Radiotherapy (RT) is one of the most frequently used methods for cancer treatment (above 50% of patients will receive RT). Despite remarkable advancements, the dose tolerances of normal tissues continue being the main limitation in RT. Finding novel approaches that allow increasing normal tissue resistance is of utmost importance. This would make it possible to escalate tumour dose, resulting in an improvement in cure rate. Along this line, the team New Approaches in Radiotherapy (NARA) works on the exploration of novel RT techniques. NARA is a team pioneering the conception and development of innovative methods based on the use of the spatial fractionation of the dose. This strategy has already shown a remarkable reduction in side effects of the radiation.

Since we do not believe in frontiers, NARA was born with an interdisciplinary and international character. We work at the interphase between medical physics, computing (Monte Carlo simulations), and radiobiology.
Key publications

Year of publication 2020

Charlotte Lamirault, Elise Brisebard, Annalisa Patriarca, Marjorie Juchaux, Delphine Crepin, Dalila Labiod, Frederic Pouzoulet, Catherine Sebrie, Laurene Jourdain, Marine Le Dudal, David Hardy, Ludovic de Marzi, Remi Dendale, Gregory Jouvin, Yolanda Prezado (2020 Sep 29)

Spatially Modulated Proton Minibeams Results in the Same Increase of Lifespan as a Uniform Target Dose Coverage in F98-Glioma-Bearing Rats.

*Radiation research* : DOI : 10.1667/RADE-19-00013.1

Charlotte Lamirault, Valérie Doyère, Marjorie Juchaux, Frederic Pouzoulet, Dalila Labiod, Remi Dendale, Annalisa Patriarca, Catherine Nauraye, Marine Le Dudal, Grégory Jouvin, David Hardy, Nicole El Massiou, Yolanda Prezado (2020 Aug 13)

Short and long-term evaluation of the impact of proton minibeam radiation therapy on motor, emotional and cognitive functions.

*Scientific reports* : 13511 : DOI : 10.1038/s41598-020-70371-w

P Lansonneur, H Mammar, C Nauraye, A Patriarca, E Hierso, R Dendale, Y Presado, L De Marzi (2020 Apr 29)

First proton minibeam radiation therapy treatment plan evaluation.

*Scientific reports* : 7025 : DOI : 10.1038/s41598-020-63975-9

Year of publication 2019

Yolanda Prezado, Gregory Jouvin, Consuelo Guardiola, Wilfredo Gonzalez, Marjorie Juchaux, Judith Bergs, Catherine Nauraye, Dalila Labiod, Ludovic De Marzi, Frederic Pouzoulet, Annalisa Patriarca, Remi Dendale (2019 Feb 1)

Tumor Control in RG2 Glioma-Bearing Rats: A Comparison Between Proton Minibeam Therapy and Standard Proton Therapy.


Year of publication 2018


Proton minibeam radiation therapy widens the therapeutic index for high-grade gliomas.

*Scientific reports* : 16479 : DOI : 10.1038/s41598-018-34796-8
Ludovic De Marzi, Annalisa Patriarca, Catherine Nauraye, Eric Hierso, Rémi Dendale, Consuelo Guardiola, Yolanda Prezado (2018 Oct 13)

**Implementation of planar proton minibeam radiation therapy using a pencil beam scanning system: A proof of concept study.**

*Medical physics*: 5305-5316 : [DOI: 10.1002/mp.13209](https://doi.org/10.1002/mp.13209)