

Intraoperative radiotherapy

[Intraoperative radiotherapy](#) allows direct radiation to the target area while sparing normal surrounding tissue. IORT is used to treat cancers that are difficult to remove during surgery and when there is a concern that microscopic amounts of cancer may remain.

Intraoperative radiotherapy for brain metastases

[Intraoperative radiotherapy for brain metastases](#).

2: Kotecha R, Ahluwalia MS, Siomin V, McDermott MW. Surgery, Stereotactic Radiosurgery, and Systemic Therapy in the Management of Operable Brain Metastasis. *Neurol Clin*. 2022 May;40(2):421-436. doi: 10.1016/j.ncl.2021.11.002. Epub 2022 Mar 31. PMID: 35465884.

3: Hamed M, Potthoff AL, Layer JP, Koch D, Borger V, Heimann M, Scafa D, Sarria GR, Holz JA, Schmeel FC, Radbruch A, Güresir E, Schäfer N, Schuss P, Garbe S, Giordano FA, Herrlinger U, Vatter H, Schmeel LC, Schneider M. Benchmarking Safety Indicators of Surgical Treatment of Brain Metastases Combined with Intraoperative Radiotherapy: Results of Prospective Observational Study with Comparative Matched-Pair Analysis. *Cancers (Basel)*. 2022 Mar 16;14(6):1515. doi: 10.3390/cancers14061515. PMID: 35326666; PMCID: PMC8946541.

4: Waqar M, Trifiletti DM, McBain C, O'Connor J, Coope DJ, Akkari L, Quinones- Hinojosa A, Borst GR. Early Therapeutic Interventions for Newly Diagnosed Glioblastoma: Rationale and Review of the Literature. *Curr Oncol Rep*. 2022 Mar;24(3):311-324. doi: 10.1007/s11912-021-01157-0. Epub 2022 Feb 4. PMID: 35119629; PMCID: PMC8885508.

5: López-Torrecilla J, Palacios Eito A, Gómez-Caamaño A, Salinas Ramos J, Samper Ots P, Rodríguez Pérez A. RENORT: a project to analyze patterns of care in radiation oncology in Spain. *Clin Transl Oncol*. 2022 Jul;24(7):1322-1332. doi: 10.1007/s12094-021-02772-w. Epub 2022 Jan 13. PMID: 35028930.

6: Cifarelli CP, Jacobson GM. Intraoperative Radiotherapy in Brain Malignancies: Indications and Outcomes in Primary and Metastatic Brain Tumors. *Front Oncol*. 2021 Nov 11;11:768168. doi: 10.3389/fonc.2021.768168. PMID: 34858846; PMCID: PMC8631760.

7: Sarria GR, Smalec Z, Muedder T, Holz JA, Scafa D, Koch D, Garbe S, Schneider M, Hamed M, Vatter H, Herrlinger U, Giordano FA, Schmeel LC. Dosimetric Comparison of Upfront Boosting With Stereotactic Radiosurgery Versus Intraoperative Radiotherapy for Glioblastoma. *Front Oncol*. 2021 Oct 28;11:759873. doi: 10.3389/fonc.2021.759873. PMID: 34778080; PMCID: PMC8581360.

8: Ylanan AMD, Pascual JSG, Cruz-Lim EMD, Ignacio KHD, Cañal JPA, Khu KJO. Intraoperative radiotherapy for glioblastoma: A systematic review of techniques and outcomes. *J Clin Neurosci*. 2021 Nov;93:36-41. doi: 10.1016/j.jocn.2021.08.022. Epub 2021 Aug 31. PMID: 34656258.

9: Sarria GR, Cifarelli CP, Kahl H, Giordano FA. In regard to Minniti et al.: Current status and recent advances in resection cavity irradiation of brain metastases-roundup to cover all angles. *Radiat Oncol*.

2021 Jul 10;16(1):127. doi: 10.1186/s13014-021-01854-x. PMID: 34246284; PMCID: PMC8272371.

10: Mansour M, Vitale V, Lombardi G, Riva G, Pancheri F, Zanusso M. Modification of MRI pattern of high-grade glioma pseudoprogression in regorafenib therapy. *J Med Imaging Radiat Oncol*. 2022 Apr;66(3):414-418. doi: 10.1111/1754-9485.13267. Epub 2021 Jun 24. PMID: 34169667.

11: Paiella S, Malleo G, Simoni N, Micera R, Guariglia S, Cavedon C, Marchegiani G, Esposito A, Landoni L, Casetti L, Tuveri M, Milella M, Secchettin E, Manzini G, Bovo C, De Pastena M, Fontana M, Salvia R, Mazzarotto R, Bassi C. A phase II trial proposal of total neoadjuvant treatment with primary chemotherapy, stereotactic body radiation therapy, and intraoperative radiation therapy in borderline resectable pancreatic adenocarcinoma. *BMC Cancer*. 2021 Feb 16;21(1):165. doi: 10.1186/s12885-021-07877-7. PMID: 33593311; PMCID: PMC7885611.

12: Dahshan BA, Weir JS, Bice RP, Renz P, Cifarelli DT, Poplawski L, Hack J, Vargo JA, Cifarelli CP. Dose homogeneity analysis of adjuvant radiation treatment in surgically resected brain metastases: Comparison of IORT, SRS, and IMRT indices. *Brachytherapy*. 2021 Mar-Apr;20(2):426-432. doi: 10.1016/j.brachy.2020.11.004. Epub 2021 Jan 14. PMID: 33454200; PMCID: PMC7979458.

13: Sarria GR, Petrova V, Wenz F, Abo-Madyan Y, Sperk E, Giordano FA. Intraoperative radiotherapy with low energy x-rays for primary and recurrent soft-tissue sarcomas. *Radiat Oncol*. 2020 May 14;15(1):110. doi: 10.1186/s13014-020-01559-7. PMID: 32410696; PMCID: PMC7227262.

14: Cifarelli CP, Brehmer S, Vargo JA, Hack JD, Kahl KH, Sarria-Vargas G, Giordano FA. Intraoperative radiotherapy (IORT) for surgically resected brain metastases: outcome analysis of an international cooperative study. *J Neurooncol*. 2019 Nov;145(2):391-397. doi: 10.1007/s11060-019-03309-6. Epub 2019 Oct 25. PMID: 31654248; PMCID: PMC7007764.

15: Sarria GR, Sperk E, Han X, Sarria GJ, Wenz F, Brehmer S, Fu B, Min S, Zhang H, Qin S, Qiu X, Hänggi D, Abo-Madyan Y, Martinez D, Cabrera C, Giordano FA. Intraoperative radiotherapy for glioblastoma: an international pooled analysis. *Radiother Oncol*. 2020 Jan;142:162-167. doi: 10.1016/j.radonc.2019.09.023. Epub 2019 Oct 16. PMID: 31629553.

16: Krivoschapkin A, Gaytan A, Salim N, Abdullaev O, Sergeev G, Marmazeev I, Cesnulis E, Killeen T. Repeat Resection and Intraoperative Radiotherapy for Malignant Gliomas of the Brain: A History and Review of Current Techniques. *World Neurosurg*. 2019 Dec;132:356-362. doi: 10.1016/j.wneu.2019.09.037. Epub 2019 Sep 16. PMID: 31536810.

17: Förster A, Böhme J, Maros ME, Brehmer S, Seiz-Rosenhagen M, Hänggi D, Wenz F, Groden C, Pope WB, Giordano FA. Longitudinal MRI findings in patients with newly diagnosed glioblastoma after intraoperative radiotherapy. *J Neuroradiol*. 2020 Mar;47(2):166-173. doi: 10.1016/j.neurad.2019.01.090. Epub 2019 Jan 16. PMID: 30659892.

18: García-Vázquez V, Sesé-Lucio B, Calvo FA, Vaquero JJ, Desco M, Pascau J. Surface scanning for 3D dose calculation in intraoperative electron radiation therapy. *Radiat Oncol*. 2018 Dec 7;13(1):243. doi: 10.1186/s13014-018-1181-0. PMID: 30526626; PMCID: PMC6286593.

19: Vargo JA, Sparks KM, Singh R, Jacobson GM, Hack JD, Cifarelli CP. Feasibility of dose escalation using intraoperative radiotherapy following resection of large brain metastases compared to post-operative stereotactic radiosurgery. *J Neurooncol*. 2018 Nov;140(2):413-420. doi: 10.1007/s11060-018-2968-4. Epub 2018 Aug 9. PMID: 30094718; PMCID: PMC6368183.

20: Giordano FA, Brehmer S, Mürle B, Welzel G, Sperk E, Keller A, Abo-Madyan Y, Scherzinger E, Clausen S, Schneider F, Herskind C, Glas M, Seiz-Rosenhagen M, Groden C, Hänggi D, Schmiedek P,

- Emami B, Souhami L, Petrecca K, Wenz F. Intraoperative Radiotherapy in Newly Diagnosed Glioblastoma (INTRAGO): An Open- Label, Dose-Escalation Phase I/II Trial. *Neurosurgery*. 2019 Jan 1;84(1):41-49. doi: 10.1093/neuros/nyy018. PMID: 29528443.
- 21: Llewelyn M, Taylor A. Re-irradiation of cervical and endometrial cancer. *Curr Opin Oncol*. 2017 Sep;29(5):343-350. doi: 10.1097/CCO.0000000000000392. PMID: 28697002.
- 22: Dengina N, Tsimafeyeu I, Mitin T. Current Role of Radiotherapy for Renal- Cell Carcinoma: Review. *Clin Genitourin Cancer*. 2017 Apr;15(2):183-187. doi: 10.1016/j.clgc.2016.09.004. Epub 2016 Sep 19. PMID: 27789182.
- 23: Cristalli G, Mercante G, Marucci L, Soriani A, Telera S, Spriano G. Intraoperative radiation therapy as adjuvant treatment in locally advanced stage tumours involving the middle ear: a hypothesis-generating retrospective study. *Acta Otorhinolaryngol Ital*. 2016 Apr;36(2):85-90. doi: 10.14639/0392-100X-486. Epub 2016 Apr 29. PMID: 27196071; PMCID: PMC4907165.
- 24: Weil RJ, Mavinkurve GG, Chao ST, Vogelbaum MA, Suh JH, Kolar M, Toms SA. Intraoperative radiotherapy to treat newly diagnosed solitary brain metastasis: initial experience and long-term outcomes. *J Neurosurg*. 2015 Apr;122(4):825-32. doi: 10.3171/2014.11.JNS1449. Epub 2015 Jan 23. PMID: 25614945.
- 25: Hsieh J, Elson P, Otvos B, Rose J, Loftus C, Rahmathulla G, Angelov L, Barnett GH, Weil RJ, Vogelbaum MA. Tumor progression in patients receiving adjuvant whole-brain radiotherapy vs localized radiotherapy after surgical resection of brain metastases. *Neurosurgery*. 2015 Apr;76(4):411-20. doi: 10.1227/NEU.0000000000000626. PMID: 25599198.
- 26: Haneder S, Giordano FA, Konstandin S, Brehmer S, Buesing KA, Schmiedek P, Schad LR, Wenz F, Schoenberg SO, Ong MM. ²³Na-MRI of recurrent glioblastoma multiforme after intraoperative radiotherapy: technical note. *Neuroradiology*. 2015 Mar;57(3):321-6. doi: 10.1007/s00234-014-1468-2. Epub 2014 Nov 27. PMID: 25428586.
- 27: Bludau F, Schmidt R, Schneider F, Reis T, Wenz F, Obertacke U, Kayser R. Lehrfähigkeit und Erlernbarkeit einer neu inaugurierten Operationsmethode. Analyse der eigenen Erfahrungskurve und des Weitergabenerfolgs am Beispiel der Kypho-IORT [Learning and teaching abilities of a newly inaugurated operation technique. Analysis of learning curves and transferability exemplified by Kypho- IORT]. *Orthopade*. 2013 Sep;42(9):772-9. German. doi: 10.1007/s00132-013-2072-6. PMID: 23989594.
- 28: Kayser R, Ender SA, Asse E, Wilhelm E, Adler F, Schmidt R, Wenz F, Obertacke U, Bludau F. Kyphoplastie in Kombination mit intraoperativer Radiotherapie. Technische und regulatorische Besonderheiten eines Konzepts zur Behandlung von Wirbelkörpermetastasen [Kyphoplasty in combination with intraoperative radiotherapy. Technical and regulatory characteristics of a concept for treatment of vertebral metastases]. *Orthopade*. 2013 Sep;42(9):765-71. German. doi: 10.1007/s00132-013-2071-7. PMID: 23887850.
- 29: Willich N. Die technischen und methodischen Entwicklungen der Radioonkologie aus ärztlicher Sicht [Technical and methodical developments of radiation oncology from a physician's point of view]. *Strahlenther Onkol*. 2012 Nov;188 Suppl 3:253-62. German. doi: 10.1007/s00066-012-0190-4. PMID: 22895626.
- 30: Lyons M, Phang I, Eljamel S. The effects of PDT in primary malignant brain tumours could be improved by intraoperative radiotherapy. *Photodiagnosis Photodyn Ther*. 2012 Mar;9(1):40-5. doi: 10.1016/j.pdpdt.2011.12.001. Epub 2011 Dec 29. PMID: 22369727.

- 31: Gondi V, Bernard JR Jr, Jabbari S, Keam J, de Amorim Bernstein KL, Dad LK, Li L, Poppe MM, Strauss JB, Chollet CT; ARRO Executive Committee. Results of the 2005-2008 Association of Residents in Radiation Oncology survey of chief residents in the United States: clinical training and resident working conditions. *Int J Radiat Oncol Biol Phys*. 2011 Nov 15;81(4):1120-7. doi: 10.1016/j.ijrobp.2010.07.018. Epub 2010 Oct 6. PMID: 20932679.
- 32: Masaki T, Matsuoka H, Kobayashi T, Abe N, Takayama M, Tonari A, Sugiyama M, Atomi Y. Quality assurance of pelvic autonomic nerve-preserving surgery for advanced lower rectal cancer-preliminary results of a randomized controlled trial. *Langenbecks Arch Surg*. 2010 Aug;395(6):607-13. doi: 10.1007/s00423-010-0655-9. Epub 2010 May 29. PMID: 20512350.
- 33: Telera S, Carapella C, Covello R, Cristalli G, Carosi MA, Pichi B, Spriano G. Malignant peripheral nerve sheath tumors of the lateral skull base. *J Craniofac Surg*. 2008 May;19(3):805-12. doi: 10.1097/SCS.0b013e31816aaac4. PMID: 18520403.
- 34: Colombo F, Francescon P, Cavedon C. [Intraoperative radiotherapy by means of a photon radiosurgical system (PRS400) after removal of recurring glioblastoma]. *Zh Vopr Neurokhir Im N N Burdenko*. 2007 Jul-Sep;(3):39-40. Russian. PMID: 18041212.
- 35: Holmes DR, Baum M, Joseph D. The TARGIT trial: targeted intraoperative radiation therapy versus conventional postoperative whole-breast radiotherapy after breast-conserving surgery for the management of early-stage invasive breast cancer (a trial update). *Am J Surg*. 2007 Oct;194(4):507-10. doi: 10.1016/j.amjsurg.2007.06.018. PMID: 17826067.
- 36: Armoogum KS, Parry JM, Souliman SK, Sutton DG, Mackay CD. Functional intercomparison of intraoperative radiotherapy equipment - Photon Radiosurgery System. *Radiat Oncol*. 2007 Feb 27;2:11. doi: 10.1186/1748-717X-2-11. PMID: 17326838; PMCID: PMC1808461.
- 37: Kalapurakal JA, Goldman S, Stellpflug W, Curran J, Sathiaselvan V, Marymont MH, Tomita T. Phase I study of intraoperative radiotherapy with photon radiosurgery system in children with recurrent brain tumors: preliminary report of first dose level (10 Gy). *Int J Radiat Oncol Biol Phys*. 2006 Jul 1;65(3):800-8. doi: 10.1016/j.ijrobp.2006.01.006. Epub 2006 Apr 3. PMID: 16580791.
- 38: Kirkpatrick JP, Cárdenas-Navia LI, Dewhirst MW. Predicting the effect of temporal variations in PO2 on tumor radiosensitivity. *Int J Radiat Oncol Biol Phys*. 2004 Jul 1;59(3):822-33. doi: 10.1016/j.ijrobp.2004.02.015. PMID: 15183486.
- 39: Shinoda J, Sakai N, Nakatani K, Funakoshi T. Prognostic factors in supratentorial WHO grade II astrocytoma in adults. *Br J Neurosurg*. 1998 Aug;12(4):318-24. doi: 10.1080/02688699844817. PMID: 10070423.
- 40: Kubo O, Muragaki Y, Iseki H, Takakura K. [Clinical evaluation of intraoperative radiotherapy using photon radiosurgery system for brain tumors]. *Gan To Kagaku Ryoho*. 1998 Jul;25(9):1348-51. Japanese. PMID: 9703825.
- 41: Shinoda J, Sakai N, Hara A, Ueda T, Sakai H, Nakatani K. Clinical trial of external beam-radiotherapy combined with daily administration of low-dose cisplatin for supratentorial glioblastoma multiforme—a pilot study. *J Neurooncol*. 1997 Oct;35(1):73-80. doi: 10.1023/a:1005816320920. PMID: 9266443.
- 42: Kato H, Wakasugi H, Yokota M, Furukawa M, Mukuta T, Yamada Y, Funakoshi A. Effectiveness of chemotherapy for advanced adenocarcinoma of the pancreas in combined modality therapy. *Intern Med*. 1994 Mar;33(3):142-6. doi: 10.2169/internalmedicine.33.142. PMID: 8061389.

43: Fuse Y, Fujita N. [The assessment and management of cancer pain]. Gan To Kagaku Ryoho. 1992 Mar;19(3):286-93. Japanese. PMID: 1543356.

44: Kofler A, Fritsch E, Maier H, Kamleitner H, Kostron H. Intraoperative Bestrahlung (IORT) von Hirngliomen [Intraoperative radiotherapy of brain gliomas]. Wien Klin Wochenschr. 1990 Sep 28;102(18):528-31. German. PMID: 2264344.

From:

<https://neurosurgerywiki.com/wiki/> - **Neurosurgery Wiki**

Permanent link:

https://neurosurgerywiki.com/wiki/doku.php?id=intraoperative_radiotherapy

Last update: **2024/06/07 02:58**

