

PROTOM INTERNATIONAL CLINICAL EFFICACY SITE

PROTON THERAPY LITERATURE

In the treatment of cancer, high doses of radiation are used to destroy cancer cells by damaging their DNA. When the DNA of a cancer cell is destroyed beyond repair, the cell dies and is then eliminated by the body through natural processes.

Proton therapy is an advanced form of radiation treatment that has been used to treat more than 280,000 people worldwide as of 2021. By 2030, it is estimated that between 300,000 and 600,000 patients will have received proton therapy treatment.

The following are research studies published between 2023 and 2024 that underscore the benefits of proton therapy for certain cancer patients. The majority of the studies employ pencil beam scanning, the most precise form of proton therapy.

PROTON THERAPY (GENERAL)

Hartsell W, Simone C, et al. [Temporal Evolution and Diagnostic Diversification of Patients Receiving Proton Therapy in the United States: A Ten-Year Trend Analysis \(2012-21\) from the National Association for Proton Therapy](#). *International Journal of Radiation Oncology*Biology*Physics*. 2023; ISSN 0360-3016, <https://doi.org/10.1016/j.ijrobp.2023.12.041>.

BREAST

G.W.Y. Chua, B.S. Ho, et al. [Intensity-Modulated Proton Therapy \(IMPT\) Offered Advantageous Dosimetry Compared to Volumetric Arc Therapy \(VMAT\) or Helical Tomotherapy \(HT\) in Patients with Synchronous Bilateral Breast Cancer](#), *International Journal of Radiation Oncology*Biology*Physics*, Volume 117, Issue 2, Supplement, 2023, Pages e169-e170, ISSN 0360-3016, <https://doi.org/10.1016/j.ijrobp.2023.06.1010>.

Hisashi Yamaguchi, Nobuyoshi Fukumitsu, Haruko Numajiri et al. [The Japanese nationwide cohort data of proton beam therapy for liver oligometastasis in breast cancer patients](#), 25 April 2023, *PREPRINT (Version 1) available at Research Square* [<https://doi.org/10.21203/rs.3.rs-2768801/v1>]

Brooks E, Vega R and et, al. [Proton Therapy for Bilateral Breast Cancer Maximizes Normal-Tissue Sparing](#). *Int J Part Ther* 2023; doi: <https://doi.org/10.14338/IJPT-22-00041.1>

Lalani N, Alqarni S, Jimenez RB, et. al. The Potential of Proton Therapy for Locally Advanced Breast Cancer: Clinical and Technical Considerations. *Current Oncology*. 2023 Feb 28; 30(3):2869-2878. <https://doi.org/10.3390/curroncol30030219>

GYNECOLOGIC

Pollock, A. E., Risher, H., et. al. Clinical Outcomes of Intensity Modulated Proton Therapy (IMPT) Re-Irradiation for Gynecologic Malignancies. *Advances in Radiation Oncology*. 2023 Feb 25; 101191. ISSN 2452-1094. <https://doi.org/10.1016/j.adro.2023.101191>.

HEAD AND NECK

Chang C-L, Lin K-C, et al. Comparing the oncologic outcomes of proton therapy and intensity-modulated radiation therapy for head and neck squamous cell carcinoma. *Radiotherapy and Oncology, Volume 190*, 2024, 109971, ISSN 0167-8140, [doi:10.1016/j.radonc.2023.109971](https://doi.org/10.1016/j.radonc.2023.109971)

Lütgendorf-Caucig C, Pelak M, et al. Prospective analysis of radiation-induced contrast enhancement (RICE) and health-related quality of life following proton therapy for CNS and skull base tumors. *International Journal of Radiation Oncology*Biophysics*, 2024, ISSN 0360-3016, [doi.org:10.1016/j.ijrobp.2024.01.007](https://doi.org/10.1016/j.ijrobp.2024.01.007).

Xu S, Frakulli R, Lin Y. Comparison of the Effectiveness of Radiotherapy with 3D-CRT, IMRT, VMAT and PT for Newly Diagnosed Glioblastoma: A Bayesian Network Meta-Analysis. *Cancers*. 2023; 15(23):5698. <https://doi.org/10.3390/cancers15235698>

Chang C, Lin K, et al. Comparative Effectiveness of Intensity-Modulated Proton Therapy Versus Intensity-Modulated Radiotherapy for Inoperable Esophageal Squamous Cell Carcinoma Patients Undergoing Curative-Intent Concurrent Chemoradiotherapy. *Journal of Thoracic Oncology*. 2023; ISSN 1556-0864, <https://doi.org/10.1016/j.jtho.2023.12.021>.

Zhou P, Du Y, Zhang Y, et al. Efficacy and Safety in Proton Therapy and Photon Therapy for Patients With Esophageal Cancer: A Meta-Analysis. *JAMA Netw Open*. 2023;6(8):e2328136. Published 2023 Aug 1. [doi:10.1001/jamanetworkopen.2023.28136](https://doi.org/10.1001/jamanetworkopen.2023.28136)

Nangia S, Gaikwad U, Noufal MP, et al. Proton therapy and oral mucositis in oral & oropharyngeal cancers: outcomes, dosimetric and NTCP benefit. *Radiat Oncol*. 2023;18(1):121. Published 2023 Jul 19. [doi:10.1186/s13014-023-02317-1](https://doi.org/10.1186/s13014-023-02317-1)

Chang C, Lin K, et al. Comparing the Oncologic Outcomes of Proton Therapy and Intensity-Modulated Radiation Therapy for Head and Neck Squamous Cell Carcinoma. *The Lancet*.

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SSRN: <https://ssrn.com/abstract=4465968> or <http://dx.doi.org/10.2139/ssrn.4465968>

Krcek R, Leiser D, García-Marqueta M, et al. [Long Term Outcome and Quality of Life of Intracranial Meningioma Patients Treated with Pencil Beam Scanning Proton Therapy](#). *Cancers (Basel)*. 2023;15(12):3099. Published 2023 Jun 7. doi:10.3390/cancers15123099

Hanna Ek, Ingrid Fagerström Kristensen, et al. [Transitioning from conventional photon therapy to proton therapy for primary brain tumors](#). *Acta Oncologica*. 62:4, 391-399. Published 2023 May 18. DOI: [10.1080/0284186X.2023.2200150](https://doi.org/10.1080/0284186X.2023.2200150)

Hiroshima Y, Ishikawa H, Sumiya T, et al. [Clinical Impact of Proton Beam Therapy for Postoperative Lymph Node Oligorecurrence of Esophageal Cancer](#). *In Vivo*. 2023;37(3):1253-1259. doi:10.21873/invivo.13202

Mavrikios, A, Goudjil, F, Beddok, A, et al. [Proton therapy and/or helical tomotherapy for locally advanced sinonasal skull base adenoid cystic carcinoma: Focus on experience of the Institut Curie and review of literature](#). *Head & Neck*. 2023; 1- 13. doi:[10.1002/hed.27371](https://doi.org/10.1002/hed.27371)

Yahya, N.; Manan, H.A. [Quality of Life and Patient-Reported Outcomes Following Proton Therapy for Oropharyngeal Carcinoma: A Systematic Review](#). *Cancers* 2023, 15, 2252. <https://doi.org/10.3390/cancers15082252>

Petrucelli A, Parent A and et, al. [Estimating Potential Benefits to Neurocognition with Proton Therapy in Adults with Brain Tumors](#). *Int J Part Ther* 2023; doi: <https://doi.org/10.14338/IJPT-22-00024.1>

Press RH, Hu L, et al. [Dosimetric Comparison of Intensity-Modulated Radiation Therapy \(IMRT\) and Intensity-Modulated Proton Therapy \(IMPT\) for a Novel Oral Tongue Avoidance Concept in Low-Risk Squamous Cell Carcinoma of the Oral Tongue](#). *Int J Part Ther*. 2023 Feb 16; DOI: <https://doi.org/10.14338/IJPT-22-00032>.

LIVER

Bush, DA, Volk, M., Smith, JC, et al. [Proton beam radiotherapy versus transarterial chemoembolization for hepatocellular carcinoma: Results of a randomized clinical trial](#). *Cancer*. 2023; 1-10. doi:[10.1002/cncr.34965](https://doi.org/10.1002/cncr.34965)

Chen MF, Chen PT, Hsieh CC, Wang CC. [Effect of Proton Therapy on Tumor Cell Killing and Immune Microenvironment for Hepatocellular Carcinoma](#). *Cells*. 2023;12(2):332. Published 2023 Jan 15. doi:10.3390/cells12020332

LUNG AND THORACIC

Cortiula F, Hendriks L, et al. [Proton and photon radiotherapy in stage III NSCLC: Effects on hematological toxicity and adjuvant immune therapy](https://doi.org/10.1016/j.radonc.2023.110019). *Radiotherapy and Oncology*. Volume 190, 2024; 110019, ISSN 0167-8140, <https://doi.org/10.1016/j.radonc.2023.110019>.

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PANCREAS

Jacob Eckstein, Isabelle Choi , et al. [Proton Therapy for Unresectable and Medically Inoperable Locally Advanced Pancreatic Cancer: Results from a Multi-Institutional Prospective Registry](https://doi.org/10.1016/j.adro.2023.101250). *Advances in Radiation Oncology*, 2023, 101250, ISSN 2452-1094, <https://doi.org/10.1016/j.adro.2023.101250>.

PEDIATRICS

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D. Leiser, T. Dantonello, R. Krcek, et al. [Long Term Clinical Outcome and Quality of Life of Children, Adolescents and Young Adults Treated with Pencil Beam Scanning Proton Therapy for Rhabdomyosarcoma](https://doi.org/10.1016/j.ijrobp.2023.06.391), *International Journal of Radiation Oncology*Biology*Physics*, Volume 117, Issue 2, Supplement, 2023, Page S77, ISSN 0360-3016, <https://doi.org/10.1016/j.ijrobp.2023.06.391>.

J. Sienna, L. Kahalley, et al. Dose Reductions to Critical Brain Organs-at-Risk and Better Cognition in Children with Medulloblastoma Receiving Proton Therapy, *International Journal of Radiation Oncology*Biology*Physics*, Volume 117, Issue 2, Supplement, 2023, Page S134, ISSN 0360-3016, <https://doi.org/10.1016/j.ijrobp.2023.06.536>.

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PROSTATE

K.R. Gergelis, M. Bai, et al. [Long-Term Patient-Reported Bowel and Urinary Quality of Life in Patients Treated with Intensity-Modulated Radiotherapy and Intensity-Modulated Proton Therapy for Localized Prostate Cancer](#). *International Journal of Radiation Oncology*Biophysics*, Volume 117, Issue 2, Supplement, 2023, Page e385, ISSN 0360-3016, <https://doi.org/10.1016/j.ijrobp.2023.06.2502>.

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RECTAL

M.Fok, S. Toh, J.E. Maducolil, et al. [455 Proton Beam Therapy in Rectal Cancer: A Systematic Review and Meta-Analysis](#). *British Journal of Surgery*, Volume 108, Issue Supplement_2, May 2021, znab135.020, <https://doi.org/10.1093/bjs/znab135.020>

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