 36 Gy RT followed by surgery then followed by Gem ×four cycles	Upfront surgery followed by Gem × four cycles	Neoadjuvant	246	27 months	66% *v* 59% (OR 1.33, *P* = .54)	9.3 *v* 9.2 (HR 0.88, *P* = .52)	15.6 *v* 14.6 mo (HR 0.96, *P* = .83)		All (52% *v* 41%)
	BRPC						79% *v* 13% (OR 24.2, *P* < .001)	6.3 *v* 6.2 (HR 0.59, *P*= .013)	17.6 *v* 13.2 mo (HR 0.62, *P* = .029)		
	All						71% *v* 40% (OR 3.61, *P* < .001)	8.1 *v* 7.7 (HR 0.73, *P* = .032)	16.0 *v* 14.3 mo (HR 0.78, *P* = .096		
PREOPANC, 2022[14]/III	RPC/ BRPC	Neoadjuvant CRT (GEM) followed by surgery then followed by Gem	Upfront surgery then followed by Gem	Neoadjuvant	246	59 months	72% *v* 43% *P* < .001		15.7 *v* 14.3 (HR 0.73, *P* = .025)	27.7% *v* 16.5% (3 years) 20.5% *v* 6.5% (5 years)	
Alliance 021101, 2016[28]/II	BRPC	Neoadjuvant four cycles of mFOLFIRINOX + CAP-CRT	None	Neoadjuvant	23		93% (14/ 15)		21.7 mo (95% CI, 15.7 to not reached)	77% (95% CI, 0.62 to 0.97; 12 months) 55% (95% CI, 0.37 to 0.80; 18 months)	All 64%
Alliance 021501, 2021[29]/II	BRPC	Eight cycles of neoadjuvant mFOLFIRINOX + surgery + four cycles of mFOLFOX6	Seven cycles of mFOLFIRINOX + SBRT or HIGRT + surgery + four cycles of mFOLFOX6	Neoadjuvant	126	27 or 31 months	42% *v* 25%		31 mo (95% CI, 22.2 to NE) *v* 17.1 (95% CI, 12.8 to 24.2)	67.9% *v* 47.3% (18 months all) 93.1% *v* 78.9% (18 months, s/p pancreatectomy)	
ESPAC-5F, 2020[30]/II	BRPC	Neoadjuvant GEMCAP or FOLFIRINOX or CRT (cap-50.4 Gy)	Upfront surgery	Neoadjuvant	90		23% *v* 15% (*P* = .721)			77% *v* 40% (1 year, HR 0.27, *P* < .001)	

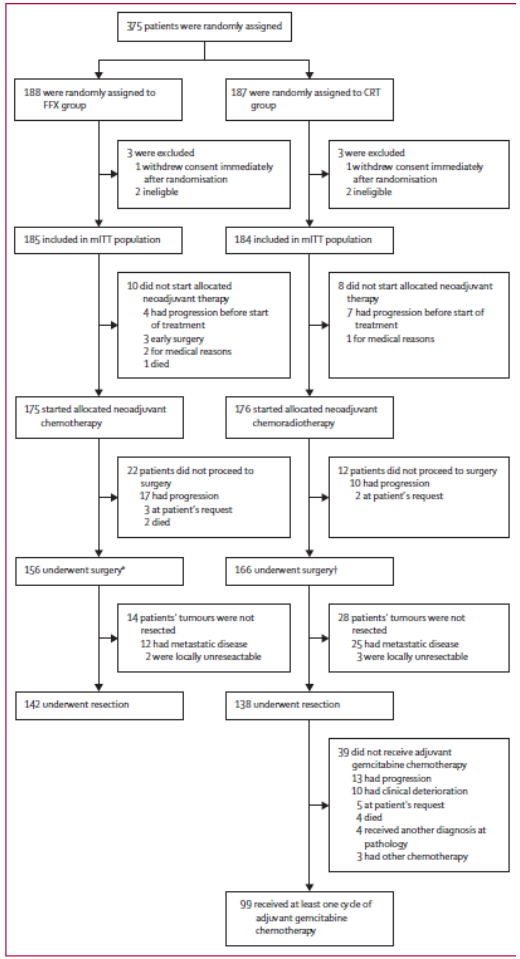
DOI https://doi.org/10.1200/OP.22.00328

Neoadjuvant FOLFIRINOX versus neoadjuvant gemcitabine-based chemoradiotherapy in resectable and borderline resectable pancreatic cancer (PREOPANC-2): a multicentre, open-label, phase 3 randomised trial

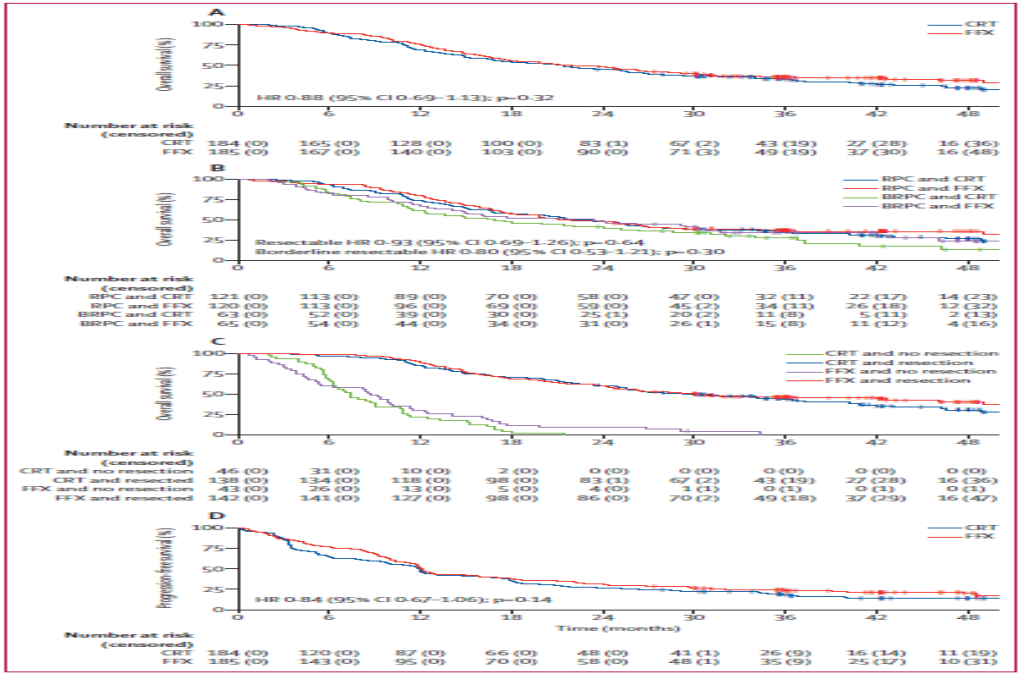
Quisette P Janssen*, Jacob L van Dam*, Marlies L van Bekkum, Bert A Bonsing, Hendrik Bos, Koop P Bosscha, Stefan A W Bouwense, Lieke Brouwer-Hol, Anna M E Bruynzeel, Olivier R Busch, Peter-Paul L O Coene, Casper H J van Eijck, Jan Willem B de Groot, Brigitte C M Haberkorn, Ignace H J T de Hingh, Tom M Karsten, Geert Kazemier, Marion B van der Kolk, Mike S L Liem, Olaf J L Loosveld, Saskia A C Luelmo, Misha D P Luyer, Leonie J M Mekenkamp, J Sven D Mieog, Vincent B Nieuwenhuijs, Joost J M E Nuyttens, Gijs A Patijn, Hjalmar C van Santvoort, Martijn W J Stommel, Eva Versteijne, Judith de Vos-Geelen, Roeland F de Wilde, Babs M Zonderhuis, Bronno van der Holt, Marjolein Y V Homs†, Geertjan van Tienhoven†, Marc G Besselink†, Johanna W Wilmink†, Bas Groot Koerkamp†, for the Dutch Pancreatic Cancer Group‡

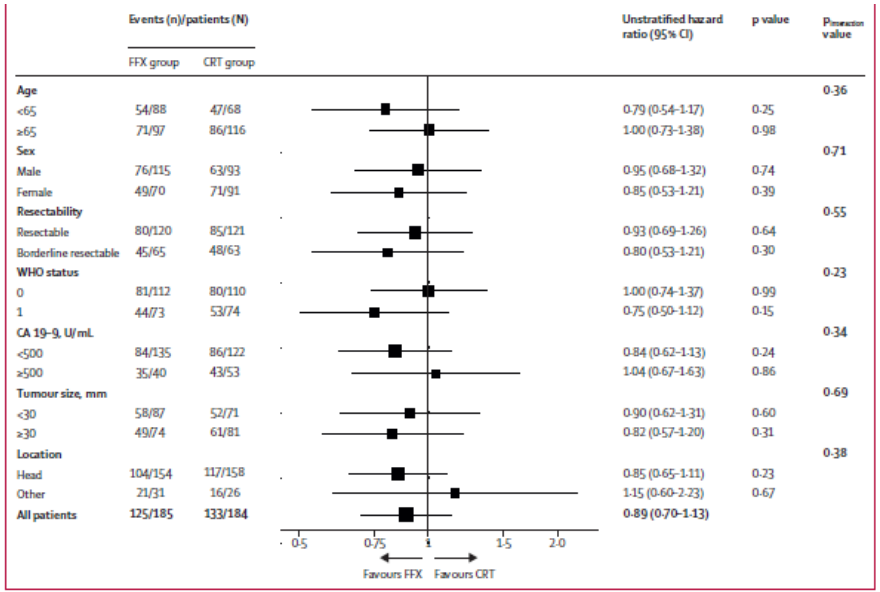
***Lancet Oncol* 2025**
Published **Online**
September 10, 2025
https://doi.org/10.1016/
S1470-2045(25)00363-8

See **Online/Comment**
https://doi.org/10.1016/
S1470-2045(25)00421-8



The Christie
NHS Foundation Trust


A
Overall survival (%)
CRT
FFX
HR 0·88 (95% CI 0·69–1·13); p=0·32
Number at risk (censored)
CRT 184 (0) 165 (0) 128 (0) 100 (0) 83 (1) 67 (2) 43 (19) 27 (28) 16 (36)
FFX 185 (0) 167 (0) 140 (0) 103 (0) 98 (0) 71 (3) 49 (19) 37 (30) 16 (48)
B
Overall survival (%)
RPC and CRT
RPC and FFX
BRPC and CRT
BRPC and FFX
Resectable HR 0·93 (95% CI 0·69–1·26); p=0·64
Borderline resectable HR 0·80 (95% CI 0·53–1·21); p=0·30
Number at risk (censored)
RPC and CRT 121 (0) 113 (0) 89 (0) 70 (0) 58 (0) 47 (0) 32 (11) 22 (17) 14 (23)
RPC and FFX 120 (0) 113 (0) 96 (0) 69 (0) 59 (0) 45 (2) 34 (11) 26 (18) 12 (32)
BRPC and CRT 63 (0) 52 (0) 39 (0) 30 (0) 25 (1) 20 (2) 11 (8) 5 (11) 2 (13)
BRPC and FFX 65 (0) 54 (0) 44 (0) 34 (0) 31 (0) 26 (1) 15 (8) 11 (12) 4 (16)
C
Overall survival (%)
CRT and no resection
CRT and resection
FFX and no resection
FFX and resection
Number at risk (censored)
CRT and no resection 46 (0) 31 (0) 10 (0) 2 (0) 0 (0) 0 (0) 0 (0) 0 (0) 0 (0)
CRT and resected 138 (0) 134 (0) 118 (0) 98 (0) 83 (1) 67 (2) 43 (19) 27 (28) 16 (36)
FFX and no resection 43 (0) 26 (0) 13 (0) 5 (0) 4 (0) 1 (1) 0 (1) 0 (1) 0 (1)
FFX and resected 142 (0) 141 (0) 127 (0) 98 (0) 86 (0) 70 (2) 49 (18) 37 (29) 16 (47)
D
Progression free survival (%)
CRT
FFX
HR 0·84 (95% CI 0·67–1·06); p=0·14
Time (months)
Number at risk (censored)
CRT 184 (0) 120 (0) 87 (0) 66 (0) 48 (0) 41 (1) 26 (9) 16 (14) 11 (19)
FFX 185 (0) 143 (0) 95 (0) 70 (0) 58 (0) 48 (1) 35 (9) 25 (17) 10 (31)


Events (n)/patients (N)
FFX group
CRT group
Unstratified hazard ratio (95% CI)
p value
Pinteraction value
Age 0·36
<65 54/88 47/68 0·79 (0·54–1·17) 0·25
≥65 71/97 86/116 1·00 (0·73–1·38) 0·98
Sex 0·71
Male 76/115 63/93 0·95 (0·68–1·32) 0·74
Female 49/70 71/91 0·85 (0·53–1·21) 0·39
Resectability 0·55
Resectable 80/120 85/121 0·93 (0·69–1·26) 0·64
Borderline resectable 45/65 48/63 0·80 (0·53–1·21) 0·30
WHO status 0·23
0 81/112 80/110 1·00 (0·74–1·37) 0·99
1 44/73 53/74 0·75 (0·50–1·12) 0·15
CA 19–9, U/mL 0·34
<500 84/135 86/122 0·84 (0·62–1·13) 0·24
≥500 35/40 43/53 1·04 (0·67–1·63) 0·86
Tumour size, mm 0·69
<30 58/87 52/71 0·90 (0·62–1·31) 0·60
≥30 49/74 61/81 0·82 (0·57–1·20) 0·31
Location 0·38
Head 104/154 117/158 0·85 (0·65–1·11) 0·23
Other 21/31 16/26 1·15 (0·60–2·23) 0·67
All patients 125/185 133/184 0·89 (0·70–1·13)
0·5
0·75
1
1·5
2·0
Favours FFX
Favours CRT

BJC British Journal of Cancer
www.nature.com/bjc

NHS The Christie NHS Foundation Trust

ARTICLE
Clinical Study

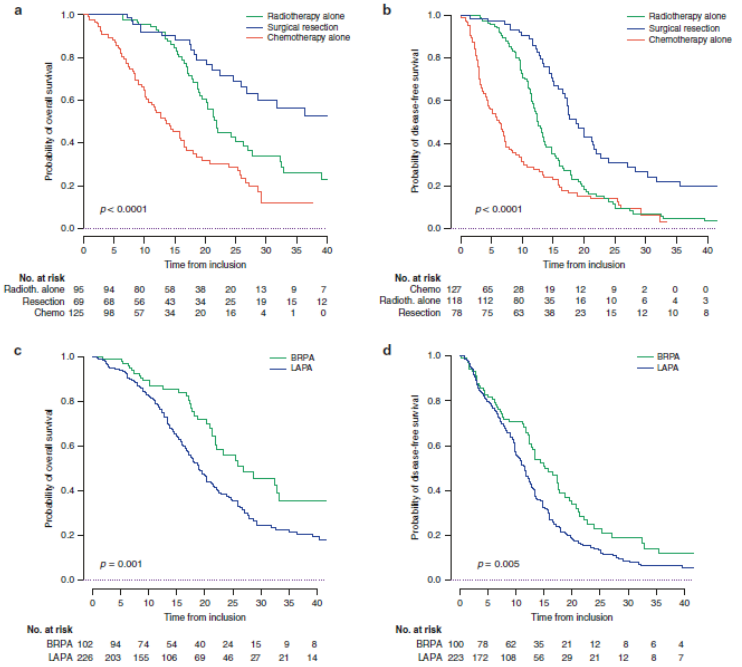
Role of FOLFIRINOX and chemoradiotherapy in locally advanced and borderline resectable pancreatic adenocarcinoma: update of the AGEO cohort

Edouard Auclin[1,2], Lysiane Marthey[3], Raef Abdallah[3], Léo Mas[4], Eric Francois[5], Angélique Saint[5], Antonio Sa Cunha[6], Angélique Vienot[7], Thierry Lecomte[8], Vincent Hautefeuille[9], Christelle de La Fouchardière[10], Matthieu Sarabi[10], Feryel Ksontini[11], Julien Forestier[12], Romain Coriat[13], Emmanuelle Fabiano[14], Florence Leroy[15], Nicolas Williet[16], Jean-Baptiste Bachet[4], David Tougeron[17] and Julien Taieb[3]

Table 3. Response rate and treatments after induction FOLFIRINOX chemotherapy.

	N (%)	Whole population *N* = 330	BRPA *N* = 102	LAPA *N* = 226	*p*
Objective radiological response (RECIST 1.1)	Complete response	11 (3.7)	1 (1.1)	10 (4.8)	0.18
	Partial response	77 (25.8)	27 (30.3)	50 (24.2)	
	Stable disease	152 (51.0)	48 (53.9)	102 (49.3)	
	Progression	58 (19.5)	13 (14.6)	45 (21.7)	
Treatment after FOLFIRINOX	Yes	201 (61.5)	69 (66.7)	129 (57.1)	0.20
	Chemoradiotherapy alone	120 (36.4)	26 (25.5)	94 (41.6)	<0.0001
	Surgery	79 (23.9)	43 (42.1)	35 (15.5)	
	With radiotherapy	33 (41.8)	17 (39.5)	15 (42.9)	0.77
	Without radiotherapy	46 (58.2)	26 (60.5)	20 (57.1)	
	Surgical exploration with no resection	12 (3.6)	6 (5.9)	6 (2.6)	0.14
Post-FOLFIRINOX radiotherapy		153 (46.6)	43 (42.6)	109 (48.4)	0.34
Dose (Gy)	Median (range)	50 (49–54)	50 (50–54)	50 (48–54)	0.85
Post-FOLFIRINOX surgical resection		*N* = 79	*N* = 43	*N* = 35	
	R0 resection	59 (74.7)	32 (74.4)	25 (71.4)	0.90
	ypT0N0	7 (8.9)	3 (7.0)	4 (11.8)	0.69
	Post-operative complication	30 (40.5)	17 (39.5)	12 (40)	0.97
	With radiotherapy	12 (38.7)	6 (35.3)	5 (38.5)	
	Without radiotherapy	18 (41.9)	11 (42.3)	7 (41.2)	
Recurrence	After radiotherapy alone (*n* = 120)	76 (63.3)	12 (46.1)	64 (68.1)	0.03
	After surgery (*n* = 79)	36 (45.6)	22 (51.2)	14 (40.0)	
	With radiotherapy	10 (30.3)	6 (35.3)	4 (26.7)	
	Without radiotherapy	26 (56.5)	16 (61.5)	10 (50.0)	
	Missing	166	43	123	
	Metastatic recurrence after consolidation treatment	70 (61.9)	22 (62.8)	48 (61.5)	0.51

BRPA borderline resectable pancreatic adenocarcinoma, *LAPA* locally advanced pancreatic adenocarcinoma.



British Journal of Cancer (2021) 124:1941–1948;
https://doi.org/10.1038/s41416-021-01341-w

ANNALS OF SURGERY OPEN
OPEN

NHS
The Christie
NHS Foundation Trust

Surgical Outcomes Following Neoadjuvant Treatment for Locally Advanced and Borderline Resectable Pancreatic Ductal Adenocarcinoma

Kai Tai Derek Yeung, PhD, FRCS,*† Sacheen Kumar, PhD, FRCS,*‡ David Cunningham, MD, FRCP, FMedSci, OBE,* Long R. Jiao, MD, FRCS,*† and Ricky Harminder Bhogal, PhD, FRCS*‡

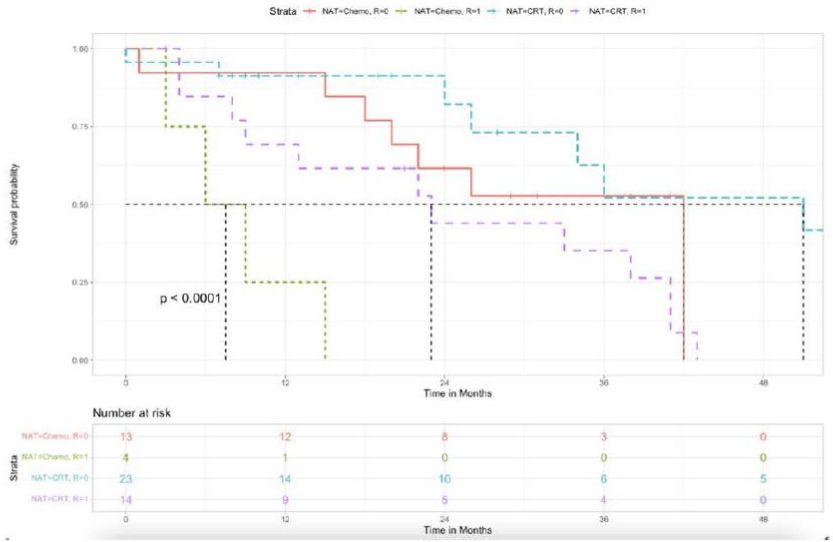


FIGURE 2. Kaplan–Meier plot: R0 versus R1 median overall survival: chemo R1 (green) 7.5 months versus CRT R1 (purple) 23 months versus Chemo R0 (red) 42 months versus CRT R0 (blue) 51 months, $P < 0.0001$.

Neoadjuvant (c)RT

- NAT for borderline resectable disease

  Need for consistent radiological assessment

  PACT – UK Project

- Precision Oncology

  Refining patient selection for benefit for RT

Locally advanced non metastatic unresectable

CONSOLIDATION RT

Clinical Trial/Phase	Clinical Stage	Intervention	Comparator	Settings	No. of Patients	Median Follow-Up	Surg. (rate)	mPFS	mOS	OS Rate (year)	AE ≥ 3
LAP-07, 2016[31]/III	LAPC	Gem or Gem/erlotinib followed by CRT (Cap): 54 Gy in 30 fractions with Cap 800 mg/m^2 twice a day	Gem or Gem/erlotinib	Induction chemo-RT	269	36.7 months	N = 18 (4%; R0 = 8)	9.9 *v* 8.4 months (HR 0.78, *P* = .06)	15.2 *v* 16.5 months (HR 1.03, *P* = .83)		Hematologic toxicity (3.9% *v* 10.4%) Nonhematologic toxicity (23.1% *v* 19.8%)
		Gem/erlotinib Gem: 1,000 mg/m^2 once every 4 weeks once daily (3-week on/1-week off) × four cycles Erlotinib 100 mg daily. Maintenance 150 mg once daily	Gem	Induction chemotherapy	442	35.9 months		6.5 *v* 7.8 months (HR 1.12, *P* = .26)	11.9 *v* 13.6 months (HR 1.19, *P* = .09)		Hematologic toxicity (40.3% *v* 34.1%): anemia (6.2% *v* 2.3%) Nonhematologic toxicity (41.0% *v* 40.0%): diarrhea (6.6% *v* 1.4%), acne (3.3% *v* 0%)
SCALOP, 2013, 2013,[32] and 2017[33]/II	LAPC	Gem-Cap × three cycles followed by CAP-RT	Gem-Cap × three cycles followed by Gem-RT	Induction chemotherapy-RT	114	10.9	N = 5 (4%; CAP-RT = 2, Gem-RT = 3), all R0	12 *v* 10.4 (HR 0.6, *P* = .12)	17.6 *v* 14.6 months (HR 0.68, *P* = .185)		All (12% *v* 37%) Hematologic (0% *v* 18%) Nonhematologic (0% *v* 26%) GI (0% *v* 16%)
LAPC-1, 2020/II	LAPC	Eight cycles of FOLFIRINOX followed by SRBT (40 Gy, five fractions)	Eight cycles FOLFIRINOX	Induction chemotherapy-RT	50 (SRBT = 39)	39 months	N = 7 (14%), all R0		18 *v* 5 months (*P* < .001)	43% *v* 6.5% (3 years, *P* = .03)	SRBT group 10%
LAPACT, 2020[34]/II	LAPC	Gem/NabP × six cycles followed by investigator's choice: continue chemotherapy, CRT, or surgery	None	Induction	106		N = 17 (16%) R0 = 7, R1 = 9	10.9 months (90% CI, 9.3 to 11.6)	18.8 months (90% CI 15.0 to 24.0)		Neutropenia: 33% Anemia: 11% Fatigue 10%
NEOLAP-AIO-PAK-0113, 2020[35]/II	LAPC	Two cycles of Gem/Nab followed by four cycles of FOLFIRINOX	Four cycles of Gem/NabP	Induction	130	24.9 months	43.9% (29/66) *v* 35.9% (23/64), OR 0.72, *P* = .38	9.5 *v* 7.7 months (HR 0.75, *P* = .18)	20.7 *v* 18.5 months (HR 0.86, *P* = .53)	34.6% *v*7.1% (2 years, resection *v* no resection)	ALL: 53% *v* 55% Neutropenia: 24% *v* 28% Nasua/vomiting: 12% *v* 3% Cholangitis: 11% *v* 9%

SABR

NHS
The Christie
NHS Foundation Trust

Stereotactic ablative body radiotherapy (SABR) refers to the precise irradiation of an image-defined extra-cranial lesion with the use of high radiation dose in a small number of fractions

UK SABR Consortium guidelines 2013

Potential benefits of SABR

- Longer freedom from treatment time / PFS
  Suker et al. EClinicalMed 17(2019)
- Improved tolerability / trend to improved OS
  CRISP metanalysis, Tcehelebi et al 2020
- Reduction in number of treatment visits
  Jones, C.M., *et al.* 2020
- Improved local control / symptom control
  Tangible benefit in reduction in pain
  Herman et al. Cancer April 2015
- Effects of SABR beyond primary disease control
  Griffin et al. IJROBP 2020. 107(4); 766-778

Roll out

The Christie NHS Foundation Trust

- NHS E approval process
  - Approved protocol and workshops by RCR-SABR_C-RTTQA
  - Test case reviewed for outlining and plan by RTTQA team (2 clinicians and physics independently).
  - Benchmarked against a pre defined standard
  - First case treated in centre independently peer reviewed by RTTQA team
  - Ongoing review as indicated
  - Mentoring
  - > 10 centres completed or partial approval

QA process

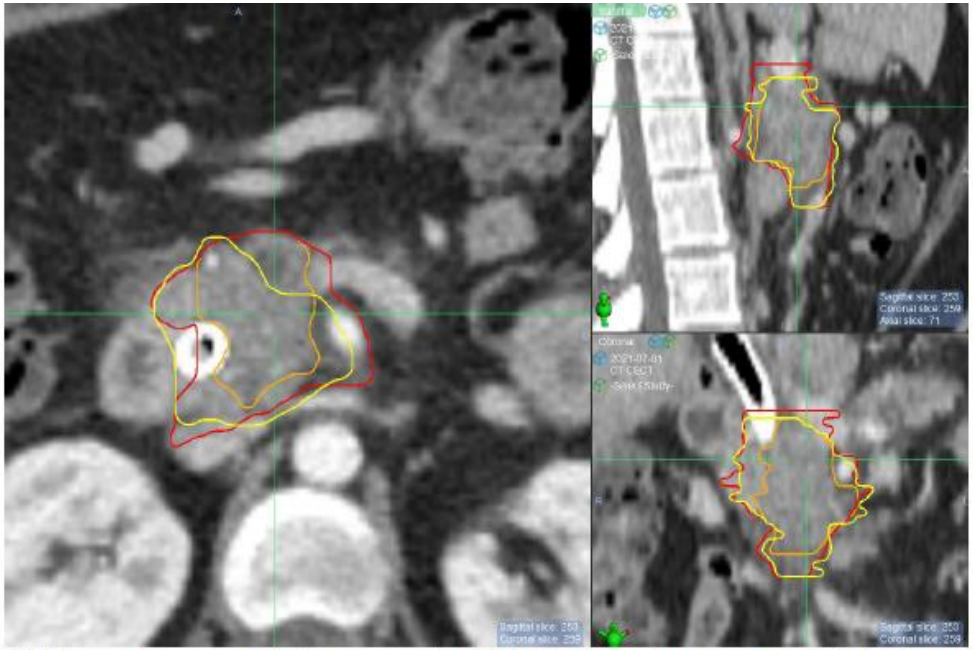


Figure 1: The maximum and minimum accepted GTVp in red and orange, respectively; in yellow the corresponding submission. In magenta the submitted duodenum

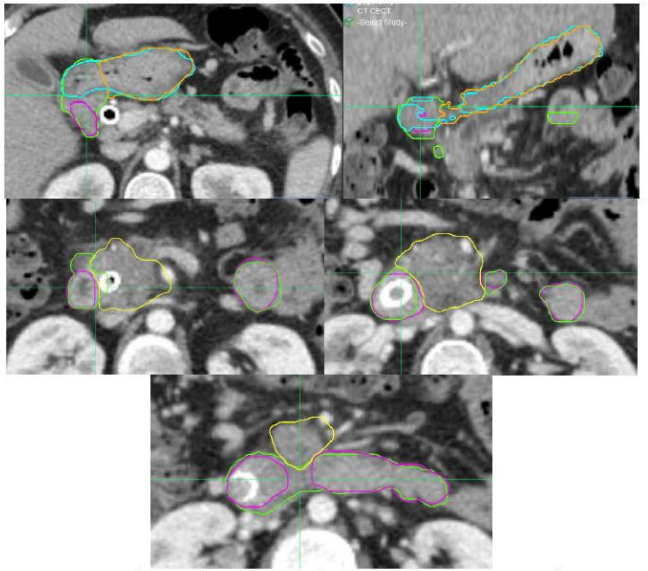
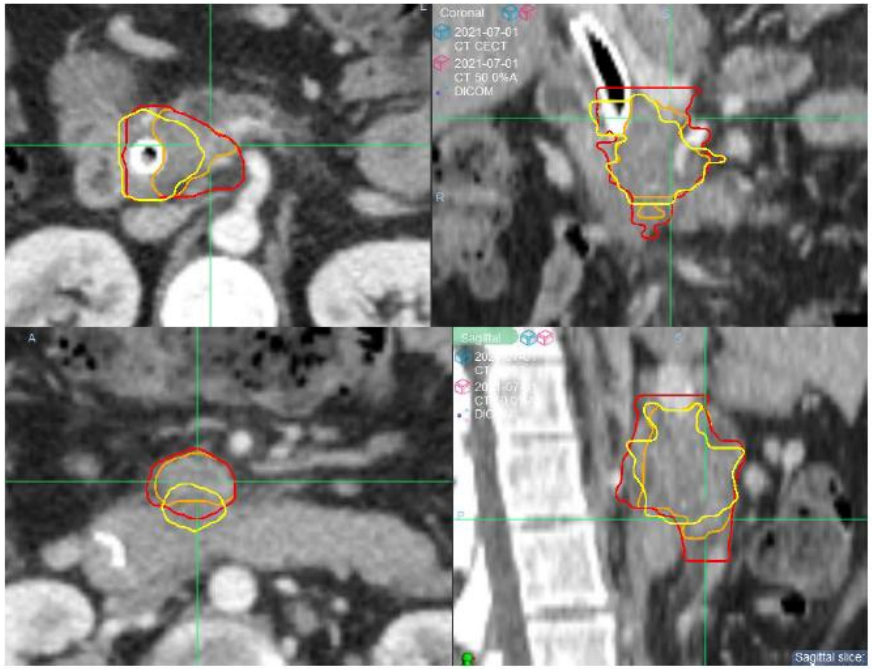


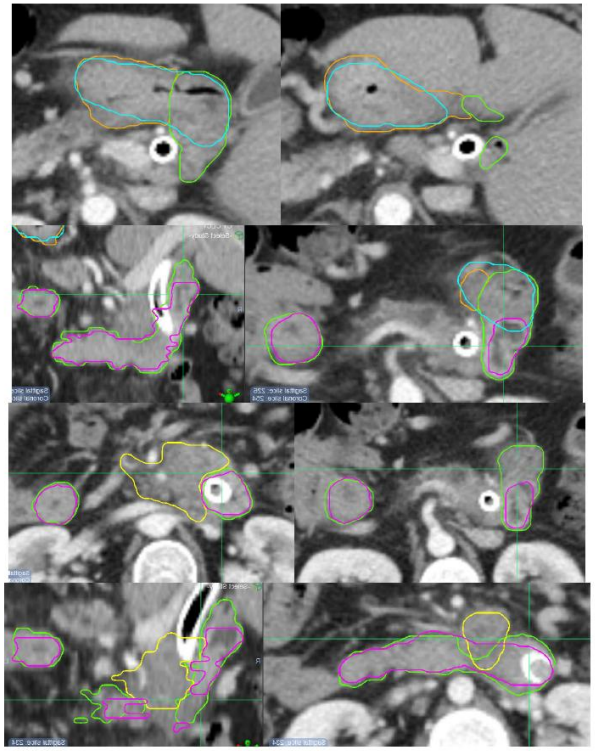
Figure 5: In green and orange the Duodenum and Stomach gold standards, respectively; in magenta and cyan the corresponding submission. In yellow the submitted GTVp

3. Conclusion

Overall outlining review decision: **Acceptable variation from the required specification***

Patty Diez – RTTQA





NHS
The Christie
Foundation Trust

RTTQA
Radiotherapy Trials Quality Assurance

NHS
NHS England and NHS Improvement

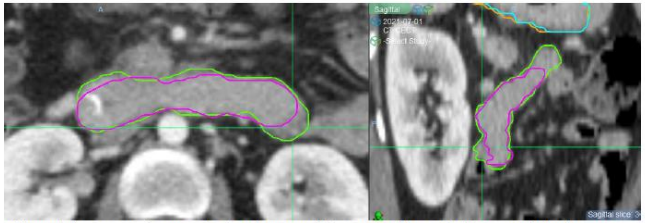


Figure 6: In green and orange the Duodenum and Stomach gold standards, respectively; in magenta and cyan the corresponding submission. In yellow the submitted GTVp

RTTQA
Radiotherapy Trials Quality Assurance

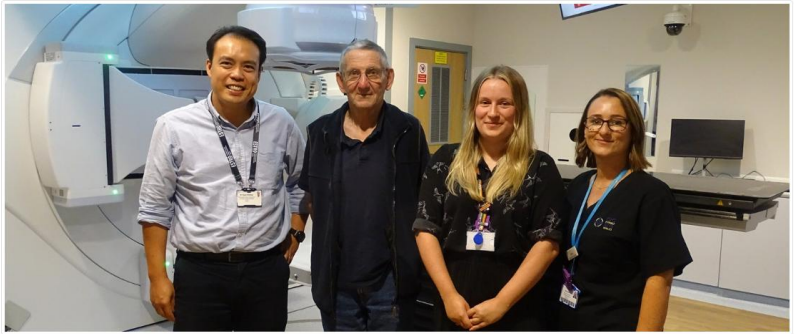
NHS
NHS England and NHS Improvement

3. Conclusion

Overall outlining review decision: **Unacceptable variation from the required specification****

Patty Diez – RTTQA

Farmer David first person in Wales to receive high-tech cancer treatment

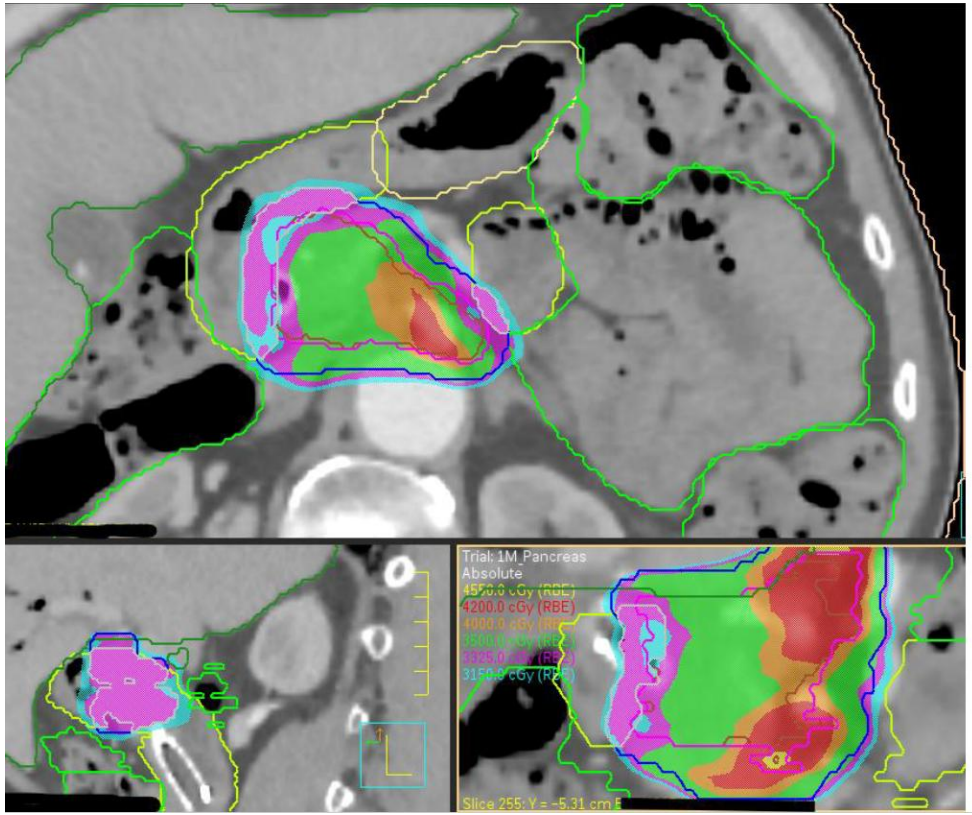


Some of the team who worked on introducing SABR for cancer of the pancreas. L-r: Sophie Jenkins, interim head of service, radiotherapy; Mark Stewart, CT radiographer lead; Anna Iles, interim Head of service – radiotherapy; Adam Selby, SABR lead radiotherapy physics scientist; Owen Nicholas, consultant clinical oncologist; Rhys Jenkins, head radiotherapy physics technologist; Lucy Faulkner, deputy head, radiotherapy physics technologists; and Tracy Lewis, pre-treatment radiotherapy lead.

"We've been working on it for a number of years, and we are now comfortable we can deliver this treatment safety and effectively," said Dr Nicholas. "This is really complex radiotherapy, so it has been a huge team effort to get to this point."

Advanced radiotherapy physics technologist Lucy Faulkner said that as part of its preparations, the SWWCC had been mentored by The Christie, which provided advice and feedback.

SABR plan



4550.0cGy (127%)
4200.0cGy (120%)
4000.0cGy (114%)
3500.0cGy (100%)
3325.0cGy (95%)
3150.0cGy (90%)

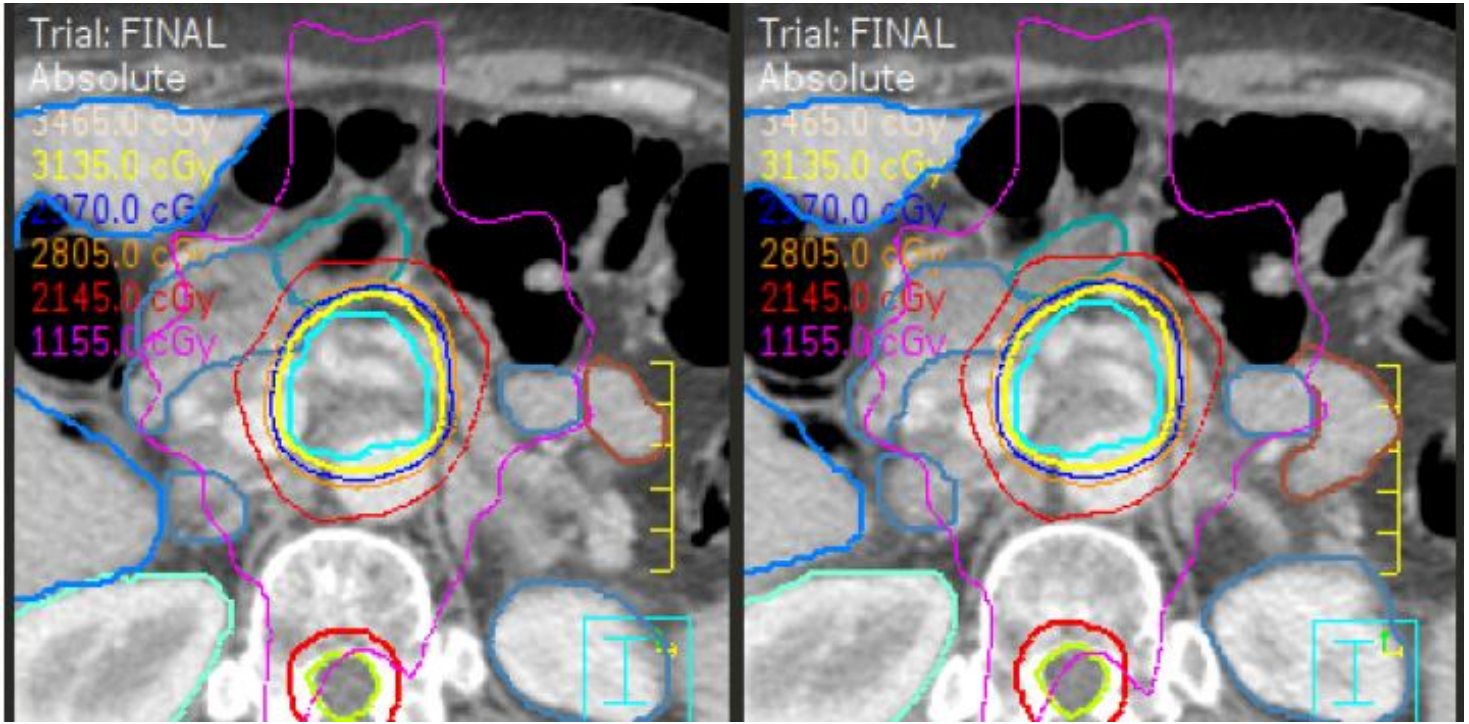
Slide courtesy Dr. Owen Nicholas, Swansea

NHS
The Christie
NHS Foundation Trust

Pancreatic SABR

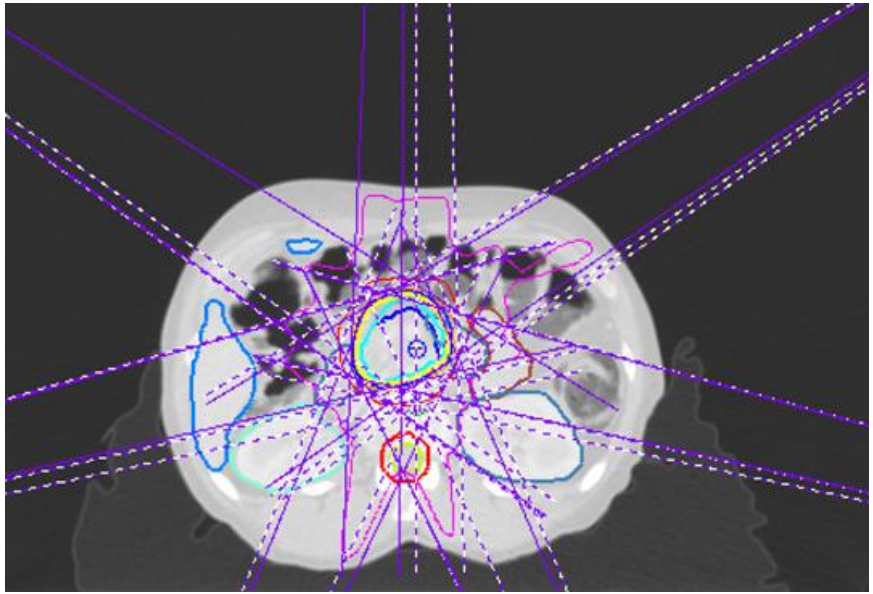
ADAPTIVE RT (ART)

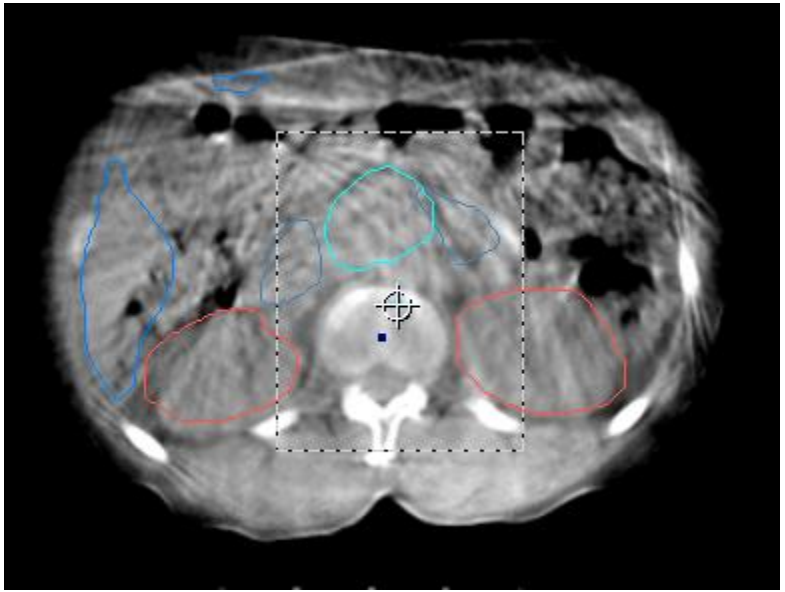
SABR pancreas



SABR plan and on treatment verification

NHS
The Christie
NHS Foundation Trust

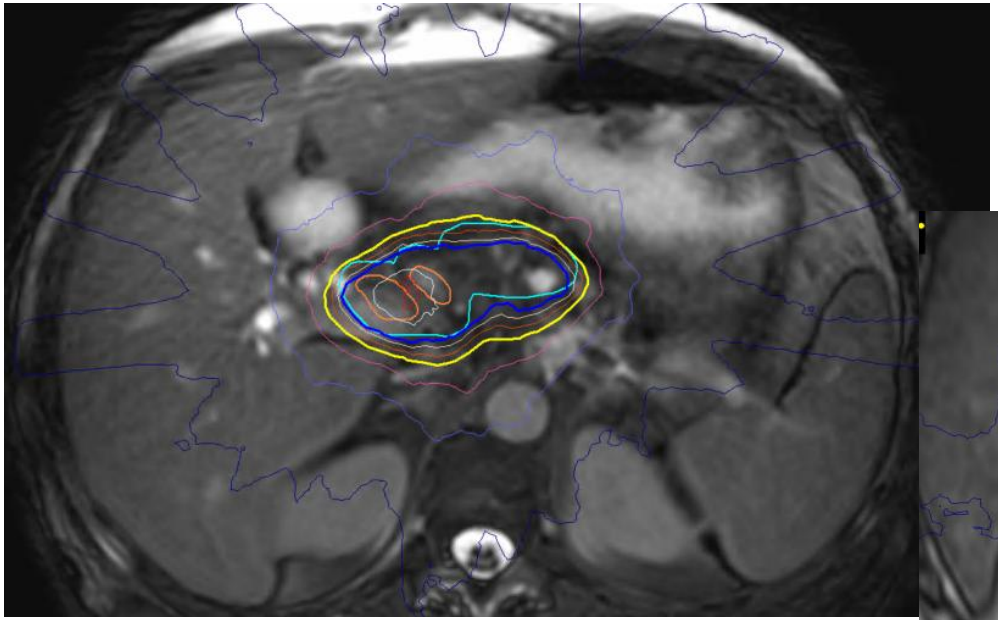


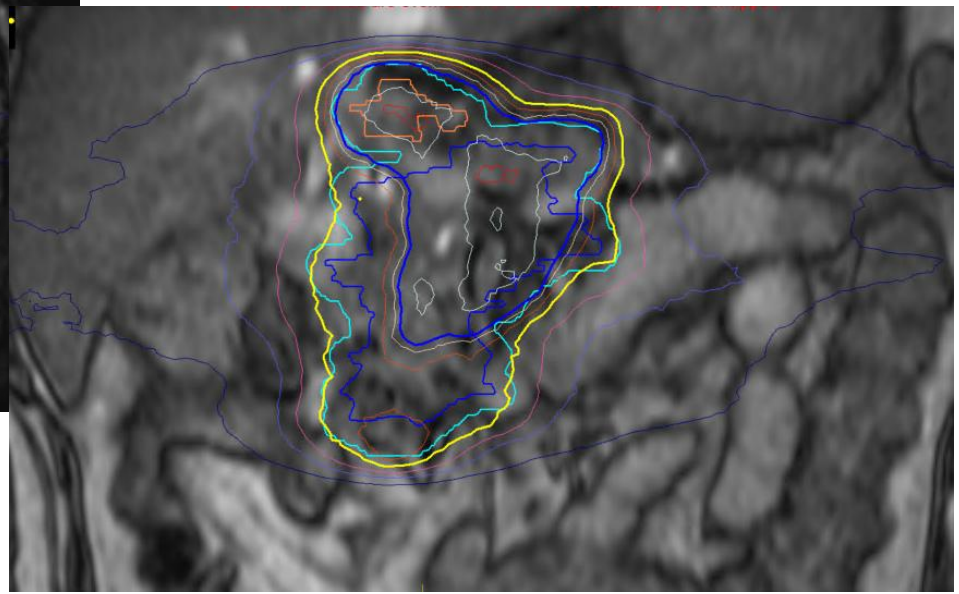


MR_Linac

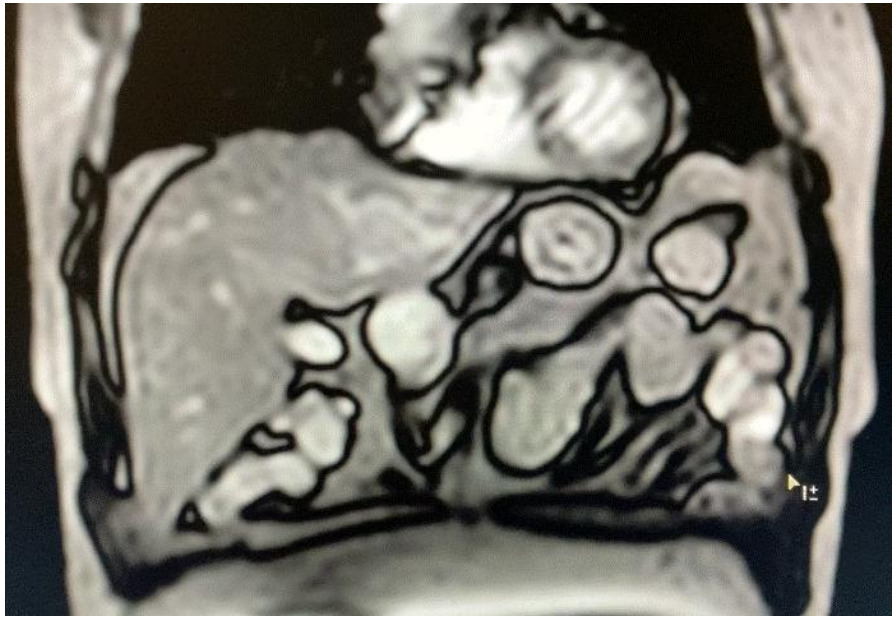
Node and primary pancreas SABR

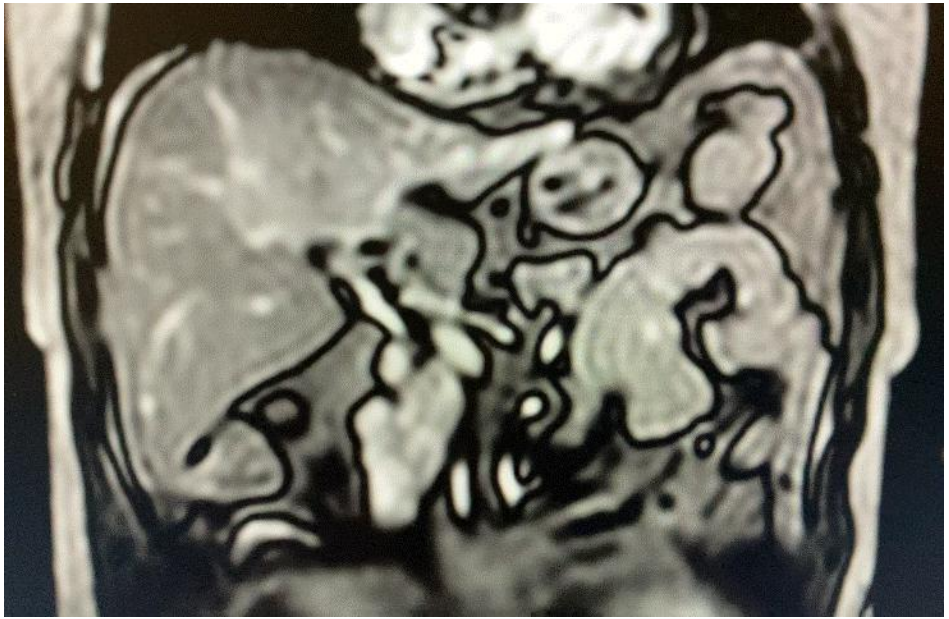
NHS
The Christie
NHS Foundation Trust





Physiological motion in BH GIFs





bFFE coronal cine in EEBH showing large peristaltic motion of pylorus and duodenum (fasted 2+hrs patient)

Courtesy Mairead Daly

INTERNATIONAL JOURNAL OF
RADIATION ONCOLOGY · BIOLOGY · PHYSICS
www.redjournal.org

NHS
The Christie
NHS Foundation Trust

CLINICAL INVESTIGATION

A Multi-Institutional Phase 2 Trial of Ablative 5-Fraction Stereotactic Magnetic Resonance-Guided On-Table Adaptive Radiation Therapy for Borderline Resectable and Locally Advanced Pancreatic Cancer

Parag Jitendra Parikh, BSE, MD,* Percy Lee, MD,† Daniel A. Low, PhD,‡ Joshua Kim, PhD,*
Kathryn E. Mittauer, PhD,§ Michael F. Bassetti, MD, PhD,‖ Carri K. Glide-Hurst, PhD,‖ Ann C. Raldow, MD, MPH,¶
Yingli Yang, PhD,¶ Lorraine Portelance, MD,# Kyle R. Padgett, PhD,# Bassem Zaki, MD,** Rongxiao Zhang, PhD,**
Hyun Kim, MD,†† Lauren E. Henke, MD,†† Alex T. Price, MS,†† Joseph D. Mancias, MD, PhD,‡‡
Christopher L. Williams, PhD,‡‡ John Ng, MD,§§ Ryan Pennell, PhD,§§ M. Raphael Pfeffer, MD,‖‖
Daphne Levin, PhD,‖‖ Adam C. Mueller, MD, PhD,¶¶ Karen E. Mooney, PhD,¶¶ Patrick Kelly, MD, PhD,##
Amish P. Shah, PhD,## Luca Boldrini, MD, PhD,*** Lorenzo Placidi, PhD,*** Martin Fuss, MD,††† and
Michael D. Chuong, MD§

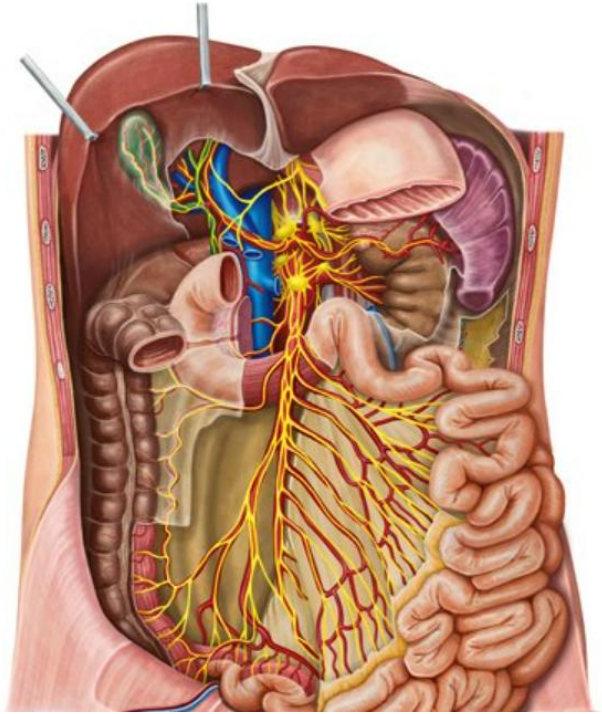
*Henry Ford Health — Cancer, Detroit, Michigan; †City of Hope National Medical Center, Los Angeles, California; ‡Department of Radiation Oncology, University of California, Los Angeles, California; §Miami Cancer Institute, Baptist Health South Florida, Miami,

- Grade 3 toxicity = 0
- 1 year (from diagnosis) PFS= 80.1%; LC = 90%; OS = 93.9%

NHS
The Christie
NHS Foundation Trust

PALLIATIVE (A)RT

Palliative radiotherapy for coeliac plexus pain

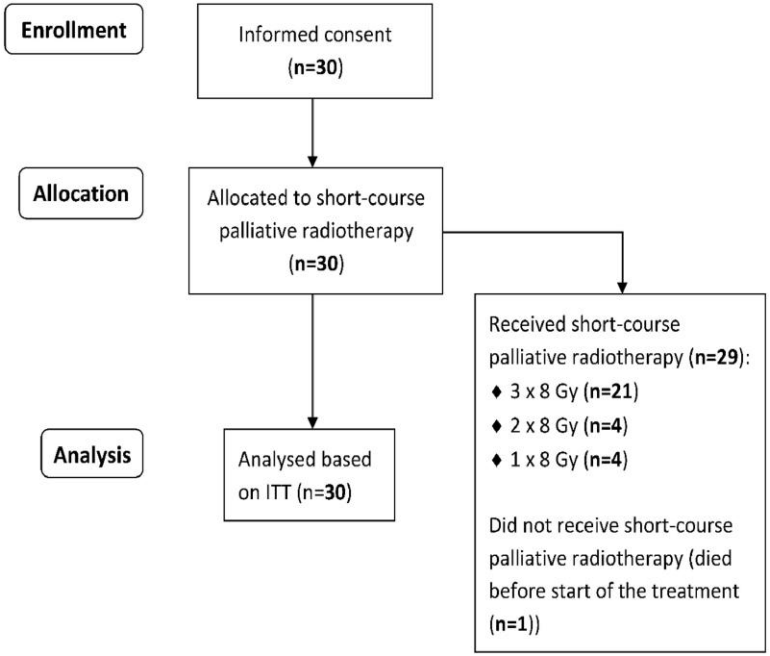


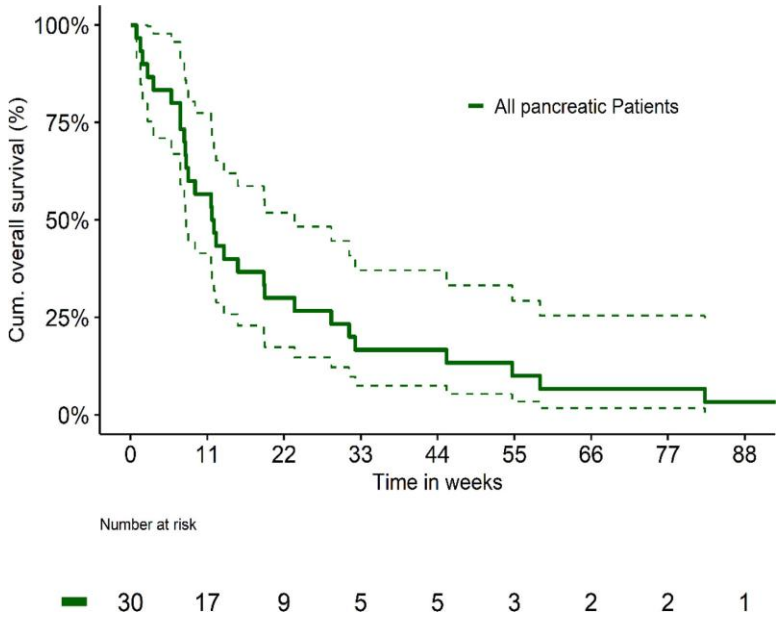
- 70% of patients with pancreatic cancer experience severe pain often due to coeliac plexus involvement
- The coeliac plexus is a nerve network attached to the abdominal aorta
- Major detriment on quality of life and often refractory to standard analgesia
- Current options for pain control include analgesia (typically high doses of opiates) or coeliac plexus block/neurolysis for refractory pain
- Small trials have suggested radiotherapy may be effective in improving pain but this is not currently frequently used in the UK

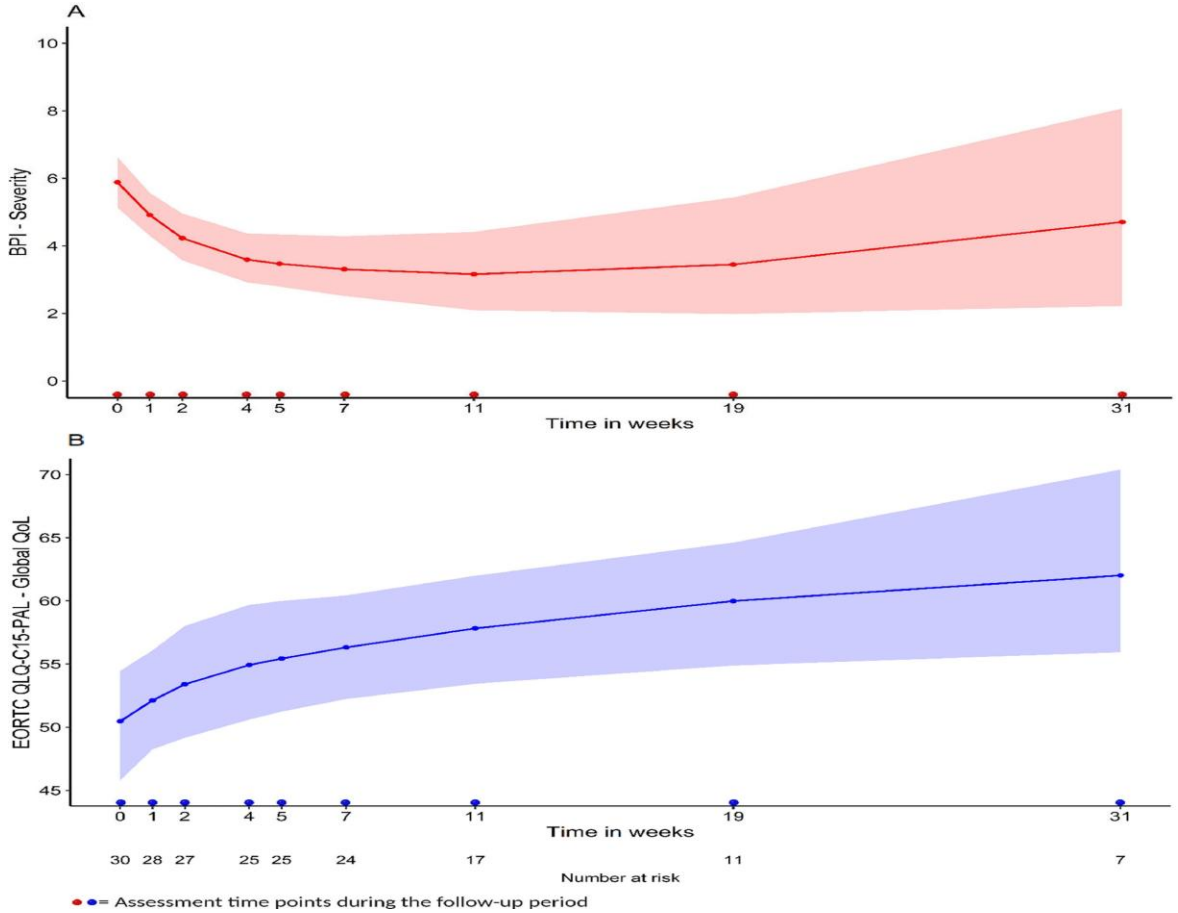
Impact of Short-Course Palliative Radiation Therapy on Pancreatic Cancer-Related Pain: Prospective Phase 2 Nonrandomized PAINPANC Trial

C. Paola Tello Valverde, MSc, Gati Ebrahimi, MD, MBA, Mirjam A. Sprangers, PhD, Konstantinos Pateras, PhD, Anna M.E. Bruynzeel, MD, PhD, Marc Jacobs, PhD, Johanna W. Wilmink, MD, PhD, Marc G. Besselink, MD, PhD, Hans Crezee, PhD, Geertjan van Tienhoven, MD, PhD, Eva Versteijne, MD, PhD

International Journal of Radiation Oncology, Biology, Physics Volume 118 Issue 2 Pages 352-361 (February 2024)





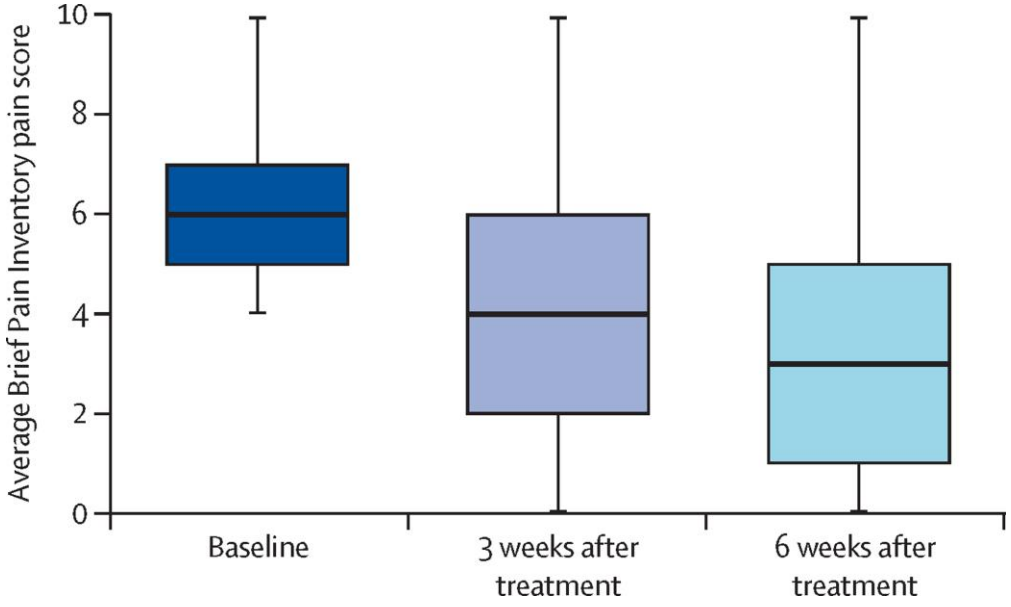


FULL TEXT ARTICLE

Celiac plexus radiosurgery for pain management in advanced cancer: a multicentre, single-arm, phase 2 trial

Yaacov R Lawrence MBBS FASTRO, Marcin Miszczyk MD PhD, Laura A Dawson MD, Dayssy Alexandra Diaz Pardo MD, Artur Aguiar MD, Dror Limon MD, Raphael M Pfeffer MBBS, Michael Buckstein MD PhD, Aisling S Barry Prof, Tikva Meron PhD, Adam P Dicker Prof, Jerzy Wydmański MD PhD, Camilla Zimmermann MD PhD, Ofer Margalit MD PhD, David Hausner MD, Ofir Morag MD, Talia Golan Prof, Galia Jacobson MD, Sergey Dubinski PhD, Teo Stanescu PhD, Ronen Fluss PhD, Laurence S Freedman Prof, Maoz Ben-Ayun PhD and Zvi Symon Prof

Lancet Oncology, The, 2024-08-01, Volume 25, Issue 8, Pages 1070-1079, Copyright © 2024 Elsevier Ltd



	Mean (SD)	Median (IQR)	p value
Opioid use on day of treatment, intravenous morphine equivalent, mg * †	54·0 (68·9); n=90	30·0 (11·6 to 65·4)	..
Opioid change at 3 weeks compared with baseline	0·15 (31·98); 95% CI −6·74 to 7·05; n=86	0·00 (−10·38 to 8·85)	0·965
Opioid change at 6 weeks compared with baseline	−16·67 (48·69); 95% CI −28·45 to −4·89; n=69	−5·00 (−22·30 to 5·00)	0·006

NHS
The Christie
NHS Foundation Trust

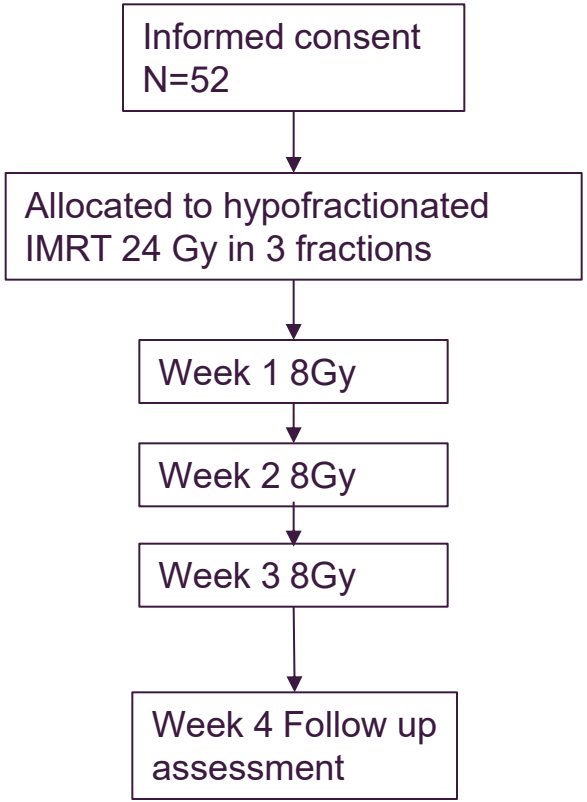
Single arm Phase 2

Primary endpoint

- Proportion of patients with a reduction in pain ≥ 2 points (BPI score) at 4 weeks

Secondary endpoints

- Mean reduction in morphine milligram equivalents
- Change in Patient's Global Impression of Change Score (PGIC)
- Acute toxicity
- Overall survival



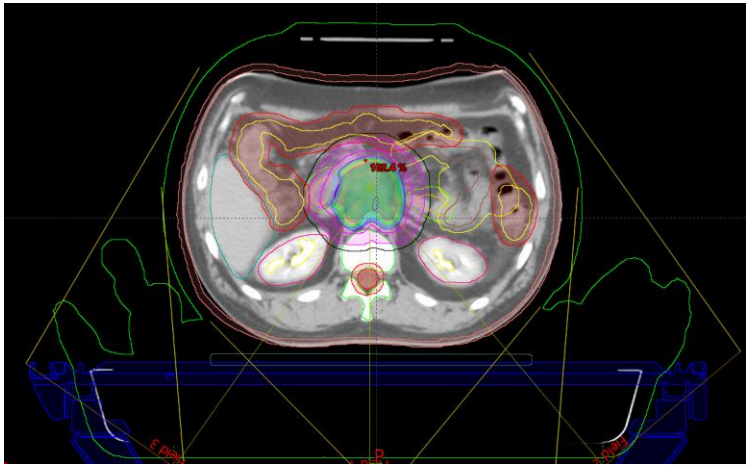
3 centres:
The Royal Marsden
The Christie
Clatterbridge

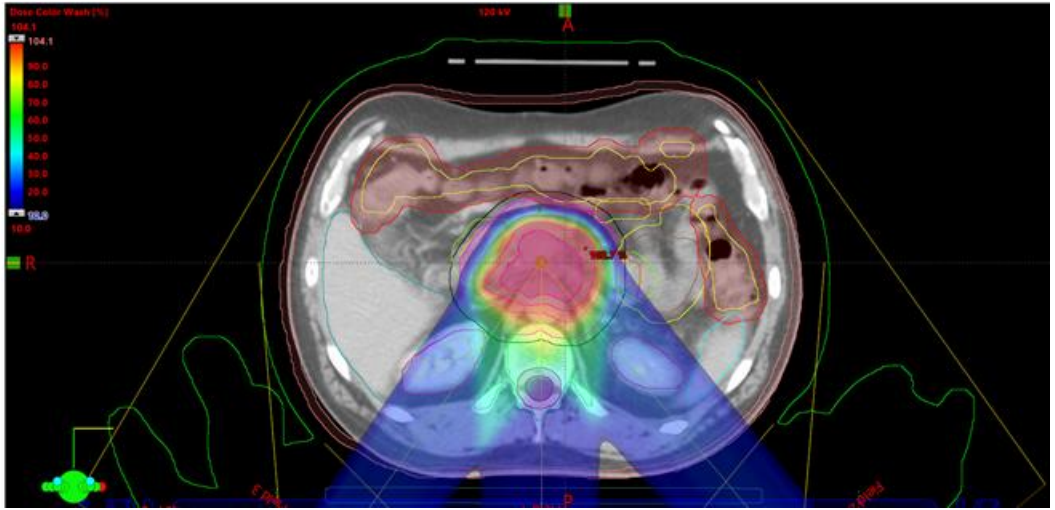
Co CI's Dr Katharine Aitken, Dr Irene Chong (RMH/ICR)

NHS
The Christie
NHS Foundation Trust

Research & Innovation

PBT ART





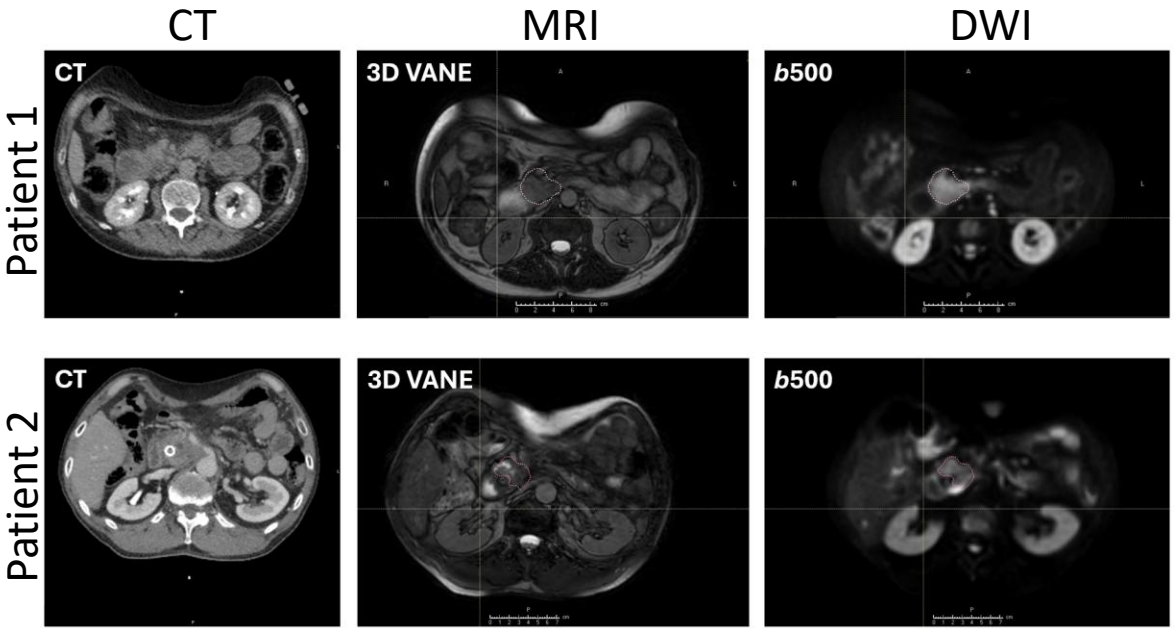
PREFER study – CI
Rob Chuter

NHS
The Christie
NHS Foundation Trust

Research and Innovation

FUNCTIONAL ART

Improving Tumour Conspicuity with Diffusion Weighted Imaging for MR-guided Radiotherapy

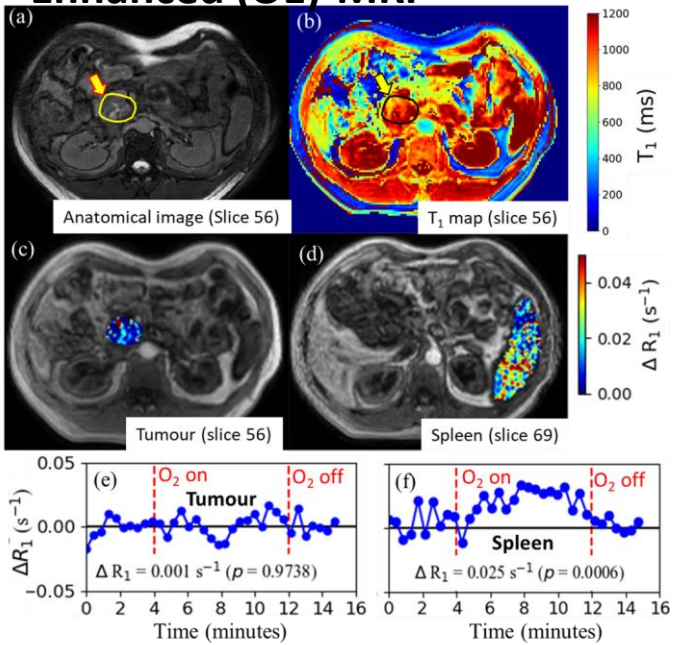


Examples showing that Diffusion weighted imaging (DWI) could provide improved definition of lesion to improve contouring confidence for treatment planning and adaption.

OE MR – CI Laura Forker , Michael Dubec

Assessing Tumour Hypoxia with Oxygen-Enhanced (OE)-MRI

NHS
The Christie
NHS Foundation Trust



ΔR_1 proportional to OE-MRI oxygen delivery:
Example shows increased oxygen in spleen compared to pancreas tumour suggesting poorly oxygenated tumour.

During pancreatic cancer RT, changes on MRI correlate to changes in gut microbiome

NHS
The Christie
NHS Foundation Trust

1. Evaluate MR imaging developed to detect surrogates of microbiome changes during RT
2. Correlate changes in the gut microbiome to treatment vs dietary changes
3. Correlate (sustained) changes in the gut microbiome to patient outcomes following pancreatic RT (incl toxicity)
4. Generate data to propose a study of dietary changes to support improved gut health (and outcomes) over RT

Tan B, et al. Clinical-radiological characteristics and intestinal microbiota in patients with pancreatic immune-related adverse events. Thorac Cancer. 2021 Jun;12(12):1814-1823

CI – Cynthia Eccles

Summary of key points

- Recognise the role and indications of radiotherapy for PDAC
- Consider radiotherapy as treatment option
- Awareness of radiotherapy innovation and future research

Acknowledgements

- Patients and carers
- PCUK team
- Pancreatic Research Group
- RTTQA (Patty Diez)
- UK HPB Medical and Clinical Oncology community
- PACT – UK Team
- MR-Linac research team and Momentum/ MR Bio/ Mid Section trials team
- Pancreatic Technical RT teams at the Christie, Royal Marsden and Leeds