Bibliographic reference	Study type/ Design	Study quality (risk of bias)	Sample size n=	Participant characteristics	Participant Positioning/ Setup	Immobilization device if used
Xiang Q, Jie W, Zhu K, Wang Q, Cheng J. **Which technique of positioning and immobilization is better for breast cancer patients in postmastectomy IMRT, single-pole or double-pole immobilization?** Journal of applied clinical medical physics. 2019;20(1):168-74.	Non-randomised comparison. Single pole to ipsilateral side (both hands on single pole) vs double pole	Low to moderate	Single pole= 54 Double pole =40 N=94 in total	Age 30 to 66 years (range) Approx 50% with left lesions, Mean weight 58.81 Kg (+/- 8.11) single pole 56.5 kg (+/-8.05)	Supine Breast board apparatus Both arms extended above their head. Head was turned to the contralateral side of the affected breast	Breast bracket (with elevation *based on image only, not described) 5 mm thermoplastic mold
Kawamura, M., Maeda, Y., Yamamoto, K., Takamatsu, S., Sato, Y., Minami, H., … Naganawa, S. (2017). **Development of the breast immobilization system in prone setup: The effect of bra in prone position to improve the breast setup error.** Journal of applied clinical medical physics, 18(4), 155–160. doi:10.1002/acm2.12116	Cross-over design repeated within patient to image with and without the bra using MRI	Low to moderate	Breast cancer patients N=33 34 lesions in total	Median age- N/A, Mean weight-N/A Cancer stage -N/A Breast size: range 156 – 1,432 cc (median 498 cc)	Prone breast board	With and without a modified commercial bra Bra settings marked on Velcro or on skin
Arimura T, Ogino T, Yoshiura T, Matsuyama M, Kondo N, Miyazaki H, et al. **A feasibility study of a hybrid breast-immobilization system for early breast cancer in proton beam therapy.** Medical physics. 2017;44(4):1268-74.	Non-patient study Single phantom, ten repeated set-ups to assess daily variability with and without the breast cup/immobilization	Moderate	N/A	phantom characteristics: a 60-year-old woman unclear breast volume	A special breast-immobilizing system (HyBIS; hybrid breast-immobilizing system) set-up that allows immobilization of the patient/phantom in a body cast, with a custom-made breast cup, that has a nipple hole for location.	An immobilization couch and vacuum body immobilizer with a separate custom-made breast cup.
De Puysseleyr A, De Neve W, De Wagter C. **A patient immobilization device for prone breast radiotherapy: Dosimetric effects and inclusion in the treatment planning system.** Phys Med. 2016 Jun;32(6):758-66. doi: 10.1016/j.ejmp.2016.04.013.	Non-patient study, physics dosimetric study	N/A	N/A	N/A	Prone	Orfit All-in-One Solution (carbon fiber baseplate, support cushions and wedge support for contralateral breast)

Kapanen M, Laaksomaa M, Skyttä T, Haltamo M, Pehkonen J, Lehtonen T, et al. **Residual position errors of lymph node surrogates in breast cancer adjuvant radiotherapy: Comparison of two arm fixation devices and the effect of arm position correction** Med Dosim. 2016 Spring;41(1):47-52. doi: 10.1016/j.meddos.2015.08.001.	Retrospective study comparing patients in two different arm positioning	High	n=113, consecutive left-sided pts Standard wrist-hold (WH) =53 House-made rod-hold(RH)= 60	Mean age, -56 yr Left breast cancer Post- breast conserving surgery	Supine Both arms extended above their head.	Candor ConBine fixation device (Candor,Gislev,Denmark) Standard wrist-hold vs House-made rod-hold
Agostinelli S, Garelli S, Bellini A, Pupillo F, Guenzi M, Bosetti D, et al. **Helical Tomotherapy of the breast: can thermoplastic immobilization improve the reproducibility of the treatment setup and the accuracy of the delivered dose?**Phys Med. 2015 Feb;31(1):49-53. doi: 10.1016/j.ejmp.2014.09.007.	Randomized comparison	Low	n= 16	Age: N/A Weight (Kg): No data presented Stage: No data	Supine Both arms extended above head. 5 tattoos: central reference, two lateral tattoos for coronal alignment and two cranio-caudal tattoos for sagittal alignment. The setup red lasers on skin tattoos with Civco Wing Board (WB group=Wing Board only) or on shell marks on Orfit thermoplastic mask (extending from the neck to the whole breast) (WB + O group= Civco Wing Board + Orfit).	Wing Board (Civco) +/- thermoplastic mask 8 patients: (, thermoplastic mask, fixed to Civco AIO indexed base plate, + five marks on mask shell. 8 patients: no additional mask
Cheng KF, Wu VW. **Comparison of the effectiveness of different immobilization systems in different body regions using daily megavoltage CT in helical tomotherapy.** Br J Radiol. 2014 Feb;87(1034):20130494. doi: 10.1259/bjr.20130494.	Retrospective, non-randomized comparison study	High	n=18 Breast	Age: N/A Weight (Kg): N/A Stage: N/A	Supine 1)Supine on VacLok and headrest Both arms extended above their head. Prone: Prone breast board, with a small VacLok under head, and a contralateral breast wedge	VacLok® system (CIVCO Medical Solutions, Orange City, IA) BodyFIX® system (Medical Intelligence, Medizintechnik GmbH, Schwabmünchen, Germany)

Kelly A, Hardcastle N, Metcalfe P, Cutajar D, Quinn A, Foo K, et al. **Surface dosimetry for breast radiotherapy in the presence of immobilization cast material.** Phys Med Biol. 2011 Feb 21;56(4):1001-13. doi: 10.1088/0031-9155/56/4/008.	Non-patient study dosimetry phantom study	N/A	N/A	Rigid anthropomorphic phantom Pendulous breasts D-size	Supine Alpha-cradle Aligned using room laser alignment to markers placed at the time of simulation.	Orfit immobilization device (Orfit Industries America, NY, USA) = unstretched = 2.6mm thick Thick vs thin immobilization cast material
Strydhorst JH, Caudrelier JM, Clark BG, Montgomery LA, Fox G, MacPherson MS. **Evaluation of a thermoplastic immobilization system for breast and chest wall radiation therapy.** Med Dosim. 2011 Spring;36(1):81-4. doi: 10.1016/j.meddos.2010.01.001.	Cohort study	High	n= 8 total 3=lumpectomy (1 left-sided, 2 right-sided) 5=mastectomy (3 right-sided, 1 left-sided, 1 Bilateral)	Patient from another trial locoregional XRT post lumpectomy or mastectomy Age: N/A Weight (Kg): N/A Stage: IIb–III (+LN involvement upfront)	Supine Both arms extended above their head Lumpectomy: ipsilateral breast pushed up to the front of the chest and the contralateral breast fall to the side Mastectomy: bolus on top of the thermoplastic shell over the surgical bed	Breastboard (CIVCO) + Thermoplastic immobilization (~3mm) extending from the shoulders to the ribcage
Bush DA, Slater JD, Garberoglio C, Yuh G, Hocko JM, Slater JM. **A technique of partial breast irradiation utilizing proton beam radiotherapy: comparison with conformal x-ray therapy.** Cancer J. 2007 Mar-Apr;13(2):114-8.	Single cohort study with no comparator	Not able to assess	n= 20 (Prone device), 10 only for dosimetry comparison	Age :N/A Weight (Kg):N/A Stage: <3CM Post lumpectomy	Prone	Treatment brassiere (Med-Tec Inc., Orange City, IA) Breast prone in cylindrical polyvinyl chloride shell with the upper and lower body supported and immobilized with Vac-Lok foam vacuum bead cushions Upper chest and breast areas are immobilized with two-part expandable foam.
Yu CX, Shao X, Zhang J, Regine W, Zheng M, Yu YS, et al. **GammaPod-a new device dedicated for stereotactic radiotherapy of breast cancer.** Med Phys. 2013 May;40(5):051703. doi: 10.1118/1.4798961.	Feasibility study	Not able to assess	N/A	Race: N/A Age: N/A Weight (Kg) N/A Stage: N/A 3 artificial clinical cases	Prone	A patented breast immobilization cup with a two-layer design using negative air pressure Vacuum-assisted breast immobilization cup with built-in stereotactic frame for GammaPod treatment

Arenas M, Hernandez V, Farrus B, Muller K, Gascon M, Pardo A, et al. **Do breast cups improve breast cancer dosimetry? A comparative study for patients with large or pendulous breasts.** Acta Oncol. 2014 Jun;53(6):795-801. doi: 10.3109/0284186X.2014.893062.	Non-randomized, Self-controlled patient study (with/out breast cup)	Low	n= 12 Each patient scanned with/out breast cup	Age N/A Weight (Kg) N/A Stage: stage I and II breast carcinoma Large: D size breast cup) Pendulous: breast tissue that fall towards the mid-axillary line or farther posteriorly and superiorly	Supine 10–20° inclined on breast-board Ipsilateral arm extended above head Contralateral breast compressed towards the rib cage by a cloth strap	Breast cups (CIVCO Medical Solutions, Kalona, IA, USA) held in place by a non-elastic cloth strap fixed around the patient's body Cups = 0.50 ± 0.05 mm thick transparent plastic material
Wroe AJ, Bush DA, Schulte RW, Slater JD. **Clinical immobilization techniques for proton therapy.** Technol Cancer Res Treat. 2015 Feb;14(1):71-9. doi: 10.7785/tcrt.2012.500398.	Summary paper	Not able to assess	N/A	Age N/A Weight (Kg) N/A Stage: N/A	Prone	Vacuum bags shaped to conform to the pod and patient contour. Clear plastic breast cup sized to the patient for breast support, with the nipple indexed to the central axis opening on the breast cup.
Gary Dillon, Robert Woodburn, Phillip Kulig, **A QA Analysis of a Contrast Localized Linac-Based Technique for Hypo-Fractionated Partial Breast Radiotherapy** International Journal of Radiology Vol2, No1(2015)	Prospective study phase II trial	Not able to assess with only QA data	n= 10 (6 left-sided, 4 right-sided)	Stage: early stage breast ca	Supine 3 internal gold-seed markers inside the surgical bed post-surgery	Elekta Stereotactic Body Frame (SBR) body frame with diaphragmatic plunger to reduce breathing
Lei Shi, Chunbo He, Xu Guo, Lisong Zhao, Tianyi Fu, Beiqiu Han. **A new method to deliver breast and chest wall radiation in breast radiotherapy for lung and heart sparing.** Int J Clin Exp Med 2016;9(7):13484-13492	Retrospective, non-randomized, patient selected based on poor dose distribution	Moderate	n= 42 (20=CCB-TPM)	Age 42years (median) Weight (Kg)-N/A Stage: T1N0M0 or stage Tis. Post lumpectomy	Supine Both arms extended above their head.	Wedged Breast-Board (WBB) vs. Commercial carbonic board fixed by a thermoplastic porous membrane (CCB-TPM)
Snider JW, Mutaf Y, Nichols E, Hall A, Vadnais P, Regine WF, et al. **Dosimetric Improvements with a Novel Breast Stereotactic Radiotherapy Device for Delivery of Preoperative Partial-Breast Irradiation.** Oncology. 2017;92(1):21-30. doi: 10.1159/000449388.	Cross-over design planning study	Low	n= 15	Stage: N/A breast conservation therapy	Prone	Breast-specific stereotactic radiotherapy device (BSRTD) – GammaPod. Vacuum-assisted breast immobilization device uses a 2-layered cup secured to the breast using negative pressure

Note: The papers that were selected based on the title and after reading were not used in the guideline are greyed out in the evidence table.

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