

## Clinical studies

**Excluded studies--8.1 What radiotherapy techniques are effective for excluding the heart from the radiation field without compromising coverage of the whole breast target volume for people with early or locally advanced breast cancer?**

Study	Reason for exclusion
Bartlett, F. R., Colgan, R. M., Carr, K., Donovan, E. M., McNair, H. A., Locke, I., Evans, P. M., Haviland, J. S., Yarnold, J. R., Kirby, A. M., The UK HeartSpare Study: randomised evaluation of voluntary deep-inspiratory breath-hold in women undergoing breast radiotherapy, <i>Radiotherapy &amp; Oncology</i> <i>Radiother Oncol</i> , 108, 242-7, 2013	Other published article of this study has been included
Bartlett, F. R., Colgan, R. M., Donovan, E. M., Carr, K., Landeg, S., Clements, N., McNair, H. A., Locke, I., Evans, P. M., Haviland, J. S., Yarnold, J. R., Kirby, A. M., Voluntary breath-hold technique for reducing heart dose in left breast radiotherapy, <i>Journal of Visualized Experiments</i> <i>J</i> , 89, 03, 2014	Does not report primary study data
Bartlett, F. R., Yarnold, J. R., Donovan, E. M., Evans, P. M., Locke, I., Kirby, A. M., Multileaf collimation cardiac shielding in breast radiotherapy: Cardiac doses are reduced, but at what cost?, <i>Clinical Oncology</i> , 25, 690-696, 2013	Retrospective study
Becker-Schiebe, M., Stockhammer, M., Hoffmann, W., Wetzel, F., Franz, H., Does mean heart dose sufficiently reflect coronary artery exposure in left-sided breast cancer radiotherapy?: Influence of respiratory gating, <i>Strahlentherapie und Onkologie</i> , 192, 624-631, 2016	Retrospective study, not meeting inclusion criteria
Bergom, C., Kelly, T., Bedi, M., Saeed, H., Prior, P., Rein, L. E., Szabo, A., Wilson, J. F., Currey, A. D., White, J., Association of Locoregional Control With High Body Mass Index in Women Undergoing Breast Conservation Therapy for Early-Stage Breast Cancer, <i>International Journal of Radiation Oncology Biology Physics</i> , 96, 65-71, 2016	Outcomes related to cardiac sparing not reported

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Study	Reason for exclusion
Bergom, C., Kelly, T., Morrow, N., Wilson, J. F., Walker, A., Xiang, Q., Ahn, K. W., White, J., Prone whole-breast irradiation using three-dimensional conformal radiotherapy in women undergoing breast conservation for early disease yields high rates of excellent to good cosmetic outcomes in patients with large and/or pendulous breasts, <i>International Journal of Radiation Oncology Biology Physics</i> , 83, 821-828, 2012	Exclusion by Outcomes: Cardiac sparing outcomes not reported.
Bergom, C., Prior, P., Kainz, K., Morrow, N. V., Ahunbay, E. E., Walker, A., Allen Li, X., White, J., A phase I/II study piloting accelerated partial breast irradiation using CT-guided intensity modulated radiation therapy in the prone position, <i>Radiotherapy &amp; Oncology</i> , 108, 215-9, 2013	Exclusion by Outcome: Cardiac sparing outcomes not reported
Brouwers, P. J. A. M., Lustberg, T., Borger, J. H., van Baardwijk, A. A. W., Jager, J. J., Murrer, L. H. P., Nijsten, S. M. J. J. G., Reymen, B. H., van Loon, J. G. M., Boersma, L. J., Set-up verification and 2-dimensional electronic portal imaging device dosimetry during breath-hold compared with free breathing in breast cancer radiation therapy, <i>Practical Radiation Oncology</i> , 5, e135-e141, 2015	Exclusion by outcome: Outcomes of interest not reported
Bush, D. A., Slater, J. D., Garberoglio, C., Yuh, G., Hocko, J. M., Slater, J. M., A technique of partial breast irradiation utilizing proton beam radiotherapy: comparison with conformal x-ray therapy, <i>Cancer Journal</i> , 13, 114-8, 2007	Partial breast irradiation
Cahlon, O., MacDonald, S., Increased cardio and cerebrovascular mortality in breast cancer patients treated with postmastectomy radiotherapy - 25 year follow-up of a randomised trial from the South Sweden Breast Cancer Group: Killander F, Anderson H, Kjellen E, et al (Skane Univ Hosp, Lund, Sweden; Lund Univ, Sweden) <i>Eur J Cancer</i> 50:2201-2210, 2014, <i>Breast Diseases</i> , 26, 74-76, 2015	Does not report on cardiac sparing
Chiu, G., Fung, W. W. K., Wu, V. W. C., Geometric and actual dose delivery accuracy in supine and prone position of breast tomotherapy, <i>Radiotherapy and Oncology</i> , 115, S596-S597, 2015	Abstract

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Conway, J. L., Conroy, L., Harper, L., Scheifele, M., Li, H., Smith, W. L., Graham, T., Phan, T., Olivotto, I. A., Deep inspiration breath-hold produces a clinically meaningful reduction in ipsilateral lung dose during locoregional radiation therapy for some women with right-sided breast cancer, <i>Practical Radiation Oncology</i> , 7, 147-153, 2017	Related to reducing doses to lung in right sided breast cancer patients
Cozzi, L., Fogliata, A., Nicolini, G., Rancati, T., Bernier, J., Breast irradiation with three conformal photon fields for patients with high lung involvement, <i>Acta Oncologica</i> , 43, 558-566, 2004	Outcomes related to lung. No comparison
Darapu, A., Balakrishnan, R., Sebastian, P., Kather Hussain, M. R., Ravindran, P., John, S., Is the Deep Inspiration Breath-Hold Technique Superior to the Free Breathing Technique in Cardiac and Lung Sparing while Treating both Left-Sided Post-Mastectomy Chest Wall and Supraclavicular Regions, <i>Case Reports in Oncology</i> , 10, 37-51, 2017	Prospective study with less than 30 patients
de Almeida, C. E., Fournier-Bidoz, N., Massabeau, C., Mazal, A., Canary, P. C., Kuroki, I. R., Campana, F., Fourquet, A., Kirova, Y. M., Potential benefits of using cardiac gated images to reduce the dose to the left anterior descending coronary during radiotherapy of left breast and internal mammary nodes, <i>Cancer RadiotherapieCancer Radiother</i> , 16, 44-51, 2012	Case report
De Puyseleyn, A., De Neve, W., De Wagter, C., A patient immobilization device for prone breast radiotherapy: Dosimetric effects and inclusion in the treatment planning system, <i>Physica Medica</i> , 32, 758-66, 2016	No patient specific data
De Puyseleyn, A., Mulliez, T., Gulyban, A., Bogaert, E., Vercauteren, T., Van Hoof, T., Van de Velde, J., Van Den Broecke, R., De Wagter, C., De Neve, W., Improved cone-beam computed tomography in supine and prone breast radiotherapy. Surface reconstruction, radiation exposure, and clinical workflow, <i>Strahlentherapie und Onkologie</i> , 189, 945-50, 2013	Cadaveric study
De Puyseleyn, A., Veldeman, L., Bogaert, E., De Wagter, C., De Neve, W., Optimizing image acquisition settings for cone-beam computed tomography in supine and prone breast radiotherapy, <i>Radiotherapy and Oncology</i> , 100, 227-230, 2011	Phantom study

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<b>Study</b>	<b>Reason for exclusion</b>
Eldredge-Hindy, H. B., Duffy, D., Yamoah, K., Simone, N. L., Skowronski, J., Dicker, A. P., Anne, P. R., Modeled risk of ischemic heart disease following left breast irradiation with deep inspiration breath-hold, <i>Practical Radiation Oncology</i> , 5, 162-168, 2015	Research Question does not relate to cardiac sparing intervention
Fung, E., Hendry, J., External beam radiotherapy (EBRT) techniques used in breast cancer treatment to reduce cardiac exposure, <i>Radiography</i> , 19, 73-78, 2013	Review article
Hayden, A. J., Rains, M., Tiver, K., Deep inspiration breath-hold technique reduces heart dose from radiotherapy for left-sided breast cancer, <i>Journal of Medical Imaging and Radiation Oncology</i> , 56, 464-472, 2012	Not enough data for extracting data for comparison
Lee, H. Y., Chang, J. S., Lee, I. J., Park, K., Kim, Y. B., Suh, C. O., Kim, J. W., Keum, K. C., The deep inspiration breath-hold technique using Abches reduces cardiac dose in patients undergoing left-sided breast irradiation, <i>Radiation Oncology Journal</i> , 31, 239-246, 2013	Prospective study with less than 30 patients
Lin, A., Sharieff, W., Juhasz, J., Whelan, T., Kim, D. H., The benefit of deep inspiration breath-hold: evaluating cardiac radiation exposure in patients after mastectomy and after breast-conserving surgery, <i>Breast Cancer</i> , 24, 86-91, 2017	There are two subgroups reported separately. Each less than 30 in sample size
Lomax, A. J., Cella, L., Weber, D., Kurtz, J. M., Miralbell, R., Potential role of intensity-modulated photons and protons in the treatment of the breast and regional nodes, <i>International journal of radiation oncology, biology, physics</i> , 55, 785-92, 2003	Plans based on data of one patient
Merino Lara, T. R., Fleury, E., Mashouf, S., Helou, J., McCann, C., Ruschin, M., Kim, A., Makhani, N., Ravi, A., Pignol, J. P., Measurement of mean cardiac dose for various breast irradiation techniques and corresponding risk of major cardiovascular event, <i>Frontiers in Oncology</i> , 4, 284, 2014	Phantom study
Mowery, Y. M., Blitzblau, R. C., The UK HeartSpare Study (Stage IB): Randomised comparison of a voluntary breath-hold technique and prone	Same as Barlett 2015

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radiotherapy after breast conserving surgery, <i>Breast Diseases</i> , 26, 237-239, 2015	
Mulliez, T., Speleers, B., Mahjoubi, K., Remouchamps, V., Gilsoul, M., Veldeman, L., Van den Broecke, R., De Neve, W., Prone left-sided whole-breast irradiation: Significant heart dose reduction using end-inspiratory versus end-expiratory gating, <i>Cancer/Radiotherapie</i> , 18, 672-677, 2014	Less than 30 patients. Does not meet inclusion criteria
Nilsson, G., Blomqvist, C., Breast cancer radiotherapy and coronary artery disease: Hazards and protection of organs at risk, <i>Breast Cancer Management</i> , 1, 13-16, 2012	Editorial
Osa, E. O. O., Dewyngaert, K., Roses, D., Speyer, J., Guth, A., Axelrod, D., Fenton Kerimian, M., Goldberg, J. D., Formenti, S. C., Prone breast intensity modulated radiation therapy: 5-year results, <i>International Journal of Radiation Oncology Biology Physics</i> , 89, 899-906, 2014	5 year follow up study. Critical outcomes not reported
Osa, E. O., Huppert, N., Fenton-Kerimian, M., Goldberg, J. D., Jozsef, G., DeWyngaert, K., Formenti, S. C., Prospective randomized trial of prone accelerated whole breast radiation therapy with a concurrent daily versus weekly boost to the tumor bed: Acute toxicity, <i>International Journal of Radiation Oncology Biology Physics</i> , 84, S84-S85, 2012	Comparison here is concurrent versus weekly boost
Sayan, M., Hopkins, W. E., Heimann, R., Deep inspiration breath-hold (DIBH) technique to reduce cardiac radiation dose in the management of breast cancer, <i>Anti-Inflammatory and Anti-Allergy Agents in Medicinal Chemistry</i> , 15,e2-14, 2016	Review article
Scull, A., Irradiation of pendulous breasts: Prone vs supine, a systematic review, <i>Journal of medical imaging and radiation oncology</i> , 58, 158, 2014	Conference Abstract.
Sixel, K. E., Aznar, M. C., Ung, Y. C., Deep inspiration breath-hold to reduce irradiated heart volume in breast cancer patients, <i>International Journal of Radiation Oncology Biology Physics</i> , 49, 199-204, 2001	Study includes 5 participants

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Study	Reason for exclusion
Smyth, L. M., Knight, K. A., Aarons, Y. K., Wasiak, J., The cardiac dose-sparing benefits of deep inspiration breath-hold in left breast irradiation: A systematic review, <i>Journal of Medical Radiation Sciences</i> , 62, 66-73, 2015	Systematic review with no additional studies
Stick, L. B., Yu, J., Maraldo, M. V., Aznar, M. C., Pedersen, A. N., Bentzen, S. M., Vogelius, I. R., Joint Estimation of Cardiac Toxicity and Recurrence Risks After Comprehensive Nodal Photon Versus Proton Therapy for Breast Cancer, <i>International Journal of Radiation Oncology Biology Physics</i> , 97, 754-761, 2017	Critical outcomes not reported
Swanson, T., Grills, I. S., Ye, H., Entwistle, A., Teahan, M., Letts, N., Yan, D., Duquette, J., Vicini, F. A., Six-year experience routinely using moderate deep inspiration breath-hold for the reduction of cardiac dose in left-sided breast irradiation for patients with early-stage or locally advanced breast cancer, <i>American Journal of Clinical Oncology: Cancer Clinical Trials</i> , 36, 24-30, 2013	Not enough data in outcome measures for comparison
Tanguturi, S. K., Lyatskaya, Y., Chen, Y., Catalano, P. J., Chen, M. H., Yeo, W. P., Marques, A., Truong, L., Yeh, M., Orlina, L., Wong, J. S., Punglia, R. S., Bellon, J. R., Prospective assessment of deep inspiration breath-hold using 3-dimensional surface tracking for irradiation of left-sided breast cancer, <i>Practical Radiation Oncology</i> , 5, 358-365, 2015	Conference Abstract available. Full text not available.
Trela, K., Eberhardt, B., Bereza, I., Misztal, L., Gabrys, D., Prone versus supine breast irradiation in early stage breast cancer patients, 69, 2009	Conference Abstract
Verhoeven, K., Sweldens, C., Petillion, S., Laenen, A., Peeters, S., Janssen, H., Van Limbergen, E., Weltens, C., Breathing adapted radiation therapy in comparison with prone position to reduce the doses to the heart, left anterior descending coronary artery, and contralateral breast in whole breast radiation therapy, <i>Practical Radiation Oncology</i> , 4, 123-129, 2014	Each comparison less than 30 sample size